

JUNE 1986
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THE RECORDING INDUSTRY MAGAZINE

Mix

Interview: Ry Cooder

**Directory:
Remote Recording
& Sound Reinforcement**

**Russ Titelman
Equipment Roadability**

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**Jimmy Buffett
Getting the Most from Remotes
Joe Jackson's Big World
CD-ROM/CD-I**

You rehearsed long hours. Spent more hours laying down tracks. And a few more adding overdubs. Now it's time to mix down to your stereo master. This is no place for compromise. Insist on a two-track recorder from Studer Revox, a company dedicated to music mastering perfection.

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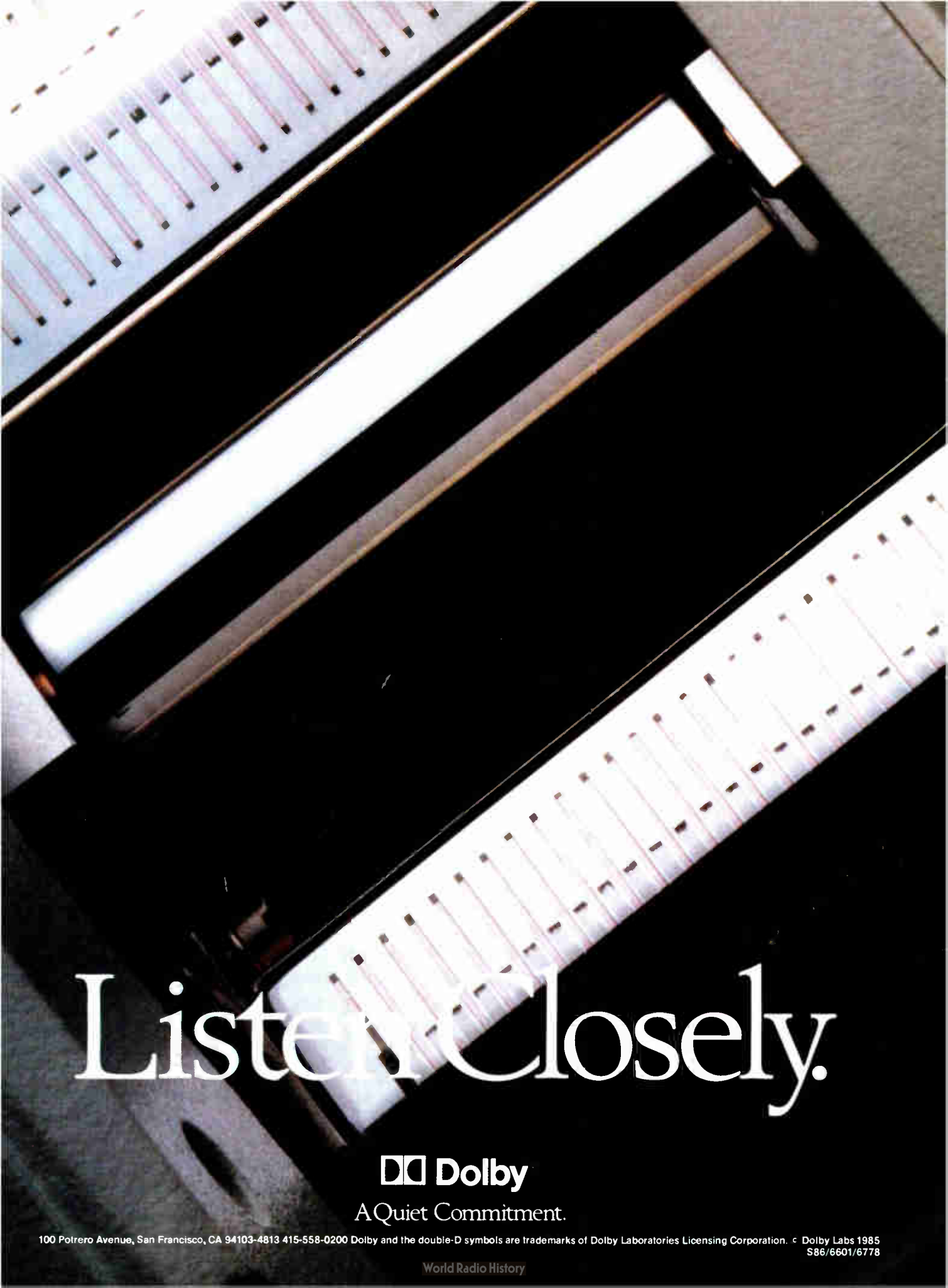
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World Radio History

Mix

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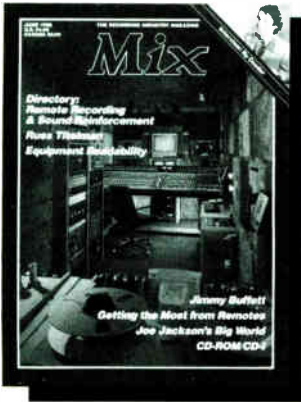
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This month's cover: The Midcom remote truck, based in the Dallas Communications Complex, offers 48-track audio and audio-for-video recording. Features include two Otari MTR-90 II 24-tracks, BTX SMPTE synchronization, JBL 4430 Biradial monitors, and a Soundcraft TS-24 console. The truck also travels with 400 feet of 42-pair snake and power cable. Cover photo: by Paul Talley.



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The life of the musician has changed considerably over the last couple of years. The rise of MIDI interfacing of electronic instruments, the proliferation of software for computer musicians and the rampant marketing of new instruments and products for musicians that we see at events such as this month's NAMM (National Association of Music Merchants) show in Chicago have all contributed to a quickly changing world for the kind of people who once spent the majority of their commitment honing their performance skills and trying to find work.

The change first struck me many years ago when reading a story in one of the magazines about how Wilson Pickett had purchased a professional 4-track recorder and put it in his basement so he could write songs and "overdub" parts. This was a relatively new concept at the time, a musician getting involved with professional equipment at home. Sure, Les Paul and others had played around with audio technology in their garages and basements, but this Wilson Pickett article seemed to suggest that soon it might be common for many musicians to take the recording process into their own hands and mine their creativity with the appropriate tools.

Then the floodgates opened. The Teac 3340, the Portastudio, Otari, Fostex . . . and the personal multi-track revolution was touching everyone.

This latest phase of the revolution has brought the rapidly emerging computer consciousness into the realm of the mainstream musician and has quickly changed the way much of today's music is composed, recorded (or is it stored?) and performed.

Musicians are still the lifeblood of the professional audio industry, however their changes must be tracked closely by the engineers, producers and technicians right now for this change to proceed in everyone's best interest. A musician who becomes too independent in realizing his or her creations runs the risk of a limited perspective and loses the objectivity a technical partner can bring to the artistic creation. On the other hand, a technical or production assistant who has failed to keep up with the increasing sophistication of the musician's tools can frustrate the musical artist to the point of loss of inspiration and synergy in this crucial relationship.

Whether the music is traditional or fresh off the hard disk, today's successful audio technologists must constantly refine their expertise in both the tools of the musician and those audio and video devices that capture and recreate the musical experience. This level of understanding has never been as demanding or as important as it is today.

Concentrating on this critical relationship between music and technology is high on our list of concerns and we'll do our best to follow the progress of this latest phase of the revolution. In this, our NAMM issue, we'll look at some of the new challenges faced by those who deal with concert sound and remote recording.

Keep reading,

A handwritten signature in black ink, appearing to read 'D. Schwartz'.

David M. Schwartz
Editor/Publisher

CURRENT

Studer/Philips Joint Venture

Willi Studer A.G. and N.V. Philips announced a joint venture agreement at the April National Association of Broadcasters Convention to research and develop Compact Disc-related professional audio systems. The joint venture will not affect on-going independent developments by both companies in the areas of magnetic tape recording and optical disk mastering systems. The first visible result of the pact will be Studer Revox America's U.S. marketing of the Philips Professional CD Player System LHH 2000 and the Philips CD Subcode Editor LHH 0425.

LaserVideo to Build Largest U.S. CD Plant

LaserVideo, Inc., a division of Quixote Corporation, has acquired a 253,000 square foot plant in Huntsville, Alabama, for the manufacture of Compact Discs. The company, which manufactured the first U.S. Compact Disc in 1983, intends production capacity to be approximately 50 million CDs per year at the new facility, with operation beginning in the last quarter of 1986 or first quarter of 1987. LaserVideo's original plant in Anaheim, California, has an annual capacity of two to three million CDs presently.

Denon CD Plant for Georgia

Denon Digital Industries Inc., a newly formed division of Nippon Columbia Ltd. of Tokyo, Japan, has announced plans for a \$30 million CD production plant to begin production in March, 1987, in Madison, Georgia. The factory will eventually employ 200 at a peak production of one million Compact Discs per month. Denon anticipates tripling the size and output of the plant as demand for CDs increases in the 1990s. Denon's parent company, Nippon Columbia, Ltd., currently manufactures Compact Discs in Japan for the Denon, Arista and RCA labels.

AKG Acquires Ursa Major

AKG Acoustics has announced the acquisition of all assets and trademarks of Ursa Major, establishing a new "Digital Products Division" within AKG Acoustics. The former Boston-based Ursa Major facility will now become AKG's U.S. center for digital product development. AKG Acoustics, Stamford, CT, facility will handle all U.S. sales and marketing, export and administration of the new division, with Christopher Moore heading up the product development team as executive vice president.

Ampex to Buy 20 Percent of Cubicomp

Ampex Corporation has reached agreement with Berkeley, California-based 3D computer graphics system maker Cubicomp Corp. to purchase 20 percent ownership of the company and to hold rights to market and manufacture Cubicomp's PictureMaker™ 3D graphics animation products to the television broadcast and post-production industry. Under the terms of the agreement, Ampex will immediately integrate PictureMaker products into its video graphics and special effects systems product line. The two companies plan to co-develop new products for the television broadcast and post-production industry.

Abeles Forms A/V Technology

Gerald Abeles, former vice-president of marketing for Ursa Major Inc., has formed A/V Technology International, to represent and distribute professional products for recording, production and post-production facilities involved with music, audio, video, film, broadcast and multimedia. The intent of the new company will be to handle outstanding products from European, Asian and Pacific manufacturers in the North American Market, and to represent American products overseas. A/V Technology will operate out of Newton Centre, MA and can be reached at (617) 965-5656.

ANT Opens U.S. Office

ANT Telecommunication, the West German telecommunication transmission engineering firm with 1985 sales of over \$400 million, has opened a U.S. subsidiary called ANT Telecommunication, Inc., located in Gaithersburg, Maryland, phone (301) 670-9777. Their wide range of electronics and telecommunications products include the telecom c4 compander noise reduction system. Jost A. Spielvogel is president of the U.S. subsidiary.

Sony/Ampex Betacam License Agreement

Ampex Corporation and Sony Broadcast Products Company have signed a licensing agreement allowing Ampex to independently manufacture and market products complying with Sony's half-inch Betacam video recording format. The agreement covers Betacam portable component video recorders, studio recorders, cameras and other developments within the format. The Betacam format is widely used in ENG/EFP applications, with over 25,000 units shipped since 1981. An improved version of the format with longer playing times and two additional audio channels, called Betacam SP, was shown at the Dallas NAB.

Roland Sues Grey Market Dealers

Roland Corporation U.S. has filed in the U.S. District Court for the Central District of California against the L.A.-based ABC International Traders, Inc., who have been marketing Roland and Boss brand electronic musical equipment intended by the Japanese manufacturer for non U.S. distribution. According to Roland officials, this type of "grey market" activity jeopardizes the safety of the users with respect to electrical considerations and also presents serious conflicts with respect to service and repair work for the users of such equipment. ABC has complied with a temporary restraining order pending the final resolution of the suit.

THE STRONGEST LINK

Otari's new EC-101 synchronizer module, when combined with the MTR-90 audio machine, creates an entirely new audio post-production system that uses a time-code-only link, via mic cable, with the master. This unique "pre-engineered" combination offers performance well beyond that of any other audio tape recorder.



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So if your studio must stay current into the 1990's, or if your facility is now expanding into post-production, your timing is perfect. The breakthrough technology that gives you the best performing tape recorder in the world is here. And if you already own a MTR-90-II, an EC-101 is available as a plug-in option. From Otari: The Technology You Can Trust. Contact your nearest Otari dealer for a demonstration, or call Otari Corporation, 2 Davis Drive, Belmont, CA 94002 (415) 592-8311 Telex: 9103764890



OTARI

INDUSTRY NOTES

3M Company recently honored the five audio teams that were nominated for the Academy Award in the "achievement in sound" category. Their fifth annual Lyra Awards were also presented for the first time to original scoring mixers **Danny Wallin** for *Out of Africa*, mixed at the **Record Plant**; **Dennis Sands** for *Back to the Future*, mixed at **Group IV Recording Studios**; **Mike Farrow** for *A Chorus Line* mixed at **Clinton Recording Studios**; **Armin Steiner** for *Silverado*, mixed at **Warner Studios**; and **Bobby Fernandez** for *Ladyhawke*, also mixed at **Warner Studios**. . . . **Allen Strange** will direct a four week intensive course on production and applications of computer and electronic music in relation to film, video, dance, theater, poetry and other dynamic arts, July 6 through August 3 at Cal Poly in San Luis Obispo, CA. Call (213) 590-5768 for more information. . . . **Gand Music & Sound** purchased the entire stock on **LinnDrum** alternate sound chips at the Linn auction in April. They can be reached at (312) 446-GAND. . . . Three new companies have joined the **Studio Center** communications production complex in Farmington Hills, MI: **Magic Lantern Productions**, a commercial production company; **Full Circle Communications**, a producer of interactive videodisks and computer-aided instruction; and **Geoffrey & Jeffrey**, an animation and special effects design company. . . . **Studer Revox America** has added **Jim Williamson** to its New York technical staff as field service engineer. . . . **Sony Professional Audio Division** has named **Ken Meyer** western regional manager. **Nick Hudak** has been appointed vice president, professional tape, for **Sony Magnetic Products Company**. . . . **Eric Trow** has joined the staff at **Production Masters** video and audio production facility in Pittsburgh, PA, as an account representative. . . . The **Association of Independent Commercial Producers** (AICP) has added a chapter in Atlanta, GA. Phone (212) 867-5720 for details. . . . **Futuristic Marketing** (FM) has formed in Fresno as a wide ranging creative musical services group. Call (209) 442-3331. . . . **Norman B. Smith** has joined the staff of **Crest National Videotape** in Hollywood, CA. . . . **Mills/James Productions**, specializing in a broad range of electronic media production, has opened new offices at 4555 North High St., in Columbus, OH, 43214. . . . **Berklee College**

of Music has been honored as the first institutional recipient of the **Yamaha Music Award**, presented annually by the Yamaha International Corporation in recognition of "outstanding contribution to the popularization of music and inspiration to musicians worldwide" **Rupert Neve** has expanded its West Coast facility adding the highly acclaimed **Rick Plushner** as western regional manager, **Laurel Cash** as western regional sales engineer. In their Bethel, CT offices, **Rhonda Kohler** was named advertising/promotions manager and **Gregory Davis** has joined the technical services staff. . . . **Gate Five Studios, Inc.**, a new 16-track recording studio and rehearsal studio designed by **Dr. Richie Moore**, has opened in Sausalito, CA. Call (415) 332-2866. . . . **Donnie Kretzschmar**, a long-time Showco employee and internationally respected sound reinforcement engineer, lost a bout with lung cancer March 15, 1986 at the age of 41. His family has asked that friends make contributions to the American Cancer Society Research Funds in his name, or contact **Chari Short** at Showco (214) 630-1188 for more information. . . . **Gerry Eschweiler** has been appointed to the newly created position of vice-president/general manager for **Digital Entertainment Canada, Inc.**, **Mitsubishi's** Canadian subsidiary for pro audio sales. . . . **Steven J. Hebrock** has been named engineering manager at **Audio Technica**. . . . **Turbosound, Inc.** has named **Ken Porter** of **Spectrum Sound** in Goodlettsville, TN, as its Dealer of the Year and has appointed **Sound Marketing** of Palos Park, IL, as its representative for WI, IL, IN, KT and MI. . . . **John T. Hartley** has been elected president and chief executive officer of the **Harris Corporation**, which employs over 31,000 people in the information technology field. . . . **Annette M. Cirillo** has been appointed video production manager for **RCA Video Production, Inc.**. . . . A Public Radio Training Conference will be held July 20 through 24 at Western Washington University, Bellingham, WA, by the **National Federation of Community Broadcasters**. Call (202) 797-8911 for information. . . . **PVS Corporate Services**, of Naperville, IL, has recently been formed to serve the video studio equipment and tape reproduction needs of midwest business/industrial firms. They can be contacted at (312) 964-5800.

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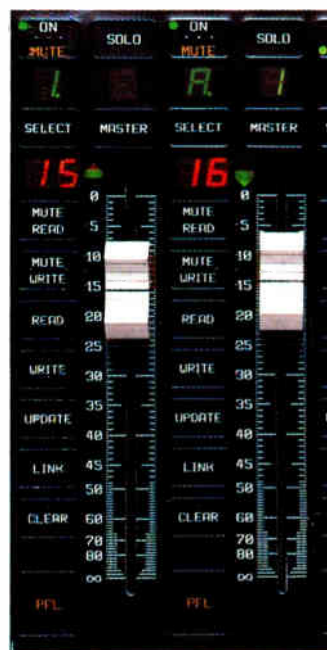
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SESSIONS

SOUTHWEST

Local Dallas vocalist **Peggy Newman** has recorded a cover of Aretha Franklin's "Since You've Been Gone" for **Red Sky Productions** at **Goodnight Dallas**. The tracks were recorded by Goodnight Dallas' recording engineer class and mixed by **Ruben Ayala** with **Tim Orsburn**... **Tom Chess** and **James Lewis** have been working at **Planet Dallas Studio** with engineer **Rick Rooney** doing pre-production work on all their songs to take back to New York... Working at **L.A.W Recording Studios**, in Las Vegas has been **Kirsty Ally**, doing vocals for the upcoming movie, **Stark II**. Engineer was **Lee Watters**, assisted by **Holly Sharpe**... **Flex** recorded and mixed a five song EP at **Lone Star Recording** in Austin, with **Stan Coppinger** producing. **Dave McNair** engineered with **Jay Hudson** assisting. Also, **Joe "King" Carrasco** recorded basic tracks and overdubs with producer **Jim Dickinson** and engineer **Joe Gracey**... **Sumet-Bernet's** studio A and studio D played host to A F C Films, doing scoring and post-production film mixing with engineer **Stacy Brownrigg** on **Thinkin' Big**... **Dave Zoller's** acoustic jazz group, **Evidence**, recorded live to digital with the help of **January Sound Studio's** (Dallas) engineer **Linda Adelfkoff**. Other activity at January Sound included engineer **Chris Green** and producer **Marshall Such** recording the Texas-based band **The Pictures**...

SOUTHEAST

At **Sounds Unreel Studios** in Memphis, producer **Eli Ball** and engineers **David Thoenner**, **Don Smith** and **Jack Holder** completed the final mixes of **William Lee Golden's** debut solo album for MCA... Recording artist **Stewart Copeland** was in Ft. Lauderdale's **New River Studios** recording and mixing the music score to video for an episode of the CBS television series **The Equalizer**. Engineer **Jeff Seitz** was at the board, assisted by **Ted Stein**... **Bill Bohannon**, writer of the hit "Shreveport, Louisiana," cut new sides at **1111 Studios** in Nashville with **Billy Sherrill** engineering... Recent activity at **Polymusic Studios** in Homewood, AL, included NYC-based jazz rocker **Randy Hunter** cutting tracks for his upcoming album on **Pandem Records**, **Andy Bray** engineering and **Cheap Trick** doing guitar, keyboard, vocals, and Synclavier production on several tracks for their new album... Country artist **R.T. Scott** has been in Memphis' **Cotton Row Recording** studio with producer **Robby Turner** finishing the



Ardent Recording in Memphis celebrated 20 years in the music industry with a reception, highlighted by the presentation of two double platinum LPs to studio owner John Fry from ZZ Top and producer Bill Ham. Pictured left to right: John Fry, Dusty Hill, Frank Beard, Bill Ham, Billy Gibbons, and Joe Hardy.

final mixes on four songs which have strong label interest... Underway at **Gizmo Recording**, Vienna, VA, is the debut album for **Mississippi Dan & The Rumba Band**. The album is being produced by **Bob Dunbar** and **Dan Niblett**... At **International Sound** in Miami Beach, **Miami Sound Machine** finished their new single for Sly Stallone's new movie **Cobra**. Engineering was **John Haag** with **Carlos Santos** assisting... **Star Track Recording Studios**, a commercial music studio based in Tulsa, has changed its name to **Universal Music & Post**, as part of the company's expanded direction...

NORTHEAST

Tommy Shaw, formally of **Styx**, cut tracks for a new album at **CCSS** in Glen Cove, NY, with Shaw and **Cannata** producing and **Clay Hutchinson** at the console... **Aaron "Louie" Hurwitz** engineered an album for **Don Haynie** and **Sheryl Samuel** called **Life in the Circus** at **NRS Recording Studios**, Hurley, New York... At **EARS** in West Orange, NJ, the group **Unity** finished recording nine tunes for their album project, which is being produced by **Chris Jasper**... Atlantic Records' **Phil Garland** was in **Reel Platinum Studios** (Lodi, NJ) cutting new tracks for his upcoming album... The **Aura Sonic** mobile unit was on hand to capture Geffen artists **Lloyd Cole & the Commotions** at **The World**, NYC, for an upcoming **MTV** live concert video. The audio was recorded and engineered by **Steven Remote**. He was assisted by **Pete Lewis**, **Paul Winnicky** and **Rita Muskardin**... **Harvey Swartz** has recorded his third Gramavision record, tentatively titled **Digging In**, with another all-star cast at **Media Sound Studios** in NYC. **David Baker** engineered and co-produced... At **Secret Sound Studio** in NYC, **Lenny White** pro-

duced **Pieces of a Dream** for Manhattan Records... At **Magic Venture Recording** in NYC, **Russell Simmons** and **Rick Rubin** produced the **Run DMC-Aerosmith** single, "Walk This Way" for the upcoming Run DMC album entitled **Raisin Hell** on Profile Records. **Pete Millius** engineered with **Michael Pannone** assisting... At **Sigma Sound**, Philadelphia, **Shirley Jones** was recorded for Philadelphia International Records. Production duties were divided between **Kenny Gamble**, **Leon Huff**, **Bunny Sigler**, **Dexter Wansel**, **Billy Lacy** and **Larry Davis**. Engineering was by **Pete Humphreys**, **Mike Tarsia**, and **Arthur Stoppe**, assisted by **Adam Silverman** and **Scott Mac Minn**... At **Rockin' Reel Recording Studios**, East Northport, NY, **Diana Hickman** has been working on her first EP. It's being produced and engineered by **David Greenberg**... The **Fat Boys** were in NYC's **D&D Recording** cutting their latest album for **Sutra Records** with producer/engineer **Dave Ogrin**. The **Latin Rascals** also produced a tune for the **Fat Boys**... **Sting** has been working at **Giant Sound Recording** in NYC, doing overdubs on his **Live in Europe** LP. **Kim Turner** is at the controls and **Claude Achille** is assisting... Activities at **Rawlston Recording** in Brooklyn, included **Kurtis Blow** laying tracks on his seventh album for Polygram Records, and also producing songs for the new **Fat Boys** album, with **Akili Walker** engineering and **Cirland Noel** assisting... At **Quad Recording** in NYC, **Skyy** mixed their new album for Capitol/EMI entitled **From the Left Side**. It was produced by **Randy Muller** and **Solomon Roberts**, engineered by **Dave Ogrin**... Away from his homeland of Jamaica but in at **Sound Heights** in Brooklyn was producer **Byron Lee** of **Dynamic Sound Recording Studios**, assembling tracks for a yet unannounced album project. Behind the board engineering was **Vince Traina** and



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smoother and denser than anything the competition offers. But when you need "nasty", gritty reverb sounds, the SP2016 has them too.

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Circle #005 on Reader Service Card

World Radio History

assistant **Wayne Koehler**. . . The first album credit for Syosset, L.I.'s **Tallysin Studios** (formerly Kingdom Sound) was **Club Ninja, Blue Oyster Cult's** new LP on CBS Records. **Club Ninja** was produced by **Sandy Pearlman** and engineered by **Paul Mandl, Toby Scott** and **John Devlin**. The remix of the album was engineered by **Mallory Earl**. . . Silver Blue Recording artist **Robey**, who scored a Top 10 record with her version of "One Night in Bangkok" on the CBS Records' distributed label, has been recording with producer **Mark Berry** at the **Broccoli Rabe Studios**, in Fairfield, NJ. . . **Northeastern Digital** (Boston) handled a live PCM-1610 digital recording of West Coast keyboardist **Paul Gillman** done at Symphony Hall in Boston, in conjunction with the **Le Studio's** remote truck. **Toby Mountain** and **Sam Boroda** engineered. . . At **Workshoppe Recording** in Douglaston, NY, director **Carl Hosch** and engineer **Rob Bengston** completed the audio post-production on the comedy-feature **Ryder P.I.** All of the sound effect layering, ambience generation, dialogue looping and music scoring was done at Workshoppe via the studio's Shadow system and video equipment. . . At **Digital By Dickinson** in Bloomfield, NJ, **Lillo Thomas** has been in with producer **Paul Laurence** to record a couple of tracks for his upcoming LP for Capitol Records. . . **Westrax Recording Studio**, NYC, has been the home for recent commercial projects including spots for Pepsi, Folger's, Ralph Lauren Polo Fashions, and Sabena Airlines. . . I-Tones keyboardist **Jon Gorr** has been producing tracks for **Idaho-Alaska** at **Newbury Sound** (Boston) with **Paul Arnold** engineering. . . At **Unique Recording** in NYC, producer/engineer **Chris Lord Alge** mixed cuts for **Pete Townshend's** latest release on ATCO records. . .

NORTHWEST

Producer/recording artist **Todd Rundgren** was in S.F.'s **Russian Hill Recording** producing lead vocal tracks with **Mark Hunter** for the group **Dragon** from New Zealand. RHR's **Samuel Lehmer** assisted. . . **Moonshine Studios** in Nevada City, CA has been busy with sessions with Sacramento bands **Shocking Pink** and **Macabre Shocks**; **Chris Takacs** engineering, **Lita Hope** assisting. . . **Joseph Watt** was in doing a dance remix for **New Order** for release on Razor Maide Records. Watt was also in recording and mixing with **Debora Iyall** for a 12-inch dance single for release on CBS Records, engineered by **John Cuniberti**. . . **Thomas Dolby** was in at **Live Oak Studio** (Berkeley, CA) recording and mixing the soundtrack for the new George Lucas film, **Howard the Duck**. The soundtrack was produced by Dolby and engineered by staff engineer **Dale Everingham**. . . Jamaican producer and session bassist **Robbie Shakespeare** has been in **Starlight Studio** in Richmond, CA, with the debut album for **Don Geran** on Rodney

Fowler's **Roddo Records**. . . **Fifth Angel** completed its first album at Seattle's **Steve Lawson Productions** with **Terry Date**. The album will be released on Shrapnel Records, the San Francisco-based label owned by Mike Varney. Also at SLP, **The Walkabouts** have been in with **Bruce Calder** working on two additional songs for an upcoming LP. . . At **Montage Recording Studio**, Newark, CA, sessions included **John Madden** doing all the AFS spots for this year with **Jamie Bridges** engineering and **Louise Singleton** assisting. Also, **Billy J. Walsh** completed vocal overdubs for his upcoming album and **Dave Rettick** with the **California Sun Band** started work on their latest 45. . . **Robin Yeager** was in at **The Plant Studios**, Sausalito, CA, producing a new album for long-time friend **Billy Bop Boman**. . . At **Triad Studios** in Redmond, WA, **Michele Grey** of The Tubes began work on a solo project with Tubes drummer **Prairie Prince** and Steve Miller bassist, **Kenny Lewis** providing rhythm. **Rick Fisher** has been engineering, with **Mike Tortorello** assisting. . .

SOUTHERN CAL

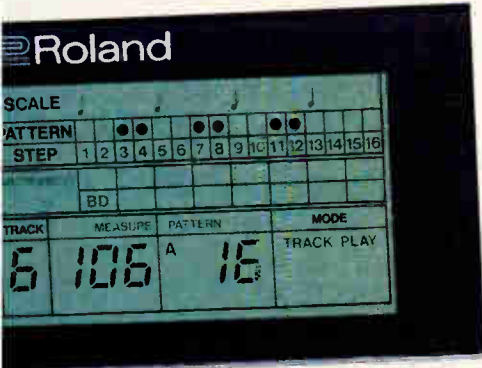
At **Image Recording** in Hollywood, **Stevie Nicks** recorded a track for **American Anthem**, an upcoming Lorimar movie. **Gordon Perry** produced with **John Kovarek** at the controls and **Steve Krause** assisting. . . At **Seawest Studios** in Hawaii, **Kalapana** was in the studio completing a new LP produced by **Groove It Prods**. . . Producers **Stimsey Hunter** and **Leo Talinero** are working on an LP for **Guitar Shorty** at **Piper Recording Studios** in Torrance. . . At **Amigo Studios** in North Hollywood, **John Denver** and **Paul Simon** have been working in Studios E and A on digital systems. Recording and producing Denver is **Roger Nichols**, with **Jerry Garzva** engineering and **Russ Bracher** assisting. **Roy Halee** is recording Simon, assisted by **Steven Strassman**. . . In beautiful Maui, Hawaii, **John Denver** layed down tracks for his new album at George Benson's **Lahaina Sound Recording Studio**. **Roger Nichols** produced and **Jerry Garzva** engineered. . . Seattle heavy-metal rockers **Queensryche** used the **Le Mobile** remote truck to record drum tracks for their forthcoming EMI-America album. Producer **Neil Kernon** chose to record in a recently vacated computer assembly building in Seattle in order to surround the drums with the natural ambience of a large, very live open space. . . **Patrice Rushen** and co-producer **Charles Mims, Jr.** were in at **Rock Steady Recording Studio** completing her first Arista LP with **Peter Chaikin** engineering, assisted by **Gloria Robertson**. . . At **Devonshire Sound Studios** in No. Hollywood, **Whitney Houston** has been recording the follow-up to her smash debut, producer **Michael Masser** and engineer **Michael Mancini**, assisted by **Dean Burt**. . . Jazz artist **Dan Siegel** was in **Skip Saylor Recording** (L.A.) for Pausa Records. Siegel produced with **Skip Saylor** and

Tom McCauley engineering. . . At **The Complex** in West L.A., **Jennifer Warnes** did tracking on her new album in Studio B. **Roscoe Beck** produced and **Greg Ladanyi** engineered. . . **Rick Nowels Productions** of Los Angeles recently composed spots for Pacific Bell and Southern California Volkswagen Dealers and recorded them at **Westlake Studios'** new Studio D. . . Austin-based duo **Timbuk 3** recorded their first LP for I.R.S. during the months of March and April in L.A. at **Dustbowl Studios**. **Dennis Herring** produced. . . At **One on One** in No. Hollywood **Rod Stewart** is back in laying down tracks with **Bob Ezrin** producing and **Paul Lani** and **Peter T. Lewis** engineering. **Jeff Bennett** is assisting the date. . . **Ray Manzarak** has been producing tracks for the new **Jim Carroll** LP at **Westlake Audio** in L.A. **Brad Gilderman** was the engineer, assisted by **Chris Budny**. . . At **Starworks** in Hollywood, British rockers **Maids of Honor** cut basic tracks with **Chris Columby** producing and engineering, and **Hot Ice** mixed eight songs for their R&B LP with **Mark Richmond** flying in from Miami to mix for Nebula Records. . . **Michel Columbier** has been producing **Rodney Franklin** for CBS Records with **Jeremy Smith** mixing and **Bino Espinoza** assisting. . . **John Dexter** was in L.A.'s **Skip Saylor Recording** producing a single for A&M's **Almo Irving Publishing**. **Skip Saylor** was engineering and **Joe Shay** assisted. . . At **West Side Sound** in L.A., **Cock Robin** recorded and mixed "Peace On Earth," b-side for their latest single. **Peter Kingsbery** produced, **David Schwartz** behind the console. . .

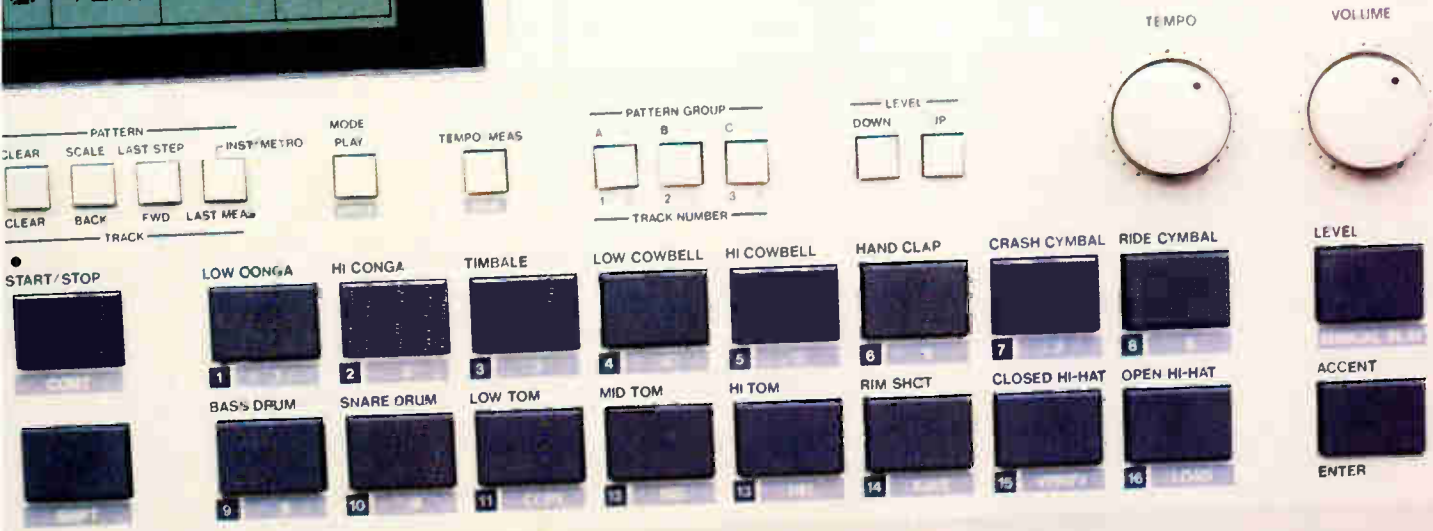
NORTH CENTRAL

Wizard of guitar pyrotechnics **Roy Buchanan** completed recording and mixing his second LP for Alligator Records. The new album, entitled **Dancing on the Edge**, was recorded at Chicago's **Streeterville Studios** and produced by Buchanan, **Dick Shurman** and Alligator president **Bruce Iglauer**. **Justin Niebank** engineered the two-week sessions. . . Action at **Northern Recording** in Cleveland, included **Eric Singer**, drummer from Black Sabbath, doing demos with **Kirk Yano**, engineer; and **Skip Martin**, former Dazz Band lead singer, cutting tracks with engineer **Greg Webster**. . . TeeVee Tunes has been working on a follow-up to last year's surprise hit, **Television's Greatest Hits**, at **Michael Levine's Studio** in Manhattan. **Dave Erlanger** produced, **Levine** engineered. . . Brother and sister blues team **Mae B. Mae** and **Eddie King** recorded an album at **Soto Sound** (Evanston, IL) for producer **Steve Weisner**. The recording is to be shopped to potential labels. . . **Cheap Trick** was in at **Sound Summit** in Lake Geneva, WI, recording a song for Paramount Pictures **Top Gun**, starring Tom Cruise. **Harold Faltermeyer** produced the track with Simple Minds engineer **Brian Reeves** at the con-

—CONTINUED ON PAGE 209



RHYTHM COMPOSER TR-505



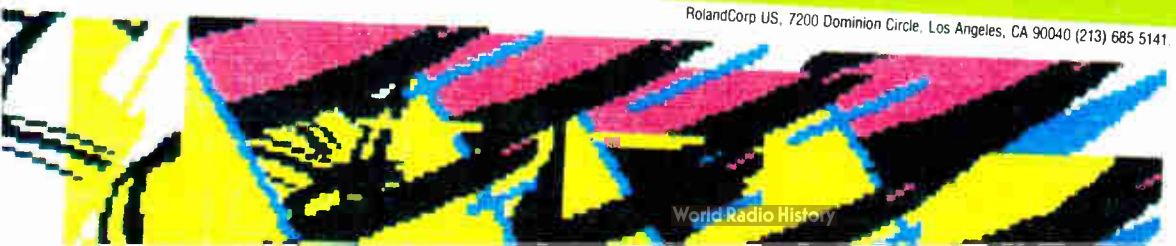
LIGHT HEAVYWEIGHT

Weighing in at only 950 grams (that's 2 lbs. 2 oz. to us), Roland's spunky new TR-505 Rhythm Composer sports a winning combination of traditional drum-kit and Latin Percussion instruments. But don't let its small size and modest price fool you—the TR-505 boasts heavy-weight digital PCM samples of kick, snare, toms, handclaps, high hats, cymbals, timbales, congas and cowbells—16 voices in all to give your rhythm tracks, rehearsals or live performances a punchy professional drum sound and feel. Behind all this brawn is a sophisticated computer brain with more than enough smarts and memory to make this drum machine your ally in the fight against boring drum programming. Program 48 of your own drum patterns (in real-time or step-time) or take advantage of 48 useful preprogrammed patterns—either way you're off and drumming right away. The large LCD display helps you keep track of every beat and performance parameter. But that's not all, our new champ still has a few moves you haven't seen. The TR-505 is a thoroughly modern MIDI instrument loaded with MIDI features and controls including an ability to respond to dynamic drum parts. Battery or AC powered, the versatile TR-505 scores an easy Technical Knock-Out over the competition. But don't say we didn't warn you—this little powerhouse will knock your socks off!

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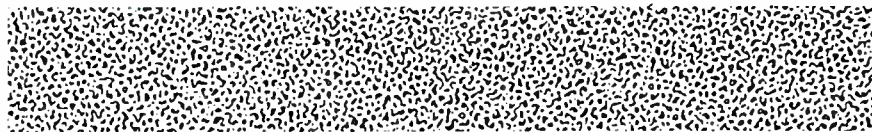
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INSIDER · AUDIO



by Ken C. Pohlmann

"Do you feel bad because the audio industry is so insignificant compared to giant industries such as computers, automobiles, frozen food, cosmetics, and sheep ranching? ... Well, that'll soon change."

Are you tired of seeing the same old faces when you go to the AES Convention? Are you shocked by the professional inbreeding that's commonplace—you know, when the marketing director of Shure goes to Audio-Technica, and before that was at E-V? Do you feel bad because the pro audio industry is so insignificant compared to giant industries such as computers, automobiles, frozen food, cosmetics, and sheep ranching? In short, are you embarrassed because the pro audio industry is so damn small?

Well, that'll soon change. In the same way that Napoleon annexed most of Europe, pro audio has annexed CD-ROM, a vast and untapped market. If diversity is the mother of profit margins, then audio practitioners should be scrambling to find a niche in this opportunity of a lifetime. CD-ROM—sounds a little too far afield? Maybe not. If you stop thinking of audio as audio, and consider it as digital data, you'll discover that you're an expert in specialized encoding practices. The CD-ROM field will need a lot of that expertise. Let's check it out.

Compact Disc-Read Only Memory encompasses any information stored on CD, other than specifically audio information. While that comprises a small market in 1986, it promises tremendous growth in the future. Think of CD-ROM as electronic paper; anything publishable is a candidate for CD-ROM, however, a CD-ROM is much more efficient than paper. Using the same laser optical technology as its music cousin, one CD-ROM disc can contain over 600 megabytes of data. That's a lot of information; for example, the Grolier Academic Encyclopedia is available on a CD-ROM (retail price \$199), but occupies only about 1/10 of the disc storage space.

Although a CD-ROM disc is visually identical to a music CD, it employs a modified data format. Data in a music CD is derived from the 44.1 kHz sampled signal, with 16-bit quantization. The 16 bits are divided into higher and lower 8-bit bytes. These data bytes (before EFM modulation) are grouped into frames of 24 bytes, and parity and a synchronization word are added. While satisfactory for music applications, a frame is too short for numerical applications. A solution emerges from the subcode field. Each frame has one 8-bit subcode byte, and data is summed over 98 frames to

CD-ROM and CD-I

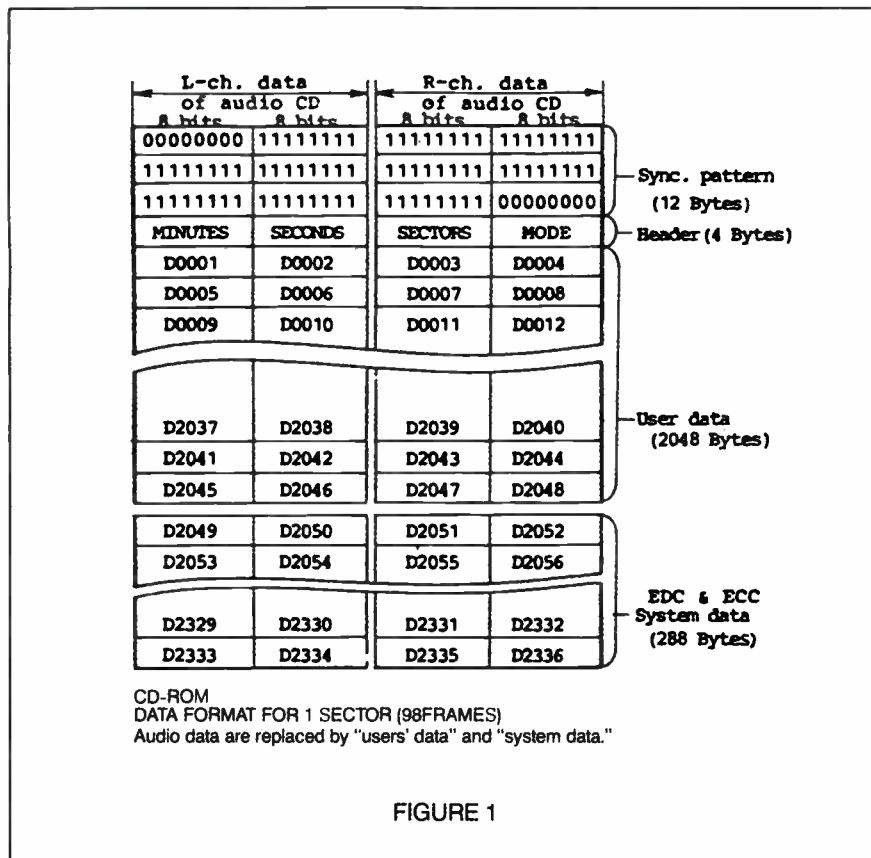


FIGURE 1



TRUTH...

OR
CONSEQUENCES.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

CONSEQUENCES: You'll never know the "truth" until you do.



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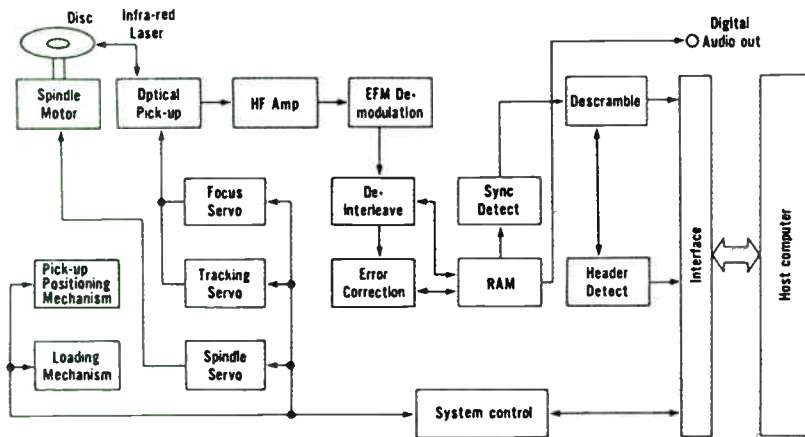


Figure 2: Block diagram of DENON CD-ROM drive

form eight 98-bit subcode words.

The effective data bit size for the 98 frames of main data area becomes 2352 bytes (24 bytes x 98 frames), as shown in Figure 1. This block is sufficiently long to handle numerical data of 2048 (2K) bytes (96 frames) as one sector without altering the audio CD format. The first 12 bytes from the 2352 byte block are used as a synchronization word, the next four bytes are used for time and address flags. Although this repeats information already found in the Q subcode, it speeds and provides greater accuracy for searching.

The 2048 bytes reserved for user data is where the actual CD-ROM data resides (recapitulating, this is formed from part of the data area gathered from 98 frames of data formerly used for music data). The remaining 288 bytes, called system data, provide for a higher degree of error detection and correction, a prerequisite for successful numerical data storage, which is more demanding than audio data. This system data forms an extended error correction code (EDC and Layered ECC) existing independently and in addition to the cross interleave Reed-Solomon error correction code already watching over each CD frame; the error rate is improved by more than 100 times, to a guaranteed 10^{-12} . The extended code may be processed either by hardware circuitry contained in the CD-ROM player, or more typically by a host computer.

The average data transfer rate is 75 sectors per second, and therefore 153.6 Kbytes per second for the constant linear velocity (CLV) of 1.2 meters per second (same as the CD). Total capacity for 60 minutes worth of disc space is thus 553 Mbytes, more for greater disc utilization.

While CD-ROM uses a data format

similar to that of music CDs, discs are not compatible. A CD-ROM drive dispenses with D/A conversion, output filtering and audio output stages, but requires a special interface, and a computer for output. A CD-ROM drive alone costs less than an audio CD player; the consolidation of both functions into one player is ideally cost-effective. A combination disc holding both music and ROM material could then be implemented.

Player design is straightforward, as shown in Figure 2. For example, con-

sider the features in the Denon drive: In accordance with the CD-ROM format, data is transferred to the host computer in blocks of 2K bytes. Using the header field, the sector address in minutes, seconds, and blocks is verified by the host computer. The disc table of contents (TOC) can be transferred to the host computer. After receiving an "audio" command from the host, the player can output audio data, accessed by the subcodes in the disc. The disc only rotates when a drive select "ready" command is given, otherwise the disc is halted, to save power and motor wear. A maximum of four drives can be controlled by one address of the host computer's interface, thus leaving open possibilities for further expansion.

An SASI-based intelligent interface and system controller is included in the drive, ready for connection to the host computer. Signal lines are shown in Figure 3. The Data Bus carries bi-directional data to or from the drive. The Select line selects the drive's system controller, which answers with a Busy signal. The Request line is driven by the controller as a strobe line for data transfer; it is answered by the host with the Acknowledge line, to execute data transfer. Combinations of Input/Output, Command/Data, and Message lines reflect contents of the data bus. The Reset initializes the drive.

A CD-ROM drive is thus a rather

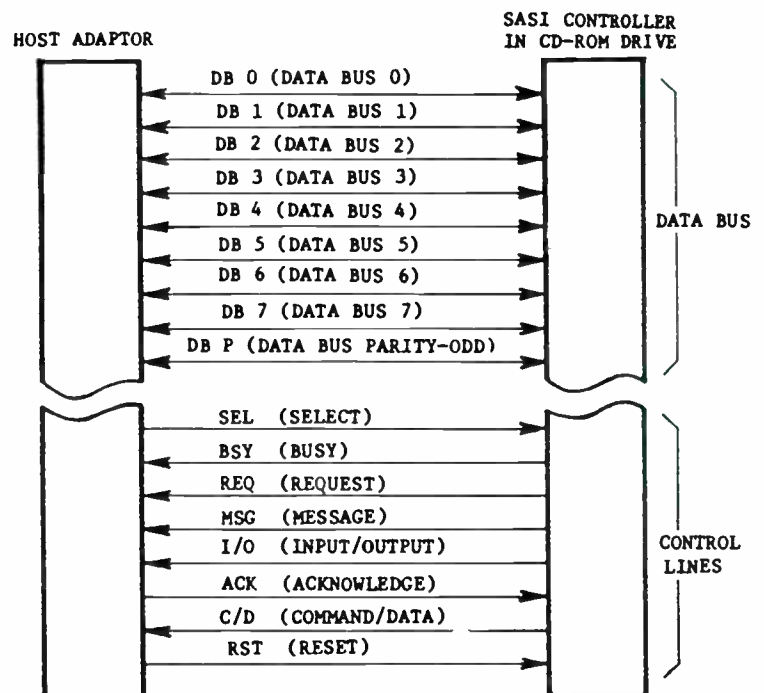
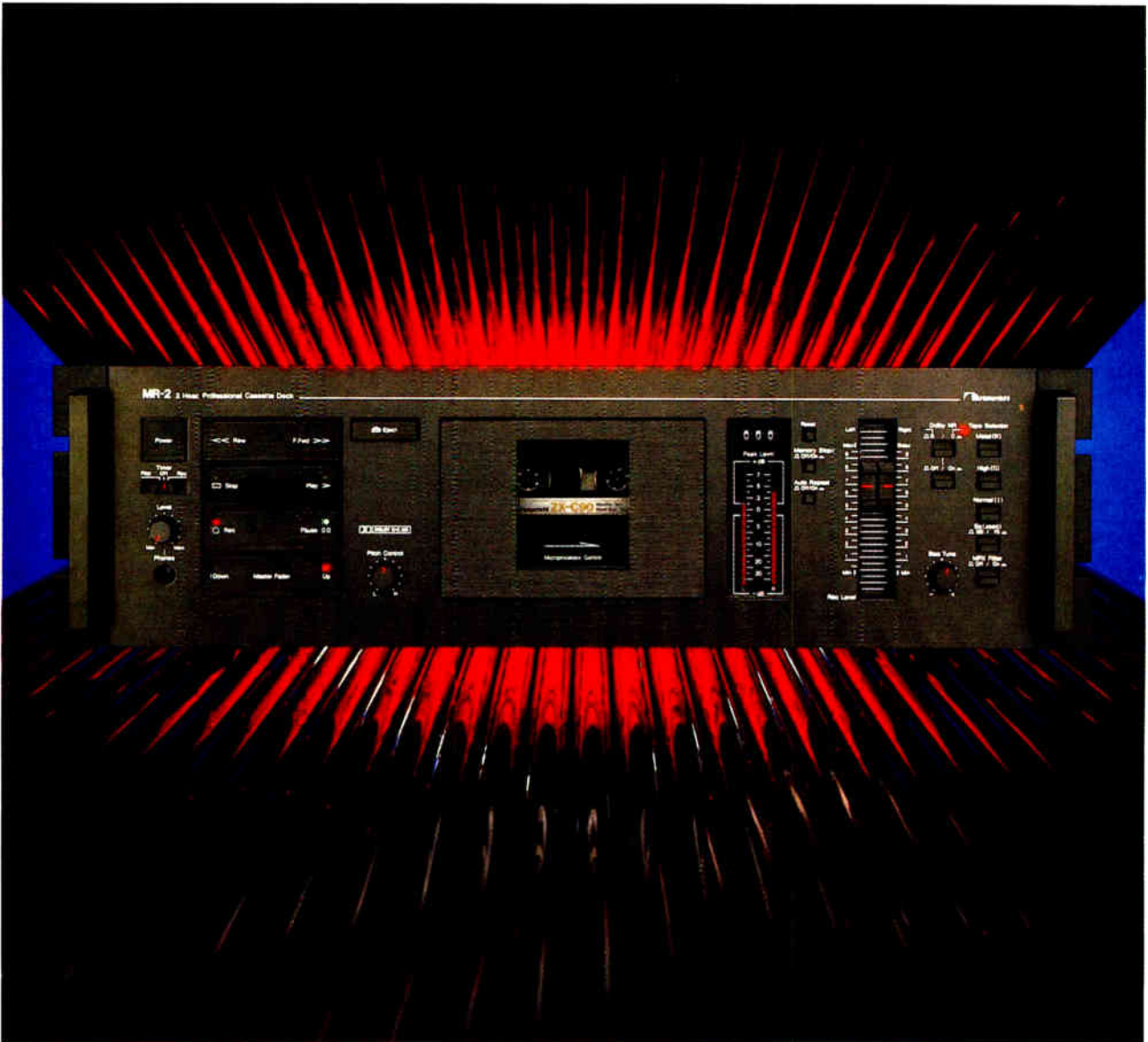


Figure 3: The host interface signal lines

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CD-INTERACTIVE SPECIFICATIONS OUTLINE

1. PHYSICAL FORMAT

Total data capacity: approx. 650 Mbytes
 Readable speed: 75 blocks/sec.
 Block: 2352 bytes
 Sub-header: 8 bytes
 Users data capacity: 2048 bytes Mode 2 form 1
 with EDC and ECC
 2328 bytes Mode 2 form 2
 without EDC and ECC

2. STORED DATA

Audio information, video information and computer data (text and binary) Block interleavable

3. AUDIO

	Stereo/Mono	Channel
CD-Digital Audio (PCM)	Stereo	1
Hi-fi Music (ADPCM)	Stereo	2
	Mono	4
Mid-fi Music (ADPCM)	Stereo	4
	Mono	8
Speech (ADPCM)	Stereo	8
	Mono	16

Playing time per channel: 70 minutes

4. VIDEO

Guideline resolution:

Normal	High
384 x 280	768 x 560

Pixel coding:

—Natural Pictures: DYUV (4:2:2)/4 Bit quantization
 —Graphics: CLUT 16 colors, 128 colors, 256 colors
 RGB 256 colors, 32768 colors

5. ONE MEDIA SYSTEM

Programs are written in 68 K object code

6. FILE STRUCTURE

Hierarchical, but able to open a file in one seek

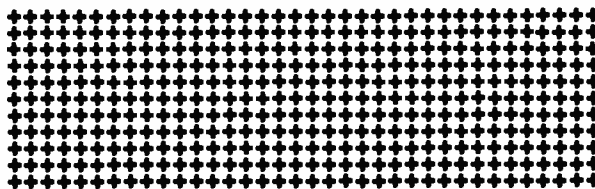


Figure 4

elegant data storage/retrieval system. How will it impact the audio business? The possibilities are considerable. For example, ask Allen Adkins, president of Optical Media Services, in Aptos, California. He has a Sony CD-ROM player, and a CD-ROM disc suggestively titled "The Universe of Sound, Volume One" containing a library of Emulator II sounds. Consider—do you think an E-mu user would rather deal with 1106 floppies, or the equivalent sound on one CD-ROM disc? That's just one of many applications, and opportunities for CD-ROM that people in the audio business can capitalize on.

What? You're still not convinced? You think CD-ROM is too new of a trick for an old audio dog to learn? Well, you might consider a newly-introduced CD-ROM format, called Interactive CD, or CD-I. This format is designed to bridge the gap between CD-ROM and audio-only CDs, specializing in audio-visual information. The CD-I format calls for a total storage capacity of 650 Mbytes, with a readable speed of 176.4 Kbytes per second. Two standards of video resolution will be supported: normal resolution of 384 x 280 pixels, and high resolution of 768 x 560 pixels. RGB graphics will support either 256 colors, or 32,768 colors standards.

To make room for extended video information, data compression techniques are used to reduce the storage space required to encode the audio program. The CD-I format offers several levels of audio quality, to be selected

according to the need for fidelity. In addition to linear 16 bit PCM encoding as employed in regular audio CDs, CD-Is will use an adaptive delta modulation-PCM (ADPCM). Three levels of fidelity can be used: Hi-fi, Mid-fi, and Speech. Stereo or monaural audio is available in these three modes. The number of channels (each with about 70 minutes of playing time) increases as the fidelity level decreases; for example, a full fidelity PCM audio program would have one 70-minute stereo channel, whereas in monaural Speech mode a disc would have 16 70-minute channels. Format specifications are shown in Figure 4.

CD-I will be applicable for music and speech, still and animated pictures, graphics, etc. In short, any audio-visual information can be encoded. Of course, there's a catch. The CD-I format is incompatible with the regular audio CD format. You'll need a special player for your CD-I discs, undoubtedly with interfacing to your home computer.

What? You're *still* not convinced? You think CD-ROM and CD-I are out of your league—at most, maybe you'll prepare some audio tracks or something—certainly, any direct hardware involvement is impossible. Well, picture this: paper has just been invented, and printing presses cost \$1 million, but someone comes along with a press for \$123,000. That's right—a CD-ROM pre-mastering system for \$123,000. Imagine the information-hungry world beating a path to your door. I'll fill you

in on that and other topics, but because you're such a skeptical S.O.B., you'll have to wait until next month.

Audio Rumor Central

Hottest Rumor: IBM is claiming patent rights to Compact Disc, is assessing a three cent/disc royalty, and CD pressing plants are paying. Old Innovative Technologies Never Die Dept: DOCData of the Netherlands has announced they will manufacture half a million CDs this year, as pilot production of their revolutionary photo-thermographic CD production process. Latest Format Twist: Mitsubishi is considering a new digital recorder with 96K sampling rate, and 18 bit converters, with a 20 bit internal architecture. Cleverest Idea Award: Robert Adams of dbx is prototyping an oversampling 18-bit A/D converter; that's right—no more brickwall filters, folks, just pure, perfect phase linearity. Will it fit onto a chip? Most Heroic Old Technology Dept: Dolby's Spectral Noise Reduction system, plugging into the cat. 22 socket, for analog recorders. We'll keep an eye (ear?) on this one. . . Look for: Denon digital mixer, editor, and PCM processor. Question: Did Sony's engineers take a look at JVC's VP-900 processor before they designed the 1630?

Do you have information or rumors for Insider Audio? Each month's hottest tip wins a secret prize from *Mix*. Contact Ken Pohlmann, University of Miami, P.O. Box 248165, Coral Gables, FL 33124, Telex 519308 or *Mix* at (415) 843-7901. ■

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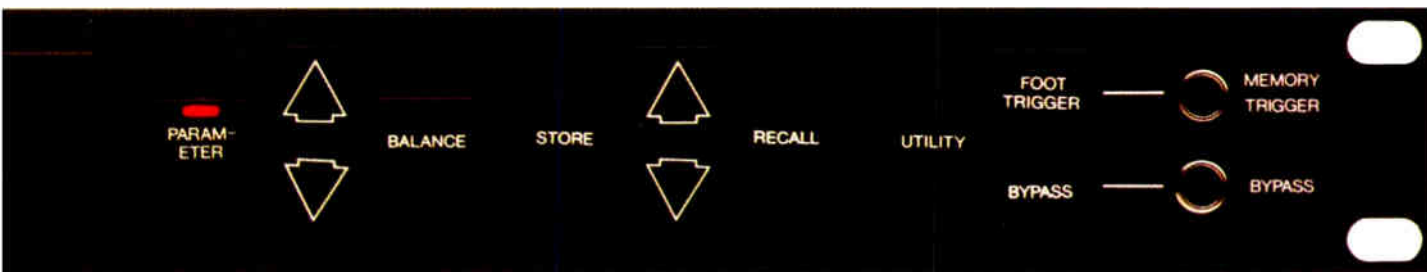
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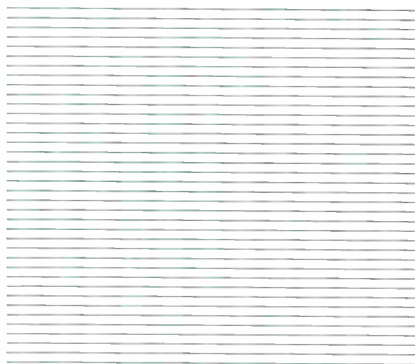
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As threatened last month, here's the opening salvo in a how-to-create-any-microphone-polar-pattern series. To begin, a little psycho-acoustics, and then some ancient history.

Back to School With Math & MICROPHONES



by John M. Woram

The famous cocktail-party effect is more than just a catch phrase. It's well-known that anyone with fair-to-middlin' hearing can "tune in" to an interesting conversation in a noisy environment. While surrounded by 360 degrees of background racket (as at the typical cocktail party), it's reasonably easy to carry on a low-

level conversation by simply ignoring the out-of-tune background piano, the clatter of glasses, and the chatter of the other guests. To do so, all you need is two ears, one brain, and a little will power.

Now then, try to record the cocktail-party chat, and what do you get? Not much of anything worth hearing. The conversation of interest is drowned out by the everything-else going on. Even an attempt to record a lecture from your seat in a reasonably quiet classroom often doesn't come off sounding like much.

In both cases, the microphone with its lack of brain power isn't capable of conveniently ignoring all sounds but the desired one(s). So you get a mixed bag of wanted and unwanted signals, and it's often difficult to hear only what you want to hear when listening to the after-the-fact recording.

Of course, the more directional the microphone the better the result, which leads us (or at least me) to the first question: how does a directional microphone distinguish between wanted and unwanted sound?

The quick answer is: simple, just point it at the wanted sound. But that's really not much of an answer. It's just an instruction to the user. So let's take a closer look at what's going on.

The Omni-directional Microphone

About the simplest microphone to build is an omni-directional one. Just stretch a diaphragm over an enclosed cavity, and as it vibrates in response to variations in the surrounding air pressure, a proportional output voltage is generated. It doesn't matter what kind of noise creates the pressure variation, or where the noise source is. If the microphone is sufficiently small (so that it doesn't get in its own way), it will hear sounds equally well from all around it. In fact, if the microphone is imagined to be at the center of a sphere, then a sound source located at any point on the surface of the sphere will be heard as well, as if it was at any other point on the sphere. In short, the microphone has no directional sensitivity, and responds only to pressure.

It's common practice to graph a microphone's output response with respect to the angular direction from which the sound arrives. Since in the



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case of an omni-directional microphone the angular direction doesn't matter, the graph is a simple circle, representing uniform sensitivity—and therefore, constant output voltage—at

school geometry, the output level may be plotted as a so-called cosine curve. And as we shall see before too long, there's a very good reason for going to the trouble of doing so.

directional microphone, and the two mic outputs are combined. If the signal happens to arrive at the front of the bi-directional mic, its output voltage adds to that from the omni-directional microphone. However, if the signal arrives at the rear, it is subtracted.

It's a fairly simple matter to balance the two microphones so that a sound arriving from the front produces equal output levels from both microphones. With the outputs combined, the total sensitivity is doubled. But if a sound now arrives at the rear of the pair, the combined equal-but-opposite levels cancel out completely.

The Uni-directional Microphone

The earliest uni-directional microphones were in fact constructed by mounting an omni-directional element and a bi-directional element in the same mic housing. The outputs were combined to produce the uni-directional response. The old Western Electric 639A was a typical example, and a screwdriver adjustment on the housing even let the user switch between patterns. Such a dual-element microphone was said to have a pressure component (from the omni-directional ribbon). That pressure-gradient term comes from the fact that this component reacted to the pressure gradient, or pressure difference, between the front and back of the ribbon element.

Back to the Math Lesson

The output of the dual-element microphone can be calculated by trotting out that equation seen above, and revising it to:

$$X = A + B\cos\theta$$

where A, the sensitivity of the pressure component, and B, the sensitivity of the pressure-gradient component.

In a typical example, A and B are equal (say, both are 0.5) so that the output level is: at zero degrees, $X = 0.5 + 0.5\cos(0) = 0.5 + 0.5(1.0) = 1$, and at 180 degrees, $X = 0.5 + 0.5\cos(180) = 0.5 + 0.5(-1) = 0$.

Once more going to the trouble of plotting the output response for all angles from zero to 360 degrees, we find a graph that accurately describes the performance of such a microphone. At the front, it's equal to the sensitivity of the omni-directional plus the bi-directional microphone. But at the rear, the output is zero: in short, the microphone is completely insensitive to sounds originating at the rear.

The response is the well known heart-shaped cardioid pattern. Only in this case, it's truly dead as far as rear-originating sounds are concerned. As we shall soon see, modern single-element cardioids rarely match this specification.

"It's more than just fun with math. All of this should suggest that by simply varying the A and B components, it should be possible to create any microphone pattern from omni- to uni-directional."

all angles (of course assuming the level of the sound source remains constant).

Although such a microphone might have an excellent frequency response, its lack of directional sensitivity rules it out for many applications, especially cocktail parties. Unfortunately, some recording engineers never get beyond this characteristic, and ignore the omni-directional microphone's many strengths. But that's a subject to be covered later.

The Bi-directional Microphone

The earliest microphones with any sort of directional sensitivity were bi-directional, and were built by suspending a flat ribbon in a magnetic field. Sounds arriving from directly in front (0 degrees) or directly behind (180 degrees) cause the ribbon to move back-and-forth (or from the rear, forth-and-back; and this distinction is important). Sounds originating at either side (90 or 270 degrees) arrive simultaneously at the front and back of the ribbon, for a total net movement of zero, and hence no output at all.

As a constant-level sound source moves in a circle around the bi-directional microphone, the output level is maximum when the sound source is at zero degrees, then tapers off to zero output at 90 degrees, and back to maximum at 180 degrees. As the sound source continues around the microphone, the pattern is a mirror image, tapering back to zero output at 270 degrees and back up to maximum at 360, or zero, degrees.

Recalling the bad old days of high-

Time Out to Review Some Math

Here's a brief summary of the values for the cosine of any angle from 0 to 360 degrees:

degrees	cosine	degrees	cosine
0	1.0		
45	0.707	225	-0.707
90	0.0	270	0.0
135	-0.707	315	0.707
180	-1.000	360	1.0

So, we can accurately represent the output level of the bi-directional microphone by the following equation:

$$X = \cos\theta$$

where X, output level, and θ , angle of the arriving sound source.

If we bother to actually plot the output level of a bi-directional microphone for all values of θ from zero to 360 degrees, the graph will be a perfect figure-8 pattern, which "graphically" illustrates just what we would expect to hear from such a microphone.

A very important point to take note of is that the negative values represent a reversal of polarity for the output voltage. In other words, the output waveform created by a signal picked up from behind a bi-directional microphone will be equal in amplitude but opposite in polarity, as compared to the same signal picked up from in front. As a practical result, if the same signal arrives at the front of one bi-directional microphone and at the rear of another, the signal will cancel out completely if the two mic outputs are combined.

The plot thickens. Visualize what happens if that signal is picked up by both an omni-directional and a bi-



W. P. Taylor

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Brief Review of Mic Math

We can use that same equation to describe any microphone, from omni- to bi- to uni-directional pattern. All that's required is to vary the proportion of the pressure and pressure-gradient components, as seen in the three examples below:

$$\begin{array}{ll}
 A + B\cos\theta & \text{for the Omni-directional pattern} \\
 1.0 + 0.0\cos\theta & \text{for the Uni-directional pattern} \\
 0.5 + 0.5\cos\theta & \text{for the Bi-directional pattern} \\
 0.0 + 1.0\cos\theta & \text{for the Uni-directional pattern}
 \end{array}$$

For the omni-directional mic, $B = 0.0$, so it doesn't matter what the cosine of the angle is, since zero-times-what-ever is always zero. The microphone is strictly a pressure device.

Moving right along, the uni-directional mic is equally dependent on both the A and B components. When these are equal, the pattern is a perfect cardioid.

And finally, the bi-directional microphone is dependent solely on the pressure-gradient component. Its output level is strictly a function of the pressure gradient component.

In these three examples, the A and B components are adjusted so that their sum always equals one for a signal arriving from up front. To make sure this all makes some kind of sense, reduce by half the sensitivity of the omni- and bi-directional equations, and then add the equations, as seen here:

$$\begin{array}{ll}
 0.5 + 0.0\cos\theta & \text{the omni-directional pattern} \\
 + 0.0 + 0.5\cos\theta & \text{the bi-directional pattern} \\
 \hline
 0.5 + 0.5\cos\theta & \text{the result is the uni-directional pattern}
 \end{array}$$

But What Does It All Mean

It's more than just fun(?) with math. All this should suggest that by simply varying the A and B components, it should be possible to create any pattern from omni- to uni-directional. The three patterns described so far are simply the best-known examples. But the so-called super-cardioid and hyper-cardioid patterns are just two more variations of the same equation.

And once the math is well-understood, it's reasonably easy to see how to create a stereo microphone pair by using one uni-directional mic and one bi-directional mic. There's nothing to it, I think. And if I figure out how to do it, this column may even be continued next month. ■

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World Radio History



Russ Titelman and Steve Winwood

by Dan Daley

PHOTO KAREN PETERSEN

RUSS TITELMAN

PRODUCTION AS DESTINY

**STEVE
WINWOOD
IS NO
LITTLE FEAT**

The Record Plant wasn't built yet when Russ Titelman was growing up on Fourth Street between Orlando and Sweetzer in Los Angeles. But that doesn't stop one from wondering if Titelman's career as a producer might have been pre-ordained to some extent. With a long and varied production discography studded with artistic gems starting with Little Feat and Randy Newman, through James Taylor, George Harrison, Paul Simon, Christine McVie and Chaka Khan, and leading up to the present as he co-drives the board with Steve Winwood, you might think that something had to augur his future.

But, if in looking for omens you think that growing up near the future site of the Record Plant is stretching things a bit, how about this: Phil Spector walks into your house when you're 13 years old, sits you down and asks your opinion on drum sounds. "That was when Phil was in The Teddy Bears," recalls Titelman. "They used to rehearse at



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my house when I was 13 or 14 years old since one of the guys in the band was my sister's boyfriend. That's when I got the bug, I guess. I would watch them rehearse and think to myself, "This is great!" Phil would also bring demos, the acetates, over to the house and play them on our Magnavox 78 rpm machine. He'd ask me, "What do you think of this?" "What do you think of the drum sound?" Things like that."

"Things like that" interested Titelman so much that he began taking guitar lessons from Spector's own teacher and hanging out with the notorious creator of the '60s sound, going to the rehearsals of various projects Spector put together. "Eventually he asked me to sing background and play guitar on some of his demos," says Titelman, who then incorporated those nascent talents as a member of Spector's next incarnation, The Spector's Three. Spector was apparently impressed enough to use Titelman on a number of record projects, including the Paris Sisters' two chart-toppers "Be My Boy" and "I Love How You Love Me." But in the long run, Spector gave the young musician more than just a few gigs; he also mentored him on the road to production. "Phil had a big effect on me," says Titelman. "As a producer, he was brilliant. He had a vision. He was making a whole new thing happen. Just by my being there, he taught me how to make records. He showed me the sequence of how a record gets made."

Titelman eventually got around to penning a few tunes himself, and when he had a few that he felt were good enough to show around, he borrowed some money from a friend's father and went into Gold Star Recording, the studio where Spector did many of his records, and cut his own demo—his first production. The tunes were apparently good enough; they landed him a staff writing deal at Screen Gems, where Don Kirschner was then at the helm. The tunes also caught the ears of the legendary songwriting duo of Barry Mann and Cynthia Weil, who invited the young composer/musician to New York where he wrote with them and other Screen Gems writers like Carole King and Gerry Goffin. A year later, in 1965, he found himself playing guitar on one of rock's earliest video manifestations, the television show *Shindig*.

Titelman continued as a session player, working on and off with, among others, Jack Nitzsche, who was the arranger on many of Spector's records and who went on to help found Crazy Horse, Neil Young's stellar back-up band. It was while working with Nitzsche on the score to Mick Jagger's film *Performance* that Titelman first

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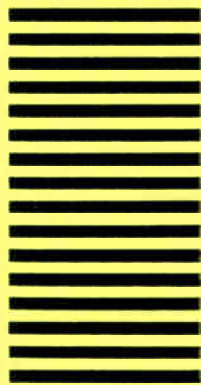
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met some of the people who would figure prominently in his burgeoning production career: Randy Newman and guitarist Lowell George. "Lowell and I were both studying the sitar at Ravi Shankar's school of music," Titelman recalls. "He was putting a band together that turned out to be Little Feat. I went to some of their rehearsals and heard what he was writing and playing, and it was great stuff. He was ready to take the band to a small label and I said no, let's go to Lenny."

"Lenny" was Lenny Waronker, a staff producer at Warner Bros. Records in Los Angeles whom Titelman had become friendly with through mutual publishing contacts. "So I brought Lowell and Billy [Payne] to Lenny's office and they played him some songs live. Lenny loved it."

Titelman produced the band's first album in 1970, and that year also marked the start of a 12-year production collaboration between Titelman and Waronker, starting with *Randy Newman Live*. Of Waronker, who is now president of the label, Titelman says, "He's a guy who comes from the trenches. Lenny knows about making records, so when an artist comes in to talk to him, he can talk to the artist as a peer." Around this time, Titelman also came aboard the Warner's ship as a staff producer and A&R man, positions he still maintains.

"The first time I heard 'Short People' [Newman's vicious 1977 hit single], I hurt my stomach I was laughing so hard," says Titelman. "I thought it was hysterical. When we cut the track [for the album *Little Criminals*], Lenny thought it was the best pop record we had ever made."

The fact that brilliant—albeit eccentric—artists like Newman (and Rickie Lee Jones, another Titelman/Waronker production) could maintain deals was due to the almost Camelot-like vibe of the music business in L.A. during the '70s. "There was an amazing sense of freedom," says Titelman about the period. "Besides the mainstream artists, we were making these weird records; not your basic garden-variety rock and roll records. We got away with it because of people like Lenny and [then label chief] Mo [Ostin]. Critics and his peers recognized Randy as being one of the great American songwriters, and Mo supported his writing. Being in a position to support something like that without being overly concerned with the economic aspects of it was great."

Titelman's association with Steve Winwood dates back to 1979, when Titelman was co-producing George Harrison's eponymously titled LP, and Winwood helped out on keyboards and vocals. "Some sideman," says Ti-

telman in a mock understatement. "We spent a few days together at George's house. There was one cut on that record where he and George sang background parts and it sounded just like the Beatles."

Winwood and Titelman developed a friendship that lasted over the years, buoyed by occasional phone calls and the Christine McVie record in 1983 on which Winwood participated and Titelman produced.

On Winwood's new record, tentatively titled *Back In The High Life Again* and his first effort in four years, the keyboardist was looking to make some changes from past patterns. One was to work with a producer—Winwood produced, engineered and

played all the instruments on his previous efforts—and his choice was Titelman. "We had a very easy and comfortable working relationship, and that had a lot to do with his decision," says Titelman. "On this record, Steve wanted to have other musicians play and have input on the record this time." Some of the players included Nile Rodgers on guitar, drummers John Robinson, Mickey Curry and Steve Ferrone, keyboard player Robby Kildgore, and a special appearance by Joe Walsh. Chaka Khan and Dan Hartman pitched in on background vocals.

Recording began in August of last year. The tunes had been worked up in demo form at Winwood's home in England. Track cutting began at Power

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Station and Right Track in New York; the balance of the project went to Unique Recording because of Winwood's penchant for technology, which Unique has in abundance, along with an SSL console similar to the one Winwood has in his home. Mixing of the record is also scheduled at Unique, whose funky heart-of-Times-Square location initially put Titelman off, but the studio's vast array of equipment quickly put both artist and producer at ease. Tom Lord Alge of Unique's staff is the primary engineer. "He's been on it the longest and has done the most work on it," according to Titelman. "We started with Jason Corsaro. He was on the record about a

"Calling a record producer a director is a good analogy. You have so many different elements involved with each artist."

month, and then previous commitments interfered. After that, Jim Boyer did two weeks, and then we wound up at Unique." Tom Lord Alge was backed up on the record by his brothers Chris, an engineer, and Jeff, an assistant.

When pressed to characterize himself as a producer, Titelman responds demurely: "Most of the people I have worked with are mainly singer/songwriters and are great artists. The raw material is already great. It's my job to help bring that to life in some way. I think it's like making a movie. Calling a record producer a director is a good analogy. You have so many different elements involved with each artist."

The intensely personal way he regards his relationships with artists (he seems to have established friendships with most if not all of those he has

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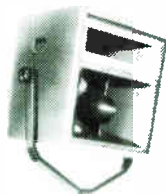
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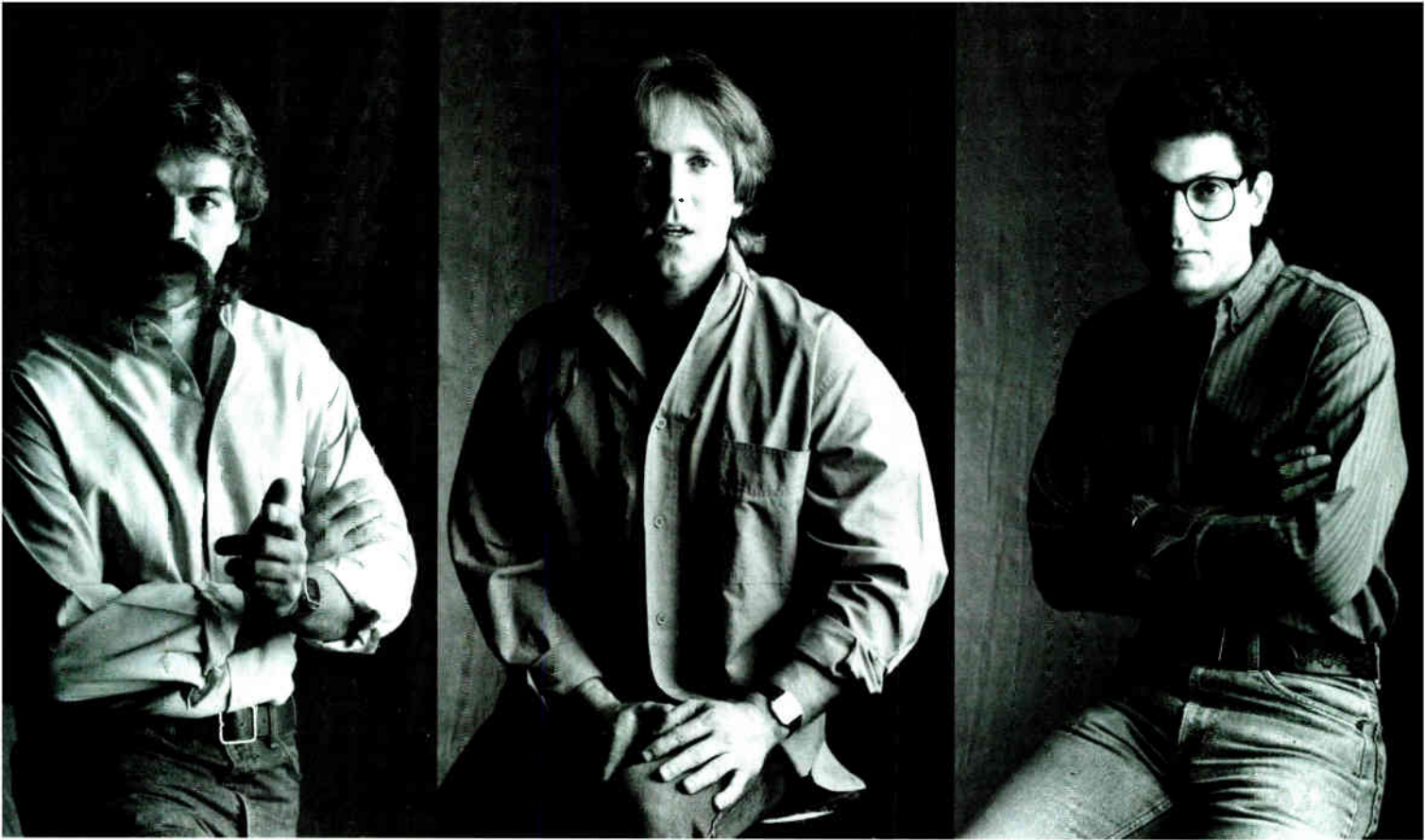


produced) is part and parcel of his approach in the studio, melding his vision with that of the performer. A quick glance at his resume indicates that most of the people he has produced are ones who developed their artistic voices before collaborating with him. It takes a certain kind of ability to work with recording artists on a level of George Harrison, Paul Simon or Chaka Khan and gain their confidence before one inch of tape ever rolls. It is this sort of quiet, self-confident manner that Titelman brings to each endeavor.

Titelman is quite happy in his position with Warner's, where he says the use of staff producers in the A&R department is the "heart and soul of the company." The itch to go independent is not one that afflicts Titelman, but when asked who he would like to produce if his choices were not limited to WEA roster artists, he replied without

hesitation: "Daryl Hall. I think he is the most amazing singer. His voice on a song like "Everytime You Go Away" makes it sound like a classic R&B song. That song could have been a hit 20 years ago. It's like a Sam Cooke song."

The kind of emotional honesty that characterized the Motown hits of the '60s is a qualitative talisman Titelman strives for when he records vocals. "It's the most important things to me," he says, adding that despite technological progress, a good vocal is still something that must be drawn out of the singer, you're not going to find it in the latest black box. "Technology can slow down the spontaneity," he says. "And you have to be careful about not taking the feeling out of a vocal performance by trying to get it too perfect. As far as vocals go, you're always looking for the thing that gets you in the heart. I've been very fortunate in my career in having worked with a lot of people who can perform like that."



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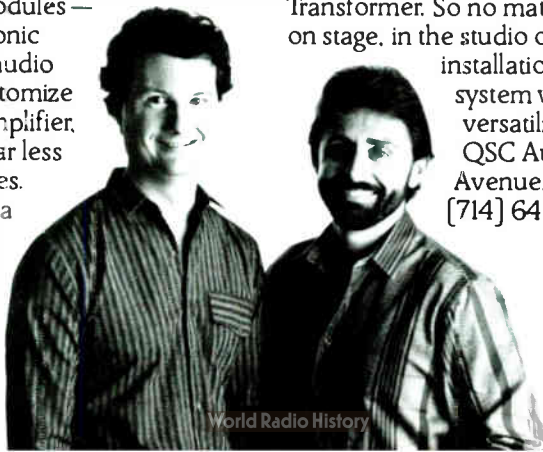
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THE FUTURE OF AUDIO CONSOLE DESIGN

by Colin Sanders, Douglas Dickey and Chris Jenkins

PART TWO

This month *Mix* magazine reproduces Part II of the Solid State Logic report, which examines the issues of digital audio as they affect console designers and users, and considers the advantages of entirely digital design. Part I of SSL's report on the Future of Audio Console Design [*Mix*, May 1986] defined the concepts of programmability and assignability, and discussed their implementation in consoles employing analog audio processing.

DIGITAL SYSTEMS

It is clear that the music, recording, broadcast, film and video post-production industries—and the consumer electronics industry—are all moving towards a future based on digital audio and video storage, synthesis, manipulation and transmission. The performance capabilities, operational efficiency, and potential for creative innovation that would be made possible by a closely coupled entirely digital audio/video chain are, in a word, profound.

In considering the future of audio console design, this fact cannot be overlooked. Programmable analog technology can never complete that chain. A fully digital console will be required.

Flexibility vs. Rigidity

Another factor in digital's favor is less obvious but equally important.

Both programmable analog and digital consoles free the designer from the constraints of mechanically linked control sets and processors. Next-generation digital consoles will take this separation one step beyond programmable analog capabilities.

In analog technology, whether standard or programmable, each function requires a dedicated audio processor—an EQ processor is a different device from a stereo panner or a noise gate. Advanced routing systems can provide a great deal of operational flexibility, but the total system architecture is still rigidly fixed in hardware. Further, the elaborate control system requirements of programmable analog consoles tend, in this respect, to make them even less flexible than standard analog. Significant modification in the field is no longer practical.

This is also true of first-generation digital consoles—but it is not an inherent digital property. In a mature digital architecture, the end user will have substantial freedom to allocate processing power as and where it is required. For example, the *same* control surface and processing complement could be used to “construct” perhaps 64 extremely comprehensive channels, or 40 comprehensive channels and 48 general purpose channels, depending on the needs of each particular project.

In the same way, the end user could “construct” the required number and kind of equalizers, compressors, time manipulation units, effects sends, subgroups and so forth. The limiting factor becomes the *amount* of processing power available rather than the *quantity and type* of processor provided by the manufacturer.

True software-determined formats will bring an end to the long era of “what you see is what you get” in con-

sole design. The potential ergonomic and economic advantages that this engenders are among the most compelling reasons to favor an all-digital approach to the future of audio console design.

The Digital Console—Audio Electronics Meets Computer Science

An abundance of technical information has been published in professional audio journals concerning digital technology, and in professional computer journals concerning audio applications. It is fascinating to observe identical subject matter approached from two very different disciplines and described in two very different languages. This observation also reveals an important clue as to exactly why it is so difficult to realize an entirely digital console that will satisfy the audio requirements of the discriminating user—namely that the required *interdisciplinary* expertise to do so is in short supply.

Today's state-of-the-art mixing consoles are the most functionally complex and sonically sophisticated analog audio devices ever developed. The individuals who use them are among the most critical listeners on the planet. They include mixing engineers, soundtrack and record producers, and many of the world's great musicians. These are highly creative individuals who demand of their instruments a rare combination of precision and the flexibility to freely improvise.

The digital audio processor is essentially a computer. There is no great mystery about the way computers function; the general principles are relatively simple. However, to achieve the degree of digital audio processing necessary to satisfy the functional and sonic requirements of those who re-



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“In a mature digital architecture, the end user will have substantial freedom to allocate processing power as and where it is required.”

Digital Audio Processing

The main component of a digital console—the digital audio processor—is a computer. Within this computer, there is a program memory where instructions defining the computer's functions are stored; a data memory where the digital codes representing the audio signals are temporarily held for processing; and the arithmetic operators, which perform the actual calculations on this data.

The processes involved are fairly basic. A small portion of the audio data, called a sample, is passed from the data memory to the arithmetic operators that perform the calculations requested by the controls. Instead of using different types of hardware to accomplish each function (as in analog technology), the digital audio processor just performs different sets of calculations.

For example, the analog process of mixing two or more signals is accomplished digitally by adding the digital numbers of their samples together. Level control and gain are done by multiplication: the number representing the audio sample is multiplied by the numbers supplied by the control set. Digital delay effects are achieved by simply storing the sample in memory, and then passing it along as and when it is required. Equalization and filtering are accomplished by combinations of these three processes.

The specific calculations performed are called algorithms. A very high level of mathematics is involved in writing these algorithms so that they can be stored efficiently in the program memory and run quickly in the arithmetic operators. Beyond these technical requirements, all computations must produce the desired effect when the results are converted from digital numbers back into audio signals.

Audio Performance

There are many differences of opinion about the current quality of digital audio. The many evident advantages of digital storage, processing and transmission well deserve the accolades they have received. However, both audiophiles whose exposure has been limited to consumer CD reproduction, and professionals who have worked with digital production equipment, have reported a variety of disturbing audible imperfections. These reports must not be lightly dismissed.

While it is beyond our scope here to provide a detailed treatise on these matters, it is important to develop at least a general understanding of the design issues that affect the audio performance of digital consoles. To assist the reader, we have endeavored to

quire such an instrument, a blindingly fast computer must be developed.

Moreover, once this computer is developed, it will be pretty useless unless its full power can be made instantly accessible *in a manner that allows and encourages improvisation*. This will require a far more advanced terminal—the mixing desk control surface—than anything that has been developed by the computer industry or the audio industry to date.

The broad dialog between audio engineers and computer scientists necessary to establish this marriage began in earnest about 15 years ago. Because more people listen to audio than create it, the initial focus has been on creating the means to digitally store, transmit and reproduce audio signals.

Devices for digital audio synthesis and time manipulation have largely resulted from offshoots of this initial research, and have been made possible by developments in digital instrumentation and measurement technology designed to serve the world's scientific, industrial and military sectors.

Focus on the feasibility of digital audio processing on the scale required to create a successful audio production system is a much more recent development—as is the establishment of the specialist teams required to implement such a system. Lastly, the market base necessary to practically support such a specialized and expensive effort has just now begun to coalesce.

It is for these reasons, rather than any insurmountable technical factors, that digital console development has not yet matched the analog state-of-the-art. And it is for these same reasons that this situation is on the verge of major change. By the end of this

decade, reliable and fully flexible digital audio console architectures, offering significant creative advantages over any possible analog variations, will be commercially available.

Initially, these systems will carry premium price tags. However, just as the cost of advanced analog systems will continue to increase, it can be confidently projected that digital costs will gradually decrease. Although standard analog consoles will continue to have a significant price advantage for some time to come, it is not unreasonable to predict that a rough parity will eventually be achieved for at least the larger systems, perhaps sometime around the turn of the century.

THE DIGITAL AUDIO CONSOLE

The digital audio console can be visualized as having five major components:

1. Digital Audio Processors
2. Controls
3. Automation
4. Audio Storage
5. Analog and Digital I/O

The first component is specific to digital consoles. With some variation, the second and third components are common to both digital and *programmable analog* consoles. The fourth component, audio storage, may form an integral part of a digital console, but must remain external to a programmable analog console. Finally, while not actually part of the console itself, conversion will be required between any analog devices and the digital console's Inputs and Outputs. Digital conversion may be required between the console's internal processing format and digital storage and transmission devices with differing formats.

avoid technical jargon and mathematics as much as possible without oversimplifying the issues into meaninglessness.

It is necessary to separately consider each of the stages where these problems occur, starting with conversion.

Conversion

In order to digitally process an audio signal, it is necessary to devise a means of expressing that signal in the form of numbers that can be operated on by the digital audio computer. This pre-processing stage is called Analog-to-Digital conversion, and is performed by a device called an ADC.

Basically, the analog audio waveform is fed into the ADC, where it is sampled at discrete time intervals. Within the ADC, each sample is held by the sample and hold circuit for the brief period required to assess its amplitude. The amplitude of each sample is expressed in a numerical form called a binary code. These codes are then passed to the digital console for processing and mixing.

After processing and mixing, the resulting digital codes must be restored from digital to analog form for listening. This post-processing stage is called Digital-to-Analog conversion, and is performed by a device called a DAC. Within the DAC, the numerical values delivered by the console's processors are held on a sample by sample basis, and each binary number is given a corresponding voltage value. The resulting stepped waveform is then bandwidth limited, restoring the audio information to a standard analog signal.

The basic audio parameters of these converters are determined by the sampling rate, which specifies the number of times per second that the analog waveform is sampled, and the bit width (word length), which determines the number of discrete amplitude levels that can be digitally represented. These two factors determine the frequency response and dynamic range of any digital device.

Frequency Response

The frequency response of a digital device is a function of its sampling rate. The theory states that if the analog audio signal *going into* the digital system is sampled at a rate slightly greater than twice its highest frequency component, it can then be restored to its original state *coming out of* the digital system by the use of the low pass filter. It is necessary, however, to ensure that the frequency difference between the highest audio frequency and the sampling frequency is outside the audio passband, to prevent the generation of audible sidetones re-

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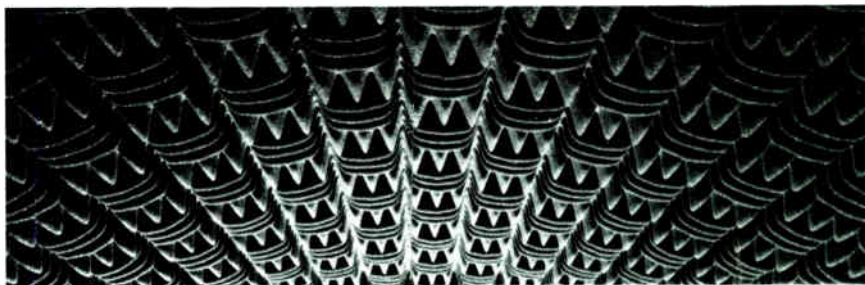
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sulting from intermodulation between the two.

A finite amount of time is required to convert each sample from one medium to the other. As the sampling rate increases, the time available for processing each sample decreases. Thus, the *highest possible* sampling frequency is restricted by the speed at which the conversion can be practically accomplished. The *lowest possible* sampling frequency is determined both by the desired audio bandwidth and the limitations of filter design.

The desire for the lowest possible sampling rate stems from factors of cost and feasibility. Processing speed costs money, and even with unlimited

money there are limits as to what can be achieved. If it were possible to build a perfect low pass filter that exhibited no attenuation at 20kHz and infinite attenuation at 20.001 kHz, a sampling rate of just over 40kHz (which would accommodate the entire range of human hearing) would be ideal.

In practice, it works out that the sampling rate must be at least 2.2 times the highest audio frequency to be reproduced. The highest fixed sampling rate specified by international standards is 48kHz, which is the highest practical rate for large scale digital processing. Even at this rate, the construction of the necessary low pass filters to provide complete separation between audio and sampling frequen-

cies is extremely difficult.

The audio consequence of such a radical filter slope is phase distortion. Anyone who has built a standard analog 24dB/octave filter has an awareness of the difficulties in maintaining phase coherence through that filter. When you consider that 48kHz is only 8kHz higher than a single octave above 20kHz, and that the requirement is for *infinite* attenuation, and not just 24dB's worth, the scope of the problem becomes clear.

As previously mentioned, digital audio development has been largely governed by market economics that recognize that far more people reproduce audio than produce it. Thus, solutions to the problems introduced by DACs have received a greater priority than the problems introduced by ADCs.

The approach taken to solving the DAC problems is called oversampling. Basically, the input to the DAC is sampled at two or four times the standard processing rate. This allows much of the filtering process to be pulled back into the digital domain, where the major portion of the radical slope can be handled without phase problems. The remaining analog filter requirements are thus diminished to a level that standard design techniques can cope with quite nicely.

As the marketplace for digital audio production equipment grows, oversampling ADCs will also become available, and the analog/digital phase shift problem will become a relic of the experimental digital age.

Dynamic Range

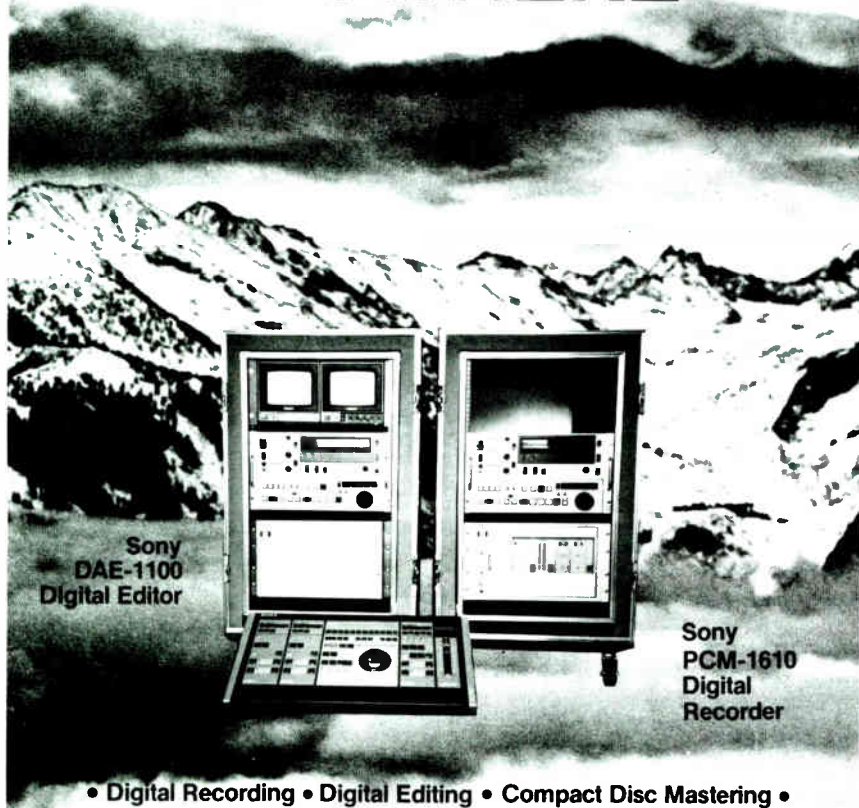
Just as sampling rate determines frequency response, bit width determines dynamic range. Back in the sample and hold circuitry of the ADC, the incoming analog signal is sampled and converted into pulses of various amplitudes. These pulses must then be converted into numbers that the digital audio computer can work with. To do this, the total amplitude range of these pulses must be divided into segments or levels, which are called quantizing levels, each of which is assigned a reference number, or binary code. The total number of binary codes available to identify pulse amplitudes is determined by the number of binary bits that the converter can handle.

This, in turn, defines the total available dynamic range of the device. The correlation between analog dynamic range and digital bit width can be broadly determined by the following rule of thumb:

$(6 \cdot n)\text{dB} = \text{Dynamic Range}$, where n is the number of bits per sample.

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professional audio systems are 16 bit systems, and thus provide a theoretical total dynamic range of 96dB. The key word here is "theoretical."

Sampling Circuitry Errors and Other Non-Linearities

Presently available 16 bit converters running at the sampling rates required for professional audio use are less than perfect. In practice, instantaneous errors occur in the process, and the error correction support provided is less than adequate. It must be understood that *anything* that results in missing codes or loss of linearity in the transfer characteristic will create audio problems, especially on transient material and low level signals.

This general category of problems tends to originate from within the support circuitry surrounding the converter chips as well as from the chips themselves. Once again, the key point is that these problems are due more to historic reasons than any specifically limiting technical barrier.

Although it is not a particularly comforting thought, error-free conversion of audio information to and from the digital medium simply requires much more precision than is necessary to deliver an intercontinental ballistic missile to a target halfway around the world. Until recently, the manufactur-

ers of 16 bit converters had not even noticed some of the non-linearities that most plague the digital audio console designer! These errors were just too small to negatively effect the accuracy of the instrumentation for which their converters were developed.

Properly optimized 16 bit DACs will be sufficient for outputs and monitoring purposes. Because of noise addition from multiple inputs, more than 16 bits are desirable for professional ADCs. The growing number of top-notch audio engineers involved in identifying and eliminating these problems has already produced substantially improved digital audio in the laboratory. As the audio industries' requirements for absolutely precise conversion grows, the pace of these developments is accelerating. Practical and stable adaptations for digital consoles will emerge.

Digital to Digital Transfer

With the advent of a mature digital audio architecture, the need for conversion between analog and digital forms will steadily diminish. Eventually, it will disappear altogether, with the exception of microphones, antique (but wonderful) effects devices, and monitor systems. Audio synthesis, processing, storage, editing, transmission

and reception will be entirely digital and impeccably faithful.

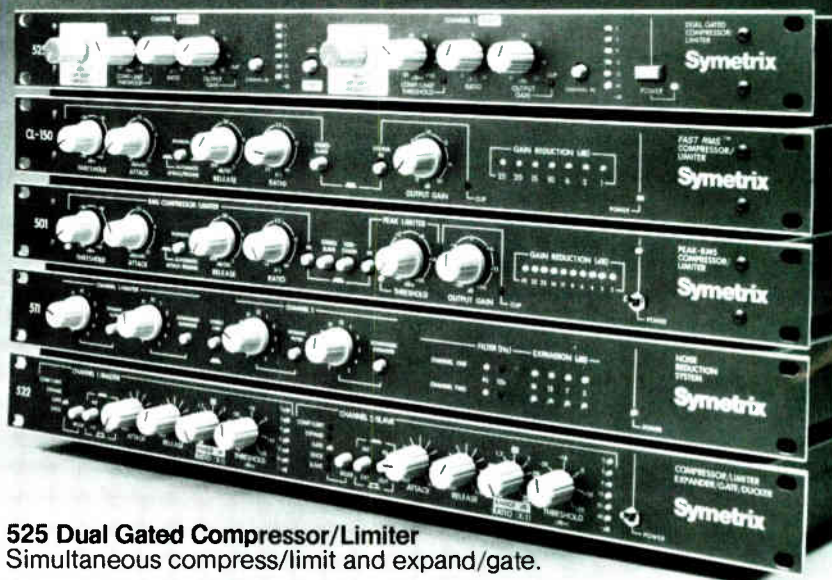
The AES/EBU Serial Transmission Format for Linearly Represented Digital Audio Data [ANSI S4.40-1985] is a major step towards this goal. This format sets a standard for direct digital connection between audio devices, requiring only a single twisted pair for transmission. The provision of compatible digital inputs and outputs on "goodie boxes," synthesizers and storage/retrieval systems is a necessary starting point.

A less obvious requirement is the establishment of standards for locking the data rate clocks of these various devices in sync. A precedent for such synchronization exists in the television industry. The audio industry must give this matter more attention now.

24 Bit Digital Audio Processing

While properly supported 16 bit converters will be sufficient for the ADCs and DACs at the inputs and outputs of a digital audio console, 16 bit processors are wholly inadequate for the tasks to be performed by the console itself. The 96dB range between noise floor and peak signal provided by true 16 bit conversion serves well in a single pass situation—but processing within any console involves many multiples of passes.

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To understand the implications of this, an analogy is useful. In an extremely limited sense, the arithmetic operators of the digital audio computer can be likened to the variable resistance elements (or their programmable substitutes) of an analog audio console. While the processes involved are *completely* different, there is a rough equivalence in their eventual results.

In a digital equalizer, for example, the audio data may pass through the multiplier 20 or more times, as well as receiving delay treatments and addition. As you would expect of any device with a 96dB dynamic range, this results in the buildup of noise and other infidelities. It must be stressed that the factors contributing to this cumulative digital degradation are entirely different from those in analog audio processing. Nonetheless, the net results are unacceptable in either medium.

In digital processors, the major problem with 16 bit is a gremlin called "rounding error." If the algorithms needed to produce the required effects result in numbers that are greater than 16 bits, the computer simply rounds the results off to the nearest number that fits. Multiplication of any 16 bit coefficient will always yield such a result—and if the system is limited to a bit width of 16, rounding error will occur. As the resulting (rounding-off) number is multiplied again and again, the difference between the actual product and the rounded-off product increases. The resulting audio effects are not at all desirable.

As is the case with higher sampling rates, higher bit widths require more processing power and this costs money. But as with sampling rates, a certain number is absolutely necessary to achieve audio performance that will meet the requirements of the discriminating listener. There is growing acknowledgement that the appropriate number for digital audio computers is 24 bits, which yields a total dynamic range of 144dB. A properly implemented 24 bit digital console architecture will yield superior results to any analog console, and will accommodate all foreseeable developments in converter, storage and transmission technology.

The Real (Time) Problems of Digital Audio Design

It is unfortunate that one analog audio technique seems destined to be carried over into the digital era. We refer to the technique of specsmanship. Unintelligible discourses on bits and sampling frequencies and floating points litter the advertising pages of most audio journals, serving only to mislead the novice and bewilder the

professional.

As we have discussed over the last several pages, there *are* audio problems relating to these issues—but the general parameters of these problems have been common knowledge in the audio manufacturing community for some time, and their specific solutions are also evident.

The *real* problems of digital console architecture can be counted on two fingers. They are speed and flexibility. These same two issues are also the real problems of any programmable control surface technology, analog or digital—but that will be discussed in the following section.

Processing Speed

Inadequate processing speed manifests itself in a variety of ways. The most common example, which has been experienced by anyone who owns a personal computer, is the wait for instructions to be carried out. In the case of personal computing, these delays are merely frustrating. In a professional digital audio computer however, such delays are completely unacceptable.

An audio processing thruput lag of only one or two milliseconds can make life very difficult. If this lag should increase beyond those limits, or vary depending on the number and type of simultaneous calculations requested, ordinary every day studio procedures such as overdubbing and track bouncing can become literally impossible.

This, by the way, is exactly the sort of real world problem that *can* be solved by computer engineers, provided that they understand the seriousness of its implications at the initial processor design stage. It is precisely for this reason that digital consoles must be developed by closely-knit *specialist teams*—each member identifying task-specific problems to be solved by one or more of the others.

An existing state-of-the-art analog console provides a good starting point for illustrating the true dimensions of the speed requirement. On a Solid State Logic SL 6000 E Series console, for example, each channel has 78 switching functions and 31 continuously variable functions. Not including master controls, this adds up to 6,104 functions on a 56 channel console.

To meet the necessary frequency response requirements, the audio processor must take one sample every 20.8 *microseconds*, which is a sampling rate of 48 kHz. Assuming that it will take you only one instruction per sample to service each of those functions, the digital audio computer equivalent of that console must be able to handle at least 293 *million* instructions per

second. In practice, the requirement is to handle two or three instructions per function, which implies at least 879 million instructions per second.

Given that one of the main reasons for advancing beyond standard analog is to make extremely large consoles possible, the digital console designer must actually be thinking in terms of *1,000 million instructions (10⁹) per second*. To put that in some perspective, if your typical office model modern 16 bit personal computer is capable of handling even one million instructions per second, you're lucky.

So one way to visualize the processing speed necessary to properly realize the audio part of a digital console is that it is roughly the equivalent of 1,000 personal computers! Readers who are familiar with computer technology will recognize the startling fact that the sorts of processing required for a practical digital console actually make Crays and similar scientific/military "super-computers" look slow—particularly in terms of memory bandwidth.

Error Logging and Checking

A typical operation in a digital audio computer is an add—you put two numbers in and get one out. What this means is that with every instruction of the machine, you're actually accessing three pieces of data memory, and probably a piece of program memory. Four bits of memory x 10⁹ instructions per second means that there are very large amounts of data flying around at amazing speeds, and correspondingly high memory bandwidth requirements.

With this number of instructions going on, it will only take one out of a very small number of these going wrong to produce a nasty click—just the sort of thing that results in a call to the maintenance department. And it is quite embarrassing if all that's left behind from that click is the impression in your client's brain, and a ruined take—and no ability whatsoever to diagnose the problem.

What maintenance wants to know is *what* happened, exactly *when and where* it happened, and most of all, *why*. This requires some scheme for error checking and error logging. For reasons of cost and capacity, this is one of the real-world requirements that didn't get addressed in first-generation digital console designs. At the time these early attempts were initiated, the leanest possible approach was dictated. There was absolutely no slack in the processors, and apart from that which actually got audio through the system, everything else was necessarily left out.

Now that the necessary chips have

finally begun to decline in cost, it is a reasonable proposition to develop large-scale digital audio processors with the proper sorts of guards that distinguish a piece of sensible professional gear from a research prototype.

Networking

The necessary processing speeds and memory bandwidth to meet the various requirements of an entirely digital audio console cannot be realized with a single processor. Instead, one must build a collection of closely coupled slower processors. Here, "slower" must be taken as a relative term. While the cost of using a large number of less capable "off-the-shelf" processors may be attractive, this approach rapidly reaches a point of diminishing returns. The full speed of each processor cannot be simply added until the necessary total is reached.

This is because as more machines are added, the management of the audio data and instructions flowing between them becomes progressively complex. To assure reliability, every bit of data that is transferred between machines must be checked for errors, and if any are detected, that data must be re-transmitted. The paths along which this information flows become bottlenecks, again slowing down the system. One quickly reaches a point where only a small percentage of each additional processor's speed is actually available.

There is no expedient solution. The individual processors must each be capable of processing tens of millions of instructions per second. This hardware, and the audio processing software to run it, and the networking software to couple it, must all be developed by the console manufacturer. This is a massive undertaking, but there is no other way to fully realize the future of audio console design.

Flexibility

It is possible, of course, to subcontract various aspects of this development to outside companies, or to delegate the individual aspects to separate task forces working within a larger organization. While these approaches can accelerate development, the consequences remind one of the old saying that "a camel is a horse that was designed by a committee."

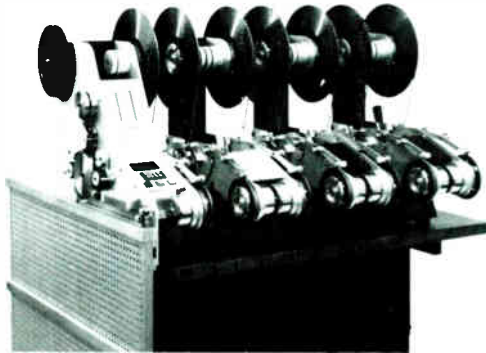
One could study a detailed specification developed by analog console designers and translate these into an equivalent digital console, but this precludes innovation. Great opportunities are irretrievably lost if the hardware organization of a digital console merely mimics that of its analog predecessors. The "fixedness" of analog control

—CONTINUED ON PAGE 203

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Sizing Up Your Market

by Tony Thomas

For your recording studio to be successful, you must define the market or markets that you aim to serve. Your studio can no longer survive by looking at the market as an aggregate: that is, by attempting to be everything to everyone. By taking a hard and long look at the market as a whole, you can then select the segment or segments that you nurture effectively and profitably.

An advantage of market segmentation is that it allows for maximum effort to be targeted to the most lucrative segments of the market. This eliminates much of the "wheel spinning" that slows the initial success of a recording studio. More of the studio's financial resources and talent pool can then be directed toward the areas that will produce the greatest return on investment.

The analytical nature of segmenting markets readily allows studio management to spot the trends as well as the overlooked but lucrative sectors in the recording field. This analysis may point toward the operation removing itself from a fading market or capitalizing on a growing one.

Effective market segmentation involves understanding the demographic (age, sex, income, etc.) and psychographic (attitude, personal preference, motivation) variables of the marketplace in order to profile the consumers of your studio's services.

You should determine the total market potential for recording in your area in terms of both the number of consumers and the amount of money spent. With that information, you can decide whether or not your planned geographic area can support your studio. The *orientation* of the market in which you are locating, with respect to the kind of recording services they routinely use, must be carefully considered. For example, the market for film scoring is limited outside of major film production centers like Hollywood or New York. Thus, setting up a film

scoring studio away from one of these production centers may be an unwise move if the market is not oriented towards such a service.

It is also important to investigate whether or not the market for recording services has been saturated in the area that you are considering putting your studio. If there are already several good studios in the area, the demand should be sufficiently heavy to warrant another one. Who are your potential clients? What age/income bracket do they fall into? How closely do the geographic area demographics replicate the type of clientele you are going after? What are their interests? What kind of environment do they enjoy working in? All of these factors will affect the location, marketing and even the decor of your proposed studio.

To bring in regular clients, it is important for your marketing effort to impart some kind of benefit of your studio that other studios in the area don't offer. Whether you promote your brand new 72 x 48 custom console, your mountain location, your specially treated studio, or the fact that you master half-inch/30 ips, you have to make your clients feel that they are getting something in your room that they can get nowhere else.

One of the most precious things that you have to offer your clients is your integrity. There is no worse enemy to the modern recording studio than a reputation for not keeping your promises with regard to rates, deadlines or what your facility is and isn't capable of doing. Follow through on what you promise to do, since word of mouth travels and sticks. In order for your studio to obtain a reputation for superior quality, it must deliver superior quality. It doesn't matter if you have the latest state-of-the-art gear or a bunch of antiques on their last legs, it is up to you to make sure that everything that comes out of your doors is representative of the image you want your studio to have, from the sound on the reel right down to the labels on the boxes.

Competition

Competition for your studio will come from two directions: those who were there before you, and those hot on your heels hoping to capture some of your success. While it is impossible to predict who will come after to try to "steal your thunder," it is advisable to survey the field carefully as you start out.

Start to track down the competition with your local telephone directory, realizing that many smaller and garage-based studios probably won't be listed either because of a lack of funds, semi-pro status, or possible zoning violations. Check local newspapers, trade publications, flyers, music shops, record stores and other places where studios are likely to advertise. Collect rate cards, brochures, directory listing information, articles on the operations, etc.

Develop some type of classification system for studios that you can easily cross-reference, such as putting each studio on a different 3 x 5 card with information on size, number of tracks, number of studios, equipment, location, years in existence, specialties, rates and credits. Chances are, the majority of your competition in the studio business will come from those studios that are closest to yours in capability, size, equipment and rates. Looking at rates can be very deceiving. It is possible, for example, for a 4-track studio to cost many tens of thousands of dollars if outfitted with a professional quality recorder, board, monitor system and a full complement of high quality mics. It is also possible for a 4-track studio to cost only a few thousand dollars if it consists of a cassette-based, 4-track mixer/recorder, a home stereo system and some cheap mics.

To determine if your suggested rate will be competitive, look at the cards of the studios with a similar equipment list and see what they are charging. If your rate is within ten-20 percent of your competitors, it is pretty safely in the ballpark. Be careful of underpricing your services, however. While there are bona fide bargains in this world, most people are generally suspicious of deals that seem too good to be true.

Your marketing efforts should, most importantly, allow you to find your niche in the business and to do the very best you can in that particular part of the field. ■

AES MEETS IN MONTREUX SWITZERLAND



Montreux, Switzerland . . . what a lovely spot for an AES convention. It reminded me a little of Lake Tahoe, had the developers invaded in about the 13th Century. The area is seductive to the recreational libido. I fought off the urge to abandon the convention center in favor of the slopes, and found this year's foray into the world-class audio arena to be a not-so-surprising mix of traditional audio life extension and cautious futurism.

In statistical terms, the 80th Audio Engineering Society Convention pulled together nearly 4,000 audio engineers from about 20 countries, the U.S. and U.K. accounting for almost half. Exhibits totalled 160, and 60 technical papers were presented, highlighted by a "video" paper presentation called "Acoustics and Computer Science," by Professor Manfred Schroeder, with discussion via a direct audio line across the Atlantic due to the author's inability to leave his Bell Laboratories obligations in New Jersey.

Product introductions are a mainstay of AES conventions, be they international or domestic, and this meeting was no exception. Among the highlights, Dolby introduced their Spectral Recording (SR) system, six years in development, which was designed to squeeze the maximum potential out of analog recorders, making their sonic performance competitive with digital. The \$750/channel plug-in modules, designed to fit Dolby A-type mainframes, employ a new coding algorithm sensitive to variations in signal spectrum as well as to level changes, in contrast to noise reduction systems that respond primarily to level variations.

(Special thanks to Pat McDonald for her photographic assistance.)



The Swiss don't mess around when it comes to fanfares. This one heralded the Awards Banquet.



Swiss-based Studer was among the 160 exhibiting manufacturers.

Adding fuel to the analog backlash, Soundcraft introduced their highly microprocessorized Saturn 24-track machine (Eurythmic Dave Stewart showed

up to place the first order), and Otari unveiled the MX 800, a moderately priced 24- (and soon to be 32-) track analog series. Preferring to cover both bases, Otari also was a proud parent to the DTR 900 multi-track digital recorders. This PD format entry was promised for U.S. release later this summer.

Digital processing and recording showed further strength in the form of Mitsubishi's new X-850 second generation multi-track. Taking advantage of the digital format wars, as well as adapting to the needs for their high-end disk manufacturing reputation, Harmonia Mundi Acoustica showed their frequency converter that not only made DASH and PD format digital march in single file, but also added digital equalization, limiting/compression and a host of other esoteric features into the same box. Formats notwithstanding, Ampex emerged as another winner, sporting digital tape products that everyone seemed to applaud.

Further digital rumors persisted regarding R-DATS, the rotating head digital 8mm cassette recorders whose size, price and performance might give all serious digital manufacturers a run for their money in the not too distant future. Stay tuned.

Other impressive showings included the PPE-2400 Programmable Parametric Equalizer from the Dutch Stage Accompany, AMS' Winchester disk based AudioFile digital audio recording/editing system, Publison's Infernal Machine update for pitch compensation at varying recording speeds, Audio+Design's Ad-Mix Digital Fader that enhances the F1/701 recorders to provide digital mixing for the first time in this format, and Electro-Voice's highly efficient low-end sound reinforcement transducer, the Thunderbolt. Studer and Sony also staged a minor coup, swapping digital tapes and playing back pre-recorded digital program material on each other's machines.

AES executive director Don Plunkett presides over the opening ceremonies.



All in all, if one reason had to be found to justify attending the international version of the AES convention other than to get the sneak preview of many new products, it might deal with the reality of professional audio more than ever before existing in a world community. The problems and solutions of our technology are of universal concern, and the international AES has proven to be the best forum so far to address many of these issues. But don't bother taking your skis; the time disappears right before your eyes.

by Al Pine

SAMPLING, PART II

IN WHICH DORIS GETS HER OATS

Let us not underestimate or take for granted this task we refer to simply as sampling... this is more than just glorified tape recording.

by Larry Oppenheimer

In our last exciting episode, our hero/heroine, The Sampler, was introduced. An examination of the different races, creeds, sexes and national origins of samplus digitalus was followed by a dissection of that most vital organ, the A/D converter (along with its trusty sidekick, the anti-alias filter). This, however, has only served

to throw our sound into the labyrinthine corridors of the digital domain, where it must be stored, edited and perhaps even processed and pitch-shifted before being played back. Will it ever emerge safely from loudspeakers again? We'll find out as we turn to the exciting conclusion of our story.

Memory demands

Memory is another significant consideration with sampling machines. There are three factors that determine the amount of memory needed in a sampling machine: the sample rate, the A/D converter resolution, and the desired sample time. These factors are essentially three sides of the same coin, so to speak. At a sample rate of 20 kHz, 20,000 samples are generated for each second of sound. Each sample must reside in its own memory location, memory typically being measured in bytes (8 bits). So if the resolution of the converter is 8 bits, 20 kb (kilobytes) of memory are used for each second. But what if the resolution is 16 bits? Each sample would then take 2 bytes of memory, resulting in 40 kb/second. If the sampler is using high-quality and expensive 16-bit conversion, though, it makes little sense to limit it to a 10 kHz bandwidth, as a 20 kHz sample rate does. Okay, so we go up to a 40 kHz sample rate. Now we're up to 80 kb/second. At that rate, eight seconds of sampling takes up 2/3 of a megabyte of memory—more than any sampler other than the Fairlight or Synclavier—and that's sound file data only. More memory is still needed for parameter data, and the system's operating software.

Ten years ago, including that much memory in a commercial musical instrument was inconceivable because of the massive cost, bulk, and heat generation involved. Five years ago, it was conceivable, but still too expensive for serious consideration. In the last few years, though, memory prices have steadily decreased and capacity has steadily increased. It is this economic factor that has allowed instruments with over 15 seconds of wide bandwidth sampling to be available for less than seven thousand dollars. But contrary to popular belief, the downward spiral in memory prices is not endless. Actually, memory prices seem to have bottomed out for the time being, and even risen a little.

Mass storage

Once all the trouble of getting a sampling has been gone to, it is necessary to offload it to some more permanent storage system. Most samplers have some kind of onboard storage, typically floppy disk, but this is not universally true: the Kurzweil 250, for example, requires a Macintosh computer for off-line storage. The Akai S-612, a relatively inexpensive rack-mount sampler, offers storage to tape, but also has an optional disk drive available. Considering the very large amounts of data that sound files contain (easily reaching several hundred kilobytes or more), tape dump can be a rather lengthy proposition, enough so to make the extra investment in a disk drive quite worthwhile. Even saving to or loading from floppy disks can take a few minutes; load time from disk can be a major consideration in live performance.

But time factors are not all there is to think about. With many samplers, one memory dump can completely fill a floppy disk. Disk libraries (and the related costs) expand at an unconscionable rate once sampling fever sets in. There are several alternatives available, with the most available being hard disks and the most promising being the new types of mass storage currently under development, notably writable optical disks, which

—CONTINUED ON PAGE 57

The Thin Man becomes a Fat Boy

... or how a Mirage Digital Multi-Sampler can make your DX-7* Deluxe



The DX-7 is a marvelous machine, but quite a few of you think it could use a little fattening up. DX sounds are punchy and crisp, but a tad on the thin side.

Not to worry. With a Mirage Digital Multi-Sampler and a MIDI cable, you can change all that.

While the DX uses operators, algorithms and sine waves to create its sonic personality, the Mirage uses multi-sampled waveforms of actual acoustic instruments for sounds with acoustic richness and character. Just connect the MIDI Out of the DX-7 to the MIDI In of the Mirage, power up your system, and turn yourself on to the hottest performance set-up going.

Partners in Crime

If killer sounds will help you steal the show, the DX and the Mirage are perfect partners in crime. There are over 100,000 sound combinations among the available DX and Mirage sounds. Rather than list them all, here are a few favorites.

Dualing pianos. DX and Mirage keyboard sounds complement each other perfectly. The electric piano sounds in particular combine the synth punch of the DX with the realistic timbre and dynamics of the Mirage. In fact, any synthesized sound takes on a new dimension when combined with the sampled acoustic counterpart. Strings, brass, mallets and fretted sounds take on a new personality when doubled on the Mirage.

The bells are stringing. The impressive bell sounds of the DX come alive with orchestral richness when combined with the Mirage string sounds from Ensoniq Sound Library Diskette 3. Depending on



Mirage sounds + DX sounds... over 100,000 combinations

how you balance the levels, the effect can be either subtle or startling. While you've got the strings loaded into the Mirage, try some of the DX synth bass sounds (especially percussive variations) and hear how well the strings support the bass.

Digital Doo-wop. The "Tah" and "Doo" vocal samples from diskette 17 add new life to many of the old standby DX sounds. Try the "Tah" and DX brass sounds together. Use the "Doo" with the caliope. The human voices add a jazzy sophistication to even clichéd patches.

The Special Effects Department

With pitch and mod wheels, velocity sensitivity, after touch, breath controller and pedals, the DX is among the most expressive synths. If the truth be known, the new Mirage operating system (version 3.0 and up) was developed specifically to take advantage of these DX features.

Through the magic of MIDI, the DX and the Mirage can be configured many different ways. For instance, you can modulate the Mirage LFO from either the DX mod wheel, breath controller, foot pedal controller, volume pedal, after touch or even the data entry slider. And all independently of how you are controlling your DX.

So you can use after touch to modulate a DX string sound while using the DX mod wheel to control vibrato of the Mirage sampled strings.

The Mirage has the ability to vary the mix between the two oscillators of each voice. The solo rock guitar sound on diskette 6, for instance, has a heavy guitar

sound on one oscillator and a harmonic feedback sound on the other. You can vary this mix with any of the DX control functions. A favorite of Mirage DX players is to use the DX after touch to control the mix. Playing the

keyboard normally gives you that "wide-open-through-a-couple-of-stacks" sound, and pressing extra hard will bring in the feedback. A little practice with the pitch and mod wheels will earn you a convincing guitar technique.

Remote Territory

Changing sounds and programs on the Mirage is simply a matter of pressing a few buttons, but if you want to rack mount your Mirage you can just as easily change sounds and programs right from your DX



Just 11 pounds of Mirage can make your lean DX a fat boy

over MIDI. Pressing one button on the DX can change your entire set-up from a sweet string background to a sizzling solo sound on both the Mirage and DX.

A Marriage made in Malvern

The Mirage DX partnership is a natural. Although the instruments are designed and built on opposite sides of the globe, they go together like hot dogs and mustard (or sushi and soy sauce). If you own a DX-7, bring it down to your authorized Ensoniq dealer and let it spend some time getting friendly with a Mirage Digital Multi-Sampler.

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Sampling on a Shoestring Budget

"How to make the most out of your MIDI set-up"

by Rod Abernethy

You can hear them everywhere... on television, radio, and movie soundtracks. Synclaviers, Fairlights, PPG Waveterms and Kurzweils; all those marvelous dream machines that most of us can't afford. How can you compete?

For those of us with small budget MIDI setups, we *can* compete. But it takes knowing and exercising a few vitally important guidelines to make the most out of the equipment that you now have.

The Price Is Right

I started my present setup with one keyboard, then I added onto the system as my budget would allow. The Korg DW-8000 or the new Ensoniq ESQ-1 is an excellent first choice; both are good all-around synths with flexible programming capabilities, and they won't completely destroy your savings account. The Ensoniq ESQ-1 also has an extensive built-in sequencer. For those of you just starting on a MIDI-controlled system like mine, I strongly urge you to take the time and learn the applications of MIDI before you pull out your wallet. It will save you time and a lot of headaches when you start your hunt for that first keyboard.

time and a lot of headaches when you start your hunt for that first keyboard.

For a sequencer, I use a Commodore 64 with the Studio 1 software by Syntech. The Studio 1 acts like an 8-track recorder with rewind, fast forward, punch-in punch-out functions to name a few and has been a great help in composing and arranging scores. To connect the C-64 or similar computer-sequencer to the rest of this type system, you must use a simple MIDI interface like the ones made by Sequential Circuits or Passport so that your computer can talk MIDI language to the rest of your system (drum machines, keyboards, etc.).

On many projects where time is the main factor, I use the Commodore 64 sequencer as the master recorder. Therefore, there's no need to use the multi-track tape recorder at all, and that reduces tape costs (and you know how expensive 2-inch tape can be). The final mix is done from the sequencer directly to the 2-track (this method usually has a big *wow-factor* with the client).

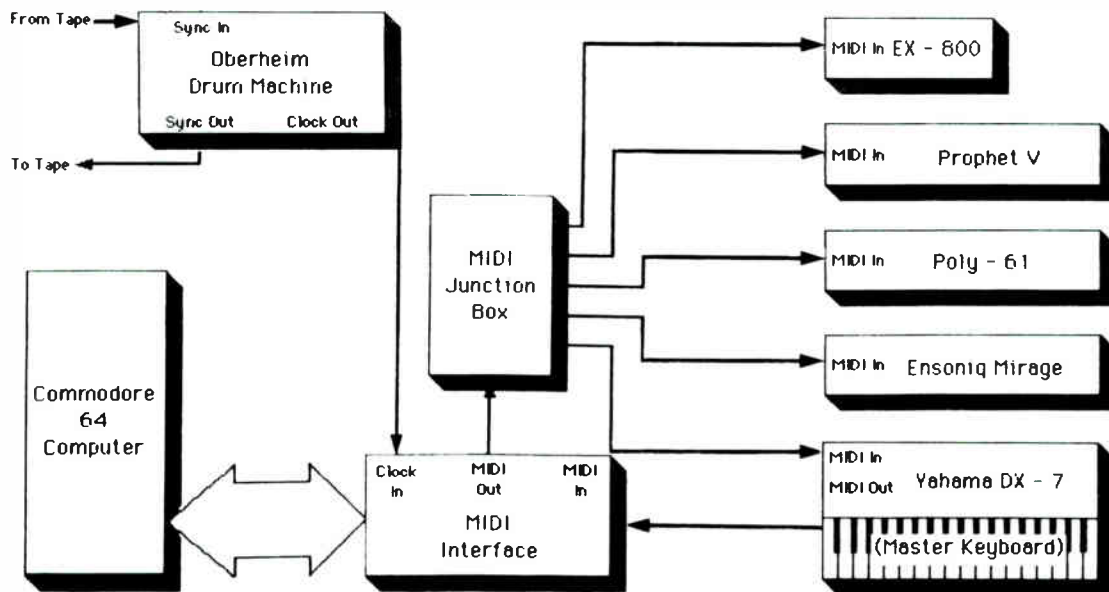
Don't be discouraged when you read about the great new sequencing software now available for the IBM PC and Macintosh when you think you're still stuck with your Commodore-64. There's lots of great

software out there for the Commodore and Apple II that will keep you busy until your budget allows for a more powerful computer.

The heartbeat of my present system is an Oberheim DX drum machine. To sync the DX to tape, I use the sync tone generated by the drum machine and route it directly to the multi-track tape recorder (I avoid going through the mixer with sync tone bleeding through to other tracks). Then I use the clock out of my DX to drive the C-64 sequencer which in turn drives the rest of my MIDI system. This arrangement has worked like a charm with very few synchronization problems.

For those of you looking for a new drum machine to use with a sequencer in the \$1,000 or under range, you have a great selection to choose from. Most all of the Roland, Yamaha, and Korg machines are loaded with great sounding digital samples, and they're equipped with MIDI. One of the most exciting uses of MIDI in computer percussion programming is that you can bypass the internal sequencing memory of the drum machine itself and use your master sequencer (such as the Commodore-64) for programming your drum sequences and songs. That way you don't have to load up a data cassette every time you want to store a song that you've

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—FROM PAGE 54, SAMPLING

may provide another order of magnitude leap in sample storage in the near (if not immediate) future.

Hard disks are available as onboard storage for only a very few devices: the Fairlight, Synclavier II, and most recently, the Emulator II. However, if a sampler can be interfaced to a personal computer (as can the Emulator II, the Prophet 2000, and the Ensoniq Mirage) and can dump its sound data over that interface, then a hard disk can be added to the computer and mass storage achieved that way. Although this solution will not load as fast as a dedicated hard disk, it still offers gobs of storage: hard disks are commonly available in sizes ranging from five to 30 Mb. At the time of this writing, the only sampler with optical storage available is the Emulator II, for which a CD-ROM has been produced by Interactive Arts International in conjunction with E-mu and Optical Media Services. Since writable optical disks are yet to be available to the general public, at this time the CD-ROM must be purchased with sounds compiled by the manufacturer (although IAI/OMS will make custom CD-ROMs from customer-supplied tapes or disks). Still, the idea of having 1100 memory dumps on-line for fast loading (ten seconds) is inviting to

Three factors determine the amount of memory needed in a sampling machine: the sample rate, the A/D converter resolution, and the desired sample time.

anyone who has had the chance to play disk jockey with their sampler.

Digital editing

Once a raw sample has been captured, it is usually necessary to edit it somewhat to get exactly the desired sound. In most cases, this is actually relatively simple to achieve technically, although it can involve a significant amount of system software. Pieces of information about the sound file can be collected into presets completely independent of the sound file itself. This approach has been well refined in the E2.

"The Emulator has what are essentially 'virtual' sound files," Massie says. "You can have a single sound file, and then create what, in E-mu terminology, is called a 'voice,' which is really a physical sound file combined with a voice descriptor. The voice descriptor has the start and end points of the physical sound, but it also has what we call 'Truncate Start' and 'Truncate End,' which are the start and end points of the virtual sound. Many voices or multiple sound descriptors can all use the same physical sound file. To move the start point of a sound, you don't have to move the physical sound file. You can if you want, that's called making truncate permanent on the

—CONTINUED ON PAGE 59



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—FROM PAGE 56, SHOESTRING

programmed on the drum machine; that information is now stored to disk with the rest of your keyboard information from the master sequencer.

Fortunately, the studio where I work has a very good array of processing equipment. Digital reverbs and delays, gates, limiters and samplers can make your dry-sounding, one man MIDI set-up sound like a "team of experts" if used cleverly and economically.

A sampling unit such as the Akai S612 or the Korg SDD-2000 can turn that wimpy little rhythm machine snare into an exploding cannon. First, sample a favorite snare sound into the sampler (you could use a real snare as the source or drop the needle on a good sounding snare from an album). Then use the previous rhythm machine snare track to trigger the newly sampled snare from the sampler. This method can also be applied to replacing other tracks like kick drums or toms, and by using your imagination you can also create some really bizarre effects. By using sampling devices, you can have the same big budget sounds on your drum tracks as the big guys. And the good news is that more good sounding samplers

are coming out at prices that almost any working musician can afford.

In the keyboard department, I'm using a Yamaha DX7, Ensoniq Mirage, Korg Poly-61, Korg EX-800, and a Prophet V. Both the Poly-61 and the Prophet V have been modified with MIDI, and it was well worth the expense. Between the C-64 and the keyboard array, I have an inexpensive MIDI junction box. If you're still using MIDI slave-outs to chain your setup, you owe it to yourself to buy a splitter box and avoid the nasty delays caused by chaining MIDI'd keyboards together.

The Mirage has been called the "poor man's Fairlight" and for good reason: it provides good polyphonic sampling at a fraction of the cost of the high-priced guys. Some might say that the Mirage lacks a little in sound quality, but for the money, it's a steal. It has saved countless hours in the studio providing quick and easy access to good bass, piano and string samples, not to mention what can be done if you have the Ensoniq Visual Editing System or the new Digidesign software for the Mirage combined with a Macintosh.

If you're a keyboard owner at any level, chances are you own a Yamaha DX7. If not, then you should

think about adding an FM digital synth to your keyboard array; these days it's a must. The Casio CZ-101 is also a good way to add those great digital percussion and electric piano sounds to your rig and it is priced at less than \$500. Another good thing about owning the DX7 or CZ-101 is the vast user-network for them that exists. Custom presets and software are in abundance (check for a user group in your area).

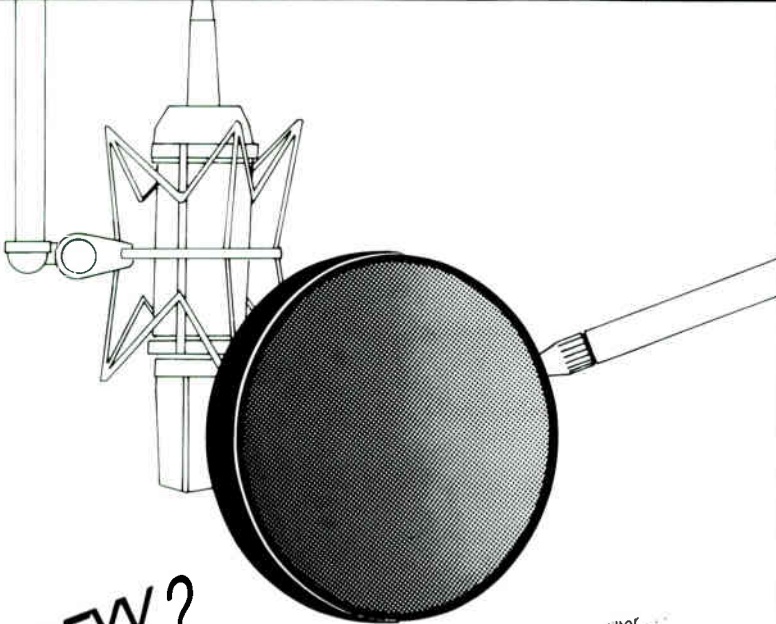
Not enough can be said about the magic of MIDI. Most any keyboard, no matter how "cheesy" it might sound by itself, can be a welcomed addition to your MIDI setup. A helpful hint for using MIDI with multiple keyboards: when trying to blend sounds together from various synths by using MIDI, try putting quick, hard-attacked patches on one synth with slow-attacked patches from another synth. For example, try the plucked koto from the Yamaha DX7 with a string sample on the Ensoniq Mirage. Using this technique is where MIDI really shines.

Down To Business

With this moderately-priced MIDI system, it's possible to tackle many musical tasks that would be associated with the Synclavier and the Fairlight. You would be surprised just how many scores for TV, radio and film were composed and recorded on modestly priced systems like mine.

Another perfect match for this MIDI setup is the corporate video score or as you may remember them, "industrials." Until recently, producers of corporate video were using stock music libraries to sweeten their films. By using composers who own such MIDI-systems as the one I described, recording costs are cut drastically, therefore making custom music competitive with the use of stock music libraries. And let's face it, wouldn't you rather have your own customized music instead of a stock track that's being used by hundreds of others?

Besides using your "MIDI-rig" for radio, television and corporate scoring, other sources of income are possible from session work on albums and equipment rentals for other studio-related projects. So don't despair when thinking about those \$25,000 and up musical computer systems that you can't afford at the present; make the most with what your budget will allow and it might surprise you. ■



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—FROM PAGE 57, SAMPLING

Emulator. If you know you're never going to use the start of a sound, or if it's blank, you throw it away. But you can keep a single physical sound file and many different pointers into that sound file, and get a lot of different effects out of the same recording. You can take a long sentence and have multiple voice descriptors pointing at that sentence, perhaps each using one word out of the sentence. Because you can have separate filter envelopes, you can have radically different sounds from one sound file.

"Every time you hit a key, the central processor reads the key number, looks into the memory to see where the key is referring, and gets the proper parameters which are then loaded into the memory controller. The mapping of key numbers to sound descriptor files gives you the ultimate flexibility, because each key can be mapped to its own sound descriptor file."

Reverse playback is also simple to do in software, just create a flag that indicates which direction the sound file should be read in, and clock the sample counter to count up or down as needed. Looping is merely another set of pointers, but it can be quite difficult to find looping points which yield the desired timbre without glitching, as noted above. All in all, digital

editing is one of the easier parts of the whole shebang.

Polyphony and pitch-shifting

Okay, now we get to the *really* tough stuff. The techniques used by a sampler to achieve polyphonic playback and pitch-shifting can make huge differences in the sound and cost of the device. Both of these are very complex digital signal processes, which can be accomplished by various methods ranging from the cheap and dirty to the exorbitant and flawless. In some cases, the choice of technique is limited by cost constraints, and other times, to be frank, by the design engineers' knowledge of the subtleties involved. Computer musicians in academic environments have been doing this kind of processing for quite a while and have evolved a number of excellent methods for it, but most commercial devices cannot afford the same kind of computing power used in universities and laboratories. Therefore, other methods have been employed. One large distinction is that commercial instruments typically use hardware-based methods, whereas mainframe-based systems have traditionally used software methods. In the following discussion, we refer only to techniques employed in commercial instruments.

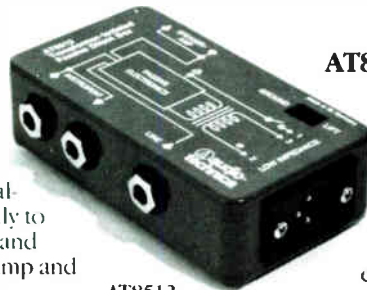
Pitch-shifting a sampled sound is done through sample rate conversion, be it "actual" or "virtual" (this terminology is mine). In the case of "actual" sample rate conversion, the sample is output by the D/A converter at a different rate than it was recorded at, analogous to speeding up or slowing down a tape. "Virtual" sample rate conversion maintains a constant D/A output sample rate, but uses processes that simulate the sound being read out at a different rate. If a machine has a constant rate of output sampling, it is considered to be a synchronous system, while machines with variable output sample rates are asynchronous.

Using some convenient numbers, we'll look at a common method of pitch-shifting in a low-cost synchronous system. Let's say that a 100 Hz source signal sampled at 30 kHz is to be played back transposed up an octave. Using an output sample rate of 60 kHz for this sample will do it, just as playing back a tape at double speed does. A synchronous system not running at a very high speed can't do that, though, so instead, every other sample is just skipped. In this fashion, the sound file is read at a constant rate, yet it finishes in half the time, giving the desired transposition. Unfortunately, this loses some of the detail in the signal. To transpose it down

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AT8512



AT8511

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an octave would entail repeating every second sample. Either way creates audible distortion, and these are simple octave transpositions—1:2 or 2:1 pitch shift ratios. When a pitch shift of, say, a major fifth is desired, a 3:2 ratio is needed, which does not quite work out as neatly as skipping or repeating every other sample. The distortion increases as the pitch shift ratio becomes less simple.

Says Massie: "It's a traditional computer music technique, but if you do the math analysis... well, you don't even have to do the math analysis: skipping or repeating samples causes distortion, and the distortion is a function of how much you change the pitch and how much high frequency content is in the sound. So, this is a very convenient hardware approach, but it produces very notorious distortion. The pitch shifting technique of skipping or repeating samples can generate significantly more distortion than you get from even cheap coding. Interestingly, if you filter it enough, you can get a pretty usable sound, and the success of machines using this technique is a testimony to the fact that quality isn't always that important. You can get acceptable quality to a large number of people if you get the price low enough. The SP-12 uses this technique, but for percussion sounds it works fine, because the type of distortion you get is actually a kind of modulation, and on percussion it sounds very percussive and appropriate."

In an asynchronous system, samples are also not skipped or repeated; instead the sample rate is adjusted to play back the appropriate pitch. In the Fairlight, each voice card has its own waveform memory, D/A converter, and clocking. To pitch shift by an octave, the clock speed for the DAC is doubled or halved; other intervals are almost as simple, requiring only a computation to determine the appropriate clock rate. In the Emulator II, a slightly different approach is taken, which has ramifications for both pitch-shifting and multichannel operation.

"The Emulator uses a very sophisticated technique, in that it has a single wavetable but it has multiple DACs which are arbitrated. All the DACs can read out of the same wavetable, yet on the Emulator, all the DACs are running at different speeds; they're asynchronous. That allows all the DACs to read one sound, for example, so you can use your whole memory for one long sound and yet play it back polyphonically. But this has a problem, because if all the DACs need a sample at once, you have a collision problem. Solving a collision problem in a multiplexed memory is very diffi-

cult. That's why very few designers have gone for that approach.

"You have to arbitrate the memory access, and in the Emulator this is done by a high-speed memory controller, which does the arbitration. That's all in hardware, and it's a clever piece of hardware, too. Dave Rossum and Tom Moxon designed it. It's Dave's idea and basically his structure. There's a similar structure in the new SP-12. The Emulator I also used a single multiplexed memory and solved the collision by FIFOing (using a First-In-First-Out queue)." The Synclavier also uses a very fast clock which is divided to yield a large number of discrete sampling frequencies, although it is actually a high-speed synchronous system.

Multichannel operation, otherwise known as polyphony, is another sticky wicket. Samplers store the sampled sound in a sound file, also called a wavetable. In this respect, they are distantly related to wavetable-based synthesizers such as the PPG and the OSCar from Europe, and the new wavetable synths from Sequential, Kawai, and Ensoniq. To have multiple sounds available simultaneously requires that each sound have memory space for a wavetable and an output channel. Again, these needs are met differently in synchronous and asynchronous systems. In synchronous systems, it is possible to multiplex one DAC for all the voices, if it is run at a speed which is at least $n \cdot SR$, where n = the number of channels. However, it is necessary to have an analog sample-and-hold for each channel to allow latching of its samples from the DAC output at the appropriate time. Unfortunately, multiplexing an audio DAC can also cause intermodulation distortion. Still, the cost saved by using a single DAC can be significant, particularly in a low-cost machine. A high end machine like the Synclavier does not need to make this compromise, hence each Synclavier channel has its own DAC. An asynchronous system, in which each channel may have a different sample rate, must have a DAC for each channel.

Another issue in polyphonic playback is the number of wavetables used. Each channel requires a chunk of memory for wavetable storage, but these chunks may or may not be physically separate. In the Fairlight they basically are; although each voice card actually contains two channels, each channel has its own independent chunk of memory. A number of wavetables may be stored in a channel's waveform memory, but they are only available to that channel (and, of course, the channel can only play one at a time). The Fairlight is set

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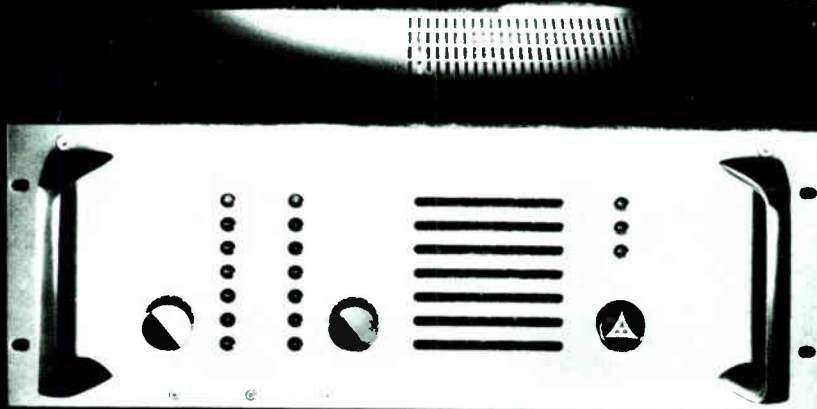
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up to be quite facile at moving blocks of data in and out of the cards, however. The E2, as stated above, has a single wavetable that can be flexibly allocated and simultaneously accessed by all voices. The Synclavier is sort of a cross between the two, as its memory cards can be partitioned amongst several sounds which are simultaneously available, but multiple cards can be accommodated within one frame. Synchronous systems can easily implement multichannel operation with a single wavetable, because the synchronicity obviates the possibility of collisions.

A fringe benefit of having to construct as daunting an interface as the E2's memory controller is that it also

allows several channels to access the same area of memory simultaneously, as detailed by Massie: "In the Emulator, there are up to 99 voices, so there can be a maximum of 99 separate sound files in memory, but the voice descriptors can all refer to the same piece of sound memory if you want. When you hit a key, if that key is mapped to a forwards voice, it starts that voice playing forwards. If you hit another key, which is mapped to a voice playing backwards, it starts up a second channel which is playing backwards, but because the memory controller in the Emulator eliminates collisions, you never have any problem. You can read the same file forwards and backwards and have mul-

multiple loops on the same sound, and never have a problem."

Digital-to-analog conversion

We're almost out of the woods, now. The digital sound data for a given channel is sent to the DAC, where it is converted to analog voltages. Unfortunately, if not filtered again, high frequency "images" can result. The demands on a reconstruction filter (as they are called) are not always as harsh as for anti-aliasing, depending (as usual) on the application. "In the Emulator, we use a high quality, programmable, 11-pole elliptical filter which tracks the channel," reveals Massie. "That way, you can feed the Emulator into another digital device or pitch shift way down and you will get no clocking noise, no images. I'm told that other manufacturers are just using four-pole filters, which is probably fine for some applications. If you have something with a lot of high frequency content, though, and you pitch shift it down, you're going to hear most of those high frequency images. You would also have problems if you're feeding the output of the instrument into another digital instrument.

"The Emulator still doesn't beat a 16-bit digital tape recorder, but it doesn't need to. Remember that a musical instrument is usually being played back polyphonically, so you're using multiple channels, and it's usually being combined with other instruments: a drummer, singers, guitar players. It's only one small component of an overall sound, so it doesn't really have to perform as well as a tape recorder which is going to be recording the entire band.

"In the SP-12, we sample at about 26 kHz, so it's got very high bandwidth, but there are a couple of channels where there is no reconstruction filter at all, and that turns out to sound great on a lot of sounds. A lot of drum machines don't have output filters on the cymbals, because all those high frequency images, the clocking noise, just add to the cymbal and make it sound more 'cymbally'."

And that brings us back to Do

Safely back in the good old analog world, you can certainly see that there is more to this stuff than glorified tape recording. Filtering, A/D conversion, editing, storage, possibly some digital signal processing, playback with pitch shift and/or polyphony, D/A conversion, analog processing and out. Let us not underestimate nor take for granted this task we refer to simply as "sampling." When the next big breakthrough comes, our words, sampled to disk for the ages, may come back to haunt us. ■

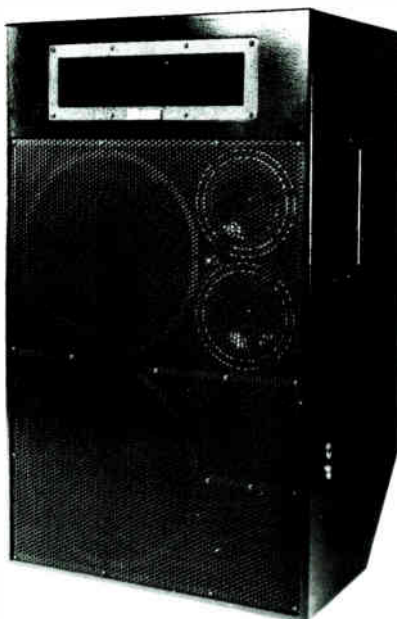
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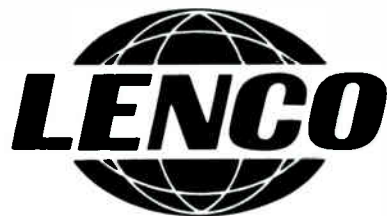
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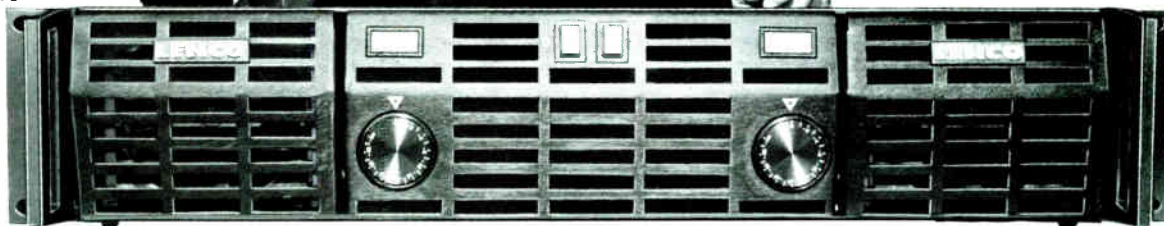
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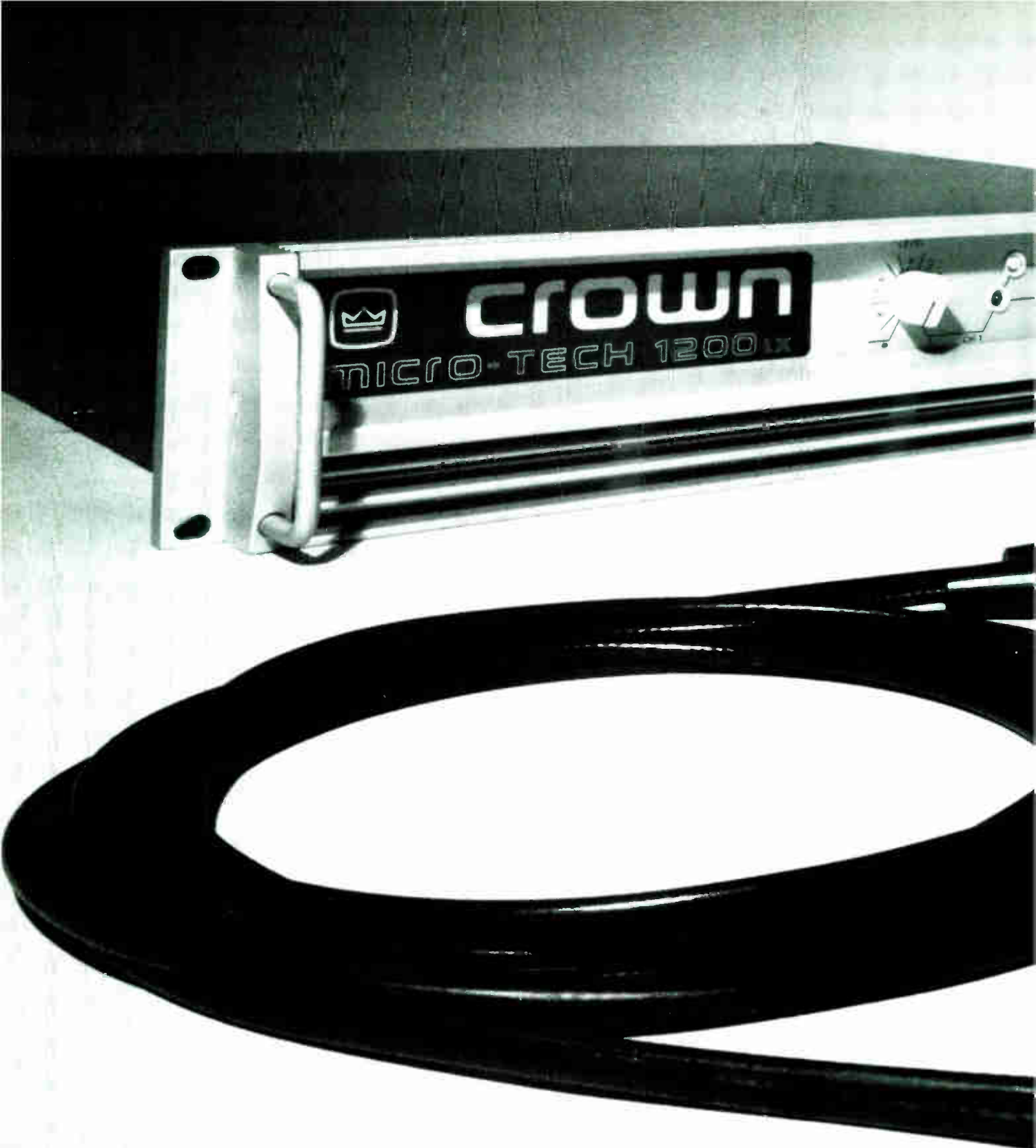
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AFTER · MIX



The Wakefield Co. signs a licensing agreement with Teldec authorizing Wakefield to plate and press Direct Metal Mastering (DMM) product. Pictured left to right are Manfred Atzert, president of Teldec; Horst Redlich, Teldec's technical director; and H.B. Chenoweth, president of The Wakefield Co.

by Philip De Lancie

In last month's "After Mix," I noted that many music industry trend watchers foresee the extinction of the phonograph record by the year 2000. While some believe this prediction to be very conservative, others in the industry are betting that the black

disk will remain important as a means of product distribution well into the coming century. Much of this apparent optimism is based on the hope that technical developments in mastering, plating and pressing will allow substantially improved product quality, thereby luring straying record buyers back to the fold.

One of those sympathetic to this view is H.P. Chenoweth, president of Wakefield Manufacturing, which produces metal parts from masters as well as pressing records. Wakefield, active in record manufacture since 1950, has recently been licensed by Teldec of West Germany to process Direct Metal Masters and to press records bearing the DMM logo. I reached Chenoweth at his office in Phoenix, Arizona, and we spoke about the DMM process and its possible effect on the outlook for the phonograph record.

Mix: Do you feel that DMM will have any impact on the current trend among music consumers away from phonograph records toward cassettes and CDs?

Chenoweth: Yes. I think the impact of DMM, once appreciated by the buying public, will tend to prolong the life of the black disk as we know it today. The guarantee given to the public with respect to DMM is that they are buying a record of considerably higher quality than previously was the case.

Mix: Let's assume that the claimed increase in quality is evident to consumers in the final product that they buy. Are there other factors influencing buying trends which might work to downplay the importance of the quality issue?

Chenoweth: I think there are some things as far as cassettes are concerned. Obviously, a cassette is a convenient vehicle. You can play the cassette in your automobile, you can play it at home, you can carry it with you. There are certain conveniences that are inherent in the cassette that are not present as far as the phonograph record is concerned.

Mix: What about the durability of the CD as compared with the vinyl record?

Chenoweth: I'm not convinced that the CD is the answer to everyone's prayers. If a phonograph record is given the same care as a fine painting, something that you would treasure, and you handle it with a lot of consideration, delicate handling, it will last a long, long time, providing that the equipment is maintained properly and the stylus is changed regularly. But people have a habit of not doing those kinds of things, and then they turn elsewhere and say the phonograph record is no good, and that is, in many instances, not the case at all.

Mix: What do you see as being the most important advantages of DMM in the plating and pressing processes?

Chenoweth: As far as manufacturing is concerned, we go directly from the copper mother, which is the copper plate cut directly from the master tape, to the stamper. By so doing, we eliminate the very delicate and somewhat expensive silvering process. Therefore, from a manufacturing point of view, you eliminate the cost of developing the metal master as well as the metal mother by using the copper mother to

—CONTINUED ON PAGE 136

DMM: NEW HOPE FOR RECORD Manufacturers



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JIMMY BUFFETT

“You’ll Never Work in this Business Again”

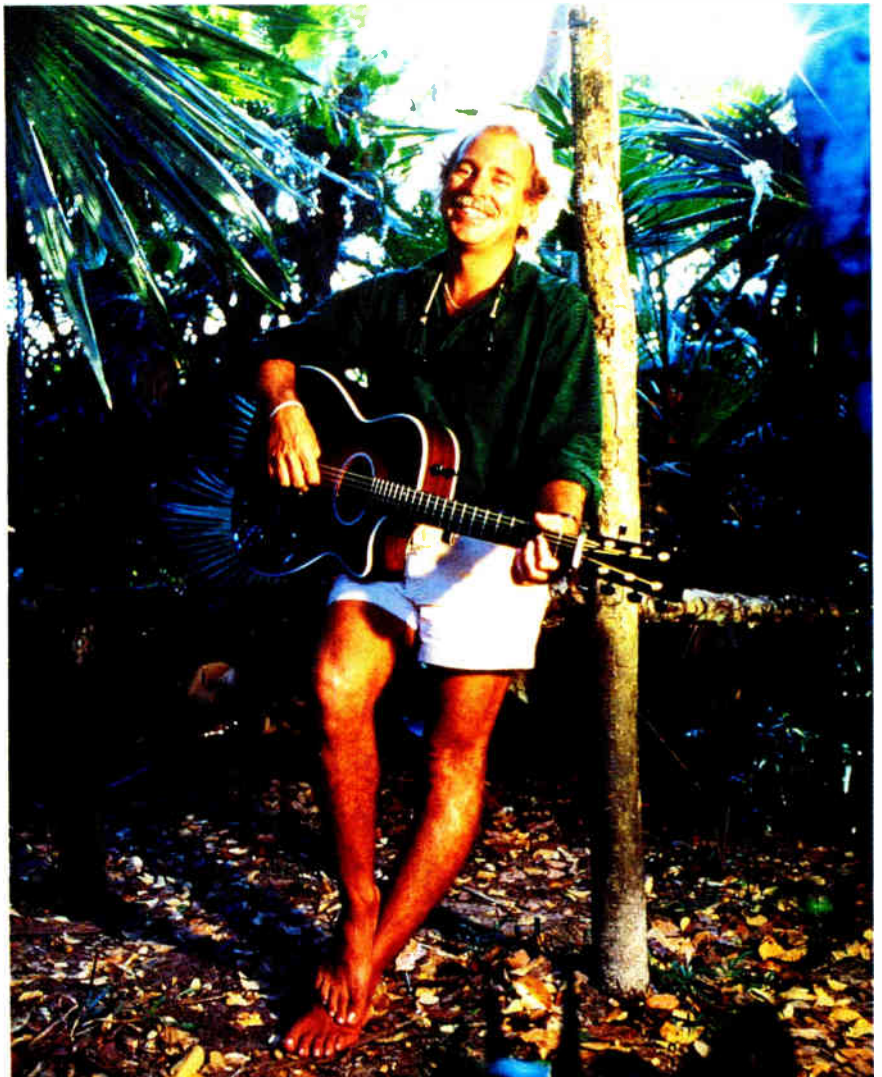


by Mr. Bonzai

Aright, you Parrotheads, stop your squawkin’! Jimmy Buffett’s got a new video and a new album to stuff in your survival kits. *Live By the Bay* is pure, adulterated Buffett, shot by the Falstaffian Jack Cole at a former boat race facility in Miami. You can see a crack show by Jimmy and such boisterous pals as Timothy B. Schmit at the world’s biggest hot tub party. A Buffett concert is a revival show, a love-in, a class reunion of Titanic proportions without that sinkin’ feeling.

As for the new album, it was a work in progress at press time. Our lunching was bicoastal by phone during a break at New River Studio in Miami. The title of the album crystallizes Buffett’s free sailin’ attitude as he tacks toward an island of honest folks and honest music. He’s bucking the music biz and is building his own, home-grown promotion machine. He’s got a newsletter called the “Coconut Telegraph” where for a tiny two bucks a year you can read up on the progress of Margaritaville, and order music, books, T-shirts and manatee puppets.

Tom McGuane insights in the liner notes for “Songs You Know by Heart:” “Jimmy Buffett has written and sung songs which are now part of our collective memory. And he has made a world of open roads, sailboats, rental cars and bars set against a curiously romantic fleabag vista where people bunch up to face the empty sea. When Texas, coconuts, Florida, sharks, nymphomaniacs, Montana, volcanos and pirates land in one spot, we understand that worlds do in fact collide.



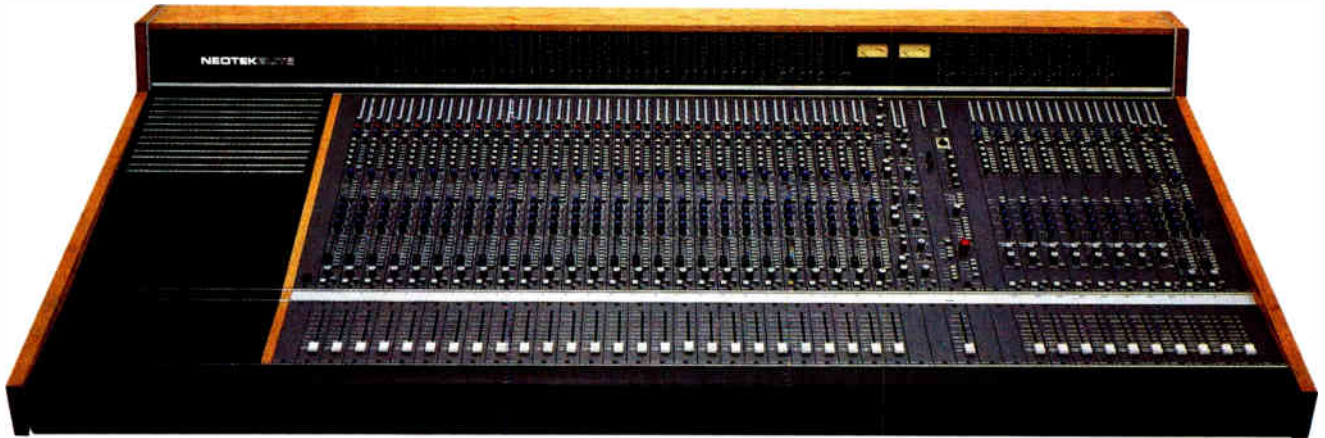
“Beyond that, Buffett has peopled this region with characters ranging from hammock dwellers dragged down by memories, fellow travellers with no memories, honored ancestors, poets, and smugglers run down by their own history like rabbits caught in the headlights. Finally, one of the figures in the drama is ‘Jimmy Buffett’ who is mostly, but not exactly Jimmy Buffett, a man with more camouflage than a Green Beret commissary.”

I thank Mr. McGuane for “The Far Side” caption for this Buffett bowsprit

on The Good Ship Parrothead. Mrs. Bonzai adds, “His music is like country style and simple but his singing is elegant, like silk clothing.” I’m a newcomer to this son of the beach mythology, but I found a “Howdy, Stranger,” a slack-jawed voice, and a front porch philosopher for the back porch majority on the other end of the line. Grab yourself a cheeseburger, pour yourself a tumbler of beaujolais while the blender cracks the ice and agave worms.

Bonzai: Hello, is this Jimmy Buffett?

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World Radio History

“I’ve gone back to my early style to make a record for Jimmy Buffett fans. I’m just not concerned anymore with what’s happening in pop radio—because they don’t play me anyway. This new album is for the Parrotheads.”

Buffett: It would be.

Bonzai: Are you working?

Buffett: Working, working, working—actually, right now I’m eating a bowl of clam chowder, but don’t tell anybody.

Bonzai: What studio are you in?

Buffett: New River studio—a great little studio they just put in down here in Florida. It’s all Neve/Necam—really nice. It’s perfect for me—I don’t have to go far to go to work.

Bonzai: You live in Key West, right?

Buffett: Yes, between there and a little island down in the French Antilles called St. Bart’s.

Bonzai: What’s the new album like?

Buffett: This album is very interesting. Basically, I’ve gone back to my early style to make a record for Jimmy Buffett fans. I’m just not concerned anymore with what’s happening in pop radio—because they don’t play me anyway. This new album is for the Parrotheads.

Bonzai: What is a Parrothead exactly?

Buffett: A fanatical Jimmy Buffett fan, in a brief phrase. They’re probably normal people most of the time, but when they come to the concerts they put on their feathers and go crazy. They know every word to every song I ever wrote.

Bonzai: I’ve been talking with a reliable source at *Mix* headquarters in Berkeley. He knows details that only a true Buffett scholar would know about—your producers, your musicians, the

changes in your recording style. This guy seems to exist on Corona beer and Buffett music. He says when he’s having a bad day and he’s stuck in traffic, your music gets him home.

Buffett: That’s a Parrothead. They’re very loyal, very die-hard. I just figured that with the tight-ass attitude of radio these days, I would just make albums for my audience. It’s getting bigger and bigger, and younger and younger—which is interesting. Half the crowds at the concerts are under 20. We’re selling out every major venue across the country and I haven’t had a hit since ‘77.

Bonzai: So you’re carving some new history for yourself—

Buffett: Carving some history—yeah. I think it’s all about to pop wide open with this new record.

Bonzai: Who’s playing with you?

Buffett: Michael Utley and I are producing, and it’s mostly my road band: Matt Betton on drums, Josh Leo on guitar, Utley on keyboards, Sam Clayton of Little Feat on congas, Willie Weeks playin’ bass, and Ralph MacDonald on percussion.

Bonzai: Who is this Utley guy, anyway?

Buffett: Yeah, who is this Utley guy? He’s, to me, one of the finest musicians and best producers around. Fortunately, he’s been on every album I ever did. He started out with Jerry Wexler playing keyboards with the Dixie Flyers. He’s highly underrated—or overlooked—as a producer and musician.

Bonzai: Well, we’ll try to rectify that situation.

Buffett: I would appreciate it. He’s really responsible for what’s goin’ on down here. We brought everybody out of the cold weather and got ‘em down here. We’ve got Reggie Young from Nashville on guitar. It’s just a great group of people and we’ve got some killer tracks. I went back and wrote some songs with the idea of bringing *AIA* into the ‘80s. That was an album that many Parrotheads consider their favorite. I tried to figure out why, but there really wasn’t any reason, other than the fact that they listen to it and identify with it more than the others. I went back and looked at some of my old styles—I’m using the same kinds of situations, but updating with characters of the ‘80s. It’s targeted totally for the war babies. I don’t think they get enough attention and there’s just not much out there for them to listen to.

Bonzai: A little education and inspiration?

Buffett: Yes, something with a little bit of intelligence, a little bit of fun and a laugh or two.

Bonzai: Did you ever run into the ghost of Ernest Hemingway down there in Key West?

Buffett: I didn’t meet him there, but I looked for him one night in Bimini. I stayed in his room at the Complete Angler Hotel and got just drunk enough to hopefully hallucinate and have him walk out of the closet. It didn’t happen, but I wrote a good story in the room—so, maybe he was there.

Bonzai: Have you seen those pictures of him writing where he’s standing up with his typewriter on a chest of drawers?

Buffett: Yeah, he always worked standing up. I sailed to Havana and visited his house in Cuba a few years ago. We did a documentary and spent some time in the tower he worked in.

Bonzai: I would think that writing that way would create a different mood—like a dancer or a fighter.

Buffett: I’ve been doing it myself—got a drafting table and I do a lot of work standing up now. You get some pretty interesting ideas because you’re moving around so much.

Bonzai: I understand you’ve written a script for *Miami Vice*.

Buffett: Yes, it’s called “Stranger than Fishin’,” and it’s about a jewel heist. We get Crockett and Tubbs out on the flats for some fishing. It’s a bit humorous, which that show desperately lacks these days. I tried to get them smilin’ a little bit. And there’s a little drama under it, with a former hooker and

Project engineer Paul Beliveau



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confidant of Che Guevera named Deste Fideles who's coming after somebody and they have to stop her.

Bonzai: Have you had any interesting conversations with porpoises lately?

Buffett: No, haven't seen any interesting porpoises lately—mermaids maybe, and manatees. The last porpoises I saw were off the coast of Belize and they were in a mating ritual. They didn't look like they wanted to be disturbed.

Bonzai: Well, we must have respect for the higher beings.

Buffett: Absolutely.

Bonzai: Who are your favorite poets?

Buffett: I saw one of them last night—Robert Penn Warren, the American poet laureate. He's one of my all time favorites, along with E.B. White, Gabriel Marcia Marquez, Lorca, and some of the old Kipling stuff. I love iambic pentameter—I'm a sucker for that—and it's gotta rhyme for me.

Bonzai: Speaking of poetry—the liner notes by Tom McGuane on your greatest hits album—some fine work there.

Buffett: He wrote the liner notes on my very first record: *A White Sportcoat and a Pink Crustacean*. I thought it would be great for him to come and write 'em again. He's a fine writer, and also my brother-in-law now.

Bonzai: You must have some pretty interesting family gatherings—

Buffett: You better believe it. (laughs)

Bonzai: Can you tell me about 'em?

Buffett: I can't tell you about 'em yet, but maybe in about 30 years when we're beyond the statute of limitations—

Bonzai: For your greatest hits package, they digitized your master tapes, didn't they?

Buffett: Yes, they digitalized me there. We all worked on it together and I'm very pleased with the way it came out. I'm a CD fanatic now. I don't like cutting digitally, but I like transferring and mastering digitally. I still like to cut on analog and then go to digital.

Bonzai: Then you stay with a project all the way?

Buffett: Yeah, and we're doing it the same way for this new record. We've got some great stuff—Ralph McDonald is amazing. We've got some calypso kinda down island stuff—I think people are just gonna get up and go WHOA! We've done some stuff so the Parrotheads can go, "That's great—I told ya so," and other people might say, "Wow, I thought he was dead—



this is pretty good shit." It's entitled *You'll Never Work in This Business Again*. And wait li you see the cover. I figured I'm hittin' 40 and I've been doing this for 20 years—I'd take a shot at 'em all. It should be cut in time for our summer tour.

Bonzai: When you pass on to the great unknown, would you like to be burned, buried, or sunk?

Buffett: I don't know yet, but I always remember a character named Juan Cadiz in a Robert Wilder book. He was too old to do anything and knew it was all over for him, so he drank a bottle of rum, got in his boat, sailed into a hurricane and never came out. Not a bad way to go.

Bonzai: I know that you were a friend of Steve Goodman's. What are your feelings about the way he dealt with death—knowing that it was coming, unlike most of us who don't have the advance warning?

Buffett: Well, I'll tell you a funny story. When he was first getting real sick I was in New York working and didn't know that he was there. Finally, somebody told me that he was in really bad shape and was being treated at a cancer clinic. I said, "Shit, I gotta find him"—so I went running over to this hospital and they wouldn't tell me anything. I said, "I got a friend here who's about to die and I'm comin' in." They were running behind me and when I found his room, it was empty. He'd checked out of the hospital and gone to Sean Kelly's house. I went there and ran up the stairs expecting to see him on a respirator—I didn't really know what to expect. When I walked in, there he was drinking Crystall. I said, "They were telling me you were

dying and here you are drinking champagne." He said, "I don't have much longer to go, so go get another bottle." We sat up all night and had a ball. Before he got real sick, we wrote a song together in the hospital: "Frank and Lola Over the Phone." He was truly one of my best friends and I miss him a lot. No one had a better sense of humor, especially with all the stuff he had to face. I miss him and I wish he was still here. That's about all I can say.

Bonzai: You sing about being the son of a son of a sailor—what was your grandfather like?

Buffett: He was an old sailing ship captain and he spoke nine languages and had been around the world god knows how many times in sailing ships and then in steam ships. He had an overall knowledge of just about everything. He'd seen everything but he was never a wise ass. He'd listen to other people telling stories when he'd seen ten times as much, but he'd only interject when he had something funny or useful to say. He had a great sense of timing, a great amount of knowledge, and a wonderful sense of humor.

Bonzai: When you sail, can you navigate by the stars?

Buffett: Oh yeah, I can do all that stuff. I'm gonna do a little sailing this weekend. After being in the studio, I need to get out on my boat and just noodle around. We call it "hydrotherapy."

Bonzai: What is so special about island life—being able to see your whole world?

Buffett: It is your world. You have to be a little crazy to live on an island—that helps. You have to have a certain frame of mind, and really enjoy the good and the bad part of island life. Living on an island is like living on a boat, or like living with a big family, because you know everybody. Sometimes you get island fever and have to get off, but I couldn't live any other way. I go to the big cities and travel around, but when I want my peace and quiet I like to sit down on a little island. I don't know what it comes from; I just think it's the most beautiful way to live. There's not much tension or hassle, and it adds years to your life.

Bonzai: Well, an artist can choose that life—

Buffett: That's right, and that's why I took this job. I love my job a lot.

Bonzai: Do you have any useful music business advice?

Buffett: As Richard Brautigan once told me, when dealing with record companies, just remember that they're always the enemy.

Bonzai: Can you imagine yourself as a musician in some other time?

Buffett: I wouldn't want to be any place other than here right now. Oh, I could imagine myself as a drummer boy in the front lines during the Civil War, and I probably would have been killed.

Bonzai: What's the most dangerous situation you've ever found yourself in?

Buffett: We were out in the middle of the ocean once and the seacock was backin' up and the boat was sinking. Everything was starting to blow up and we just had to fix it or die. There was no choice in the matter and it was a hairy couple of days. One guy got hurt real bad and we had to take care of him, but we made it.

Bonzai: Does being way out in the ocean make you feel like a little fly speck?

Buffett: Absolutely. It makes you feel like all the shit that you have to deal with in this business doesn't really amount to much when put in a bigger perspective. Sailing keeps me sane, because I believe that if it all fell through tomorrow, I could go back to fishin'. I'd miss this, but it wouldn't be the end of my life. I could have a hit record or I could go fishin'.

Bonzai: Is there anyone in the world you would like to meet?

Buffett: Walter Cronkite. I'd love to go sailin' with him.

Bonzai: What's the most important question you can ask yourself?

Buffett: Am I still havin' fun? If the answer is yes, I keep going. If the answer is no, then I have to do something about it.

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

Buffett: Oh, lord, I haven't made too many bad ones, but there are a couple. The biggest mistake of my life was buying an MGB.

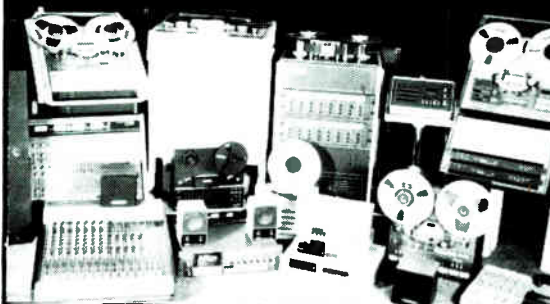
Bonzai: One of those cars that likes to be fondled, repaired, and played with on a daily basis—

Buffett: I didn't have time for that. I didn't know what I had gotten into. It blew up, so I ran it off highway U.S. 1 into the water.

Bonzai: How would you like to be remembered in history?

Buffett: My epitaph is going to read: "Now we can get some work done." ■

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JOE JACKSON GOES DIGITAL TWO-TRACK

David Kershenbaum Guides Joe Jackson Through a "Big World"

by Dan Daley

"Joe was right when he said that we mastered the record first, then we mixed it, then we made it."

So says veteran producer David Kershenbaum of the eclectic Joe Jack-

son's latest venture onto vinyl. Jackson, Kershenbaum and a small army of support troupes turned New York City's Roundabout Theater—a stately theatrical venue that has never been used for music, rock or otherwise—into a

recording studio during five shows over three nights in late January. They were looking to make a record with all the spontaneity of a live performance, but to do it in as controlled an environment as they possibly could.

But what makes this record singular is that all recording was done directly to digital 2-track. There would be no multi-track to play with at the end of this record; what you heard was what you got. "I call it an album recorded live, versus a 'live album,'" says Kershenbaum. "This is not a live album in the sense that there is audience participation; it's an album recorded in front of people to achieve the fire and urgency in the music you only get from playing live."

The result of this is *Big World*, a Jackson-eyed view of the human condition in various corners of the globe, a retrospective of the artist's travels with an album jacket that features liner notes and lyrics translated into several languages. "It's thematic in much the same way that *Night and Day* was of his street experiences in New York," observes Kershenbaum.

The producer points out that, "The technological aspects of this album are something (Joe) has wanted to do for a couple of years, and this record in particular lent itself to being recorded directly to 2-track digital," adding that the technological concept definitely came before the thematic one. "Usually what Joe does is write about what is meaningful to him at the time... I think the writing would have been the same no matter what the technology was." Kershenbaum, who has produced all of Jackson's records except *Jumping Jive* and *Beat Crazy*,

recalls that *Look Sharp* was also recorded onto 2-track. "It was not that different conceptually, and if the technology had existed in those days, we might have done it (digitally)."

Since digital has become viable and

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more available, both Jackson and Kershenbaum discussed the possibility of using it the way they have on *Big World*—"We never considered any other way," says Kershenbaum—and in September, 1985, they began to assemble a team to create the record and to plot out the considerable logistics involved.

Jackson gave home demo tapes of the proposed material to Kershenbaum, and the two went over the tunes. The band was put together and began rehearsing. The next decision was who was to record it. Mike Frondelli, whose most recent efforts have included Pat Benatar (*Seven The Hard Way*), Oingo Boingo (*Dead Man's Party*) and the Del-Lords (*Johnny Comes Marching Home*), had just finished working on an Eddie Money project with Kershenbaum at Ocean Way in Los Angeles. Frondelli agreed, liking the challenge implicit in the project. "As far as I know, no one has done a pop record in this kind of environment before," says the Queens, New York, native. "(Joe) didn't want a perfect record; he wanted a warts-and-all record. He didn't want us to do any multi-tracking because the temptation would have been there to rely on it."

Kershenbaum next chose the remote unit that would do the actual recording: Guy Charbonneau's Le Mobile. They had worked together before on Peter Frampton's 1981 *Break All The Rules*, which was recorded on A&M's Los Angeles soundstage with Kershenbaum producing from his office in the complex, listening and watching on audio/video lines snaked in from the truck. But the clinchers in that choice were Le Mobile's Neve console and "Guy's reputation for high quality equipment and maintenance," says the producer.

In early December, the band began

doing warm-up dates in clubs in the New York metropolitan area. The gigs were for the most part unannounced, and during the first few, Frondelli and Kershenbaum simply watched and listened, making mental notes and becoming familiar with the material and performances. In January, Le Mobile arrived and the shows began to be taped, alternating between multi-track and 2-track formats.

The next task was to outfit the remote truck with the special equipment needed for this project, a task that fell to Dave Hewitt, project sound coordinator. Various additional EQs and preamps were secured, mainly from Martin Audio, in particular four Massenburg preamps, considered crucial by Kershenbaum. "Massenburg is considered the hot scientist right now for hot rod mixing and audio gear," he says. "It's difficult to rent them, they're so back-ordered. He also makes a parametric equalizer that is relatively phase shift-free and just beautiful sounding."

The centerpiece of this technological gaggle was the digital 2-track. "We started out with the Sony 1610," says Frondelli, "until the 1630 became available. We compared the two, and there was a vast difference. The 1630 had a much more open and warm sound." Kershenbaum concurs: "There was a major difference in the reproduction of the echo; it opened up more and breathed. A lot of the harshness that is characteristic of digital recording was gone," which was critical to Kershenbaum since Compact Disc would be the flagship format for this record, along with analog disk and cassette.

Two other major items were dealt with even as the local dates proceeded. First was the matter of a venue. Production coordinator Hernando Cort-

right located the Roundabout, a small theater on East 18th Street in Manhattan that seemed to fit the necessary criteria. The next problem was finding a sound company. Kershenbaum had approached former Yes soundman Paul DeVilliers to do the house sound. The South African-born engineer, who recently co-produced Mr. Mister's recent and quite successful LP, had prior commitments, but he highly recommended Al Tucker of Maryland Sound, who accepted.

Masterdisk in New York was decided upon as the mastering studio, with veteran Bob Ludwig as the engineer. Frequent trips were made between the truck, the hall and Masterdisk, using the facilities at the last to be the final reference points for equalization. All the teams were now in place.

"A Whole 'Nother Ball Game"

The uniqueness of the situation became readily apparent as they moved into the Roundabout in the days before the first show. While classical records have been recorded live to digital 2-track before, even in concert situations sound reinforcement is not used. "It became a whole 'nother ballgame," recalls Frondelli. "You're not only dealing with the sound of the act itself, you're also dealing with the sound of the house and the PA. Traditionally in live rock records, you use the room for its ambience, and take everything else direct. (With a PA), it becomes more difficult, especially when you're pushing between 90 to 110 dB in the house."

Miking was the next problem to face, and it illustrated the degree of compromise necessary between recording needs and live needs. "My attitude was to tight-mic everything," says Frondelli, "because phase-wise I do a lot better in situations where there's a lot of open mics on the stage." Since guitarist Vinnie Zumbo and bassist Rick Ford were finding it difficult to give the necessary vocal performances while playing, four additional vocalists were now on the stage, making for more open mics, "and, as a result, you have a lot of ambient sound running around onstage," notes Frondelli.

Choice and location of room mics took a considerable amount of time and energy, according to Kershenbaum: "We had some vintage M50s—a very rare mic—as well as a Schoeps and some PZMs available. We tried a number of combinations." While looking for optimal mic locations, they also encountered a consistent low frequency rumble generated by the hall in test tapings. Guy Charbonneau suggested that placing the PZMs on both side walls would help mitigate the

DAVID KERSHENBAUM

"Joe is a meticulous artist who operates at extremely high levels of creativity. He hears things in his head in much the same way, I think, that someone like Beethoven did."

That flattering assessment of Joe Jackson is also a good example of David Kershenbaum's capacity for eloquence. His ability to both understand the essence of an artist and to be able to express it has helped the Springfield, Massachusetts, native through a long career as a producer, garnering numerous gold and platinum souvenirs along the way.

Playing guitar since he was five, Kershenbaum had musical aspirations right from the beginning. During college, he literally commuted between Springfield and Los Angeles, shopping tapes between semesters. On one of these trips in 1967, he met Mike Curb, who signed Kershenbaum to his Sidewalk Records as an artist. Kershenbaum spent the next two years shuttling between Sidewalk, Capitol and Bell, while still managing to stay in college.

After graduation, a lack of success early on led him to a stint in the National Guard, and finally to

—CONTINUED ON PAGE 134

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Jackson and band go through their paces.

JOE JACKSON'S "DEAR AUDIENCE"

The following are excerpts from a card given to patrons at Jackson's shows at the Roundabout Theater, January 23 through 25, 1986:

We're recording live, direct to 2-track digital master, for my next LP . . . what you hear during these five shows will be exactly what goes on the record.

We're asking you to help us make it work. The main thing you can do to help is to keep quiet! We don't want you to behave like you're in church or something, but shouting and whistling during quiet passages is not going to be appreciated, and anyone who thinks he's going to be immortalized on record by shouting something at such a moment will at best be disappointed (since we won't use it), and at worst be thrown out.

You can also help by waiting until a song is absolutely, definitely finished before applauding. . . It might be necessary, at some point, to repeat a song, or stop and start again if something goes wrong. We hope you'll bear with us.

Thanks for your cooperation and for being part of this unique event. Enjoy the show. . . .

Cheers,
Joe Jackson

—D.D.

rumble, and at the same time provide a wider stereo image. Placing the Schoeps dead center and hanging it from the balcony completed the ambient miking situation.

The drums caused Frondelli some concern. Drummer Gary Burke's dynamics ranged widely, and the tunes called for a lot of subtleties. "I found out you couldn't use a gate on him unless you had a separate trigger source and put a pickup on the drum head, and it didn't make sense (to do that)," says Frondelli. "So I came up with this kick drum extension made out of chicken wire and case foam attached to the front of the kick with a packing blanket. Its purpose was to get the microphone far away enough from the kick drum head so it didn't clip and so it would produce a fatter sound. The packing blanket kept the toms and cymbals out of it. With drums up on the riser, I had almost no leakage at all, and I was able to get away without using a gate."

Joe Jackson had some mic changes, too. "Traditionally, Joe has always recorded with a Calrec microphone owned by David (Kershenbaum)," recalls Frondelli, "which we tried to use initially. But since this was a live application, the idea of putting that condenser in the middle of the stage with Joe grabbing the mic while singing, and its sensitivity to being rattled, we found we couldn't shock-mount it well

enough to use it." They reverted to an AKG 535 for Joe's vocals, a mic that Joe discovered worked very well for his live voice on his most recent tour. It was another example of the compromise between live and recording applications that were to characterize the entire project.

As the week wound down and the show nights grew closer, the trips to Masterdisk—reference checking the tapes being made aboard *Le Mobile* from its station outside the front of the Roundabout—became more frequent. For a single bed chassis, *Le Mobile*'s interior is deceptively roomy, but the nature of the recording put space at a premium. In addition to Kershenbaum and Frondelli sharing duties at the Neve 8058, Guy Charbonneau manned the tape machines behind the console with the additional tasks of monitoring echo and effects changes, and Eddie Ciletti labored up front as the digital tape technician. "Eddie was running both digital machines, keeping track of all the SMPTE codes [the show was also being filmed for a documentary] and tape numbers, and also noting the comments that we'd yell out as we went along," says Kershenbaum.

By the first show (Thursday, January 23), the four of them were working smoothly together. Tape strips for the console noting channel allocations for each song were hung in sequence from the upholstered walls of *Le Mo-*

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bile, awaiting their turn; the console had been templated with color codes and hand-drawn clock faces indicating the position of each EQ setting and effect level; there were cue cards that Frondelli had drawn up listing the structure, instrumentation and sequence of events for each song. Two 1630 2-track machines were running, to insure against dropouts—with five shows over three nights there were only so many chances of getting a good take on each song. Al Tucker and his people were inside the Roundabout, waiting for the lights to dim.

Five Minutes, Mr. Jackson

A sold-out crowd filed in through the doors, past signs indicating "Absolutely No Tape Recorders Allowed," a stipulation not taken lightly—coats were thoroughly patted down, and all bags were inspected. Tickets stated that doors would close precisely at 8:05 p.m. At 8:20, the house lights dimmed, and Joe Jackson strode onstage without announcement. He seemed confident, though not overwhelmingly so; there was an edge to his demeanor that was palpable; the edge that would hopefully make this performance a record. The audience, though alerted to the real business at hand for the evening (see sidebar

"Dear Audience"), still seemed confused and wondered how to respond. The slender figure onstage initially appeared to be torn between being Joe Jackson the recording artist, and Joe Jackson the performer.

After the first number, Jackson reiterated the *raison d'être* for the evening, saying tonight was "not quite a show and not quite a recording session; it's a combination." But the audience, or at least parts of it, continued to respond like one would expect an audience to respond—they applauded and hooted and cheered like the obvious partisan crowd they were. To Jackson's left was a music stand apparently containing lyric sheets and other instructions. But throughout the performance—or session—the pages seemed to be out of order, to his considerable annoyance. Jackson apologized for the delays with intimately humorous asides, and eventually got the audience to keep still as endings either faded or trailed away. Now and then a voice from the seats would yell out, "All right!" evincing a wince from Rick Ford as he manipulated a vibrato fade on his Fender bass.

At other times, a disembodied voice from the side of the stage—talkback from the truck—asked Joe to repeat a song, or stopped him in the middle of

an intro, or requested that he repeat an intro or a tag. Jackson complied each time, sometimes with a sarcastic response to the ghostly offstage voices emanating from Le Mobile, not so much to place blame for a particular glitch as to keep the crowd on his side of the electronic boogaloo that they were all participating in. But Jackson understood the priorities involved: this was a record first, a show second, and a visual representation third, if not lower in the hierarchy of things, given Jackson's well-documented disdain towards video. There was a moment in one performance where he publicly reprimanded the camera crew for making too much noise and breaking his concentration during the ballad "Hometown."

Several songs had to be stopped and started again during the shows, while others required new endings or intros when the sequence of songs was completed. By then, though, the onus of making a record seemed off his shoulders, and his intensity gave way to an insouciance that allowed those onstage to rock to their hearts' content.

"The choice of songs was never in question; we were waiting for performances," says Kershenbaum of his tenure in Le Mobile. "People were rooting for us. It was like Rocky. 'Hometown' was a difficult one; we had to redo it several times. Finally, on the last take of the last night, it was great. We always knew we were going to get it... but there were always things we were reaching for.

"There's no way of describing the feeling when you're getting down to the end that Joe might be able to give you the take that you absolutely had to have. It was easily the peak of my whole career. It was the most nervous that I've been in years, but at the same time, the most thrilled. As we were sitting listening in Le Mobile, we could have heard a pin drop on some takes. We were using little Visonik Davids at a very low level so we could talk to each other. We were exhausted at the end of a song."

By Saturday night, it was all over. At the point at which any other live record would be ready for weeks or months of additional overdubbing, fixing and mixing, Joe Jackson and company had a series of tapes which, except for some digital editing and, "sonically speaking, Bob Ludwig," according to Frondelli, constituted a finished product.

Eddie Ciletti transferred the takes to analog tape so some test edits could be run. Satisfied with what they had, they moved into Masterdisk where Scott Hull worked with the Sony DAE-1100 digital audio editor. What pleased

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them perhaps as much as Joe's performances was that the tapes were virtually free of crowd noises, due to the excellent separation they achieved at the Roundabout, and the cooperation of the audiences.

One problem during this stage was that two songs required speed changes, which on digital is not as simple as tweaking the VFO control, as you would on analog. The system they had been working on utilized floating recording heads. To effect a speed variance, the signal had to be transferred to a DASH (Digital Audio Stationary Heads) system. At RCA Studios in New York, Frondelli, working with engineer Tom MacCluskey and assistants Juan Marquez and Francisco Rodriguez, loaded the selected songs onto a PCM-1610 and transferred them to a Soundstream 300-Megabyte disk. Using the disk as the transfer medium, the signal was then moved to a Soundstream digital 8-track deck with a 50 kHz sampling rate (the sampling rate on the PCM-1610 was 44.1 kHz). The output of this deck was linked to a Studer SFC 16 sampling rate matcher. Here, a VCO was used to varispeed the tape to the desired tempo, after which the song was then re-recorded onto another PCM-1610. "It was a laborious process," says Frondelli, "but it was well worth it in the end."

Mastering involved another unique departure from tradition; direct to metal mastering (DMM) eliminates two steps in the process of getting to disk. A copper alloy mother is used, which is kept on a stainless steel backing and stored in a freezer, since copper oxidizes rapidly. This process then allows for the elimination of the silver-plated father and the nickel-plated mother stages. Hence, no plating anomalies. An additional benefit is that this process maintains consistent fidelity throughout the record, right through the inner bands of a disk where under traditional mastering methods some fidelity is lost. "It's something very new," says Frondelli. "It gives you a very wide dynamic range, and you can then go directly to Compact Disc, since the process is D-to-D."

In retrospect, Frondelli adds, "I don't know if it's going to set a trend in recording, but people do seem to be going more for feel, and worrying less about whether every note is perfect," characterizing the project in part as a collection of old techniques with better tape recorders.

Not For Everyone

Looking back, David Kershenbaum is enthusiastic: "I would do it again; so would Joe. We've talked about it. I don't think every artist could pull it off. It

LE MOBILE

"People ask me where I keep my truck," says Le Mobile's owner and designer, Guy Charbonneau. "I tell them, 'Under my bed.' And my bed could be anywhere."

The peripatetic French Canadian was born in Montreal, but has locations in New York, Nashville and Los Angeles, where he currently resides. A life-long fascination with cars, music and electronics led him to Le Mobile, a studio encased in a 22-foot box perched on the bed of a GMC truck.

David Kershenbaum was at-

requires an incredible amount of discipline on the musicians' and the artist's part. Joe has great phrasing and great pitch, and since there's no going back or dropping in or otherwise altering it, it takes someone with that kind of ability to pull it off. I can't tell you the number of people who said, 'You're crazy, you'll never pull it off, why risk these great songs?' But we wanted to prove to ourselves that we could do it. We both wanted that kind of challenge. We wanted to do something that no

one had ever done. We loved the idea of catching something that spontaneous and putting it on a medium that would make it sound phenomenal. Everybody asked us why we wanted to do that, and our answer was, 'Why not?' It would have been easy for Joe to say, 'OK, run a multi-track just in case.' But he always contended—and he was right—that if we even had a multi-track nearby, we'd fall back on it. As long as we knew we had to pull it off, we would."

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in a way because now, with the truck and the studio [at the base in Maryland] we can have either analog or digital at any time without having to shut one or the other down. This move gives us a lot more flexibility, obviously.

"Digital presents different problems for a remote than analog does," he says. "Powerwise, it draws much more, and the amount of heat a digital machine gives off can be amazing. Plus, depending on where you are, the amount of RF you're liable to pick up can vary a lot. But the good points are that you roll in and you don't have to go through alignment; you flip it on and you're ready to go. And certainly it's an advantage that you can have an hour tape, whereas with most analog machines you can only do that with 14-inch reels, which most remote trucks don't have. That's another reason we bought the Otaris—we had Studers but they couldn't take 14-inch reels."

Sheffield's truck pulled into Houston a full four days before the big event, and that was after most of the production was in place. Jarre and his production company included over 100 people from France, Clair Brothers had their sound system installed well in advance, and two Crowe 48-foot video trailers covered the visual side of the spectacular. "I'm not exaggerating when I say that this bash cost millions," Van Horn says. "They paid for the best all down the line and that's one reason it ended up going so well. No expense was spared.

"We were hired primarily to do the recording of the show," he continues, "but one of the [Otaris] machines was used to send out cues to all the people operating fireworks and lasers. It went through phone lines to buildings all over the city. The other two Otaris were for the recording. Our truck sent live time-code to everybody, so that everything was always in sync—the video truck, the effects, and the music, most of which was performed live. It was really a massive undertaking. There were major fireworks displays on every rooftop, lasers doing things you've never imagined, umpteen televisions that had different digital effects, a hundred-voice choir. It was truly a Texas-sized event, it had the potential to be a real nightmare, but it really went smoothly when you consider the logistics of it all. In fact, [here Van Horn pauses and takes a deep breath] I've heard that the city wants to do it again!"

Jarre is releasing a video of the extravaganza, and it is there that Sheffield's handiwork from that evening will truly go on display for the first time. "This really was one of those things you have to see to believe," Van Horn enthuses.

Mike Simpson
Midcom

Dallas, Texas

The boom in audio-for-video has kept Midcom's truck—equipped with Otari recorders locked with a BTX Softouch/Cypher synchronizer, a Soundcraft TS-24 console and a slew of out-board gear—busy just about around the clock. "We pride ourselves in having a truck that stands up to network specifications," says Midcom's Mike Simpson. "When you're working with the networks it's all gotta work, it's gotta work in real time, and it can't hum and can't buzz."

Midcom got to demonstrate the versatility of its operation recently when it was tagged by one of Texas' leading department store chains, Sanger-Harris, to handle audio, video and sound reinforcement for a combination concert/fashion show sponsored by the chain. "They did something I've never seen before," Simpson relates. "To introduce their spring fashion lines, they decided to produce a one-hour syndicated TV program to show in different cities around the state. So they retained us to do 24-track sound-code mix, and sound reinforcement—we have a 4-way system of about 15,000 watts; it uses a Soundcraft 800B 32-channel front console and [Soundcraft] 400 monitor console. We built the system for the purpose of interfacing with our remote truck, primarily for media-type events, which we do a fair amount of.

"The interesting thing about this event," he continues, "was there were two stages, 90 degrees apart from each other. On the main performance stage—the rock and roll stage—were Blood, Sweat & Tears, The Supremes, and Bo Diddley. On the other stage there was a long runway for models and a few dancers. It was really quite a production; it must have cost Sanger-Harris \$700,000 to \$800,000 including post-production, and they also staged the actual concert as a benefit for the Children's Medical center. Once it was posted, they took the show to seven other markets where they have stores. I understand it got very good ratings, so in the end it was money well spent. Certainly they couldn't have gotten the kind of exposure they did if they'd just bought an hour of commercials to run on shows. This way the people saw the fashions and also saw some good music."

Although Midcom had never worked with any of the musicians before the event, the recording went off without a hitch. "We had our truck directly off the main stage, as did John Crowe Productions, who handled the video end," Simpson says. "Usually on projects like this, much more care goes

into the video than the audio, but I have to give a lot of credit to Sanger-Harris and the people from Spindletop Productions. They are very audio conscious. The fact that they wanted a multi-track of the event shows they were serious about the audio, because obviously you then have much more control of the mix in post than if you only had a two-track mix on the fly."

In the end, the four-hour show was edited down to a one-hour special, "and it looked and sounded good," Simpson says. "Everyone got what they wanted. Everyone was very cooperative all the way, though working under less-than-perfect conditions [such as no soundchecks for the bands]. And hey, those old groups can still rock!" Fortunately for the client.

Steven Remote

ASL Mobile Audio/Video
Flushing, New York

At ASL, Steven Remote is always looking ahead for the next innovation that is going to make remote recording an easier and more pleasurable pursuit. When we called, he was still in the process of putting in a Harrison MR-4 fully automated console and perfecting an elaborate updating of the truck's wiring. A few nights earlier, ASL had provided the audio for an MTV concert by Scottish phenoms Lloyd Cole & the Commotions at Manhattan's World Theater, and Remote was still excited about how the truck performed.

"We designed and put in this extensive—and expensive—interface panel that has 76 mic lines in, eight video inputs, four independent communication lines, five incoming phone lines, two stereo outputs and a mono feed out," he says. "It really has made life very simple for us. We're also in the process of making an extensive MIDI patch bay so it's easier to control the outboard gear and some of the keyboard stuff we have, plus we're working on a video patch bay. For the Lloyd Cole show, they wanted a stereo mix plus a mono mix running to two 24-tracks plus a couple of cassettes for the band and the engineers, so this new setup was perfect for that sort of thing."

Like some of the others we spoke with, Remote has observed that in audio-video projects, the video end tends to demand more time and attention from producers, "though certainly there is more interest in good sound than ever before. Generally, though, we find ourselves having to work around the schedules of the video people, which is one more reason to have a simplified [wiring] setup in the audio truck. We probably will save an average of two to three hours this way.

For the Lloyd Cole show everything was relatively easy. We had a 1:30 call for a show that started at about ten, which is generous in this business. Before we got the new panels, we'd be running around constantly on the day of a show. This allows us to relax—but just a little."

On another, somewhat related front, Remote says that he's excited about all the sampling work he's started to do in his truck. "What we've been doing is going out and sampling sounds in strange places," he says. "Yesterday we sampled everything from snares to Heineken bottles smashing, planks of wood hitting each other, metal against metal, all kinds of stuff. I see this as being a big part of the

future for me. I'm hooking up with Korg and we're going to record a gospel choir for their new sampling keyboard that's coming out this summer. I'm hoping to do a lot more of that kind of thing, too."

Timothy Powell

Metro Mobile Location
Chicago, IL

It seems somehow appropriate that the project that was fresh on the mind of Metro Mobile's Timothy Powell when we called was a series of live recording dates with blues harmonica king James Cotton. After all, Chicago is still undisputedly the blues capital of the world, and it is also home of the

—CONTINUED ON PAGE 204

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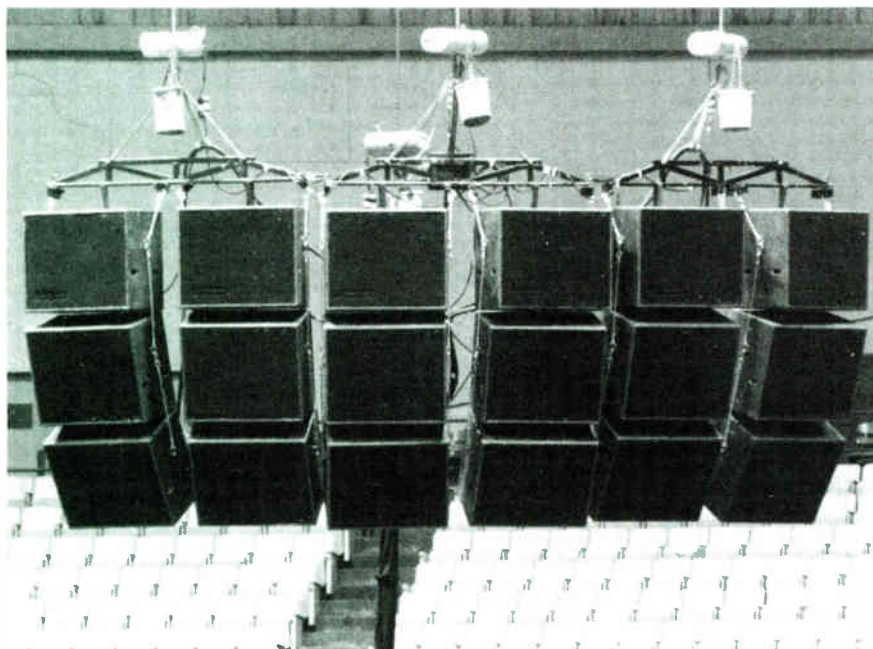
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SOUND ON STAGE



An 18 box Turbosound TMS-3 array used by Eighth Day Sound.

TMS-3 Enclosure

For a growing group of regional concert sound system rental firms, the Turbosound TMS-3 loudspeaker enclosures form the backbone of newly-assembled systems that are both compact and powerful. Each unit is loaded with a pair of proprietary 15-inch speakers, two 10-inch speakers, and a 2-inch high frequency compression driver. The tri-amped enclosure houses patented TurboBass™ and TurboMid™ devices, with recommended crossover points being 250 Hz and 3.7 KHz. The system's midrange section spans nearly four octaves, making it a stand-out for live performance use where vocal clarity is important.

Networking

As the popularity of these enclosures has grown, some sound companies equipped with Turbosound have found it beneficial to collaborate on concert projects with other similarly-equipped companies. Firms such as Crystal-Taylor Systems (Philadelphia, PA), Eighth Day Sound (Cleveland, OH), L.D. Systems (Houston, TX), Linear Sound (Oakland, CA) and Spectrum Sound (Nashville, TN) have all recently shared information and begun to explore the possibilities that are offered by a "national network" of Turbosound-equipped companies.

These firms are recommending each other to touring clients preparing to venture into different regions of the country. Some cooperative data transfer has taken place regarding technical details such as power amplification and hanging system techniques. While each company has a distinct regional identity, some have been getting involved with national touring as well. For a "network" to be more than just a hardware user's club, specific project collaboration must be in evidence. Let's look briefly at each of these firms.

Crystal-Taylor Systems

"The Turbosound enclosures have solved a specific problem for us," says Crystal-Taylor Systems' owner-partner Marty Garcia. "The TMS-3 is compact and it sounds great. Knowing that there are other firms around the country that have the same systems is something like an insurance policy. We can find compatible gear around the nation

Regional PA Companies and the Turbosound "NETWORK"

by Mike Stande

A survey of loudspeaker systems in use at live concerts today would probably show that more productions than ever before are relying on pre-engineered, commercially available modular speaker systems. In the past, concert sound companies have traditionally relied on their own special combination of components and cabinetry. As the concert sound business becomes more competitive, many touring firms are turning to manufactured speaker systems instead of home-built, custom rigs.

The movement in the direction of pre-built enclosure use has been stimulated by such companies as Turbo-

sound Sales, Ltd. A member of the Turbosound group of companies (London, New York), the manufacturing firm first introduced its TMS-3 loudspeaker enclosure to the American marketplace less than five years ago. Since that time, the company's line has been expanded to include the TMS-1 (a compact, passive 3-way full-range enclosure), the TMS-2A (a bi-amped, 3-way line array enclosure), and the TMS-4 (a bi-amped 3-way full-range unit featuring an 18-inch bass driver). The TSW-124 is a sub bass enclosure loaded with a custom-built 24 inch speaker. A new introduction by the company is Turbosound's TSE Integrated series of separated bass and mid/high enclosures, which use a multi-directional mounting stand.

THE ADVANTAGES OF A STUDIO CONDENSER WITHOUT A SOUND OF ITS OWN



For all of its virtues, the typical studio condenser imparts a definite character to any recording. These impositions are often considered inevitable technical imperfections: accepted, ignored or tolerated by audio engineers.

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The MC 740's freedom from exaggerated sibilance or graininess and its greatly reduced distortion are immediately apparent to critical listeners. European and American engineers have already commented on the startling accuracy of the 740, and the way it reveals the subtle differences between instru-

ments and ambient environments.

Accuracy And Versatility Without Compromise. Uniform (<2 dB from actual machine specs, not just published specs) frequency response curves for all five polar patterns may seem a remarkable breakthrough. To Beyer, this is simply a design criterion for the microphone. Similarly, there is no contradiction in the fact that the 740 is exceptionally sensitive, yet also withstands extreme SPLs (up to 144 dB with the 10 dB attenuator in circuit).

Hear What You Could Be Missing. The MC 740's unconventional design offers a clear alternative. The best way to evaluate the difference the MC 740 can make is to work with it in your studio. To arrange a hands-on audition of this remarkable new audio instrument, contact your Beyer dealer or write us: Beyer Dynamic Inc., 5-05 Burns Avenue, Hicksville NY 11801.

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as we travel."

Crystal-Taylor sent a Turbosound system around the country in 1985 with Grover Washington, Jr. "On that project, we carried a full speaker system with us," explains Garcia. "We did subcontract Linear Sound from Oakland for a flying hardware date. We anticipate that larger projects in the future will involve more cooperation with other Turbosound-equipped companies."

Recently, the company supplied a 22-box rental system to New York's Radio City Music Hall. The system was operated by the building personnel. "We did shows there for James Brown, Evelyn 'Champagne' King, and Bill Cosby," states Garcia. "We set up nine boxes per side with a four-box centering overhead cluster. Radio City's staff has already offered us more rental dates in the future."

Eighth Day Sound

Based in Cleveland, Eighth Day Sound partners Tom Arko and John Perovsek literally followed a Turbosound system around the country before committing themselves to a major purchase. "We went from city to city in 1983, listening to the Styx tour as the Turbosound system was used in a variety of different venues," notes Arko. "We decided that the TMS-3 enclosures fit our own needs for a speaker system. Sound, efficiency, low weight, looks and packaging were all there."

Upon receiving their first Turbosound shipment, Eighth Day Sound technicians became involved in fulfilling a variety of new tour commitments ranging from Jethro Tull to Culture Club. Recent work has included shows

with Kool & The Gang, Tom Jones, The Tubes, Patti LaBelle, and Twisted Sister.

L.D. Systems

L.D. Systems of Houston, has found the Turbosound TMS series to work well for both touring and local rental work. "We're thinking about expanding our TMS-3 rental stock later this year," forecasts L.D. Systems staff engineer Doug Alexander. "We first became interested in them after seeing David Gilmour's tour where 12 cabinets were flown per side in rather large arenas. We were impressed by the cabinet's full-range projection capabilities."

L.D. Systems regularly carries eight TMS-3 boxes on tour with Don Williams, an entertainer whose sound the company has taken care of for over seven years. "The TMS-3 is an excellent vocal projector," explains Doug Alexander. "Don Williams has always toured with a fairly small system, and his voice is the most important part of the mix. We use a Soundcraft Model 500 console, Klark-Teknik equalization and Brooke-Siren Systems crossovers, along with QSC 3500 and 3800 power amplifiers. That touring package works extremely well with Don's show."

Linear Sound

Kent and Kaj Kline of Linear Sound Systems in Oakland, California, searched for several years for the "ideal" loudspeaker package for live performance use. The brothers originally did local rental and regional touring projects with custom-built, component type systems. "It came down to some simple concepts," Kent Kline notes. "How long does it take you to

put the system on the truck, set it up, do the show, and get it back home? How much sound can you get from a small system? We looked at a variety of different options before buying our first group of 36 TMS-3s. They sound good, they are lightweight, and our clients like them."

Kline figures that 50 percent of Linear's system rental work is rock music. "We also do a tremendous number of events that feature other musical styles," he explains. "Bluegrass festivals, civic events, symphonic shows and corporate entertainment all must be serviced with some of the same gear that we use for doing rock tours with groups such as Chaka Khan and Greg Kihn. Most of our clients haven't heard Turbosound prior to working with us, but most love the sound of the system. We get lots of repeat business."

Linear Sound has cooperated with other Turbosound-equipped firms in the recent past. "We were subcontracted by Eighth Day for work with both Kool & The Gang and Placido Domingo," Kline says. "However, no matter what type of hardware a sound company has, it is still personal service that makes a difference. We aren't just sitting around expecting the loudspeakers to get gigs for us."

Linear recently provided a TMS-3 system for use by Bay Area rocker Greg Kihn. Twelve boxes were stacked at stage level at the Fairgrounds Exhibition Hall in Reno, Nevada. An additional pair was brought along for side-fill stage monitors. "This is a good example of what makes the TMS-3 such a good package," says Greg Kihn's live soundmixer Michael Rugis. "We had to fit the whole show in a 24-foot truck to make it work—band gear, PA, and lights. When coupled with the Hafler amps that Linear Sound uses, the TMS-3s give me plenty of level and great sound in a minimum amount of truck space. We've used them in all types of situations. We have a great relationship with Linear Sound. When we take this show on the road in the future for larger events, we'll have them supply a system."

Like many other Turbosound-equipped firms, Linear Sound uses Soundcraft consoles and Brooke-Siren Systems crossovers. Unlike some other firms, however, Linear has chosen to load their TMS-3 enclosures with Emilar EC-320A compression drivers. "The Emilar is very smooth, with a great upper-end response," says Kent Kline. "We based our decision on listening tests. The TAD and JBL drivers work well, too, but we felt one driver gave too much upper midrange response for a single cabinet. The Emilars make it a well-balanced package."

Spectrum Audio crew checks cluster before flying at Ronnie Milsap show in Louisville, KY.

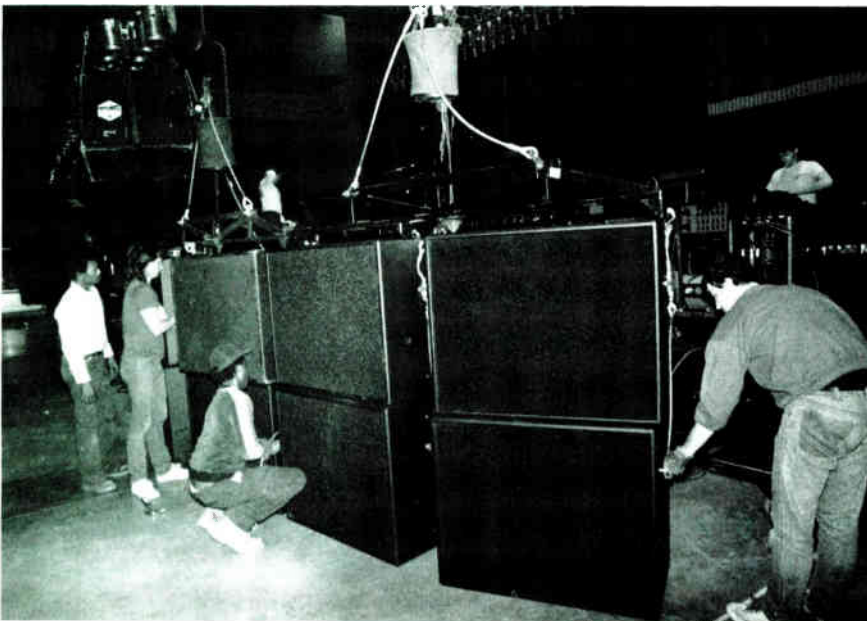


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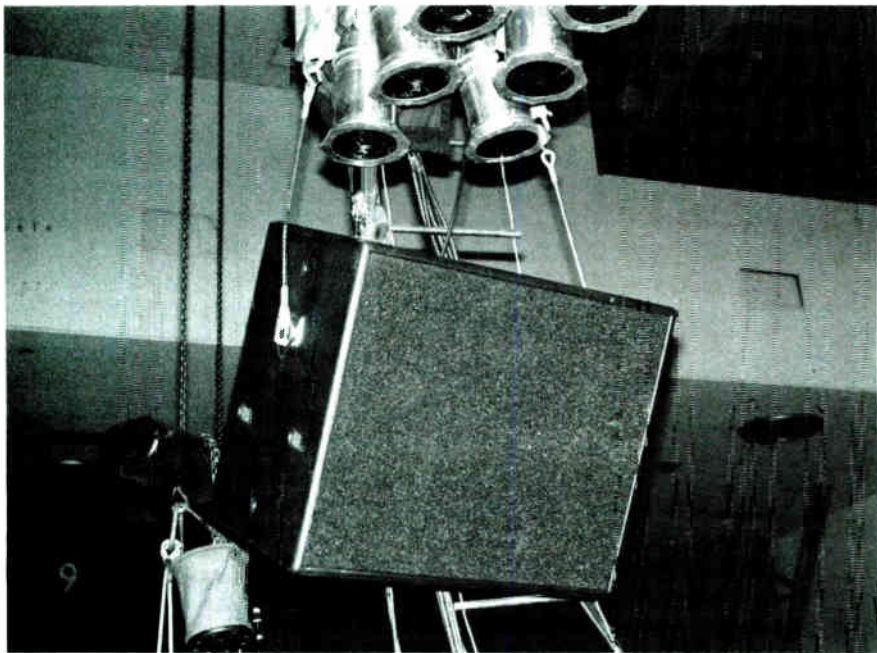


PHOTO: MIKE STANDE

TMS-3 hung from light truss becomes a sidefill monitor.

Spectrum Sound

Ken Porter, owner of Spectrum Sound in Nashville, Tennessee, has found the TMS-3 to be an excellent speaker system for use with country music. A majority of his firm's work is done with such artists as the Statler Brothers, Lee Greenwood and Ronnie Milsap.

In February of this year, Spectrum sent out a 16-cabinet TMS-3 system on tour with Ronnie Milsap. An additional pair of boxes were used for overhead sidefill monitors. The tour's first show took place at the 6450-seat capacity Louisville Gardens in Louisville, Kentucky.

"The flying system hardware available through Turbosound has made it easier than ever before to get a sound system up into the air," says Spectrum Sound technician Mike Pasquale. "We are using one chain motor here to support four enclosures. The flying truss bars are lightweight, and don't take up much space in the truck. Today, that's more important than ever."

Spectrum systems are powered by QSC Series Three power amplifiers (Model 3800 for the lows and mids, and Model 3500 for the high frequencies). Two amplifier racks are used on each side, with each rack powering eight cabinets.

The house mix position for Ronnie Milsap featured a new Soundcraft Model 500 32-input console, Klark-Teknik DN360 stereo 1/3 octave graphic equalizers, and Brooke-Siren Systems FDS 340 electronic crossovers. The system was operated by veteran live

soundmixer Randy Gardner.

Gardner stresses easy portability, small size and clean looks as factors in his decision to use the TMS-3 enclosures. "They sound good, too," he enthuses. "We have found only eight cabinets per side to work well with our show, even in large venues. We need more for larger rooms like the Los Angeles Forum, which is coming up next month. We'll be subcontracting more cabinets from another Turbosound-equipped company on the West Coast."

An Emerging Trend

The ability of newer, smaller aggressive concert sound companies to actively compete in the fast-paced live sound rental market depends largely on a firm's having the right equipment, experienced crews and a professional business image. Production managers today are seeking sound systems that travel well, and look as good as they sound. Many newer firms have never undertaken serious, nationwide tour projects, and are finding that a good way to first become involved in such events is by subcontracting loudspeaker systems for major shows.

This emerging trend in live sound is not limited to one brand of speaker system. Similar "user group networks" have come into being that use products from such manufacturers as Meyer Sound Laboratories and Hill Audio. The development of such networks offers touring shows a new option when considering production arrangements for nationwide and global productions. ■

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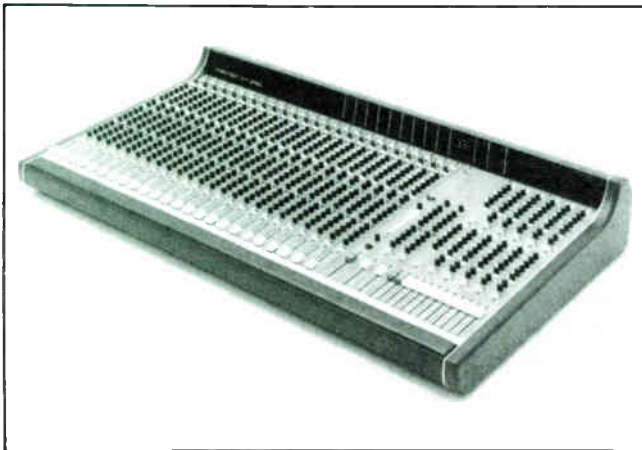


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PREVIEW



Soundtracs MC Monitor Console

Designed as a complement to the M Series sound reinforcement board, the new MC monitor console from Soundtracs is available in either 24 or 32 input versions. Features include ten monitor and two auxiliary outputs (all with full parametric EQ and a variety of pre/post fade selections), two independent aux returns for sending externally processed signals to the ten monitor outputs, 4-band EQ on the input channels, input signal presence LEDs, and LED metering of monitor sends, solo, and aux sends. The MC provides comprehensive talkback facilities for communicating with the front-of-house console or intercom systems, and comes with a 19-inch rack mounted power supply and PVC dust cover.

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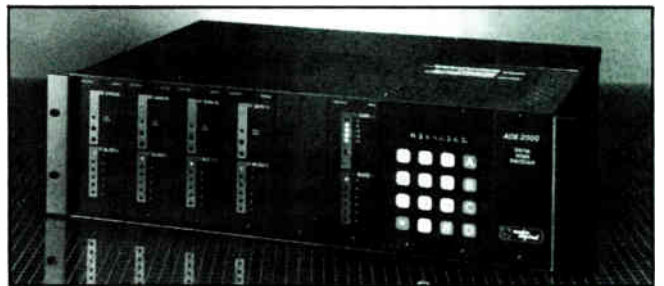
AKG D-70ME Microphone

The D-70ME from AKG Acoustics, Inc. is a low-cost cardioid microphone designed specifically for the home recording/musician market. Features include balanced operation with 3-pin XLR output connector, medium (200-1000 ohms) impedance, built-in pop screen, and handling of sound pressure levels of up to 128 dB. The D-70ME is priced at \$50 retail, and includes a mic stand adapter.

LinnDrum Pattern Storage System

Digital Sound Technologies, of High Point, NC, has introduced the Fast Finder, a Commodore 64 disk-based system for the storage and retrieval of song patterns for the LinnDrum. Fast Finder is an efficient and inexpensive (\$49.95) alternative to storing patterns on cassette, and offers fast disk access, greater reliability, an easy-to-use computer filing system, and a print function for running hard copies of song pattern and memo data. The package includes an interconnecting cable, operating disk and storage case.

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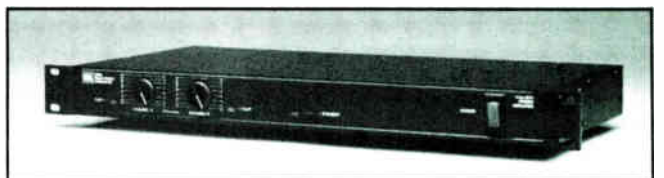


Automated Delay System

Audio/Digital, Inc. of Eugene, OR, has introduced the ADX-2000 Digital Signal Processor and digital delay modules for the automated delay control of distributed speaker systems. Sophisticated microprocessor control and nonvolatile memory storage of delay settings allow users to quickly reconfigure the entire delay system, which may include up to six input channels and 40 output channels. The ADX-2000 is particularly useful for installations where delay settings will be changed frequently, including convention facilities, touring sound systems, and theme park exhibits.

A user can key in and store settings for 12 complete system configurations, then recall any configuration for use in seconds. In addition to delay functions, the modules currently available also perform channel on/off and output gain functions. Delay settings range from ten microseconds to 261 milliseconds (1048 milliseconds optional) in increments of one microsecond or one millisecond.

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JBL Model 6215 Power Amplifier

The Model 6215 from JBL is a single rack space power amplifier designed for low power applications, such as headphone listening or driving small studio or broadcast monitors. The 6215 features fully complementary devices in all predriver, driver and output stages, and output power is rated at 35 watts/channel into 8 ohms, 45 watts/ch into

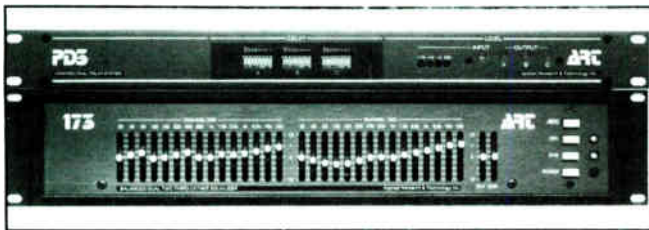
4 ohms, and 90 watts bridged mono at 8 ohms. Input terminations are 1/4-inch TRS, XLR type and barrier strip; outputs are 5-way binding posts.

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Marshall Cable/Connector Catalog

Marshall Electronics Inc., has published a new source-book featuring connectors, wire and cable, cable assemblies and installation accessories for the audio, video and communications industries. Included are Mogami Superflexible cables, Tajimi connectors, Sound Runner high-density copper speaker and mic lines, and much more, such as patch bay panels, RF amplifiers and coaxial relays. For a free copy, write to Marshall, Dept. C, Box 2027, Culver City, CA 90230.

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ART PD3 Professional Delay System

The PD3 Professional Delay System from Applied Research & Technology, of Rochester, NY, is a high-performance, multi-tapped digital delay system designed for a variety of applications in fixed-installation and portable sound reinforcement systems, recording studios, and post-production facilities. Offering 16-bit linear quantization and a 64kHz sampling rate, a full 20kHz bandwidth is realized. Each of the three output delays is individually adjustable (in 1ms steps) via front panel DIP switches for up to 225ms of delay. Input and outputs are active balanced, with both barrier strip and 1/4-inch connections provided. The PD3 is priced at \$749, including security cover.

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Chappell Expands Music Library

Chappell, the world's largest music publisher, has released two new series in its repertoire of over 400 albums of production music. The additions, all digitally recorded, are the Chap AV Series—with punchy contemporary themes for the AV/promotional market—and the Chap Series, a comprehensive music source ranging from historical pieces to electronic and rock. The Chappell library is exclusively represented by TRF Music, Inc. of New York City, and is available on stereo LPs and tape. A free catalog and music sampler are available on request.

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MIDI Cord Tester

CAE Sound, of San Mateo, CA, has introduced a simple device that tests MIDI cables for proper operation. The small, lightweight tester requires no power. To use, simply insert one end of the cable in question into a MIDI instrument's MIDI Out jack and the other into the cable tester. If the cable is good, the tester's LED will flash when the MIDI instrument is operated in any way that transmits information to MIDI Out. The unit retails for \$12.95.

Circle #068 on Reader Service Card

Drumpulse Programming Software

Drumpulse of Knoxville, TN, is now offering rhythm programming software on cassette tapes (designed by studio session drummer Chuck Bradley) for use with most major brand drum computers, including Yamaha, Sequential, Korg and Roland. The programs are loaded into drum machines via a standard cassette recorder and have the capacity of filling 80 percent of the machine's memory, leaving the user 20 percent for programming song functions. Currently available programs, priced at \$14.95 each, include: basic patterns of rock, funk, country, Latin and swing; patterns of 1984's pop, country and rock hits; fusion and funk, Latin and reggae; country two beat, swing, shuffle and ballads; popular rock patterns; and jazz patterns.

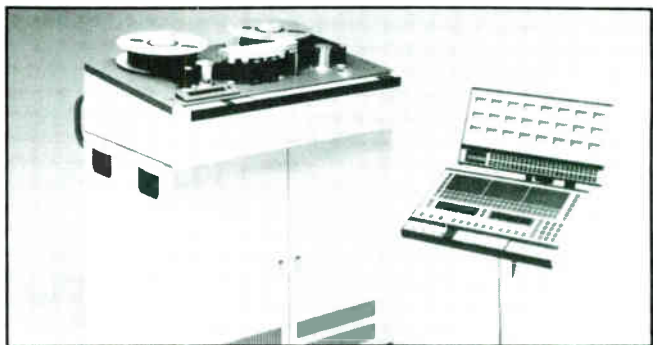
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TDM Design Crossovers

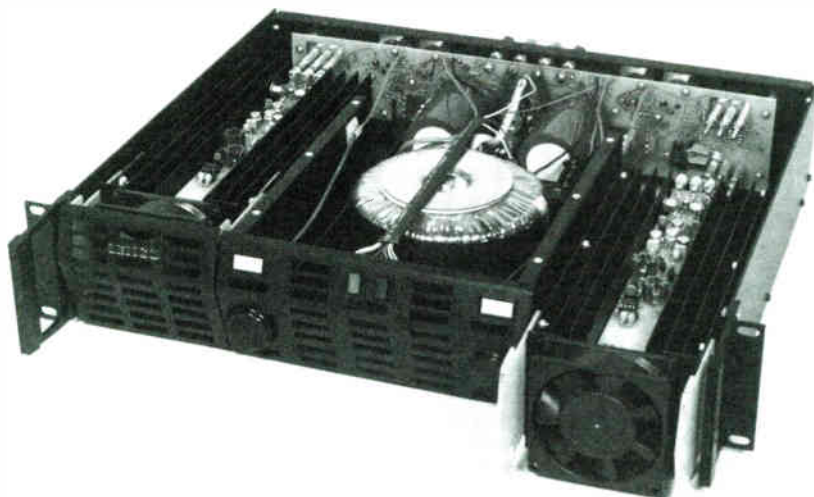
New from TDM Design of Hillsboro, OR, are the models 24CX-2 and 24CX-4 frequency dividing networks, utilizing Linkwitz-Riley filters with a flat summed electrical response throughout the crossover region. Both the 24CX-2 (stereo 2-way) and 24CX-4 (stereo 3-way or quad 2-way) feature balanced or unbalanced operation, 24dB/octave slopes, built-in Constant Directivity horn equalization (+3dB at 3.5kHz rising at 6dB/octave to 22kHz), and an external power supply for low noise. The 24CX-2 is \$299.95, and 24CX-4 is \$399.95; including a transparent security cover.

Circle #071 on Reader Service Card



Soundcraft Saturn Multi-track

Unveiled at the NAB Convention, Saturn from Soundcraft USA (a division of IBI Professional) is a new multi-track design based on a three year R&D effort combining the latest in digital control over analog signals. The first units are scheduled for delivery this summer, and are available in either 16- or 24-track formats. Features include: a comprehensive "Total Remote" microprocessor control system, ultra low flutter transport design, 10 position auto-locate, 32 programmable sequences via function keys with edit facilities, computer alignment of equalization and bias parameters, and four tape alignment memories.



LENCO MPA-2100 AMPLIFIER

by Ken C. Pohlmann
and Bill Johnston

Does the world really need another power amplifier? It might, but only if the new product offered significant advantages over the existing population amplifiers. Could a company heretofore not involved in professional audio expect to waltz in with such a product? Highly unlikely.

With skepticism firmly in mind, we evaluated the new Lenco MPA-2100 power amplifier. We quickly discovered that we had a revelation on our hands.

Lenco is not well known to the professional audio recording world. Located in Jackson, Missouri, the Lenco Corporation houses eight different divisions including welding, plastics, foundry, and electronics, all carrying a first class reputation. The list of clients and end users of Lenco communications equipment includes all the major television networks, many Federal government agencies, and a list of corporations that reads like a who's who of high technology. Their electronic division product line includes television terminal equipment such as sync pulse generators, video monitors, stu-

dio distribution amplifiers, test equipment and time base correctors. Thus, the move into studio monitor ampli-

Lenco MPA-2100 Manufacturer Specifications

Power output: 100 w/ch RMS @ 8 ohms, 200w/ch RMS @ 4 ohms, 400w RMS mono @ 8 ohms, 500w RMS mono @ 4 ohms

THD: 0.02% (100w/ch @ 8 ohms, 10-10kHz); 0.035% (400w mono @ 8 ohms, 10-10kHz)

IMD: 0.006% (4 ohms, 200w, 60Hz/7kHz mixed 4:1)

Power bandwidth: 1Hz-100kHz, +0,-1 dB

Slew rate, minimum: 700V/microsecond, symmetrical 8 ohm load.

Note—Represents only partial transition when HF termination is in place (1 ohm in series with 0.22 microfarad). Unloaded slew exceeds 1000V/microsecond.

Load Impedance: 2 ohms to infinity with musical program material
Damping factor: 600 minimum (20-20k Hz)

Propagation delay: 100 nanoseconds, 8 ohm load

fiers is not a total surprise.

Lenco realized that entry into the professional studio amplifier market required a serious re-evaluation of the utility and performance characteristics of audio power amplifiers. Three areas were targeted for special consideration—serviceability, thermal operating parameters, and sonic performance. The final goal was the creation of a new reference standard amplifier; nearly two years were spent in achieving it. The primary intended application of the MPA-2100 is as an audio monitor amp, but it was also conceived for the purpose of instrumentation analysis of digital audio signals and transient intermodulation factors that arise during the processing of digitally encoded signals. Absolute performance and accuracy were of the utmost concern.

The Lenco MPA-2100 is 100 percent modular, consisting of a mainframe that holds an AC power supply, and two power modules that each house a regulated supply. The two power modules are removable from the front panel, allowing the modules to be extracted from the mainframe without removing the frame from its rack mounting. A "crowbar" action from the front door assembly loosens the

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modules from tight, high-current silver connectors on the rear-mounted motherboard. This allows each module to slide in and out with the help of sturdy, hard plastic guides connected to the top and bottom of the casing. Each module contains easily accessible power supply and output fuses on the underside. Furthermore, the modules are completely channel-interchangeable, to save down time.

An integral thermistor controlled vari-speed fan is mounted on the front end of each of the modules. The fans are completely independent of each other and will accelerate the air velocity linearly with respect to the temperature of the corresponding module. The fans draw air through the amp

module heat sinks, and expel the air through the front of the mainframe in a non-recirculating manner. This avoids spilling the air into the back of a rack system, which would only serve to collect heat and defeat the intended purpose.

The front panel is simple, yet complete. A lighted yellow indicator switch indicates the "off" state when the amplifier is plugged in, but not turned on. The amplifier will return to this state in the presence of a fault condition. The switch is labeled as "0." A "1" switch, with a lighted green indicator, connects the power supply to the AC lines, and enables the amplifier output.

Each power module is supplied with a front panel indicator that lights green

when the module is working within normal operating parameters, and turns to red at the onset of clipping. Inside the front grill of each module, warning indicators show cooling fan failure. Independent gain controls for left and right are provided as well.

The rear panel employs Neutrik locking 1/4-inch phone jacks and XLR connectors for balanced input connection. Output connections are 40 amp gold-plated five-way binding posts bolted internally to the motherboard with metal pylons, allowing easy termination to either bare wire or banana-type connectors.


Internally, no expense was spared in the use of high quality parts and strict design practices. Audio pathways are restricted to circuit board etch. The signal never passes through a wiring harness of any kind, reducing inductive vagaries. The only wiring harness used in the amplifier is for AC power routing. To aid in this, the front panel gain controls are connected to long shafts that reach back to the motherboard to minimize the signal path length. Output lines are interlaced with power supply lines to cancel parasitic magnetic inductance. To minimize transient intermodulation distortion, a two-pole front-end filter is employed. The primary amplifier architecture is entirely direct coupled without any passive components between semiconductor devices. Only one percent metal film resistors are used in the signal path.

In the past, some high spec amps have been reputed to overload, breakdown, and more often than not, smolder a bit. The Lenco MPA-2100 was designed with the eradication of this legacy in mind. The temperature reactive fans and heat sink are coupled with three significant protection circuits. Current overload is protected by DC power and output fusing. Independent thermal breakers for each power module are introduced for high temperature stress. These breakers are located in the amplifier feedback loop, not in the signal path. And finally, a DC output detection circuit prevents speaker damage. Each of these fault conditions returns the amp to the "0" state.

Subjective Evaluation

Our first reaction to this amplifier out of the carton was one of skepticism. The amp will not win any awards in the "best dressed" category. Yet this trivial aspect was soon forgotten, as the performance of the amp proved to be outstanding.

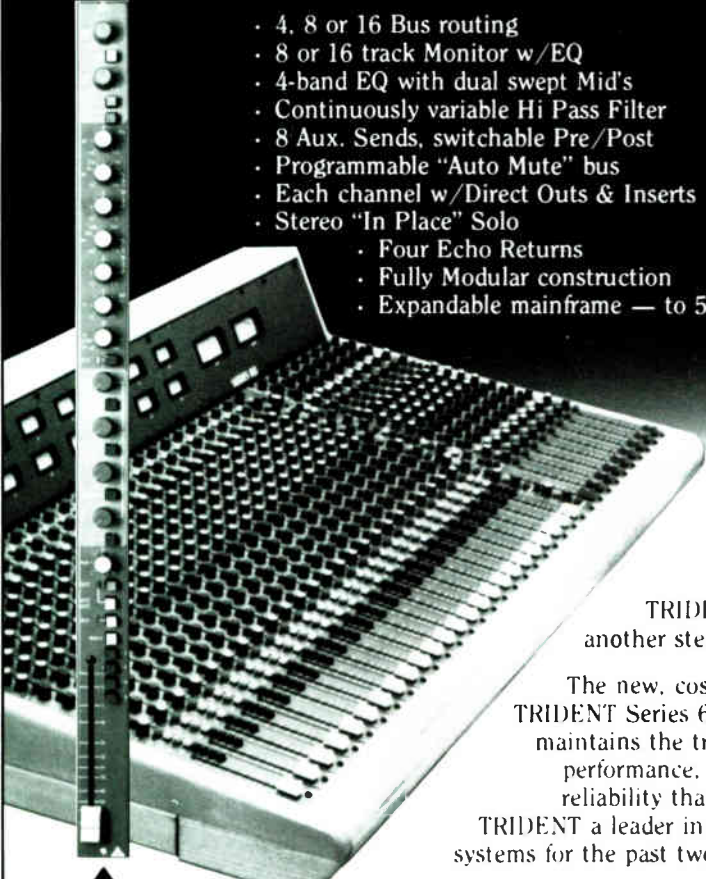
In A/B listening tests comparing the Lenco with other amplifiers, an astounding difference was apparent. Our first test used a digital recording,



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comparing the 100-watt Lenco with our normal control room amplifier, a famous name 750-watt amplifier. The reference monitors were Auratone T6 subcompacts. There was no contest. The differences were dramatic. The Lenco exhibited incredibly tight low-mids, giving an added clarity, and superior imaging. This in turn cleaned up the whole low end by better defining the second and third partials of the 20-100Hz range.

In a second listening test, we journeyed to a high-end audio shop, and compared a comparably-priced audiophile amplifier, listening through audiophile loudspeakers. Although the sonic differences narrowed, we agreed that the Lenco's sound was superior. We were particularly impressed with the firm low end, and smooth upper mid-range. Most impressive was the simple fact that this brute-force professional amp had outperformed its highly tweaked golden ears cousin. If only professional monitors could say the same...

In general, the high end of the Lenco is bright, but not brittle. The impressive slew rate of the MPA-2100 coupled with the wide power bandwidth allows musical program signals to pass unaltered, and thus uncolored. The combination of this accurate high end with the tight low end give the amplifier incredible punch. The amp is only rated at 100 watts per side (8 ohm), yet seems to be delivering more. Perhaps the accuracy allows the ears to hear the entire spectrum more comfortably, thus the gain doesn't have to be cranked up to compensate. In other words, it is possible that "punch" and "power" have all too often been confused in the past. This Lenco demonstrates that punch can be derived from dynamic performance.

Lenco warns that users should be aware that the high damping factor of the MPA-2100 must be accounted for. If the MPA-2100 replaces an amplifier in a room that has been tuned, especially if the previous amplifier had a low damping spec, the room should be retuned with the Lenco. Amplifiers with low damping specs tend to allow overexcursion of the speaker cone which gives more bass than what the source signal is actually relaying. Thus, if the Lenco were to directly replace the amp, it would seem to be deficient in the low end, which it is not. Once the room is retuned with the Lenco, a "truer" low end will be realized.

The Lenco, however, is not beyond improvement. After shutting off the system because of a fault condition, the protective circuitry will not reset. Although systems that do reset after a fault tend to oscillate between on and

off in the presence of an ongoing fault condition, some amplifiers will attempt to reset a few times, and then shut off if the fault persists. The reset became a problem in our studio because switching between the main and alternate speakers put a glitch on the Lenco's input. The sensitive protection circuitry caught the "fault" and would shut down on occasion.

Lenco has put a considerable amount of time and research into this product, and it shows. The amplifier is often the most neglected part of the audio chain when it comes to sound quality, and perhaps the redirected attention that Lenco has given it will set a new standard. The consolidation of robust construction, designed lon-

gevity, ease of servicing, and truly audiophile-quality sonics is unprecedented in our experience. This amplifier receives our highest recommendation.

The Lenco MPA-2100 comes with a full five year warranty for parts and labor. Lenco is developing a 250 watts per side (8 ohm) due to be ready this summer. A consumer version of the MPA-2100 is also in the works. Power supplies for other countries are available upon request. The MPA-2100 lists for \$2850. For more information, contact Jim Rhodes, Audio Product Development and Management, Electronics Division, 300 North Maryland, P.O. Box 348, Jackson, Missouri 63755. (314) 243-3147. ■

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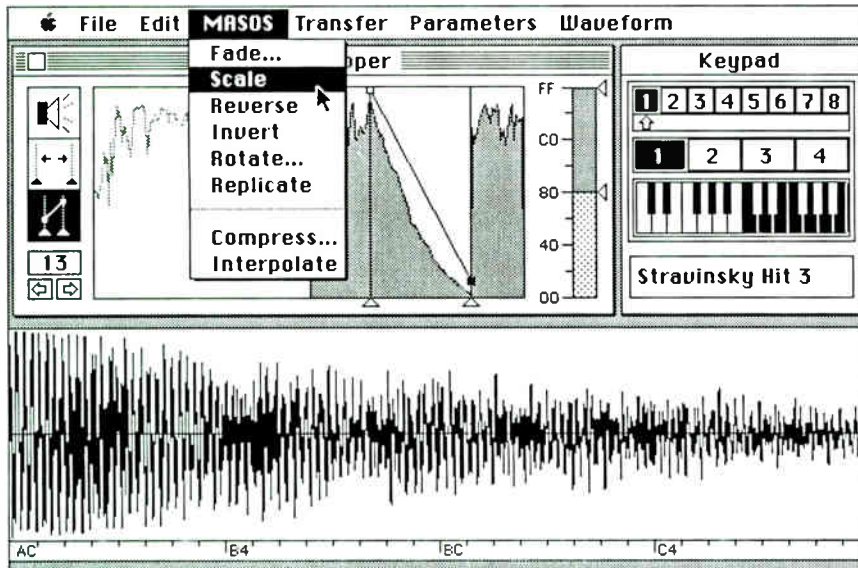


Figure One: Extensive Digital Audio Processing

THE SOUND LAB/ MACINTOSH PACKAGE:

Simple Sample Editing for the Ensoniq Mirage

by Bruce Nazarian

If you have been reading my "In Sync" column each month (seen elsewhere in these pages), then you already know that I am always excited about the use of computers in music. In the past few years, computers have provided many tools to enhance the music-making process, prompting many talented musicians to add "programmer" to their list of credentials. One of the things I am most excited about is the current trend towards mating personal computers with computer-based musical instruments to form "computer music systems"—systems that combine the controlling power of one computer with the music-making ability of another. A good example of this is the new Sound Lab™/Macintosh™ package for digital sampling and editing with the Ensoniq Mirage™.

Sampling Comes of Age

In the late 1970s, the Fairlight CMI™ awakened us to the use of digital sampling technology for music. After one

listen to Todd Rundgren or Peter Gabriel, most of us computerized musicians started dreaming about being able to harness that musical power in our productions. But one look at the price tag was usually enough to bring those digital dreams crashing down in a hurry. At \$30,000-plus, the Fairlight continued to be a dream for all but the most well-heeled musicians. Shortly thereafter, E-mu's affordable sampler, the Emulator™ appeared on the market at around \$6,000. A lot of us looked wistfully at our checkbooks and thought, "Close... maybe next year." Sampling still remained the "Technology of the Rich and Famous." In the months after E-mu's entry into the digital sampling field, advances in microchip technology set the stage for the designers at Ensoniq to realize their dream. They developed the "Q-chip," a high-speed audio processing circuit. This tiny chip, together with a fast micro-processor, lots of user memory and efficient operating software formed the basis of a powerful new instrument, the Ensoniq Mirage digital sampling keyboard.

The Mirage Appears...

After the Mirage made its debut at the 1985 NAMM Winter Market in Anaheim, the reaction quickly spread across the country. The Mirage created a stampede of keyboard players and others who immediately swamped their music stores to see and buy this new digital child. Here at last was the people's sampling unit: versatile, compact, powerful, and incredibly affordable. Everybody that saw it wanted it, everybody that wanted it ordered it, and the factory delivered them as fast as it could manufacture them. The Mirage created the biggest sensation since the Yamaha DX7 debut a few years before. To see why, you only have to examine its features.

The Mirage is a full-function digital sampling keyboard. Each half of its split keyboard has 64K of sample memory (RAM), enough to sample just over two seconds of sound at full bandwidth. Each of its eight voices has two digital oscillators, a voltage-controlled filter and a voltage-controlled amplifier with LFO and Velocity modulation. This allows for complete tailoring of the playback of the sampled sound, something even the original Emulator didn't have. The Mirage comes with an onboard 3.5-inch disk drive for storage of sampled sounds and sequences. The MIDI implementation in the Mirage is complete, and is continually getting better. The operating system has just been updated to allow MIDI Breath Controller and Aftertouch modulation. It's no wonder that the Mirage created such a stir at its introduction. No one had ever seen a sampler with all these features for a list price of \$1695 (including some wonderful factory samples).

The Macintosh

While digital technology was being embraced by musical instrument manufacturers, the computer industry was rolling along at full speed. Advances in microprocessor technology and high-capacity memory chips, as well as new concepts in user interfacing, helped in the development of Apple's innovative Macintosh personal computer. A truly unique product, the Mac's impact on the computing public is due as much to its friendly "point-and-click" operation as its marvelous graphics-oriented environment. Let's face it—using a Mac is really fun. Once you get used to pointing and clicking,

 Roland

Reverb, truly realized. Consider this: assemble every conceivable parameter of natural and plate reverberation, incorporate the possibilities of non-linear (gated) reverberation, augment these with a parametric equalizer, use a 16-bit A/D/A converter and a 28-bit parallel-operation signal processor. Put all of that under computer control for one-button convenience, and complete the picture with MIDI control for (no button) convenience. Roland has not only considered these ideas, we have realized them, in the SRV-2000 MIDI Digital Reverb. Roland Corp. US, 7200 Dominion Circle, Los Angeles, CA 90040.

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you practically forget the computer is there. (Larry Oppenheimer's January '86 Field Test on the Emulator II/Sound Designer package includes a great deal of information on the Mac, so I'll resist the temptation to go on for days about what a great computer it really is.)

Sound Lab Brings Them Together

To make the connection between the cost-effective sampling keyboard and the innovative personal computer here comes Sound Lab. Donny Blank and David Willenbrink, the hard-working hackers who are Blank Software, quickly recognized the capabilities of both Mirage and Mac, and set out to link them. Sound Lab is what they created: software that allows the Macintosh to store and edit sounds for the Mirage. Besides being the first Mac package to provide these functions for the Mirage, Sound Lab is very effective in its graphics-oriented approach to sample editing. Using the familiar "point-and-click" Macintosh techniques, Sound Lab makes sampling and editing sounds on the Mirage fast, easy and fun.

An Open Window

Sound Lab provides a much-needed visual aid to creating and editing samples, literally an "open window" into

the Mirage's memory. After only a few minutes of working with Sound Lab, I was sold. This approach to editing really works! Using the Mirage's integral LED display for editing can be somewhat time consuming and isn't very instinctive. Even with MASOS, the Mirage Advanced Sampling Operating System, multi-sampling and editing on the Mirage can be tricky. The Mirage Visual Editing System for the Apple II computers was a definite step in the right direction. Sound Lab builds on the foundation begun by MVES, taking it from functional to downright elegant. With the Mac and MASOS-M, Sound Lab forms an integrated system that really gets the most out of a Mirage. (I should mention though, that a thorough knowledge of both MASOS and the Mirage is invaluable in making best use of Sound Lab).

Putting Sound Lab On-line

Loading up Sound Lab for a quick tour is quite easy. The only thing that is needed besides a Mac, a Mirage, and the Sound Lab program disk is a Mac-to-MIDI interface. I was fortunate enough to be able to evaluate Sound Lab with three of the currently available interfaces: Assimilation Process' MIDI Conductor, Musicworks' MacMIDI Star, and Opcode Systems' MIDIMac Pro. Each interface has some unique

features that may appeal to different users. The MIDI Conductor, for example, preserves the Mac's modem port connection by providing a duplicate DB-9 socket on the interface. Both the MacMIDI Star and the MIDIMac Pro have multiple MIDI outputs, like having a built-in MIDI mult box. All three interface units worked perfectly with Sound Lab.

Opening a Dialog

To use Sound Lab, a communications link must first be established between the Mac and the Mirage. "Booting" from the MASOS-M disk included with Sound Lab will give the Mirage the necessary programming to enable its MIDI-fied dialog with the Mac. Sound Lab expects a Mirage running MASOS-M to be on-line when it starts, and it won't run until it finds one. (This may change with Version 1.1, as many users have asked for the ability to run Sound Lab "off-line.") The MIDI link is the means by which Sound Lab loads wavesample data in and out, and echoes parameter changes back to the Mirage. Although parameter changes are instantaneous, loading or sending a whole upper or lower memory bank takes a bit longer. Once the MIDI dialog is established between Mac and Mirage, Sound Lab automatically updates the Mirage parameters to reflect

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any on-screen editing. As soon as you've clicked the mouse, you can instantly hear your changes on the Mirage.

Windows, Windows Everywhere

Sound Lab makes effective use of the Mac's window display technique, using eight of them to show the various parameters and their values. Each window can be opened or closed as needed, and each can be moved around on the screen to best suit your working style. (See Fig. 1 for a typical display.) Each keyboard half (upper and lower) has its own set of windows, corresponding to the Mirage's upper and lower keyboard halves. By clicking on the upper or lower half of the keyboard icon in the Keypad window, the user selects which one to view. The keypad also allows selection of the current wavesample (1-8) and the current program (1-4).

The Overview window provides a general look at the wavesample data, showing an amplitude curve of the entire sample memory. The memory allocator bar, on the right, shows what portion of memory is used for the currently selected sample, while the sample data itself is highlighted in gray. The vertical "Sound Cursors" show the beginning and ending extent of the current sample, and can be used in conjunction with the Edit and MASOS menus to perform various functions on the sample data. For example, duplicating a sample is as easy as setting the sound cursors to the desired start and end points, "copying" it to the waveform "clipboard," mousing the sound cursors to the destination point and "pasting" it there. Making a sample play backwards is even easier. Just set the sound cursors on the portion of the sample you want to reverse, select "REVERSE" from the MASOS menu and it's instantly turned around. You can also set the position of the sound cursors numerically, for fine tuning. The Overview window also includes the Scale Line Controller, for use with Sound Lab's level scaling functions. With a few painless clicks you can do fade-ins and fade-outs. A few more clicks prepare samples for smooth 3dB crossfades. Sound Lab enhances MASOS by adding two functions of its own: an exclusive "software compression" function, which can digitally modify the sample's dynamic range, and "interpolation," which computes a new sample in between every two original samples, doubling your effective sampling rate *after* you have sampled.

Visual Waves

The Series window (bottom) gives a two-dimensional view of the sample

data, graphed as amplitude vs. time (memory address). The Page window gives a "hi-resolution" look at each individual page of the wavesample series, thoughtfully providing a pencil icon with which to edit existing wavesample data. This really comes in handy for editing out clicks or pops that may have crept into your samples. You can even draw in waveforms from scratch. Another window, Loop Splice, is an invaluable aid to creating good loops. This window displays the beginning and ending samples of the proposed loop, showing the loop intersection precisely. You just scroll the waveform until the ends match. The Top Key window controls assignment of which keys play which sam-

ple, graphically displaying a keyboard with the sample numbers above. The Program window displays the VCF and VCA parameters for the current program, as well as other useful info, while the Relatives window shows various filter and amplitude settings for each of the eight wavesamples. Other dialog boxes give you access to the Mirage's keyboard configuration parameters, and help set up sampling times and input filter frequencies. One of the things that Sound Lab does well is coordinate setting the various input filter values and sampling rates while providing a tuning reference note for your sample. It really takes the guesswork out of sampling!

There are many ways to split a mic, but only one way is best

Jensen MB-series Mic Splitter Transformers

When you need to split a mic, you should use a transformer because it provides a balanced, isolated signal to the input of each mixer; none of the mixers' grounds need be connected to each other (via the mic cable) so ground-loop induced noise is easily avoided. There must be a Faraday shield on each winding so that the transformer will not provide a path for capacitive coupling of common mode noise.

JENSEN TRANSFORMERS are best because, in addition to meeting these requirements, they minimize degradation of the mic signal's frequency response, phase response, and distortion characteristics. To prevent common mode noise from being converted to a differential signal, each end of every winding in a JENSEN TRANSFORMER has its capacitance precision-matched to that winding's Faraday shield. These are just a few of the reasons why most engineers end up using JENSEN splitter transformers.

The JENSEN JE-MB-C, JE-MB-D and JE-MB-E microphone bridging transformers will split a mic signal to 2, 3 or 4 mixers.

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—CONTINUED FROM PAGE 101

You Can Hear It, Too!

One unique feature included in Sound Lab is the use of the Mac's internal amp and speaker to play samples. This makes it a snap to audition changes while you are working. Just click on the speaker icon and Mac will play back the edited sample! Connected to an external speaker, the Mac sounds amazingly hi-fi. The convenience of having the onboard audio is somewhat limited because the Mac cannot duplicate the effect of the Mirage's VCFs and VCAs. Also, the playback pitch of the Mac is fixed. To hear the sample in proper context and pitch, you really need to play it from the Mirage keyboard.

Sound Disk Librarian

In addition to all of its other functions, Sound Lab allows the Mac to act as a librarian for Mirage samples, with the added feature of individual names for each sample. Just as a great computer needs a good library of programs to succeed, widespread acceptance of a sampling keyboard is limited only by the sound library available to load into it. The Mirage sound library is getting larger every day, as more Mirage owners and third-party sound developers get in on the act. The Ensoniq factory library now numbers 17

sound disks, and more are on the way as fast as they can be organized. According to Rob Weber, Ensoniq's director of marketing, the company is committed to developing and releasing one new sound disk per month, each with a minimum of three new sounds! In addition, K-Muse, an independent developer, has a library of over 100 alternate disks for the Mirage, with sounds prepared by well known West Coast sampler Arne Schultz (Michael Boddicker's ex-sound designer). This library is currently being readied for release. I have auditioned several of the K-Muse alternate sounds and all of the Ensoniq factory sound disks and they really sound great! The increasing number of alternate sound disks and the growth of the Transoniq Hacker (Mirage User's newsletter) shows that the system is well supported in the marketplace, a healthy sign for prospective purchasers.

A Powerful System

The Mirage/Mac/Sound Lab system is further proof of the growing use of computers in music. It also shows that modest-priced components can be integrated to provide functions previously obtainable only on expensive systems like the Fairlight and Synclavier. This is the same trend we have been seeing in medium-priced systems,

like Sound Designer for the Emulator II and MacAttach for the Kurzweil. And the trend continues with the newer low-end systems, as well. Digidesign has already announced new versions of their Mac-based Sound Designer for the Mirage and the Prophet 2000. The new Roland S-10 and S-50 samplers come with built-in editing software, and I wouldn't be surprised if someone develops a Macintosh package for AKAI's new multi-sampler as well. Sound Lab seems to be the first of many new programs that promise to greatly enhance the power of affordable keyboards. If you own a Mirage and a Macintosh, Sound Lab is a must-have. If you don't yet own a Mac, programs like Sound Lab could convince you to buy one.

Acknowledgements

My thanks to Donny Blank and David Willenbrink of Blank Software for making Sound Lab available for this Field Test. Mac-to-MIDI interfaces were generously provided by Peter Gotcher of Digidesign (MIDI Conductor), John Amaral of Freelance Musicworks and Paul DeBenedictis of Opcode Systems. Thanks also to Kevin Kent of K-Muse, and Rob Weber and Tom Darling of Ensoniq for providing an in-depth look at their sound libraries. ■



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TOA

AMPING SOUND SYSTEMS

by George Petersen

It started out as a great idea for a story: talk with a number of sound reinforcement pros around the country about what they are looking for in amplification. The easy answers came forth quickly: everybody wants a 5000-watt, audiophile-quality amp that can still deliver full power while being dropped from an airplane into an active volcano; of course, the unit shouldn't weigh more than a fuzz box or cost over two cents per watt. However, while people in sound reinforcement do occasionally like to dream of such wonders, they are used to dealing with the realities of life on the road, using real life equipment in real life situations. With this in mind, we asked some touring sound pros for some advice on finding the right amplifiers to suit their needs.

"Amplifiers have come a long way over the years, using different DC protection methods," says Vernon Lewallen of Cincinnati's Celestial Sound, "and the Carver, QSC, and Crown Micro-Tech are among the best amplifiers on the market. We've been using QSC—they have a fast slew rate, good headroom and dual power supplies—to showcase our speaker systems."

Celestial has been involved in designing speaker systems for the past seven years, and plans to market their VLHP-1/VLLF-1 speakers later this year. The system, (which recently was on the road with Christian metal rockers Stryper), is a vented, phase and amplitude coherent, two-box design with JBL 18-inch woofers, E-V 12-inch midrange, and TAD 4001 on the top end. "We're using QSC 3800s, with the 3500 amplifiers on the sub-low end, which gives each twin-18 enclosure 1250 watts," Lewallen adds. "Actually, I never really believed in QSC until a couple of years ago, when they

came out with their new series. Since they went with the new Toshiba output transistors and the fast front ends on the amplifiers, they have the sound quality we prefer. The QSC is heavy, which I don't like—but I do like its sound and the redundancy of the amplifier: it gives us the dynamic operating range we need. We haven't had any failures."

While Audio West, of Yorba Linda, CA (near Anaheim) is only nine months old, owner Danny Huebsch is certainly no newcomer to the industry, having mixed Crystal Gayle on the road for the past five years. Huebsch purchased a large contingent of Renkus-Heinz "Smart System" speakers for Gayle's touring needs, and recently added a second Smart System to the Audio West inventory.

Huebsch's extensive on the road experience gave him plenty of insight on what was available before he decided on a system to purchase. "We had been using regional sound companies for the past five years, so we've seen just about every amplifier that's out there. There are a lot of great amplifiers, with a variety to fit nearly every need. When we started looking to buy a system, we wanted amps that would be as light as possible, yet reliable. We ended up with the Crown Micro-Tech LX Series, which is very nice, having relay protection in front of the power supply rather than on the speaker load. The first Micro-Tech we looked at had problems handling dead shorts—it blew the finals (stages) out—but the LX Series handled it and shut down with no problem.

"The LX Series also has other upgrades: indicators for input distortion and soon, but its DC protection is very reliable. We have a Renkus-Heinz Smart System, which protects the speakers and components from just about everything else. The only protection we didn't have was from DC,

so we went with the Crowns. A low failure rate is very important to somebody taking a system on the road for 150 shows a year. We have 40 or 50 LX Micro-Techs and haven't had a problem with one of them."

The quest for reliability is also echoed by Jack Boessnick, the president of Hood Industries in Cleveland. Hood's main system is comprised of their single-box, three-way enclosures fitted with McCauley speakers and Renkus-Heinz HF drivers, and is well suited for their industrial and theatrical clients; while separate subwoofers can be added for a full-tilt concert system. "We use Hill DX-3000 for the low end," notes Boessnick. "They're able to deliver lots of current, which is exactly what you want for low end. What we look for in an amplifier is reliability: if it shorts and blows up, it's no good. People need reliability more than anything else."

An interesting trend Boessnick has noticed over the past few months is an increasing number of amplifier companies bringing product in for Hood Industries to check out. "I think manufacturers see that there's a 'Hood Industries' in every town: we're not Clair Brothers or Showco, and don't buy hundreds of amplifiers at a time, but their thinking is that if they get in with a regional sound company, their product will be seen by a lot of the local people who are buying amplifiers."

In terms of reliability, speaker snakes and wiring interface systems are just as important as selecting amplifiers, for even the best available gear cannot meet performance specs when hooked up via shoddy or inadequate connections. Michael Sinclair, of See Factor Industry (Long Island City, NY) makes sure that attention is paid to all details of their two systems before they go on the road.

For example, all banana plug connections used are secured in place with cable ties, because "no matter what grade of banana plugs you use, they'll still vibrate out on the road. They are then connected to XLRs on the back of the amp racks for our Martin system, and to an EP-4 for our Meyer System," Sinclair notes. "We also did a lot of testing of wire for the speaker snakes, like taking it out of a freezer and then hitting it, because that's probably the worse case scenario: having a truck drive overnight through snow, and unloading in a hockey rink where the cables are put on ice. We've been using Belden cable, and it's worked out well, but I'm still not convinced about the EP-4 connector. I really wish there was something between that and a Pyle National—so we could afford it *and* like it. We use a lot of these military style Pyle

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Nationals in our lighting system, and as a speaker connector, it seems to be the only alternative to the EP-4."

However, amplifier reliability remains of paramount importance to See Factor, who at press time was touring with Rush and is slated to be handling a number of events in connection with next month's Statue of Liberty celebration in New York City. After comparing a number of amps, the company chose Crest, with model 4001s on the Meyer system, and model 3500s on the Martin system. "We have about 200 Crest amps and the failure rate has been about one percent over five years," Sinclair explains. "The 4001s turned out to have exactly the power we need for the (Meyer) MSL-3, and it sounds very good."

Audio Analysts, of Plattsburgh, NY, had six systems out on tour when we checked in with them, for acts ranging from The Alarm to Van Halen. The latter's sound requirements necessitated 50 of Audio Analysts' flying four-way cabinets for the mains and 12 floor fill monitors built into the stage, and with a large roster of top acts as steady customers, Audio Analysts have to be particularly thorough when evaluating equipment to take on the road, and amplifiers are no exception.

Their analysis procedure begins

with bench testing: looking at power output, frequency response, distortion, damping factors—all specifications are checked out. According to Lecessese, this first stage is followed by some more extreme procedures: "plugging input and output, paralleling two channels, driving 300-foot cables wrapped in a coil and connected to a speaker or capacitor—general torture testing. We also have a mechanical test, a drop test, and a vibration test where we borrow a paint can shaker and let it go for a while."

However, it's not only the megatour companies such as Audio Analysts that employ arduous testing before selecting gear. Amplifier reliability is a crucial factor of obvious importance to sound reinforcement companies of all sizes. Dallas-based Crossroads Audio, a mid-sized firm, has been doing concert sound and industrial dates for 14 years: their current system uses flying full-range, three-way cabinets they designed, with horn loaded Electro-Voice 15-inch LF and 12-inch MF and Renkus-Heinz/Emilar HF components. Some of Crossroads' recent jobs range from the Texas Sesquicentennial TV show and the Dallas NAB Convention to concerts for The Bangles and Joan Baez.

Company owner Chuck Conrad

says that Crossroads was the first sound reinforcement firm to use the Peavey DECA 700 and 1200 digital power amplifiers, while doing preliminary field testing for Peavey. "We have no complaints about them," Conrad notes, "they're lightweight, put out lots of power, and sound good. The DECA 1200s have 600 watts/channel into eight ohms, which is a lot of power in a 26-pound amplifier."

It's no secret that owners of sound companies are constantly being contacted by salespersons, all claiming to have the "ultimate" in technology, and Conrad seems to take an almost fiendish delight in checking out such boasts. "Other than normal testing, like running frequency response and power checks on the bench," explains Conrad, "my favorite test is to take an amp up to full power for about 20 minutes, short the output with a large piece of wire, and then leave it that way. I've had a few sales reps go home with some smokey amplifiers, but working into a short circuit is a pretty realistic test of PA and rental situations. A lot of people will use 1/4-inch phone plugs for their hookups, and they have a nasty habit of coming out halfway and shorting. Amplifiers that blow up under those circumstances aren't acceptable to us." ■

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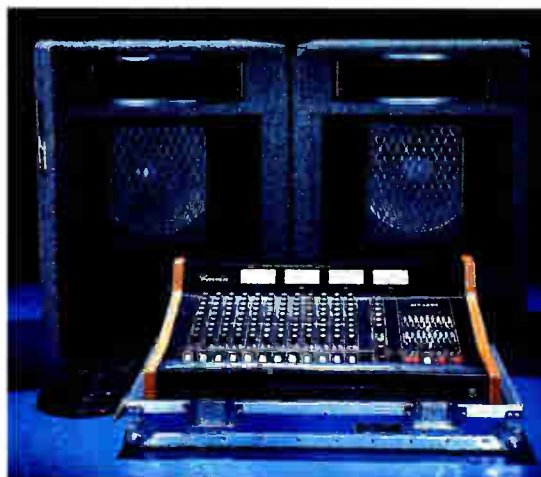
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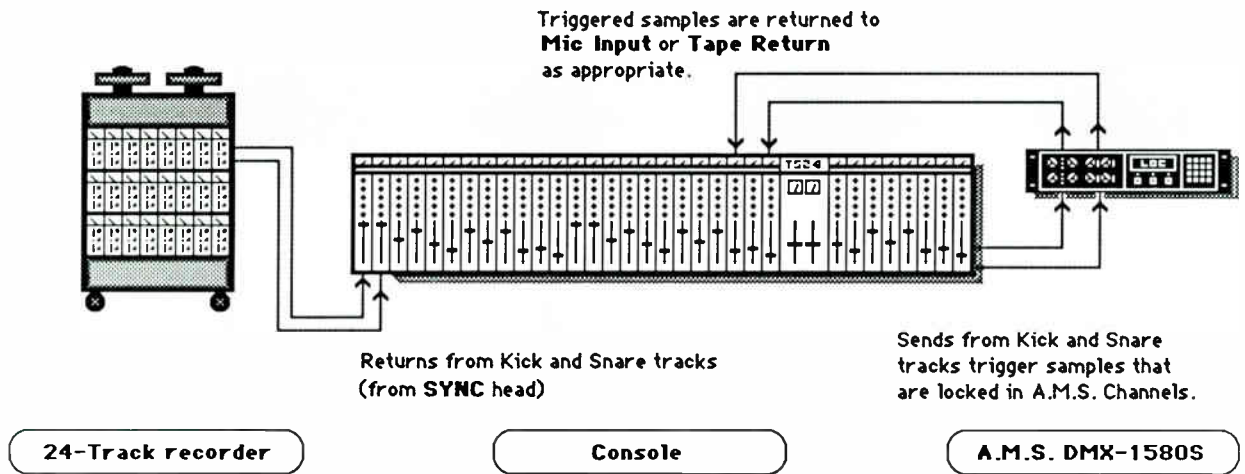


Fig. 1 - Triggering Samples with A.M.S. Digital Delay

ARTYORK BRUCE NAZARIAN

by Bruce Nazarian

Unless you have been hibernating in some remote part of the Himalayas, you're very aware of what's happening in contemporary music production. I can sum it up in one word:

Sampling!

Sampling is, of course, the creation of digitized pieces of real sounds. Digital samplers come in all sizes and prices: from high end units like the Fairlight C.M.I. and Synclavier, through midline units like the Emulator I & II,

Kurzweil and PPG Wave 2.3 with Wave-term "B," to affordables like the Ensoniq Mirage, Prophet 2000 and Roland's new S50 and S10. Samplers are so much in vogue today they are practically standard equipment in most control rooms. So are the recently introduced Linn 9000 and E-mu SP12 drum machines with user sound sampling built-in. The use of sampled sounds for music productions is such an accepted fact that it has even started to change some production practices. In addition to the ever-increasing use of custom samples of real drums in drum machines like the Linn 9000 and the SP-12, it is now commonplace to find producers cutting live rhythm tracks with marginal drum sounds, then using the recorded tracks to trigger in incredible drum sounds to replace them. Record remixer have been having a field day using triggered samples to augment or totally replace the original drum sounds for their remixes. Whether for temporary replacement in a mix, or for permanent replacement on a master tape, triggering these sampled sounds is the subject of this month's "In Sync."

Getting Prepared

Let's start off by covering a few obvious points. First, in order to use triggered samples, you need a few things: something to trigger (the "sample"), something to play it from (the "sam-

A User's Guide To Triggering Sampled Sounds

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pler”), and something to tell it when to play (the “trigger source”). Since one of the most common uses of triggered samples is to replace drum sounds from a master tape during a mixdown, let’s cover that first. Usually, the drum sounds already recorded on tape are used as the trigger sources for the replacement samples. Believe it or not, one of the most-used devices for drum replacement isn’t a sampling keyboard at all, but the amazing AMS DMX-1580S Digital Delay with Loop Edit System. The AMS was one of the first digital delays with provisions for editing and audio triggering of its sample memory. Its 16-bit digital dynamic range and incredible sound quality have been big factors in its acceptance as an industry standard. The sound quality is so good that top producers like Steve Levine (Culture Club) have been using the AMS to “fly in” extended vocal passages that are virtually indistinguishable from the original track. In the wake of the AMS’ success, other units have appeared on the market that offer sample editing and triggering as standard features. These include the BEL BD80, BD240 and BD320, the CompuEffectron, the AKAI S612 MIDI Sampler, and the Eventide SP2016. In all of these units, the idea is identical: capture a sample of sound, and then edit both ends to remove extraneous noise or unwanted events from the retriggered sound. Price aside, the biggest differences between these units are in sampling time, bandwidth, and dynamic range.

How It Works

Using the DMX-1580S for drum replacement is straightforward. Fig. 1 shows a typical setup for triggering AMS drum samples during a mix. (Note that Tracks 1 and 2 are being monitored from the sync head. I’ll explain more about this later). Since the most recent software update for the AMS allows the independent use of both sample channels, we are using channel 1 for Kick drum and channel 2 for Snare drum, a typical example. (I am assuming that you have already locked in and edited suitable snare and kick drum samples for use as your replacement sounds.) In most cases, the signal that is used to trigger the sample is the sound you want to replace, i.e. snare triggers snare sample, etc. Getting the sampler to trigger is no big trick. The presence of a signal at the audio input of the AMS will trigger the playback. You just patch the proper trigger source signal from the multi-track recorder to the correct channel input. (The CompuEffectron can be triggered from an audio source, but it requires an additional circuit. The AKAI S612 sampler may either

be played by a MIDI note event, or by an audio trigger, if you have added the AKAI trigger conversion kit. Check with an AKAI dealer for more information). In any event, getting the sample to trigger is actually the easy part. What really makes this a tricky technique is getting the new sample to sync in at exactly the same spot as the original signal. This is necessary so as not to destroy the rhythmic relationship between the drums and the rest of the track. Knowing how to correct for this is essential when using triggered samples.

Drum Replacement in a Mix

You may have been wondering why the Kick drum and Snare drum tracks in our Fig. 1 example were being monitored from the sync head during a mix. This is due to our old nemesis, “processor delay”: the time it takes for the sampler’s control computer to acknowledge the trigger signal and initiate a sample playback. Inevitably, some amount of time delay is introduced by the triggering process. For those of you who may have used the AMS DMX-1580S, we have some concrete numbers that may be of interest. Dave Baldwin, service tech for Harris Sound (AMS’ U.S. distributor) reports that recent bench tests of the most recent version of the DMX-1580S have shown a trigger delay on the order of 700 microseconds. (That’s .7 milliseconds!) Combined with an edit resolution of 1 millisecond, that’s 1.7 msec. maximum before the AMS will play out your sample. Any way you slice it, that’s pretty darn fast! Still, it may not be fast enough to prevent some audible time lag from being introduced if the sample is triggered from the repro head. Monitoring the trigger signal from the sync head during a mix is the easiest way of compensating for the delay introduced during the triggering process, since the playback from the sync head precedes the repro head signal. Using a DDL between the sync head playback and the sampler input allows the sample to be aligned correctly with the sound it is supposed to replace.

Permanent Drum Replacement

Using triggered samples for temporary replacement in a mix is a pretty easy task, as we have seen. But what do you do when you want to record the triggered samples, and all signals, including the triggers, can only be monitored from the sync head? Fortunately, there is a technique for dealing with this problem. In fact, we have used this same technique before, with sync tracks. Once again, it is the “backwards, out-of-sync bounce to an unused track” trick. This time, though,

we will be bouncing the trigger source signal, instead of the sync track. By doing this, we move the trigger signal *ahead* in time, giving us a little breathing room to compensate for the processor delay we will encounter. (Don’t get confused—this is actually easier to do than it is to describe. If you’re not sure about how to go about bouncing tracks backwards, refer back to “In Sync” for July ‘85—“Troubleshooting Digital Gremlins”).

Creating a Trigger Track

Let’s say you want to replace the snare on your master. It’s easy. First, you must create a “trigger track” for your snare sample. Turn the tape upside-down and bounce the snare track from the repro head while the tape plays backwards. After you turn the tape right-side up again, listen to this track in the monitor mix. It should sound weird, as it is playing many milliseconds ahead of all the other tracks on the master. If it doesn’t sound early, reread the above paragraph and check your actions (you may not have bounced out-of-sync). If it sounds weird, it’s probably right. Now patch a digital delay (DDL) in between the *return* from the trigger track and the *input* to the sampler. Initially set the delay time to 0 (zero) msec. We’ll use the DDL to add in the exact delay necessary to put the triggered sample right on top of the ORIGINAL track. Solo the original track (NOT the trigger track) and the triggered sample input signal and check for a “phase-lock.” This will happen when the signals are within about 5-10 msec. of each other (you may have to adjust the playback levels until the two drum sounds are at about equal levels in the monitor mix). At this point, they will begin to “phase cancel,” and you can carefully adjust the DDL until they null each other out completely (they may not actually null if the two drum sounds are very different, but you should be able to hear the phasing). At this point, they should be locked. Now comes the fun part: turn off the original source track and listen to the replacement sample placed in its proper perspective in the mix. It should be right in the pocket. If it isn’t, tweak the delay time up or down until the new sample feels right. I know this doesn’t sound very scientific, but your ear is a better judge of feel than a calculator.

And Now . . . The Easy Way

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THE COMPLETE DRUM INTERFACE.

There are a lot of drum interfaces on the market that can do one or two things extremely well. However, no other drum interface comes close to matching the complete range of features found on the new MTM from Simmons.

MTM is an eight channel fully programmable interface unit that converts drum pad, tape or acoustic drum signals to trigger both MIDI and non-MIDI electronic sound sources under full dynamic control. Its signal processing capabilities are a result of extensive research and development by Simmons Electronics culminating in unique applications of existing interface technologies combined with totally new innovations.

Designed primarily for use with Simmons electronic percussion synthesizers, the MTM enhances the dynamic range and performance of the SDS5 and SDS7 by placing a computer between the drum pads and drum brain. MTM will also act as a fully assignable MIDI interface that can produce unlimited melodic, harmonic, tonal and rhythmic effects via drum pad triggering when used in conjunction with MIDI sound generators.

MTM has many other applications as well. For example, it can be used as an interface between acoustic and electronic drums, acoustic drums and MIDI

equipped synthesizers or in the recording studio for converting audio signals on tape to MIDI code.

As the complete drum interface, MTM allows creative flexibility for programming several signal processing parameters, each of which is independently adjustable.

SIGNAL PROCESSING CAPABILITIES.

● TRIGGER PROCESSING

Threshold, the dynamic level an incoming signal must reach before it is recognized as a trigger, is programmable for Absolute, Initial, Fractional and Cross Channel characteristics.

Hold-off is used as a programmable gate system which "cleans up" incoming acoustic and electronic trigger

signals while allowing a controllable time period for each channel during which MTM will not recognize an incoming signal as a trigger or generate an output.

With MTM's on-board micro-computer, dynamic enhancement of

trigger signals is possible through velocity tracking, compression and expansion.

● MIDI PROCESSING

MTM's MIDI capability is designed for full programmable implementation including note assignment, channel assignment as well as

patch and program changes.

● EFFECTS PROCESSING

Repeat Echo, Sequencing and Note Layering are just a few of the MTM's programmable on-board effects. Repeat Echo is a single note retriggering effect that is adjustable for echo decay and echo speed. The Sequencing function allows programming of sequences up to sixteen notes on each drum per program. Pitched and non-pitched chords under full dynamic control are made possible by MTM's Note Layering effect.

● CHANNEL ROUTE PROCESSING

MTM's innovative design permits independent control of input to output channel routing.

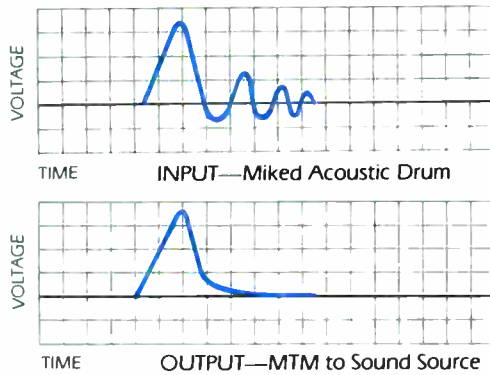
● OUTPUT PROCESSING

Programmable dynamic control of pulse height and width allows triggering of non-MIDI drum machines requiring a voltage pulse.

CHALLENGE YOUR CREATIVITY.

Just as Simmons' original SDS5 completely changed the way drums were played, the flexibility and features of the MTM will challenge the creativity of even the most sophisticated electronic musician.

So when it comes to completing your drum interface, choose the Simmons MTM. Anything else could be a complete disappointment.



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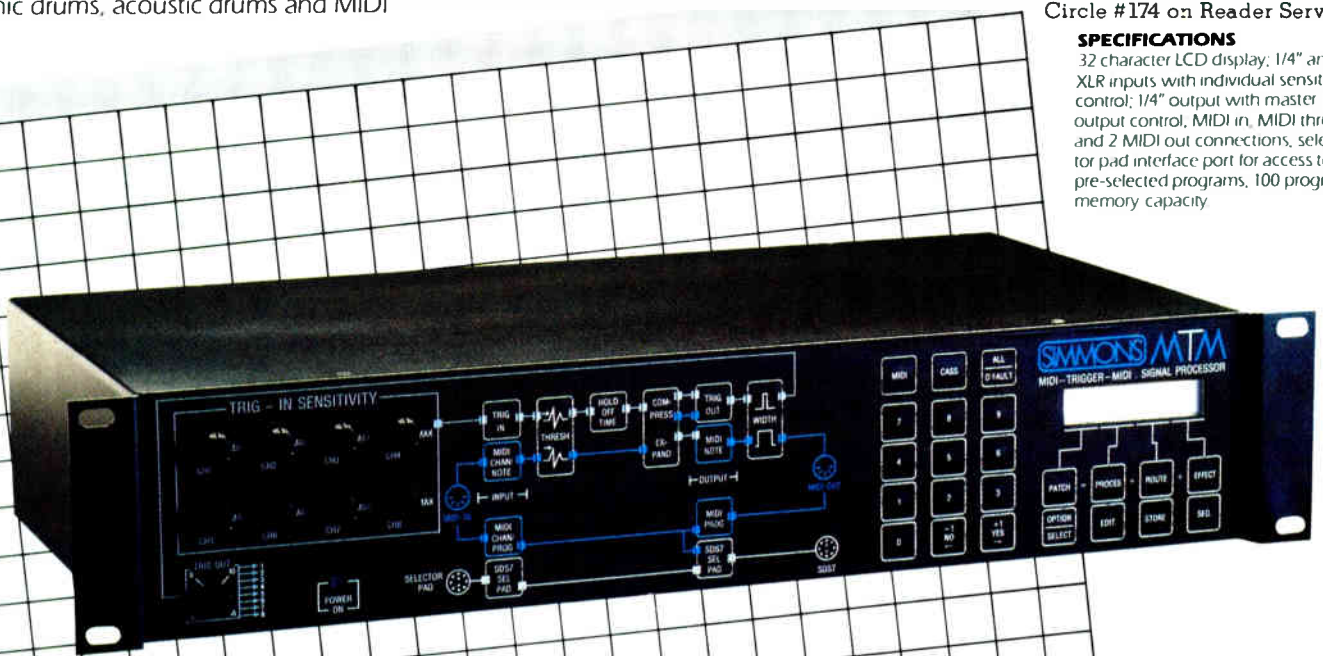
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is usually worth it. But what would you say if I told you of a technique that would allow you to accomplish the same thing without reversing the tape and bouncing? A way to monitor a track *before* it plays through the sync head of your multi-track machine? Sound interesting? Read on.

Trigger Advance

If you use (or own) an Otari MTR-90, then this gizmo is for you. Actually, it really isn't a gizmo, but a modification to a standard MTR-90 audio card. Dubbed the "Trigger Advance TA-1," this mod makes the erase head of the MTR-90 act as a "preview" head, allowing a track to be monitored in advance of the sync head playback. Using this signal as a trigger source should provide plenty of time for even the slowest sampler to trigger. And unless you plan on erasing the trigger source track while you are using it, you shouldn't have any problems with the TA-1. The preview output from the erase head appears at the micro-jack output on the bottom edge of the MTR audio card, replacing the oscilloscope test point that normally appears there. To prevent the full level bias signal from feeding into your outboard circuitry, the preview output is automatically muted while recording. Implementing the TA-1 shouldn't be an expensive proposition either, as just a few audio cards can be modified and then shifted from track to track as they are needed. The TA-1's conceptual developer, producer/musician Gary Spaniola says the TA-1 is just the thing for hassle-free drum replacement. The TA-1's technical developer, independent audio technician David Carlstrom indicates that reaction to the TA-1 has been very positive. He is presently modifying the TA-1 design for other multi-track machines as well. For more information about the TA-1 for the MTR-90 or any other multi-track machine, contact David Carlstrom at ElectroMedia Service, 24166 Haggerty Rd., Farmington Hills, MI 48024. (313-477-6502) Happy triggering!

Making it Trigger With MIDI

Using the AMS DMX-1580S is only one way to trigger sampled drum sounds. In last month's column, I showed how the Roland Octapad could be used with a sampling keyboard to play drum samples or other sounds from MIDI or from event triggers routed to its six trigger inputs. This same technique can be used with taped drum tracks as the trigger signal source. Several devices exist that can trigger samples by providing a conversion from various signal forms to MIDI note events, suitable for playing a MIDI-equipped sampler:

The Sycologic PSP (Percussion Signal Processor) is an extremely sophisticated signal conditioner that can translate either drum tracks from tape or real time drum pad events into MIDI notes. The number of adjustments on the PSP is staggering! (You'll want to have the owner's manual on hand the first few times you use it). It is also unique in that it has pre-programmed "feel" tables that can adjust the placement of the output pulse to add the missing "human factor."

Patience is a necessity when setting up drum sample triggering. Even with the most sophisticated signal processing equipment, it invariably takes longer to accomplish than you first envisioned.

The Simmons MTM (MIDI-Trigger-MIDI) interface also provides a similar pad-to-MIDI event conversion, and is designed to interface directly with Simmons drum pads, as well as audio from tape.

Even though it's not a MIDI trigger unit, Garfield Electronics' "Drum Doctor" is worth including here. This six-channel processor can output TTL triggers to play drum sounds, and also provides VCAs as a means of adding dynamics to otherwise non-dynamic drum samples, something usually achievable only through MIDI triggering. The Drum Doctor is just the thing to use with non-MIDI drum machines that require a TTL trigger pulse, like the LinnDrum or Oberheim DMX. (Remember, even though the Drum Doctor is a six-channel device, you can only trigger ONE LinnDrum sound at a time from the external trigger inputs.)

Last, but surely not least, patience is a necessity when setting up drum sample triggering. Even with the most sophisticated signal processing equipment, it will invariably take longer to accomplish than you have first envisioned. Just remember, there is always a way to make your sample lock in, even if you haven't found it yet!

An Epilog...

By now I am sure that most of you have heard of the recent closing of Linn Electronics. It is a sad thing, too, as it occurred at the same time as the release of what should have been their vindication: the latest operating system revision for the Linn 9000. This software, Version 5.17, is something that every Linn 9000 owner should experience. It shows that, despite initial software bugs, bad raps and blow-ups, the Linn 9000 is one elegant machine! In addition to addressing most of the known (and unknown) bugs that existed in previous versions, 5.17 finally includes many previously promised features that turn the 9000 into a well-behaved, disciplined sequencer. And, it's faster than ever! If you own a Linn 9000, and have not yet acquired this software, sets of 5-EPROMs are available at reasonable cost from several sources, including Music Dealer's Service in Chicago, Unique Recording Studios in New York (212-921-1711) and Linn Electronics' former service manager Brad Cox (in the L.A. area: 818-708-1645).

...And a Personal Note

The Linn 9000 is, in my opinion, the finest (and, I believe, the *only*) integrated drum machine/MIDI sequencer. Although the promise of what could have been many exciting new products from Linn Electronics now seems dim, it is not extinguished. In a recent letter to dealers and friends, Roger Linn indicated that he will continue his effort to forge a new business alliance that would allow the most recent Linn products (Linn Sequencer, and MIDI Studio at least) to eventually come to market again, as well as to provide support for all Linn owners presently without warranty service. It would be a shame if a creative force like Linn Electronics was allowed to fade away after having brought us so many innovative ideas. If you would like to pass along your comments or support to Roger, mail addressed to the Linn Electronics office in Tarzana will be forwarded to him personally. Hang in there Roger... we're all rooting for you!

Feedback Department

As always, if you have comments or suggestions, you are welcome to send them to In Sync c/o Mix magazine, 2608 Ninth Street, Berkeley, CA 94710. You can also reach me via the IMC computer network... just address your E-mail to GNOME-US. And stay tuned for some more exciting news about In Sync entering the on-line computer world (Get your modems ready!) See you next month with an overview of audio-to-audio sync and 48-track "slave reel" recording techniques. ■

ROADABILITY ROUNDTABLE

A "CASE" STUDY

Twenty years of co-existence with amplified rock music has forced considerable advances in the reliability and consistency of professional sound equipment...

by Chris Michie

This month's Audio Forum focuses attention on the issue of "roadability" as it applies to professional audio equipment. When the topic for discussion was chosen, it was expected that the Forum participants would have a great deal to say about the design and manufacture of the equipment they use and would have constructive suggestions for ways in which manufacturers could improve their products. However, as it turns out, none of those professionals that we interviewed had more than a very few problems with the equipment they use. Obviously, under the extraordinary conditions of a major concert tour, equipment fails; but all those interviewed seemed satisfied with the time-between-failure characteristics of their equipment.

This welcome, yet somewhat unexpected, response suggests that perhaps "roadability" is a dead issue. After all, 20 years of co-existence with amplified rock music has forced considerable advances in the reliability and consistency of professional sound equipment. Further, the general knowledge of the end-users has grown immensely during that period and there has been a corresponding decline in the number of instances of equipment failure due to operator error.

The net increase in equipment reliability is not coincidental. An industry

that was once almost entirely the province of a few enthusiastic individuals has seen a steady influx of cash and engineering talent. This has resulted in the phenomenal growth of a new and highly visible arm of the international entertainment industry, and this new market has been seriously targeted by many international manufacturing companies, most notably the Japanese. Companies like Yamaha have brought to pro-audio manufacturing a level of R & D and marketing expertise that was inconceivable in the early days, and one of the cornerstones of their success has been reliability. However, most new products have some teething troubles, and it was interesting to hear how different companies dealt with these problems.

**Mark Strosahl,
United Sound Associates,
Yakima, Washington**

How do you rate "roadability" as a feature of equipment used for a road tour?

It's crucial. We spend a lot of time here testing equipment, which we have a lot of fun doing. The main issue, of course, is whether that piece of gear is going to stand up to the abuse of travel, and at the same time perform a number of functions and perform them well. We normally wind up concentrating on sonic quality and roadability. The more central a piece of equipment is to the system, the more important roadworthiness becomes. The console, crossovers and drive signal outputs have to be essentially bullet-proof and we spend a lot of time (and money) on redundancy in those systems, protecting ourselves against the unthinkable and the supposedly impossible. Of course, you can't take two main consoles on the road and expect to generate a return on your investment, but crossovers, amplifiers and so on are more easily duplicated. On the other hand, there's a point where you spend more time and labor on pre-



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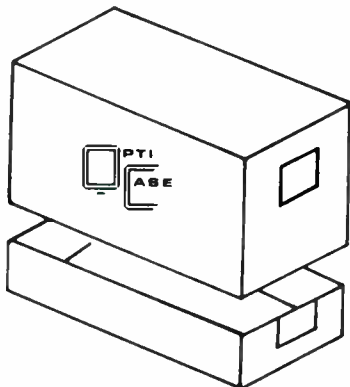
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venting failure than it would cost to buy a spare piece of equipment. Something is going to happen out there that will cause a catastrophic failure and then your spare piece of gear will have to be used anyway.

Looking back, is there a particular instance of the unthinkable and the impossible that comes to mind? About 30 minutes before a Ronnie Montrose show, our main output snake from the mixer to the amplifiers developed a short and sent the whole system into oscillation. We were without a backup for that particular cable system—I've never felt as vulnerable to fate as I did then. After 15 minutes, we

Yes, I'm afraid so. We've had the same man tip over the same amp rack on its face twice, through failing to listen to instructions on how to handle the unit. I find that really irritating.

Have you modified any pieces of equipment in order to make them more roadable?

There are certain things that we do to make the gear a little more roadable. We use Crest amplifiers, which are extremely durable. There were some design problems in the past that we had to fix, but we've had very few problems since. I'm constantly amazed at how well the stuff operates and how good it sounds for the money it costs.

"If we didn't have faith in our equipment, the spares we would have to carry would consume an enormous amount of truck space..."

found that the cable was not properly secured to the main output connector and was arcing—that was the only problem. There were no shorts in the cable after all, but that incident really highlighted the delicacy of parts of the system and how much time you have to spend protecting yourself against the kind of accidental damage that will interrupt signal flow. That was the most critical failure that we've ever had.

Do you see items like loudspeaker cabinets deteriorating over time due to handling, trucking or weather?

We see some of that. I think our most common problem with loudspeakers is that when we get a batch, we test them at low power and they check out OK, but then later we find that the magnetic gap has shifted and there'll be a failure. I think it's a quality control problem at the manufacturer. But generally speaking we find that the cone drivers we use are very reliable, provided you design your system properly with enough compression to clip off the nasty stuff. All the speakers we use, Gauss, JBL, Electro-Voice, have proved equally durable.

Do you have any difficulties when your equipment is handled by stage crews?

Do you feel equipment should be serviced as soon as it comes off the road, or do you subscribe to the "If it's not broken, don't fix it" philosophy?

I don't like to take the cover off something if there's no good reason to do so. If we have a problem on the road, we generally have the spares and test equipment necessary to repair it then and there, but it seems that over the last ten years the manufacturers have become more aware of what we need to see in terms of reliability. At the same time, that makes us more vulnerable to whether or not the manufacturer is making a profit, since any shortcuts in manufacture generally result in reduced reliability. There are some dangers in relying on the manufacturers too much but, of course, we can't really compete in terms of building the equipment ourselves.

How much of your equipment budget is spent on packaging?

We spend about 12 percent on packaging. We have a complete manufacturing plant and have access to all the different methods used in cabinet manufacture and it has really paid off. We've spent a lot of time standardizing in our case manufacture, rack manufacture and speaker cabinet manufacture. A lot of my experience is in architecture and design, and that has ena-

bled us to spend time looking at what we were going to end up with, and the form it would take. We standardized as much as we could and it has turned out to be extremely cost-effective.

Kevin Kelley, Midwest Concert Systems, Normal, Illinois

We're a small-to-medium PA company. We also do retail sales, PA design and we offer a complete rental service, from club PA rental and DJ systems all the way up to touring systems for medium-sized arenas. We handle most of the better pro-audio products for our retail operation and we use the best products in our rental division.

What products do you use in your touring packages?

In the touring systems, we use all Carver power amps, Rane equalizers and crossovers, and also Pro Audio Systems Crossovers. We use Armor and Anvil roadcases and build a lot of our own. Our speaker cabinets contain JBL, Gauss and McCauley drivers—McCauley is a company that we've found to be very high quality. Our high end is 90 percent JBL. We use Biamp, Allen & Heath and, if we can get hold of it, Soundcraft. We try to use the PA equipment that we carry in our

retail operation, so that, for instance, if a band likes a system but is unwilling to lease or rent, then they can buy what we have been renting to them, which backs up our retail.

How do you choose equipment for a tour?

We keep in touch and see what people are looking for in the industry—what the bands and sound crews look for. As far as roadability, we keep track of what holds up and what blows up and make determinations on that basis. On the road, we carry spare power amps, one per system, and a pair of high-frequency drivers, but we've never had a system go down while in use; we generally find problems before they start through preventive maintenance.

Do you take systems "to the bench" when they come in from a show or only fix things that have problems?

We don't have many problems with the equipment we now have, and we've discontinued using the equipment that did give us problems. We recone low-end speakers after six months, no matter if they're blown or not, just because of the heavy use they get. Most of the engineers know their systems pretty well and can tell im-

mediately if something's not right, and at that point we can determine where the problem is from the symptoms.

Do you have problems with equipment being handled by persons other than your employees?

We sometimes have problems with the smaller systems because the people who rent them are often not familiar with the connections, or the loads that can be handled and so on. As far as physical abuse, if it's in a roadcase it's pretty well protected.

John L. Fleskes, Cetacea Sound, Memphis, Tennessee

We're a fairly new company, three years old. We're operating a 50kw system and we specialize in festivals and outdoor shows for 50,000 to 100,000. Our system breaks down into three smaller systems and we do a lot of the college circuit shows and also the large club and small auditorium shows. The snake system we have is set up so that we can do an additional mix for television, for instance. We're planning to get into the touring business and we've been looking at Turbosound and Meyer loudspeakers for a new system. We're aiming at putting together an

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"...we've never had a system go down while in use; we generally find problems before they start through preventative maintenance."

How important is reliability when buying new equipment?

Incredibly important. If we didn't have faith in our equipment, the spares we would have to carry would consume an enormous amount of truck space, not to mention our operating budget. We use only Soundcraft consoles in our PA system because we have seen them survive terrible abuse and still work — someone is going to have to prove to me that there is a more reliable console for live shows than Soundcraft. We travelled with Yamaha consoles for a while, but the weight of those consoles makes it easy to get hurt. For amplifiers, we use QSC Series 3 dual/mono amplifiers because they are so easy to replace. They are incredibly reliable amplifiers, but if one of them goes down it can be replaced virtually without powering down the amp rack. We've never had an overheating problem, even on an outdoor stage in the middle of July, and temperatures here in Memphis can be over 100 degrees, easily. Of course, we carry spares for the most critical parts, but I trust the gear we take out.

Are you ever worried when your equipment is moved by people who aren't paying attention to what they're doing?

Well, there's a concern there — my equipment is like my children to me. After a show, before we power down, we check to see that everything is still working. We check every microphone and driver and every line in the console and return everything to zero. A

lot of people don't care for their gear, or anyone else's, as they should. This may not print very well, but I've always got one of my engineers breathing down the neck of anyone we're worried about. If that person is comfortable, and we feel comfortable after watching them for a bit, then we'll let them go by themselves; but somebody that's not paying very close attention—we're right there with them. We know the equipment, and two heads are better than one, so it can only help to have someone there looking over your shoulder.

What are your experiences with the reliability of outboard gear?

I've found the PCM series from Lexicon to be some of the best, most cost-effective equipment I've ever seen. It sounds phenomenal and we've never had a problem with it, and again, doing festivals as we do, we really put the equipment to the test. For instance, last year we did the World Cookout Barbecue Contest for about 75,000 people—by the time we left, there was barbecue sauce on everything! It's nice to see something that will take that kind of abuse and still function. We use a Lexicon 224 and we have an Ursa Major 8 x 32, which some people had problems with, but we're crazy about ours—it hasn't given us a problem since the day we took it out of the box. We're also fond of the dbx mainframe gear which is very modular, sounds good, and is very versatile.

What about microphones and direct boxes?

We built our own D.I. boxes using Jensen transformers and we added a few features we wanted, like variable pads. As far as microphones, we use only Shure 58s and 57s on stage with some additional condensers for drum overheads. That way the monitor engineer has fewer variables to deal with and can do a better job. We've used different microphones on the front line, but by going to a consistent pattern we've managed to get a few more dB onstage and reduced the number of incidental squeals.

**Dwight Dyer,
Eagle Sound Productions,
Greeley, Colorado**

We're a location recording and concert sound company and we also have a small studio. We do medium size concert sound—no heavy-duty rock and roll shows. We haven't been taking the big rock concert shows because there's too much abuse on the system when you don't have massive amounts of equipment—we've got

enough to comfortably cover 5,000 people, but if you've got from ten to 20,000 there's no way we can create that warm, yet present SPL for everybody without having massive stacks up there. We use JBL drivers and, although we've burnt out some horn diaphragms, we haven't had any failures in the cone drivers. We are using Phase Linear 700B amplifiers, which must be 12 years old—we started out with them in 1973—and we have some Crown 300A and Ashly FET 500 amps.

Do you see any differences in reliability between the older and newer amplifiers?

Well, the older amplifiers don't have the sophisticated protection circuitry

that the newer ones do—you can dead-short the Ashlys and nothing will happen, whereas the Phase Linears will get hot and eventually shut down if you drive them too hard; if that occurs too often you'll probably blow some output transistors.

What console are you using?

A Soundcraft 400B. I had a long chat with Deane Jensen of Jensen Transformers in which he explained the theory of high quality transformers versus IC balancing on the input. As a result of our conversation, we're going to Jensen transformers on the inputs, which should improve our signal-to-noise, although the Soundcraft is very good to begin with: you can't hear any noise.

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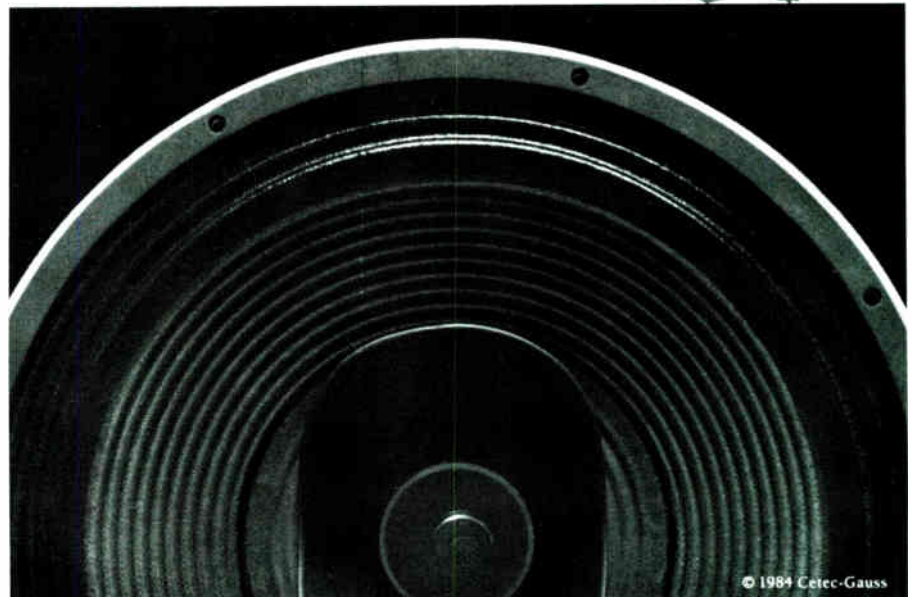
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**Jerry Pfeffer, Sound on Stage,
Brisbane, California**

I started the company in my garage, years ago. One of my first equipment choices was McIntosh amplifiers because they had transformers, which made them very forgiving when you plugged them in wrong. As I built everything myself, I quickly found that it was necessary to put everything in a roadcase; that was hard, buying a new piece of equipment and then having to buy a roadcase for it, but without a roadcase it would be useless. As we went along, we could see which pieces of equipment would last and which pieces wouldn't and, among the pieces that we built, what worked and what didn't.

Can you think of pieces of equipment that you had to give up on because they wouldn't hold up on the road?

There were certain kinds of packaging that became necessary. For instance, we started to build shock-mounted amp racks so that the wheels were

“...if you spend \$100 on something, you'd have to spend another \$30 to \$50 on a case for it—I suppose a third of my equipment (budget) is cases and wheels.”

de-coupled from the amps and we had to secure the backs of amplifiers as well as the rails—most amplifiers were not designed to be trucked and, although they were rack-mountable, you still had to support the rear. A Crown DC300A would just tear out of the rails if you bounced it around. The next development was to build a case around an amplifier that would itself sustain a fall, such as from a lift-gate

on a truck. We originally built things into wooden boxes, but after a few accidents we went to mounting the equipment in a steel cage within the wooden box. Inside the amps themselves we had to address a number of problems—capacitors, for instance, which would work loose from the circuit boards because of vibration.

What about mixers?

When I started, we used tube mixers—the capacitors would always be shaking loose. Vibration was always the killer on the road from day to day so it became important to have an air-ride trailer. The next thing was to develop cabling and interface systems that were foolproof, so that you couldn't accidentally blow things up by making a wrong patch.

It always struck me that loudspeakers are especially vulnerable in a truck because, if you stack them upright, the magnets are hanging off the back of the baskets and getting bounced up and down.

We found that if you didn't support the horn drivers then, right away, you'd have broken horns, because of the weight of the drivers, but the 15-inch cone speakers would maintain integrity. However, in the early days when I had Voice-of-the-Theater cabinets that I'd built myself, the baffleboards would come loose and I realized I'd have to improve on just nails and glue! Also, putting steel grating across the front of woofers became a 'roadability' issue, and, of course, if your artists are going to climb on the monitor speakers then you have to put a steel mesh over them.

Do you have any idea what proportion of your equipment budget has been spent on roadcases?

I would expect that if you spend \$100 on something you'd have to spend another \$30 to \$50 on a case for it—I suppose a third of my equipment is cases and wheels.

Have you had many problems with the effects rack units, which were usually designed more for studio use than roadwork?

From time to time. Certain IC sockets are not very good and don't hold the ICs very well. A lot of companies now solder them directly to the board, which is probably the ultimate best, but if you have to replace the thing, it takes more time, so there's a trade-off. When we go through the gear once or twice a year as part of our preventative maintenance, we find cracks and we'll end up building braces and extra support brackets. ■

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M. I. U P D A T E

by Craig Anderton

I finally got a chance to sit down and get into the Atari 520ST, and I must say it's a pretty impressive machine. The color monitor is very clean (no fuzziness), the mouse responds well, the operating system is a snap to use, and all of this comes in at a most reasonable price. What I don't like is that the basic system is a little too modular for my tastes—there are cords from the power supply to the computer, from the monitor to the computer, from the disk drive to the computer, from the disk drive to its own power supply, and then there's the AC cords for all of this stuff. . . . but help is on the way. The 1040ST, Atari's one megabyte machine, has a built-in disk drive that helps cut the clutter considerably.

As far as I'm concerned, the most important aspect of Atari's new computers is the MIDI port. It's very easy to see those words on paper and not be impressed, but when you're actually plugging your instrument *directly into a computer*—no interfaces—there's something significant about that. The Atari does feel a little "cheap," and the model I had on loan arrived D.O.A. Fortunately, I had just finished editing an article on the ST for *Electronic Musician* magazine, where the author (Malcolm Cecil) counseled pushing in on chips that might have come loose during transit. I followed his advice and all was well.

Software is starting to appear for the ST. One program that exists now is DX Droid from Hybrid Arts. This program is essentially a voice editor and patch librarian—but with some significant twists. First is the use of the Atari's medium-resolution graphics mode to do some very tasty envelope and keyboard displays. More importantly, there is a random patch generation function. There is some intelligence built into this so that it doesn't generate musically useless settings (e.g. vary the LFO speed if depth is turned down all the way anyway). Random patch generation doesn't produce such fantastic sounds all by itself, but it does give you a head start. With a little touch-up editing, you can turn a randomly-generated patch into something that sounds like you slaved over it for hours. Hybrid Arts is also converting their Atari 130XE sequencer program for the 520ST, and adding several enhancements while they're at it.

Electronic Music Publishing House has come up with MIDIPLAY, a 16 channel single track MIDI recorder for the ST. While apparently slanted more for the consumer market, this is a very useful and inexpensive tool for composers who like to play away at a keyboard without having to think about much else. You can record into MIDIPLAY, but should you run out of memory, the program simply erases the first batch of stuff you recorded. Basically, MIDIPLAY turns the Atari ST into the MIDI equivalent of a cassette recorder.

Hippopotamus Software has introduced a software/hardware sampling combination for the Atari, but they have far bigger plans ahead. So does Dr. T software, which is currently working on software for the ST. Activision is also developing products for the ST.

The increasing interest in the ST has caused some counter-moves at Commodore, who dropped the price of the Amiga by \$500 during the months of April and May. MusicData is one of the companies developing software for the Amiga, and several of the video-related products for the Amiga are finally making it to market. I have also heard that Roger Powell's programs for the Amiga, which were in limbo after the demise of Cherry Lane's software division, are being polished and finished by another programmer and they should be out eventually.

Speaking of Commodore, I got a chance to try out MusicData's Soundfiler patch librarian program for the Commodore-64. This is a "nothin' fancy" program, but I sure have found it useful. One reason is that it supports four synthesizers I use regularly, and eliminates the cassette interface shuffle which has been known to cause many a premature gray hair. MusicData has a bunch of other new products out, including a revised version of their sequencer, some DX programming aids, and DX and Casio sounds.

On the subject of other new packages, Dr. T has just completed an algorithmic composition program. This produces sequences all by itself without certain parameters; these sequences are, as you might expect, compatible with the Dr. T keyboard controlled sequencer. Incidentally, the Doctor is also coming up with a version of the keyboard controlled sequencer for the Commodore 128. And there's more. . .

No interface required! Atari's one megabyte machine, the 1040ST, has a built-in MIDI port.



a new company, Sonus, has been formed and seems very keen on the Commodore 128 as a low-cost, well-supported computer (it runs all C-64 software) for musicians. Their first product will be a sequencer.

Meanwhile, the Data Dumpstor (from Music Service Software) stores system exclusive data from a variety of instruments (Yamaha, SCI, Oberheim, Korg, and more) on disk using a Commodore 64 and 1541 disk drive. This information can include patch data, sequences, drum machine patterns, and so on. And let's not forget that excellent IBM PC software keeps appearing. One impressive package, Octave-Plateau's Patch Master, is primarily a librarian program designed to upload and download system exclusive data; but there's also a "system organizer" aspect to the program. This can perform such tricks as fully set up 32 instruments over MIDI (MIDI channel, mode, program number, etc.) and make these various setups instantly available. A Bank arrangement function allows for easy swapping of patches in and among various banks of patches.

Software, software everywhere. . . it's great to be able to pop a disk into a computer and have it perform a whole new bag of tricks. The same machine that organizes your patches can provide MIDI delay, sequence your synthesizers, or even come up with its own sounds and sequences. And just think, the music software industry is only a couple of years old. I wonder what will be in next year's bag of tricks? ■

MUSIC NOTES



Ry Cooder (right) and Otis Taylor during the *Crossroads* soundtrack session.

Ry Cooder's *Crossroads*

by Iain Blair

It's hot outside the Chaplin Soundstage on the A&M lot in the middle of Hollywood, thanks to an early heat wave, as sweaty grips unload film equipment, and anxious-looking production assistants scurry in and out of a door marked CLOSED SET—ABSOLUTELY NO VISITORS.

It's even hotter inside, thanks to an impromptu jam led by guitarist Ry Cooder, who's killing time between takes doing what he loves best: singing and playing. What's going on here is shooting of the title track video for *Crossroads*, Columbia Pictures' new release about blues and its legacy. Cooder, who scored the entire film, is enjoying himself immensely—as are all the crew members and extras crowding around the stage as the guitarist lets rip with a few burning slide licks, lookin' right at home.

"The moment I read the script, I knew I *had* to do this film," Cooder

explains later. It's easy to see why, for *Crossroads* (the title is taken from the classic Robert Johnson song) is that rarest of Hollywood creations: an intelligent, sensitive and unsentimental tale. Ironically, this film about a dying art form fairly crackles with vitality and life thanks to some inspired direction from Walter Hill (*48 Hours*), fine performances from Joe Seneca and Ralph (*Karate Kid*) Macchio, and Cooder's haunting score.

Seneca, who was acclaimed for his work in *Silverado* and *The Verdict*, plays Willie Brown (aka Blind Boy Fulton), an aging Delta bluesman. "He's one of the all-time great harmonica players and singers ever to emerge from Mississippi, and reputed to have been a friend of the legendary Robert Johnson," Cooder explains. "But like the long-dead Johnson, Willie has found fame short-lived and when we first meet him he's languishing in a New York nursing home, having been imprisoned years earlier for killing another bluesman in a fight.

"He's befriended by an aspiring young guitar player (played by Macchio), who eventually helps him es-

cape back to the Delta in exchange for teaching him one of Johnson's lost songs—and that's how it all begins. There's a lot of humor, drama, folklore and feeling in this story, and that's what really appealed to me—along with the obvious fact that *Crossroads* deals with music I personally love. Opportunities to score this type of project just don't come along very often in Hollywood today."

Cooder has spent a lifetime studying and assimilating the entire spectrum of American music, from blues and country to cajun, R&B, and rock and roll. Along the way, he's played and recorded with such diverse performers as Taj Mahal, Captain Beefheart, the Rolling Stones, Arlo Guthrie and Randy Newman. He's released some ten solo albums, among them *Paradise and Lunch* (early gospel songs), *Chicken Skin Music* (Hawaiian slack-key and Tex-Mex), and *Bop til You Drop* (vintage rhythm and blues). His film scoring credits include *Alamo Bay*, *Paris, Texas*, *The Long Riders*, and others. It all adds up to a comprehensive and eclectic exploration of America's musical roots.

Mix: When did you start doing soundtracks?

Cooder: It started way back in '69 when I worked with Jack Nitzsche on *Performance*. I enjoyed the freedom soundtracks give you to try out all sorts of things. Jack taught me a lot about how to write for film. He'd say, "Just look at the scene and play what you feel," and I'd dig around in all my

THE FAR SIDE

By GARY LARSON



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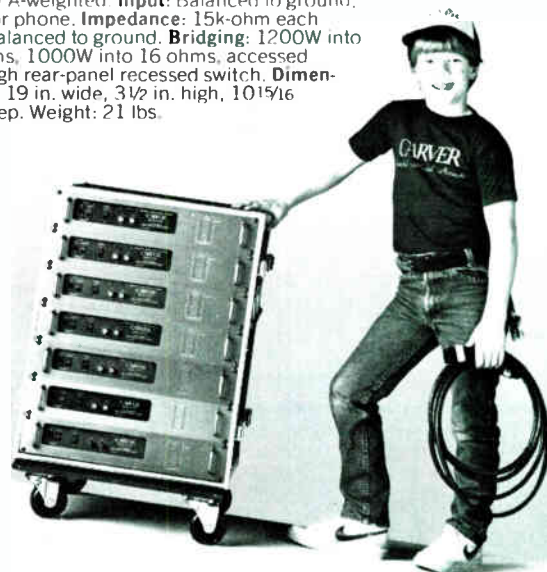
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"Carver has managed to deliver a tremendous amount of power in a small lightweight package at a very reasonable cost..."

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roots and let something float to the surface.

Mix: How did you get involved in *Crossroads*?

Cooder: Through Walter Hill. We've worked together on a lot of projects, starting with *The Long Riders* in 1980. Since then, I've scored *Southern Comfort*, *Streets of Fire* and *Brewster's Millions* for him. I think we work well together, so when he called me about this film I jumped at the chance. It's rare that you get a film like this, where the music plays such an integral part. It really is a main character, as opposed to the normal type of "Hollywood" movie where you're busy trying to keep out of the way of all the talk.

This one was a labor of love. It took over a year to do, because there was a lot of music to wrangle up and a lot of songs to write. But I had a lot of fun doing it, and it was pretty challenging.

Mix: I see you co-wrote some of the songs with Steve Vai (who appears as the Devil's guitarist) and Joe Seneca.

Cooder: Yeah. It worked out really well, because Joe's quite a songwriter. In fact, we all got real lucky with him, because he turned in an incredible performance that, to me at least, transcends the usual Hollywood-type role of the old black man. He's just so natural in the role—not at all over-dramatic or corny—just very *real*. And that made Ralph, who's also a very naturalistic type of actor, even stronger.

Mix: Macchio looks pretty convincing as a guitarist, first as a prodigy at Juilliard and then later when he's playing the blues. Did you coach him?

Cooder: [Laughs] Yeah, and it was a lot of work for both of us. He couldn't even play when he was cast, so we had to teach him how to play both blues and classical guitar *and* how to look comfortable and natural with the instrument. I think he did an amazing job, and for a non-musician he's very convincing to me. It's a tough role, as a lot of the classical pieces at the beginning and end are extremely fast and very demanding because they're so precise—and it all has to *look* precise. Obviously you can't use a double or totally fake it through the film. The blues bits were easier to fake for the cameras.

Mix: There's so little done on the blues in film today. This must have been quite a brave move on Walter Hill's part.

Cooder: You're right, and he's given the film a lot of depth, a lot of resonance, and that's real important when

you're dealing with something as emotional as the blues. It's a tricky thing, 'cause the public is uninformed about blues, and Hollywood can't figure out how to make it commercial and sell it. But Walter's taken a simple story about two people on a journey—and everyone can relate to that—and made it work on several levels. Yes, it's a road story, but it's also about hero-worship and the story of the blues as well as being an intriguing metaphysical story. As one character says in the movie, "It's about good men feelin' bad."

That whole subtext of the blues is Walter's handle on it, which allows him to create a situation you can then call a "Hollywood movie." And that way, hopefully, it'll reach a wider audience.

Mix: Does it sadden you that blues is so largely ignored today?

Cooder: It used to, but not anymore. The sad truth is that it's practically dead of neglect, but you also have to realize that it barely existed in the first place. It pretty much died off after the '20s and '30s, and now it's just a museum thing. You can tell that because we all honor it culturally today. Everyone's quick to say that "blues is a great part of our native American culture" and things like that. It's inevitable, I suppose, since the way of life down south that produced all the music has largely changed—except in Mississippi, which is still the same sort of place it was back then.

What you won't find is blues that really *lives*. Frank Frost, who appears in *Crossroads*, is probably the only guy left who stays in this little town and doesn't give a shit. He makes ten dollars a night playing in Greenville, and that's fine as far as he's concerned. I don't think it's fine, and I'm sure he'd like to do better. But then, he's not on the folk circuit or the blues circuit or the showcase circuits guys like B.B. King got onto. He's a throwback, and while there may be a few more like him buried out there somewhere, there sure aren't too many.

Mix: How did you set about scoring *Crossroads*?

Cooder: For a start, you see a lot of music in the film, so I tried to write a score that was very impressionistic and abstract. The problem was keeping a balance. I didn't want to make it exclusively the blues on top of all the songs, or it would just be too much. So I aimed for something that's more a *reflection* of the blues. It's a tone or feeling, and not just melancholy, but kinda quiet. It's quite a simple score, like the music itself, and hopefully it's equally

effective for that.

Mix: You seem to be doing more soundtracks than anything else these days.

Cooder: Yeah. It's my job now. I take it as that because over the past three or four years, I've earned a living for the first time in my life, and I don't have to go crazy doing it or blow it all on hotels and planes.

Mix: It sounds as though you don't enjoy the road very much.

Cooder: The road was a total drag for me. I loved to play for everybody, but I just can't make a living at it. Perhaps I could if I had a big hit, but at the same time, why should I leave my family and take off across the face of the earth for months and months and be unhappy and tired all the time? I just don't see it.

Scoring movies is not only great fun, but far more interesting and stimulating for someone like me because I'm used to using music as a tool—taking the various elements and making something completely new out of them. Writing music for film is the perfect opportunity to do that, because you look at the visuals and just let your imagination soar. You can see what you're dealing with, like a puzzle, and I really like that. I like this a whole

lot better than playing for two hours and then throwing away the other 22—which is exactly what you do every damn day on the road. I miss that onstage thing, but man, it's *no way* to live!

Mix: Will you ever start performing again?

Cooder: I don't know. My regular rhythm section is scattered all around doing different things, and it just doesn't seem possible to perform too often. I love to jam, work with the cats, sing and play together. That's something that doesn't happen too often nowadays—people really *playing*, ensemble music. But I have a feeling public tastes are changin'. Perhaps we're emerging from that era of drum machines and electronic stuff and getting back to handmade music. People will always want to see *live* music, and it hasn't been around much lately.

Those big 20,000-seat gigs have to do with spectacle; people come looking for the same thing they've seen on TV. *Nothing* beats the sheer magic of a few live musicians working out together in a club or small hall, and most people *don't* see it. They end up staying home, watching TV and listening to some high-tech record untouched by human hands, and I think it's a

great shame.

Mix: What about your own recording plans?

Cooder: I'm thinking about going back into the studio to do another solo album, but I'm in no real hurry right now. I've got a few more film projects waiting in the wings. The great thing about Hollywood is that they make movies all the time, and with the emergence of the rock and roll soundtrack, it's suddenly big business. That's great for someone like me, 'cause someone's got to score these movies and it can't always be John Williams! ■

Lol Halsey's Surfaces

the Gradual Approach

by David Gans

There are several good reasons why it took Lol Halsey seven years to finish his DIY album, *Surfaces*, recently released on his own Neko label. For one thing, his day gig—road-managing other people's tours, including the Doobie Brothers, Lacy J. Dalton, and (currently) Huey Lewis & the News—keeps him away from his home studio

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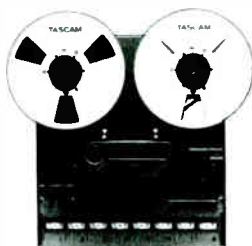
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Lol Halsey

PHOTO SU SUTTLE

upwards of nine months a year. "In '84, I was on the road for ten months," he says. "All the work I've done on the record was done between engagements with bands."

When he does get home to San Francisco, Halsey prefers to work at home with a shifting assortment of mixers, tape decks and peripherals. It's therapeutic in a way that recording in a studio can't be. "I can't be so creative paying 50 bucks an hour in a studio," he asserts. The fun of recording lies in the experimentation of working on his own, as artist, producer and engineer. "I like to find things out for myself. I get a great feeling of accomplishment. It takes a lot longer, and you get stuck more often, but when you finally get it together, it feels really great."

The expatriated Englishman came to America ten years ago "just to look around" and ended up staying put, first in Santa Cruz and now in San Francisco. His musical training started with "enforced piano lessons" at age seven. "I was never really that fond of the piano at the time, because I don't think I ever had a teacher who inspired me to enjoy the instrument. Too many scales and exercises. I took up guitar, and that led to synthesizers. That's the thing that kept me interested in music—the synthesizer gave me the ability to write different, more orchestrated music."

He has played in bands off and on over the years, but not professionally—"therapy bands, I call them. There was a band in Santa Cruz called The Overdose that used to play once a week but never performed live."

That's okay with him. Halsey's preferences run more to private exploration. "I never wanted to play other people's stuff, and I find it hard to play with other people. Where I feel most

at home is muckin' around in my studio, which is how this album came about. All this music came from having the time to mess around and learn what did and didn't work."

Surfaces is a collection of instrumentals, freely involving elements of jazz, rock, classical and new-age synth textures. Halsey started on a TEAC A-3340 4-track lo these many years ago, then graduated to eight and then 16 tracks. Halsey sees *Surfaces* as "an 8-track album that was sort of tarted up a bit with the 16. The tracks were written and recorded with the strengths and limitations of 8-track. I learned a lot that way; all those people who record their first album on 64 tracks don't necessarily learn as much studio creativity as if they'd struggled with the machines."

"The hardest part was going to the 16-track while I still had an 8-track board," he notes. "I had to go through a patch bay to monitor what was on the tape. I made a couple of mistakes that way," including "saying bye-bye" to his drum track on one piece. He now has a Sound Workshop Series 30 that allows him to monitor all 16 tracks at once.

The emphasis is on trial-and-error rather than technique. "It's more important for people to think I'm original than for someone to say I'm a gifted musician. I really wanted to do this all myself."

Essential to this experimental ethic is Halsey's willingness to throw things away. "I'm not the first person to say this: if it doesn't work, scrap it. I'm not afraid to change my mind about something. What you end up with may be a lot better than what you thought you were going to get in the first place."

Nor is he convinced that more is better in the hardware department. Recording at home, he says, "it's very hard to feel technically satisfied, even though you're not comparing your stuff musically with what's on the market. I didn't want to put something out where everyone would say, 'He's got some good ideas, but it sounds pretty bad,' y'know. This is not to say it's not great to work on better gear, but if you've got the ideas, they're going to come out. You can make it work on a lot of different stuff."

"When I listened to my 16-track mixes, I realized I hadn't added much because I had devised arrangements that worked within those limitations; I did the drums either mono or stereo, for example. All I did with the 16-track was add five tracks of tambourine... I decided I'd either put it out like it was—mixed nicely—or do it over again."

Two songs on *Surfaces*, "Machu Picchu" and "Amphetamine Dobros," have parts that survived from those

first sessions seven years ago. "Dobros" began with a Sideman, "the solid-state drum machine that came with Wurlitzer organs. I put down the bass drum for a slow blues, and I added a rhythm guitar part and two slide guitars. I can't remember whether it was an accident or whether I did it deliberately, but I played it back at the fast speed and I decided to go with the two sped-up dobro guitars. The piece sat as four tracks for a while, through a couple of tours," he laughs.

When he got an 8-track, he added more instruments at the normal speed. "I bounced the four tracks straight over to the 8-track, and then I did exactly the same thing when I got the 16-track."

One thing Halsey didn't do was mix to two tracks and bounce back to the multi-track. "I was frightened of committing to a mix I didn't like; a lot of the process was to do bits, chuck 'em, bring another bit in, chuck it—'Ah, that sounds good. I'll keep that'—That would give me a bit more direction."

Cutting tape is a major part of the fun for Halsey. "Editing used to be used to disguise things, but I like the idea of using edits spectacularly—to change the feel completely, change the instrumentation and arrangements. I like things that flow, that move from one thing to another without breaks—

clever things. On 'Moving Parts,' I created five or six 2- or 3-minute passages of basic drum beat on a cheap Roland drum machine and then started to add to them. I decided it was going to be in different sections, and then I recorded them all separately with the idea that I would then splice them all back together.

"There are probably 30 edits in the piece. It went from being 20 minutes long to being five minutes long. I had five sections, and I've got 50 cassettes in my house with every single possible permutation of the order in which these parts could fit together. And they *all* worked! That was the most frustrating, ironic thing. It ended up being completely different, for a variety of reasons. I loved the abruptness, but it didn't quite work. I needed to be able to create some parts that went through the transitions, so I had to commit myself to an order so I could splice the multi-track."

Accidents will happen. "I destroyed half the piece by rearranging it too many times (literally cutting apart the master while experimenting with different sequences). I listened to it after making maybe six cuts on the tape, and I'd put one bit of tape in backwards—which sounded awful—and somehow I'd also lost a second of music. You can lose a bar, but a sec-

ond isn't a musical amount of time. There can be confusion over which head you're monitoring from... and also, some of these bits of tape are only two inches long. All I could do was put it back the way it was, because I'd blown it."

Turning disaster into opportunity is just another part of the adventure. "That's always been in my mind: how can I make the accidents work for me?"

Not all Halsey's bold creative strokes came from errors, however. For the introduction to "Amphetamine Dobros," Halsey made a 2-track dub of the drum track from a passage in the middle of the song and then spliced it onto the beginning of the piece. "There's also a breakdown in the middle of the song that didn't exist. Instead of muting everything, I actually made a cut in the tape, found some drums and spliced them in... I did that in quite a few places, taking bits from here and sticking them in there—*improvising with tape.*"

Halsey resisted the temptation to trot his famous friends out just so he could plaster their names across the album cover. *Surfaces* does feature guest performances by woodwind/keyboard wizard Cornelius Bumpus, ex-Humans Sterling Storm and Jimmy Norris, and a handful of others, but their partici-

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pation, says Halsey, was more spontaneous than calculated. "People would drop in, and I'd have an idea—'I want you to play this thing'... If I could have done it all myself, I probably would have.

"Cornelius did each of his sax parts in one take, with no more than one listen to anything. I knew his time was valuable... On 'Jakarta,' I had him play to a very rudimentary track, totally improvised, and I laid pieces of it in afterwards.

"Sterling Storm came over with the basic parts of 'March of the Clouds.' I found a drumbeat, we laid down his rhythm guitars, I put down a synthesizer, and he put down a lead line. The musical essence of it came from him, and then we started working on it together. I couldn't tell you now what part I did and what part he did—it was as collaborative as you can get."

There are two versions of "March of the Clouds" on *Surfaces*. "That song sat for awhile on 8-track, more like you hear it on the hard side, with drums. We mixed lots of different versions of it, heading in different directions, and then Sterling muted all the rhythm instruments, like a reverse dub effect. In dub, you get rid of all the melody instruments and leave the

rhythm. The two versions are exactly the same music, but the soft side just has the synth voices: water drops, clouds, wind, human voices, and the melody. It's exactly the same piece as the other side, but the mix is radically different—a 'cerebral' dub... an *anti*-dub. It sounded so haunting, so pretty.

"I like the idea of combining very electronic tones with acoustic, natural and real sounds. I like to include bits of real life—sound effects, for want of a better word. There are bits of location tapes that I recorded myself, and one bit I stole from a sound-effects record—that car on 'Driving Lesson.'

"I had to wild-sync it. I had these car horns on a record, and I wanted to sync them into the cut so they were on the beat. It took me days... I did things like speed up the tape so the car horns were in tune with the track. Took me forever."

One of Halsey's favorite found-sound pieces is the snoring koala that gave "Koala's Dream" its name. "I was running around this bird sanctuary near Brisbane, Australia, with a shotgun mic and a tape recorder. All of a sudden I hear this sound, and there's this dinky little koala snuggled up in a tree, snoring. I *had* to use it. That's the reason that piece is called 'Koala's

Dream' as opposed to the other 25 working titles it had."

Surfaces' two sides are dubbed "hard surface" and "soft surface." "As it evolved and I found out what I was writing, there was such a variety of material that I decided to separate them instead of chopping around between the moods.

"The soft side evolved before the hard side did. I had pieces that flowed from one to the other, that seemed to have a similarity. The segues don't exist on the multi-track masters. I had to dub premixed, faded intros and endings onto half-track and then splice them onto the back end of two tracks on the multi-track—then splice that back into the half-track when I mixed it down again."

Surfaces was nominated for a Bay Area Music Award in the debut album category, which was all the encouragement Halsey needed to continue his explorations. Noting that he completed "Outback" in only a few hours near the end of the project, he quips, "At this rate, the next record might only take me four or five years."

[*Surfaces* is available by mail from Neko Records, P.O. Box 880933, San Francisco, CA 94188; \$9.50 postpaid.]



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World Radio History

Rick Derringer: Guitar Hero Turned Producer

by Bill Milkowski

The door of the spacious Manhattan apartment swung open and there stood Rick Derringer in a floor-length striped nightshirt and fuzzy tiger slippers, Christmas presents from his wife, Liz, the gadabout rock columnist and cable TV interviewer. My gaze went right to the slippers and Rick grinned sheepishly, "I'd better not let Hulk Hogan catch me in these."

Derringer has been hanging out with lots of wrestlers lately, guys with big ugly scars and bulging, megaton biceps. They don't take kindly to any man wearing fuzzy tiger slippers, least of all the producer of their collective album, *The Wrestlers*. Bad for the image.

Derringer produced six of the ten cuts and played most of the guitar and bass on that novelty LP. He appears in the video of "Land of a Thousand Dances," the classic rocker written by Fats Domino, popularized in the early '60s by Cannibal & the Headhunters and updated here with the help of such celebrated World Wrestling Federation grapplers as Junk Yard Dog, Bobby Heenan, Rowdy Roddy Piper and the legendary Fred Blassie. A second single and video were released recently ("Real American," co-written by Derringer and partner Bernard Kenny), and plans are already in the works for a follow-up album, *The Wrestlers II*.

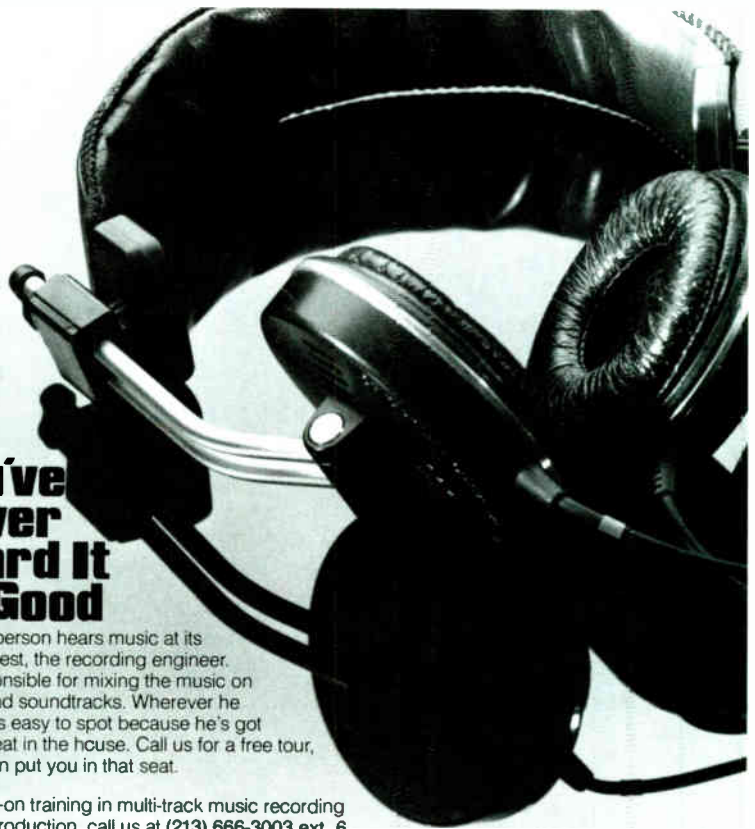
But that ain't all. Derringer has also been aligning his talents with the likes of Cyndi Lauper, Kansas, Don Johnson of *Miami Vice*, and Cap'n Crunch of Quaker Oats.

Cap'n Crunch?

Well, it seems Derringer is producing an album by a group of kids called the Crunch Bunch as part of a campaign to hype the sugary cereal. Quaker is underwriting the costs of the album and video to tie in with the Crunch Bunch's Saturday morning TV show. It's the single biggest recording budget Derringer has ever had to work with.

"*The Wrestlers* was an analog recording," Derringer notes. "I took the analog stereo masters and transferred them to a digital format. For a lot of projects nowadays, it's useful for budget reasons to record analog and mix digital. If I could afford it, I'd go digital all the way, and for this Crunch Bunch project we could afford it. The whole thing is digital."

Derringer insists, however, that technology is less important than other factors in recording. Take, for exam-



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ple, the impressive debut of singer-songwriter Mason Ruffner. Derringer played some guitar and bass on the self-titled CBS release, and he says the record is "my favorite of all the things I've done in the last ten years."

The site for the recording of *Mason Ruffner* was an especially significant choice. "This was an interesting new artist with his own band. The guy is from Fort Worth, Texas, and he's lived the last eight years in New Orleans. He never traveled to play anywhere outside Louisiana. We thought it might change his music if we took him to New York or Hollywood. Sometimes people don't even know they're doing it, but take 'em to New York and all of a sudden they're trying to play like they're from New York.

"I didn't think that would be the best thing for Mason and his band, so we decided to record them in an environment where they wouldn't have to change, where we could capture just what they've got. We took Mason to Studio in the Country in Bogalusa, about 50 minutes outside New Orleans in a nice setting where you're not bothered by any big city kind of stuff. It turned out to be a great move, because the music sounds like it's supposed to sound."

Studio in the Country is a state-of-the-art facility that Derringer believes is on a par with the very best studios in the country. It's highly regarded among the heavyweights—Stevie Wonder did some of his *Secret Life of Plants* there; Kansas recorded "Dust in the Wind" there. Derringer seems to appreciate the ambiance of the place as much as its tech, if not more.

"It has a Studer [deck] and a Harrison board, which is a good setup, but

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that doesn't matter much to me... when you get down to it, music is made by musicians and not by tape machines. I really feel that the environment controls the music more than the machines do."

A case in point: "I used to wonder how the Eagles got such a good blend on their background vocals. One day when I was working with Bill Szymczyk, who recorded them, I asked him about it. He said, 'They'd come in, have a little booze, maybe smoke a joint, have some food or somethin', and hang out for a while. Then they'd start feelin' pretty good and they'd want to do that background part.

"They'd walk into the studio, I'd put up one microphone, they'd get around it, and... they'd sing.'

"I said, 'Ah, I get it. It's just *them!*'

"It's true. When you feel good and the music feels right, it's going to sound right. And the technology is there to

Derringer's classic single, "Hang On Sloop" was recorded on what today might be considered the equivalent of a portastudio...

record it. Music is 99 percent something other than the recording process, and I feel like a lot of times we put too much importance on the technological part of it."

This, from a guy who grew up along with recording technology. In earlier days, with his band The McCoys, Derringer considered 4-track recording a luxury. His classic single, "Hang On Sloop" (which was recently recognized by the Ohio State Legislature as the official rock song of the state of Ohio) was recorded on what today might be considered the equivalent of a portastudio. "We did the basic on a couple of tracks and then bounced that into one track, leaving three, then filled up the rest with harmony vocals and guitar parts. It was primitive by today's digital standards, but if the engineers were good enough, you could make records like *Sgt. Pepper*."

Derringer recently added "designer" to his credits. Two years ago he drew up the plans for a custom guitar that the B.C. Rich company eventually marketed as the Stealth guitar. It sold rather well, prompting Derringer and B.C. Rich to go to work on another model.

"In the process of doing the Stealth, I found that there were some things



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that still weren't exactly perfect—a couple of balance things, and positioning of toggle switches and knobs that I thought I could make a little better. So on the new one, I moved the tone controls in subtle ways, and I went from 24 frets to 22. Having 24 frets makes you want to play higher and I've found that I like the meatier register of the guitar better. I want a guitar that makes me play lower, which is the intent of the Derringer model."

The striking new B.C. Rich guitar has beveled edges and is hand-painted in bright day-glo colors like pink and black. This custom-made axe sells for \$1500, which Derringer feels is a good price for a handmade instrument.

"B.C. Rich guitars are good because although it's an assembly-line process, the guitars are strictly handmade. There are guys who take a big piece of wood and start carving a guitar out of it. No big machine does it—a guy does it with a knife or a chisel, like whittling.

"Once that process is done, another guy sands it, then a guy does the fingerboard, then it goes to an electronics specialist, then to a guy who sets it up and puts on the bridge, and so forth. The buyer can get anything he or she wants—exotic woods or air-brushing, or special orders—and pretty fast, too.

"Getting a handmade guitar usually means going to a small shop where they turn out maybe one or two a month. Because of that they have to charge a lot of money for each one. But B.C. Rich is set up to turn out several handmade guitars quickly, which brings the price down."

Derringer's last album under his own name was released more than two years ago (*Good Dirty Fun*, with the single "I Play Guitar"), but he's got plenty of material ready for another outing. "Bernard Kenny and I have about 30 or 40 songs stockpiled, and I think we're going to get to some of them this year with a record and a tour. I just haven't done much of that lately because I've been so busy on the other side of the glass."

And with the prospects of a new Kansas album, the Don Johnson album and a second Wrestling album, it looks as though Rick Derringer may indeed be spending a lot of time on the other side of the glass this year. Ohio's favorite rock and roll son has come a long way since "Hang On Sloopy." Who knows? Maybe if "Real American" catches on, it could become a contender in a New National Anthem Hunt along with "Born in the USA," James Brown's "Living in America," and the other patriotic pop items released in the past year or so.

Cast your vote. ■

—FROM PAGE 76, KERSHENBAUM

Chicago, where he became a copywriter for an ad agency. There, his talent for music quickly led him into jingles, which in turn re-sparked his personal musical ambitions.

In 1971, he decided to leave advertising and dedicate himself to production. He knocked on doors in L.A., tapes in hand, until finally both RCA and CBS made him offers. On the day by which he had to make his choice, L.A. experienced a serious earthquake. After the shocks subsided, Kershbaum called CBS, but the earthquake had prevented his contact there from getting to the office. "That made my decision real easy," remembers Kershbaum, who then went with a staff position at RCA.

His first signing and production was B.W. Stevenson in 1971. Kershbaum produced both of Stevenson's records, the second of which spawned the hits "My Maria" and "Shambala."

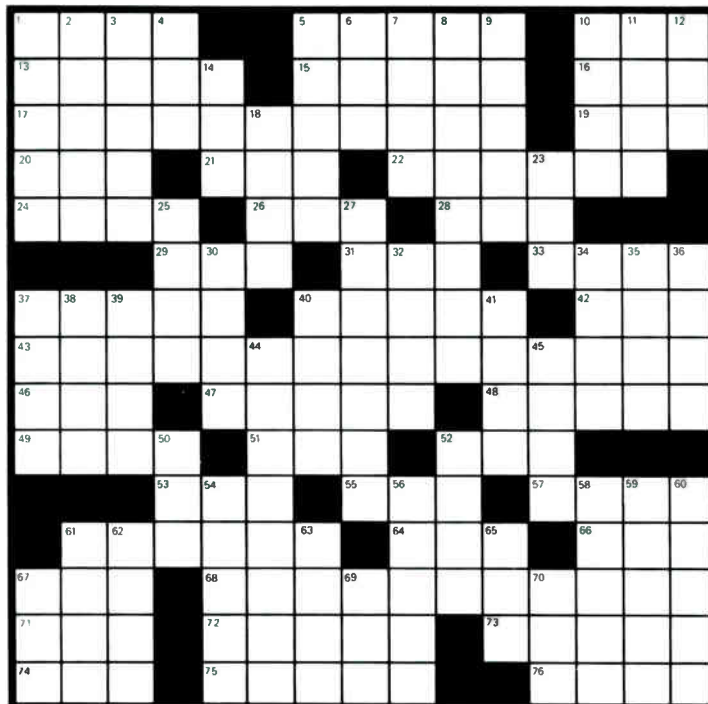
He moved over to A&M in the mid-'70s after Jerry Moss gave him the shot at producing Joan Baez' *Diamonds and Rust*, which was quite successful. He co-produced a string of artists throughout the '70s, including Hoyt Axton and The Ozark Mountain Daredevils. But seeing an Elvis Costello show in England became a pivotal experience for Kershbaum. He took on the "new" music with a passion, starting with Jackson's *Look Sharp*, then *I'm The Man*. That led to his being behind the board on Duran Duran's first LP, *Rio*. He was back with Jackson for *Night & Day* and *Body & Soul*, and 1985 found him with Supertramp for their *Brother Where You Bound* LP. Kershbaum's most recent project is The Boomerangs (nee The Coconuts) on Atlantic.

MTO Music Library

Designed for the production music needs of advertising, radio, television, film and AV presentations, the Made To Order music library offers 12 albums of music to fit a variety of moods. Categories included in this initial release range from news and sports themes to dramatic themes, rock and techno-pop. Each album presents cuts of various lengths: five second tags, 30/60 second spots, and two minute long versions. For more information, contact MTO, 6255 Sunset Blvd., Suite 1126, Los Angeles, CA 90028.

MIX WORDS

- ACROSS**
- Minstrel's axe
 - Sty decoration
 - Non-polar device used in crossovers (abbr.)
 - Fr. river
 - Ethiopian city
 - Go quickly
 - Film craftsman
 - Djinn
 - Digital reverb mfg.
 - Numerical prefix
 - Film _____
 - WWI plane
 - Rainbow prefix
 - Type of bread
 - The Contadora countries belong to this
 - Business deg.
 - Judge
 - Appetizing jelly
 - Keeping up
 - S.A. country
 - Extra product of 68A, hopefully
 - "_____ House,"
 - CSN&Y song
 - Tie up
 - Cloudy prefix
 - Soprano saxophonist MacMurray
 - N.Y. opera
 - S.A. revolutionary
 - Something to improve with
 - Prophet-10 mfg.
 - Cicatrix
 - Music biz scandal
 - Adam _____
 - Collection of sayings
 - Poke
 - Occupation of writing functional and source music
 - Rio de _____
 - _____ Martenot
 - Side show
 - Turk official
 - "Get _____," Temp-itations and Rare Earth hit
 - Bonanza name



"PHANTOM OF THE FEATURE"

©1986 Armand E. St. Martin

- DOWN**
- Certain beans
 - Take away
 - Seed cover
 - Silkworm
 - Console necessity
 - Amin
 - Plenty
 - Type of recorder
 - Chapin
 - Computer _____
 - Directs
 - Roger Ramjet's proton energy pill
 - Outside prefix
 - Goddess of Discord
 - Comparative suffix
 - Murder
 - Collisions
 - Electric metal band
 - Invention inventor (mus.)
 - For short, for short
 - Perform in lots of cities
 - Fire saint
 - Since
 - Tangy
 - _____ Prairie League
 - British composer
 - Per
 - Movie composing visual aid (on paper)
 - 1966 Knickerbocker's hit
 - Doris
 - The President
 - Extend oneself
 - Girl's nickname
 - African town
 - Singer Murray and namesakes
 - Flies off the handle
 - Cut
 - "It's _____!"
 - Alan _____
 - Rocky hill
 - Biblical man
 - Club _____
 - Cheer

The Digital Power in Texas

48 Track Sony Digital Studio

Solid State Logic 6000E Console with Total Recall

Sony PCM 1610/DAE 1100 Digital Editor and Mastering System

Adams-Smith Synchronization of Audio/Video

Dual 24 Track Remote Truck

Digital Audio Rentals, Consulting and Engineering

Digital Services

Recording Studios

1001 River Oaks Bank Tower • 2001 Kirby Drive • Houston, Texas 77019

For more information, contact John Moran or Chris Smith at 713/664-5258 or 713/520-0201.

Circle #108 on Reader Service Card

World Radio History

—CONTINUED FROM PAGE 66, AFTERMIX
provide the stampers.

As far as quality is concerned, you don't lose any of the original quality because DMM cuts directly into the copper plate. So, because the sound grooves are cut directly into the copper mother, you get a direct transfer from the master tape, therefore you've got a more accurate and realistic transfer of sound.

Mix: How many stampers can be made from each copper master?

Chenoweth: We guarantee a minimum of 20 stampers per copper mother. It is possible to go considerably beyond 20, but that depends on a number of variables.

Mix: If one uses the conventional mastering process, how many stampers can be produced from each laquer master?

Chenoweth: That varies from plant to plant, depending on their adherence to quality factors. At the Wakefield Company, for example, we have a standard of five stampers per mother, and five mothers per metal master. We would probably pull 25 stampers total from a laquer through the normal process.

Mix: Is it accurate to say that the pressing part of the manufacturing process is the same for both DMM and conventional product?

Chenoweth: Yes. We give the same care and consideration to all pressings irrespective of whether they are conventional or DMM.

Mix: What, then, does the pressing part of the DMM license mean?

Chenoweth: We do the same thing as far as pressing is concerned, however, the standards that have been set by Teldec having to do with signal-to-noise ratio and other factors are very stringent, thereby eliminating some master tapes from even qualifying for DMM. The DMM cutting houses have to look at the quality of the master tape to be sure that it falls within the parameters of the technical requirements set forth by Teldec. It is very possible that we can go through the DMM process per se, and go ahead and press, but that the pressing cannot carry the DMM logo or sticker because the master tape doesn't meet the technical qualifications that are necessary for a DMM pressing. It's the only way that Teldec has of protecting the quality that is assured by the DMM logo.

Mix: Are there any plans that you know of for some sort of campaign to explain to consumers why they should

buy DMM stickered product?

Chenoweth: We have plans within the company, which hopefully will be approved by Teldec, whereby we can begin a campaign to make the buying public aware of the quality of DMM pressings. But anything that we do that carries the DMM logo and/or refers to DMM has to be approved by Teldec.

Mix: Are there any types of program material which, for technical reasons, such as the need for a wide, easy to track groove, might be inappropriate for the DMM process?

Chenoweth: No, I don't think so at all. It's simply a matter of the technical skill of the mastering engineer to recognize up front what kind of program material he's dealing with. If he does, he can master accordingly.

Mix: What DMM projects have been manufactured by Wakefield since the licensing agreement was signed?

Chenoweth: Angel DMM, which is Capitol/EMI, ECM and Blue Note.

Mix: What impact, if any, is this DMM licensing agreement likely to have on Wakefield's non-DMM clients?

Chenoweth: I don't think any. Most of the clients of the Wakefield Company who have pressed with us for a number of years in the conventional way will continue to do that. They have the option of going to DMM, but that's strictly an option. I don't think our additional capability of providing DMM will influence our existing customer base one way or the other. It's just an added advantage.

Digital Audio Disc Corporation has announced plans to increase CD production capacity at its facility in Terre Haute, Indiana, by 200 percent over the next two years. The announcement, which coincided with the commemoration of the facility's ten millionth CD, projected a doubling of capacity to two million disks per month by the end of 1986. Output of twice that number is targeted for late 1987. President Norio Ohga of Sony Corporation, parent company of Digital Audio Disc, noted that "The Terre Haute facility is one of the fastest growing arms of the worldwide Sony family. The expansion of Terre Haute combined with Japanese production will make us the largest volume producer of CDs."

Electro Sound, Sunnysvale, California, recently unveiled a new, totally redesigned tape duplicating system with a 480/240 ips master and three speed digitally adjusted slave units. The slaves' microprocessors, featuring

permanent memory storage of all operating parameters, allow rapid format changeover with assured accuracy to duplicators dealing with varying speeds and tape stocks. In introducing the new system, known as the Electro Sound 4800, company president Bob Barone stated: "We are all well aware of the impact of the CD and its technology, but we are also convinced of the short and long term viability of the audio cassette or we would not have invested the considerable research and development monies this type of redesign requires."

Electro Sound Group has also announced the addition of video duplication services to its capabilities. An initial capacity of two million units per year is projected at ESG's Long Island Plant, with similar installations following at other facilities across the country.

Ampex Corporation's Magnetic Tape Division has introduced two new longer lengths of 615/616 audio cassette duplication pancakes. The 11-inch diameter C60 pancake, at 10,100 feet, offers 15 percent more tape than the standard length, while the 11¼-inch C90 pancake offers 23 percent more. The new lengths, allowing an average of five more programs per pancake, are targeted for high volume duplicators.

Media Home Entertainment of Culver City, California, is expanding its video duplicating, packaging and warehousing facilities to accommodate outside clients at its previously all in-house plant. A new division, Media Video Services, has been created to administer the expanded operation. The plant currently features 1000 stereo hi-fi duplication machines in both VHS and Beta, with plans to double that number by 1987. Media also expects to introduce 8mm duplicators as 8mm software needs increase in the marketplace.

Studer Revox America has announced the sale of 200 Revox B215 audio cassette decks to Resolution Video, Audio and Film of Burlington VT for real time cassette duplication. Resolution is expected to take delivery of another 200 decks within the year. . . . Accurate Sound Corporation recently completed installation of two AS200-A high speed reel-to-reel duplicator systems at the Voice of America facilities in Washington, D.C. The new installation, utilizing ASC's fiber optic control system, has quadrupled V.O.A.'s production capacity. . . . The Cutting Edge of Ferndale, NY announced recent 45 projects for the Nigel, Marcopaulo and Rain Records labels, as well as EPs for the Traveller label. ■

Task:

Copy a few
cassettes today,
a thousand
tomorrow and
ten thousand
next week. *BK*



Problem:

Find a one-stop source for tape duplicating equipment that accomplishes the small tasks and the big ones—profitably.

Solution:

Telex—unquestionably the company with the widest, most versatile line of tape duplicating products in the industry.

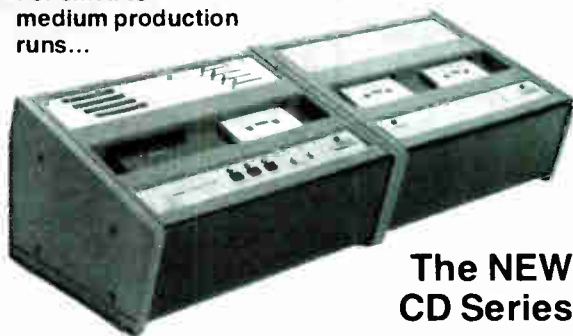
Telex has a duplicator that fits your needs—today, tomorrow and next week.

Whether it's a new suit for yourself or electronics for your business, it makes sense to shop where you have the widest selection. And, if your purchase is as crucial to the profit line as a high speed tape duplicator, you shouldn't settle for a model that **almost** fits your needs.

Telex has models that copy as few as one cassette at a time or as many as twenty-three. Telex models are available in mono or stereo and also offer a wide variety of copying configurations such as cassette to cassette, reel to cassette, cassette to reel or reel to reel. For small to medium run cassette duplication, choose one of the new Telex CD Series, but if you need open reel capability plus larger cassette production, one of the Model 6120 configurations is probably best for you. At Telex, you can find the right duplicator at the right price, and you'll find it faster. For more information and detailed specifications, write to Telex Communications, Inc., 9600 Aldrich Ave. So., Minneapolis, Minnesota 55420, Telephone: 612-887-5550.

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medium production
runs...



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CD Series

TELEX®



The Model
6120—for
medium to
large produc-
tion runs

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At the 1986 NAB show in Dallas, The Droid Works unveiled the latest versions of Sound-Droid™ (shown here) and Edit-Droid™. Both now utilize a modular building-block design approach, which simplifies future system expansion.

Film Inc./PMI for finally giving the global village textbook rhetoric some lights, camera and action. Roll over, Marshall McLuhan.

Production Notes:

Director Francis Delia's mu-vid production company announces a major expansion. The Wolfe Company (Hollywood, CA) is representing two more directors: documentary filmmaker Jean-Pierre Dutilleaux, and mu-vid director Yuri Sivolop, whose credits include clips by Modern English and Ian Cussick.

Delia has also named a chief executive officer to his four-year-old company: Louis Rapage is former VP of marketing and production at Exit/A&M, and has also worked in music video programming at Aan Landsburg Productions. Emily Cherniss, previously with the Playboy Channel's Ancillary Marketing Division, will be director of operations under Rapage. . . Positive Video of Orinda, CA has hired computer graphics artist Clare Doyle as Paintbox artist and graphic designer. Doyle comes from One Pass Film & Video, where she operated the Dubner CBG-2. . . GRP Records has jumped into the mu-vid arena with "GRP Live in Session." The long-form program features highlights of the GRP "JVC Jazz Festival '85" tour with Dave Grusin, Lee Ritenour, Diane Schurr on vocals, flutist Dave Valentine and Brazilian composer Ivan Lins, among others. . .

Video Brochures?

The Video Brokers, a Sausalito, California-based firm, has introduced the Video Brochure System™, a new marketing tool for the video music and recording industry. VBS consists of a four-color outer sleeve slipped over a molded styrofoam container with room inside for promotional materials or lyrics, and a custom-fitted inner tray holding a business card and videotape (VHS, Beta, 8mm, or 3/4-inch formats). The video cassette is identified by two-color labels and is protected by a four-color dust jacket. According to Video Brokers principal Michael Biel, complete packages are available for about \$10 per unit, including four-color outer sleeve and dust jacket (printed from the client's artwork), styrofoam container, tape labels and tape stock with duplication. ■

Ampex and Sony Offer Mutual Support in Digital and Beta Formats

Ampex's new 4Fsc composite digital video signal system got a big boost April 3 in New York when Sony announced that the company will support the format with plans to produce their own composite digital recording equipment.

The 4Fsc format (four times frequency of the subcarrier) is a 19mm composite digital videotape recorder designed as an alternative to the component SMPTE-EBU D-1 format. Ampex's Dave Detmers stresses that the company's commitment to D-1 is as strong as ever. "We're submitting it as a second standard," says Detmers. "The fact is that for certain markets, people want the benefits of digital technology, but can't afford to convert to a whole component system from the ground up. They figure that if they can buy one digital videotape recorder without having to get the digital switcher and everything else, they can afford it. It's just not practical, in some cases, to go component.

"Sony has also acknowledged this need in the marketplace, and they will build the same composite digital format," Detmers explains.

Ampex says that the composite format also delivers three times the play time of D-1 systems which use the same cassettes. Ampex demonstrated its first composite digital tape recorder in 1979. According to Detmers, talks with Sony have been going on for a decade, and Ampex is very pleased that an agreement has finally been reached.

But there've been more than digital discussions in the board rooms: Ampex has entered the small format mar-

ket by throwing their commitment to the Betacam and Betacam SP formats . . . so now on the battleground of EFP and ENG production, strewn with dead formats, Betacam celebrates a victory. Producers, take note that the new SP format yields 90 minutes of record time per cassette instead of 20.

One more development at Redwood California headquarters for Ampex: the company has just purchased 20 percent of Berkeley, California-based Cubicomp, creators of the Cubicomp solid modeling computer graphics system.

Jack Calmes: Big Man on Campus

Mix readers know Jack Calmes as one of the founders of the very successful Dallas-based concert production company, Showco. (Calmes left Showco in 1979.) His newest project represents one of the most innovative uses of communications technology in education. As president of The College Satellite Network, Calmes has organized a membership of more than 200 major universities and colleges nationwide, whose students are able to see and talk back-and-forth with specialists through a two-way satellite link. The goal is to assemble a panel of experts to cover a particular topic so students can interact with them. Whether the subject is Academy Award-winning films with directors such as Lawrence Kasdan and Peter Bogdanovich, or congressmen discussing U.S. foreign policy, students can literally use the world as their textbook. . . and their concert hall. Live music from cities such as London, New York, Sydney, and Los Angeles is scheduled to follow each panel.

Congratulations to Calmes and to



Funny, It Doesn't Look Like A Mixing Console.

Or a synchronizer. Or even a splicing block. But the new CASS 1 Computer-Aided Sound System lets you edit and mix like never before.

With a powerful computer that provides you with both audio console fader automation and computer-assisted audio editing for film and tape. All in one system.

CASS 1 lets you breeze through mixing and editing with innovative new features like up to 32 automated faders and 4-band parametric equalizer modules.

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with SMPTE time code, which automatically remembers all editing information.

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For more information on CASS 1, call us at 800/932-3400 (outside California), 800/982-3400 (in Califor-

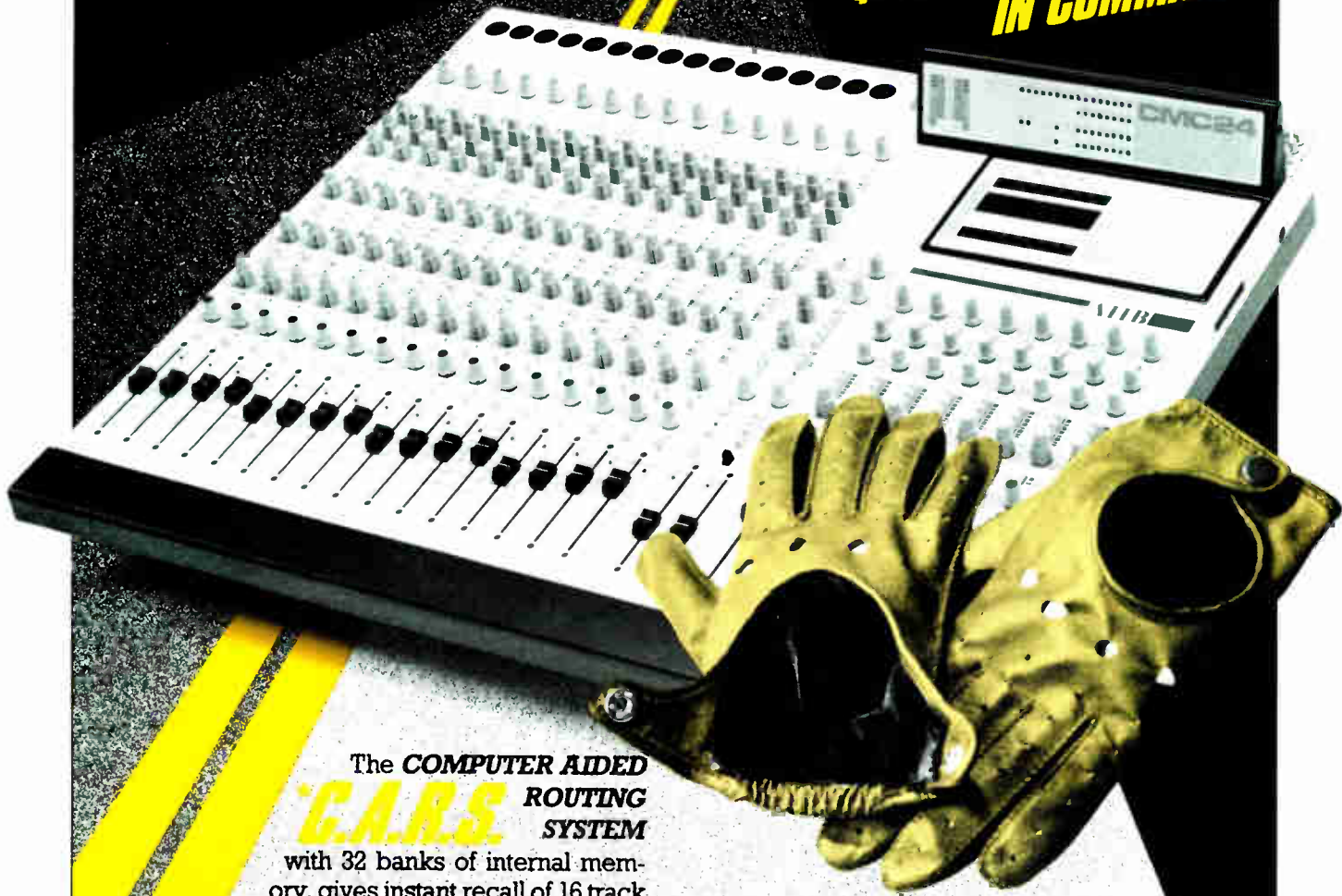
nia) or 408/988-2000 (outside U.S.). CMX Corporation, 2230 Martin Ave., Santa Clara, CA 95050. TLX: 910 338 2175.

CASS 1 Computer-Aided Sound System. It doesn't look like a mixing console because it's so much more.



CMC 24* MK II FEEL THE POWER!

\$7200 PUTS YOU** IN COMMAND



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with 32 banks of internal memory, gives instant recall of 16 track bus assignment and muting information (24 input channels and 16 monitor/input channels) through the onboard microprocessor.

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In addition, with optional Computer Interface/Sequencers, the CMC-24 may be controlled by an external source such as Keyboard, Drum Computer or Tape Track. Anyway enough talk, we believe the Excitement is in the Driving. . . We know you're ready!

For More detailed information on how the new CMC Series can bring your Mixing Capabilities into the Computer Age, contact your local authorized AHB dealer today.

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1986 DIRECTORY

REMOTE RECORDING and SOUND REINFORCEMENT



<input type="checkbox"/>	CONTENTS	<input type="checkbox"/>
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164	NORTH CENTRAL STATES	
174	NORTHEAST STATES	
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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. Basic listings (name, address, contact) are provided free of charge. Extended listings (equipment, credits, specialization), and photographs or company logos may be included at a nominal charge. If you would like to be listed in a *Mix* Directory, write or call Lauri Newman, *Mix* Directories, 2608 Ninth Street, Berkeley, CA 94710, (415) 843-7901.

Upcoming Directory Deadlines:

Southern California Studios: **June 3, 1986**

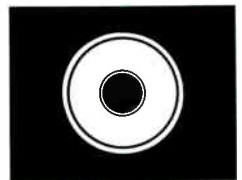
North Central/Canadian Studios: **July 2, 1986**

New Products Directory: **August 1, 1986**

Mastering, Pressing and Tape Duplication: **September 3, 1986**



REMOTE RECORDING and SOUND REINFORCEMENT



The following companies offer a variety of services in the field of sound reinforcement and remote recording. All of the information in this Remote Recording and Sound Reinforcement Directory is based on questionnaires mailed in January 1986. People, equipment and locations may change, so please verify critical information with the companies directly.



Mix does not take responsibility for the accuracy of the information supplied to us by the firms listed. We encourage all remote recording operations (audio, video, or both) and sound reinforcement companies to contact us here at *Mix*, so as to be included in our next listings.

L I S T I N G S

NORTHWEST

ACE TUNEL SOUND

Sound Reinf., Rentals
P.O. Box 11641, Portland, OR 97211
(503) 287-5366
Contact: Zack Zaccaria, Tony Zaccaria

AFFILIATED BROADCASTING, KRAK RADIO

Audio Recording
3336 El Camino Ave., Sacramento, CA 95821
(916) 482-7100
Contact: Jay Lemmons

AIRTEK/INTERMOUNTAIN LIGHT & AUDIO

Sound Reinf., Lights, Audio & Video Recording
502 N. 20th St., Billings, MT 59101
(406) 252-7733
Contact: Mark Peterson, Doug McShane

AKASHIC RECORDS/MOBILE MODULAR RECORDING SYSTEM

Rentals, Audio Recording
c/o AIC Pro Audio, 1717 Solano Way #31
Concord, CA 94520
(415) 686-6493
Contact: Ron Timmons
Equipment: Portable modular 24-track recording system: MCI JH-800 console, 8 inputs George Massenburg Labs transformerless preamps, API 24-track monitor section w/patch bay, 3M M-79 transformerless 24-track tape machine w/upgraded electronics. Mics: AKG, Neumann, Sennheiser, Shure, Sony, Synchron, Electro-Voice, Beyer; M49, C12, SM69, Telefunken 251 tube mics. Also: Drawmer tube limiters, RCA BA6A tube limiters, Drawmer noise gates, AMS RX16 digital reverb, Lexicon PCM70 digital processor, Yamaha NS-10M speakers, McIntosh 2100 power amp, Yamaha power headphone system, stands, cords, etc. Sony PCM-F1 digital processor with Meyer filter available.

ALASKA STAGECRAFT INC.

Sound Reinf., Lights, Staging, Audio Recording
1025 Orca St., Anchorage, AK 99501
(907) 276-5671
Contact: John M. Nelson

AMERICAN SYSTEMS INC.

Sound Reinf.
30982 Huntwood Ave. Ste. 204, Hayward, CA 94544
(415) 471-7451
Contact: R.T. Kehoe

AMERICAN CONCERT TOURS

Sound Reinf., Rentals
3618 Tahoma Place West, Tacoma, WA 98466
(206) 564-1361
Contact: Dick Summers, Dennis Livingston

APOGEE SOUND INC.

Sound Reinf.
1150 Industrial Ave. Ste. C, Petaluma, CA 94952
(707) 778-8887
Contact: Brian Glenn

APTOS AUDIO

Audio Recording
P.O. Box 1445, Aptos, CA 95001
(408) 684-1555
Contact: Kenneth Mabie

AQURIUS SOUND INC.

Sound Reinf., Audio Recording
347 Loma Vista, Pacifica, CA 94044
(415) 359-7210
Contact: Robert J. Ring

ARTICHOKE PRODUCTIONS

Audio & Video Recording
4114 Linden St., Oakland, CA 94608
(415) 655-1283
Contact: Paul Kalbach

ASSOCIATED SOUND

Sound Reinf., Rentals, Audio Recording
2120 P St., Sacramento, CA 95816
(916) 443-4773
Contact: Wally Clark

AUDIO ACTIVE SOUND SYSTEMS

Sound Reinf., Rentals
1031 Middlehoff Ln., Oroville, CA 95965
(916) 533-6152
Contact: Stan Bunstock, Hank Hampton
Service Available: Audio Active provides services for a variety of applications from 70 7 volt long run distribution systems to concert systems (tri-amped 24 ch. house, 16 x 6 monitors mixes) featuring JBL, E V, Yamaha, Studiomaster, Sennheiser, Shure, Beyer, dbx, etc. Systems for rodeos, industrial dem., ag judging and auctions, theater, races and stage equipment rentals. Credits include Chico Blues Society, Bellamy Bros., Sawyer Brown, John Anderson, Eddie & the Tide, Sonny Rhodes & the Texas Twisters, Johnny Lee, Mat Labs, David Frizzel, Steel Breeze, Mel McDaniel, Game Theory, Lassen Co. Fair, Butte Co. Fair, Plumas Co. Fair, Silver Dollar Fair, Tigar Bell, Tern Gibbs, Reba McIntyre, to name a few.

AUDIO HAWAII

Sound Reinf., Rentals, Audio Recording
96-1173 Waihona St. #B-4, Pearl City, HI 96782
(808) 455-5875
Contact: Jim Fern

AUDIO SYSTEM RENTALS

Sound Reinf., Rentals, Video Recording
21169 W. River Rd., Stevinson, CA 95374
(209) 576-8632, 632-7098
Contact: Donald Setaro, Ray Vierra

AUDIO VIDEO RESOURCES

Audio & Video Recording
60 Broadway, San Francisco, CA 94111
(415) 781-2603
Contact: Gary Duoss

AUDIO VISUAL ASSOCIATES

*Sound Reinf., Lights, Staging, Rentals,
Audio & Video Recording*
1515 Old Bayshore Hwy., Burlingame, CA 94010
(415) 692-1271
Contact: Ron Vierra

AUDIO VISUAL CENTER

*Sound Reinf., Lights, Staging, Rentals,
Audio & Video Recording*
484 Lighthouse Ave., Monterey, CA 93950
(408) 373-2125
Contact: Keith Tabb

AUDIO WEST

Sound Reinf., Lights, Rentals
2070 Monte Diablo Ave., Stockton, CA 95203
(209) 948-6623
Contact: Edward P. Elzel

AUDISSEY

Sound Reinf., Rentals, Audio Recording
1020 Auahi St., Bldg. #6, Honolulu, HI 96814
(808) 521-6791
Contact: Rick Parlee, Gerald Luke

TIM AYERS PRODUCTIONS

Audio & Video Recording
398 11th St. Ste. 303, San Francisco, CA 94103
(415) 864-5858
Contact: Tim Ayers

BACKSTREET AUDIO

Sound Reinf.
4304 N. Madison, Spokane, WA 99205
(509) 326-2827
Contact: Mike Canning

BACKSTREET RECORDING

Audio Recording
101 E. Broadway #312, Missoula, MT 59802
(406) 721-9789
Contact: Phil Hamilton

BANANAS AT LARGE

Rentals
802 4th St., San Rafael, CA 94901
(415) 457-7600
Contact: Tim Fntz

BAND AIDS

*Sound Reinf., Lights, Staging, Rentals,
Audio Recording*
3782 E. Austin, Fresno, CA 93726
(209) 227-1224
Contact: Bob Martin
Services Available: The Central Valley's only audio equipment rental service specializing in professional sound gear and complete technical support services. P.A./sound reinforcement systems available for touring, concerts, clubs, showcases, rehearsals. Remote/location sound mixing systems for media feeds (cable-video-broadcast-film). Complete mixing/editing (duplication) facilities for single and commercial production. Experienced live sound engineering/stage production teams available. Pre-, post-production services for record production demo/showcase, packages, artist development, promos. Custom sound equipment package designs, consultation, construction, maintenance. Daily or block rental rates available, 24/hr. service

BIG EAR RECORDING

Audio & Video Recording
801 McClay Rd., Novato, CA 94967
(415) 892-5911
Contact: Mel Martin

BLACK BOXES INC.

Sound Reinf., Audio & Video Recording
1570 Davidson, San Francisco, CA
(415) 695-9555
Contact: Mike Joseph

BUCKSHOT (Sound Division)

Sound Reinf., Lights
398 N. Laurel, Ashland, OR 97520
(503) 488-2034
Contact: Steve Read
Services Available: Superb club PA: all JBL 5-way speaker system w/lenses and horns, 16 x 4 x 2, 16 x 2, (4) 1/2 octaves. Exciter, PCM41, PCM42, PCM60. Power: SAE,

Soundcraftsman, Cerwin Vega, Crown (2800 watt). Lights: (14) Par 56, Rack power 8-channel, 4-scene controller. Equipment available subject to Buckshot band's schedule. Buckshot is an extremely versatile top quality act w/sound and lights available as a complete package for local or regional shows. Credits include: sound for Nicolette Larson, Tower of Power, Jesse Colin Young, Nu-Shooz. Sound plus warm-up for Elvin Bishop.

CARAWAY AUDIO

Sound Reinf., Rentals
1775 Old County Rd. #19, Belmont, CA 94002
(415) 594-1790
Contact: Doug or Steve Caraway

CASCADE SOUND

Sound Reinf., Lights, Staging, Rentals
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Contact: Larry Carroll

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(408) 438-2331
Contact: Rick Chaisse

CHERRY RECORDING

Audio Recording
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(503) 399-9775
Contact: Ron Skog

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Contact: John P. Yacura

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Sound Reinf., Lights, Staging, Rentals
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(303) 772-3933
Contact: Tom Beaman

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(916) 363-3230
Contact: Tom Lewis, Richard Schumen

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Contact: Joe Conti

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(707) 526-2297
Contact: Don Lind, Shery Gordon

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(916) 969-8785
Contact: Michael Nolasco

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(907) 789-3783
Contact: Rick Stitt

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Contact: Bill Borgh

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Contact: Eric Koch

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Contact: Darrel R. Medeiros

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Contact: Curt Hare

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(503) 942-5877
Contact: James Roger Nelson

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(206) 868-8980
Contact: Mark Crouter

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Contact: Frank Henderson

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Contact: Drew Canulette

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(206) 935-9683
Contact: Ed Dupras

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(801) 384-2304
Contact: Craig C. Garrett

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Contact: Dwight D. Oyer

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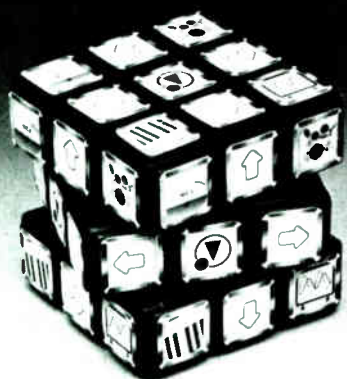
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Services Available: Complete packages for record production, video and radio broadcast taping, film and commercial production. Simultaneous record and broadcast packaging a specialty. Experienced three-man crew. Call for rates and brochure.

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Contact: Bernie Rivera

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Contact: Jim Bennett

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(503) 233-1710
Contact: George Schulze

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Contact: Glenn A. Maloy

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(808) 323-3315
Contact: Eric Jaeger

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(406) 248-5896
Contact: Bob Hale

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(415) 752-6389
Contact: Joe Begin, Vicky Hamile

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(206) 242-7308
Contact: Tom Wilson

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(209) 946-2582
Contact: Joshua Sacco

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(702) 882-8258
Contact: Chuck Harold

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(303) 669-1525
Contact: Brian Salyards

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(303) 337-0033
Contact: Jake Anthony

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(415) 486-1166
Contact: Helen Meyer

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(206) 771-7257
Contact: Charlie Morgan

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50 Freeport Blvd. Ste. 24, Sparks, NV 89431
(702) 331-5555
Contact: Walter H. Wellman

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Sound Reinf., Rentals, Audio Recording
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(209) 292-8438
Contact: Mark Seibert

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Contact: Ron

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(916) 894-5555
Contact: Clint Simic

NORTHERN SOUND & COMMUNICATION
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(406) 752-3100
Contact: C. John Hirschfelder

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Contact: Paul Buescher

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Contact: Ben Rothenberg

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Contact: Rob Folsom

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(916) 284-6929
Contact: Hank Alrich

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(408) 247-3327
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(206) 535-7268
Contact: Bob Holden



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(916) 483-2340

Contact: Kai Coffey Hibbard
Equipment: Otari MTR 90 24 track w/ Autolocator, MCI JH-110B-14 2 track, 3M M56 2-track, (4) TEAC cassette decks, custom Tangent 3216 console (24 x 24, w/ modified EQ and mic pre-amps, second solo bus, and 24 additional inputs); E V Sentry 500 monitors, JBL 4313s, M&K close field monitors, Auratone Yamaha and Crown power amps, UREI LA-4 limiters, Lexicon PCM60 digital reverb, passive and active direct boxes, digital delays, and gates. Other outboard gear available on request 24 ch 3-way isolated split w/ individual ground lifts, 16 ch 2-way isolated split, 250' main snake, 65' subsnakes, additional lengths available Mic complement includes Neumann, AKG, Sennheiser, Shure, E V Crown PZM, Beyer, Audio-Technica; plus stands, adapters, video monitors, and intercom system. Truck has custom designed control room: 18 x 7.6 x 7.6, air conditioning, lift gates, 440/220/110 V transformer isolated AC distribution system, and is pre-wired for additional 24-track machine

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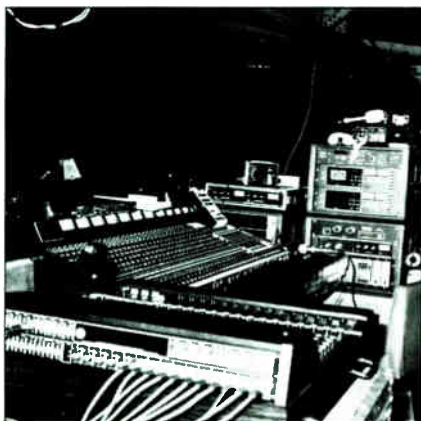
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Contact: Kevin R. Slover, Jeff Herzog

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(503) 686-9325
Contact: George Relles

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(808) 456-4827
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Contact: Rich Pires

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Contact: Norman B. Ross

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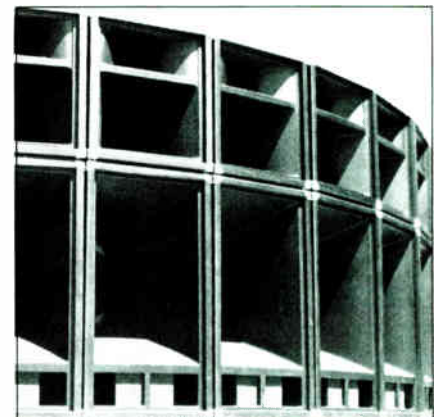
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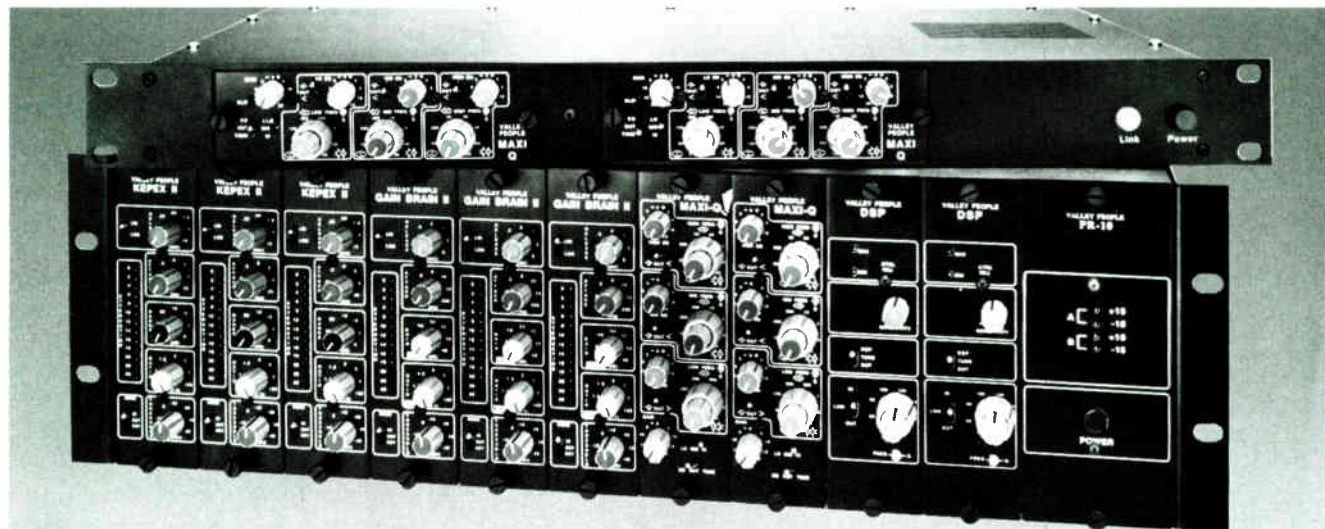
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MEDIACOM
Video Recording
 31320 Via Colinas Ste. 120

REMOTE RECORDING and SOUND REINFORCEMENT

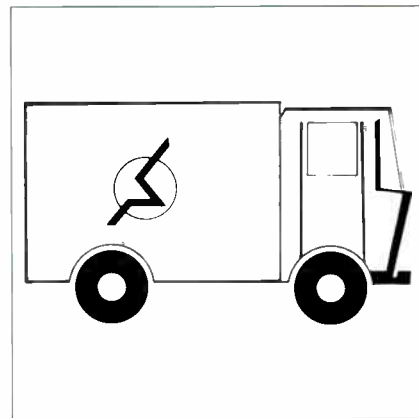


SO. CALIFORNIA

Westlake Village, CA 91362
 (818) 991-5452
 Contact: Felix Girard

MERCANTILE RECORDING
Audio Recording
 P.O. Box 2271, Palm Springs, CA 92263
 (619) 320-4848
 Contact: Kent Fox

METZGER AUDIO
Sound Reinf., Lights, Staging
 La Mirada, CA
 (714) 739-0882
 Contact: Tim Metzger



MOBILE TRACKING SYSTEMS
 Van Nuys, CA

MOBILE TRACKING SYSTEMS
Audio Recording
 P.O. Box 4474, Van Nuys, CA 91412
 (818) 997-8636
 Contact: Shelly Hillman
Equipment: Ford Econoline systems first designed by The Record Plant, later redesigned by Andre Lewis and Mobile Tracking Systems for lower cost recording. MTS is equipped with modified Tascam Model 15 board and 90 lb 1 inch 16 track recorder w/auto locator, Sony digital PCM F1 2 track Ana 4 track cassette and Tascam 122 and 50A cassette-decks Effects Roland SRV 2000 digital reverb, Yamaha digital reverb, Ellectron II, Akai Sampler w/disk drive, Roland SDE 2500 digital delay, Orband Parasound spring reverb, Tascam PE 40 parametric EQs (2) Roland Dimension D, Roland PV synth (2) dbx 160, Boss Micro Rack w/compressor/limiter (2) and digital delay Drum machines E mu SP 12, Roland 707 Roland Octapad Pad 8 LinnDrum Oberheim DMX Keyboards Roland JP 8 (MIDI'd), JX8P, Oberheim OB8, Casio CZ 5000 (w/sequencer) CZ 101 (2), 360 Systems MIDI Bass Computer, Panasonic Sr Partner w/Roland MPS software and librarian software for keyboards

Services Available: The Mobile Tracking Systems truck was redesigned with two purposes in mind incorporating the underlying theme "low-cost/high-tech" (its size allows easy access almost anywhere!) (1) Club gigs and/or rehearsal locations remote recordings at costs affordable to groups to capture your "live" sound (2) Fully equipped mobile control room w/full synthesized, MIDI'd, sequenced, direct sound recording for complete record productions from "demos" to "masters" Full production staff includes: producers, engineers, and musicians. We'll make your song into a record at affordable rates. Of course you can combine purposes 1 and 2 to suit your own needs.

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 (805) 544-8944
 Contact: Jack Lutz

MUSIC POWER RENTALS
Rentals
 4693 University Ave., San Diego, CA 92105
 (619) 282-4011
 Contact: Eric Denton

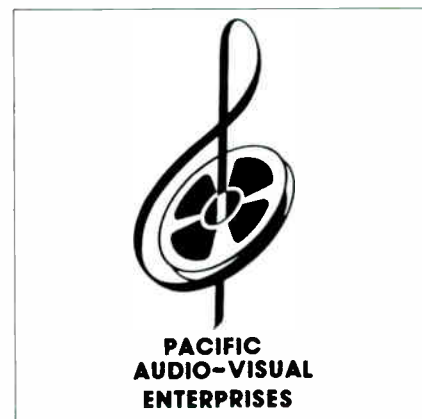
NOVA SOUND RESEARCH
Sound Reinf.
 2323 Corinth St., W. Los Angeles, CA 90064
 (213) 477-1621
 Contact: Ed Maloney

ODD E O ENGINEERING
Rentals, Audio Recording
 1740 N. Gramercy Pl. Ste. 101, Hollywood, CA 90028
 (213) 465-1762
 Contact: Jeff McLane

ONESTOP STUDIOS
Sound Reinf., Lights, Audio & Video Recording
 6952 Winnetka Ave., Canoga Park, CA 91306
 (818) 345-8765
 Contact: Cathy or Bob
Services Available: We provide audio, light and sound reinforcement for any remote occasion. We coordinate anything from guitar demos in our studio to larger on location projects. We also offer publishing, orchestrating, songwriting, musicians, deejays, photography, producers, engineers, consultants. We have an 8 track recording facility with access to 16 to 24 track studios and video taping. Credits include various projects with Bobby Sherman an album with Vern McKee, Blue Denim Records, Sunkist, American Minor, Bakerhood, Bud Teachout, Benton Ministries, and Midnight Star. Owner Bob Blank has over 25 years experience. We are a small company primarily serving the Christian music community.

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Audio Recording
 P.O. Box 4523, Santa Barbara, CA 93103
 (805) 965-6392
 Contact: Barbara Hirsch, Ilana Eden

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Audio Recording
 P.O. Box 91209, Long Beach, CA 90809
 (213) 434-5355
 Contact: Jonathan Marcus



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 ENTERPRISES**

PACIFIC AUDIO VISUAL ENTERPRISES
 Monrovia, CA

PACIFIC AUDIO VISUAL ENTERPRISES
Sound Reinf., Audio Recording
 545 Cloverleaf Way, Monrovia, CA 91016
 (818) 359-8012

Contact: Ron Streicher

Equipment: Location recording specializing in acoustical music events—live-to-stereo mixing and live broadcasts. Microphones by Schoeps, AKG, Coles, Neumann, Beyer, and PZM; custom designed and built mixing consoles; recorders by Studer, Revox, and Sony (including PCM-F1 digital), fully portable and ready to travel anywhere in the world. Also work for sound reinforcement projects of a similar nature.

Services Available: Specialty in classical music recording (and sound reinforcement); credits include: Los Angeles Philharmonic and the Philadelphia Orchestras, National Public Radio, PBS, and numerous other artists and record labels. Particularly adept at live-to-stereo mixing, using primary mixing techniques. Ready to travel, worldwide.

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 337 W Arrow Hwy., Upland, CA 91786
 (714) 982-2074

Contact: Gary Lynne Payne

PHUSION

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Contact: Mark O Paul

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Contact: Steve Powers

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 4146 Bellingham Ave., Studio City, CA 91604
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Contact: Keith A. Wester

R.A.T. SOUND

Sound Reinf.
 5439 W 6th St., Los Angeles, CA
 (213) 857-1096

Contact: Brian Benjamin

R.B. SOUND CO.

Audio Recording
 9582 Mirage Ave., Garden Grove, CA 92644
 (714) 638-0879

Contact: R. in. iy. Smith

REBER PRODUCTIONS

Audio & Video Recording
 453 23rd Pl., Manhattan Beach, CA 90266
 (213) 545-1700

Contact: Garry Reber

RECORD PLANT REMOTE RECORDING

Audio Recording
 1032 N. Sycamore, Los Angeles, CA 90038
 (213) 653-0240

Contact: Mark Eshelman

Equipment: M.V. III 44 x 32 API console; John Meyer monitors; M.V. II 44 x 24 API console; JBL monitors; 154 mg. ut. Jensen splitter systems. 1985 credits include: A.M. Awards; Grammy Awards; Academy Awards; Country Music Awards; Digital productions include: Phil Collins film; Jackson's film; Bruce Springsteen.



RECORD PLANT
 Los Angeles, CA

RISING STAR RECORDING

Audio Recording
 2307 Holly Ln., Newport Beach, CA 92663
 (714) 631-2307

Contact: Rudy Ising

ROSE STUDIOS

Audio Recording
 1098 Rose Ave., El Centro, CA 92243
 (619) 352-5774

Contact: Danny Berg

CORRECTION:

Our April cover studio was identified as Pacific Video Recorders; it should have read Pacific Video Resources. Our apologies.

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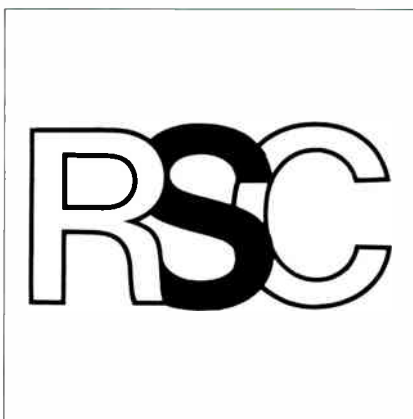
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REMOTE RECORDING and SOUND REINFORCEMENT



SO. CALIFORNIA



RSC/RECORDING SERVICES COMPANY
Burbank, CA

RSC/RECORDING SERVICES COMPANY

Audio Recording
2414 W. Olive Ave., Burbank, CA 91506
(818) 843-6800

Contact: Ken Dahlinger

Equipment: RSC's 24 track remote truck is a comfortable control room on wheels with 50 microphone inputs, and a choice of all audio tape formats. Equipment available includes Audiotronics 501 26 x 24 x 16 and Soundcraft 200 24 x 8 consoles, (2) Ampex MM1200 8, 16, 24 tracks and (2) Ampex ATR 100 2, 4 track recorders, (2) M 24 Dolby noise reduction systems, some limiters (4) LA3A, (3) dbx 160, (2) 1176, LA2A, LA4A, Lexicon 200 digital reverb, Lexicon Super Prime Time delay, SMPTE/60 Hz synclock resolvers, (2) 3-way mic splitter systems, video monitors, and an experienced crew.

Services Available: For over ten years in the Los Angeles and the western U.S., RSC has been providing quality mobile 24-track music recording for television. RSC's mobile facilities are complemented by its audio post-production studios, which are equipped to sweeten 1 inch and 3/4-inch videos. RSC offers a choice of all audio tape formats fully interlaced to your choice of Shadow or Q Lock synchronizers. Services available include sweetening, mixing, voice-overs pre lay music and/or sound effects lay downs, laybacks transfers and SMPTE window dubs. Please call for rates.

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(714) 639-8342

Contact: Steven Forster

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841 Barton Ave., Camarillo, CA 93010
(805) 484-4284
Contact: Doug Coler

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Sound Reinf., Audio Recording
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(619) 222-0238
Contact: Ken Totten

SKYSYSTEMS, INC.

Sound Reinf., Lights, Rentals, Audio Recording
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(818) 793-9389
Contact: Chris Bernauer

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(213) 735-6221
Contact: Cary Greenanmyer

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P.O. Box 648, North Hollywood, CA 91603
(818) 764-3355
Contact: Denny McLane

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Sound Reinf., Lights, Rentals,
Audio & Video Recording
7220 N. Rosemead Blvd. Ste. 108
San Gabriel, CA 91775
(818) 287-0921
Contact: Todd Barry Tony Bohlin

SOUND CONSULTANTS

Sound Reinf., Lights, Staging, Rentals,
Audio Recording
4774 Longbranch Ave., San Diego, CA 92107
(619) 222-4592
Contact: Vardan Burke

SOUND IMAGE

Sound Reinf.
1945 Diamond St., San Marcos, CA 92007
(619) 744-8460
Contact: Ross, Ritto, Mike Adams, Les Banks

SOUND INVESTMENT ENTERPRISES

Sound Reinf., Lights
P.O. Box 4139, Thousand Oaks, CA 91359
(818) 991-3400
Contact: Jim McCandless

SOUND MASTER



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North Hollywood, CA

SOUND MASTER AUDIO/VIDEO RECORDING
Sound Reinf., Audio & Video Recording
10747 Magnolia Blvd., North Hollywood, CA 91601
(213) 650-8000

Contact: Barbara Ingoldisby
Equipment: (12) Carvin 1330 Horn loaded bass cabinets w/E 140 JBL drivers, (12) Carvin R540 radial horns w/Renkus Heinz drivers, (2) 1215A Alec bass cabinets, (4) 908 Carvin cabinets, Renkus Heinz tweeters, Carvin and BGW power amps equalizing 6,000 watts, Carvin 1602 16 x 4 console, effects rack w/limiters DDLs, flange graphics, AKG BX 10 reverb, house system is tm amp'd, (10) bi-amped floor monitors, (2) Klipsch side fills, Carvin 160z 16 x 4 console, spotlights, and complete array of microphones. Three 5-ton trucks—one for sound reinforcement; one for

remote recording, completely self contained power, will travel to any location, 5 ton video truck w/generator, mic roware, TV cameras, editing, full video production for any location Also complete video marine lab for all under water video Equipment includes Hitachi, Sony, JVC, and Crosspoint Latch

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(213) 393-5332
Contact: David Epstein

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(619) 744-8460
Contact: Ross Ritto, Michael Adams

STANAL SOUND LTD

Sound Reinf.
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(818) 764-5200
Contact: Stanley Miller

STUDIO FIVE SOUND

Sound Reinf., Audio & Video Recording
P.O. Box 4291, Point Mugu, CA 93042
(805) 485-7454
Contact: Jim Pearson



STUDIO ON WHEELS
Glendale, CA

STUDIO ON WHEELS

Sound Reinf., Rentals, Audio Recording
339 #6 W. Windsor Rd., Glendale, CA 91204
(818) 243-6165

Contact: John Faizarano

Equipment: 3M M79 24 track, Sony PCM 3324 digital, 24 track Tascam 80 81 dbx TEAC 3300 4 track, Spectra-sonics 28 x 24 w/lader reverse, QSC power amps, JBL 4310 studio monitors, Auratone and Yamaha NS 10M JRE1 1176 and dbx 163 limiters digital delay digital reverb AKG, Shure Electro Voice Sennheiser Neumann PZM and Beyer microphones color TV monitoring Clear Com communications

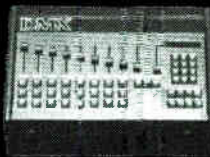
Services Available: Clients include: Long Beach Blues Festival (B B King, Eric Burdon, Charlie Musselwhite etc) Black Flag at Keystone in San Francisco Bravisimo TV shoot at Pomona Fairgrounds and the Palace 216 Zag at the Roxy Savage Grace at the Troubadour La Jazz Choir Valley Master Chorale Larry Carlton Matty Clark Lizzy Borden Star Licks and others 24 track live \$500/day 24 track sessions \$300/day, dual 24 track \$1,000/day digital 24 track \$1,000 8 track live \$300/day 8 track sessions \$200/day

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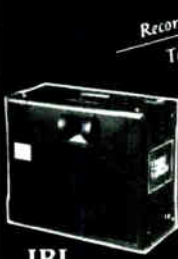
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 Contact: A. Taylor

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 (619) 481-3030
 Contact: Malcolm Falk

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 1694 6th St., Coachella, CA 92236
 (619) 398-5534
 Contact: Jim Tolliver, Renee DiClemente

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 (213) 467-8849
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Audio & Video Recording
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 (714) 492-5082
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 (818) 240-9977
 Contact: John Denlinger

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 (714) 953-5082
 Contact: Paul Chapman, Greg Christy

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 (213) 204-5000
 Contact: Doug Field

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 (714) 543-6155
 Contact: Evan Williams

RICK WISE SOUND
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 (213) 838-7642
 Contact: Rick Wise

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Every month, *Mix* publishes listings of vital services and facilities for the recording industry. To be included in a *Mix* Directory, write or call: Lauri Newman, *Mix* Listings, 2608 Ninth Street, Berkeley, CA 94710, (415) 843-7901.



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Contact: Roy Poole

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Contact: Tommy Bensberg

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(405) 794-9735
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(602) 991-2802
Contact: Mane
Equipment: Chaton Recordings proudly presents the CAT (Chaton Audio Truck), a full 2-inch, 24-track mobile recording facility. The CAT is capable of handling virtually any type of on-location audio production, from live concerts and albums to remote broadcast, commercial projects and films. Chaton, with an eye to the future, has designed the CAT for complete interface and synchronization of the multi-track with any professional video or film facility, via SMPTE code. This provides post-production remix capabilities to obtain optimum soundtracks for your video or film productions. A simultaneous audio feed provides instant sound mix to video—independent of the multi-track recording. The CAT's video monitoring portion, consists of one 17-inch color monitor and three 5-inch b/w monitors, enabling simultaneous viewing of the truck's stage communications camera, as well as any auxiliary production cameras.

CISCO SOUND
Sound Reinf.
Box 16583, Lubbock, TX 79490
(806) 763-3537
Contact: C.K. Bucy

CLAWSON'S MUSIC
Sound Reinf., Lights, Rentals
2701 S.P.I.D., Corpus Christi, TX 78415
(512) 854-5894
Contact: Bob Clawson

COMCAST SOUND COMMUNICATIONS, INC.
Sound Reinf.
4030 Harry Hines Blvd., Dallas, TX 75219
(214) 528-7623
Contact: Jason Jordan

CORNERSTONE AUDIO
Sound Reinf.
P.O. Box 306, Clinton, OK 73601
(405) 323-7694
Contact: Michael Bingenheimer

CRAIG'S MUSIC
Sound Reinf., Lights
123 Dallas Ave., Weatherford, TX 76086
(817) 599-8021
Contact: Craig Swancy

CREATIVE SOUND PRODUCTIONS
Audio Recording
9000 Southwest Freeway #320, Houston, TX 77074
(713) 777-9975
Contact: Edward Smith

CROSSROADS AUDIO, INC.
Sound Reinf., Lights, Rentals, Audio Recording
2623 Myrtle Springs Ave., Dallas, TX 75220
(214) 358-2623
Contact: Chuck Conrad, Doug Hall

DALLAS SOUND SERVICE
Sound Reinf., Rentals
P.O. Box 901906, Dallas, TX 75390
(214) 321-9509
Contact: Joe Osborne

DARK CASTLE SOUND PRODUCTIONS
Sound Reinf.
530 Utah S.E., Albuquerque, NM 87108
(505) 265-4787

DB ASSOCIATES
Sound Reinf.
Box 14892, Austin, TX 78761
(512) 835-4572
Contact: Doran W. Bryson

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SOUTHERN CALIFORNIA STUDIOS!!

The Mix Annual Southern California Studio Directory will be published in September, 1986.

Deadline for submitting questionnaires is JUNE 13.

For a questionnaire or any assistance, please call the Mix Directories Department at (415) 843-7901.

**FINAL DEADLINE:
JUNE 13**

REMOTE RECORDING and SOUND REINFORCEMENT



SOUTHWEST

D.C. SOUND
Sound Reinf., Audio Recording
11352 Gatewood, Dallas, TX 75218
(214) 328-2491
Contact: Danny Grogan

AL DEPAULIS MUSIC CENTER, INC.
Sound Reinf., Lights, Rentals
4972 S. Maryland Pkwy., Las Vegas, NV 89109
(702) 736-1100
Contact: Al DePaulis

DJ'S SOUND PRODUCTIONS
Sound Reinf., Audio & Video Recording
2712 Avenue M, Nederland, TX 77627
(409) 722-5383
Contact: Wayne Dyess

DOCTOR AUDIO
Sound Reinf., Audio Recording
6707 Willamette Dr., Austin, TX 78723
(512) 926-6222
Contact: Kenny Epstein

DOVE & NOTE RECORDING CO.
Audio Recording
15415 W. Antone Circle, Houston, TX 77071
(713) 723-7109
Contact: Mike Lamm, John Lehmann
Services Available: Independent engineers specializing in classical music, recording on location exclusively 2- and 24 track digital recording. Credits include: Houston Symphony Orchestra, Houston Grand Opera, Concert Chorale of Houston, Texas Chamber Orchestra, Singing Boys of Houston, 7th International Van Cliburn Piano Competition, KLEF-FM, KUHT-TV, KTRK TV, KTXH TV

DUPLI-TAPES, INC.
Audio & Video Recording
4545 Bissonnet Ste. 104, Bellaire, TX 77401
(713) 432-0435
Contact: Gail Moseley

DYNAMIC SOUND CO.
Sound Reinf., Lights
2675 N. Bronco, Las Vegas, NV 89108
(702) 645-3000
Contact: Dale D. Dudley

ELECTRIC EAR PRODUCTIONS
Sound Reinf., Lights, Staging, Rentals
3737 50th St., Lubbock, TX 79413
(806) 797-5833
Contact: Scott Slinker

FLASH INTERNATIONAL
Sound Reinf., Audio Recording
P.O. Box 580058, Houston, TX 77258
(713) 489-9899
Contact: Renel "Flash" Boudreaux

FLETCHER SOUND COMPANY
Sound Reinf., Audio Recording
P.O. Box 681613, Houston, TX 77268
(713) 580-8883
Contact: Tom Fletcher

FORTRAX AUDIO VIDEO
*Sound Reinf., Lights, Rentals,
Audio & Video Recording*
6643 Ascot, Dallas, TX 75214
(214) 692-6242
Contact: Pete Haqan

**GABRIEL ENGINEERING/
ARIZONA REMOTE RECORDERS**
Sound Reinf., Audio Recording
833 W. Main, Mesa, AZ 85201
(602) 969-8663, 834-9511
Contact: Brent Gabrielsen, Chet Kendrick

GOLDEN ENTERPRISES
Sound Reinf.
P.O. Box 2397, Kilgore, TX 75663
Contact: Randy Golden

GOLDEN RECORDING
Audio Recording
9321 E. 27th St., Tucson, AZ 85710
(602) 885-6132
Contact: Eddie or Scott Golden

GRAND THEFT SOUND
Sound Reinf., Rentals
2607 N. Britain, Irving, TX 75062
(214) 252-8628
Contact: Jimmy Papa, Mike Raupp

HEAVENLY SOUND PRODUCTIONS
*Sound Reinf., Lights, Staging, Rentals,
Audio Recording*
P.O. Box 11097-225, Phoenix, AZ 85064
(602) 249-3300
Contact: Rex Myers

HIDDEN FOREST STUDIOS
Sound Reinf., Rentals, Audio Recording
421 Hidden Forest, Longview, TX 75605
(214) 663-1817
Contact: Gary Boren

HOLLYWOOD SOUND PRO'S
Sound Reinf.
605 Paseo Canada, San Antonio, TX 78232
(512) 494-1597
Contact: Dan Bonacci

HORIZON ENTERTAINMENT
Sound Reinf., Lights
P.O. Box 300146, Houston, TX 77230
(713) 747-6433
Contact: Gary M. Seline

ITTI STUDIOS
Audio Recording
4305 S. Mingo Ste. A, Tulsa, OK 74146
(918) 663-7700
Contact: Sonny Gray

JOHNSON ENGINEERING
Sound Reinf., Lights, Audio Recording
3965 E. Foothills Dr., Sierra Vista, AZ 85635
(602) 458-3208
Contact: Jim Johnson

JORDAN SOUND PRODUCTIONS
Sound Reinf., Audio & Video Recording
P.O. Box 1444, Huntsville, TX 77340
(409) 291-0007
Contact: Gary W. Jordan

LARR COMPUTER CORP.
Audio Recording
P.O. Box 3842, Houston, TX 77253
(713) 440-9224
Contact: Dr. Herbst

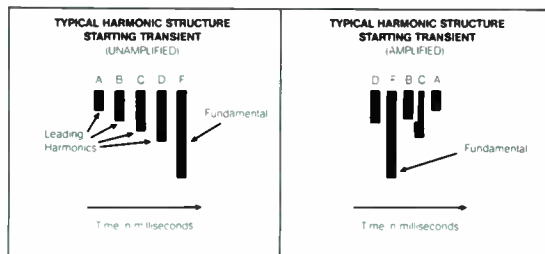
"I can't imagine ever recording without BBE™ again."

Steve Levine, Producer of Culture Club, The Beach Boys.

Steve Levine's got an ear for hits. He can pick a winning song out of a hundred rough demos, take it into the studio and polish it till it's Triple Platinum. That's why he's topped the charts time after time with trendsetters like the Culture Club. That's why he was named 1984 British Phonographic Institute Producer of the Year. And

develop, due to voice coil characteristics, reflected impedance from the environment, crossover impedance anomalies and the mechanical properties of dynamic speakers. The relationships among the fundamental frequencies, their leading harmonics and between the leading harmonics

correction to take place automatically. Convenient front-panel controls let you boost low frequencies and regulate the



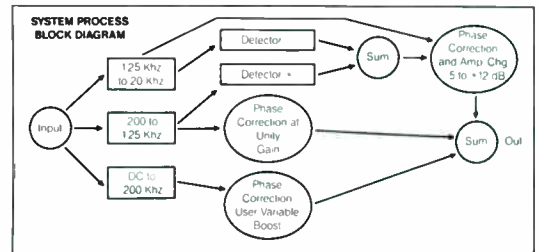
that's why Steve Levine records with the BBE 202R. When Steve produced The Beach Boys' new all-digital album, the 202R was on the team, too.

"BBE is digital what equalizers were to analog. I'm particularly impressed with BBE's effect on synthesizers."

BBE has its own sharp ear for sound. It senses and instantly corrects problems in that all-important interface between amplifier and speaker. That's where phase and "overhang" distortion

themselves become distorted in both amplitude and time. The result? Muddiness, poor imaging and pinched, colorized sound that lacks the presence and punch of the real thing.

The BBE 202R puts the clarity and sparkle back into amplified and recorded sound. We like to think of it as the "unprocessor." Rather than artificially altering the original source, BBE restores the natural harmonic balances that were present in the live performance. How? First it divides the audio spectrum into three bandwidths. Then it applies phase correction across the full spectrum and dynamic high frequency amplitude compensation as required. BBE's continual sampling of the mid/high frequency relationship allows this

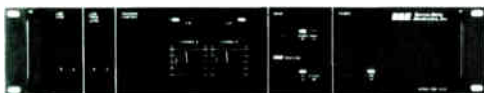


amount of high-frequency amplitude correction to suit your needs. There's no encoding or decoding involved, so BBE can be used anywhere in the recording chain—from individual tracks on a multitrack tape to a mastering lab monitoring system.

Successful producers like Steve Levine count on BBE to bring that hit potential into focus. Why not discover the hidden potential in your own recordings?

To find out what the BBE 202R can do for your sound, contact your professional sound dealer.

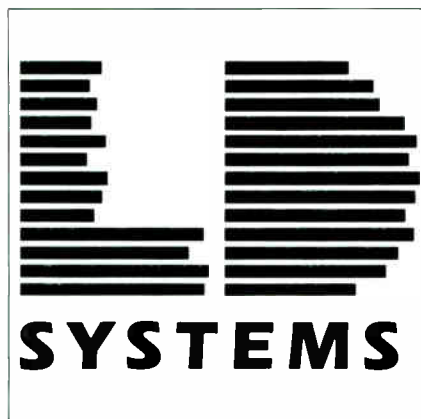
Or write to us at Barcus-Berry Electronics, 5500 Bolsa Avenue, Huntington Beach, CA 92649, or call 1-714-897-6766.



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 Contact: Laird Davis



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 Houston, TX

L.D. SYSTEMS, INC
Sound Reinf., Lights, Rentals
 467 W. 38th, Houston, TX 77018
 (713) 695-9400
 Contact: Tom Smith
 Equipment: Professional sound reinforcement and lighting systems available for local, regional and national touring. Stereo 4 way speaker systems, 32 channel mixing consoles, multi mix monitor systems, and a wide variety of signal processing including digital reverb, noise gates, etc. Capabilities of systems range from showcase venues to rock and roll arenas and outdoor events.
 Services Available: Services range from direct equipment rental to full systems with crews. Staff includes experienced sound and lighting engineers. All services are supported by L.D. Systems' pro audio sales and manufacturing divisions which are involved with full sound system, instrument system, and recording system design and fabrication. Lighting services and equipment are also available.

LONG BRANCH STUDIOS
Sound Reinf., Audio & Video Recording
 6314 E. 13th, Tulsa, OK 74112
 (918) 832-7640
 Contact: Gregg Gardner

MAGNUM SOUND
Sound Reinf., Lights
 6085 E. 22nd St. Ste. 324, Tucson, AZ 85711
 (602) 745-0377
 Contact: Mark Gillis, Tom Dzubialak

MESQUITE RECORDING STUDIO
 3129 N. Hwy 67 (I-30) Ste. H-1, Mesquite, TX 75150
 (214) 270-7453
 Contact: Don McKnight



METEX INTERNATIONAL CORP
 Laredo, TX

REMOTE RECORDING and SOUND REINFORCEMENT



SOUTHWEST

METEX INTERNATIONAL CORP
Sound Reinf.
 1217 Lincoln St., Laredo, TX 77040
 (512) 722-3941
 Contact: Edward L. Foster
 Equipment: Crown, JBL dbx Ashly, TEAC, Tascam, Delta Lab, Altec, Ramco, Shure, Sennheiser, L&E, Luminor, Lite Lab, Meteor, Sony, Sche., HME, MXR, TDK, Maxell, Ampex, Electro Voice, Nakamichi and Panasonic industrial.
 Services Available: Consultation for sound reinforcement, recording studio, stage lighting and installation.



MIDCOM, INC
 Irving, TX

MIDCOM, INC.
Sound Reinf., Rentals, Audio Recording
 Three Dallas Communications Complex, Ste 108
 6311 N. O'Connor, LB50, Irving, TX 75039
 (214) 869-2144
 Contact: Mike Simpson
 Equipment: A pair of Otari MTR 90 Series II 24-track tape machines locked together with a BTX Softouch/Cypher/Shadow time code synchronizer and editing system. Soundcraft TS 24 40 channel console, Lexicon 224XL and Lexicon 200 digital reverbs, Otari MTR 10 2 track w/center time code track, Studer A8.0 2-track w/center time code track, Nakamichi MR 1B Otari 5050BII 2 track, Eventide H969 Harmonizer, Lexicon Model 95 Prime Time II, 24-channel TTM noise reduction system (Dolby dbx or Telcom), JBL 4430 Bi Radial monitors w/White Instruments 7A octave EQ, dbx Series 900 trans-RTS 3 channel/dual listen intercom system, ClearCom 2 channel intercom, RTS 8 channel IFB system, 10 line key telephone system, RCC and cellular mobile telephone, wide assortment of microphones.
 Services Available: Midcom's 48 track remote audio facility specializes in location audio recording and audio for video and teleproduction. Equipped with state-of-the-art hardware, Midcom offers the finest remote recording truck and crew to be found in the southwest. Recent credits include Bob Banner Associates productions of "Face of the 80s" and "SMU Presents League of Women Voters National Presidential Debates." Country Crossroads for Actis Network, NBC TV special, Stars Salute the US Olympic Team. Other credits available upon request.

M.P. PRODUCTION
Sound Reinf., Lights, Staging
 1601 Westpark Dr. Ste. 8, Little Rock, AR 72204
 (501) 664-2183
 Contact: Mike Pope
 Equipment: Stereo 5-way house system with all necessary hardware for flying or ground support. JBL components, Crown PSA-2 power, UREI crossovers, Klark Teknik or White EQs, Roland programmable digital reverb, Roland DDLs, Eventide Harmonizer, Omni Craft noise gates, dbx 160 comp/limiters, Stevenson 34 x 8 x 2 console. Monitor system includes bi-amped floor wedges, 3-way drum fill, 4-way side fills, Crown PSA-2 and D150 power UREI crossovers, White EQs, Stevenson 32 x 12 console, other consoles available upon request.

MUSIC LIFE PRODUCTIONS
Audio Recording
 1817 High Vista Ct., Ft. Worth, TX 76112
 (817) 654-0134
 Contact: Conan Reynolds

MUSICIAN-CONCERT SOUND DIVISION
Sound Reinf., Staging, Rentals
 4595 Washington Blvd., P.O. Box 991
 Beaumont, TX 77704
 (409) 842-2224
 Contact: Frank Halter

THE MUZIC COMPLEX
Sound Reinf., Lights, Staging, Rentals, Audio & Video Recording
 520 S.W. Dr., Jonesboro, AR 72401
 (501) 972-0321
 Contact: Jimmy Boling

NAKED ZOO WEST
Sound Reinf., Lights, Staging
 6640 Valley View Blvd., Las Vegas, NV 89118
 (702) 361-5999
 Contact: C.J. Powell

OB STUDIOS
Sound Reinf., Audio & Video Recording
 5932 N. Grove, Oko, OK 73122
 (405) 721-3727
 Contact: Larry G. O'Rear

O.K. SOUND
Sound Reinf., Lights, Rentals
 6040 Brittmore Rd., Houston, TX 77401
 (713) 530-5136
 Contact: Richard Bunch, Jim Johnson

OKLAHOMA AUDIO & LIGHTING SUPPLY
Sound Reinf., Lights, Rentals
 111 Hal Muldrow Dr. Norman, OK 73069
 (405) 364-5733
 Contact: Steve Grunder



OMEGA AUDIO & RECORDING, INC.
 Dallas, TX

OMEGA AUDIO & RECORDING, INC.
Audio Recording
 8036 Aviation Pl., Dallas, TX 75235
 (214) 350-9066
 Contact: Paul Christensen
 Equipment: 1978 GMC Loadstar with crew sleeper and

power tailgate; refueling range 850 miles, 35 ft. long. Automated Processes (API) 32 x 24 mixing console w/API 550A EQ. Program buses equipped w/(8) stereo VCA groups, 600 ft. 54 pair snake w/transformer splits. Truck wired for 90 inputs. (2) Otari MTR-90 24-track machines, (2) Otari MTR-10 2-, 4-track machines, (2) Technics cassette decks, (95) microphones of every major brand and variety, Teletronix LA-2A limiter, dbx 165 limiter, (2) dbx 162 stereo limiter, (3) dbx 160 limiters, (2) UREI 1176 LN limiters, Orban stereo parametric EQ, JBL 4430 Bi-Radial monitors powered by Yamaha P2200 amps via UREI 539 1/3 octave room equalizers. Auratones also available. Lexicon 224-X LARC, MXR 01a digital reverb, (2) DeltaLab Super Prime Time Lines, RTS 2-channel PL system, EXR Exciter, 150 amp stage foldback power system.

Services Available: This facility is the former Filmways/Heider Mobile #2 which Omega Audio recently acquired from the Record Plant in L.A. Omega has refurbished this legendary unit to provide one of the finest units in North America. Omega's experience dates from 1973 w/artists such as Johnny Cash, Bob Hope, Commodores, Oak Ridge Boys, Alabama, Prince, Cameo, Andre Crouch, Shannon, WNET-PBS Great Performances, Dick Clark Prod., Barry & Enright Prod., Houston Grand Opera, Spyro Gyra, Pat Boone, Loretta Lynn, Joseph Cates Productions, Anne Murray, Willie Nelson, Charlie Pride, Ben Vereen, Art Garfunkel, Waylon Jennings, Al Jarreau, Charlie Daniels Band, Asleep at the Wheel, The Ramones, Michael Franks, Boomtown Rats, Average White Band, Bobby Short, Marilyn McCoo & Billy Davis Jr., Glen Campbell, Sandy Patti, Amy Grant.

OPTIMUM SOUND

Sound Reinf.
6900 W. 42nd St., Little Rock, AR 72204
(501) 562-2225
Contact: Robert E. Long

OPUS ONE

Audio Recording
P.O. Box 3341, Fayetteville, AR 72702
(501) 521-OPUS
Contact: Richard A. Rew

Services Available: Our mobile studio specializes in band and classical live and studio recording—symphonic, chamber, combo and solo. We can provide stereo broadcast feeds and/or commentary when required. Broadcast credits include PBS, APR, AFRTS, Arkansas ETV, and Australian radio. Recording credits include: The North Arkansas Symphony, Music Festival of Arkansas, Da Capo Chamber Players, Alexander String Quartet, Brazos Baroque, Yuri Anshelevich, Joseph Genualdi, Selma Epstein, Stephanie Chase, Evan Johnson, and Kenneth Cooper. Complete album production from recording to jacket design to pressing. In house art, graphics, and publication department. 15 years experience. 2 FCC first, AES, NARTE.

ORLANDO SOUND CO.

Sound Reinf.
1024 E. Berry St., Ft. Worth, TX 76110
(817) 921-4643
Contact: Ronnie Orlando

PARAGON PRODUCTIONS

Sound Reinf., Lights
926 Terrace Mtn. Dr., Austin, TX 78746
(512) 327-1783
Contact: David H. Poole

PHANTOM PRODUCTIONS/HSC

Audio Recording
P.O. Box 4870, Austin, TX
(512) 288-1044
Contact: Martin Theophilus

PRODIGAL SOUND

Sound Reinf., Rentals, Audio Recording
1504 Malone, Denton, TX 76201
(817) 566-5555
Contact: Greg Ellenwood

THE PRODUCTION BLOCK

Audio Recording
906 E. 5th, Austin, TX 78702
(512) 472-8975
Contact: Laine Ferrante/Bill Harwell

PROTEUS PRODUCTIONS

Sound Reinf.
P.O. 1151, Bisbee, AZ 85603
(602) 432-4424
Contact: Scott Baekeland

THE RANCH RECORDING STUDIO "MOBILE ONE"

Audio Recording
Rt. 2 Box 53, Duncan, OK 73533
(405) 255-9037

Contact: L. Mark Edwards

Equipment: 25-foot mobile audio truck with 12 x 7.5 x 7.5 control room. Yamaha RM2408 (30 x 24) console, Tascam MS-16 16-track Tascam 38 8-track, (2) Otari 5050 2-tracks, (2) Tascam 122 cassette decks, Yamaha power amps, JBL 4312 and 4401 monitors, RTS (2 channel) intercom, (2) Ikegami b/w TV monitors and cameras, Octave-Audio Q-2 headphone distribution amp w/Sennheiser, Beyer, and Sony headphones, (2) Lexicon PCM60s, Lexicon PCM42, Orban 111B, DeltaLab ADM-256, (3) dbx 166s Ashly SC-50, (2) UREI LA4s, 250-foot 27-input microphone snake w/2 Jensen splits, Neumann, Shure, Beyer, Sennheiser, AKG, RCA, Octave-Audio microphones and DIs. 24 track tape machine available upon request.

RAPASOUND & TRASH RECORDS

Audio Recording
P.O. Box 1017, Jerome, AZ 86331
(602) 634-8894

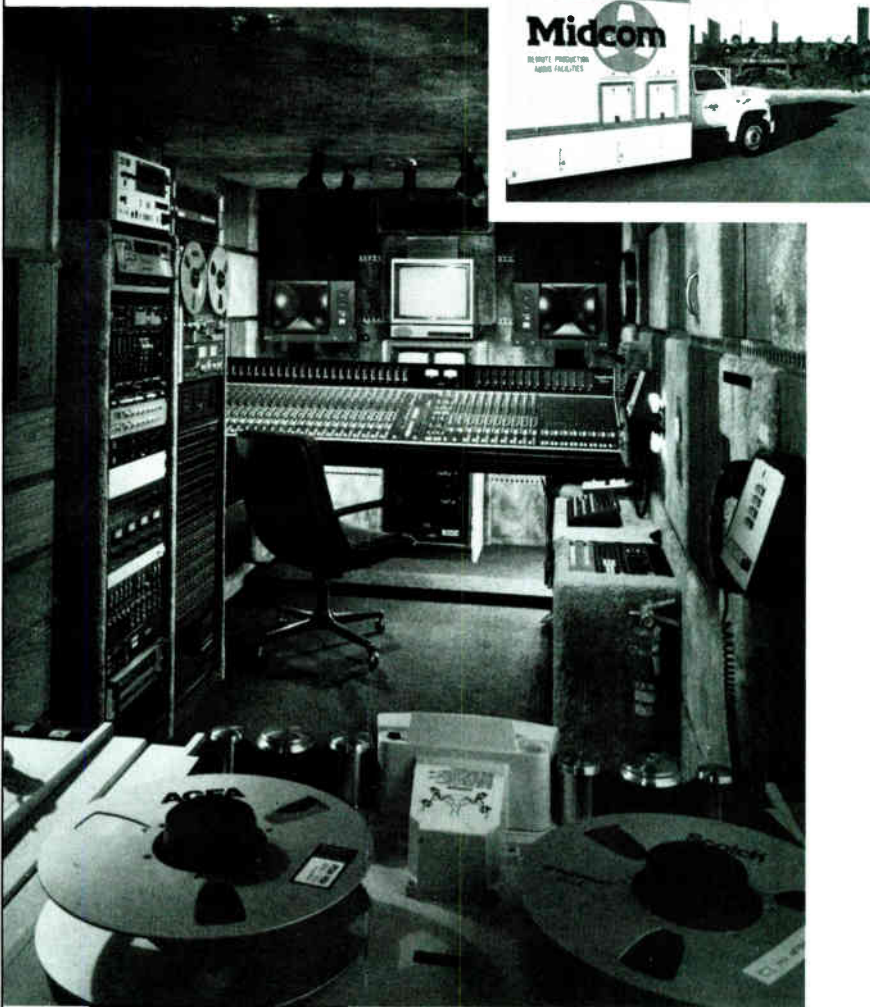
Contact: Walter Rapaport Steve Mikuika

Services Available: (2) 8-track remote recording. Live broadcasting a specialty. Video recording on request. Clubs and small events or concerts. Videos on request. The real bonus here is the experience of the operators. Rapaport, a former San Francisco Bay Area road manager, sound engineer and record producer, owned a small PA company that did sound for such groups as Van Morrison, the Tubes and Pablo Cruise. Steve Mikuika w/an M.A. in electronic engineering, has designed several Phoenix tele vision studios.

RDM AUDIO SERVICES

Sound Reinf., Rentals
2551 Texas Ave. S, Shiloh Pl., Ste. G
College Sta., TX 77840
(409) 696-8273
Contact: James Haislet

THE ULTIMATE IN REMOTE AUDIO TECHNOLOGY.



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FX RACK

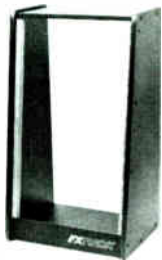
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REMOTE RECORDING and SOUND REINFORCEMENT



SOUTHWEST

**America,
we've got you covered.**



REELSOUND RECORDING CO.
Austin, TX

REELSOUND RECORDING CO
Audio & Video Recording
2304 Sheri Oaks Ln., Austin, TX 78745
(512) 472-3325
3400 Spring Brook Dr., Nashville, TN 37201
(615) 385-0220
Contact: Malcolm Harper David Perkins
Equipment: Unit #1 Austin based unit 42-ft. Sierra/Hidley tractor-trailer unit, 18-ft. control room, overdub room and lounge. MCI/Sony 636LM automated console, (2) MCI JH-24 tape machines, (2) MCI 2-track 2/half-inch heads (2) Nikko cassette decks, (8) Drawmer 201 gates (4) Dyna Mites, dbx 900 rack 4-limiters (2) DS parametric 4, LA-3As, Jrsa 8 x 32 reverb RTS intercom Sony color TV system 48 input Jensen transformer splitter, Westlake, JBL, Yamaha and Auratone speakers, Crown power amps, White 1/4 octave voicing, Beyer, Neumann, Shure, RCA, E-V AKG, Sennheiser, PZM, Countryman, and C-ducer mics Unit #2 Nashville TN based 1948 Fixible road bus MCI JH-428LM console Ampex AM 10 MCI JH-114 24-track Ampex 440B 2-track, Aiwa double cassette deck (6) Drawmer gates, (4) Kepex, (4) Gain Brains, (2) dbx 160, dbx 160X, UREI graphics, API 525 and 550A units, MIC-MIX reverb, AMS reverb Delta DS 2, Yamaha delay RTS intercom, (36) Jensen splitter Sony color TV system Shure AKG Neumann E-V RCA Beyer PZM Countryman Dis Services Available: Remote recording for TV film and radio concerts, record album projects and mixdown, video sweetening. Credits: DJR, Westwood One, NBC "The Source," PBS-TV, Word, Benson, Epic, Warner Bros, Capitol Savoy Artists Tears for Fears, AC/DC, The Fixx, Journey Genesis Robert Plant Eric Johnson Dave Perkins Jay Aaron Willie Nelson Eddie Rabbit Silvia Lee Greenwood, Judas Priest Ted Nugent Gap Band, Patti LaBelle, Kool and the Gang, Frankie Beverly and Maze, Amy Grant, Petra, Jerusalem, Frank Meece, Leon Patillo Awards: two gold RIAA and one platinum awards (2) Ampex Golden Reel Awards 17 years experience in remote recording and the best crew anyone could ask for Mason Harlow Gordon Garrison Rusty Buckner Brent Campbell and many more

ROCKIN' ROBIN GUITARS & MUSIC
Sound Reinf.
3619 S. Shepherd, Houston, TX 77098
(713) 529-5442
Contact: Bart

SCOOTER'S AUDIO
Sound Reinf.
P.O. Box 796, Hale Center, TX 79041
(806) 839-2541
Contact: Lynn "Scooter" Brown

SCRATCH-N-SNIFF STUDIO
Audio Recording
200 Timber Creek Ste. 105, Richwood, TX 77531
(409) 265-1127
Contact: Charles F. Balcz Cory Heckler

SEMPER FIDELIS AUDIO
Audio Recording
2211 59th, Lubbock, TX 79412
(806) 792-8282
Contact: Jim Tountas

SHADOW PRODUCTIONS
Sound Reinf., Lights, Audio & Video Recording
7332 Rampart Ste. 100, Houston, TX 77081
(713) 271-8019
Contact: Phil Davis

SHOWCO, INC.
Sound Reinf., Lights
201 Regal Row, Dallas, TX 75247
(214) 630-1188
Contact: Wil Sharpe

SLYDER PROFESSIONAL AUDIO
Sound Reinf., Lights, Rentals
2109 W. Ross Ave., Phoenix, AZ 85027
(602) 265-2322
Contact: Thom Casey George Blake

SOUND ARTS RECORDING STUDIO
Audio Recording
2036 Pasket, Houston, TX 77092
(713) 688-8067
Contact: Jeff Wells

SOUND IDEA PRODUCTIONS
Sound Reinf., Staging, Rentals, Audio Recording
1620 W. Surrey, Phoenix, AZ 85029
(602) 942-7363
Contact: James G.G. Larson

SOUND SERVICES
Sound Reinf., Lights, Rentals, Audio & Video Recording
P.O. Box 306, Mayflower, AR 72106
(501) 470-1382
Contact: Richard Thornton

SOUND SOUTHWEST
Sound Reinf., Rentals
2611 N. Bellline Rd. #110, Sunnyvale, TX 75182
(214) 226-3069
Contact: Richard Martinez

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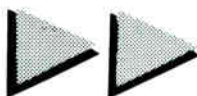


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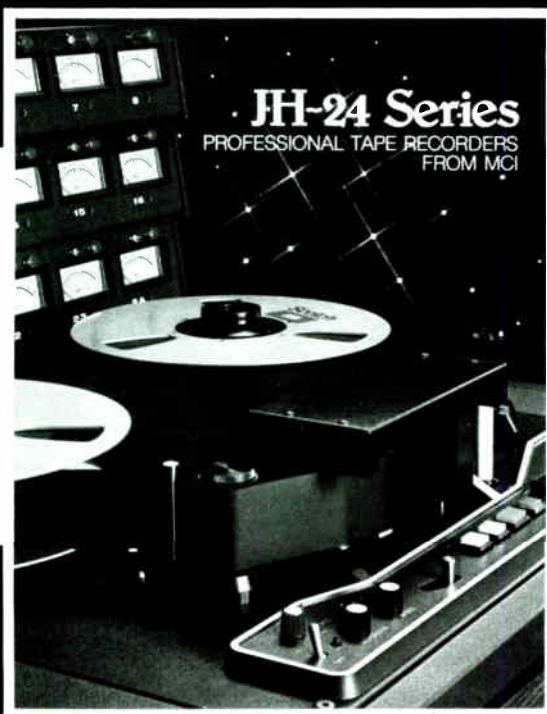
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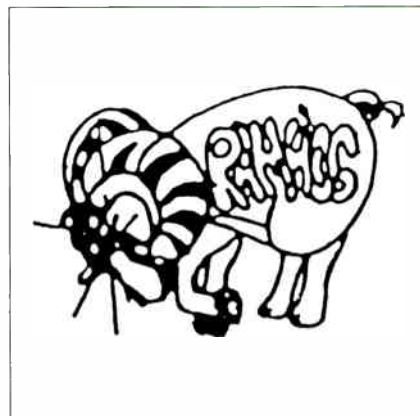
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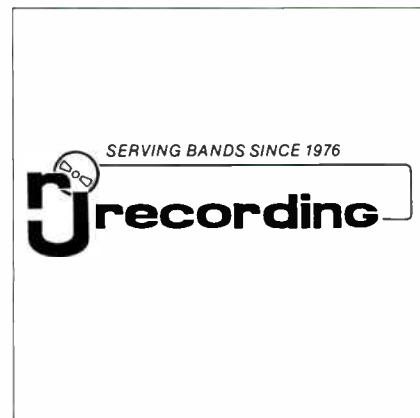
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Contact: Greg Glazier

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(313) 289-3838
Contact: George Milkovich

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(216) 951-3955, 352-9802
Contact: Michael Bishop

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(913) 625-9634
Contact: Mark Meckel

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(308) 384-6889
Contact: Larry Suhr

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Audio Recording
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(219) 432-8176
Contact: Chuck Surack, Chet Chambers

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(313) 881-5167
Contact: Kenny Keys

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Contact: Jeff Wormley

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(414) 241-5641
Contact: Todd A. Boettcher

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Sound Reinf., Rentals
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(313) 852-2044
Contact: Ted Kashmerick, Al Rawa

TANGLEWOOD RECORDING
Audio Recording
9520 47th St., Brookfield, IL 60513
(312) 485-0020
Contact: Tiny Hugar

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Contact: John Landreth

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(616) 428-2021
Contact: Joel L. Motel

REMOTE RECORDING and SOUND REINFORCEMENT



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P.O. Box 402, Austin, MN 55912
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Contact: Chris Davis

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(614) 594-6171
Contact: Doug Anderson

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(816) 361-8455
Contact: Eugene Gold

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(515) 964-7155
Contact: Joe R. Denton

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Sound Reinf., Lights, Staging, Rentals
321 E Superior, Lebanon, IN 46052
(317) 482-0271
Contact: Mark T. Thompkins

TONYS SOUND REINFORCEMENT
Sound Reinf.
635 S. 20th #2, Lincoln, NE 68510
(402) 435-1619
Contact: Anthony Streeton

THE TOP IN SOUND, INC.
Sound Reinf.
3409 State Road 9 N., Anderson, IN 46012
(317) 649-8111
Contact: Pat Topolsky

TRACK ONE AUDIO SERVICES
Sound Reinf., Audio & Video Recording
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(312) 799-8096
Contact: Morris Jones

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(417) 887-6581
Contact: Steven Smith

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(414) 242-9010
Contact: Paul Edwards, Daryll DeYoung, Darrell Klompaker

T.R.S.
Sound Reinf., Audio & Video Recording
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(219) 489-4297
Contact: Tom Tempel



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Chicago, IL

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Sound Reinf., Lights, Staging, Rentals
7005 S. Pulaski Ave., Chicago, IL 60629
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Contact: Joe Papaerelli

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Contact: Mark Walls

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Contact: J.J. Thomas

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(216) 248-3770
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(312) 398-2095
Contact: Lowell S. Woodman

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Contact: Ron Wheeler

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(312) 525-4837
Contact: Ed Salka

WAVELENGTH PRODUCTIONS
Sound Reinf.
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(312) 348-7787
Contact: Marcy J. Hochberg



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(815) 962-0221
Contact: Dennis M. Williams

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(313) 540-9040
Contact: Tom Chavez

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Contact: Jack Black, Dave Sturm

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U.K.: Audio Analysts Inc./Roadstar, Carver House, Carver St., Sheffield, England
SI-4FS 011-44-742-27014, E-Mail: DGS 1917

CANADA: Audio Analysts Inc., 1875-D Panama St., Brossard, Quebec J4W 2SR,
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Contact: Sam Catanese

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(914) 331-1726
Contact: Mr. Vercelletto

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(212) 865-3108
Contact: Malcolm Addey

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(212) 486-0856
Contact: Stuart J. Allyn

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(617) 961-2617
Contact: Peter Kmiec

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*Sound Reinf., Lights, Rentals,
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(203) 633-9481
Contact: Ken Soudan
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(607) 734-8704
Contact: James Cue

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Contact: Chns Andersen

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(212) 736-9570
Contact: David Andrews

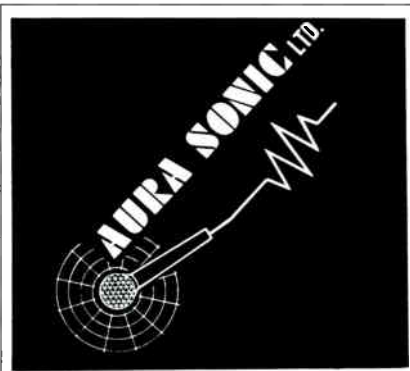
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(716) 436-8475
Contact: Mike or Seth

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(718) 886-6500
Contact: Steven Remote
Equipment: Otari MTR-90 24-track (24-, 32-track digital recording available upon request); Otari MTR-10; (2) Otari 5050BII; (2) Denon DRM-4 cassette decks; Nakamichi DMP-100 w/Sony SL-400 Super Beta Hifi recorder; Harrison MR-4 36/32 w/ARMS automation. Monitors by UREI 813, K&H 092, Yamaha NS-10M, E-V Sentry 100A, Yamaha amplification, Klark-Teknik DN780, Yamaha REV7, Lexicon PCM60, large complement of delays, limiters, compressors, gates and EQs by Lexicon, Klark-Teknik, Korg, MXR, Ursa Major, Valley People, dbx, Brooke-Siren UREI, Rebs, Orban, Ashly, Eventide, MICMIX and Akai. Over 80 mics and directs by Neumann, Sennheiser, Shure, E-V,

REMOTE RECORDING and SOUND REINFORCEMENT



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Contact: David A. Chambers

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Contact: Jim O'Connor

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Contact: Joseph Wahlgren

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(201) 322-4466
Contact: Warren C. Slaten

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(413) 665-7122
Contact: Art Steele

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 (716) 467-0032
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 (717) 896-3926
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REMOTE RECORDING and SOUND REINFORCEMENT



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 (301) 946-7364
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 Contact: Zeke Zola

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 Contact: Jeff Brubaker

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 (202) 737-9111
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 (609) 881-7645
 Contact: Terri Candelora, Ed Candelora Jr.

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 Contact: Bob Potter

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 Contact: Larry Scott

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 Westbrook, ME 04092
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 (203) 666-8311
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 Contact: William Meredith

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 Contact: Ray Maxwell

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 (207) 729-1265
 Contact: Rick Racine

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Contact: Don Wade

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Contact: Jim Landis

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Contact: Jeffrey Alan Forsburg

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(412) 751-5737
Contact: Vic David

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Audio & Video Recording
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(607) 324-4411
Contact: Tim Vogel

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Contact: Stephen Masucci
Equipment: Turbosound TMS enclosures, Crown and QSC amplification, dbx, DeltaLab, Aphex, JBL, Rane, A.K.G., Countryman and Shure products are utilized throughout all of our systems. Special items can be provided upon request. In addition, full transportation and technicians are available.

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Contact: Paul Cornell

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(516) 781-7710
Contact: Michael R. Jenkins

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(401) 273-8473
Contact: Stewart Counts

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Contact: Jeff Dunning, Kevin O'Connell

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Contact: Michael Gallagher

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(718) 347-1221
Contact: Tim Horsting


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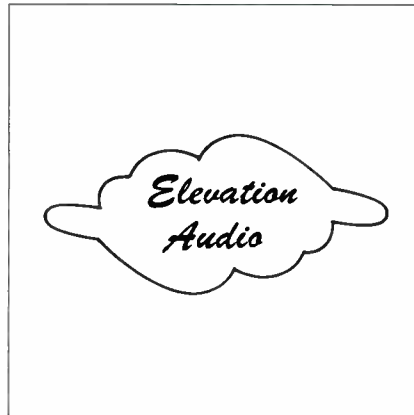
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ISSUE: JUNE 1986 CARD EXPIRES OCTOBER 1 1986

Name _____ Phone _____
 Company _____ Title _____
 Address _____
 City _____ State _____ Zip _____

PLEASE CIRCLE ONE ENTRY FOR EACH CATEGORY:

1. **Principle activity of your business:**
 - A. Recording Studio
 - B. Sound Reinforcement
 - C. Equipment Supplier
 - D. Equipment Mfg
 - E. Record/Tape Processing
 - F. Video Production
 - G. Video Post-Production
 - H. Broadcast
 - I. Record Company
 - J. Production Company
 - K. Contractor/Installer
 - L. Studio Design/Acoustics
 - M. Recording/Music School
2. **Job Title**
 - A. Owner/Manager
 - B. Sales/Marketing
 - C. Producer
 - D. Engineer
 - E. Technician
 - F. Consultant
 - G. Student
 - H. Musician/Performer
3. **Read Mix primarily for:**
 - 1. Technical/Applications articles
 - 2. News columns
 - 3. Music industry coverage
 - 4. Interviews
 - 5. New product columns
 - 6. Listings
 - 7. Advertising
4. **No. of years in industry:**
 - A. Less than 1
 - B. 1 - 3
 - C. 4 - 7
 - D. 8 - 12
 - E. 13 or more
5. **What is your annual budget for equipment?**
 - 1. Under \$50,000
 - 2. \$50,000 - \$149,000
 - 3. \$150,000 - \$249,000
 - 4. \$250,000 - \$499,000
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7. **Purchasing authority:**
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002	032	062	092	122	152	182	212	242	272	302	332
003	033	063	093	123	153	183	213	243	273	303	333
004	034	064	094	124	154	184	214	244	274	304	334
005	035	065	095	125	155	185	215	245	275	305	335
006	036	066	096	126	156	186	216	246	276	306	336
007	037	067	097	127	157	187	217	247	277	307	337
008	038	068	098	128	158	188	218	248	278	308	338
009	039	069	099	129	159	189	219	249	279	309	339
010	040	070	100	130	160	190	220	250	280	310	340
011	041	071	101	131	161	191	221	251	281	311	341
012	042	072	102	132	162	192	222	252	282	312	342
013	043	073	103	133	163	193	223	253	283	313	343
014	044	074	104	134	164	194	224	254	284	314	344
015	045	075	105	135	165	195	225	255	285	315	345
016	046	076	106	136	166	196	226	256	286	316	346
017	047	077	107	137	167	197	227	257	287	317	347
018	048	078	108	138	168	198	228	258	288	318	348
019	049	079	109	139	169	199	229	259	289	319	349
020	050	080	110	140	170	200	230	260	290	320	350
021	051	081	111	141	171	201	231	261	291	321	351
022	052	082	112	142	172	202	232	262	292	322	352
023	053	083	113	143	173	203	233	263	293	323	353
024	054	084	114	144	174	204	234	264	294	324	354
025	055	085	115	145	175	205	235	265	295	325	355
026	056	086	116	146	176	206	236	266	296	326	356
027	057	087	117	147	177	207	237	267	297	327	357
028	058	088	118	148	178	208	238	268	298	328	358
029	059	089	119	149	179	209	239	269	299	329	359
030	060	090	120	150	180	210	240	270	300	330	360

Circle number 360 for 12 monthly issues of Mix and we will send you subscription information.



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To receive more information on the products and services advertised in this issue of Mix, circle the corresponding numbers on the attached reader service postcard, detach and mail promptly. Please supply all information requested.

*Important notice to readers: reader service inquiries are mailed directly to the advertiser, who is solely responsible for sending out product information. Mix does not process inquiries or guarantee advertiser response.

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ISSUE: JUNE 1986 CARD EXPIRES OCTOBER 1 1986

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 Address _____
 City _____ State _____ Zip _____

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 - C. Equipment Supplier
 - D. Equipment Mfg
 - E. Record/Tape Processing
 - F. Video Production
 - G. Video Post-Production
 - H. Broadcast
 - I. Record Company
 - J. Production Company
 - K. Contractor/Installer
 - L. Studio Design/Acoustics
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2. **Job Title**
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030	060	090	120	150	180	210	240	270	300	330	360

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177 Highland Ave., Kingston, NY 12401
(914) 338-2534
Contact: Peter Lewis



LIVE TRACKS MOBILE RECORDING
Philadelphia, PA

LIVE TRACKS MOBILE RECORDING
Sound Reinf., Audio Recording
6201 Crittenden St., Philadelphia, PA 19138
(215) 276-8734
Contact: Charles Griffin

Equipment: Custom design mobile van, Tascam M-32 2 track, Tascam M 44 4 track, Technics M 222 cassette, Tascam M 3 8 x 4 x 2 board, DeltaLab ADM 256 digital delay, dbx 150 and dbx DX-4 noise reduction, Shure SM57, Audio Technica 450PS, Sony 2710 Beta HiFi and PCM.
Services Available: On location recording, radio production, and video production

LOCATION RECORDING, INC.
Audio Recording
122 E. Rocks Rd., Norwalk, CT 06851
(203) 371-4757
Contact: Anthony M. Scalisi

JAN MACK
Audio Recording
46 Garden Terrace, Bridgeport, CT 06605
(203) 579-7879

Contact: Jan Mack, Bryant Northcutt
Services Available: Stereo or multi-miking direct to 2 track, music and spoken word editing; small orders real time cassette duplication. Specializing in classical and acoustic music: orchestral, choral, chamber music, church music, etc. AV experience (film, slides, video).

MAGIC PRODUCTIONS

Sound Reinf., Lights
133 W 90th St., New York, NY 10024
(718) 224-8886
Contact: Luis

MAGNETIK PRODUCTIONS

Sound Reinf., Audio Recording
1533 Cherry St., Philadelphia, PA 19102
(215) 563-2010
Contact: Bob Wakeley

MALCOLM HILL ASSOCIATES, INC.

Sound Reinf.
20 N. Mulberry St., Hagerstown, MD 21740
(301) 733-9337
Contact: Mike Scarle

MALLOY PRODUCTION COMPANY INC.

Sound Reinf., Rentals, Audio Recording
1544 E. Passyunk Ave., Philadelphia, PA
(215) 467-5486
Contact: Paul T. Calvi

MAN FROM MARS PRODUCTIONS

Audio Recording
159 Orange St., Manchester, NH 03104
(603) 668-0652
Contact: Ed Brouder

MAR-JON AUDIO/VISUAL

Sound Reinf., Lights, Rentals
15 Ridge Rd., Rensselaer, NY 12144
(518) 477-7809
Contact: Conrad (C.J.) Jones

MARTIN AUDIO

Sound Reinf.
19 Alva St., New Bedford, MA 02740
(617) 994-7141
Contact: George Martin

MARTIN RECORDING STUDIOS

Audio Recording
8710 Patton Rd., Wyndmoor, PA 19118
(215) 233-1606
Contact: Niles Martin

MARYLAND SOUND INDUSTRIES/ NORTHWEST SOUND

Sound Reinf.
4900 Wetheredsville Rd., Baltimore, MD 21207
(301) 448-1400
Contact: Will Parry

MASON HALL STUDIOS

Audio Recording
Mason Hall, Fredonia State University
Fredonia, NY 14063
(716) 673-3154
Contact: Bryan Leskowitz

MASQUE SOUND & RECORDING

Sound Reinf., Rentals
331 W 51st St., New York, NY 10019
(212) 245-4623
Contact: Bob Bender, Tom Sorce

MATRIX AUDIO

Sound Reinf., Lights, Rentals, Audio Recording
P.O. Box 4097, Middletown, RI 02840
(401) 846-8597
Contact: Cliff Christian

MAX SOUND

Sound Reinf., Lights, Staging, Rentals, Audio Recording
2½ Wyman St. N., Rye Brook, NY 10573
(914) 939-3819
Contact: Chns Greco

M.B. ENTERTAINMENT PRODUCTIONS

Sound Reinf., Lights
163 Brookside Ave., Irvington, NJ 07111
(201) 374-3921
Contact: Mark A. Beckett

McCORMACK SOUND

Sound Reinf., Lights
16 Briarwood Dr., New Bedford, MA 02745
(617) 998-1218
Contact: Mike

MCE RECORDING STUDIOS

Sound Reinf., Audio Recording
467 State St., Schenectady, NY 12305
(518) 382-1762
Contact: Mark Ernst

BRUCE McNICHOLS MUSKRAT PRODS., INC.

Audio Recording
44 N. Central Ave., Elmsford, NY 10523
(212) 409-1902, (914) 592-3144

MIDDLE HOUSE SOUND, INC.

Sound Reinf., Lights, Rentals
512 Kingman St., E. Taunton, MA 02718
(617) 823-5127
Contact: Rick Washburn

JON MILLER PRODUCTION STUDIOS

Sound Reinf., Lights, Rentals, Audio & Video Recording
7249 Airport Rd., Bath, MA 18014
(215) 837-7550
Contact: Jon Miller

MIRROR SOUND STUDIOS

Audio Recording
1731 Cinnaminson Ave., Cinnaminson, NJ 08077
(609) 829-9413
Contact: Ken Fordyce

MIX MASTERS

Sound Reinf., Rentals
Brooklyn, NY
(718) 771-6213
Contact: Kool

MOBILE RECORDERS LTD.

Audio & Video Recording
Berkshire Rd., Southbury, CT 06488
(203) 264-2659

MODE MUSIC

Sound Reinf., Audio Recording
1238 Bay St., Staten Island, NY 10305
(718) 816-4888
Contact: John Pennino

MODULAR SOUND

Sound Reinf., Staging, Rentals
Box 388, Princeton Junction, NJ 08550
(609) 989-1919
Contact: Robyn Gately, Vann Weller, Randy Weinholz

MUSIC MARKET, INC.

Sound Reinf.
265 Essex St., Lawrence, MA 01840
(617) 683-9169
Contact: Rosemary D'Unso

NATIONAL VIDEO CENTER/RECORDING STUDIOS

Audio & Video Recording
460 W 42nd St., New York, NY 10036
(212) 279-2000
Contact: Bill Keily, Andrew Lustig

NEW ENGLAND MOBILE RECORDING

Audio Recording
81 Circuit Dr., Stow, MA 01775
(617) 897-7554
Contact: Alan W. Goodrich
Services Available: New England mobile recording is a complete 24-track location recording studio. It is ideal for large concerts, albums, and radio broadcast work. The facility has an attractive and spacious interior that can accommodate an entire band as easily as a stationary studio would. Three isolation chambers provide recording

possibilities unavailable from most mobile units. The bus, a customized eagle motor coach, is wired for 16 video and 52 exterior audio inputs, and 40 interior inputs. We presently use equipment by: MCI, Tascam, DOD, JBL/Augsburger monitors, Shure, AKG, Audio-Technica, Sennheiser, Dolby Labs, Countryman Assoc., Sescam, custom made snake (260-foot) and splitter (52 x 2), Crown, Phase Linear, Beyer, Roland, Auratone, E-V, Yamaha, Mesa-Boogie, and Neumann. Additional audio and video equipment can be brought in as required. Our friendly and knowledgeable staff would like to confer with you about your recording needs. Call for further information.

NEXT STATION STUDIOS

Sound Reinf., Lights, Rentals, Audio & Video Recording
154 New Norwalk Rd., New Canaan, CT 06840
(203) 966-7124
Contact: Paul Tocco, Michael Smolen

NICKEL RECORDING

Audio Recording
168 Buckingham St., Hartford, CT 06106
(203) 524-5656
Contact: Jack Stang

NON CHALANT

Sound Reinf., Lights, Audio Recording
P.O. Box 64, Ardmore, PA 19003
(215) 649-0365
Contact: Frank Kurz, Bob McNamara

NORTH COUNTRY SOUNDS/ EASTMAN TELEPRODUCTIONS

Audio & Video Recording
175 Bunker Hill, Auburn, NH 03032
(603) 483-2662
Contact: Tom Bartlett

NORTHEASTERN DIGITAL RECORDING

Audio & Video Recording
1108 Boylston St. Ste. 303, Boston, MA 02215
(617) 753-1192, 353-0963
Contact: Toby Mountain
Equipment: Sony PCM-1610 digital audio processor, Sony DAE-1100 digital audio editor, Sony BVU-800 ¾-inch video recorders (2) for digital audio or video, Sony PCM-F1 and Sony PCM-701 (modified) processors, Sony SL-2000 Beta video recorders (2) AKG, Schoeps, Sennheiser microphones. Custom Trois 2005A 12 x 4 x 2 mixer, Ramsa WR 8118 18 x 4 x 2 mixer; 185 Ford Econoline van for transport. All equipment rack-mounted for delivery anywhere.

NOVA SOUNDS & SIGHTS

Audio & Video Recording
878 Broadway, Somerville, MA 02144
(617) 646-1899
Contact: Deine Schone

OFF THE WALL SOUND

Sound Reinf., Lights, Staging, Audio Recording
10 Howland Circle, W. Caldwell, NJ 07006
(201) 228-4099
Contact: Dennis Wall

OMEGA RECORDING STUDIOS

Audio Recording
5609 Fishers Ln., Rockville, MD 20852
(301) 946-4686
Contact: Betty Phelps

ONE HAND CLAPPING

Sound Reinf., Audio Recording
58A Phelps Ave., New Brunswick, NJ 08901
(201) 545-6533
Contact: Terry Richards

OPEN EAR RECORDERS

Audio Recording
373 Trapelo Rd., Belmont, MA 02178
(617) 484-6938
Contact: Paul F. Terras



**OPUS I
SOUND**

• PRO SOUND REINFORCEMENT

OPUS I SOUND
Poughkeepsie, NY

OPUS I SOUND

Sound Reinf., Lights
56 Dutchess Ave., Poughkeepsie, NY 12601
(914) 452-5726
Contact: Kevin Farrell

Services Available: Opus I Sound specializes in concert sound systems, featuring full range and modular horn loaded enclosures. Systems are available for touring on a daily, weekly or monthly basis, with engineers and working road crew. Main and monitor systems available independently or together. Soundcraft, Hill and Yamaha consoles. Hill and Crown power. Stage lighting.

PA DA PUBLISHING & RECORDING

Audio Recording
27 Washington Sq. N. Rm. 4D, New York, NY 10011
(212) 228-1808
Contact: Eddy Davis

PANDEMONIUM AUDIO

Sound Reinf.
16 Dorchester Dr., Manhasset, NY 11030
(516) 365-7810
Contact: C.P. Pores

Services Available: Our EAW/Hill Audio/Soundcraft systems are available for one nighters, regional, or national tours. Concert systems since 1977 with experience and credits in all forms of sound reinforcement—from country to heavy metal to reggae—from Mickey Gilley to Zebra to Steel Pulse. Installations, consultants, retail and system sales and "The Used Equipment List" an ongoing equipment exchange with listings from MCI and Otari to Bose and Peavey.

PAOLANGELI PRODUCTIONS

Sound Reinf., Lights, Audio Recording
1865 Dryden Rd., Freeville, NY 13068
(607) 347-4559
Contact: Tom Paolangeli

PARAGON MUSIC CO.

Sound Reinf., Rentals
501 N. Clinton Ave., Wenonah, NJ 08090
(609) 468-2454
Contact: Victor Gehring

PASO SOUND PRODUCTS, INC.

Sound Reinf., Audio Recording
14 First St., Pelham, NY 10804
(914) 738-4800
Contact: David Moore

PAYNE CONCERT SOUND CO.

Sound Reinf., Lights, Staging, Rentals, Audio Recording
138 N. Union St., Burlington, VT 05401
(802) 863-3861
Contact: Stephen R. Payne

Services Available: Professional 32 channel concert sound up to 10,000 seats. Tremendous variety of experience from B.B. King to Randy Newman, Richard Thompson, Marshall Crenshaw, Steve Forbert, The Band, Chubby Checker, Del Fuegos, Jonathan Edwards, Steve Morse, Los Lobos, Warren Zevon, Rick Nelson, The Stompers, Steeleye Span, Jesse Winchester, Doc Watson, Carole King, Junior Walker, Joe King Carrasco, Marie Osmond, Yellowman.

**REMOTE RECORDING and
SOUND REINFORCEMENT**



NORTHEAST

PAYNE PRODUCTIONS LTD.

Sound Reinf., Lights, Rentals
138 N. Union St., Burlington, VT 05401
(802) 863-3861
Contact: Stephen R. Payne

PEABODY RECORDING STUDIOS

Audio Recording
1E Mt. Vernon Pl., Baltimore, MD 21202
(301) 659-8136
Contact: Alan P. Kelauer

PEIRCE-PHELPS, INC. AUDIO SYSTEMS DIVISION

Sound Reinf.
2000 N. 59th St., Philadelphia, PA 19131
(215) 879-7236
Contact: Charles Moore

PENNSYLVANIA PUBLIC ADDRESS (P.A.P.A.)

Sound Reinf., Rentals
234 E. Main Ave., Myerstown, PA 17067
(717) 866-4983
Contact: Glenn S. Adams

PERSIA SOUND

Sound Reinf., Lights, Audio & Video Recording
11 Argonne St., Staten Island, NY 10305
(718) 816-6384
Contact: Chris Vollar

PFISTERER SOUND ENGINEERING

Sound Reinf.
855 Mansion Dr., Huntingdon Valley, PA 19006
(215) 947-5149
Contact: George Pfisterer

PGH COMMUNICATIONS CORP.

Sound Reinf.
431 McNeilly Rd., Pittsburgh, PA 15226
(412) 344-3555
Contact: Michael Bieoa, Ed Hunger

PHILADELPHIA SOUND PRODUCTIONS

Sound Reinf., Audio Recording
4335 Osage Ave., Philadelphia, PA 19104
(215) 382-5390
Contact: J. Walter Mosetter

PLUM STUDIO, LTD.

Audio Recording
2 Washington St., Haverhill, MA 01830
(617) 372-4236
Contact: Richard Tiegen

POMEROY AUDIO

Audio Recording
193 Baltic St., Brooklyn, NY 11201
(718) 855-2650
Contact: Doug Pomeroy
Services Available: Digital and analog 2- and 4-track recording; minimal and multiple mic set-ups; all types

music: concerts, club dates, etc. Highest quality equipment, very reasonable rates; will assist clients in finding suitable recording location. Credits include Metropolitan Opera House (VSOP Records), Don Elliott, Phil Bodner, Billy Butterfield and others live at Eddie Condon's, Adam Makowicz (Slash Records); various artists in NYC's Town Hall.

POWER PLAY RECORDS INC.

Sound Reinf., Lights, Rentals, Audio & Video Recording
198 Bloomfield Ave., Newark, NJ 07104
(201) 481-0972

Contact: Greg Furgason
Equipment: Audio Yamaha PM 700 24 in, Harrison "Alive" 32 in, Soundcraft 400B 24 in, Ursa Major Star Gate digital reverb, dbx and Eventide limiters, 19 and 38 pair snakes, (2) Audioarts Parametrics EQ, (2) Lexicon PCM 41 DDL, DeltaLab DL-2 DDL, Ampex MM 1200 24-track, Tascam 85 16B 16-track, (2) Otari MX-5050 8D 8-track, Nakamichi DMP-100 digital mastering processor, (2) Otari MX 5050 BII 2 track, (6) Soundcraftsman graphic EQ and power amps, (12) Bose 800 speakers, (2) E.V. subwoofers. Video (2)Thompson 601A minicam 14 1 lens, Grass Valley 1400 switcher, Ikegami EC-35 w/all lens and filters, Lowell and Berkey Colortran lighting kits, Sony BVU 100 ¼-inch, (2) Sony VU—5850 ¼-inch, Sony SL—2000 half inch, Ampex VPR-20 one inch, Sony BVH 500A one inch, 1984 Ford Econoline 150 truck.

POWER SUPPLY SOUND CO. INC.

Sound Reinf., Lights, Staging, Rentals
3107 Delaware Ave., Buffalo, NY 14217
(716) 873-5358
Contact: Simon Crawford

POWERHOUSE PRODUCTION

Sound Reinf., Lights, Staging
402 Park St., Jamestown, NY 14701
(716) 484-7656
Contact: Robert Nelson

PRAGMATECH SOUND CORP.

Sound Reinf., Rentals
4516 Byron Ave., Bronx, NY 10466
(212) 325-8888
Contact: Jim Salta

PRE-PRODUCTION SERVICES

Audio Recording
Boston, MA 02115
(617) 236-1944
Contact: Lonnie Bedell
Equipment: Fostex 8 track recorder, Yamaha 8 x 4 console, Yamaha RX 11 drum machine, DeltaLab digital delay, Symetrix comp/limiter, parametric EQ, graphic EQ, Yamaha REV7 digital reverb, (3) noise gates. Mics. Shure SM57, Shure 515; (2) Sennheiser 421, Tascam PE120, Audio Technica ATM 11, AT818, Fender P2; C Ducer Plus mic stands, cables, AKG phones, direct boxes, tuner, etc. Transportation not included.

PRO MIX INC.

Sound Reinf., Rentals
50 Webster Ave., New Rochelle, NY 10801
(914) 633-3233
Contact: Lew Mead

PROJECT PRODUCTIONS

Sound Reinf., Lights
574 Pompton Ave., Cedar Grove, NJ 07021
(201) 239-0995
Contact: Jackson

PROPHETIC GOSPEL SOUND

Sound Reinf., Audio Recording
597 E. 95th St., Brooklyn, NY 11236
(718) 346-3513
Contact: K. Williams

PSI PHI SOUND

Sound Reinf., Rentals, Audio Recording
46 Oak Hill Terrace, Penfield, NY 14526
(716) 248-3268
Contact: John A. Nugent

P.T. SOUND

Sound Reinf.
34 Lombard St., Pittsfield, MA 01201
(413) 442-6731
Contact: Peter Tognini, Chris Mattoon

Services Available: We specialize in small to medium size tours and concerts, venues to 6,500 seats. Systems up to 32 x 8 on the house, 6 way monitor mix with 8 bi-amped floor wedges, two trn-amped drum fills. We have worked throughout the northeast with acts such as Henny Youngman, John Conlee, Busboys, Greg Allman, Bonnie Raitt, Pat Travers, Joe Perry, King Crimson, Uriah Heep, Molly Hatchet (only to name a few). We use the latest equipment from Yamaha, Soundcraft, JBL, EAW, Carver, Crown, Lexicon, UREI, Aphex. We put emphasis on high quality sound and efficiently run shows. Remember PT Sound.

PYRAMID SOUND INC.
Audio & Video Recording
 105 E. Clinton St., Ithaca, NY 14850
 (607) 273-3931
 Contact: Alex Penelas

R&R RECORDING STUDIO
Audio Recording
 8 Center St., Fairchance, PA 15436
 (412) 564-2581, 564-2769
 Contact: Randy R. Rhodes

RAG TRACK SOUND
Sound Reinf., Audio Recording
 P.O. Box 30604, Washington, DC 20030
 (202) 584-9207
 Contact: Robert A. Grady

RAINBOW SOUND
Sound Reinf., Audio Recording
 24 Riverleigh Pl., Amityville, NY 11701
 (516) 691-5514

Contact: Wayne Fairchild, Gary Haglich
Equipment: Rainbow Sound has been providing professional sound reinforcement services for over ten years. Our systems are designed for a clean, flat frequency response and features equipment such as Soundcraft and Hill mixing consoles, with Lexicon ART, and Ashly signal processing devices. Our amp racks consist of Crown and BGW amplifiers, powering arrays and monitors made up of JBL and Altec components. Our PAs have played such diverse venues as The Lighthouse Cafe and Studio 54, Carnegie Hall, The Felt Forum, Lincoln Center, and Central Park. Some of the artists who have utilized our systems have been Whitney Houston, Stan Getz, Don McLean, David Johanson, Louise Mandrell, Winton Marsalis, and The New York Grand Opera Co. Our in-house trained crews are professional and efficient, capable of handling the most demanding of shows. More information about fees and services are available upon request.

RANDOM AIRES
Audio Recording
 85th and Park Ave., New York, NY 10028
 (718) 237-2908
 Contact: M W Campbell

RARE EARTH AUDIO
Sound Reinf., Audio Recording
 603 Galahad Rd., Plymouth Meeting, PA 19462
 (215) 825-2298
 Contact: Jeremy Birnbaum

RAY PRO SOUND
Sound Reinf., Rentals
 1902 Wharton Rd., Jenkintown, PA 19046
 (215) 576-1627, 885-9773
 Contact: Greg Flynn

Equipment: Effects: Eventide Harmonizer and Instant Flanger. Lexicon PCM60, dbx 160 X compressors, Omni Craft noise gate, Effectron 1024, consoles Yamaha 1516, Kelsey mono 8, Biamp Stereo-6 (rack mounted), cabinets Community RS 320, Joe's 18 inch PRO, PAS 3-way time align, E V 3 way wedges, amplification Crown M-600, Micro Tech 1000, DC-300 A, 150-A, microphones: SM58, SM57, ATM 41, PL 6, AKG D-12, PE-5 EQ, music equipment Yamaha G-100 II G-100, Fender Rhodes piano, Prophet-5, vehicles Ford F-700 (18-foot w/ramp).

Services Available: We rent components to full systems. Roadies and engineers supplied. Band equipment transported. If we don't have it we can get it. We specialize in live music and full system rentals. Our engineers work closely with each customer's artistic requirements. Day, week and month rentals.

RCNY MUST ROCK PRODUCTIONS
Sound Reinf.
 167 W. 81st St. Ste. 5-C, New York, NY 10024
 (212) 659-2727
 Contact: Ivan Rodriguez



RECORD PLANT STUDIOS
 New York, NY

RECORD PLANT STUDIOS
Audio Recording
 321 W 44th St., New York, NY 10036
 (212) 581-6505

Contact: Kooster McAllister, Mitch Plotkin
Equipment: Console 48 input, 32 bus custom Trident Series 80 Tape machine (2) Ampex MM1200, Ampex ATR 102 2 track and 4 track. Monitors: UREI 813, Yamaha NS 10, B&W DM100, ROR Monitor amp Bryston 4E, Crown DC300A Inboard (2) UREI 1176, (2) dbx 160, (2) dbx 160X, Lexicon PCM60, Yamaha REV7, (11) custom API distribution amplifiers, Sony 22 inch monitor, Video Humbuck coil, isolated video and code/sync patchbay w/tie lines. Outboard: extensive selection of outboard is available from our studio. Input box: 56 input 3-way splitter w/Jenison JE-MB-D transformers, 12 channel line level aux. box with (3) video lines. Main snake: 500-foot Belden 56 mic, 12 line, 3 video Microphones Neumann, AKG, Sony, Beyer, Shure, E-V Misc. Sony AVC 1400 video camera, Chaos Audio intercom, wide assortment of mic stands, 6 and 12 channel sub snakes.

Services Available: In the last year this truck has provided audio for Live Aid, Farm Aid, *Sunday in the Park with George* (Showtime), the *Martin Luther King Special* with Stevie Wonder and Bob Dylan (NBC) to name a few. The truck is currently involved with Columbia Pictures shooting *Ishitar* starring Dustin Hoffman and Warren Beatty. From video and film, to live satellite broadcasts, all can be handled with ease. With four independent auxiliary snake systems and a comprehensive video and code/sync patch bay, combined with our custom API line distribution network, signal quality is kept at the highest possible standards throughout.

RECORDINGS
Audio Recording
 336 Belmont St., Watertown, MA 02172
 (617) 926-0546
 Contact: Sam Negri

REDLINE AUDIO
Sound Reinf., Lights, Rentals
 664 Manor Rd., Staten Island, NY 10314
 (718) 761-2440
 Contact: Stephen Anagnostis

REEL PRODUCTIONS
Audio Recording
 P.O. Box 427, Allston, MA 02134
 (617) 576-2872
 Contact: Ted Evans

REELS ON WHEELS, INC.
Audio Recording
 RD #2 Pudding St., Carmel, NY 10512
 (914) 225-1837
 Contact: Chris Cassone

PHIL REIGH SOUND
Sound Reinf.
 814 E. 5th St. Bellwood, PA 16617
 (814) 742-8291
 Contact: Phil Reigh

REL SOUND MUSIC STUDIO
Sound Reinf., Audio Recording
 144 Fenner St., Fall River, MA 02724
 (617) 672-6695
 Contact: Robert E. Levesque



REMOTE RECORDING SERVICES, INC.
 Monsey, NY

REMOTE RECORDING SERVICES, INC.
Sound Reinf., Rentals, Audio & Video Recording
 20 Kennedy Parkway, Monsey, NY 10952
 (914) 425-8569

Contact: David and Dusty Hewitt, Phil Gitomer
Equipment: 35-foot Peterbilt tractor van, 44 x 32 API mixing console (96 input capability), (2) Ampex 1200 tape recorders, (3) Bryston 4B an ps, Crown D-150 Modified Westlake speakers w/TAD drivers, Yamaha NS 10 speakers, JEL 4411, Auratones. Outboard equipment available includes UREI limiters, Lexicon and Ursa reverbs, custom API distribution amplifiers. There are color and black & white CC monitors, the Sony 7610 digital processor is also available.

Services Available: Remote Recording Services offers many services: remote audio production on a national and international basis. Consulting services and engineering services are available. We also offer portable remote facilities for remote locations. We specialize in the Sony 3324 and 1610 digital systems for remote recordings. Credits: Remote Recording Services was the audio consulting firm for Live Aid, Prince's tour last year, and most recently we provided the audio for the Tribute to Martin Luther King, Jr.

RETRAC PRODUCTIONS
Sound Reinf., Lights
 Box 694, Burlington, VT 05402
 (802) 862-2797
 Contact: Jonathan Carter

RHAPSODY RECORDING
Audio & Video Recording
 P.O. Box 3692, Washington, DC 20007
 Contact: Alphonso Bennett

RIEDEL AUDIO SERVICES
Sound Reinf., Audio Recording
 109 Commack Rd., Islip, NY 11751
 (516) 277-9418
 Contact: Rich Riedel

RLA INTERNATIONAL, LTD.
Sound Reinf.
 38-11 29th St., Long Island City, NY 11101
 (718) 706-0766
 Contact: Richard F. Long

ROADSHOW
Sound Reinf., Lights, Rentals
 900 Old Liverpool Rd., Liverpool, NY 13088
 (315) 479-8524
 Contact: Lloyd Ales

ROAR PRODUCTIONS INC.
Audio Recording
 6655-H Dobbins Rd., Columbia, MD 21045
 (301) 596-0600
 Contact: Steven Rosch

ROCK SYSTEMS AUDIO
Sound Reinf.
 29 Werman Ct., Plainview, NY 11803
 (516) 454-8008
 Contact: Joseph Light

ROCKIN ROBIN SOUND & LIGHTING
Sound Reinf., Lights, Staging, Rentals,
Audio & Video Recording
 351 Dersam St., Port Vue, PA 15133
 (412) 673-4678
 Contact: Chuck Gilchrist

ROCKS VILLAGE RECORDING
Audio Recording
 77 Old Amesburg Line Rd., Haverhill, MA 01830
 (617) 372-8866
 Contact: Mo'g Daley, Tom Daley

ROSNER CUSTOM SOUND INC.
Sound Reinf.
 11-38 31 Ave., Long Island City, NY 11106
 (718) 726-5600
 Contact: Alex Rosner

RTM AUDIO
Sound Reinf.
 55 3rd Ave., Garwood, NJ 07027
 (201) 789-9352
 Contact: Tom Mathews

RTM SOUND
Sound Reinf., Lights
 26 Sun St., Enfield, CT 06082
 (203) 749-7753
 Contact: Tim Kelley

RTS SUPPLIES & RECORDING
Sound Reinf., Audio Recording
 2804 Erie St. S.E., Washington, DC 20020
 (202) 584-9207
 Contact: Bob Altman

SCAVENGER SOUND INC.
Sound Reinf., Lights, Staging, Rentals
 1130 Inner Circle, Baltimore, MD 21225
 (301) 355-1199
 Contact: John Harding

SCOOP AUDIO/VISUAL
Sound Reinf., Lights
 Union Rm 254, Stony Brook, NY 11794
 (516) 246-3316
 Contact: C.J. Herman

SEE FACTOR INDUSTRY INC.
Sound Reinf., Lights
 37-11 30th St., Long Island City, NY 11101
 (718) 784-4200
 Contact: Mike Sinclair

SELECT SOUND RECORDING STUDIO
Audio Recording
 2315 Elmwood Ave., Kenmore, NY 14217
 (716) 873-2717
 Contact: Chuck Mandrell

SHANGRILA SOUND
Sound Reinf., Lights
 625 Berdan Ave., Wayne, NJ 07470
 (201) 694-7867
 Contact: Jeff D. Windwer

SHEFFIELD AUDIO-VIDEO PRODUCTIONS
Audio & Video Recording
 13816 Sunnybrook Rd., Phoenix, MD 21131
 (301) 628-7260
 Contact: Richard Van Horn

Equipment: 30 foot custom diesel Mack truck (heated and air conditioned for comfort), Leibert computer power regulator, spacious oak and carpet control room, Trident Series 80 and Amek consoles, (2) Sony PCM 3324 digital 24 track (2) Otari MTR 90 24 track, (2) Technics cassette decks, UREI 811B and Yamaha NS 10 monitors, Shure, Sony, Beyers, AKG, Crown PZM, Sennheiser and Neumann microphones, Lexicon 200 and Lexicon Prime Time II reverb and delays; (2) UREI 1176, (2) dbx 160, (2) dbx 160X, (4) Valley People Dyna-Mites, (2) Orban parametric equalizers, BTX Cypher time code generator/router/inserter, RTS Communications and closed circuit video system, 200 foot of 52 pair audio snake, 48 channels of Jensen Transformer isolated mic splitters and 200 foot main power cable. Additional power and audio cable available if needed.
Services Available: Multi-track digital recording, audio for video. Credits: PBS New Year's Eve jazz special, Mr.

REMOTE RECORDING and SOUND REINFORCEMENT



NORTHEAST



SHEFFIELD AUDIO-VIDEO PRODUCTIONS
 Phoenix, MD

Mister MTV special, National Symphony, Ella Fitzgerald and Oscar Peterson, and others. Services: In-house pack ages with SSL 4000E and video post production.

SHOESTRING STUDIO
Sound Reinf., Audio Recording
 Belchertown, MA 01007
 (413) 323-4930
 Contact: Russ Annis

SIRIUS SOUND
Sound Reinf., Rentals
 71 Summer St., Claremont, NH 03743
 (603) 543-3712
 Contact: Brian Mitchell

S K SOUND
Sound Reinf., Lights, Rentals
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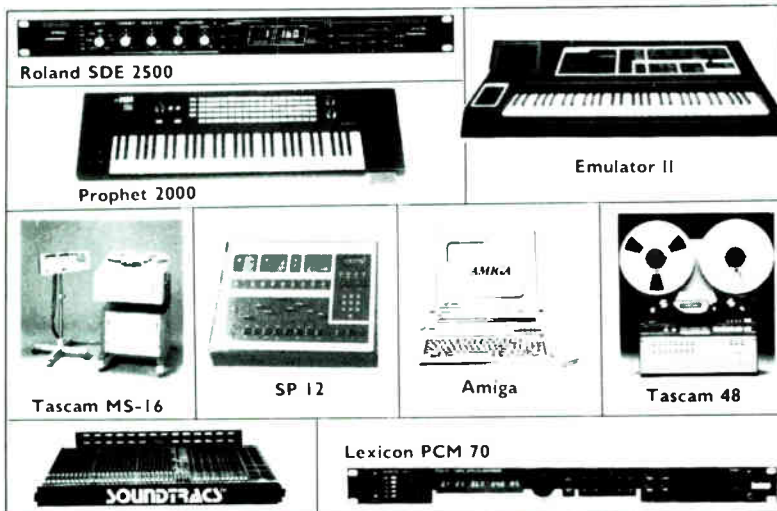
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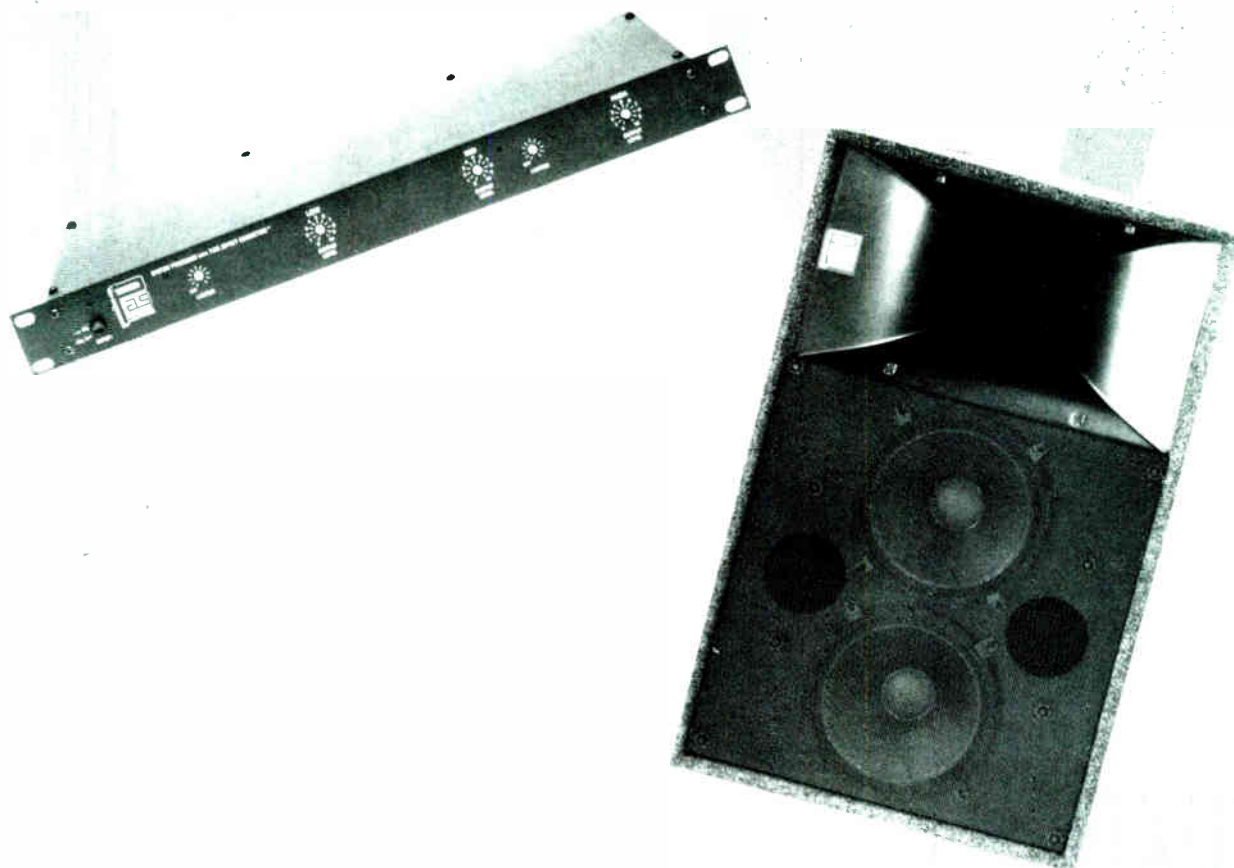
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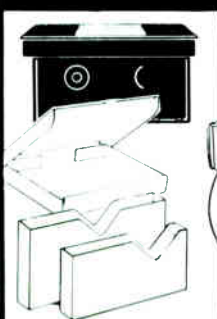
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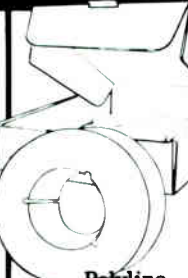
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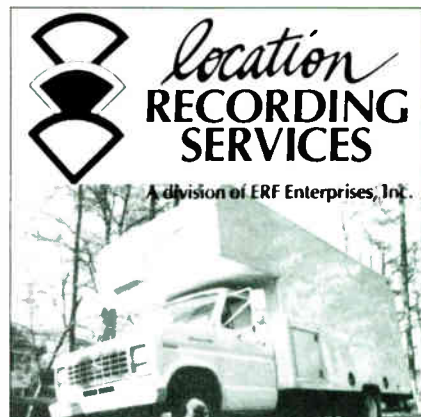
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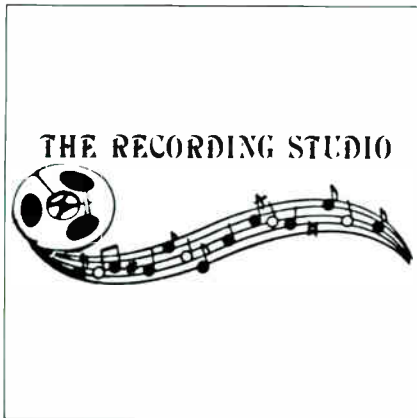
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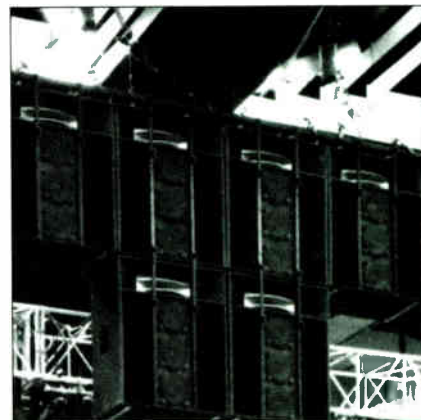
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—CONTINUED FROM PAGE 49

architectures, which limit the mixing engineer to choices presented as a small group of "factory presets," has no place in digital design.

In a mature digital architecture, there should be only two sets of restrictions—those imposed by the amount of processing power available, and those inherent in the imagination of the individual operating the system. "Devices" such as digital equalizers, compressors or delay treatments should accommodate user modification. There should be no restrictions on the creation of signal paths or the assignment of devices to any desired point in any signal path—with one set of exceptions.

Those exceptions are instances in which the operator's request would produce a clearly unintended circumstance, such as feeding an output back to its input and sending the resulting howl to all the headphones. If properly implemented, such safeguards actually encourage experimentation rather than restricting it. They are a vital part of a guarantee that states "Play around as much as you want—infinite combinations are available to you. If you happen to stumble on one that would create a disaster, don't worry. All such states are automatically disallowed, and requests for them will result only in an error message."

While it is relatively easy to define disallowed states in large-scale digital devices such as generating plants ("never open valve A when valve B is closed") or flight simulators ("wheels down before landing"), audio consoles are of an entirely different nature. Their design must satisfy the curiosity of their operators, whose natural inclination is to improvise—to break the rules.

Such design requires more than a high level of experience and facility with computers, and more than a keen understanding about audio consoles and studio computers. It requires a new kind of interdisciplinary specialization, where both sets of knowledge are combined with an intuitive feel for the artistic possibilities that this specific marriage should allow. Developing that feel takes more than money, it takes effort and time. Fortunately, the future that it will create shows every sign of being well worth the wait.

Of course, all of this potential is worthless if the interface between the human user and the audio processor is difficult to understand, operationally inefficient or both. The fascinating topic of Controls and Displays for the Future of Audio Console Design is discussed in the third and final part of the SSL Report in next month's *Mix* magazine.

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—FROM PAGE 87, REMOTE RECORDING

hot blues label, Alligator Records, for whom Cotton was recording. As the only 24-track remote in Chicago, Metro Mobile was a logical choice for Alligator boss Bruce Iglauer and his chief engineer, Streeterville's Justin Niebank. The album was culled from three consecutive nights at Biddy Mulligan's, a top Chicago night spot.

"I've recorded at Mulligan's about 20 times before, so I really have the place down pretty well," comments Powell. "We know how to fly our cables above the floor in a certain way and we have little mic flanges for the audience mics already installed there because of all the work I do there for WXRT radio. It really helps a lot to know the room you're recording in before you go in. There are a lot fewer surprises that way."

Through the years, Powell has learned how to work with the room's particular idiosyncracies. "Normally in a club environment like that, you'd want to put your audience mics midway back in the middle," Powell says, "but there, the bar is right in front of the stage not very far back and you can hear the phone ringing and all this other noise, so we tend to mic farther back where the energy is always a little crazier."

The engineers also had to deal with

miking Cotton's band—which includes a loud horn section—in such a way that their parts wouldn't bleed through onto the others'. They solved this potential problem by using directional Sennheiser 441s on the horns. "With those, you're either on the mic or off."

Still, with all the preparation, the recording was not without its problems. The first set the first night was marred by "some high frequency hash coming off a Yamaha keyboard that was modulating with the bias circuit on the 24-track," according to Powell, and Cotton, who was quite nervous about the recording, kept using his harmonica mic for vocals and vice versa. "But we figured both of those out without too much problem and once the band really settled into a groove there was plenty of good stuff for the album. The recording is real clean—in fact, someone complained that there was actually too much isolation—not enough bleed—but I think that's a compliment. You can always put some of that back with digital reverb and all."

The album (*Live from Chicago*) was mixed by Niebank on one of Streeterville's SSLs and released by Alligator in mid-April. "There's definitely something special about capturing a great blues performance," Powell enthuses, "and this was one of the best we've done in a long time."

John Moran Digital Services

Houston, Texas

For sheer on-the-job trauma, John Moran's is the tale of woe to beat. His Digital Services was contracted to handle the audio end of the major event of the Texas Sesquicentennial celebration, a massive free outdoor concert featuring Willie Nelson and the Houston Symphony (playing separate sets and together) in that city's beautiful San Jacinto Park. Sounds like it would be a blast, right? Well, yes—up to a point.

"Have you ever tried to mic an 80-plus piece symphony orchestra outdoors, without a shell on a coastal prairie with the wind blowing?" asks Moran good naturedly. He is surprisingly calm—chalk that up to a few well-earned days of rest in the resort area of Galveston immediately following the event. "Generally we like to mic symphonies pretty minimally, just get a few well-placed stereo pairs up there, but for this we used 32 mics on the symphony alone. We did manage to sub those down in the mix to the equivalent of about four stereo groups, but it was certainly a lot different than what you'd encounter working in a symphony hall, to say the least."

The sheer logistics involved in this undertaking would be enough to daunt lesser men. Digital Services' truck was parked some 850 feet from the stage, which meant that they had to run cables ("a lot of wire, I can assure you," Moran comments) a huge distance. "The people from Crowe's [once again, the video company of choice] were running some of their wires even longer," he adds. LD Systems brought in a huge sound reinforcement system to get the sound out to the 80,000 or so spectators on hand.

Moran's bad dream started, though, when the Houston Symphony "flatly refused to do any kind of rehearsal. 'Oh, it's in our contract that we don't play in direct sunlight,'" Moran recalls, mocking the symphony's position. "They don't want their instruments hurt by the sun or something. Well, how about spare instruments, or something so we could do some kind of a soundcheck? But no—instead they sat in their chairs while we argued with the representative from the AF of M and they got paid for sitting there doing nothing. They were supposed to rehearse at 3 p.m. and 4:30 and they just squandered it all away doing nothing. It was the least professional thing I've ever encountered, and it's my understanding it's not the first time the Houston Symphony has pulled this maneuver. Needless to say, I was not pleased about the notion of hitting the air with 32 mics that you

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don't know anything about except that when you scratch 'em you get signal back. Willie Nelson wanted to rehearse with them, too, but they just would not bend, so everyone went into the show completely cold."

In the end, of course, the show went quite smoothly. Mixer John Lehman had the symphony's sound in shape by the middle of the first piece and their eventual pairing with Nelson was as impressive as everyone had hoped. "It could have been a small nightmare," says Moran. "The fact that it worked out as well as it did can be directly attributed to the technical expertise of the crews involved. Everyone kept cool and did what they had to do. Our job, in a way, is to do what we do and be transparent. Nobody should know we're there. And I think we achieve that most of the time."

Now if he could just make the Houston Symphony transparent so they disappear...

Phil Edwards

Phil Edwards Remote Recording
Hayward, California

Let's close this article on an up note by telling a story where everything went just about perfectly. ("Fairy tales can come true/It can happen to you...") Recently, Phil Edwards, who runs one of the leading remote businesses in the San Francisco Bay Area, recently worked the kind of job an engineer dreams of: a cooperative band in a familiar venue for a faithful client—Woody Herman's big band at the Great American Music Hall (in SF) for the Concord Jazz label.

Edwards has worked at the Music Hall numerous times through the years, so he's very familiar with the room's peculiarities and, even more importantly, with the house's sound mixer and the club's equipment. The afternoon before the show, "We got a full two hour rehearsal, which is practically unheard of," Edwards says. "Usually, if you get 15 minutes with a group you're doing great. A lot of more established musicians just won't do soundchecks, but here the average age is about 25 and they're really into their music and they want it to sound great, so they'll do anything for you."

"The longer I'm in this business," he continues, "the more I appreciate the value of a soundcheck. It's not like you can't do something on the fly, but why should you have to 'concede' the first two songs or so to getting the sound right? We did a recording for a major jazz group a while ago where they refused to do a soundcheck and it was in a club I'd never worked in before. We'd worked with the band before, so we miked them the way we normally did. But about three notes

into the show I realized that we had a disaster on our hands. The PA sounded atrocious and there was bass just everywhere. The worst thing was that there was *nothing* we could do about it. That sort of situation usually doesn't happen if you get that soundcheck."

Having two hours with Herman's band allowed Edwards and company to anticipate dynamic shifts in the music during the performance and make sure everything was miked properly. "For a large group like this, we'll normally assign the tracks in stereo groups, but with extra mics for solos by the trumpets or 'bones. The saxes each get individual mics because the players usually play more than one reed and there are strange combina-

tions where if you were miking them in pairs you'd lose one or the other a bit. You do a lot of interior mixing on a band like this, and that's another reason preparation is important."

Edwards used a wide variety of mics for the Herman date: U87s on the horns; 421s on the reeds; 451s, 421s and SM56s on the drums; and, a particular favorite of Edwards', the C-Ducer on the piano. "I first used one about two years ago and I was really impressed. It's not the kind of thing you'd want to use on solo piano, but for a group like this one, where the piano is more part of a section than the dominant instrument, the C-Ducer is phenomenal. You get great isolation from it." ■

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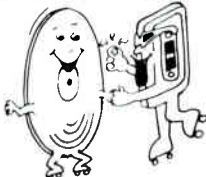
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—CONTINUED FROM PAGE 12

trois. Assisting the session was *Jim Bartz*. . . At *United Sound Systems* in Detroit, the legendary *Four Tops* completed work on a new album for Motown Records in studio A. Engineering was handled by *Tony Peluso*, with *Mike Iacopelli* and *Frank "Cornbread" Corn, Jr.* as assistants. . . Gospel singer/saxophonist *Arthur Scales* worked on his current album project with producer *Jun Mhoon* at *Tone Zone Recording* in Chicago. Also contributing their talent to the project were producer *Ron Scott* and Tone Zone engineer *Roger Heiss*. . . Music tracks for *Mac Loving's* new single were recorded at *ARS Recording Studio* in Alsip, IL. Engineering the tracks was *Harry Brotman*. . . At *Studio A*, Dearborn Heights, MI, Warner Bros. recording artist *Earl Klugh* layed down rhythm tracks for his upcoming self-produced album with *Warren Woods* engineering, assisted by *Jim Romeo*. . . In Windsor, Ontario, *Polaris Recording* has finished tracks for Detroit jazz pianist *Andrea Cheolas*, upcoming LP and French singer *Richard Bastien's* new single. Both projects were produced by *Tom Borshuk* and engineered by *Chuck Reynolds* and *Mike Sponarski*. . . *Toby Redd* has finished recording their debut LP at *Steller Sound* in Sterling Hgts., MI, for Nempor CBS, produced and engineered by *Gary Spaniola*; and *Ready for the World* has just started recording their second LP for MCA Records, co-produced and engineered by *Spaniola*. . . *Kim Mitchell* mixed his self-produced new album at *Andre Perry's Le*

Studio in Morin Heights, Quebec. *Paul Northfield* engineered the album, *Shaking Like a Human Being*, to be released in June on *Alert Records*. . .

STUDIO NEWS

Millbrook Sound Studios (Millbrook, NY) became the first studio in the northeast to install the new *Tannoy SFM* double 15-inch dual concentric studio monitors with sync-source crossover coupled to the new *Tannoy SR840* class A MOSFET power amplifier. Other recent additions include *Tannoy NFM-8* near field monitors, *Klark-Teknik's DN780* digital reverb, two *Lexicon PCM60s*, and more. . . *Verbatim Recording Studio* is the name of a new 8-track facility in River Edge, NJ. Specializing in synthesizer and computer recording, *V.R.S.* has been designed for pre-pro, production work, and artists who need to work within a tight budget. For rates and further information, contact *Lawrence J. Cullen* at (201) 262-8255. . . *ICE Associates, Inc.* of Bala Cynwyd, PA installed a second complete sync-lock system to lock their multi-track audio tape recorder to video. . . *Theta Sound Studio* in L.A. is now 16-track. It has added the new *Tascam MS-16* one-inch 16-track recorder with 16 channels of dbx noise reduction and a full feature Autolocator unit. Also joining the 8-, 4-, 2-track line-up are *AKGs* tube mic, *Yamaha REV7* and *Roland SRV-2000* digital reverbs, *Korg sa.mple/de-*

lay, and more. . . *Westec Audio* (NYC) has recently completed the installation of the recording studio at the *LaGuardia High School for the Performing Arts*. . . At *Digitrax Studios*, (Buford, GA) *Original Sin*, an Atlanta-based band, finished final tracks for their upcoming EP. The session was engineered by *Lee Day*, produced by *Ricki K. Atha*. . . *ARS Recording Studio* in Alsip, IL, has recently installed a keyboard section to its control room. Consisting of: *Yamaha DX7*, *TX7*, *Ensoniq Mirage*, *Casio CZ101*, *Roland Planet-S*, *360 Systems MIDI* bass, *Linn Sequencer 32-track MIDI* recorder and *Linn-Drum* drum machine. . . *Digital Music Products* (DMP), the Stamford, CT-based audiophile CD label has installed a second *X-80* Digital Master Recorder. . . *Laser Edit*, the Burbank, CA-based post-production company, has opened a sixth laser disk editing room featuring the *Spectra Image* editing system with dual-headed laser disk players. . . *Toys in the Attic* (San Francisco, CA) has expanded and relocated its studio facilities to *Oakland, CA*. The move was made primarily to accommodate pre-production for *The Big Picture*, *Windham Hill* recording artist *Russel Walder's* newest project. Recent acquisitions include a *Yamaha DX7*, *Oberheim Xpander*, *Sequential Prophet 2000* sampler, *Total Music* software, and a *Ramsa 8118* console, all from *AIC Pro Audio* (Concord, CA). . . After nine years as sole engineer at the studio, *Jerry Soto* of *Soto Sound* (Evanston, IL) has hired an additional staff engineer—*Bruce Gomez*.

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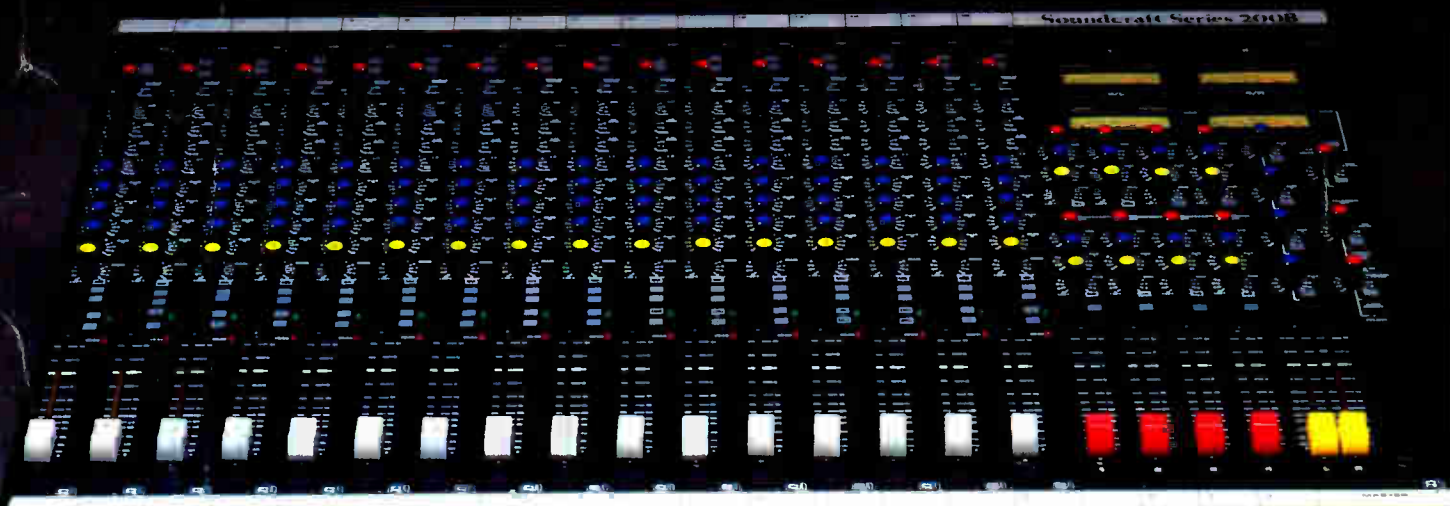
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