Control Room Design • Bobby McFerrin: The Human Sampler

MIX

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AUSTRALIAN RECORDING: YESTERDAY AND TODAY

INTERVIEWS: SONY'S ROGER LAGADEC SSL'S COLIN SANDERS

THE RECORDING INDUSTRY MAGAZINE

Inside Lucasfilm's New Recording Complex

Directory: Studio Designers & Suppliers

Twenty reas
WES

Westar Outperforms That Well-Known Console.

Compare features, specifications, sonic performance and dynamic automation options, and you'll agree. Exclusive features are: Fully parametric EQ on all 4 bands, eight echo/cue sends, dual stereo mix buses, 60 segment LED meters with spectrum analyzer, up to 64 track monitor, from 20 to 60 inputs, field expandable frame, and three levels of automation options. And excellence in performance: Transformerless +28dBm outputs, EIN at −129dBm, Output noise at −86dB, IM distortion at 0.02% with VCAs, Crosstalk at −80dB, Wide band frequency response and high RF immunity.

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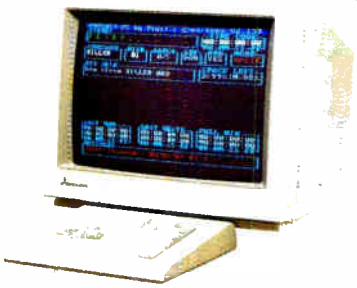
The Westar is a totally modular console using airframe design concepts for strength and rigidity. Individual frame sections are in groups of 8 I/O modules, with plug-in frame wiring for true field expandability. New sophisticated limiter/compressor/gate modules may be fitted, wired either in-line with the input module or peripheral. Plug in interchangeable equalizers and preamplifiers in each I/O module give instant user selectability and allow the addition of new technology at any time.

Compumix PC Hard Disk Automation.

Compumix PC is a powerful and technically advanced automation system, providing storage on floppy diskettes of an unlimited number of mixes and off line editing of mix data. The Compumix PC comes complete with IBM XT compatible PC (with Dual Floppy and 20 MB Hard Disk Drives), Mitsubishi 13″ color graphics monitor, custom and standard keyboard, and all cables and software. Compumix PC is probably the most cost-effective high-performance

ns to choose TAR

automation system available today, and a perfect fit for Westar. As a bonus. the new AMP (Assistant Mixer Program) software provides the mixing engineer and the producer with time saving and practical features like track sheets, telephone auto dialing, timers, and quick-find reference tables.



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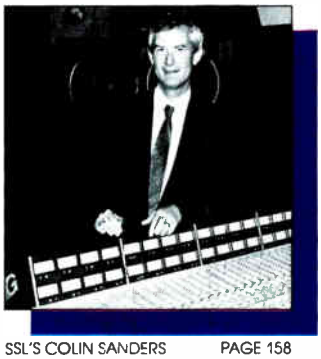

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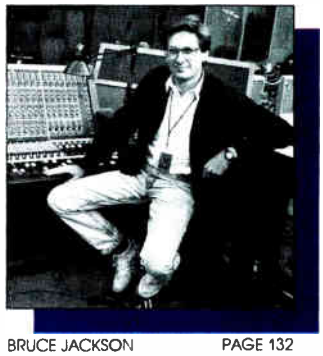

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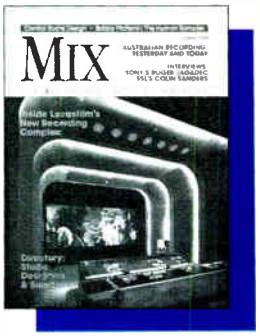
FEATURES

COLUMNS



Cover: The final mix studio at Lucasfilm's Skywalker Ranch in Marin County features a customized SSL 5000 Series console with 88 automated inputs and an additional 24-input side mixer. The room is designed to meet NC-20 criteria and comfortably seats 20. Acoustical engineering was done by Charles M. Salter Associates, and the architects were Backen Arrigoni & Ross, Inc. **Photo:** Douglas Salin

DEPARTMENTS

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BPA

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FROM THE EDITOR

There appears to be no end to the number of CD configurations being launched these days. And while it may seem like a confusing mess of competing formats, the CD itself is coming out the winner. One way or another, each of these entries employs a CD drive and many of its universal parameters.

One of the most significant introductions to date, CD+MIDI, was unveiled by Warner New Media at the June Consumer Electronics Show in Chicago. This was an upgrade to the CD+G (for Graphics) format that they had shown last January at the Las Vegas CES show.

Warner New Media is headed up by Stan Cornyn, the Warner Records whiz, who you may remember as an early evangelist for CD-I. His new iteration of the CD can now include up to 16 channels of MIDI information (stored along with graphics in the subcode area of the disc), as well as a full-length album of digital quality audio.

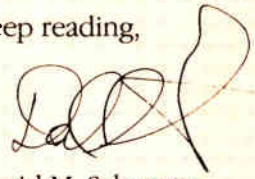
According to Cornyn, "Turning a CD+G player or a Graphics-equipped CD-Video 'Combi' player into a CD+G+M machine involves a very small change—adding a connection which increases the manufacturing cost by about $2."

While just a handful of partners have so far signed up for CD+MIDI, they include such heavyweights as Apple Computer, Coda Music Software, Ensoniq, JVC and Warner/Chappell Music.

Putting a little imagination together with these alliances, it's easy to see why Warner New Media is excited about this development. This format will allow listeners to do such things as relocate instruments or voices in the playback mix, change the sound of the instruments by revoicing the parts in the arrangement with the listener's own MIDI equipment, or change tempos and keys. CD+MIDI allows the user to print out sheet music from a recording, resequence a song structure, or repeat sections for rehearsal or music instruction.

We are in a fascinating window of time, watching industry professionals building and betting their careers on the twists and turns of an evolving storage device. How big will it all get, and when will it get there? If you know that one, please get in touch so we can sign you up as our investment counselor.

Keep reading,



David M. Schwartz
Editor-in-Chief

CURRENT

Major CD Development

Warner New Media recently announced the development of CD+MIDI, a system with broad applications for the musical instrument and computer industries, as well as the consumer electronics hardware and software markets.

In addition to CD-quality digital audio, CD+MIDI can provide MIDI data *and* graphics information, both of which can be encoded onto the standard CD subcode channel. By using MIDI compact discs and a CD player, the user can not only listen to music, but *make* music and manipulate music on playback.

TEC Hall of Famers Announced

Les Paul and the late Bob Liftin have been elected to the newly established TEC Awards Hall of Fame. The Hall of Fame Award was created by Mix Publications as part of the TEC Awards to recognize individuals whose careers have exemplified the spirit of creative and technical excellence in this field. Paul and Liftin will be honored during the TEC Awards ceremony on November 3 at the Biltmore in Los Angeles.

S.F. Music Fair

"High Technology in Music" is the focus of the Third Annual Music Fair, presented by SF/NARAS on September 10-11 at San Francisco State University's Creative Arts Building. Leading designers, manufacturers, dealers and users of advanced music-making systems will be on hand to share their experiences and insights into this ever-changing area.

Exhibitors include Ampex, Gibson Guitars, E-mu Systems, Meyer Sound, Panasonic, Yamaha, Peavey and WaveFrame Corp. Three centrally located theaters will offer major name entertainment, panel discussions on controversial industry topics, workshops and demonstrations. For more information, call (415) 681-1170.

NAB Calls for a United Front

At the Electronic Industries Association's annual convention, NAB president and CEO Edward O. Fritts called on television receiver suppliers to join forces with NAB to help ensure a universally compatible standard for advanced TV systems.

Advanced television (ATV) "is the next giant step in TV technology, and it's right around the corner," said Fritts. ATV systems —HDTV among them—will provide wide-screen pictures with sharper resolution than that of present receivers and with CD-quality stereo sound.

Two factors are imperative, stated Fritts, for ATV's consumer acceptance: everyone must use the same, compatible ATV standard, which the Federal Communications Commission should establish; and the FCC "must take all steps within its discretionary powers to ensure that the spectrum needs of free over-the-air broadcast consumers are given the Commission's highest priority."

According to Fritts, the NAB has commissioned a firm to come up with the "ultimate radio receiver," to be unveiled at NAB's radio convention this fall. It will incorporate both AM and FM stereo, with the new FMX system for enhancing existing FM stereo signals, and with new standards for AM audio reception.

Interactive Entertainment

The first conference to focus on interactive entertainment, Inter-Tainment '88, is slated for October 24-25 at the Vista Hotel in New York City.

The conference, co-sponsored by Alexander & Associates and *Twin* magazine, will consist of 25 separate sessions focusing on new, interactive entertainment software. Attendees will be given a broad perspective on the marketing, distribution, financing and production techniques and issues critical to succeeding in the business, according to program director Michael Masconi.

"The common thread throughout all of these technologies and applications," says Howard Ballon of Alexander & Associates, "is entertainment. How can we meet the challenge of reaching and exciting consumers with a new category of products? How can we give consumers the entertainment experiences they want?"

For more information, contact conference coordinator Sally E. Chin at Alexander & Associates, (212) 382-3929.

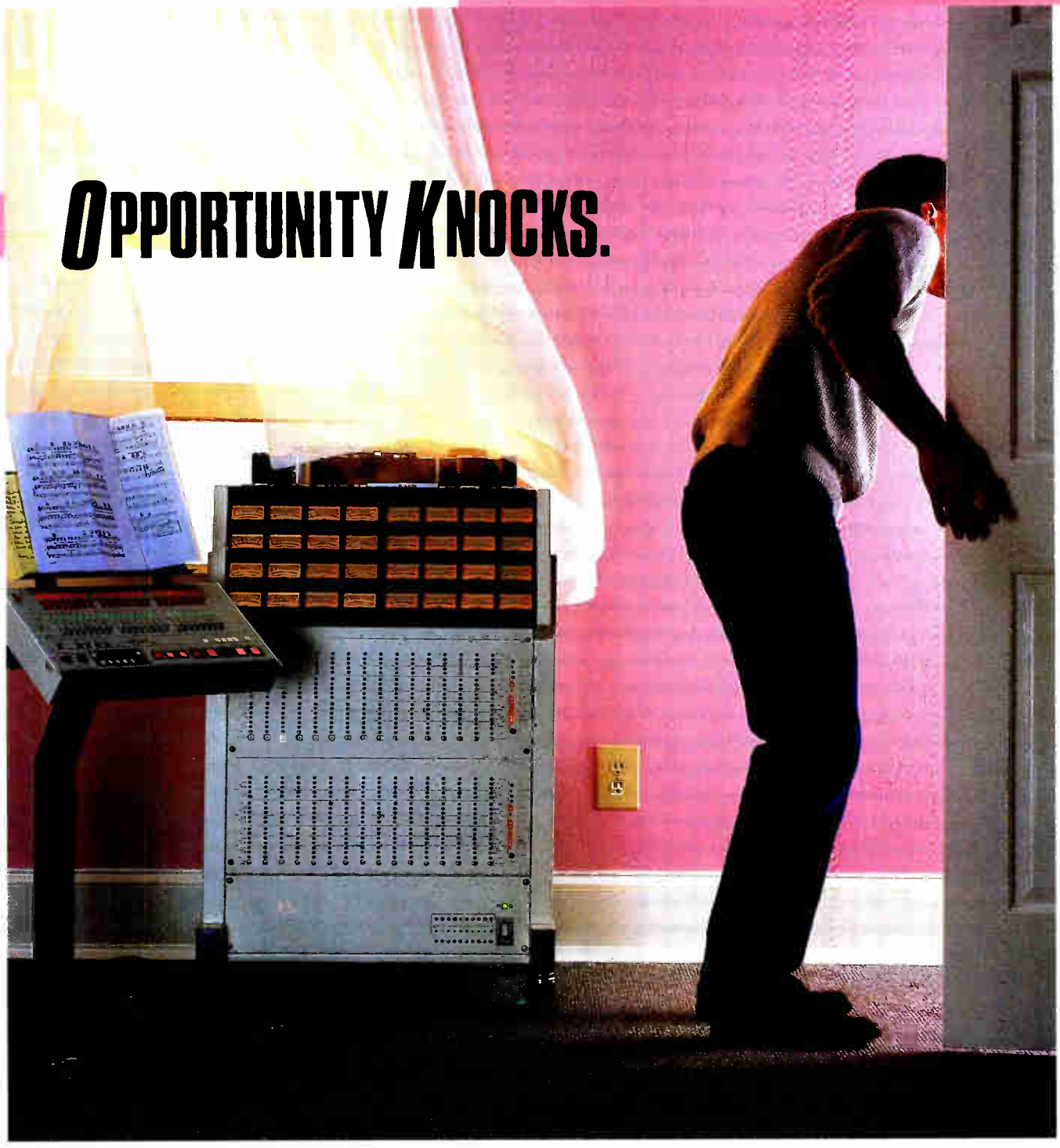
Half-Rack Standard Proposed

An ad hoc manufacturers' committee met at the recent NSCA Convention in Reno to start the process of developing a mechanical and electrical standard for the increasingly popular half-rack format ("HR") pro audio equipment.

The main goal of the HR standard is compatibility in mounting half-rack products made by different manufacturers. The secondary goal is a universal, low-voltage powering method that will allow all equipment powered in that way to be exempt from UL listing requirements, with all HR units using identical supply voltages and connections.

Participating companies include ART, Ashly Audio, Furman Sound, Rane Corporation and Symetrix. For more information, contact Jim Furman of Furman Sound, 30 Rich Street, Greenbrae, CA 94904. ■

OPPORTUNITY KNOCKS.



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INDUSTRY NOTES

Sony appointed **James Frische** as president of **Digital Audio Disc Corporation**, its Terre Haute, Indiana, compact disc manufacturing subsidiary...**Toa Electronics** named **Rick Kamlet** as national sales manager of their professional music and entertainment division ...England's **Soundtracs plc** brought in **Phil Guy** as marketing manager...**Mike Joseph** came on board at **Electro-Voice** as their pro audio market development manager...**American Interactive Media** named **Harry Jenkins** to a new position, vice-president of production services...**Bill Frazee** was promoted to vice-president/general manager at **Editel/L.A.**... **Michael Laskow** has accepted the job of general manager at **L.A. Studios**...**Terry Dean** is now vice-president of sales for **Sound Image**'s New England and mid-Atlantic states...**Otari** moved into their new U.S. headquarters at 378 Vintage Park Drive, Foster City, CA 94404, (415) 341-5900...**Ryder Sound Services** in L.A. will spend $1.5 million to expand its facilities ...**Ron Schiller** was hired by **Telex Measurements Inc.** as senior project engineer...**Klark-Teknik** appointed **Peter Cornell** as technical support manager and **Yoel (Zolli) Schwarcz** as product manager...**Keith Thomas** was promoted at **Capitol Records** to manager of electronics...**Harris Corporation** hired **Thomas Yingst** to be their vice-president/general manager of the broadcast division ...The **Walt Disney World Company** promoted **Robert Allen** to director of film and television productions...**Memory-Tech Inc.** gave **Hugh Landy** new responsibilities as senior sales VP...**Century Financial Services Group**, a national equipment leasing company that works with manufacturers, dealers, vendors and end users, has opened an office at 635 Berry Street, Ste. G, Brea, CA 92621, (714) 529-0121...**3M** presented its seventh annual "Lyra" awards to the five audio teams nominated for the Academy Award's Achievement in Sound category (*Empire of the Sun, Lethal Weapon, RoboCop, Last Emperor, Witches of Eastwick*)...**Randall Smith** was named Western regional sales manager of **FOR-A Corporation**...**California Video Sales, Inc.** opened a 23,000-square-foot sales office, demo facility and warehouse at 11261 Sunrise Park Drive, Rancho Cordova, CA 95742, (916) 638-4400...**Turbosound Ltd.** hired **Richard Frankson** as marketing manager...**Fane Acoustics** contracted with systems design consultant **Stephen Court** to develop a range of professional enclosures and monitors... **Charles M. Salter Associates**, an acoustical consulting firm, appointed **Elizabeth Cohen** as principal consultant...Simon Systems™ has incorporated in California as **Simon Systems Engineering, Inc.** ...**TekCom Corporation** hired **Michael Mueller** to work in sales ...**Selkirk Communications Group** acquired **The Magnetic North Corporation** and **The Magnetic Fax Corporation**... **Zero Corporation**, a California company that designs and manufactures enclosures and accessories for the electronics industry, has acquired **Anvil Cases**, a producer of carrying and transit cases...**Oval Window Audio** in Yarmouth, ME, appointed **Robert Gilmore** as marketing director...**Chris Cassone** was named chief engineer/producer at **Squires Productions, Inc.**, a full-service audio and video production company in White Plains, NY...**Visulux**, a producer of high-resolution visual information systems, appointed **Dr. Der-Chang Hsieh** as vice-president of engineering...**Rank Cintel, Inc.** relocated its Midwest offices to 830 E. Higgins Rd., Ste. 103, Schaumburg, IL 60173, (312) 884-0770.

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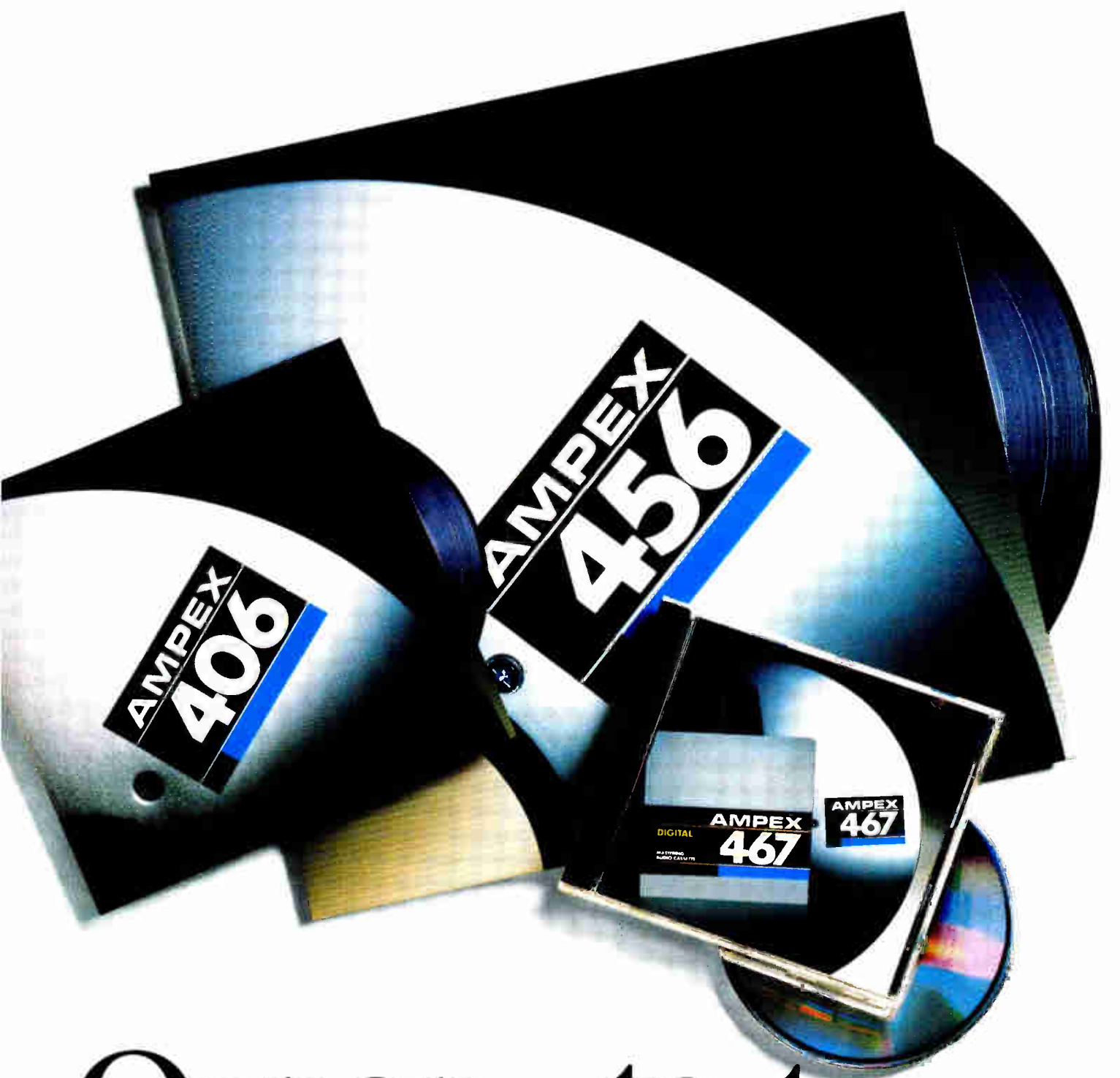

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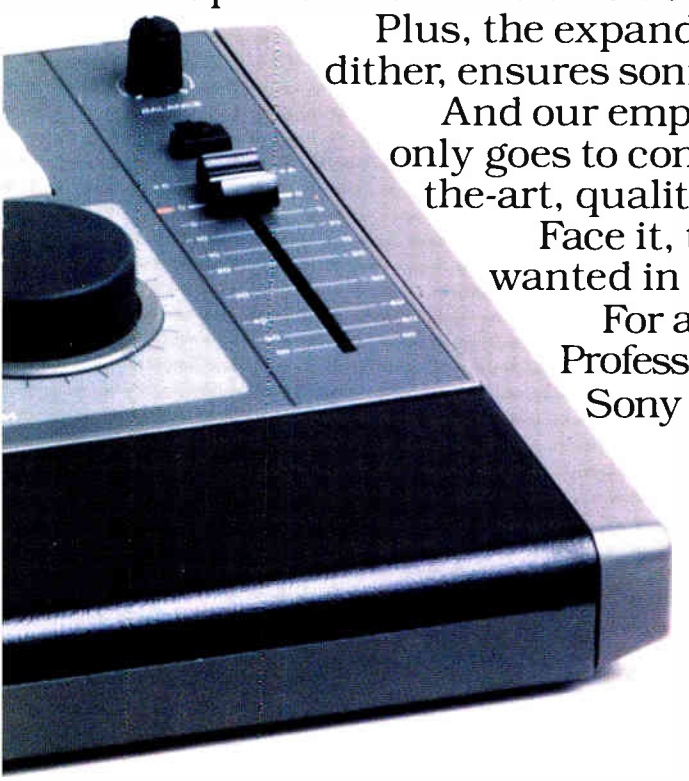

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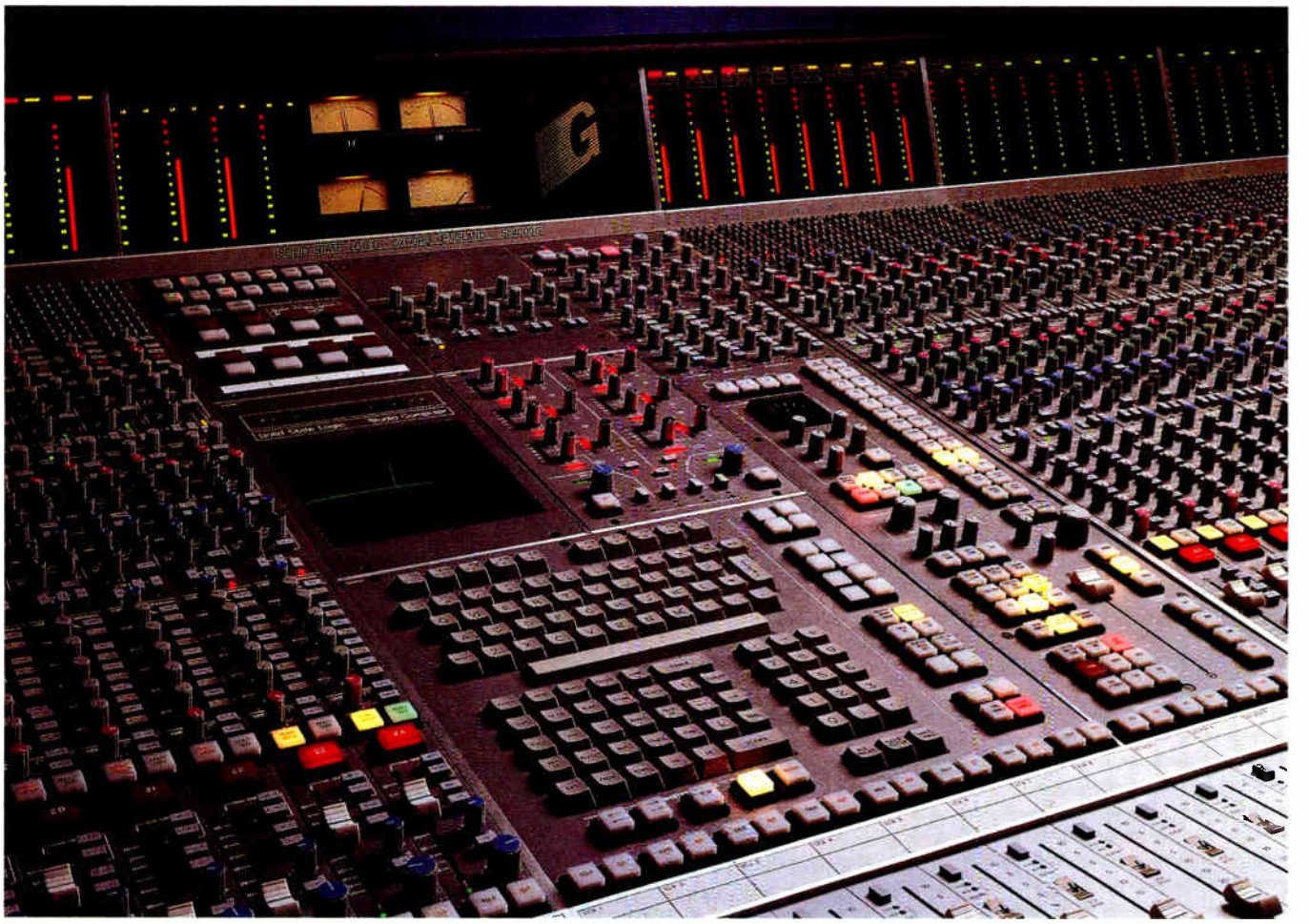

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SESSIONS
AND STUDIO NEWS

NORTHEAST

RCA-Novus artist **Peter Moffitt** has been at **Calliope Productions** in NY, cutting tracks with **Sue Fisher** at the console... Jazz horn player **Roy Nathanson** was at New York's **Sound On Sound Recording**, with **Hugo Dwyer** engineering and **Peter M. Beckerman** assisting...At **Studio 4** in Philadelphia, DJ **Cash Money** and MC **Marvelous** finished cutting their first album for Sleeping Bag Records, with **Joe "The Butcher" Nicolo** engineering ...At Jersey City, New Jersey's **Bassment Studio**, engineer/producer **Craig Bevan** has been laying tracks for a follow-up single to *Fly Tetas* by **Jose Chinga**...**Arif Mardin** has been recording several tracks for **Marc V.**'s new LP on Elektra Records at **Atlantic Studios** in New York, co-producing with **Reggie Griffin** for George Daly Productions...NYC's **39th Street Music** saw **Wayne Brathwaite**, **Barry Eastman** and **Faree Hagg** producing tracks for saxophonist **Najee**'s upcoming release on the EMI/Manhattan label, entitled *Day By Day*. **Richard Kaye**, **Steve Goldman** and **Michael Alaire** shared engineering duties, with assistance from 39th Street's **Edward Douglas**...MCA recording artists **Heavy-D and the Boyz** are in **Chung King Studio B** in NYC working on a new single from their second album. **Eddie F.** is producing and **Jay Henry** is at the console...**Nelson Diaz** is at NYC's **Power Play Studios** mixing **Dyan Buckeleu**'s new single, titled "Gotta Do." Engineering is **Norberto Cotto** with **Keith E. Jacks** assisting...**Sunday Productions** recently used **Blank Productions**' 24-track facility in Stamford, CT, for Coke International's all-music commercial featuring **Whitney Houston**...At **Acme Recording Studios** in Mamaroneck, NY, CMG recording artists, **The SOS All-Stars**, are working on their upcoming fall release, *Greetings From Mamaroneck*. Engineering on the sessions is **Rory Young**...Ontario-based **Comfort Sound** used its mobile truck to record two concerts by guitar wizard **Leo Kottke** for an upcoming PBS special. Three of the songs will be used on his next LP...NYC's newly remodeled **Evergreen Recording** has seen producer **James Bratton** in laying tracks for recording artist **Sybil**, with Evergreen's **Cassie Russell** at the console...

SOUTHEAST

Atlanta's **Head Master Studios** is currently in production with country & western singer, **T. Chad Kramer**. **Jim Hedden** is the engineer, with **Ike Eisenhuth** producing ...The **Ted Howe Ensemble** just completed work on their new album at **New Age Sight & Sound** in Atlanta. The dates were produced by **Ted Howe**, **Jim Brock** and **Bill Allgood**...MTM artist **Judy Rodman** is finishing her latest album project at **Sound Emporium** in Nashville. **Garth Fundis** is producing, with **Gary Laney** engineering...Producer **Harold Shedd** is at Nashville's **Music Mill**, working with engineers **Jim Cotton** and **Joe Scaife**, and RCA artist **K.T. Oslin** ...News from **Reflection Sound Studios** in Charlotte, NC, is that producer **Jamie Hoover** and engineer **Mark Williams** recently wrapped up mixes on some new material by **Robert Crenshaw**... **Taj Mahal**, **Sweet Honey in the Rock**, **Cephas & Wiggins** and **Doc Watson** are just a few of the performers who will be included in the album *Smithsonian Salute to Woody Guthrie and Leadbelly*, slated for release on CBS Records. The tracks were recorded at **Bias Recording** in Springfield, VA, by **Jim Robeson** and produced by **Ralph Rinzler**...Current recording projects in Fort Lauderdale's **New River Studios** include vocal overdubs for **The Everly Brothers**' new LP for PolyGram Records. The brothers are producing with assistance from **Larrie Londin**. **Ted Stein** is engineering, with **Dave Barton** and **John Portuondo** assisting...

NORTH CENTRAL

CBS recording artist **Donnie Miller** was in at **Chapman Recording Studios** in Kansas City, MO. Engineering and producing was **Jason Corsaro**, assisted by **Greg Warrell** and **Mike Frazier**...**Al Hudson & One Way** cut and digitally mixed their LP for Capitol Records and **The Disc, Ltd.**, in East Detroit, MI...In Columbus, OH, **Amerisound Studios**' jingle production company recorded spots for the Kroger national grocery chain. Created in conjunction with **Lyon Video** and **Pierce Productions**, the commercial was engineered by **Dan Green**...Veteran R&B artists **The O'Jays** have been in the studios at **Kopperhead Productions** in North Canton, OH, working on four songs for their upcoming album. **Walt Williams** of the group has been producing, with **Bruce Hensal** and **George Payne** engineering ...At Chicago's **Seagrape Recording Studios**, **Mario "Smokin'" Diaz** of **Hot Mix 5** tracked and mixed his latest Latin dance song, "Can You Feel It," with **Tommy White** engineering...

NORTHWEST

Huey Lewis & The News are finishing up the basic tracks for their new album at **Studio D Recording** in Sausalito, CA, with **Robert Missbach** engineering and **Jim "Watts" Bereecke** assisting...Eclectic San Francisco quintet **Game Theory** has returned to **CD Studios** to record tracks for their fourth Enigma/Capitol album. **Mitch Easter**, who produced the two previous releases by the band, is again at the helm, with **Gary Hobish** engineering and **Deanne Franklin** assisting... From San Francisco, **Dave Wellhausen**

Studios reports that recent album projects include **Stu Blank & His Nasty Habits** for Kingspot Records, **Russ Lake** producing, and a recent effort by popular local group, **The Phonz**...**Rumor Hazit** is currently completing work on an album at **Silver Shadow Productions** in Concord, CA. **Johnny Smoke** is engineering and producing...Producer **Alan Glass** was at **London Bridge Studios** in Seattle working on Bogey V & Atlantis, featuring pianist **Bogey Vujkov**...Across the border in Burnaby, B.C., **Sue Medley** has been working on her debut album with co-producer **John MacArthur Ellis** at **Inside Trak Studios**. **Dave Slagter** has been engineering, with assistance from **Gary Tole**... Back in San Francisco, **Alpha & Omega Studios** has completed recording **Blue Oyster Cult**'s new album, *Imaginos*, for CBS Records. The album was produced by **Sandy Pearlman**, mixed by **Steve Brown** and engineered by **Paul Mandl** ...From Novato, CA, comes word that **Bravo** is at **Calypso Recording Studio** finishing tracks for an upcoming LP. **Doug Adams** is producing, with **Michael Verchiani** engineering...**RAM** was at **Fantasy Records** in Berkeley recently, mastering a new single with **George Horn** at the controls. It's for summer release on Zebroverground Records...

SOUTHWEST

Dallas-based **Omega Audio**, now in its 15th year, recently completed remote recordings for **U2** and **Lynyrd Skynyrd** ...Austin, TX-based **Reelsound Recording Company** was in Denver with its 48-track audio truck-trailer, recording **Def Leppard**'s in-concert video and live album. The band and **Peter Mensch** produced, and the company filmed the ten-camera shoot. The 24-track recording was handled by **Malcolm Harper**, **Mason Harlow** and **Greg Klinginsmith**...Producer **Robert Sterling** was in at **Future Audio** in Dallas recently, cutting tracks and vocal overdubs for Home Sweet Home Records artist **Gary Floyd**. **John Mayfield** engineered the sessions...**Lone Star Studios** in Austin, TX, reports that **Shane Decker and the Vibrolux Cowboys** have been recording a six-song demo for MTM Music with **James Tuttle** engineering...**Soundworks Recording Studios** in Las Vegas has been busy recording **Anne Murray** for a Warner Brothers Records project, **Steve Dorff** producing... **Patrick Keel** and **Rick Rooney** have been working with **Uptown** on their updated version of "Rescue Me," due for release soon on Oak Lawn Records...

SOUTHERN CALIFORNIA

Recent activity at **Paramount Studios** in Hollywood (under new management since September 1987) has included a new album project by **Leslie Drayton** for Island Records...At Burbank's **Red Zone Studios**, former Klymaxx artist **Bernadette Cooper** is producing **Madame X** for Atlantic Records with **Gerry Brown** engineering...**Richard Elliot** of Tower of Power has finished recording and mixing tracks at **Valley Center Studios** in Van Nuys, for his upcoming solo album on Intima Records. **Allan Hirschberg** engineered with **Kevin Reeves** assisting... **Keith Olsen** has been producing **Night Ranger**'s upcoming LP on Camel/MCA at his own studio, **Goodnight LA**, in Los Angeles...Currently working at **Lion Share Recording Studios** in L.A. is **Randy Newman**, with **Mark Knopfler** producing and **Frank Wolf** engineering ...**Kris Kristofferson** has been at Hollywood's **Sunset Sound Factory**, finishing up an album of his "Greatest Hits," with **Larry Hirsch** engineering and producing ...At **Larrabee Sound** in L.A., **Ross Vanelli** and **Jeffrey Osborne** have been mixing "Can't Go Back On A Promise" by Osborne for A&M Records...**Ozzy Osbourne** has just completed an album project for CBS Records at **The Enterprise Recording Studios** in Burbank, with assistance from producer **Roy Thomas Baker**...**Skyline Recording** in Topanga Park, CA, reports that **Humberto Garcia** is finishing vocal overdubs for Spanish artist **Sante Fe**, for release on CBS International...**Burt Bacharach** is at Hollywood's **Conway Recording Studio** with engineer **Mick Guzauski** to track and mix the score for Warner Brothers' new film, *Arthur On The Rocks*, with **Chris de Burgh** contributing vocals to the title track ...Also in Hollywood, **Genetic Music** is being used by producer/composer **David Campbell** to track and mix the title song for another upcoming motion picture, *Mindgames*...**Guy Charbonneau**'s L.A.-based **Le Mobile** remote truck has been in the SF Bay Area recording a new album for **The Grateful Dead**...**Randy Meisner** and **Rick Roberts** recently joined forces on a new self-produced project at **Sound Image Studio**. **John Henning** has been at the controls...**West Side Sound** in L.A. is the site of producer **Ian Prince**'s latest project for Chrysalis, featuring artists **Elisa Fiorillo** and **Edele Bertie**...

STUDIO NEWS

White Crow Audio in Burlington, VT, has just completed installation of a GML Servo Automation System on their Neve 8068 recording console...**Livewire Audio** in Oceanport, NJ, has upgraded its facility to include a Tascam MS-16 16-track recorder, SMPTE/MIDI time code interlock and Sony PCM digital mixdown capability...**RCA Studios** in New York City has recently refurbished its Studio C and has installed a Sony MXP-3000 audio console...West Hollywood's **Summa Music Group** has opened Studio A, a new remix room and overdub studio equipped with a 64-input SSL 4000 G Series console...In other news from Hollywood, **Waves Sound Recorders** has just opened the doors on Studio E, their newest production room. The room is equipped with a Soundcraft console and MCI machines...**Timothy Powell** of **Metro-Mobile** in Glenview, IL, has just completed installation of a 50-input NEOTEK Elite console in his remote truck... **Bobby Nathan** has purchased two ADR 68K digital reverb & effects processors for his mixing suites at **Unique Recording Studios** in NYC...In Ashland, OH, **Cedarwood Recording** recently remodeled and expanded its production capabilities with the purchase of an Ampex MM-1000 16-track recorder...**Soto Sound Studio** has moved to a new 3,000-square-foot facility in Chicago and upgraded to a 16 x 8 NEOTEK Series I console...Las Vegas is the site of Nevada's newest automated multi-track facility, **N.R.S.**, which opened its doors in June. The facility includes an automated 56-input MCI console, Cipher Digital Audio editing for video, a MIDI preproduction room and four stage/rehearsal studios...**Amerisound Studios** in Columbus, OH, has relocated and upgraded its facility with the addition of a MIDI production/mix room and Tannoy SGM-1000 monitors...**Susquehanna Sound** in Northumberland, PA, has begun construction of a second production studio and MIDI room. New additions to Studio A include a Sony PCM-2500 DAT recorder and an Emulator II+...**Steven Remote** has been busy upgrading his **ASL Mobile Audio** unit. The new air-ride, turbocharged Navistar International truck includes a Sony DTC-1000ES DAT deck, a 40-channel Brooke-Siren System active splitter network with five built-in BSS direct boxes and a plethora of other equipment...

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by Ken Pohlmann

AES
REPORT ON THE SIXTH INTERNATIONAL CONFERENCE

In May 5 through 8, the Audio Engineering Society held its sixth international conference at the Stouffer Hotel in Nashville, Tennessee. As in past conferences, a single topic occupied the proceedings: 12 papers sessions were devoted to sound reinforcement and architectural acoustics. With an emphasis on education useful to the practicing professional, topics ranged from stereophonic sound reinforcement to electronic architecture, from computer-aided sound system design to new concepts in equalization and loudspeaker design. A summary of paper topics can only provide a sample of the proceedings, yet may help to convey the kind of timely information that was presented.

The conference opened with "The History of Sound Reinforcement," in which Jesse Klapholz traced the origins of the electroacoustics industry from the vacuum tube onward. Research by Western Electric, RCA and other contributors, as documented by numerous journals, forms the foundation of today's theoretical and practical work.

Papers in the second session addressed TDS (time-delay spectrometry) and its applications. In "A Short History of the TEF Revolution," Don Davis described the formulation of Richard Heyser's technology and its slow introduction to the industry as a dedicated analysis tool. As Davis noted, the advanced nature of Heyser's thought almost precluded its acceptance. In "The Impact of TDS on Instrumentation Philosophy," Gerald Stanley further described the implementation of TDS, and the digital signal synthesis and computer-based data acquisition methods the technique required and has since acted to enhance. In "Complex Time-Response Measurements Using TEF: Importance of the Functional Form Phase Shift, Part I," Peter D'Antonio and John Konnert noted that in addition to frequency response, time response is a complex, analytic signal which can be characterized by its magnitude and phase. Using TDS and the TEF analyzer, the complex time response can be explored. The authors presented a mathemetical derivation of TDS used in this application.

"The Polar Energy Time Curve" by Farrel Becker described new software for the Techron TEF analyzer which extracts accurate directional information from four or six Energy Time Curve measurements using a cardioid microphone. Unlike similar techniques using bi-directional microphones, the direction of arrival versus

Hot topics for '88: architectural acoustics & sound reinforcement, seen from an array of perspectives.

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Audio professionals everywhere are turning to the Fostex E-Series recorders for their production and post-production needs. So much so, you hear the results of their work nearly every day — in movie soundtracks, commercial and cable television shows, industrial and educational films and videos and, of course, hit records.

The E-Series features gapless "punching" so there's no blank space *after the punch-out point. Only recorders which are much more expensive offer this sophisticated function. But since you can't run a fully automated system without it, Fostex includes gapless punch-in/out as standard equipment on the E-Series.*

Also standard is a synchronizer port which will interface with all SMPTE time code based systems. When used with the Fostex synchronizer, Model 4030, you can then use our software program to perform sophisticated audio assembly editing.

Models E-8 and E-16 are multitrack recorders with built-in noise reduction.

Models E-2 and E-22 (not shown) are 2-track master recorders with a third, center channel for SMPTE time code control. This is a standard feature, *not an option. You will have complete compatibility with existing 2-track tapes, plus the ability to run computer derived edit decision lists and full automation.*

Servo control of the reels in the edit mode will help you pin-point cues and spot erase. When the pitch control is engaged, the exact percentage *of speed deviation is displayed so that when you need to re-set the control, you can do so precisely, and the real-time counter features search-to-zero even from the negative domain.*

The E-2 uses 1/4" tape at 7-1/2 & 15 Ips (15 & 30 Ips speeds are optional); the E-22 uses 1/2" tape at 15 & 30 Ips.

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So if you're looking for a professional recording instrument, there's a Fostex E-Series recorder that can help you wth two important "E" words: Efficiency and Effectiveness. The E-Series can also help you achieve the most important "E" word of all: Excellence.

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time or intensity of individual reflections is precisely displayed. "Evaluation of Room Speech Transmission Index and Modulation-Transfer Function by the Use of Time-Delay Spectrometry" by Don Keele showed how TDS can be used to determine STI and MTF as an extension of the computation of the squared impulse response of a linear passive system. Because the new technique takes into consideration the energy-time response, calculations more closely follow actual energy decay in a room.

The third session addressed the technique of stereophonic sound reinforcement in attempting to convey a spatial perspective in a theatrical presentation. "Multi-Channel and Surround-Sound Reinforcement: Past, Present, and Future" by Kyle Holbrook reviewed a number of spatial systems ranging from early 2-channel to modern multi-channel time delay systems. A tri-ambient synthesis stereo soundfield processor was introduced. "Stereo Sound Reinforcement for Assembly Spaces" by David Klepper described the use of stereo sound in large spaces such as auditoriums, theaters and churches, to accurately convey spatial perspective when people speak from several positions. A center channel, and possibly five or more channels, may be required. Abe Jacob's "Is It On, Yet?" explored the use of sound systems to impart the illusion of identifying locations of sound sources, using source localization and source-independent measurement and equalization of the loudspeaker system. "The Delta Stereophony System: A Multi-Channel Sound System to Achieve True Directionality and Depth" by Norbert Sobol proposed a new multi-channel reinforcement system based on appropriately delayed, distributed loudspeakers to re-create depth and direction perspective. This DDS principle utilizes the law of the first wavefront to use delay time differences (as opposed to intensity differences) for localization cues.

The fourth session presented papers on computer-aided sound system design. "Loudspeaker Arrays—A Computer-Assisted Method of Designing" by Thomas McCarthy described the computer implementation of the room mapping-isobar overlay method of loudspeaker array design. The room is drawn as seen by the loudspeaker, and the coverage pattern is drawn as seen by the room. John Eargle's "Recent Program Updates for CADP (Central Array Design Program)" described new refinements in this IBM PC-based program for determining coverage of loudspeaker arrays on seating planes. Intelligibility analysis is provided, as is mechanical design feature. In addition, the user is offered three choices for loudspeaker pattern simulation. "The New Generation of the PHD™ Array-Design Program" by John Prohs described a program used for design, verification or improvement of loudspeaker configurations. Flexibility in architectural factors, mapping procedures, coverage modeling, system reconfiguration, and performance prediction is provided.

"The Latest Advances in Predicting Sound System Performance in Real Spaces: Combining Intuitive User Interface with Acoustically Relevant Output" by Kenneth Jacob and Thomas Birkle presented a prediction program

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The stand-alone Direct-to-Disk is based on the same hard disk storage and proprietary processing technology that has made the Synclavier® the industry standard for reliable performance in the studio and on the road. And like the Synclavier, the Direct-to-Disk system is modular and **software updateable**. As new features become available, you upgrade simply by loading in a floppy disk.

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for sound system performance. A sound system's environment is geometrically represented, and sound system strategies may be assessed.

"Acousta-CADD™—The Next Generation of Sound System Design Software" by John Lanphere described a new graphics-based software program offering interactive analytic, predictive and visualization functions. Ray-tracing methods are linked with isobars on space floor and walls. Another Lanphere paper, "A Decision Tree for Feature Selection and Configuration of Sound System Design Software," offered an approach to designing a software package in which sorting and ranking of features and functions are provided.

The fifth session presented papers on computer control of sound systems. "CSEAS—A Computer-Aided Sound Effects System" by Masahiro Isobe and Akira Mochimaru described a computer-aided sound effects system for theaters. CSEAS controls tape recorders or other output devices to provide sound effects. "The DSP 610—A Computer-Controlled Processor for a Truly Directional Sound Reinforcement System (The Delta Stereophony System)" by Norbert Sobol presented a multi-channel delay processor which provides directionality in sound systems. Multiple delay times are computed to control input/output levels and times for sources. Charlie Richmond's "Computer-Controlled Systems in the Performing Arts" described the technical demands placed on a real-time events system and the evolution of a hardware computer-controlled audio system. "Computer Control of Complex Systems and Description of RS-422 Protocol" by Hardy Martin and Ed Young discussed techniques used in the control of audio switching and monitoring, and defined the RS-422 serial interface.

The sixth session presented papers on sound systems for live theater. "Sound Systems for Educational Theater" by Richard Thomas discussed the types of theater structures found in educational institutions and used to train students in the use of professional systems. Jan Nebozenko's "Sound Systems for Professional Theater: Broadway and Road Shows" presented the problems unique to sound system engineering for professional theater. "Computer Control of Theatrical Sound Systems" by Charlie Richmond explained the opposing needs of live theater sound: spontaneous operation and preprogrammed events. "MCA: A Microcomputer-Controlled Audio Console for Theater Sound and Other Purposes where Complex Sound Images are Needed" by Matti Sarapaltio described the use of an integrated system including conventional mixing, storable switching and level controls.

The seventh session included papers describing sound systems in acoustically difficult venues. "What To Do When the Ideal System is Not Possible" by David Klepper, "Sound Systems at the 1988 Winter Olympics" by Kenneth Jacob and "The Sound System for Shah Alam Mosque" by R. Philbrick each described examples of difficult installations and methods used to achieve desired results.

The eighth session contained papers describing new concepts in equalization. "The Concept of Full-System Equalization" by Bob Thurmond examined the problems inherent in any installation and the way in which full equalization may be used to minimize anomolies. Frequency response, coverage uniformity, delay, component interfacing, distortion, levels, feedback and other imperfections can all be addressed. "Operator-Adjustable Equalizers: An Overview" by Dennis Bohn presented a look at the categories and types of analog equalizers. Circuit topologies, a manufacturers list and a summary history were included. "Combining Signal Processing and Power Amplification to Produce Flat Power Response Multi-Way Sound Reinforcement Systems" by Brian Wachner discussed the problem of delay in the propagation of wavefronts between ported bass cabinets and controlled coverage horns. "Equalization, Current Practice and New Directions" by Richard Cabot addressed some of the problems of equalization in sound reinforcement and showed how measurement and use of recently developed devices such as computer-controllable equalizers and digital equalizers may allow a new approach.

The ninth session presented papers on new concepts in loudspeaker design. "A Short History of the Experience and Reasoning Behind the Development of the Turbosound Cluster System" by Tony Andrews and John Newsham discussed the development of these point-source cluster devices. "Two New Solutions to Classic Problems of Bass Reproduction: 1) Acoustic Waveguide Technology and 2) Radiation Using Acoustic Masses" by John Naab described how the use of aligned waveguides on either side of a transducer provides extended low-frequency response by providing multiple voice coil excursion minima over a wide bandwidth. "Evolution of the Smart System" by William Gelow discussed the development of a processor, power amplifier and loudspeaker for integrated performance. "Subharmonic and Nonharmonic Distortions Generated by High-Frequency Compression Drivers" by Jerry Hubbard discussed how distortion products result from modes of vibration of a domed diaphragm or nonlinearities of the compliance.

In "An Electronic Loudspeaker Enhancement and Protection Device," Michael Miles introduced a device said to optimize frequency, time and dynamic response of a loudspeaker, allowing safe operation at maximum limits. "Modulation Transfer Function as a Tool in Transducer Selection" by Fancher Murray presented concepts of MTF information transfer and compared various compression driver structures. "Advances in All-Cone Monitoring Loudspeakers" by Claude Fortier discussed the advantages and disadvantages of active equalization and filtering, and other design considerations, when applied to all-cone systems. "New Magnetic System Designs for Sound Reinforcement Loudspeaker Applications" by Raymond Newman and Paul Fidlin discussed the use of nontraditional materials in loudspeaker mechanisms, and their design considerations. "Miniature Direct-Radiator Subwoofer Modules" by Stephen Woolley described a component designed from large-array performance requirements, toward Thiele-Small parameters.

The tenth session held papers on electronic architecture topics. "Application of Modeling Tools in the Process of Planning Electronic Room Acoustics" by Jean Blauert discussed the use of electronic and acoustic modeling tools in a three-stage process. "A Review of Reverberation Enhancement Systems" by P.W. Barnett summarized those systems and their related problems such as coloration and stability.

—CONTINUED ON PAGE 112

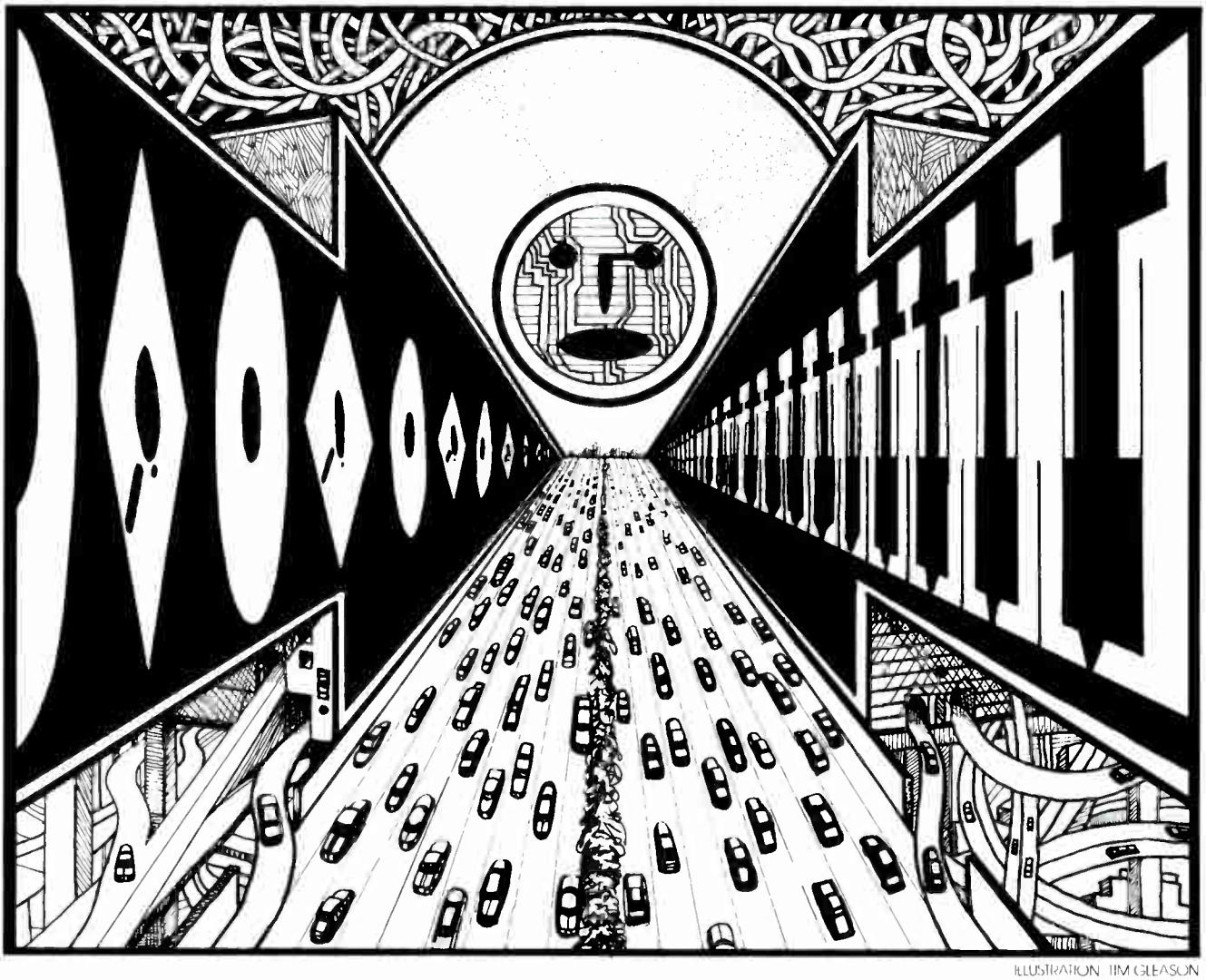
by Stephen St. Croix

BACK TO BACK WITH THE FUTURE

The year is 2008. The place—what is left of Los Angeles. As I walk into one of the few remaining recording studios of the monster persuasion, I think back to the time when they were everywhere. You know, those multi-room giants that used to be at almost every intersection in greater downtown Hollywood way back in the early 1980s.

Remember back then? When you could make it from Santa Monica to Laguna Beach in 35 minutes if you had a black Lamborghini Countach, two radar detectors and didn't mind driving at 3 a.m.? When studios were carefully designed, island retreats in the middle of that amazing sea of cacophony called L.A.?

Cool and dark, those recording studios let you totally escape the deafening noise of the big city, and blissfully create deafening noise of your own.



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Before After

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After we make TourGroup mics sound great, we design them with the durability to handle the road. After 158 setups and load-outs with The Fabulous Thunderbirds' stage crew, 158 overnight long hauls, 158 high-energy shows, it's hard to see the difference between the out-of-the box M 700 on the left and this one—the one that was "Tuff Enough" for Kim Wilson.

More importantly, it's even harder to *hear* the difference. But that's something you'll have to prove to yourself. Fortunately, every time you put a TourGroup microphone to the test, you can take advantage of unparalleled Beyer sound.

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THE FAST LANE

Ah, yes, to rub shoulders with the hyper-famous, to do ridiculously good work and be paid ridiculously good money.

To have the limo waiting in the parking lot *all night,* ready in case you suddenly felt the need for a visit to Takasushi. To have the guards apologetically notify you that even more appreciators have shown up outside and they would really like to meet the talent, you, the tape op, the runner, anybody associated with the project....

Well, I digress. They say that certain smells can cause vivid memories to flash before you. I guess that is true. Thinking back on those times often causes this to happen for me, and *this* time it is severe, triggered by a certain smell, an association that was so powerful that for a moment I was there again: 2-inch Scotch 250.

Sorry. I'm back. Back to the present, May 13th, 2008. Well, they have buzzed me in, and I am in the main control room. They are pumping the room down now, doing a thermal purge. The computers really heat things up, and the only way to stay ahead is to pre-cool.

Some of the optical links seem a bit funky, they are Windexing them now and little blue lights are everywhere. I remember the day I realized Windex was replacing Cramolin as the cool connector cleaner.

They are winding up the hard drives and confirming all the data links. House crystal reference has not been powered down in months, but they are checking it anyway. They must be sure there has been no drift at all, since the video release comes first, with the audio following at the proper marketing moment.

All the linked automation sequences are being loaded, along with endless board setups, digital EQ setups and effects. Multiple digital multitracks are double-checked and locked. This is going to be a serious session. The artist has paid for a Number One hit, and so it shall be.

* * * * *

Wait. It is beginning. Everyone is coming in now, quietly, smoothly. They all know exactly where to go, where to sit, what to do; like a flight crew entering a cockpit. Almost every one of these guys opens a briefcase or bag and pulls out a couple of disks, and proceeds to insert them into the drives they sit facing.

No talking, no laughing, no smoking, no drugs. I am again struck by the startling metamorphosis of the recording process. Could it be it is no longer a game? Has it actually turned into *horror of horrors*—a business?

Tape rolls. There is no experimenting with monitor levels. In fact, the control room level pot was never even touched. I wait in total silence, watching the machines roll tape; some of the slaved computers flash effects changes on their screens while others actually show score. For the shortest moment I wonder when the final button will be pushed and we will actually hear the music, and then I am suddenly hit with the deafening intro to what will no doubt be next month's Number One rock single. You see, all of the knobs had *already* been turned, the buttons pushed and the song had begun. After all this time, I am still caught a bit off guard by noiseless music.

There is more locked up in this room than in a medium-sized jail; over 60 tracks of digital audio, and who knows how many synths playing along live under the watchful glowing eyes of a multitude of micro Macs. No noise. No confusion. But, something else is strange. Oh, yes, no band.

We are not *recording* a group, we are *building* a song! A hit song at that. The vocal tracks are dry and naked, almost unrecognizable as a famous artist. There must be 30 little sections, sometimes several versions of the same part, each isolated on its own track. The synthesizer parts aren't even really there. The *talent* is there, captured on disk as a MIDI performance, locked to the tape by means of that ancient SMPTE time code system. What was that again? System for Making Perfect Timing Elusive?

It is, of course, crazy to actually record synthesizer performances (with the exception of scratch tracks). If you did that, the player would have to perform perfectly. Though not so rare today, a bigger problem exists. What if there is a change in the score days after the recording is made? Then, not only do you have to bring in the player again, try to have him match the playing for a punch, with the right feeling, but you have to hope you can match the voice and effects exactly. Not too

421

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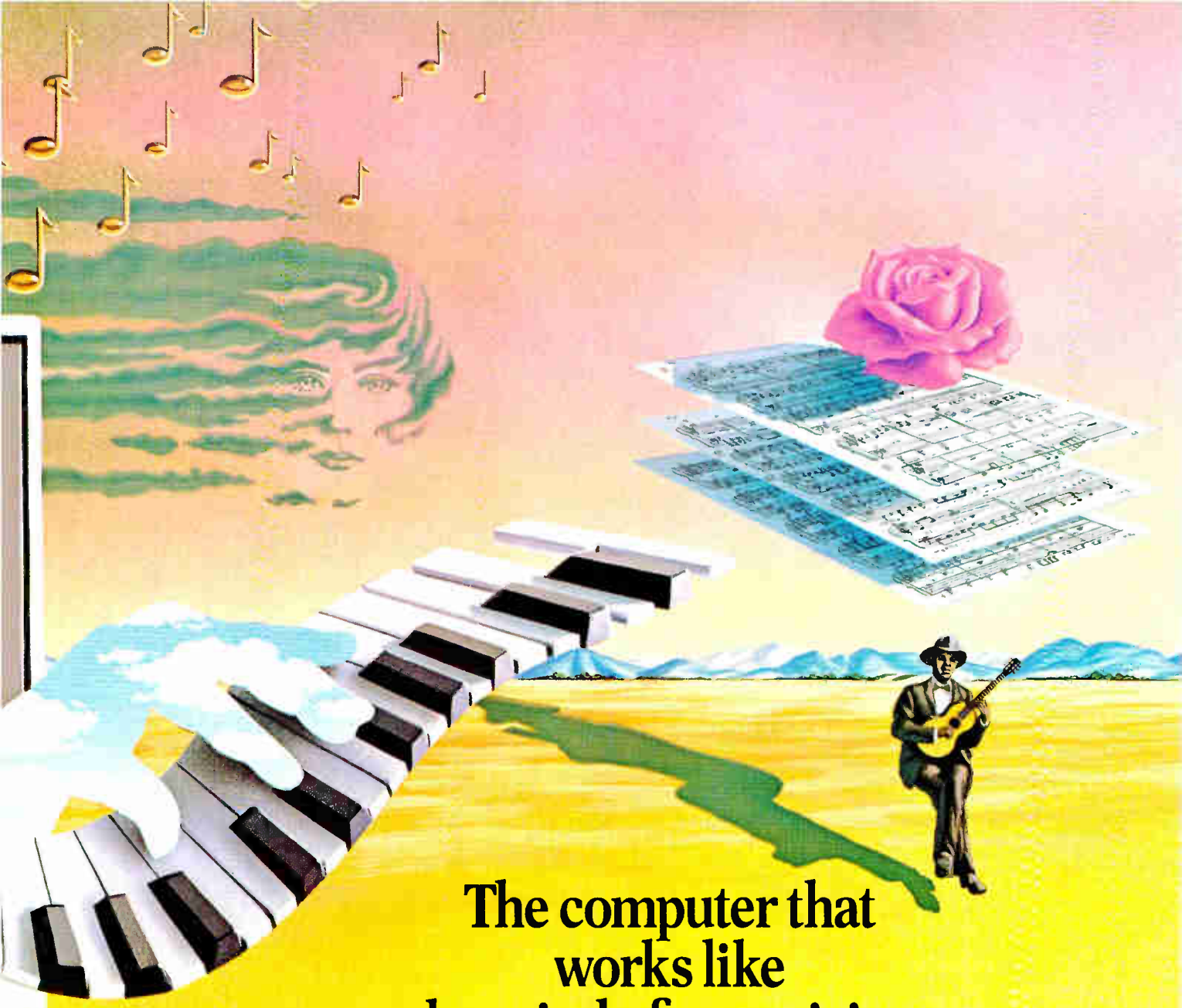

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TASCAM

likely. What if there is a tempo change or tempo map edit? Then the synth's pitch changes. Nice.

But these are not the main reasons for avoiding printed synths. Versatility, artistic creativity and independence are what this entire session is about. As the song is constructed from the plethora of elements and vocal snippets, it is entirely possible—no, probable—that the original choice of synth voices may turn out to be less than ideal. As the song forms and begins to take on its own unique character, that buzzy lead voice you thought was so cool when the scratch tracks were laid down may not be appropriate any longer, though the performance itself might be perfect.

To have the power to separate the two and modify each component at will is crucial. The concept of total freedom to try 20 different voices if you wish, all with identical performances and without any concern for the player, is the real key. Today's tunes are actually songs in the key of bytes. It is for these reasons that we never actually record synthesizers anymore, we just print the MIDI performance to disk.

Some of the drums are there on tape, real ones, it seems. I have never actually seen them, but I am assured they were physical drums, recorded with a device that uses a thin strip of metal and some sort of high-voltage capacitive field to sense compression waves in air and convert them into usable electrical signals (which were *immediately* converted into real audio: PCM).

Some are sampled. Some are totally synthetic; not the cheese boxes of the '70s or early '80s, but awesome resynthesized drums you will talk about for days after you have heard them. The temptation to have drum performances that are beyond the ability of any carbon-based life form has been tastefully resisted, and the drum tracks I hear on the monitors reflect a skill level of only 20% above what is actually possible. I applaud the restraint. I am told not to applaud any more, as it confuses the engineers.

As these little pieces of the puzzle are put together with unbelievable skill, I hear a song being born, a hit that is truly greater than the sum of its parts. What seemed almost like silly little riffs and sounds three hours ago are falling into place with seamless precision. Parts that do not fit perfectly are ruthlessly and rapidly modified. Twenty people that have never even met are suddenly playing together perfectly—interactively. This tune will be on the charts and the players still will not have met.

Now they break out the tricks. More than 15 forms of psychoacoustic trickery will be incorporated into this tune, to make it sound and *feel* right. They know what "right" is, too. It is what they did last month on the last Number One hit. Their computers remember exactly how to do it again today.

* * * * *

It is a few days later, and I have a CD of the tune. It is serious. It will hit. Of course it will, that is why they recorded it. The business has changed; it is finally growing up, concentrating, purifying. As when anything or anybody grows up, there is an unavoidable loss of playfulness, lightheartedness, informality. With maturity comes responsibility. Those who could not deliver have failed. The few survivors have learned how to survive and grow. They deliver. Massive technology is one of the tools that can give the needed competitive and creative edge.

But this story is not about that hypertechnology. It is really about those few people who know what to do with it. You can throw serious technology at a jerk and you might hurt him with the sharp edges. GIGO, you know. On the other hand (or with the other hand?), you can throw serious technology at someone who has the skill and talent to actually use it, and you get music and money. Now those are two things *everybody* likes.

One last thing. About the date: I was only fooling. The story is accurate, but the date was actually 1988. The artist's name—well, I wish I could tell you. ■

Mr. St. Croix lives on the East Coast, but works on the West Coast. He figures that due to time compression as a function of the added velocity during air travel for five hours each trip, he gets a little chunk of added time. This has added up to over 200 milliseconds so far; more than enough time to do cool stuff.

by Mel Lambert

ACOUSTICS AND THEIR UNDERSTANDING

All of us with a definitive sense of hearing and an appreciation for a good musical or vocal performance can make a respectable living in this business. Honest. It's painless. You'll love it.

Being better at your job—the kind of guy/gal who gets the repeat calls from the innovative producers—takes a little extra. You know the trick: being in the right place at the right time counts for a lot. In this day and age, however, there are so many more people crowding into that same place at the same time that we're rapidly beginning to live in a Standing-Room-Only world. Sure, you can check out of your scheduled future and slide into technical support—"lateral career suicide," as a headhunter colleague once described it—but a good mind is a terrible thing to waste.

So what's a good way to impress your fee-paying clients and ensure a prosperous future: fame and fortune on the audio-production merry-go-round? Easy. Listen. No, I don't mean, "Listen up, I have something to tell you"; rather, you should spend more time closing your mind to those distracting outside influences and simply listen in the control room or live sound environment where you currently work.

Okay, you are now familiar with the background noise level in your current location and the system's idling or quiescent noise. Now put some simple musical tones through the loudspeakers. Not necessarily a composite mix; keep it basic—maybe a solo piano track or a string ensemble. Or even an a cappella vocal track. Use a good tape copy or a CD, so at least we know the source material is reasonably untainted.

What are we listening for? We can detect a reasonably flat, unflattering frequency response from the system, with little listener fatigue even at modest monitoring levels. (Keep the monitor fader below 50% for now; you want to ensure that your ears remain as fresh as possible. High-level transients can wait until later.)

In a live performance application, does the sound have an open, clear personality? Or is it tight and abrasive? If you are faced with the latter, consider looking at the crossover systems, array orientation or the amplifier gain structures.

By and large, though, what you are primarily listening for is the way in which the room or live venue interfaces with the sound projected at it by the monitoring system. (The situation is a shade more complicated with multiple-array sound rigs in large outdoor venues.) The way in which the sound is presented to the room, and the way the room affects it, can be divided into two categories: time-dependent and time-independent factors.

The latter category is mainly concerned with absorption of certain frequencies as the sound travels through the air and the way that sound bounces off surfaces around the room before it reaches your ears at the monitoring position and/or is absorbed by the audience at a live performance. By and large, these time-averaged effects are well-behaved and can be calculated using standard geometric formulae.

For example, travel-path analysis quickly shows which side wall and

ceiling surfaces should be treated with absorbent materials to prevent unwanted reflections as the sound travels from the loudspeaker cabinets to our ears and interferes with the direct paths. Also, we can predict how reaiming the monitors can reduce console splash and subsequent comb filtering at the mixing position. Or that the hanging of an absorbent blanket from the ceiling of a reverberant sports arena, for example, might help to dampen out a vicious flutter echo that builds up into a muddy boom.

The more troublesome effects—the ones that are so subjectively annoying—are those time-dependent factors. One example is a distinct echo from a rear stadium wall which, in a composite mix, averages out to a horrific "ringing" noise, but which during a drum solo means that the audience is hearing each drum sound several times as the sound echoes off one wall after another. The result is extremely confusing.

In a studio control room, we might be faced with similar sound-reflection paths causing smearing of the sound portrait at the mixing position, an effect that is highly dependent upon the sound levels being monitored.

The more energy we pump into the room, the more we can expect those unwanted reflections to interfere with the sound mix. In addition, the ratio of direct sound to spurious reflections from random directions into our monitoring position contributes to a worsening sound texture. We eventually reach the point where the program material mix is indistinct and lacking in precision, while during passages where a single instrument or vocal is heard, the sound is reverberant and bright.

I am describing a worst-case situation, one that you probably won't encounter more than a couple of times during your career. (And those types of control rooms should be avoided, simply for the sake of your engineering sanity; avoiding troublesome live arenas may not be a practical reality, but there are alternative solutions.)

Not too many years ago, the situation in the control room was different, and more troublesome. Rooms were built to be highly absorbent, with large amounts of bass trapping and layers of Rockwool behind a pleasant-looking outer wall wrapping. That these rooms could handle high sound levels became obvious. What took us a while to discover, however, was that the absorption of all that high-level sound came at a definite price. As we added more and more level to the mix, the point at which the time-independent factors transitioned into the more obvious time-dependent characteristics was occurring at elevated SPLs.

The subjective result was that a reasonably interesting mix at low to medium levels would alter, as the monitor control was turned up, into a very different sound mix at high levels. Instruments that might be forward in the mix at lower levels—such as a keyboard solo—would become buried under the snare sounds. Because of its frequency content relative to the other instrumentation, the piano would begin to excite certain room modes that only kicked in at elevated listening levels.

We were then faced with a choice: either monitor at low levels, and almost certainly end up with a stunning mix that may, or may not, sound similar when replayed at other studios and/or domestic listening situations. Or wind up the monitor level, run the risk of savage hearing damage (no free lunches in this game), and maybe end up with a mix that, strangely enough, sounded great just about anywhere you took it.

There are theories that try to explain this latter phenomenon. For me, the truth probably lies in the realm of psycho-acoustics; at certain combinations of monitor levels and ambient surroundings, our appreciation of sonic detail, balances and color shades moves into a nebulous area of non-objectivity. We all have been there, both in the studio and on the road: the mix is building under our fingers as we make gross changes in balances between the rhythm section, solo instrumentation and vocals (assuming that we are dealing with a fairly "con-

—CONTINUED ON NEXT PAGE

ventional" song structure). Then we begin to refine the balance, adding effects and other subtleties. Finally—and we know instantly when it happens—the mix jumps into place.

Reaching the eventual—and glorious—stage of knowing that a mix is just right, results from a different set of circumstances in an acoustically bad room, as opposed to the types of control room and performance area we try to secure for our recording or live sound projects. The bottom line is that these days, we have a better than average chance of producing a mix we understand, rather than one which, despite what we might think is happening, resulted from us fighting to ensure a rational balance.

The modern phenomenon stems from three key developments:

- A growing evolution in control-room design towards relying on close- and mid-field monitoring, where there is a better than average chance that we are located in the direct path of sound from the loudspeaker system(s);
- The use of two- or three-way monitoring systems designed with more than a passing acquaintance with time-alignment techniques and crossover filter design; and
- Control-room acoustics that sensibly attempt to control unwanted sound reflections and frequency response anomalies across the listening position with subtle acoustic treatment, and which leave the room sounding reasonably live but with a controlled ambience.

In live performance, there have been similar major developments in speaker technologies and processing techniques that have resulted in a more consistent approach, including:

- High-efficiency, three- and four-way loudspeaker cabinets that can be easily stacked and aimed to cover discrete sections of the audience seating area, and which can be supplemented with a complementary design of subwoofers and HF arrays.
- Equalization and time-domain processors that use real-time program material to measure and compare the output from the house mixer with that of a calibration mic in the audience and automatically alter the system's overall steady-state (and, soon, the impulse) response according to macroscopic changes in sound absorption caused by temperature changes, audience size and so on.
- An appreciation of house mixers for "less can be more"; in other words, simply increasing the SPL is, more often than not, counterproductive in a problematic environment. Rather, the approach might be to reorient the system and place some cabinets on a delay, and/or investigate simple ways of dampening troublesome room tones and spurious flutter echoes.

An ounce of prevention can save a ton of grief down the line. That our working habits and attitudes are often affected by a lack of understanding of the complex ways in which sound reacts with the environment in which it is being replayed can be fundamental to the development of our audio production skills. You know it makes sense. ■

Mel Lambert has been intimately involved in the pro audio industry—on both sides of the Atlantic—for the past decade. Formerly editor of Recording Engineer/Producer *magazine, he currently is a partner in the Marcus*Lambert PR firm, and the president of Media & Marketing, a consultancy service for the pro audio industry.*

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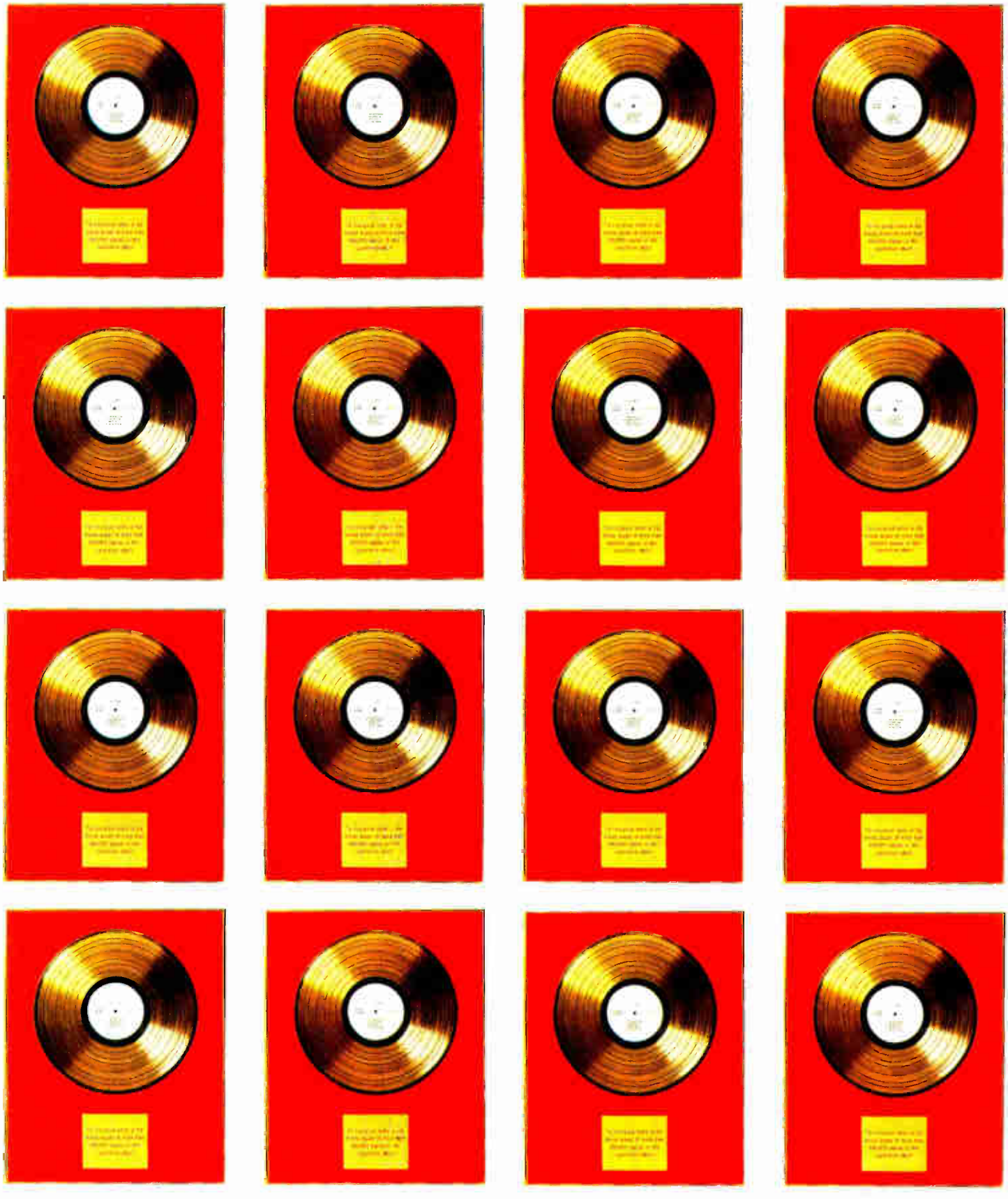

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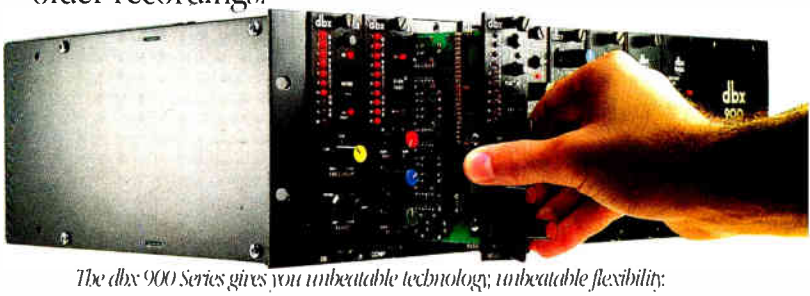

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The technical building houses a total of 32 editing suites, located in clusters near each of the two pre-mix rooms. Shown above is an editing suite equipped with an EditDroid system.

THE DOORS ARE OPEN

by Paul Potyen

A short time ago in a galaxy not so very far away. . . it is a period of expansion. A famous movie maker envisions a top-flight film post-production facility to be built on his 2,000-acre ranch in rural Marin County, Northern California. The plans call for a scoring stage, ADR room, Foley room, mixing and editing suites, film and video transfer rooms, screening room—everything a filmmaker could possibly want.

Five years later, that vision has become reality. George Lucas' Skywalker Ranch is the site of what may be the most complete film post-production facility in the world. The secluded ranch also includes residential facilities for outside production companies and is the home of Lucasfilm Ltd. (the umbrella company for Sprocket Systems, its post-production division) as well as several other related divisions.

The Ranch Legend

The setting belies the high-tech nature of the business. To give the architects and planners a better picture of his vision, George created a "legend" of the Ranch. Says Lucasfilm technical director Tomlinson Holman, "The story describes a wealthy family who owns the Ranch. In the early '30s, the son has gone off to film school. After observing the Hollywood studios of the '30s, he decides to turn the ranch into a film studio. There is already a building on the property, which was a winery, circa 1895. The son proceeds to make the winery into a technical building, converting the hops bin into a scoring stage, the distillery into an atrium area, etc. Different styles are evident: a decorative 'Heidi' style in the lounge

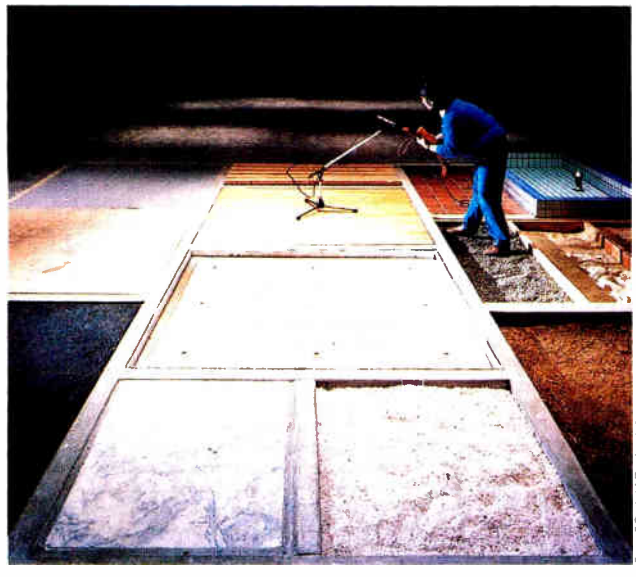

PHOTO: MARVIN WAX

The 1,600 sq. ft. Foley stage is equipped with various floor surfaces and a water tank, and is acoustically designed to a rating of NC 5 for recording extremely low-level sounds. The control room uses an SSL 5000 console and an Otari MTR-90 recorder.

SKYWALKER RANCH

areas and an 'Art Moderne' style in the work spaces. If you worked in a Hollywood studio in the 1930s, you would work in an Art Moderne setting, and when you went home you might look out to your back yard through the kitchen window with painted curlicue wooden brackets and trim, and there would typically be little stenciled shelves of knickknacks. And all of this is superimposed over this 19th century winery architecture. While this might seem a bit weird to a visiting architect, it doesn't seem at all odd to George or other film people, because they are used to turning the corner on sets that are quite disparate."

Even as the finishing touches are applied to the technical building, it is being used by clients. Relaxing in one of the elegantly appointed conference rooms overlooking a landscape of rolling hills, meadows and forests, Sprocket's director of engineering, Tom Scott, muses, "The current perception of Lucasfilm is, 'That's where George Lucas does his secret projects. No one else is ever allowed in.' Nothing could be further from the truth. Last year, we didn't do any Lucas films, but we did a whole bunch of outside films."

A Guinea Pig Named Tucker

Nonetheless, one of the first complete tests of the facility's capabilities is Lucas' latest effort, *Tucker*. It was shot in Northern California, in Sonoma, Oakland, San Francisco and at the site of an old Ford plant in Richmond. Every day the film was sent to L.A. for processing, the dailies delivered back to the Ranch for viewing. Although the first part of the editing was done in Francis Coppola's San Francisco office, the team moved to the editing facilities at the Ranch in October. The final picture editing was completed there, the picture was locked just before Christmas, and the sound editors came on board right after the New Year. Much of the automated dialog replacement (ADR) recording was done in L.A. or New York, since that's where most of the actors were. However, some recording of individuals and "walla" (crowd

David Carroll: Snake Charmer

David Carroll Electronics handled the installation of all of the wiring in the technical building, with the exception of the Foley and the ADR stages. The Berkeley-based company designs and engineers custom systems and provides complete hardware fabrication for film, recording and television broadcast. Recent clients include Dolby Labs and Zoetrope studios.

They started working on the Ranch project in June of '87. "Sprockets determined what equipment would be used and where it would go," recounts Carroll. "They delivered rack plans to us, and we developed the wiring lists from that information. We fabricated the cables, installed them and tested them. We also put in the open-frame cable tray throughout the building. [The whole building was installed with the computer floor two feet above the slab.] We started full-scale production in mid-August, prefabricating the cables in our Berkeley warehouse and installing finished cables on-site. [Cable runs in excess of 100 feet were usually done on-site.] After we installed and tested the cables, Lucasfilm unpacked the equipment, installed it in racks, connected it and tested it. We put in all of the snakes for the building, including video control wiring as well as audio. At one point in the project, we employed over two dozen people."

It has been estimated that if they had used single-pair wire for the entire installation, they would have used more than 500 miles of wire.

One interesting feature was an Elco patch bay system, for patching 24-track machines into mixing consoles, an idea conceptualized by (Lucasfilm engineer) John Brenneis and designed by Carroll. It handles major reconfigurations of a studio, including the Dolbys and the mix consoles as well as the tape machines. It's possible to reconfigure whole areas of a patch bay by using those 24-track connectors.

"Another design aspect that helped us was the star, or centralized cross-connect style of architecture of the cable systems," Carroll points out. The system is designed around three major nodes: the cross-connect systems in the west local, east local and central machine rooms. All equipment is tied to that wall and jumpered across in the cross-connect. There's no direct cable routing from console to tape machine.

The entire building was originally designed with digital audio in

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*Rick Allen notwithstanding

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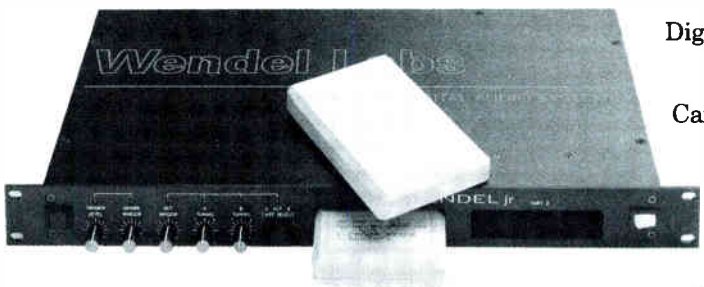

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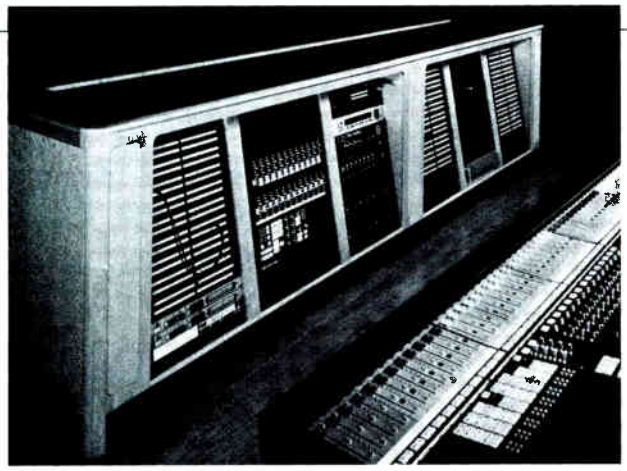

Equipment credenza in the west final mix room at Skywalker Ranch.

—FROM PAGE 37, DAVID CARROLL

mind. Carroll speculates, "If we had started with a conventional film mix studio in mind it's likely that we would have had two much larger local machine rooms, and no central machine room. We had to tear out conduit and put in new cable tray because the original designers thought that fiber optic cables would be used in an all-digital environment. To provide for a full cross-connect in the limited space allowed, we designed a wall-mount, hinged rack system to mount the ADC Ultrapatch panels, which were used throughout the building."

David's brother, Rob, was involved in the design of the credenzas and worked with him to develop design solutions. It was important to provide complete rear access (500 8-pair cables go to each), so they designed a way to allow each credenza to be rolled out about 2½ feet without tangling cables. It weighs about a ton with all of the equipment and cabling, so they designed a heavy-duty, electrically releasable brake, which allows it to be moved by one person.

—*P.P.*

—FROM PAGE 37, SKYWALKER RANCH

sounds) took place on the Ranch's ADR stage.

At about the same time, sound designer Richard Beggs was creating detailed background sounds on a 24-track machine in his San Francisco studio. The sound editors at the Ranch would record and cut Foley material, as well as assemble effects from the sound library. Explains operations manager Cate Coombs, "For instance, they brought the Tucker cars out here to the Ranch one weekend to record Tucker engine sounds. There was nothing in the sound library that could approach that sound. We also used some old clunkers to record some generic car sounds, like cars hitting potholes. You don't want to do that with a Tucker." For more generic sound effects, Sprocket Systems has a 900-hour sound effects library stored on audio tape. Work is under way to find an efficient means of automating the library.

Tucker's music was created by British pop star Joe Jackson. His score was recorded in England. There is, however, a scene that takes place in an airplane hangar, with a 30-piece brass band. Scott recalls, "There was a reasonable recording done on the set, but there was a shot of the director conducting the band at a different tempo than the band had played. There was nothing we could do to make that music work, so we used the scoring stage to re-record the piece of music at the correct tempo to sync with the conductor."

The scoring stage can handle an orchestra of 120 people, but at this point the scoring control room still uses temporary recording equipment. "When the control room is completed, we'll be able to record the music here as well," comments Tom Kobayashi, vice-

> "Anyone can come here and be treated the way our boss expects to be treated."

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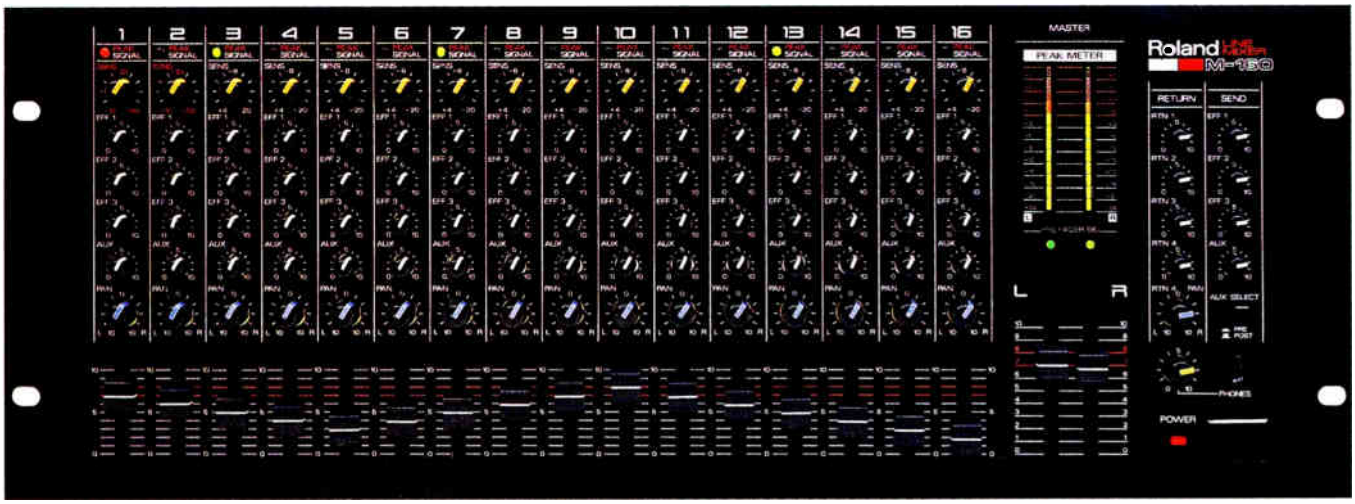
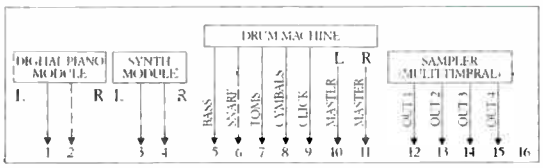


ACTUAL DIMENSIONS: 19"W x 9¹⁵/₁₆"D x 7"H

Actually, it's not even necessary that you have everything. Even if you have just a stereo keyboard, a sampler and a drum machine with separate voice outputs, you've already exhausted the capabilities of a conventional eight-channel mixer. And that's the reason behind the new M-160 and M-240 Line Mixers from Roland: modern electronic equipment demands modern mixers.



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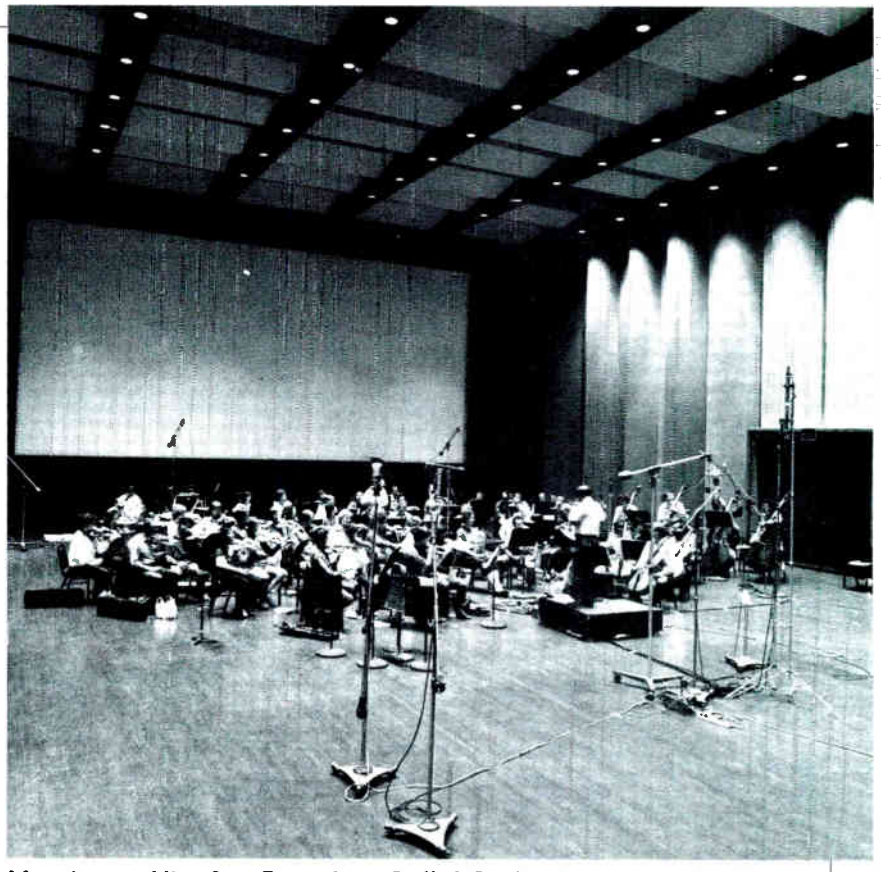
president of Lucasfilm and general manager of Sprockets. Scott muses, "Do we want to be traditional and use a Neve console with Studer tape machines, or should we consider a digital console and digital recorders? We're still pondering this question of direction. So far we've been concentrating on analog equipment with SR. We see that as carrying us a long way. There's no question that someday it'll all be digital, but nobody knows when, and in the meantime we have to make movies, we'd like to make a profit, and we have to be practical about it."

The film sound mixing process usually begins with pre-mixes to boil the tracks down to a manageable number. The first priority is dialog, against which all other audio is referenced. Customized SSL 5000 consoles and Otari MTR-90 recorders are used in each of the three mixing rooms. The music for *Tucker* was recorded in England on a Mitsubishi digital 32-track machine, and some preliminary mixes were done there. Additional music mixing and editing was done at the Ranch as were 18 to 20 tracks of Foley. Several days were spent pre-mixing them down to 35mm film. The same process is true of the other sound effects.

The Sprockets team has also fully

—CONTINUED ON PAGE 46



Members of the San Francisco Ballet Orchestra record the first session on the Skywalker sound stage. The 5,000 sq. ft. floor can accommodate up to 120 musicians; the viewing screen measures 48 x 38 feet. The walls and 29-foot ceiling have retractable baffles that can alter reverberation from .7 to 3.5 seconds. Jack Leahy and Gary Clayton from San Francisco's Russian Hill Recording engineered this session and tested the room's many sonic variables, completing post-production at their studio.

Acoustical Considerations At The Technical Building

Virtually every construction project in the film sound business is a remodel. Due to the nature of film lots, there has been little new construction over the years. So when the planners got together to design this facility, "One of the biggest problems was that there was nothing to model it after," comments Tomlinson Holman, tech director at Lucasfilm.

Holman came to Sprocket Systems in 1980 and built the facilities on Kerner Boulevard in San Rafael, which was a prototype for the technical building at the Ranch. He moved out to the Ranch in the summer of '83 to establish standards for the technical building. "The original plan called for a post-production building located to the right of the main house," says Holman. "It was to cover about 50,000 square feet. They had a drawing to show the outside, but there were no development drawings of the inside. We had a mandate from George to build a facility capable of handling post-production of five large stereo movies per year."

As it turns out, Skywalker Ranch is capable of much more variety. A lot of the building's features resulted from the way that Lucasfilm worked on pictures such as *Return of the Jedi* and *Indiana Jones & The Temple of Doom*. There are two sets of edit-mix suites in an upstairs/downstairs orientation, allowing lots of contact between the picture editors and sound editors. Two productions can take place simultaneously. The studios in the rest of the building—the machine rooms, offices, ADR room, Foley room and scoring stage—all support what goes on in those suites. If necessary, the two production areas can be completely isolated from each other. Each area has its own internal staircase, mixing room and set of editing rooms.

This arrangement brings about a tighter relationship between editors and mixers than is common in the film industry. Holman explains, "On the basis of our experience at Kerner Boulevard, we arrived at a number of 11 editing rooms per mixing suite—five on the first floor, six on the second. They were designed with plans for a Moviola, a flatbed editor, an editing table or an EditDroid."

The design team planned for a fairly large central machine room

The ADR (Automated Dialog Replacement) stage uses an MTE ADR controller, 6-track 35 mm and 1-track 35 mm recorders with Dolby SR, and Otari 2- and 24-track machines with SR. Both 35 mm projection and video are available.

—FROM PAGE 43, SKYWALKER RANCH

addressed the industry need for a more elaborate transfer facility. "With all these different formats, you have to provide more than just ¼-inch-to-35mm transfers, or CD sound library-to-35mm," emphasizes Coombs. "Then there's also noise reduction, digital and various synchronization formats. We're equipped to handle the most bizarre, obsolete transfer formats that an outside producer could possibly ask for."

One-Stop-Shopping

Scott and Kobayashi like to think of the tech building as a one-stop facility. "George's idea was that once he finishes production, he can come home," says Kobayashi. "He doesn't have to fly to L.A. or London to get a score. And that's why we have residential facilities here for outside production companies. We have four apartments and four hotel rooms with separate kitchens, dining rooms and living rooms."

Scott fantasizes, "The ideal client is one who allows us to get involved early on, to help in the planning of an overall schedule from post-production to picture release. It doesn't matter whether it's big- or small-budget. We'd love to be able to work with clients who do projects just like George's, but we've decided to look for clients that want the kind of treatment he gets. Anyone can come here and be treated the way our boss expects to be treated. We've tried to set up a range of available services for outside producers." Sprocket's "mandate" is, says Coombs, "to be versatile, flexible and competitive, whether it's a low-budgeted, tightly scheduled film or a major feature. Their policy is to never supplant anybody from the outside in favor of a Lucasfilm project. Scott estimates that anywhere between zero to 50% of the available time will be used by Lucasfilm, depending on Lucas' production schedule. "We've been doing outside business all along, but now we have the space to do more non-Lucasfilm work. In the next 12 months we anticipate a lot of outside work," says Coombs. ■

Paul Potyen is associate editor of Mix.

A View From the Mixing Console

Lucasfilm's Randy Thom began his film career recording sound effects and assisting on the mix for *Apocalypse Now*, and while doing so, he met the Lucasfilm people. His most recent work has been as a mixer on *Tucker*.

Thom and the other Lucasfilm mixers and sound designers were consulted regarding the equipment for the Ranch's technical building. At the time, Solid State Logic had designed a line of consoles for broadcast use, and they were looking to get into film post-production. With minor changes to the Series 5000 modules, they created a system for film mixing. Lucasfilm's Brian Kelly was the primary figure in discussions with console manufacturers. Kelly worked with SSL to help refine the electrical and physical requirements, assisting in the design and testing.

Thom notes, "In Hollywood, you can expect to see three people at a mixing console: one mixing dialog, another mixing sound effects, the third mixing music. In Northern California the duties get passed around. So we often have one or two mixers. But if we want to pull work from Hollywood or other major filmmaking centers, we have to show them what they expect to see. So, while the console is designed so three people can work together, it's also possible for one sound designer to operate it."

The board is separated into three sections. Sound effects typically take up more faders than anything else, so they are in the center section, with dialog on the left and music on the right. The board can be treated as three separate consoles, each with or without automation. Another area in which the SSL consoles were customized for film production was panning. In film, sometimes you want to pan through as many as six channels. Most mixers operate in four-channel mode —left, center, right and surround— and infrequently there are stereo surrounds. The speakers on the

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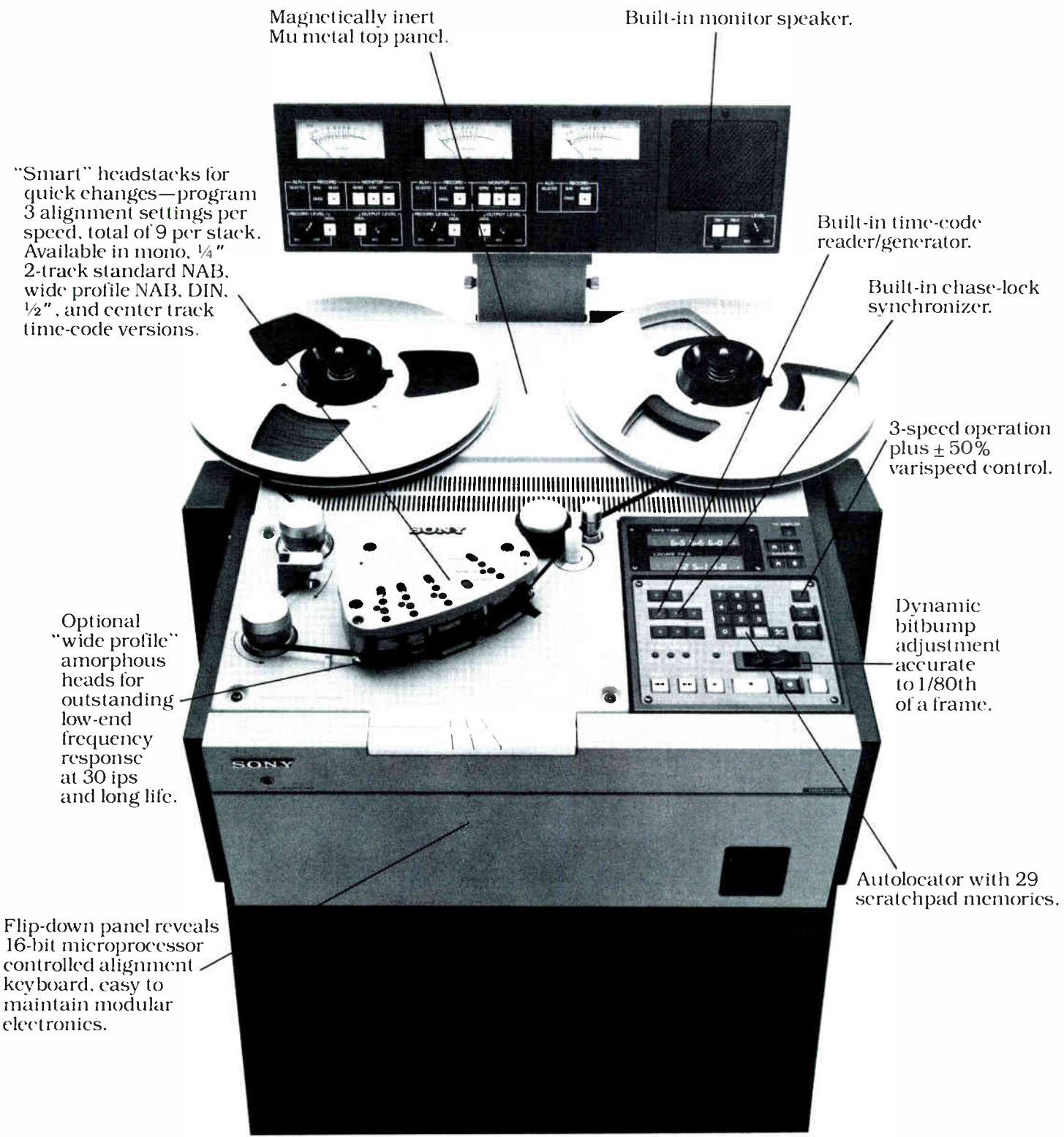

—FROM PAGE 45, ACOUSTICAL CONSIDERATIONS

all the cloth in the walls are prime root diffusers.

The third kind of space is the Foley stage, which you want as near-anechoic and quiet as possible. You want to be able to record the rustle of clothing, bring it up 40 dB to make it read through everything else going on, and have no characteristic reverberation.

The fourth is the scoring stage, a highly adjustable room (minimum 0.7 seconds, maximum 3.5 seconds empty). It is the only space in the building that can be made very reverberant to capture a natural acoustic quality. You can approximate that with digital reverb systems, but the orchestral sounding score a la *Star Wars* is best recorded in live, concert hall-size rooms. The scoring stage is also a quiet space, built to NC10 with the air-handling equipment operating.

The team also addressed sound isolation between spaces, background noise generated by the mechanical systems, and maintenance of the noise environment on the Ranch itself. For instance, they put all noise-making compressors and reciprocating equipment and large fans in a vault under the parking lot. There are no pumps in the building. There are large banks of five-foot-long silencers on the inlet and seven-foot silencers on the discharge, so the environment in the parking lot and the surrounding grounds are not disturbed.

Holman points out that they categorized the rooms. Category A includes the primary recording spaces —the scoring stage, final mixes, premixes; category B is less restrictive and includes sound transfer and certain control rooms; category C still has to have some amount of acoustic control, but less than the record rooms. "It was a way of programming the building to get what you want and not spend more than you need to as a result," he explains.

One of the challenges in building this facility was to acheive a "look" when an acoustical performance may be in conflict with it. One example, says Schwind, resulted from the desire to have velvet walls in the screening room. "The choice of cloth came into contention, because the visually preferred cloth was acoustically tested and failed to meet our requirements. So we tested many different pieces of velvet until we found one that worked."

When you spend money to build something like this from scratch, the emphasis is to get the sound isolation right, rather than the room acoustics. You can't ever fix the sound isolation. But you can always remodel a room. However, according to Schwind, "In the design process the sound isolation is the best known of the two, and easier to get, so I actually spend more time working on the room acoustics to make sure that it can be changed in the future." ■

—FROM PAGE 47, A VIEW

sides and the back of the theater are fed by the surround channel. Usually it's sound effects that are panned, although on occasion they'll pan dialog or music.

Thom also felt that another important difference has to do "not so much with the equipment as with the people. I think it's unfortunate that people, especially the young, novice engineers, get the impression that it's the devices that create the sound. I would rather work in a studio that had old funky gear, and interesting people with bright ideas, than the other way around. At Lucasfilm, we have the best of both worlds. The equipment is as good as any place on the planet, and it's hard to imagine a better chemistry of individuals to work with.

"I used to spend a lot of time thinking about how to make the most pristine recording possible, and the longer I worked in film, the more I've come to think, 'you should spend much more of your time thinking about what it is you're going to record than how you're going to record it.' There's no doubt in my mind that the better creative people get in their medium, the less they think about the tools, and the more they think about the content." ■

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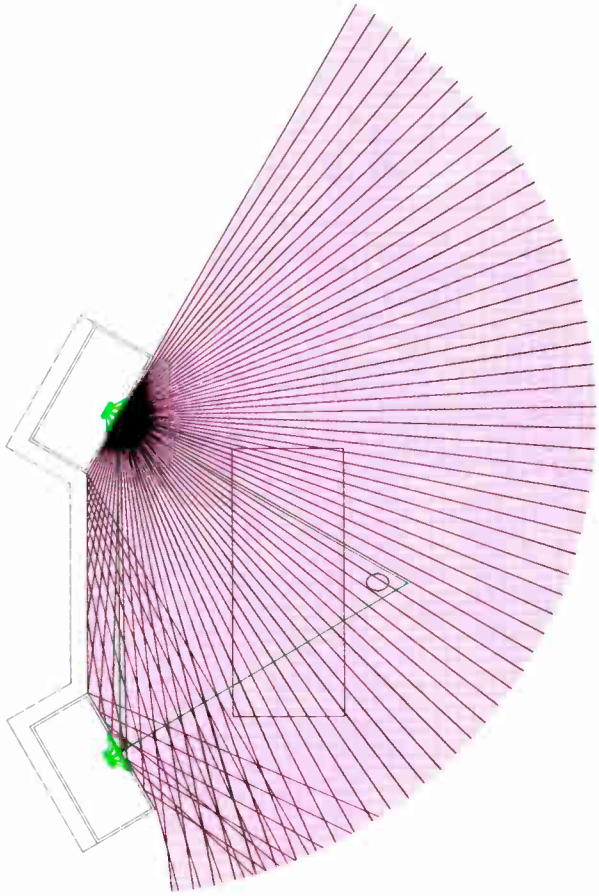
BY BILL MORRISON

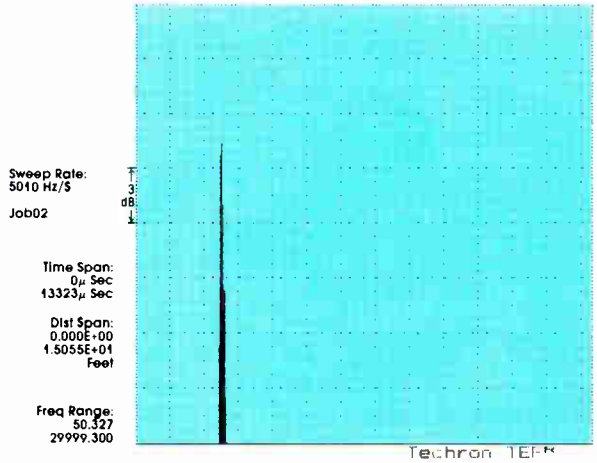
A LOOK AT CONTROL ROOM DESIGN AND GEOMETRY

An understanding of the role geometry plays in control room design is critical to achieving monitoring accuracy. Control rooms are often designed with geometrical shapes that introduce inherent monitoring inaccuracies, and such costly mistakes can be avoided if *correct* geometry is incorporated in the design stage of the control room.

The fundamental goal—and the justification for intensive engineering efforts in control room design—is to achieve an environment which provides accurate monitoring. Engineers and producers must be able to make acoustically unbiased decisions concerning the music they are recording, mixing and producing, and achieving accurate monitoring requires both an accurate control room and an accurate monitor loudspeaker system. The monitor loudspeaker must be designed to produce, at the engineer's position, an exact acoustical analog of the input musical signal. The control room must be designed to provide a space that does not allow room reflections to interfere with the monitor's output at the engineer's position.

Toward the goal of providing an accurate control room, the geometrical design of the control room is critically important. When room boundaries (ceilings, walls, floors, consoles and equipment) are oriented such that off-axis output from the monitor loudspeaker is reflected into the engineer's position, time and frequency response degradations to monitoring accuracy are introduced. The geometrical shape of the control room and the orientation of surfaces within the room must be designed properly to prevent room





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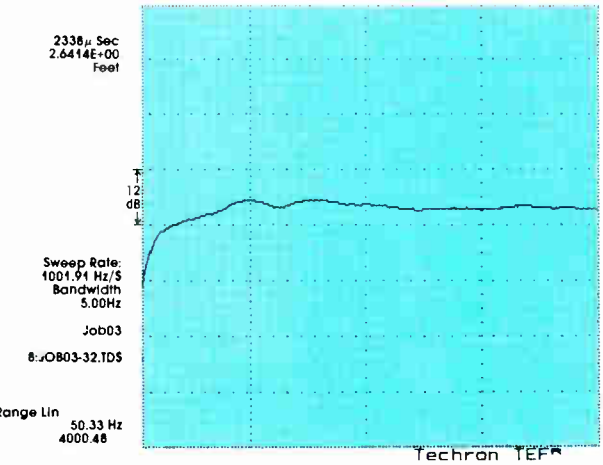

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FIG. 1: Front Wall Geometry

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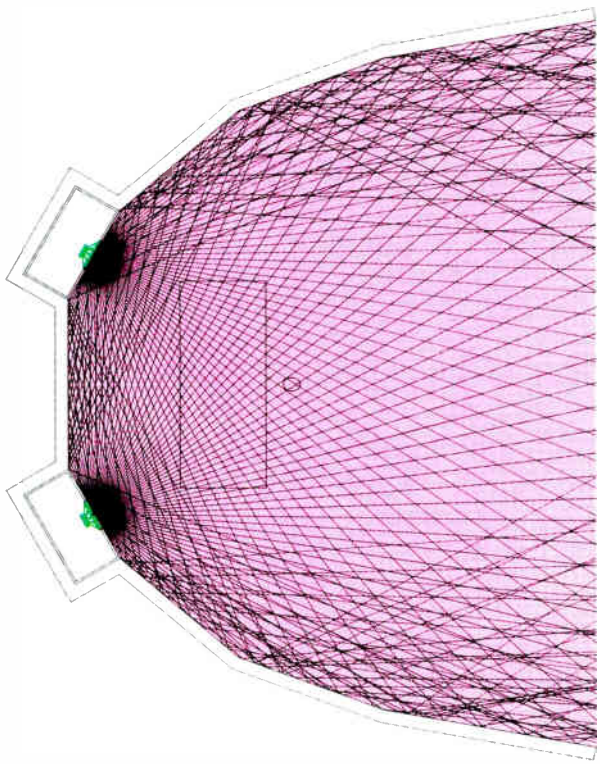
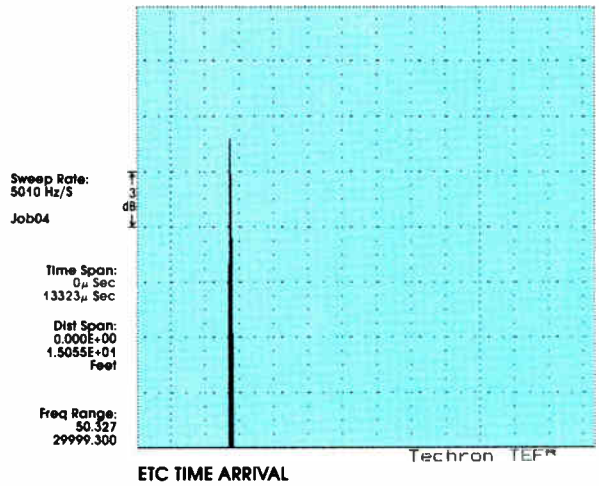
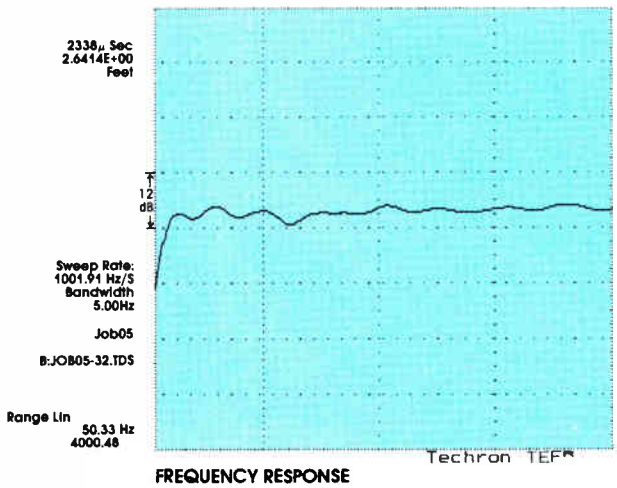




ETC TIME ARRIVAL



FREQUENCY RESPONSE

FIG. 3: Splayed Side Walls

lation occurs, nor can he accurately perceive program-imbedded reverberation or directional cues which coincide with the arrival of the room-introduced reflected signals.

To eliminate side wall reflections from entering the engineer's position, the side walls must be splayed outwardly such that off-axis propagation paths from the monitors and reflections from the front and opposite monitor baffles are incident upon the splayed walls at properly designed small angles. The resulting equally small angles of reflection do not enter the engineer's position. To minimize the width of the control room design, the side walls are segmented, with each segment splayed less severely. A properly designed side wall geometry is shown in the reflection and TEF analysis in **Fig. 3**. To determine the correct geometry of the walls, either a computer-based reflection model and/or an actual scale model of the control room should be constructed. Testing of a quarter scale or larger model of the control room design with the use of a TEF analyzer is easily accomplished and very educational. Hinged wall segments held within constraints for particular situations can be easily constructed, modified and refined. Costly "real world" mistakes can be avoided at this stage of the design.

Costly mistakes can be avoided if correct geometry is incorporated in the design stage.

Back wall construction should be designed to completely eliminate or greatly attenuate any reflections to the engineer's position. This requires deep wedge absorbers, inverse wedge absorbers, gradient density fiberglass, or other diffusive/absorptive methods which will eliminate strong reflections.

Ceiling geometry is just as critical as wall geometry. The reflection and subsequent monitoring accuracy problems created by an incorrect ceiling geometry are shown in **Fig. 4** (as viewed through the vertical monitor-

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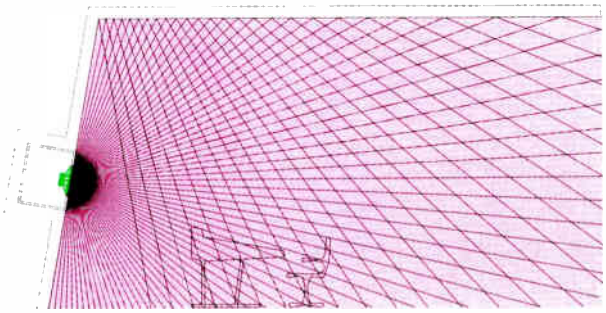
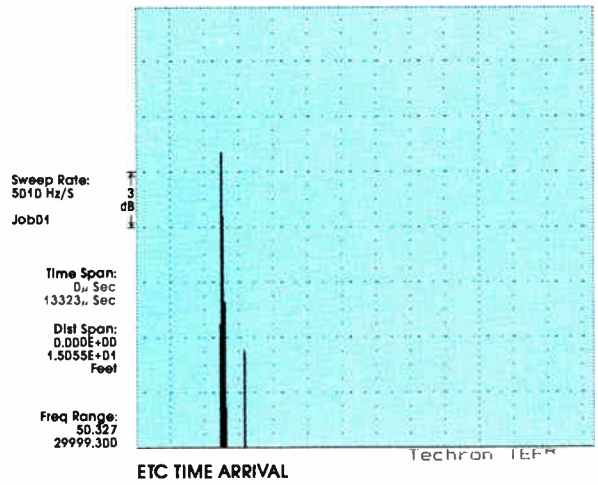
FIG. 4: Ceiling Reflections





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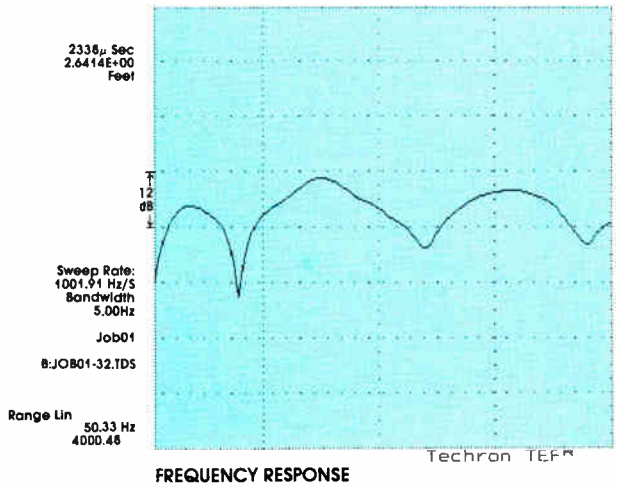
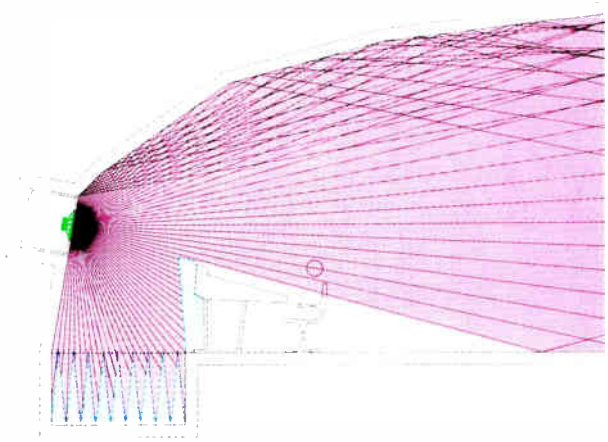
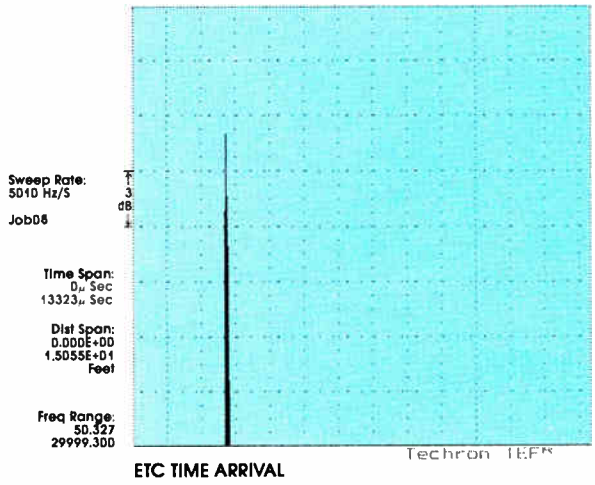


FREQUENCY RESPONSE

FIG. 5: Splayed Ceiling





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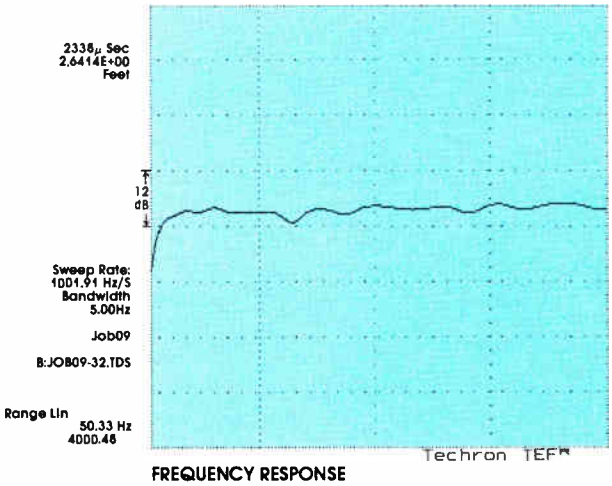
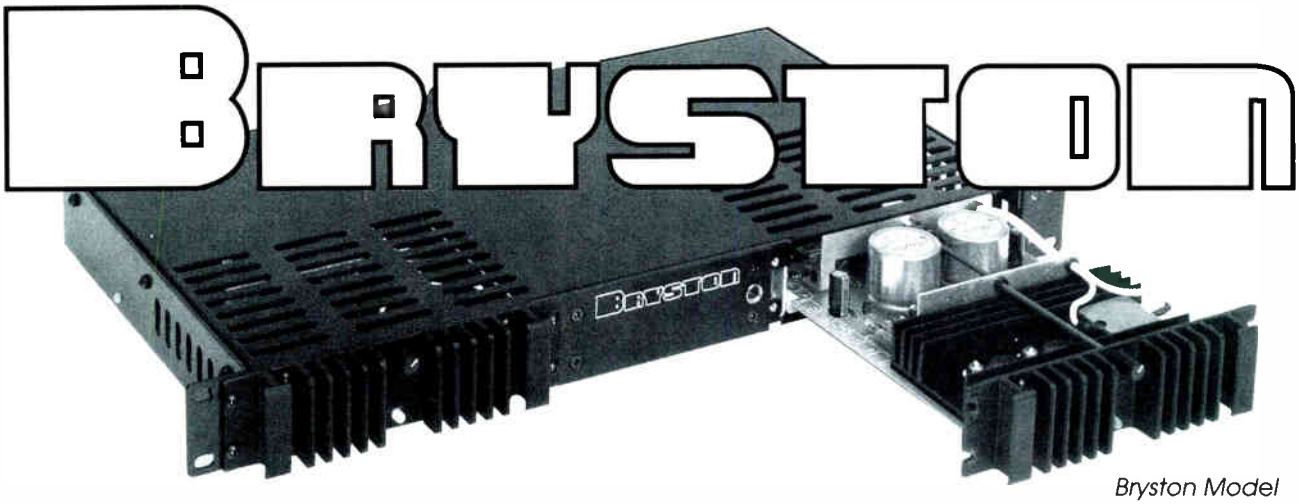


FREQUENCY RESPONSE

ing axis). To eliminate reflections from the ceiling, the ceiling must be segmented and splayed upward so that propagation paths from the monitor's off-axis output are incident upon the segmented surfaces at properly designed small angles. Small angles of incidence produce small angles of reflection which do not sharply reflect from the ceiling into the listening position. A correct geometrical solution and TEF analysis is shown in **Fig. 5**. Note this geometry is viewed through the vertical plane of the monitoring axis and is not a side view of the control room. To produce a side view for construction, this view must be projected to a center line of the room. To simplify control room construction, the segment breaks in the ceiling should be designed to match the side wall segment breaks.

Floor reflections can be eliminated by constructing a grid-covered absorp-

BRYSTON



Bryston Model 2B-LP PRO XLR

BRYSTON POWER AMPLIFIERS CONTINUE TO DEFINE THE STATE-OF-THE-ART IN MUSICAL ACCURACY, LONG TERM RELIABILITY AND PRODUCT INTEGRITY.

BRYSTON design philosophy incorporates three general concepts.

1. Musical accuracy
2. Long term reliability
3. Product integrity

MUSICAL ACCURACY

Musical accuracy is reflected throughout all Bryston power amplifiers and includes the necessity for wide-band transient accuracy, open loop linearity ahead of closed loop specifications, and power supply design as an integral part of the overall sonic and electrical performance of a power amplifier.

We have found that a simple carbon film resistor can contribute more static distortion to a signal than the entire remainder of the amplifiers circuitry combined. We discovered that some parameters of transistors must be controlled as much as 1000 times more closely before their contribution to audible distortion is rendered negligible.

We discovered that under certain actual conditions of speaker loading, amplifiers were incapable of yielding high-power transients without distortion.

Each of the various steps or stages in every Bryston amplifier, from the input section to the output section, without exception, are designed to optimize the musical experience.

STANDARDS OF RELIABILITY

WE consider this criterion to be exceedingly important. We have applied techniques and materials in our everyday construction of electronic equipment more typically utilized in the military and aerospace industries.

All components used in Bryston power amplifiers are specified for continuous duty at maximum power, with typical safety margins of 250%.

The power transistors used in all Bryston amplifiers are 100% tested for safe operating area, both before and after installation in the circuit. They are then taken to a "burn-in" table when they are given a capacitor load, a square-wave input signal, and set at slightly under clipping for a period of 100 hours. During this time, the input signal is cycled three hours on to one hour off, to exert additional thermal stress.

Following the burn-in period, the amplifiers are monitored for DC bias stability for approximately another full day. At this point, they are returned to the test bench for another complete checkout of all operating parameters and functions, at which time a test sheet is made, and included in the packing with the unit.

As may be seen, Bryston takes very seriously the correct functioning and long term reliability of its products.

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BRYSTON contends that the term 'best' should apply to the honesty pride and courage with which we conduct our business, as well as to the performance of our products.

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tion pit in the floor area between the console and the front wall (as shown in **Fig. 5**). A front console bunker can be used to absorb and/or deflect propagation paths into the absorption pit.

The console and meter bridge must be analyzed and adjusted to insure that surfaces on the console are angled such that incident propagation path angles are equal to or less than zero. This prevents reflections from angling upward into the engineer's position. Acoustical treatment may be required on the meter bridge for optimum monitoring accuracy. A reflection analysis should be performed on auxiliary equipment to determine a placement or orientation which does not allow strong reflections into the engineer's position.

These control room geometrical guide lines apply easily to the construction of new facilities, but what can be done about existing control rooms? The first step is to document the existing geometry and perform a reflection analysis as viewed through planes which intersect the monitoring axis. The reflection analysis can be based on computer modeling or through TEF-tested scale models. Through reflection analysis, the surfaces that introduce reflections into the engineer's position can be identified and design alternatives considered.

With careful consideration for the geometrical design of the control room, careful selection of an accurate control room loudspeaker monitor, rigid construction techniques, low ambient noise levels and appropriately designed control room isolation, the benefits of accurate control room monitoring can be realized. ■

Bill Morrison is the owner of Acoustical Physics Laboratories of Doraville, Georgia.

by Tony Thomas

JOHN FLESKES

STUDIO FINANCING AT MEMPHIS SOUND

Designing a recording studio has never been easy; these days, it is more difficult than ever. With the advent of digital recording and its uncompromising quality, every acoustic and electronic flaw in a studio is seemingly magnified a thousand times. Also, MIDI has not only changed the way records are made—it has changed the way studios are designed. Roomy control rooms and smaller studios have become the norm in recent years, since more music is being made behind the console and less behind the glass.

Spiraling construction costs have made second guessing almost unthinkable. Finished plans have to take into account present needs as well as future technologies, such as fiber optic cables and elaborate MIDI local area networks. The days of building a studio from the ground up every few years are past. Studios built in the late '80s should be just as viable in the late '90s, at least from a design standpoint.

How do you go about building a studio that can survive into the next century? To find out, we spoke with John Fleskes of Memphis Sound Productions, a studio located at the site of Pee Wee's saloon on historical Beale Street—where W. C. Handy reportedly wrote his classic "Memphis Blues" and "St. Louis Blues." Memphis Sound

John Fleskes (R) with Memphis Sound staff engineer Daniel Pfeifer.

started seven years ago as an 8-track writer's facility. One year ago, Fleskes and his partners, Tim Goodwin and John McDowell, moved Memphis Sound into its Beale Street location and made the transition to its present 24-track analog/2-track digital configuration. Memphis Sound also houses two publishing companies and a record company—enterprises that keep the studio busy when it is not used for music industry projects. We caught up with Fleskes at the start of a typical busy day at Memphis Sound.

Mix: How did you finance your transition to a 24-track facility?

Fleskes: It was mostly a self-financed expansion. The studio began as a pet project between the three partners; it was a way for us to produce our own projects at no cost, because we are all songwriters and performers. Since we wanted to make the studio self-sustaining, we didn't take salaries and put all of the profits back into buying equipment and studio expansion. It was a Las Vegas-style crapshoot for all of us, but we really felt good about the building, the location and the talent of the musicians in Memphis.

Also, when the 8-track tapes we were cutting began to get airplay and were being used to shop demos, we knew it was time to make the jump up. The rest of the financing we received from a local bank here in Memphis. The banks are starting to address the needs of the music community here in Memphis, which is something that they haven't really done since the Stax era. The banks in Nashville have always been responsive to the music industry, and the banks in Memphis are starting to come around again.

Mix: How did you arrive at your final design, and how did you go about budgeting for it?

Fleskes: We have enormous respect for a studio designer, who lives up near Nashville, by the name of Steven Durr. He came down and did some things with our 8-track studio that were, to me, incomprehensible. I didn't realize that an 8-track studio could be brought to the level of quality he took us to. He made the room and monitors sound incredible! When we got the building, we asked Steve to do a design for us on a spec basis. He asked us what we wanted to see, and we bounced ideas around for awhile. When he brought back the initial drawings, we were so impressed, our jaws dropped.

He was able to take the verbal descriptions of what we were picturing in our minds and, with the building plans, was able to give us exactly what we had described. He also worked out the estimated construction costs and worked in his fee as a percentage. We're talking about a really massive undertaking, since our main studio is about 60 x 45 x 33 feet with three ceiling levels and three floor levels. The control room is about 27 x 25 x 14 feet. We also have a tape machine room on the side that is behind glass doors, because when I'm mixing new age or classical music, I want to mix to silence, not to ambient fan noise from some piece of equipment. Consequently, everything that makes noise goes in that room.

Also, Steve designed our monitor system as part of the room. That saved us the expense of buying monitors and then having to make them work with the room. The monitors were designed for the room and vice-versa, so

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Over the last two years New York area recording studios have been moving steadily toward a "new standard". Tannoy loudspeakers, whether the PBM 6.5 mini-nearfield, LGM 12" bookshelf or the large format dual 15" FSM pictured at right, have become the choice of "golden-eared" independents such as Bob Rosa and Frank Filipetti as well as a vast number of studios, production houses and broadcasters. Increasingly, the power behind any of these Tannoys, regardless of size, has become the Perreaux high resolution mosfet amplifier. Its high slew rate, rise time, peak current and voltage swing capabilities along with a phase accuracy to within one degree make Perreaux the obvious partner for the equally transparent Tannoys. In order to fully realize the potential of this combination critical listeners are turning to silver and teflon composite Kimber Kable at both the input/interconnect and output/speaker ends of the audio chain. The resultant clarity, definition and preservation of spatial information has established the Tannoy/Perreaux/Kimber Kable system as **the** professional reference. For those seeking to push their capabilities to the limit, we also custom build 24" copolymer cone Hartley subwoofer systems extending low frequency response to 16 Hertz..... a **true** 16 Hertz.

In addition to installing the finest monitor systems we also specialize in packaging the most advanced outboard gear into effects racks for all applications. Of particular interest is the new computer-driven **QUANTEC** XL now with powerful **and** user-friendly Mac software (IBM & Atari are standard), the legendary **MARSHALL** 5402 Time Modulator **analog** delay and AR-300 Tape Eliminator, the **EVENTIDE** H3000 Ultra-harmonizer and SP 2016 Multi-fx reverb/sampler, the **AKG** ADR-68K reverb/sampler, the **T.C. ELECTRONICS** 2290 delay/sampler and 1210 Spatial Expander / Chorus / Flanger, the **KLARK TEKNIK** DN 780 reverb, the unique **DREW** Y-Expressor envelope modifier and Genesis DSP, and introducing the remarkable new **NEVE PRISM SERIES** rack featuring "V Series" EQ & mic pre/dynamics modules.

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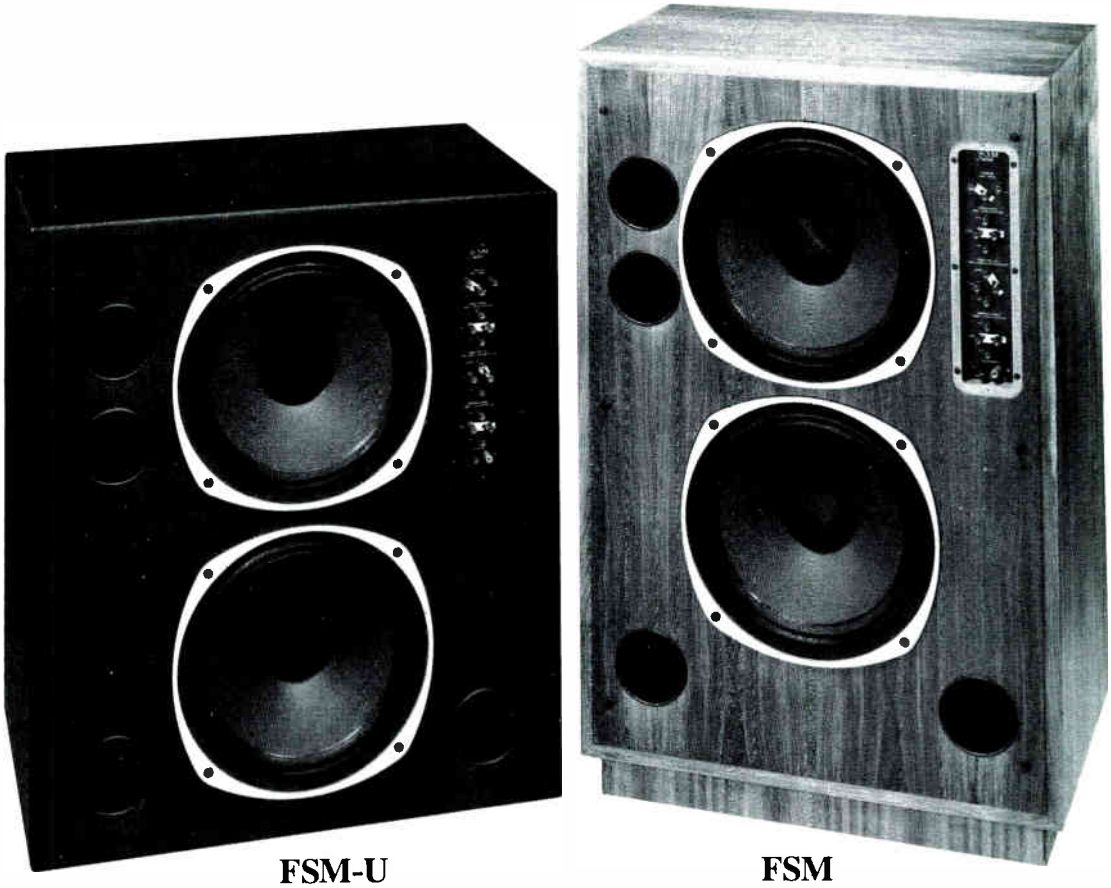

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The main competitor of our new FSM studio monitor is surely the most popular large monitor in use in the U.S. today. It is, in fact, a standard. And perhaps for good reason too. Originally conceived as a high SPL pop monitor, it took advantage of the dual-concentric principle of speaker design pioneered by Tannoy over forty years ago.

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ON THE SUBTLE SIDE:

It is the artful blending together of these obvious advantages that yield a more musical, accurate, powerful, non-fatiguing presentation of sound. This allows the engineer and producer to mold the finer details of a mix in a more precise way than ever before.

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they work together perfectly. There are also elements of the design that are important, but not visible to the eye. For example, we had Steve copper shield the studio and control room, increasing their RF rejection. Because of the size of the room, that required considerable design and engineering to layer it in properly. There are two independent video conduit networks and three independent audio conduit networks, all rigid and all separately grounded. He also did quite a bit of research to make sure that this place was designed to accommodate future technologies.

Mix: How did you cope with the down time involved while the studio was under construction?

Fleskes: Studios typically cost twice as much and take twice as long to build as you think they will. That is just the way it goes. The advantage we had is that we were building in an entirely different location. That allowed us to continue to operate the 8-track studio, and even slave in all the 24-track gear and test it out thoroughly. When we moved all the gear over, it only took ten days to get up and running.

Mix: How did you decide on equipment?

Fleskes: We got the Soundcraft TS-24 console because I am a partner in a Soundcraft dealership. It is a very good console and we have had super luck with it. We have had very little maintenance with it; it's very musical and very clean. As far as tape decks, I've been sold on Otari gear for years because of its impeccable performance. In terms of other gear, we have been acquiring it for a long time. I have a knack for finding pieces of used gear that people are getting rid of for some reason. As a result, we're loaded with outboard gear—we have two Lexicon 224XLs with updates, one 224, two dbx 900 mainframes, two dozen gates, compressors and limiters, and stereo pairs of every kind of delay and reverb you can think of. I'm also into vintage microphones and I'm real patient about getting them for great prices. Any time I go out of town, I'll go take a look at vintage microphones. We've acquired about 60 mics over the years.

Mix: How much did MIDI enter into the design?

Fleskes: In the control room, we have multiple patch bays, ¼-inch and XLRs dedicated to the producer's desk area especially for MIDI keyboard work. We also have tie lines, grounding and power lines for instruments like the Synclavier, so that when someone brings one in, we are able to put the Direct-to-Disk system in the equipment room, making for a very quiet working environment.

Mix: When do you think you'll have to redesign the room?

Fleskes: Hopefully not for at least ten years. With the way we did the conduit system, we're ready for fiber optic cables or whatever cable system becomes standard.

Mix: Do you have any advice for other studio owners who are about to design a facility?

Fleskes: If you are going to build a facility, don't build it for the money. Build it for the music. You can make easier money owning a pizza parlor. ■

Tony Thomas has been involved in broadcasting, recording, and publishing for over a decade. He is managing director of Target Communications International, a full-service ad agency, broadcast production firm and MIDI-based recording studio based in Southern California.

ECHO TIMES

AUDIOFILE POWER INCREASED YET AGAIN

For over 2 years now, AudioFile owners in the field have been receiving both hardware and software enhancements to their systems. Usually these upgrades are a direct result of collaboration with users on how to improve the AudioFile system for their particular requirements, allowing work to be completed more easily, faster and more accurately.

The latest series of modifications available for AudioFile have significantly expanded the scope of the system and attracted an extremely positive response from existing owners as well as a wave of new orders from recording studios and CD pre mastering facilities.

The latest enhancements can be summarised as follows:

* Full emulation of analogue tape Reel-Rocking, and between 2× and zero varispeed backwards or forwards.
* All 8 ouputs of the system can be selected simultaneously, alternatively 6 can be output whilst two record, either against the system's internal clock or against external timecode.
* A significant increase in the processing power of the system allows even faster access and screen changes.
* Once any piece of material has been recorded, programmable adjustment within AudioFile can provide either a level cut or a level boost to a maximum of 6dB on playback from AudioFile.
* Any recordings made on AudioFile can be digitally mixed within the system for output on any one (or pair) of the 8 channels.
* Any stereo recordings on AudioFile can be digitally panned left or right within the system.

The significance of this first set of modifications means that a single recording can be used in a particular scene several times with adjustment to level and position in the stereo image being made. These features can negate the costly requirement for a console automation system when dubbing and mixing to picture.

Finally, a new and very powerful Digital Signal Processing (DSP) card has been made available. The first of a series of software addressable features on this card now permits a highly realistic emulation of tape Reel-Rocking which is most valuable when used in the Cut-and-Splice page of AudioFile.
Particularly since the implementation of Cut and Splice, in conjunction with Reel-Rock and internal digital mixing, AudioFile has seen a strong commitment to the system from a group of the world's most respected CD pre-mastering facilities.

AMPEX INTERFACE PROVIDES FOR AUTOMATIC ON-LINE EDITING OF AUDIO BY VIDEO EDIT CONTROLLERS

AMS and AMPEX agreed almost twelve months ago to co-operate on the development of an interface that would allow AudioFile to be controlled automatically by a video editor.
This interface is now available for AudioFile and effectively causes AudioFile to emulate either a VPR 3 or VPR 6 machine.
During on-line video editing sessions, a VPR-3 or VPR-6 port on the video editor may be assigned to AudioFile. By setting pre-roll and post-roll default on the video editor, AudioFile will automatically record audio 'tops and tails' at either side of all video edit points.
AudioFile is then able, either on or off line, to take advantage of its disc storage technology to sweeten any or all audio edits. The powerful (Cut and Splice) editing software in AudioFile can accommodate track slipping, programmable cross fades up to 10 seconds, level adjustments at edit points from cut to +6dB and even pan. The entire edit splice point can also be moved backwards or forwards, and audio pre or post the video edit point can individually be made to key point the edit point in order to achieve the best possible audio edit.
One more thing that AudioFile can do that proves very difficult, if not impossible, to do with tape:-
Once the audio edits have been corrected, the 8 track capability of AudioFile can still be used off line for dialogue replacement, adding music tracks or synching of additional sound effects.
The finished result can be laid back to the video master without the audio degradation associated with multiple tape generations which result from conventional treatment of audio during video editing.
Further information and a demonstration may be booked from any AMS distributor listed on the back of this issue of Echo Times.

UA 8000 UPDATE

Music Factory are installing a Calrec UA8000 console in their recently expanded and refurbished Studio 1 in Cardiff. The 48 channel console is fitted with the AMS TASC Automation/Machine Control System.
Music Factory, who record all kinds of music chose the Calrec UA8000 because of its unrivalled combination of Audio Performance and flexibility of operation, features which have long been acclaimed by users of the UA8000 at PUK in Denmark, Abbey Road and Mastermix in Nashville.
Studio Manager, John Davies, said the UA8000 had been chosen so they could offer a facility which was uniquely superior to their competitors and which would put them in the company of world class studios.
The new studio is already heavily booked for 1988 on the strength of the Calrec UA8000 console.

AMS DMX'S AND RMX'S GO DOWN BIG DOWN UNDER

Chase Music Pty, Ltd., the largest outboard studio rental company in Australia has recently experienced a large growth in demand for AMS outboard equipment, particularly the RMX 16 digital reverberator and the DMX 15-80S dual channel digital delay line/pitch changer/sampler.

Although the demand has focused on recording studios, the number of foreign bands touring Australia who are now specifying AMS audio processors has also seen a significant increase.

Jim Taig, managing director of Chase, puts this increase in demand for AMS effects systems down to the recent chart sucess of several black American artistes such as Janet Jackson and other groups produced by Jimmy Jam and Terry Lewis in Minneapolis.

"My clients specify the RMX 16 because they prefer the warmth of sound that the system provides and seem less interested in many of the fancy gimmicks offered by the glut of the newer reverbs that have been coming out of America and Japan" says Jim Taig. "Just as gimmicks don't seem to point the way as to what makes a good reverb, price doesn't either – my clients seem to prefer the RMX 16 to the more expensive 480L or the less expensive REV-5".

"Many manufacturers have blatently tried to copy AMS sounds, however, my clients include most of Australia's top producers and although I am sure they are familiar with every new device that comes along I know that the RMX 16 reigns supreme when it comes to the sounds people prefer."

Jim Taig and his partner Peter Cobbin are themselves Producer/Engineers and seem to be continually impressed by the number of new and varied possibilites they discover whilst working on projects of their own with the DMX 15-80S. Jim currently has an album called "Wa Wa Nee" on Epic Sony sitting at number 35 in the U.S. charts and one trick used by Jim may well prove of interest to many other DMX owners out there:

"Many of the vocals on the album were flown-in to different choruses using the DMX 15-80S. What I discovered was that by hitting the reset button, both channels started recording at the same time and that is the way I captured all the stereo samples from my F1 before flying them in. It didn't stop there though because once you really get into sampling like this you soon find you run out of time – no matter how much storage you have! The solution I've found and used successfully is to load my samples onto a Studer A800, varispeed it up by 3 or 4 half tones and then load the time-compressed sample into the AMS. Once it is in the unit I then use my MIDI interface to a DX 7 which I can then play the sample back down 3 or 4 half tones to restore it to its original pitch!"

And why go to all this trouble? Well as Jim (like many other converts to using the DMX 15-80S as a sampler) says – "There are a lot of samplers and sampling keyboards out there at a range of prices, but again nothing so far gives the richness of sound quality that can be achieved by using the AMS."

Chase Music can supply a selection of Yamaha Reverbs and Delays as well as 2 Lexicon 480L's and 2 PCM 70's. In terms of AMS units, Chase owns 7 AMS units and will currently increase that to 8 by adding another RMX 16.

Chase Music can be contacted in New South Wales on 61-2-957-2929.

ROYAL VISIT

The 12th of November 1987 was an historic day for the area of England where AMS is based. Her Majesty Queen Elizabeth II and His Royal Highness Prince Philip, Duke of Edinburgh visited the town for the first time in over 20 years.

The Duke of Edinburgh's reason for visiting the town was to be shown round the AMS operation and officially to open the company's new headquarters building.

Over 100 guests, comprising customers and foreign distributors, were delighted by His Royal Highness taking time to chat informally with many of them before officially unveiling a plaque and signing the visitor's book to commemorate the opening.

Although the AMS Research and Development building and production wing had been in operation for some time, the new 22,000 square foot Calrec production wing had only been occupied by the Calrec workforce some 14 days earlier.

In a letter of thanks from His Royal Highness following the event, the Duke had said he had had a most enjoyable and worthwhile visit and had been delighted to have the opportunity to see such a thrusting young company on home ground.

AMS-USA

With the increasing interest in both AMS and Calrec products in the United States of America comes the opening of a distribution and support office for the entire range of AMS and Calrec products.

The office will supply all AMS and Calrec reps and dealers across the United States and become the service centre for everything from AMS audio processors and AudioFile to Calrec consoles and the SoundField microphone.

In charge of AMS Industries Inc., will be Mr. Nigel Branwell who has been handling Calrec sales for some 6 years and has also been a dealer for AMS audio processors for three years.

Nigel commented on his appointment "There are no two companies in the entire industry that could be more complementary to each other. Although AMS have achieved a great deal of success in America, people here are only just beginnning to discover for themselves why Calrec is such a highly respected name in Europe. Whether you talk about the AMS AudioFile, the UA 8000 music console with TASC automation, the digitally assignable console, the SoundField Microphone or AMS audio processors – there isn't a single product range from the company that isn't impacting very positively in the U.S. at this very moment. With this new commitment to the American market I believe every customer, new and old, has just got themselves a hidden bonus and as far as I am concerned, I feel my experience with both AMS and Calrec landed me the most exciting position in the American pro audio business."

SPAIN – TRADITIONAL INDUSTRY UPGRADES TO AUDIOFILE

Although AMS has had international success with many of its products worldwide, countries such as Spain – because of population – have never been high on the AMS distributor sales chart. Now however, with AudioFile, the success and promise of sales in countries like Spain shows just how quickly the acceptance of disc based audio manipulation is growing. Pictured right is Mr. Jim Kashishian, owner of the first AudioFile in Madrid, Spain. Alongside Jim is sound engineer Ruben Rapöso sitting in front of the second AudioFile installed in Madrid at Estudios Exa.

Jim Kashishian said "Spain has a well established dubbing and post-synching industry which has successfully employed a very traditional approach. High technology solutions to combining sound and vision in these areas usually fall short of the requirement and fail to stimulate the interest of the engineers. Not so with AudioFile! There are a lot of companies here getting very excited about this new way of working and already this excitement is turning into investment because, for once, a product like AudioFile can show, even after a very short demonstration, how it is possible to get the right sort of returns on that investment.

STOP PRESS · STOP PRESS · STOP PRESS ·

ATA NOR VIDEO CENTRO TO RECEIVE THIRD AUDIOFILE IN MADRID FEB 88.

THE SOUNDFIELD INTERVIEW

"WE'VE PRODUCED 83 CHART HITS IN 3 YEARS, WE'VE MIXED 31 NUMBER 1'S THIS YEAR SO FAR AND SOLD 80 MILLION SINGLES WORLDWIDE – AND WE OWN TWO MICROPHONES."
– PETE WATERMAN.

Talk to anybody who has worked with a Calrec SoundField and not only will you find total support for claims 'The Best Microphone In The World', but also a total inability to explain how any studio can record without one!

A strong claim for 'just a microphone!' Maybe not! What owners rave about is not that the SoundField can record ambisonically, not even that it is the cleanest sounding microphone in the world.

The truly unique thing about SoundField is that it can be used as a post production system. The SoundField microphone can be placed anywhere for a stereo recording: once everyone has gone home the 'black box' that is an integral part of the system can be used to zoom-in, or zoom-out, zoom-left or zoom-right, even zoom-up or zoom-down.

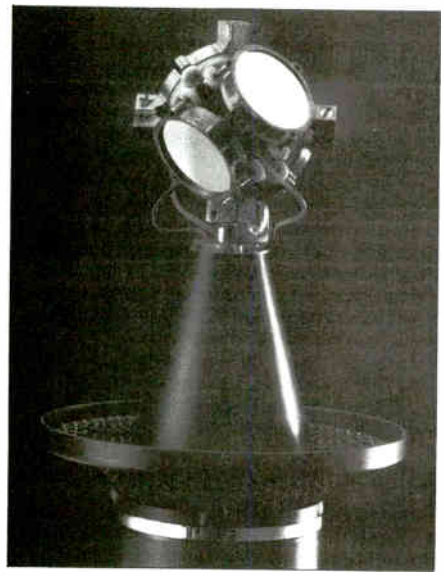
No wonder you are about to hear why Pete Waterman, in all his hit-making empire, only has need for two microphones – of course both SoundFields!

Nobody raises an eyebrow now when every week a newer, cheaper, supposedly 'far better' digital delay line or digital reverb hits the streets. If you want to find out how a microphone could give your studio the edge that used to be the difference between owning a digital reverb or not – read on....

PETE WATERMAN

Pete Waterman was born in Coventry and although his working week is spent in his London studio, his home is now in Warrington. Pete started as a Disc Jockey and whilst trying to get into radio he stumbled into the record industry and landed a job in A&R at CBS and then Magnet Records.

A.M.S.: *So did the job in A&R result in you seeing the inside of a studio for the first time?*



Pete Waterman : Yes it did and I found myself more and more having to go to the studio when a band was recording. That's really what puzzled me. Why anyone would employ a D.J. to make decisions in a studio when everything there was so far beyond his comprehension. I was being paid to make decisions that were affecting professional musicians and engineers when I didn't understand what the desk did or what a 24 track tape machine was! People had to listen to me and respond to my whims and fancies.

A.M.S.: *But obviously you were successful at doing this?*

P.W.: Yes but that made me realise how sorry the record industry was and as I became more successful I set myself on the idea that if anybody can employ really talented people in the studio situation, along with record producers and have a whole 'locked-in' family set up, they wouldn't allow a young renegade A&R guy to come and and tell them how to do things.

A.M.S.: *But it worked for you!*

P.W.: Yes, but just think of record companies sending producers from one studio to another where they didn't know the monitoring, they didn't know the room and they'd even have to hire in mountains of missing outboard gear.

A.M.S.: *So not only a good recipe for disaster, but very expensive too?*

P.W.: It just didn't make sense. When we started Stock, Aitken and Waterman, studios didn't own AMS DMX or RMX units. If they did, they had one unit maximum. The first thing we bought were three AMS DMX 15-80S units, all with almost maximum delay and dual pitch changers. People were amazed when we turned up at outside studios with an effects rack that was probably worth more than all the equipment in the studio! But at least the record companies didn't have to go to rental companies and pay their prices for the equipment. It wasn't uncommon in London for the record companies to be stuck with a bill for the studio per day, and an even bigger one for the AMS rental.

A.M.S.: *So is that what prompted you to build your own studio?*

P.W.: We seriously made the decision to go the whole hog. Strangely enough that is where we first bumped into Calrec because we wanted a UA 8000. The only reason we didn't end up with a UA 8000 was because we needed a console immediately and we would have had a six-month wait for our UA 8000 to be built. Whilst we were up at the Calrec factory in Hebden Bridge we saw the SoundField microphone which was timely because we'd just been having a problem with Pete Burns of Dead or Alive's vocals. He was distorting every microphone we put in front of him and we just kept having to ask him to stand further back and we therefore couldn't get the sound we wanted.

A.M.S.: *So how did you get on with SoundField?*

P.W.: We borrowed one and bought it immediately after the first time we used it. We had tried every mic there was and the first thing

the SoundField did for us was to allow us to record Pete Burns vocals. It's the only mic that could do it!

A.M.S.: *Besides not distorting, what other benefits did SoundField have?*

P.W.: SoundField is the only microphone that doesn't colour sound. If you work with Neuman or AKG they all have a sound which you either love or hate. For me, every other mic gives a misty sort of shroud to vocals and no matter what you do you'll never get rid of that. For anyone else who has had that feeling I'll tell you now, the only way to be rid of that shroud is by using a SoundField.

A.M.S.: *You obviously are very proud of your recorded vocals using SoundField, so going back to A&R people how do they react to your approach?*

P.W.: Well, we've sold about eleven and a half million singles by the end of the summer this year, and of the four biggest singles in the UK so far – three of them are ours. So A&R people can't complain!

A.M.S.: *Do you keep your eye on new audio processors and mics that keep appearing?*

P.W.: Of course we do, we're as interested as anyone else in new toys but it keeps coming back to the same thing – with SoundFields and four AMS units in each room we are absolutely covered and nothing can beat that combination. Trends come and go with equipment but any studio that doesn't work with AMS units is not in the real world! I could work without AMS units but it would make life very difficult. We're in the position now where manufacturers like Akai, Yamaha and Roland send everything down to us for our comments, just in terms of samplers we must have hundreds of the things. We've got the most up-to-date Fairlight Series III and a Synclavier – but just in terms of sampling nothing can compare to the combined quality and ease of use of the AMS DMX 15-80S. When you are making hit records for a living that sort of thing becomes very important.

A.M.S.: *With Stock, Aitken and Waterman and PWL Studios it seems your personal philosophy and approach has worked extremely well. What do you say to any other producers and engineers who want to know your secret?!*

P.W.: There certainly seems to be an air of disbelief. Probably the funniest story is the one asked by many world famous engineers or producers who know the work we've done and want to look round the studios and ask questions on mic techniques. The first question always asked is what's your range of microphones? The answer I always give is we've got two and they're SoundFields. Usually they have never heard of Calrec SoundFields and so the question then comes back – No, but what do you use for vocals? Calrec SoundFields. No, but haven't you got 87's or 47's? No, No, No – we've got SoundFields! But what do you use for the drum kit? We use a SoundField! No, I mean what do you use for the bass drum? A SoundField, we use one SoundField for the whole kit. But how do you get that fantastic horn section sound? We use a SoundField – I don't think you quite understand – we use one microphone for everything! But what about that string section of about twenty players on the Dead or Alive track? Yep! One microphone, the SoundField.

A.M.S.: *Did you enlighten anybody?*

P.W.: I don't think so, but there again none of them have worked with a SoundField. I've done interviews where I always get asked why am I so excited about using a SoundField? When you have worked with one it's like changing from a black and white TV set to a colour. You realise that people aren't shades of grey but they are made up of colours. You ask anybody that's worked with a SoundField – nobody that's worked with one can understand why there isn't one in every studio.

A.M.S.: *Do you think the price puts people off?*

P.W.: This is another of those crazy things about the record industry. When you put a studio together it's common to spend a quarter of a million pounds on a console, a hundred and ten thousand pounds on a digital tape machine and stick a microphone up that's 50 years old and expect it to record the best sound in the world! Test it for yourself, anyone who has made the sort of investment we've just talked about will still think that a four hundred pound microphone is expensive! My little boy just bought a forty pound sampling keyboard – you might as well rip the mic out of that thing and use that if you think four hundred pounds is expensive when it comes to making the most of a half million pound investment.

A.M.S.: *Microphone technique is still probably one of the few remaining areas of 'black art' when it comes to modern recording. Is the SoundField difficult to get into?*

P.W.: No not really. It's like anything else though, if you've worked with anybody that has experienced the SoundField you'll definitely learn faster. You wouldn't stick an SSL in the hands of anyone who's just come off a Trident and expect immediate results. My 17 year old kids who are working as tape op's can use it so it can't be that difficult! You obviously get better and better results as you get used to it and the most exciting thing is you keep improving your technique. There is no limit, the microphone is beyond the individual's capabilities and not the other way round which is usually the case with all other mics.

A.M.S.: *Do you have any special tricks?*

P.W.: One thing I enjoy doing is recording vocals in the control room whilst monitoring at a normal level. I've done this with Mel and Kim and Bananarama. The SoundField can be tuned to allow vocals to be recorded without recording spillage from the monitors which seems unbelievable but is a very valuable technique once you've mastered it. Let's face it, the thing that comes through most on a record should be the human voice and the recording engineer's job is to record that human voice better than anybody else. The key to that is not the console or the tape machine – it's the microphone and in our case it's the SoundField. We have a sound booth with a SoundField that keeps our studios busy 7 days a week, 24 hours a day!

A.M.S.: *Surely you have salesmen who visit you with new products that they claim are better?*

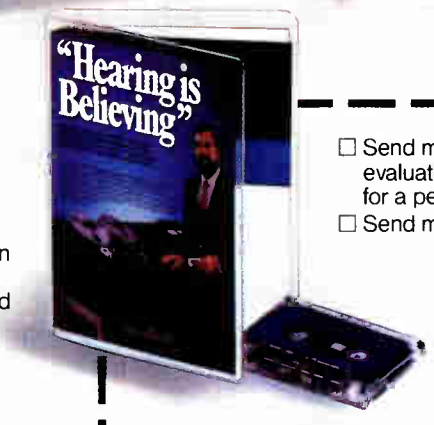
P.W.: Oh all the time, and I say – fine, and I go and get two secretaries and sit them in front of the speakers and I tell them that every time they hear a vocal they like to put a tick. Every time they hear one they don't they put a cross. I switch from SoundField to the other mic and every time I can see a cross being put down. I even try and fool the girls but every time the SoundField gets a tick. Even the salesman eventually had to admit that his mic sounded harsh and cruel compared to the SoundField. The girls picked the sound they liked – as simple as that.

A.M.S.: *And your success record?*

P.W.: We've produced 83 chart hits in 3 years, we've mixed 31 number 1's this year so far, we've sold worldwide about 80 million singles, we're building studio 4 and we've got studios 5, 6, 7 and 8 on the drawing board. Last month 18 of the top 40 singles were mixed by us!
The SoundField has been the best three thousand pounds I ever spent in my life! It's made me a multi-millionaire. Anybody that spends the time on a SoundField will be more than rewarded.

Professional

The Telex 6120XLP. A new audio tape duplicator with 8X speed and tougher specs.



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Mix 8/88

SOUND ACHIEVEMENT

TEC WINNER'S PROFILE

PHOTO BY STUDIO ONE, RENO

Few have revolutionized studio design like Chips Davis, pioneer of LEDE® technology and designer of world-class rooms, from Granny's House in Reno to Sounds Interchange in Toronto. *Mix* readers acknowledged his achievements by voting him the 1987 Technical Excellence and Creativity Award for Acoustics/Studio Design. Chips Davis has mastered the blueprint for excellence:

PHOTO BY C.R. KING

Defining stereo: "Stereo is not left/right. Stereo is left/right, front/back, up/down. It's a dimensional entity. The better you can hear in a space, the better you can mix dimensionally."

Control room philosophy: "There isn't yet a control room where we have an acoustic neutrality, a blank, white canvas. We've still got a canvas that's got a little color. The more neutral canvas we start with, the more we can do in our painting, and we don't have to cover up so much."

Advice to new designers: "Learn music — the artistic point of the music, learn to engineer, learn what you hear, and then learn the acoustics."

The TEC Awards: "The TEC Awards are something that has been long overdue. They help bring to the forefront the people who are on the cutting edge of our business and give them their just due."

***Mix* magazine:** "*Mix*'s database is invaluable to everyone in the business who's looking for information. It's a superb magazine. It has its own niche and is part of our industry."

MIX THE RECORDING INDUSTRY MAGAZINE

The 1988 TEC Awards will be held Nov. 3 in Los Angeles. Call (415) 653-3307 for more information.

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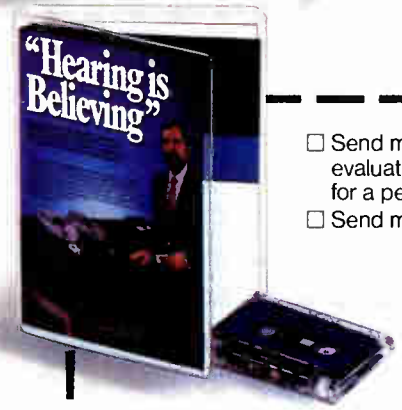

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DESIGNING THE COUNTRY'S NEWEST STUDIOS

THE HUMAN INTERFACE

BY LINDA JACOBSON

"Castles in the air—they're so easy to take refuge in. So easy to build, too."

—Henrik Ibsen, *Ghosts*

When people set out to build their dream studio, they usually start with a mental image. Whether the image becomes reality depends on so many factors, not the least of which is the help provided by the *experts*—studio designers. These experts know that live performance studios have certain parameters for architectural layout, different from those for MIDI studios, or audio post-production studios. But no matter what the facility's function is, it must implement the personal feelings and desires of its owner.

Mix wanted to learn what happens when imagination meets science in the realm of studio design. So we contacted the owners and managers of new facilities (or new rooms in existing facilities) to find out.

• • •

When folks choose to work and live in the same place, the results reflect personal tastes far more than any other type of business situation. Such is the case with Plum Sound & Video in the seacoast town of Newburyport, Mass. (an hour north of Boston). Built from scratch, it houses both a recording/commercial production studio *and* its owners, Richard and Vivian Tiegen. Richard Tiegen saw the need for "a high-quality, live, ambient space, with high ceilings and performance-oriented acoustics, that can accommodate a large number of musicians." Though Plum is equipped for video production and post work, Tiegen notes, "We didn't want to be everything for everybody, and when deciding the architectural concept and design, we had to keep that in mind."

To that end, Plum is an unusual, contemporary, Class A wood-frame structure that was a year in the making: the first floor holds the studio and control room (which opened in May); part of the second floor is a continuation of the first (with its sloping, cathedral ceilings), and the other part is offices and a lounge-with-a-sea-view (Tiegen expects the lounge to evolve

The building "footprint" determined the lay-out of San Francisco's Savage Studios.

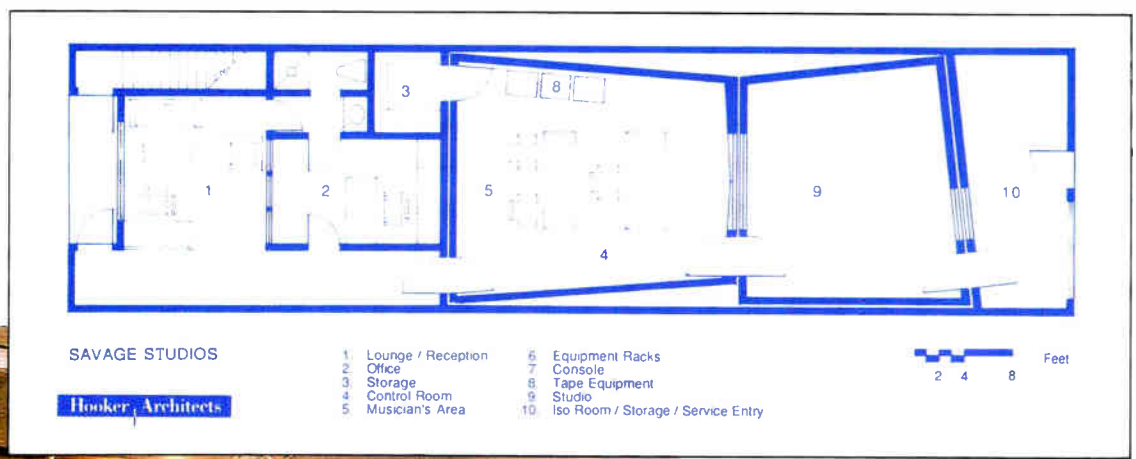
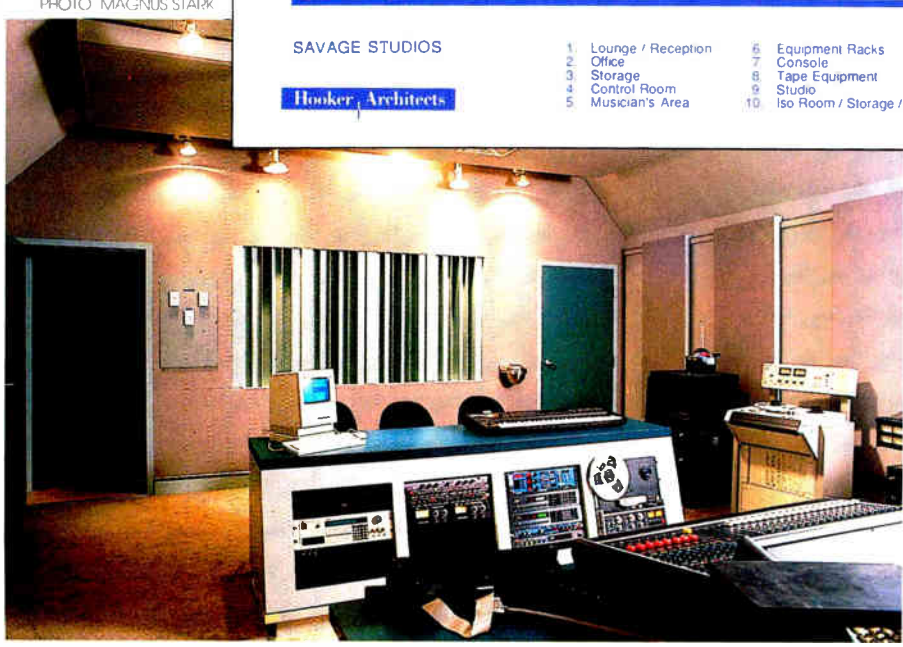


PHOTO MAGNUS STARK



into a MIDI/synth room). The third floor is a full apartment, its windows overlooking the ocean.

Before building Plum, Tiegen had been involved in music engineering and producing for 20 years and had worked at New York's Atlantic Studios. Plum's design, says Tiegen, is based on "bits and pieces from rooms in New York, good-sounding rooms with good-sounding consoles, great places to lay tracks. So I had my own designs and the standard textbook ideas, plus ideas from architects and consultants I was working with [Architectural Energies in Northampton, New Hampshire; Bolt, Baranek & Newman in Boston]. At one point after I had the building footprint and was thinking about the shape of the room, I didn't know which way to turn. I'd heard Jim Falconer's name a lot [Falconer is an independent who's designed over 175 studios, including Electric Lady and Atlantic], so I gave him a call.

"Aside from Jim's credentials, what impressed me," continues Tiegen, "was that he was easy to talk with. A lot of acoustic designers are on a head trip and feel their way is the only way. Jim's worked with major designers who do things by the book and he knows that sometimes that works, and sometimes it doesn't. The fact that he was originally an artist also impressed me, because he conceptualizes visually as well as audio-wise. I think that all too often, we people in the audio community lose our sight and lock into our ears."

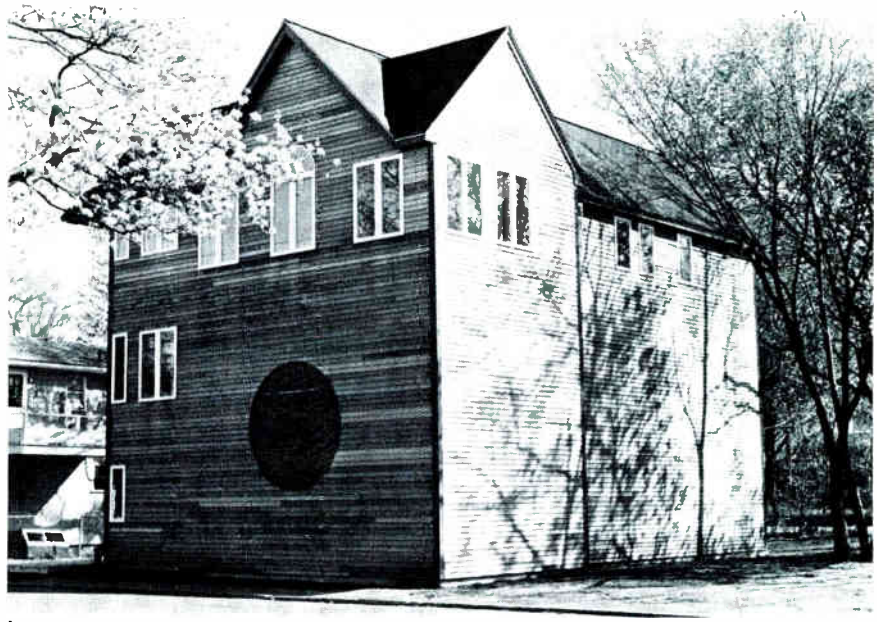
Local contractors and the architects had input on room lay-out and would call Falconer, who set the limits. The wood-frame construction utilizes 2 x 8s; the ceilings are lined, floating and isolated. Carpeting covers all-cement floors, which are several feet thick. The studio and control room float, isolated from the building and each other. Acoustic response of the 480-sq. ft. studio (plus two iso booths) ranges from "very live to very dead." The control room features a modified 32-channel Neve 8108, Sony 24-track machines and digital mixdown, and measures about 300 square feet. Tiegen notes, "Jim set up plans based on modified LEDE®. We'd build, then he'd come in and say everything is fine as long as you do this, this and this. We used his own proprietary diffusors, absorbers and treatment."

With so many parties involved in the project, did Tiegen experience any problems? "Intellectual effetism," he says simply. "You have to be political. Instead of being an audio producer or engineer, I became a supportive team member, politician and business guy. It was tough and very stressful."

When veteran producer/songwriter Joe Thomas purchased a Tom Hidley studio design ten years ago, he didn't get the chance to implement it. But today, the now highly modified design is River North, Chicago's newest recording/production facility. It contains four studio/control rooms (two of which are leased, "condo"-style, to music production houses) and a Synclavier suite under construction.

Thomas presided over the design and building of this "record-oriented jingle studio." Input came from the people who would primarily work there: technical engineer Don Arbuckle, who laid out the wiring; recording engineer Larry Millas, who handled the acoustical end; and chairman-of-the-board Steve Devick, who, conveniently, owned a construction firm in Chicago. After eight months of well-capitalized planning and construction, the modified Hidley design became River North's Studio A.

Although the team itself finalized the design, independent acoustic consultants were asked to come in for a day or two. ("The room was analyzed four times," Thomas says, "and all the



Lrg.rms., ocean vu: the third floor is a full, modern apartment, but floors 1 and 2 house Plum Sound & Video in Newburyport, MA.

results were different. So we picked their brains, and took things we liked.") Thomas says their team "had bitch sessions about studios we'd been in and put good ideas from 25 studios into the Hidley design. For instance, I was in a studio in New York that had a brick wall, which was noisy, but I liked it. Fortunately our building frame has 18 inches of concrete and can support an interior brick wall, so we put one on top of the floating floor in Studio A. We combined that with some wood and heavy trapping, so on one side you get a distinct live sound. Also, the places I enjoyed had high ceilings in the studio and control room. The 'feel' of the control room is important, because people live in them. The acoustics guys say high ceilings do something to the sound, but aesthetically—if the clients don't like to spend 40 hours a week there, it doesn't matter how it sounds. We wanted to look high-tech and homey. We stuck with neutral tones, but went overboard on designs in the wood, the spaciousness, the lighting, switchplates, things we can change later. The control room is heavily trapped, very bright, with lots of wood and R19 fiberglass."

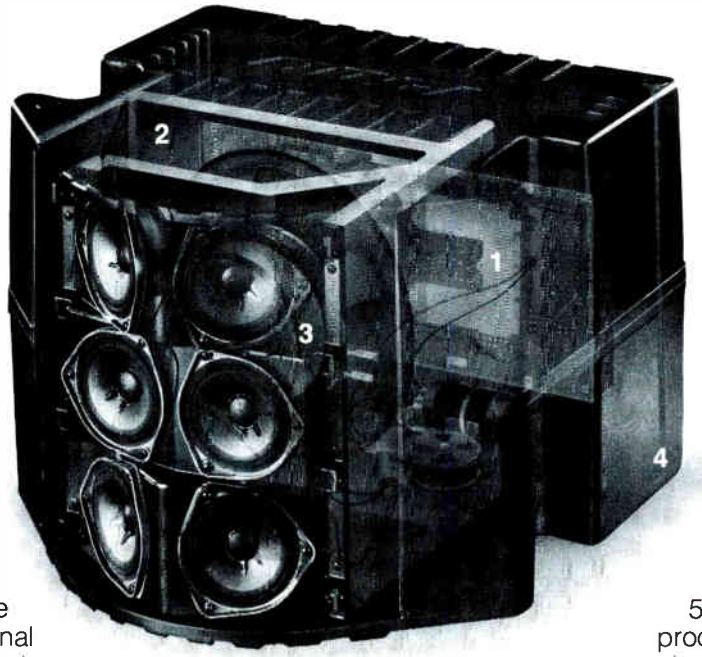
For the studio, says Thomas, "we found a unique, inexpensive way to soundproof the walls. We built a small 'studio,' four feet by five feet, put it on a floated box, put in a JBL studio monitor, cranked it up to 120 decibels, covered it, sealed the box, then used a meter to test the leakage of the structure. As a result, our basic sound-stopper wound up as a 2 x 6 stud with three sheets of 5/8-inch drywall and a couple of sheets of 3/16-inch leading, with R19 insulation."

Finally, because both Thomas and Millas have been performers, they thought it important to provide "custom" atmosphere: "Studio A has theater lighting, with colored gels and spotlights for musicians who are used to performing on stage. If you put these guys in the right mode, they're probably going to write better. On the other hand, for commercial work it can look just the opposite, with bright white lights like a factory."

When a production company gets to build an audio post room in a spanking new, full-service audio/video complex, hopefully all goes according to plan. The people of Ron Rose Productions, based in Southfield, Mich. (near Detroit) recently experienced the pains of scheduling contractors when they constructed an audio post room for their Farmington Hills outpost (part of a production and post facility belonging to Grace & Wild Studios).

The stand-alone, second-floor room, designed by Ron Rose chief engineer Bill Bryan, primarily handles commercial productions and offers custom synthesizer tracks. It has an automated Neotek Elite board and Otari 24-track and 2-track machines, set up for scoring to picture via one-inch Sony video machines and 36-inch monitor. The room measures about 40 x 22 and includes a vocal booth, moveable drapery, carpeted floors, parquet floors

The Bose® Acoustimass® Professional Powered Speaker System



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The design of the Acoustimass Professional system takes this important fact into consideration: your time is money. So, all system electronics, including the amplifier and loudspeaker equalization (1), are right where they belong: with the speaker. Forget about spending your valuable time building heavy electronics racks. Everything you need for sound amplification is in one compact, self-contained package that's easy to transport and install. The enclosure's integral hang points make hanging or flying the 80 pound cabinet a simple task.* Setting up the Acoustimass Professional system is as easy as plugging in AC power, connecting line-level from the signal source, and aiming the system.

Clear, natural sound for a variety of applications.
Besides convenience features, the Acoustimass Professional system contains two new proprietary Bose audio technologies: *Acoustimass speaker design and the Two-State Modulation amplifier.* Together, they deliver performance far beyond what you'd expect from such a compact, manageable package. Rather than relying on vibrating cones to directly radiate sound like conventional speakers, the patented Acoustimass speaker uses two masses of air to launch sound into the listening environment (2), dramatically reducing distortion. The unique circuitry in the system's patented Two-State Modulation amplifier delivers enough clean power to meet the needs of almost any sound reinforcement situation. The result: *Purer sound and increased bass output* at nearly any volume level—all from a speaker that's a fraction of the size and weight of conventional designs.

Use it almost anywhere—you can *count* on it.
You can depend on the Acoustimass Professional powered speaker system. Its woofer and wide-range patented HVC drivers (3) are virtually indestructible, and carry a full, transferable 5-year warranty. Its amplifier produces almost no heat, and carries a full, transferable 3-year warranty. And its cabinet (4) is an advanced high-technology polyurethane enclosure, designed to endure many times the stress that would prove fatal to ordinary speakers.

Use the Acoustimass Professional system in clubs, churches, theatres, auditoriums, performing halls—in short, *anywhere* that high fidelity sound reproduction and ease of use is important. Audition the Bose Acoustimass Professional powered speaker system soon. For more information write: Bose Corporation, Professional Products, Dept. MM, The Mountain, Framingham, MA 01701.

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under the board and producer's desk, and a drop ceiling with textured acoustic tile. Ron Rose Productions will probably add another suite, an 8-track room possibly containing a tapeless mixing system. The facility also features a separate machine room, conference room and kitchen, all conceptualized by Bryan.

Bryan's been with Ron Rose for 11 years, after attending the Lawrence Institute of Technology and RETS. He built and maintains all Ron Rose studios ("ten or 11 studios in Southfield and in another facility we share with Postique [a video post house]"). Bryan wanted the new room to look somewhat like Editel in New York. "One of the things I like about their audio post room is the multi-level seating, so I modeled it after that. People who sit in the back of the room are higher up and can look down at what's going on." Because of local code restrictions, Bryan hired an architect, Bob Jason from Royal Oak. "This was his first time doing a studio, so I had to educate him about how to build a quiet one."

Along with the time it took to educate the architect, there were other time-consumers—"partly because the ceiling was not as high as we would have liked it," Bryan explains. "Since the room has four levels, the heating and air conditioning duct work had to go in the ceiling and run between the girders, which complicated it. We wanted the vocal booth to be quiet, which required longer runs and duct work than normal. Also, we had to add sound traps to the duct work to keep the noise down to an absolute minimum. We also needed more electrical than what the suite actually provided us. As a result, the job took longer and was a lot more involved." The room opened in July, but was supposed to be finished in May.

Scheduling difficulties contributed to the slow-down. Bryan remarks, "You can't really bring in tradespeople to do things one time. You have to bring them in multiple times, and it's tough to get them to schedule. A good electrician isn't free all the time—you may want him to come Tuesday to finish something, but can't always have that. Both the architect and I oversaw the construction, but I would have liked tighter control. Next time there'll be somebody there more often, like myself or the architect."

When a facility that serves as an educational institution and full-service audio/video complex grows from 8,000 to 23,000 square feet, someone's doing something right. And when its design must please students, engineers, film and TV clients and a major equipment manufacturer, someone's got to do *everything* right.

Now in its tenth year, the Full Sail Center for the Recording Arts is moving from one suburb of Orlando to another, growing from one studio to seven. The new two-story Full Sail—which should be completed this fall—contains two Synclavier suites, an NED Direct-to-Disk suite, a 48-track analog room, a studio attached to a 48-track recording truck, an 8-track analog production room with voice-over booth, and a one-inch, full-service video production and post facility. All rooms float within the main structure. In these digs Full Sail teaches everything from multi-track and direct-to-disk recording to editing two-track for commercials. Education comprises 60% of business, and outside clients—including the Disney empire—take 40%.

Chief administrator Jon Phelps says location was a key factor in planning. "We had to pay attention to student housing and things students need when they're not in school. We also

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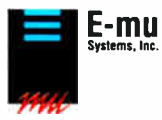

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The IEQ with Smartcurve™ is a programmable, high performance graphic equalizer that includes a video output. For those who wish to enjoy the video output of the IEQ, ART makes the IEQ Video Monitor.* Smartcurve™, proprietary software developed by ART gives you instant actual frequency response as easy as the push of a button.
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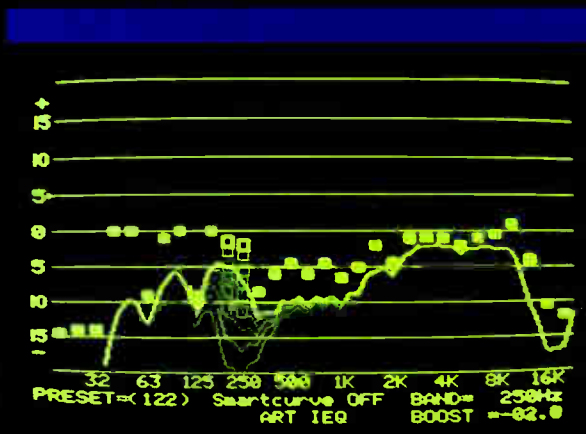
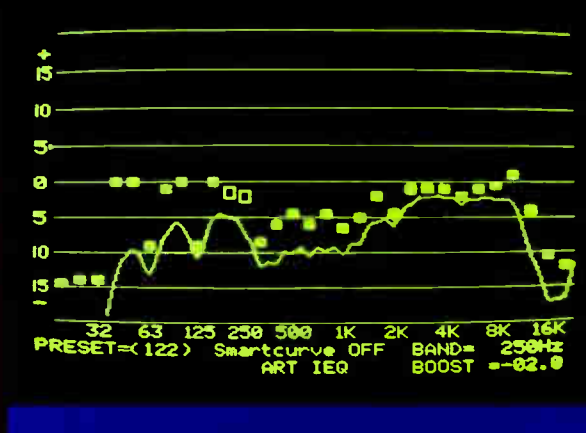


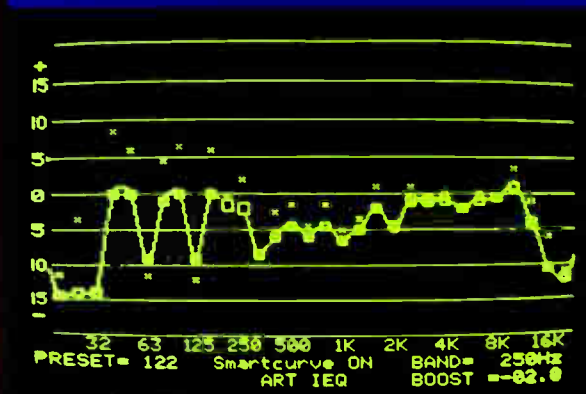
1 See the Sound

This is a video output of the IEQ as the unit is being adjusted. The sliders can be moved ± 15dB in 1/2dB steps to get the exact response you need. With the simple push of a button, complex equalization can be done in seconds with incredible accuracy.



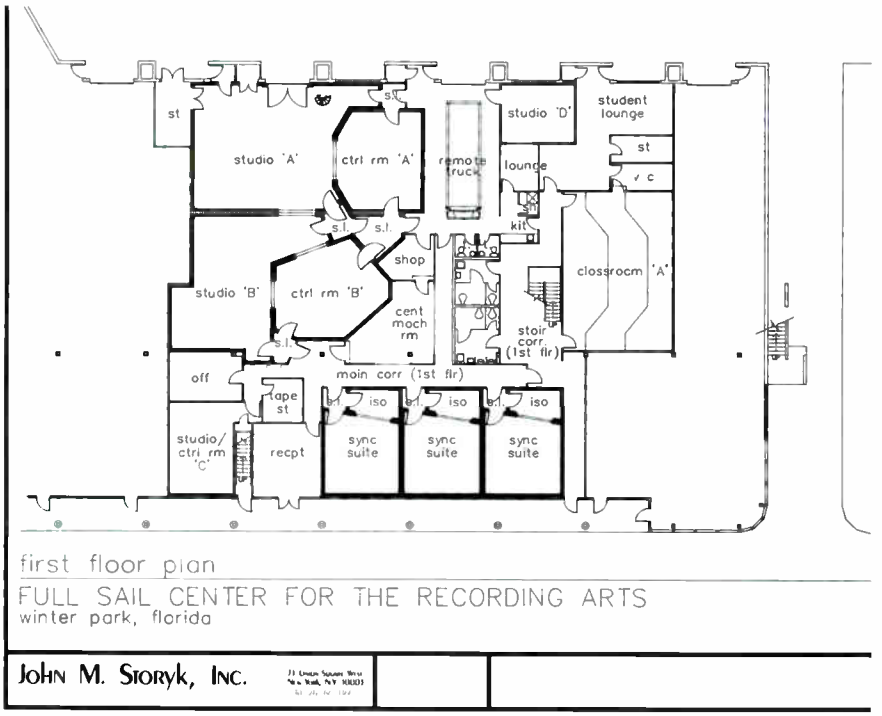
2 Hear the Sound

The power of the IEQ readily becomes apparent as the video display plots the frequency response due to the slider settings. The IEQ offers high quality constant "Q" equalization. The video graphic display shows the correlation between the sliders and the frequency response.



3 Perfect Sound

Turn Smartcurve™ on and perfect equalization is at your fingertips. Note the difference between the second frame, (Smartcurve™ OFF) and this frame. The position of the sliders represent the actual frequency response of the EQ. Interaction between bands is virtually eliminated. Incredible! Just think, now when you adjust the EQ you get exactly what you need. The "perfect" EQ? Let your eyes and ears decide.



First floor plan for Full Sail (near Orlando), designed by John Storyk of NYC. The second floor is a continuation of the first and also holds 18 offices, two labs, two lounges, a large classroom, a library and other administrative-type rooms.

paid attention to the movie business—we see a need in this area for people who know audio for film and television. We also needed a building that gave us the right image. We are the official school for New England Digital, and we train corporate clients on Synclavier and Direct-to-Disk, so we wanted a place that was upscale from where we were."

To help find a location and design the facility, Phelps went straight to designer John Storyk of New York City. "He designed our existing facility," explains Phelps. "Also, as well as being experienced in acoustics, John comes from an architectural point of view. This place needed great attention when it came to function, because on one side you have 'student world' with classrooms, libraries, lounges and labs, and then there's 'recording world.' John hasn't just designed studios, but laboratories, classrooms, conference centers. Also important is that he's a real-world person, not lost somewhere in science." Phelps adds that he also called upon a local design firm to work with Storyk long-distance to satisfy building codes and other local legal restrictions.

Storyk flew to Florida several times to check out potential locations. Their final choice, says Phelps, is "a unique, commercial warehouse-type complex with 23-foot ceilings, all high-tech with mirrored glass and beautiful landscaping."

One special Full Sail feature is a Synclavier digital audio production suite containing a large voice-over booth, mixing console, and several media on which to put the two-track product. "This idea was a combination of John's, New England Digital's, and ours," says Phelps. "We flew to Vermont to talk with NED's design engineers about what this room should do. We discussed interfacing the locations, because all the studios can instantly access the central machine room and have a Synclavier controlled in them. The classrooms and labs can do the same. I met with John in Woodstock, New York, the night before I went to NED, and went over his designs and questions. He had been in touch with NED by phone." Storyk also traveled to Florida "every couple of weeks with his own team—an electrical engineer, a mechanical engineer, a structural engineer."

Overall design inspiration, notes Phelps, "was based on what we want to be able to do. For instance, the audio and video studios are connected

While it is state run, it's sure top flight—it's the new mixdown studio/classroom at Middle Tennessee State University. It features an extra-wide listening area and a Neotek Elite with moving faders.

by glass, so a conductor can lead an orchestra session in one studio and a soloist in the other. Good friends in the industry gave me a lot of advice, like Freddy Piro who owns Mama Jo's in Los Angeles. My chief engineer, Gary Platt, led the project from a studio/interfacing point of view, working with John Storyk and going with me to NED. And throughout the process, members of the staff involved in education were involved in the classroom design."

With so many factors to deal with, Phelps says they only had "small problems concerning cable runs and how long we can run a control cable. We're putting the Synclavier computers in a central machine room, so we had to work with NED's engineers on combining cables. But the difficult part was squeezing this facility into 23,000 feet. John Storyk did it, though it took three or four tries. He'd call me on Thursday and say, 'There's *no* way.' Then he'd call me on Friday and say, 'I figured it out!' "

When you want to improve the acoustics of a classic room without changing its basic design, what do you do? Engineer Mark Hall found out when he oversaw the make-over of Studio A in his dad Rick's renowned Fame Recording Studios in Muscle Shoals, Alabama. The very same room from which hits have streamed (via Otis Redding, Allman Brothers, Rolling Stones, Paul Simon, etc.) got a face-lift with the addition of a 32-input Neve 8232 with MasterMix automation and faders—after years of functioning at superstar level with a second-hand MCI 600 Series.

"Production-wise, we had three Number One country records last year," explains Hill, "but we felt we weren't able to make modern records. We didn't feel like the quality was there, what with all the technological advances." So they bought the Neve—which was installed and wired by Nashville console installer Fred Hill—and called in Nashville studio designer Steve Durr.

"Steve had tuned our speakers for years," Hill says, "and we had never known he was an incredible room designer. When we found out, we said, 'We'll use Steve.' He was familiar with what we want, and everybody knew Steve knew what he was talking about; when he'd tune a room it was like going from darkness to daylight. And he knows my dad wants things done a certain way—his way. We never considered anybody else.

"We asked Steve what we could do, without changing the framework of the design or the feel of the room," continues Hill. "Our goals were to gain technical advantages and make the room sound tighter and quieter—when someone would turn on the copy machine upstairs, it would go to tape. So Steve covered critical sectors of the walls and ceiling with multiple layers of Corning 703 insulation to eliminate first-order reflections. We remounted the glass in the double windows (between the control room and studio) on rubber, and added Corning 703 to the base between the glass, to further tighten the bottom end, because the studio monitors are located above the window. We reran Mogami cables to all outboard equipment, regrounded and ran technical power, as opposed to basic AC.

"We rebraced the floor in the control room to change the resonant frequencies off the floor," Hill adds. "We put in 30 to 40 4 x 4s under the room. Also, we put in original Ed Long UREI 813s. We're using a minimal amount of passive EQ, and the room is flat to 30 cycles. Doing all this added an octave to the bottom end of the room.

"We also put in new carpeting and replaced the fabric on top of the insulation and surfaces, in both control rooms and studios. We had bright orange and blaring colors, so we went to a calmer green."

Carpenters installed the insulation and rebraced the floor, but Hill notes, "We were in charge. Alan Shulman, the engineer who works on 90% of our stuff, had a lot of input. He worked closely with Steve on the ideas." The day-to-day working team consisted of Hill, Shulman, Fred Hill, maintenance engineer Randy Blevins and studio manager Rusty Moody. "Steve Durr directed us, as far as what to do. He came in when we were beginning the [console] installation and said acoustically we need to do this, this and this. He came back after Fred was through and said, OK, now we need to do this and this. Last, he tuned the rooms.

"Anybody who worked in the room before knew it was a wonderfully flat room, and now there's no comparison," concludes Hill. "The process took less than a month, without any problems. Randy re-installed the MCI in Studio B, and now B is quieter and sounds better than A did before. We also got quite a bit of new outboard gear. We are a real recording studio now!"

When a public institution asks the government for money to build a new recording room, they cross their fingers and hope for the best. Luck was with Chris Haseleu, director of the

Center for Recording Arts & Sciences at Middle Tennessee State University (located ten minutes from Nashville). It took a year to build the room though, which Haseleu says "had a lot to do with the bidding process." The end product is a mixdown/overdub room with all-new gear (Neotek Elite, Disk-Mix moving fader automation, Sony PCM 3324 digital 24-track). It covers 720 square feet of machine room, control room, and vocal/acoustic recording area, tied to a large, empty hall. The new facility supplements an analog recording studio, which was "working 24 hours a day and we still weren't taking care of all our business, so we decided to build a new studio. We had to fight with the administration for the space.

"Once we got the space, my first decision was, do we put in a small control room and small studio, or a nice-sized control room and small vocal area?" continues Haseleu. "I decided on a nice control room because we're training engineer/producers rather than performers. Then we had to get a studio designer. I wanted one I was familiar with, which reduced the number. I wanted someone fairly local, which reduced it to the Southeastern region. I talked to lots of people before settling on Bob Todrank [of Nashville].

"Bob had previously worked with us because he was interested in our program," notes Haseleu. "Also, he was full-service; he could do the design, and was also an equipment retailer. I enjoyed his company and he seemed to enjoy mine. We were interested in each others' ideas. Bob is well-equipped with TEF® gear, a CAD setup for design, and he's up-to-date on time delay spectrometry and the use of diffusors. That was real important to me. He designed the studio as a reflection-free zone.

"We worked closely because we had special requirements; this is a classroom/lab, so we need a real wide listening area. We need to put people behind the engineer, so they can see what's happening with the board and hear what's happening with the monitors. Also, I absolutely insisted on a machine room. That's unusual, at least in Nashville, where everybody puts their machines in the control room. The other thing was, this had to be an acoustically excellent environment, which in some ways is more important than the equipment.

"Bob came up with two or three configurations tailored to the school environment, and we decided on one I thought met our needs the best," recalls Haseleu. "Once we got the space from the administration, the campus planner knew that Bob knew his business and basically let him go. A local firm, Viking Construction, built the room. They've done studios in the Nashville area and worked with Bob before, and that was important to us too. We incorporated things he had done in other studios, like the RPG™ diffusors. One unique thing is that Peter D'Antonio [RPG's inventor] designed the whole back wall as a low-frequency diffusor. We're excited about the way it's turned out. Today we have about $465,000 in the building, including design, construction and equipment. That's a lot of money for a public institution!"

When their first studio, a 16-track facility in San Bernardino, California was burglarized, 25-year-old Tony Shepperd and 26-year-old Armi Atil decided to head for the hills of

PHOTO DEREK SMITH COURTESY CENTRO CORP

Post Perfect, a NYC video post house, boasts a new video edit room with modified Neve and Grass Valley audio-follows-video systems. Mechanical design and installation were handled by Centro. Says president Pat Howley, "Centro is price-competitive and does remarkable work—including beautiful casework, neat wiring and good documentation."

Riverside (between Palm Springs and L.A.), where they built the 24-track Carrera Recording Studios. Carrera handles commercials and audio-for-TV broadcast and has installed a Neve 8232, Westlake BBSM-15 monitors, a Synclavier and a Steinway grand to attract music clients from L.A.

Riverside, says Shepperd, offers low-rent industrial park/warehouse space, which is where they found a 2,660-sq. ft. suite to house Carrera. Its design was inspired by Westlake Audio's Studio D. "Chris Fichera from Westlake helped with our first studio, and we wanted his expertise again. I knew I wanted a tape machine alcove [you can see, but not hear, the machines], and ample room for clients so they won't be in the producer's or engineer's way. Also, it was essential that the Synclavier be in the sweet spot, in the center of the control room.

"I sketched out exactly what I wanted," Shepperd says. "Then Chris took the sketch and said, 'If we're going to build monitors, we'll need 15s, and the wall angle needs to be such-and-such,' and he dealt with his architect on the room's technical specifications, working out the details the construction guys would need to build. We took the basic shape of Westlake Studio D and expanded it. But their design called for an eight-foot [absorptive/reflective] pinnacle in back of the room that wouldn't allow for a producer's desk. We decided to use RPG™ instead to tighten the sound, and positioned absorptive materials so there wouldn't be standing bass waves. All the walls are double-walled with 2 x 4 studs, two layers of 5/8-inch sheetrock, half-inch soundboard, and one inch of 703 insulation. In addition to a very live, warm acoustic environment, we wanted Carrera to look great. Clear oak is everywhere, and there are four types of lighting in the studio to create the right mood." The 26 x 30 control room has a 14-foot ceiling and includes a small vocal booth faced with glass blocks.

Because the construction firm didn't specialize in studio construction, Shepperd supervised every step. The project started in September '87, and went smoothly until an earthquake hit Southern California a month later. "The Riverside planning department red-tagged all new construction. They wanted new load-bearing calculations from a structural engineer and almost forced us to dig a two-foot concrete trench in the sub-floor around the bearing walls. After the smoke cleared, the city decided we didn't need the trench, but their indecision stopped construction for two months. That pushed the opening to June."

Business has gone well from Day

—CONTINUED ON PAGE 173

STUDIO DESIGNERS and SUPPLIERS

Information in the following directory section is based on questionnaires mailed earlier this year and was supplied by those facilities listed. *Mix* claims no responsibility for the accuracy of this information. Personnel, equipment, locations and rates may change, so please verify critical information with the companies directly.

Sanctuary Recording's Studio A, part of a new six-room complex in Manhattan's Soho district, offers an upgraded, fully automated API 40x24 console and Studer A800 MKIII 24-track and A820 2-track recorders. Designed in a plush '50s motif by Jim Falconer, the complex includes comfortable live-in accommodations. The 27' x 30' control room is one of the largest in Manhattan. Photo: Robert Wolsch.

CONTENTS

Mix listings procedure: every month, *Mix* mails questionnaires to recording studios and/or other vital facilities and services for the recording, sound and video production industries. There is a nominal charge to list a Boldface Listing (name, address, contact) and an Extended Listing (equipment, credits, specialization and photo or logo). If you would like to be listed in a *Mix* Directory, write or call the *Mix* Directories Department, 6400 Hollis Street #12, Emeryville, CA 94608, (415) 653-3307.

Upcoming Directory Deadlines:
AES/New Audio, Video & Music Products: **August 15, 1988**
Tape & Disc Manufacturing: **September 6, 1988**
Northwest Studios: **October 4, 1988**

SOUND ACHIEVEMENT

TEC WINNER'S PROFILE

PHOTO BY STUDIO ONE, RENO

Few have revolutionized studio design like Chips Davis, pioneer of LEDE® technology and designer of world-class rooms, from Granny's House in Reno to Sounds Interchange in Toronto. *Mix* readers acknowledged his achievements by voting him the 1987 Technical Excellence and Creativity Award for Acoustics/Studio Design. Chips Davis has mastered the blueprint for excellence:

PHOTO BY C.R. KING

Defining stereo: "Stereo is not left/right. Stereo is left/right, front/back, up/down. It's a dimensional entity. The better you can hear in a space, the better you can mix dimensionally."

Control room philosophy: "There isn't yet a control room where we have an acoustic neutrality, a blank, white canvas. We've still got a canvas that's got a little color. The more neutral canvas we start with, the more we can do in our painting, and we don't have to cover up so much."

Advice to new designers: "Learn music — the artistic point of the music, learn to engineer, learn what you hear, and then learn the acoustics."

The TEC Awards: "The TEC Awards are something that has been long overdue. They help bring to the forefront the people who are on the cutting edge of our business and give them their just due."

***Mix* magazine:** "*Mix*'s database is invaluable to everyone in the business who's looking for information. It's a superb magazine. It has its own niche and is part of our industry."

MIX THE RECORDING INDUSTRY MAGAZINE

The 1988 TEC Awards will be held Nov. 3 in Los Angeles. Call (415) 653-3307 for more information.

STUDIO DESIGNERS & SUPPLIERS

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

NORTHEAST

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

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

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

SAM ASH MUSIC STORES; *SES*; 124 Fulton Ave.; Hempstead, NY 11550; (800) 4 SAM ASH; (718) 347-7757. Contact: Mail order.

A/T SCHARFF RENTALS; *ER*; 599 Eleventh Ave.; New York, NY 10036; (212) 582-4400; (212) 905-7030. Contact: Peter B. Scharff, Josh Weisberg. Services/Specialization: A/T Scharff Rentals provides recording studios with the latest state-of-the-art equipment . . . 24 hours a day. We have a huge inventory of digital recording equipment, outboard and special effects gear, and the latest in wireless microphone technology. Our after-hours number is 212-905-7030 for "the best that money can rent" 24 hours a day!

AUDIO TASK GROUP; *SD, AC, SES, EI, MR*; One Franklin Park N.; Buffalo, NY 14202; (716) 886-6300. Contact: David M. Bellanca.

AUDIO VIDEO RESEARCH GROUP
Newtonville, MA

AUDIO VIDEO RESEARCH GROUP; *SES, EI, MR, SD, AC*; 5 Walnut Terr., #2; Newtonville, MA 02160; (617) 332-1441. Contact: Octavio Brito, Tim Ingles. Services/Specialization: Accurate qualification of the needs and resources of the audio/video professional is the difference between staying in business or not. Whether you own an 8-track demo room or a 24-track multi-media facility, AVR will support your venture. We offer design, sales and installations coupled with an extensive technical maintenance program. Our optional 24-hour plans and warranted used equipment listings enhance your final project without crippling your bank account. Our staff has "hands-on" experience in audio/video engineering and production, giving AVR a wider perspective than most. This results in a personalized and thorough approach to all clients, no matter the size. When you need vintage equipment, expert design and technical service, the best in new gear or audio/video consultations, you will find a positive alternative in AVR. Our business is keeping you in business.

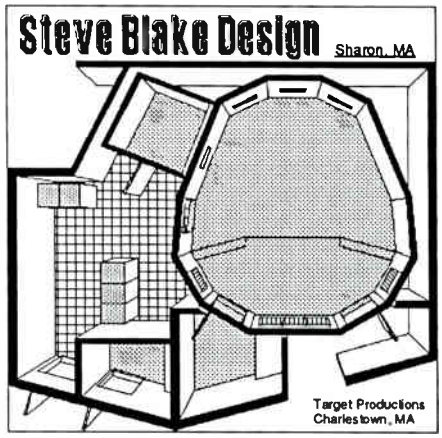
AUDIOTECHNIQUES; *SES, EI, MR, ER*; 1619 Broadway; New York, NY 10019; (212) 586-5989. Contact: Bill Dexter, Bob Berlimen.

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

FRANKLYN R. BEEMISH & CO.; *SD, AC*; 574 Sunrise Hwy.; Baldwin, NY 11510; (516) 867-8510. Contact: Frank Beemish.

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

STEVE BLAKE DESIGN; *SD, AC*; 6 Bird Ln.; Sharon, MA 02067; (617) 784-2543. Contact: Steve Blake. Services/Specialization: Services offered: acoustical/architectural consultation and 3D CAD design. Audio/video/MIDI system design. Custom cabinetry design/build. LEDE™ control room design, TEF® analysis and LEDR™ stereo imagery analysis. Clients include: Audio for Video: Target Productions, Charlestown, MA; Vizwiz Film/Video, Boston; Video One, Boston; Megaphone, Portland, ME; Chedd/Angier Productions, Watertown, MA; Polymedia, Boston; In House Productions, Cambridge, MA; Corporate: Bose Corp., Framingham, MA; Digital Equip.



STEVE BLAKE DESIGN
Sharon, MA

Corp., Bedford, MA; Lotus Development, Cambridge, MA. Recording: Long View Farm, North Brookfield, MA; The Outpost, Stoughton, MA; Troy Spencer Productions, Carneys Point, NJ; Celebration Sounds, Pawtucket, RI; Kevin Tracey Productions, Manchester, NH; Hoyt & Walker, Little Rock, AK; Making Waves, Wakefield, RI; Straight Up Music, Arlington, MA; Wayside Recording, Malden, MA; Institutional: BCTV Studios, Brown University; Rhode Island School of Design, Providence, RI; Beth Israel Hospital, Boston; Estabrook Hall, Clark University. (LEDE™ is a trade mark of Synergetic Audio Concepts. TEF® is a registered trade mark of Crown International. LEDR™ is a trade mark of Northwestern University.)

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

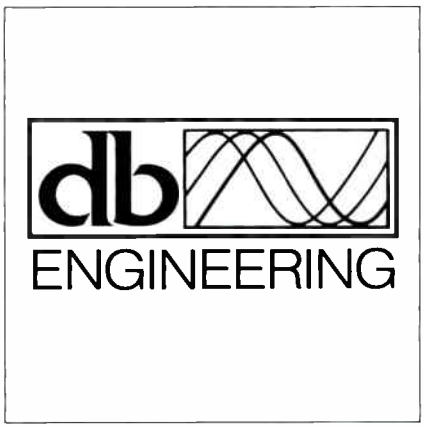
C & S DESIGN; *SD, AC*; 92-46 219 Street; Queens Village, NY 11428; (718) 464-8875. Contact: Carl C. Christianson.

CAPRON INC.; 278 West St.; Needham, MA 02194; (617) 444-8850. Contact: James L. Warwick.

CAVANAUGH TOCCI ASSOCIATES, INC.; *AC*; 327 F Boston Post Rd.; Sudbury, MA 01776; (617) 443-7871. Contact: Thomas G. Boulianne.

COMMON MODE; *SD, EI, MR*; 66 Oakridge Rd.; West Orange, NJ 07052; (201) 669-0707. Contact: Paul Fowlie.

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



DB ENGINEERING
Boston, MA

DB ENGINEERING; *SD, AC, SES, EI, MR*; 331 Newbury St.; Boston, MA 02115; (617) 262-0155 service; (617) 262-0311 sales. Contact: David (db) Butler. Services/Specialization: Factory authorized Otari and Tascam service center, studio design, acoustical treatment, sight evaluation, wiring system design and installation, pre-fabricated PB and mic panels. Full-line dealers of pro audio and video equipment. Used equipment brokers with in-house service and warranty available. The unusual combination of technical expertise and music production background are only two of the many reasons to have db design and build your next facility. We are first and foremost the top service company in New England-not

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just another dealer with a technical department. Our lines: Trident, Aries and Seck consoles, Adams-Smith 2600 and Zeta III (time code products), Megamix automation, Ashly, TC Electronic, Aphex and Klark-Teknik signal processing, Gauss, Auratone and Bag End monitors, AKG, Beyer and Sennheiser mics plus too many more to list. We are the only broker that backs our used equipment with a fully equipped service facility. Recent projects: Wendell Recording, upgrade to 40-track with Trident Series 24 automated console; Verte Prod., new 1" 16-track from ground up; Video One, new 24-track mix-to-pix system.

DBM TECHNICAL SERVICES
New York, NY

DBM TECHNICAL SERVICES; *MR*; 124 W. 19 St., 7th Floor; New York, NY 10011; (212) 645-2626. Contact: Joseph Weitekamp. Services/Specialization: Factory authorized synthesizer service on E-mu, Akai, Oberheim, Roland and Optical Media International. Non-warranty repair of all popular brands of electronic music equipment. Home of the Memorymoog MIDI update. Custom MIDI hardware and software development. Expert repairs on recording and sound reinforcement gear. Factory-trained HME wireless mic service. All popular brands of wireless mics serviced. Quick turnaround. Priority rush service available.

ELECTRONIC
ACOUSTIC
RESEARCH
SYSTEMS

E.A.R.S. (ELECTRONIC ACOUSTIC RESEARCH SYSTEMS)
Boston, MA

E.A.R.S. (ELECTRONIC ACOUSTIC RESEARCH SYSTEMS); 300 Putnam Ave.; Cambridge, MA 02139; (617) 547-1750; (407) 380-EARS. Contact: Rob Rosati, Mike Corbett. Services/Specialization: E.A.R.S. is a full-service audio engineering company, serving the recording and sound reinforcement fields. A firm of experienced professionals, we specialize in the design of control rooms, studios, post-production facilities, theaters and sound reinforcement systems. The electronics division offers maintenance, modification and installation of equipment, power and grounding schemes, patch bay wiring, interface panels and custom electronic devices. Computer-aided design and computer-aided engineering techniques are utilized extensively in our acoustics division to provide accurate, innovative designs, complete facility planning and modifications. E.A.R.S. manufactures variable acoustic wall systems (VARA-WALL™), acoustical panels, a control room monitoring system and audio switching systems. We

NORTHEAST STUDIO DESIGNERS & SUPPLIERS

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

also carry many well-respected lines of professional audio equipment and acoustical materials. Credits: Aerosmith, Blackbeard Studios, Bon Jovi, Boston, Boston Music Complex, Club New England, Al DiMeola, Downtown Recorders, Full Sail Center for the Recording Arts, Barry Goudreau Studios, Judas Priest, Majestic Theatre, Musitech Productions, Newbury Sound, North Shore Music Theater, Soundscape Productions, Spyro Gyra, Starke Lake Studios, Star Trax Studios, Top of the Hub Discotheque, Pat Travers, Tropical Productions, Wolf's Head, Inc.

Ergo DESIGNS

ERGO DESIGNS
Brooklyn, NY

ERGO DESIGNS; *SD, EI*; 219 Dekalb Ave.; Brooklyn, NY 11205; (718) 522-0671; (718) 727-6286. Contact: Alex Noyes, Mark Ramsay. Services/Specialization: Ergo Designs is a full-service audio and MIDI design company providing everything from consultation and system design to purchasing and installation contracting. Design services are available for audio recording studios, video/film post-production, personal studios and performance systems. Specialties include upgrading existing facilities and designing complete integrated synchronization systems for SFX and ADR. All work is delivered with a complete customer support package, including a staff training program, allowing for seamless expansion and continued operational efficiency. We are not distributors, so we provide independent, unbiased equipment selection. Ergo Designs offers expanding services from consultation to installation of full turn-key systems, within budget, on time and ready for use.

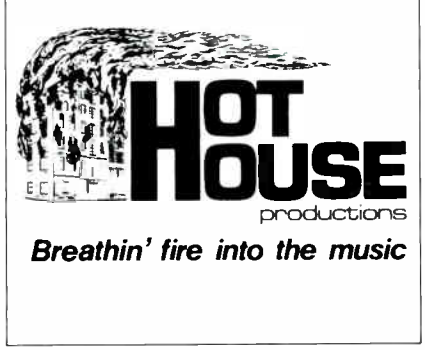
F&K ASSOCIATES; *SD, AC, SES, EI*; 262 Franklin St.; Brooklyn, NY 11222; (718) 625-3140. Contact: Mark Farran.

CHRIS GATELY AUDIO SERVICES; *EI, MR, ER*; PO Box 526; Bryn Mawr, PA 19010; (215) 525-3605. Contact: Christopher D. Gately.

HIGH TECH SERVICES; *SD, EI, MR*; PO Box 572; Blackwood, NJ 08012; (609) 22 VIDEO; (609) 228-4336. Contact: Paul Bailey. Services/Specialization: A Manhattan-based technical service company: studio maintenance, system design/procurement/engineering/installation. After six years, our clients include Air France, Baker Sound, Covenant House, Electra Records/Warner Comm., The Juilliard School, Narwood Productions, Nutmeg Recording, PolyGram Records Inc., Sound Hound Inc., Zoe Productions. Factory-trained MCI, Studer, Ampro/Scully, Otari, Harrison. Plus: JVC, Soundtracs, TAC-Scorpion, Sound Workshop, Tascam. Phone: 609-22-VIDEO 609-228-4336. "3 techies - no waiting!"

HIGH TECH SERVICES
VIDEO/AUDIO SYSTEMS

HIGH TECH SERVICES
Blackwood, NJ



HOT HOUSE PRODUCTIONS
Highland, NY

HOT HOUSE PRODUCTIONS; *SD, AC, SES, EI, ER*; RD. 1, Box 362A; Highland, NY 12528; (914) 691-6077, 11am-6pm. Services/Specialization: We are a small organization built on close personal client relations. In addition to the broad range of products offered, we provide system design, installation and maintenance for the pro and semi-pro recording studio, disco, sound reinforcement, electronic musician and home audiophile. Our recording studio/demonstration facility is available for equipment evaluation by appointment only. We specialize in custom state-of-the-art studio monitor systems featuring Tannoy dual concentric loudspeakers/Hartley 16 hertz subwoofers/braided Teflon and silver Kimber Kable/Perreaux & Australian monitor MOSFET power amps/Anechoa absorbers. Another primary focus is world-class FX packages including the computer-driven Quantec XL/Marshall 5402 Time Modulator/AKG ADR68k reverb-sampler/Eventide 3000 and 2016/TC 2290 DDL-sampler/Klark Teknik DN780 reverb/ Neve Prism series/Drew Y-expressor and Genesis DSP Adams-Smith, Aries, Alesis, Aphex, Audio Logic, BBE, Beyer, Biamp, Brooke-Siren, C.D.T., Celestion, J.L. Cooper, Crown, dbx, DDA, Digitech, EAW, Emilar, EXR, Fane, Fostex, Goldline, Hill, HME, JBL, Kyocera, Lexicon, LofTech, Milab, Nakamichi, Neumann, Orban, Otari, Rane, Roland CPE Edit/Automation Systems, Samson, SCS, Sennheiser, Soundcraft, Soundtracks, Studer-Revox, Studiomaster, Symetrix, Thorens, Trident, UREI and Valley International.

IMERO FIORENTINO ASSOCIATES; *SD*; 44 W. 63rd St.; New York, NY 10023; (212) 246-0600. Contact: Bill Marshall.

JEM-FAB CORP.; *SD, AC, EI*; 574 Sunrise Hwy.; Baldwin, NY 11510; (516) 867-8510. Contact: F.R. Beemish, Brad Oswald.

LOGICAL AUDIO SOLUTIONS; *EI, MR*; 325 Saude Ave.; Essington, PA 19029; (215) 521-2933. Contact: Lee Hoover.

LOUD & CLEAN ENGINEERING CONSULTANTS; *EI, MR*; 95 Warren Ave.; Boston, MA 02136; (617) 364-7007. Contact: Grady Moates. Services/Specialization: We provide a cost-effective way to upgrade the sonic performance of your existing systems. Internal electronic improvements to your consoles, audio processors and analog tape decks bring their performance much closer to state-of-the-art. Optimization of interfaces reduces noise and distortion to near theoretical

limits. We work with your local maintenance staff to further reduce your upgrade costs.

MARTIN AUDIO VIDEO CORPORATION
New York, NY

MARTIN AUDIO VIDEO CORPORATION; *SES, EI, MR, ER*; 423 W. 55th St.; New York, NY 10019; (212) 541-5900. Services Specialization: As New York's leading pro audio dealer, Martin Audio has 25 years experience in the sales, installation and servicing of audio equipment for recording, broadcasting and post-production. In addition to over 100 major lines of equipment, Martin is the exclusive New York-area source for Amek, Harrison, Neotek and Sound Workshop consoles, Otari's MTR and DTR lines of analog and digital tape recorders, AMS and Lexicon Advanced Products signal processors, B&K and Sanken microphones, the Lexicon Opus digital workstation, and TimeLine synchronizers. Other featured items include Dolby SR Spectral Recording processors and Sony Professional Digital recorders. Martin also offers our customers the latest MIDI synthesizer and digital sampling hardware and software and extensive applications expertise in our Martin Music Technologies division. Among the musical product lines available are Akai, Digidesign, E-mu, Korg, Kurzweil, Mark of the Unicorn, Oberheim, Opcode, Optical Media, Roland and Sycologic, most of which are on display in a complete, working MIDI studio/demo room. Martin Audio also features the largest pro audio parts department in New York and a fully equipped rental division.

MARTIN RENTALS; *ER*; 423 W. 55th St.; New York, NY 10019; (212) 265-4646. Contact: K.C. Green. Services/Specialization: Martin Rentals features an extensive selection of the best-maintained rental equipment in the East. We rent Otari MTR-90 multi-track and MTR-12 and MTR-20 2- and 4-track analog recorders, Sony PCM-3324 digital multi-tracks, PCM-1630 2-track digital processors and PCM-2500 R-DAT DASH 2-track recorders; TimeLine Lynx synchronizers, Dolby and dbx noise reduction, digital delays and reverbs by AMS, Eventide, Lexicon, Quantec and Yamaha, a wide assortment of microphones including B&K, the Calrec Soundfield, Sanken and both vintage and modern models from AKG and Neumann, wireless mic systems by HME, Sennheiser and Sony, and a complete range of compressors, de-essers, equalizers, limiters and signal enhancers, including some select, vintage tube units.

MARYLAND SOUND INDUSTRIES, INC.; *EI*; 4900 Wetheredsville Rd.; Baltimore, MD 21207; (301) 448-1400. Contact: Will Parry.

MDI/PRECISION MOTOR WORKS
Hudson, MA

MDI/PRECISION MOTOR WORKS; *SES, MR*; 241 White Pond Rd.; Hudson, MA 01749; (617) 562-4420. Contact: Jeff Gilman. Services/Specialization: Guaranteed motor maintenance and general rebuilding for all professional tape recorders. Custom close tolerance machining and modifications with requested overnite turnaround. New and rebuilt replacement motors, shaft refinishing, precision bearings in-stock. Distributor for L.J. Scully, Shimpo America, AKG Acoustics, Intracleen Products and a host of other unique tools and accessories for the engineer and technician.

MERIDIAN DESIGN ASSOCIATES
New York, NY

MERIDIAN DESIGN ASSOCIATES; *SD*; 561 Broadway, Ste. 8C; New York, NY 10012; (212) 431-8643. Contact: Antonio Argibay, Bice C. Wilson. Services/Specialization: Meridian Design Associates is an architectural firm with many years' experience in the design and construction administration of audio/video facilities offering a broad range of services from working with a client to develop a program expressing the needs of a new facility, to site evaluation, design coordination of acoustical and technical systems, construction administration and ongoing facilities management. The project experi-

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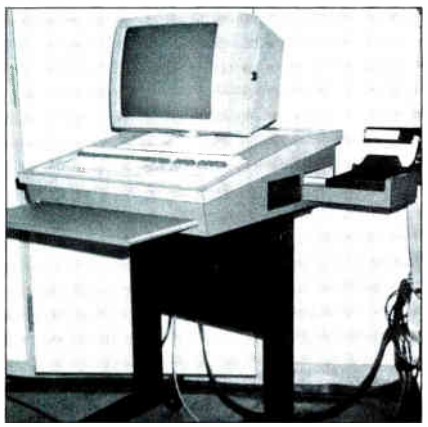
ence of the partners includes recording studios, video studios, audio/video post-production facilities, experimental media centers and broadcast facilities with budgets ranging from $200,000 up to $5 million. This extensive experience in the field allows us to design state-of-the-art facilities tailored to the needs and image of our clients. The common thread which runs through all our work is the ability to weave together the complex parameters which give shape to a project, thereby creating exciting, innovative, yet practical designs.

MULTI-SONUS, INC.; 87 N. Clinton Ave., Ste. 412; Rochester, NY 14604; (716) 325-3006. Contact: Rick Zicari. Services/Specialization: Specialists in the art of speaker reconing and repairing. Factory authorized for most studio monitors including Tannoy, JBL, Yamaha, UREI, Altec, E-V, Cetec Gauss, Fostex, Toa, Auratone, Bose, Emilar, Pas, Celestion, Advent, Renkus-Heinz and more. Realizing the importance of studio time, we minimize down time by stocking many parts and offering the fastest service available. All work is guaranteed to factory specification. Call us today for all your speaker needs, whether you are a recording studio or have a home or sound reinforcement system. We also have replacement transducers for Yamaha NS-10Ms ready for shipment for those who wish to replace parts themselves or keep them in stock. Sit back and enjoy a rare commodity—high quality service and product integrity!



NASSA DESIGN & MANUFACTURING
Bearsville, NY

NASSA DESIGN & MANUFACTURING; *SES*; Box 367; Bearsville, NY 12409; (914) 679-9544. Contact: Kenneth W. Lonas. Services/Specialization: Nassa specializes in the design, construction and installation of custom production consoles, computer workstations, outboard equipment racks, keyboard tables and enclosures for your entire studio or a single piece of gear. You will find Nassa products in studios throughout the Northeast and on the road with numerous touring artists. We have workstation designs for the Synclavier digital audio system, Fairlight, Kurzweil and individual MIDI-based systems. We can put all components in an efficient arrangement suitable to any music/video production environment. We are ready to work with you on every design aspect from studio construction and remodeling, equipment enclosures and acoustic treatment, to wiring installations.

NEW YORK TECHNICAL SUPPORT, LTD.; *SD, EI, MR*; 35 Hardscrabble Hill; Chappaqua, NY 10514; (914) 238-4171. Contact: Greg Hanks, Rose LoPresti. Services/Specialization: New York Technical Support, Ltd. is a full-service maintenance firm that caters to the technical needs of the recording, film and broadcast industries. We provide design, consultation, installation and repair services. Our specialties include custom design and fabrication, computer modeling and simulation of control room ergonomic design, installation and wiring services, tape machine care and repair, power and ground distribution, analysis and fault finding, EMT tuning, modification and refurbishment, and scheduled contract maintenance service. We are factory trained, equipped and recommended to service: Ampex, MCI, 3M, Neve, Otari, Sony, Studer, Trident, SSL. For more information, please call Greg Hanks at (914) 238-4171.

NORTH STAR AUDIO VIDEO; *SD, AC, SES, EI*; 1367 High Ridge Rd.; Stamford, CT 06903; (203) 968-2323. Contact: Thomas C. Lanik. Services/Specialization: With twenty years of background experience in the New York metropolitan area, North Star Audio Video Corp. proudly represents the following manufacturers: Otari, JBL Pro, AKG, UREI, Soundcraft, Bruel & Kjaer, dbx, Neumann, Orban, Beyer, Shure, Symetrix, White Instruments, Lexicon, Stax Kogyo, ART, Stable Cables and many others. We are well associated with some of the audio industry's finest designers, engineers, installation specialists and contractors. Let us know if we can recommend one to you.

NORTHEAST STUDIO DESIGNERS & SUPPLIERS

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

Northeastern Communications Concepts, Inc.

NORTHEASTERN COMMUNICATIONS CONCEPTS, INC.
New York, NY

NORTHEASTERN COMMUNICATIONS CONCEPTS, INC.; *SD, AC*; PO Box 1853, Grand Central Station; New York, NY 10163; (212) 972-1320. Services/Specialization: NCC offers complete architectural, acoustical, and electronic design services exclusively for recording studios, and radio/television facilities, in addition to comprehensive project and construction management. NCC projects have ranged from the largest AM/FM broadcast facility in New York to the smallest modular voice-over studio. To assure an unbiased responsiveness to your equipment requirements, the company does not represent any manufacturer or vendor, allowing specification of a virtually unlimited selection of products for design or custom equipment fabrication for unique applications. Drawing on their extensive backgrounds in media operations, engineering and acoustics, NCC design professionals work with state-of-the-art Bruel & Kjaer measuring devices and proprietary computer-aided analysis and design software. They can provide you with a cost-effective, fully integrated, electronic, acoustical and visual environment to inspire your creativity. If you work with music, voice, commercials or programming, call NCC for results, not just hardware.

Pandemonium Audio

PANDEMONIUM AUDIO
Manhasset, NY

PANDEMONIUM AUDIO; *SD, AC, SES, EI*; 16 Dorchester Dr.; Manhasset, NY 11030; (516) 365-7810. Contact: C P Pores. Services/Specialization: Sales of new equipment, retail and complete studio packages, installation, hardware and acoustical consultants, equipment and studio analysis and studio design. With Charles Bilello, our acoustical consultant (an accredited LEDE™ designer), using TEF™ analysis and measurement for the creation of RFZ™/RPG™ designs for studios and critical listening environments, utilizing Reflection Phase Grating acoustical diffusors. As well as the analysis of existing rooms and hardware. We also publish *The Used Equipment List*, since 1981, a regular listing of used equipment available through Pandemonium Audio, from AKG to Harrison to Trident to complete studios. Credits available upon request. Call for further information.

POWER PLAY RECORDS, INC.; *SD, AC, EI, ER*; 223-225 Washington St.; Newark, NJ 07101; (201) 642-5747. Contact: Terreri and Ferdinand or Greg Furguson.

DANIEL QUEEN ASSOCIATES; *AC*; 239 W. 23rd St.; New York, NY 10011; (212) 243-6661. Services/Specialization: Daniel Queen Associates is an acoustical consulting firm founded in 1970 in Chicago. It moved its main office and laboratory to New York City in 1983. A member of the National Council of Acoustical Consultants, the firm maintains a laboratory and mainframe computer for electroacoustic, acoustic, audio and video measurement and analysis. Mr. Queen is a fellow of the Audio Engineering Society and its Technical Council Chairman. The firm specializes in solutions to difficult acoustical, audio, and noise control problems, such as duplicating in small rooms the acoustics of large performance spaces, matching monitoring facilities, and exorcising acoustical gremlins. Clients include architects, manufacturers, studios and other consultants.

ROR AUDIO RESEARCH; *SD, AC, SES, EI, MR, ER*; 161-14 Union Turnpike; Flushing, NY 11366; (718) 969-3660; (718) 969-3792. Contact: Shimon Ron. Services/Specialization: ROR has been designing, manufacturing and servicing multitrack consoles, parametric EQs, monitor systems and other electronic and acoustic innovations since 1972. A representative list of professional users and clients includes: recording studios: (international) Fonovision Internacional, Bogota, Colombia, Hljodriti Studios, Reykjavik, Iceland, Studio Katy, Brussels, Belgium, Pink Floyd's Britannia Row, London, England, Marcus Musik, London, England; Le Studio, Montreal, Canada. Noah, Tokyo, Japan. (New York) Record Plant, A&R, Bearsville, Power Station, Electric Lady, Editel, Sorcerer Sound, RPM, Sigma, MSP, Blue Rock, Celestial Sound, Skyline, Howard Schwartz, Regent, Don Casale, Mike Mantler's and Carla Bley's Watt Works, Staten Sound (Los Angeles); Record Plant (Connecticut), Ace Frehley (KISS) Studio. Mastering rooms. (New York) Sterling Sound, Frankford Wayne. Clubs and restaurants: (New York) The Sporting Club, World Yacht's Dinner Cruise Ships, America, Pig Heaven, Jerry's, Water Club, River Cafe, Central Falls, Cafe Pacifico, Be-Bop Cafe, Fiorucci (clothing store), John Dellaria (beauty salon), etc.

ROSNER CUSTOM SOUND, INC.; *SES, EI, MR*; 11-38 31 Ave.; Long Island, NY 11106; (718) 726-5600; (718) 956-7516 FAX. Contact: Alex Rosner.

TED ROTHSTEIN; *SD, AC, SES, EI, MR*; 280 Park Ave. S., #8B; New York, NY 10010; (212) 475-5064 Tel.; (212) 475-4877 FAX. Contact: Ted Rothstein. Services/Specialization: Ted Rothstein (former owner of ROR Audio) has been designing, manufacturing and servicing multi-track consoles, parametric equalizers, monitor systems and other electronic and acoustic innovations since 1970. A representative list of clients and professional users of Ted Rothstein's designs includes: Recording studios: London, England: Pink Floyd's Britannia Row, Marcus Musik, Bogota, Columbia Fonovision International, Reykjavik, Iceland Hljodriti Studios, Brussels, Belgium: Studio Katy, Tokyo, Japan. Noah, New York. Tamarand Studio, A&R, Bearsville, Power Station, Electric Lady, Sorcerer Sound, RPM, MSP, Celestial Sound, Skyline, Don Casale, Mike Mantler's and Carla Bley's Watt Works, Los Angeles. Record Plant, Connecticut. Ace Frehley (KISS) Studio, Mastering rooms. Sterling Sound, Frankford Wayne; Discos, clubs and restaurants: Bangkok. NASA, Spaceadrome, New York. The Sporting Club, World Yacht's Dinner Cruise Ships, America, Water Club, River Cafe, Central Falls, Los Angeles. L.A. Stock Exchange. New York Health & Racquet Club. Yacht. Hard Rock Cafe: Reykjavik, Tokyo, Cancun (Mexico), New York.

RPG DIFFUSOR SYSTEMS, INC.; *SD, AC, SES*; 12003 Wimbleton St.; Largo, MD 20772; (301) 249-5647. Contact: Dr. Peter D'Antonio. Services/Specialization: RPG Diffusor Systems now offers a complete acoustical treatment system consisting of an expanded line of broad-bandwidth wide-angle sound diffusors, the QRD® DIFFUSOR, a broad-bandwidth sound absorber, the ABFFUSOR®, and a rotatable triangular variable acoustics module consisting of a diffusive, absorptive and reflective side, the TRIFFUSOR®. The new RPG Home Concert Hall provides the ultimate residential listening room acoustical treatment. Worldwide distributor, dealer, rep and sound contractor applications now being accepted. Application: recording/broadcast/post/mastering facilities, audio/video and teleconferencing rooms, music rehearsal rooms, acoustical shells, worship spaces, auditoriums, performing arts facilities, audiophile listening rooms and schools. Installa-

RPG DIFFUSOR SYSTEMS, INC.

RPG DIFFUSOR SYSTEMS, INC.
Largo, MD

tions: CBS, Los Angeles and London, DMP, Stamford, CT, Eurythmics' Church Studio, London; Granny's House, Reno; Limelight Video, Miami; Lucas Films, Skywalker Ranch, McClear Place, Toronto; NBC, NY, Burbank, Chicago; Peter Gabriel, Box Mill, UK; Rhinoceros Studios, Sydney; Spectrum Studios, Portland; Sterling Sound, NY; The Enterprise, Burbank; Whitney Houston, Mendham, NJ

SHEN, MILSOM & ASSOCIATES, INC.; 6 E. 39th St.; New York, NY 10016; (212) 213-2811. Services/Specialization: Consultants in acoustics and audio/visual systems. Acoustical services: design of walls, floors, ceilings, doors and vision panels to provide adequate sound isolation, selection of appropriate interior acoustical finishes for reverberation control, analysis of HVAC systems to achieve low background noise levels. Audio-visual services: design of audio and video recording studios, control rooms, edit rooms, voice-over booths, conference rooms, theaters, boardrooms, screening rooms, auditoriums, lecture halls, etc.

SONIX; *SES, EI, MR, ER*; 518 Pleasant St.; Northampton, MA 01060; (413) 586-1651. Contact: Kathy or Scott.

SOUND CONTROL; *SD, AC, SES, EI, ER*; 1528-80 St.; Brooklyn, NY 11228; (718) 837-6237. Contact: Dan Prosseda.

John M. Storyk Associates, Inc.
Architectural & Acoustical Design
31 Union Square West
New York, N.Y. 10003
(212) 675-1166
John M. Storyk
President

JOHN M. STORYK ASSOCIATES, INC.
New York, NY

JOHN M. STORYK, INC.; *SD*; 31 Union Sq. W.; New York, NY 10003; (212) 675-1166. Contact: Tobe Fitterman

STUDIO CONSULTANTS, INC.; *SD, AC, SES, ER*; 321 W. 44th St.; New York, NY 10036; (212) 586-7376. Contact: Doug Simon

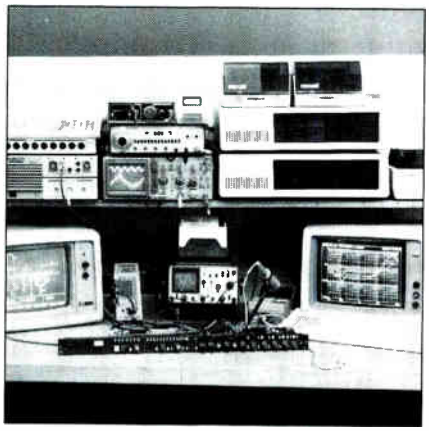
SYSTEM EXCLUSIVE, INC.; *SD, EI, MR*; 196 Pinehurst Ave., Ste. 3H; New York, NY 10033; (212) 795-2771. Contact: Cliff Govier. Services/Specialization: Design and fabrication of turnkey multi-media systems for all levels of production. Full CAD design and documentation implemented on all projects. Existing documentation transferred and upgraded to CAD. Custom panels and interface engineered and fabricated for unique and specific purpose. Highly skilled installation teams and site supervision available for subcontracting and in-house projects. Well-established contacts with manufacturers and suppliers expands purchasing possibilities.

TECHNICAL SERVICE SPECIALISTS INC.; *SD, AC, EI, MR*; HVM Box 6219; Kingston, NY 12401; (914) 339-6183. Contact: Chris Wasserbach.

TEKCOM CORPORATION

TEKCOM CORP.
Philadelphia, PA

TEKCOM CORP.; *SD, AC, SES, EI, MR, ER*; 1020 N. Delaware Ave.; Philadelphia, PA 19125; (215) 426-6700. Contact: Lou Maresca, L. Richard Feld, Michael Mueller. Services/Specialization: Exclusive mid-Atlantic distributor for: Otari MTR-90, DTR-700 and DTR-900 tape recorders, Amek, DDA and Trident mixing consoles, Dolby noise reduction and SR processing systems; AMS, Eventide and Lexicon advanced products, Audio Kinetics and TimeLine synchronizers, Kurzweil music systems, Dyaxis Digital Audio, Mac MIDI systems, Neumann and B&K studio condenser microphones. We also offer expert factory-trained tape recorder and loudspeaker repair.



TLM ELECTRONICS INC.
Pleasantville, NY

TLM ELECTRONICS INC.; *SD, SES, EI, MR, ER*; 343 Manville Rd., #6B; Pleasantville, NY 10570; (914) 769-6423. Contact: Tony Marra, Lori Marra. Services/Specialization: TLM Electronics Inc. is a technical service company which provides warranty and non-warranty services to the recording and sound reinforcement industries. With our extensive inventory of audio test equipment we offer both in-house and field service. Our computer-automated test equipment supplies hard copy test results with each repair so you can verify the performance of your equipment. Although we repair anything audio, we particularly specialize in mixing console modifications. Our Soundcraft grounding modifications have proven to be as much as 6dB quieter than a new factory console. And our Soundcraft 200B independent routing modification is now a recording studio standard. If you have something that you wish your console could do—give us a call. We are not only factory-trained by Soundcraft, Trident, Neve, etc. but we are factory authorized and recommended by them. In addition, we offer warranty service for BBS, Carver, Fostex, Ramsa, Trident, etc.

VIDEO DESIGNERS; *SD, EI, MR*; PO Box 212; Somerville, MA 02143; (617) 628-4952. Contact: Zack Niman.

VIDEO SYNCRACIES; *SD, AC, EI, MR, ER*; PO Box 127; Center Valley, PA 18034; (215) 965-HDTV. Contact: Phyllis Wald.

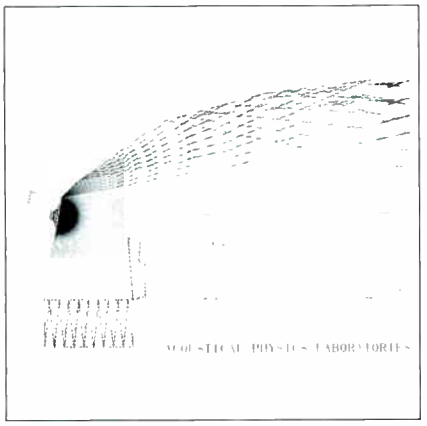
VISUAL MUSIC TECHNICAL SERVICES; *SD, SES, EI, MR, ER*; 235 E. 13th St.; New York, NY 10003; (212) 505-9281. Contact: Jay Henry.

WASHINGTON MUSIC CENTER; *SD, AC, SES, EI, MR*; 11151 Veirs Mill Rd.; Wheaton, MD 20902; (301) 946-8808. Contact: Carl Culos.

WASHINGTON PROFESSIONAL SYSTEMS; *SD, AC, SES, EI, MR*; 11157 Veirs Mill Rd.; Wheaton, MD 20902; (301) 942-6800. Contact: Thomas Peters.

DANIEL J. ZELLMAN CONSULTANT; *SD, AC, EI*; 41 First Ave., Ste. 16; New York, NY 10003; (212) 533-3574. Services/Specialization: Over twenty-five years of experience in recording studio design, construction and operations in the areas of records, film and audio post Acoustical and electronic analysis/troubleshooting using Techron TEF-10 analyzer and Bruel & Kjaer microphone Extensive experience with Adams-Smith, TimeLine and EECO lockup systems, unsupported transports and non-standard interfacing. Time code and synchronization specialist Custom electronic projects welcome Thorough knowledge of video systems for audio post facilities Many modifications available to enhance operational modes of existing video and audio equipment Member and supporter A.E.S., S.M.P.T.E., Syn Aud Con

SOUTHEAST



ACOUSTICAL PHYSICS LABORATORIES
Doraville, GA

ACOUSTICAL PHYSICS LABORATORIES; *SD, AC, SES, EI, MR*; 3877 Foxford Dr.; Doraville, GA 30340; (404) 934-9217. Contact: Bill Morrison Services/Specialization: Acoustical Physics Laboratories specializes in the design, analysis and installation of control rooms, studios and monitoring systems Through the use of TEF™ System 12 computer analysis, dual-channel FFT measurements, CADD acoustical models and acoustical scale models, high accuracy designs are developed, installed and performance certified Control rooms and monitoring systems are designed for first arrival frequency and time domain accuracy. Each design incorporates correct room/monitor/console/equipment geometry combined with spectrally accurate diffusion and absorption to achieve room monitoring accuracy Acoustical Physics Laboratories designs, supplies and installs high-accuracy monitoring systems which incorporate cone and soft dome drivers in time-correct 3-way alignments This proven approach to monitor system design results in the highest levels of distortion and coloration All designs are CADD prepared and presented in precision architectural E-size drawings with written, detailed specifications Hard copy TEF™ computer plots document all stages of design work from the initial model testing to the monitor design and the final installation Installations include recording studios, video and film production facilities, theaters, auditoriums, concert halls and churches.

AMERICAN AUDIO, INC.; *AC, EI*; PO Box 1719; Ruston, LA 71273; (318) 251-0290. Contact: James F Young

API AUDIO PRODUCTS, INC.; *SES, EI, MR, ER*; 7951 Twist Ln.; Springfield, VA 22153; (703) 455-8188. Contact: Paul Wolff

AUDIO ASSOCIATES; *SD, AC, SES, EI, MR, ER*; 637 W. Tennessee St.; Tallahassee, FL 32304; (904) 224-2635. Contact: W T Menasco, David Menasco, Richard Menasco

B.A.E. (BLEVINS AUDIO EXCHANGE); *SES*; 1717 Elm Hill Pike, Ste. B-8; Nashville, TN 37210; (615) 391-0429. Contact: Randy Blevins, Steve Howell

M.A. BENINGTON INC.; *SES, EI*; 2459 Cuchura Dr.; Birmingham, AL 35244; (205) 988-0707. Contact: Mike Benington

BIG BEAR AUDIO VIDEO INC.; *SES, EI, MR, ER*; 1419 E. Second St.; Sheffield, AL 35660; (205) 381-6812. Contact: Lane Sutherland, Larry Sutherland, Peter Akers

SOUTHEAST
STUDIO DESIGNERS & SUPPLIERS

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

CATES MUSIC CENTER; *AC, EI, MR*; 305 W. Walnut St.; Johnson City, TN 37601; (615) 928-8821. Contact: Carl or Jeff Cates

COMMUNICATIONS ENGINEERING, INC.; *SD, AC, SES, EI, MR*; 4228 King St., PO Box 16100; Alexandria, VA 22302; (703) 379-0711. Contact: Carlos Fernandini, Larry Brody. Services/Specialization: Engineering/management and technology consultation to the communications industry. Engineering technical design, fabrication and installation of communications systems, from small audio/video rooms to television, editing, production and post-production, teleconferencing, satellite, microwave systems, acoustics design Extensive use of CAD/CAE (computer-aided design/computer-aided engineering) and computerized management tools from start to finish of projects. Turn-key installations

FLAT RESPONSE ACOUSTICAL CONSULTING & EQUIP.; *SD, AC, SES, EI*; PO Box 464188; Lawrenceville, GA 30246; (404) 921-7941. Contact: Gene Smith

INFINITE AUDIO SYSTEMS, INC.; *SES, EI*; Miami, FL 33155; (305) 445-7313. Contact: Lord Toussaint

INTEGRITY AUDIO; *SES*; 2759 Skyland Dr. NE; Atlanta, GA 30319; (404) 636-2601. Contact: Lewis E. Frisch.

JT COMMUNICATIONS; *MR*; 579 NE 44th Ave.; Ocala, FL 32671; (904) 236-0744. Contact: Jim Trapani

LIGHT AND SOUND; *SD, AC*; PO Box 3604; Norfolk, VA 23514; (804) 622-8337. Contact: Dirk Kuyk

MELLOTONE ACOUSTICAL FABRICS; *SES*; PO Box 145; Blacksburg, SC 29702; (803) 839-6341. Contact: A H. Silverman, Sylvia B Grigg. Services/Specialization: Mellotone—the most widely accepted acoustical fabric for over 40 years It is completely sound transparent, does not absorb moisture or dirt and has a zero flame spread rating When backed with a sound absorbent panel, Mellotone fabrics allow the sound to pass through to be absorbed by the backing material Mellotone has been specified by architects and designers and used in virtually thousands of structures worldwide All fabrics are inventoried and available for immediate shipment Please call or write for samples and information.

NATIONAL AUDIO TECHNOLOGY & ELECTRONICS CO.; *SD, AC, SES, EI*; PO Box 1327; Holly Hill, FL 32017; (904) 255-2240. Contact: Nate Mudge

NATIONAL SOUND ENGINEERING
Norcross, GA

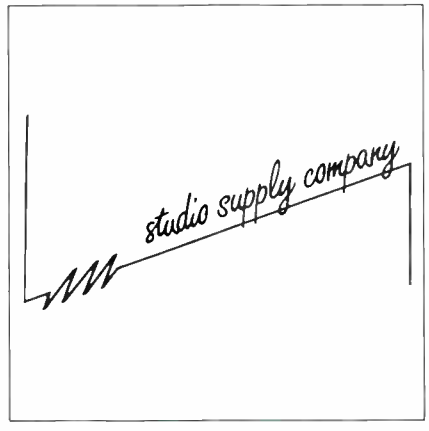
NATIONAL SOUND ENGINEERING; *SD, AC, SES, EI*; 1756 Wilwat Dr.; Norcross, GA 30093; (404) 447-1717. Contact: Tom Hayward Services/Specialization: Unlike music stores which offer very little in the way of acoustical or technical skills, we provide a broad-base of recording, broadcast and video equipment lines This is coupled with a "second to none" warranty program and a genuine knowledge of acoustical criteria which we are not too proud to share with you Whether your needs are as simple as a cassette or R-DAT to the complexity of an audio/video multi-track production studio, we'll be right beside you from start to finish Design, equipment, installation, service Let us make your dream come true...NSE.

PROFESSIONAL SOUND ADVICE; *SD, SES, EI, MR*; 111 39th St. N.; Birmingham, AL 35222; (800) 826-6552; (205) 592-4555. Contact: Noah L White, Barry Bailey

RELIABLE MUSIC
Charlotte, NC

RELIABLE MUSIC; *SES, EI, MR, ER*; 650 E. Stonewall St.; Charlotte, NC 28202; (704) 375-8662. Contact: Tom Fonner, Bill Evans, Tim Dixon, Don Kendrick. Services/Specialization: Reliable Music has been serving pro audio and music retail needs in the Southeast for over 25 years We have a progressive staff with hands-on experience in sound reinforcement, tape recording and broadcast equipment Our keyboard division is thoroughly versed in MIDI applications for recording and live performance We offer major brands and we have five factory-trained technicians in-house for prompt service on the equipment we sell Our installation crews specialize in church, club and studio systems For information on recording and broadcast equipment, contact Tom Fonner, for sound reinforcement, contact Bill Evans, and for sound installations, contact Don Kendrick at (704) 375-8662, Monday-Saturday 10 a.m.-6 p.m.

STAGE & STUDIO CONSTRUCTION SERVICES, INC.; *SD, AC, SES, EI, MR*; 212 E. Franklin St.; Raleigh, NC 27604; (919) 834-6380. Contact: Gregory B Shriver



STUDIO SUPPLY COMPANY, INC.
Nashville, TN

STUDIO SUPPLY COMPANY, INC.; *SD, AC, SES, EI, MR, ER*; 1717 Elm Hill Pike, Ste. B-9; Nashville, TN 37210; (615) 391-0050. Contact: John Alderson, Linda Buchanan, Terry Palmer

STUDIOWORKS; *SD, AC, SES, EI, MR*; 1018 Central Ave.; Charlotte, NC 28204; (704) 375-1053; (800) 438-5921. Contact: Chip Garrett Services/Specialization: Studioworks is the

STUDIOWORKS

RECORDING & BROADCAST EQUIPMENT

STUDIOWORKS
Charlotte, NC

team with working experience in recording and pro audio. Studioworks is closely associated with Reflection Sound Studios, which means you can talk with the people that have actual session experience with the equipment they sell and real-world experience in studio acoustics (both design and construction). Studioworks has supplied recording companies all over the country and has been a leader in sales of consoles and full turnkey systems. In fact, over 60 session-proven lines of equipment and supplies are available. We also offer complete consultation about systems for recording film sound, broadcast, theater sound and sound contracting. Studioworks is very interested in helping the "Artist Studio" get a good start as well as building the multi-machine 24-track complexes. We want to begin a long-term relationship with your company and back it with experience.

SYNERGETIC SERVICES, INC.; *SD, AC, EI, MR*; 1926 NE 151 St.; North Miami Beach, FL 33162; (305) 947-7372. Contact: Ross Alexander.

TECHNICAL AUDIO SYSTEMS; *SD, AC, SES, EI, MR, ER*; 3095-H Presidential Dr.; Atlanta, GA 30340; (404) 457-0988. Contact: Ron Montgomery, Steve Starnes. Services/Specialization: Recording studio equipment, broadcast audio equipment, ENG/EFP equipment, video equipment, noise control, design/consultation, most major lines, leasing available, production-experienced staff.

R.L. TODRANK & ASSOCIATES
Nashville, TN

R.L. TODRANK & ASSOCIATES; *SD, AC*; PO Box 290125; Nashville, TN 37229; (615) 885-6553. Contact: Robert Todrank. Services/Specialization: Over 18 years experience, specializing in acoustical and electronics systems design services, reflection free zones, RPG and LFD diffusion, custom monitoring systems, traditional as well as LEDE™ concepts. Exclusive importer of BOXER all soft dome control room monitoring systems. Recording studio monitor evaluations and recommendations. On site TEF™ and TDS analysis and evaluation services. Full computer-aided design (CAD) and drafting facilities. Experts in technical project management for all audio/video facilities. Acoustical and technical audio/video consultation services for architects. Recent projects include The Welk Music Group, Middle Tennessee State University, Federal Bureau of Investigation, Barbara Mandrell and Northern Telecom, Inc.'s Center For Information Studies.

TRACKSIDE ENGINEERING; *SD, AC, SES, EI, MR*; 2652-C S. Cobb Dr.; Smyrna, GA 30080; (404) 436-3024. Contact: Les Duncan.

NORTH CENTRAL

ADVANCED LOGIC SYSTEMS; *SD, AC, SES, EI, MR, ER*; 59 Franklin St.; Canal Winchester, OH 43110; (614) 837-1936. Contact: Chet Hall.

AVC SYSTEMS; *SD, SES, EI, MR, ER*; 2709 E. 25th St.; Minneapolis, MN 55406; (612) 831-3435. Contact: John Borman.

BRIDGEWATER CUSTOM SOUND; *SES, EI, MR, ER*; 15957 S. Halsted; Harvey, IL 60426; (312) 596-0309. Contact: Bob Sheffield, Jeff Pallin.

C & C CONSULTANTS; *SD, AC, SES, EI*; 2215 C St.; Lincoln, NE 68502; (402) 474-2215. Contact: Dominque J. Cheenne.

FULL COMPASS SYSTEMS LTD.; *SD, AC, SES, EI, MR, ER*; 6729 Seybold Rd.; Madison, WI 53705; (608) 271-1100. Contact: Jeff Lipp.

GAND MUSIC & SOUND; *SES*; 780 Frontage Rd.; Northfield, IL 60093; (312) 446-4263. Contact: Steve Ponte, Bob Tjarks.

HY JAMES-THE AUDIO PROFESSIONALS; *SD, SES, EI, MR, ER*; 24166 Haggerty; Farmington Hills, MI 48024; (313) 471-0027. Contact: Henry Root, Tom Greenberg, Jay "Hot Sam" Barth. Services/Specialization: Digital audio—Otari DTR-900, OPUS, Dyaxis; tape recorders—Otari, Fostex; R-DAT—Sony, Ramsa, Fostex; mixers—Harrison, Amek, Soundcraft, Ramsa and more; microphones—Neumann, B&K, Beyer, TRAM and Audio-Technica; signal processing—Lexicon, Symetrix, dbx, Eventide; monitors—UREI, JBL and Tannoy; synchronizers—TimeLine and Fostex. Hy James is a support

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HY JAMES-THE AUDIO PROFESSIONALS
Farmington Hills, MI

and service intensive professional audio company with carefully selected products to serve our clients requirements

ICB AUDIO COMPANY; *SD, AC, SES, EI, MR, ER*; 1349 E. McMillan; Cincinnati, OH 45206; (513) 281-5535. Services/Specialization: ICB Audio is a full service, cost conscious professional audio and video dealership. We carry over 100 leading brands of audio and video equipment suitable for recording studios, broadcast, video production, industrial, sound reinforcement and home applications. Our services extend way beyond equipment sales. We provide a very high level of service to our customers including equipment repair and on-site maintenance. We offer consultation services, education and design assistance in many states and outside the U.S.A. We also sell hi-fidelity rocks for your yard. Each of our sales associates works regularly as an end user of the products we supply (musician, sound engineer, etc.) so when you talk to us, you know we understand your needs. Call us today for more information. Mention this *Mix* magazine listing and we'll send you a discount certificate towards your first purchase with us. Sales (513) 281-5535. Service (513) 281-3629 weekdays 10 a.m. to 6 p.m. EST

NORTH CENTRAL STUDIO DESIGNERS & SUPPLIERS

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

ICB AUDIO COMPANY
Cincinnati, OH

LINNEMANN SOUND, INC.; *SD, AC, SES, EI, MR, ER*; PO Box 452, 1020 Somonauk St.; Sycamore, IL 60178; (815) 895-8219. Contact: Terry Linnemann

MEDIA SYSTEMS; *SD, AC, SES, EI, MR*; 57036 Cedar Rd.; Osceola, IN 46561; (219) 259-2814. Contact: Bob Trulock

PI KEYBOARDS & AUDIO, INC.; *SES, EI, MR, ER*; 2121 Brookpark Rd.; Cleveland, OH 44134; (800) 541-2733. Contact: Joe or Dave. Services/Specialization: Pi Keyboards & Audio, Inc. has been specializing in supplying pro audio and keyboard equipment to the Ohio region since 1974. Our sales staff is among the area's most experienced in terms of combining recording technology with keyboard technology, namely MIDI/SMPTE interfacing and synchronization. We supply Otari, Tascam, Nakamichi and Yamaha recorders; Soundcraft, Tascam, Studiomaster, DDA and Yamaha consoles; E-mu, Ensoniq, Roland, Kurzweil and Yamaha keyboards; all MIDI software; TCE, BBE, Eventide, Rane, dbx, ART, Lexicon, Valley, Aphex and Yamaha processing; JBL, UREI, Tannoy and Yamaha monitors. These products may be auditioned in our working showrooms. Our service department provides warranty and non-warranty service on all brands that we sell. The speaker reconing department is the area's finest. We offer discount prices yet maintain full after-sale support. Many items are available for rent. Join the many satisfied Pi customers by giving us a call now!

PYRAMID AUDIO INC.; *SD, SES, EI, MR, ER*; 450 W. Taft Dr.; South Holland, IL 60473; (312) 339-8014. Contact: Larry Schara, Rob Vukelich, Mike Acklin

QUALITY SOUND DESIGN/CONSTRUCTION; *SD, AC, SES, EI*; 3215 Wild Horse Dr., PO Box 128; Foristell, MO 63348; (314) 673-2577. Contact: Gerard M. Quinn, Gary Manuel. Services/Specialization: Quality Sound has been influential in creating world class acoustical environments for over a decade, specializing in design and construction of state-of-the-art video and audio recording studios, soundstages & pro listing rooms. Our work has taken us across the country, renovating older facilities and constructing new ones. We have designed and constructed such projects as "United Press International's World Headquarters" in Washington, DC and "Jimmy Swaggart's World Headquarters" Baton Rouge, Louisiana. We have built surroundings that workers find aesthetically pleasing and conducive to work, without losing sight of the needs of the building owner. We provide quality working space to meet everyone's needs. Quality Sound is interested in working directly with the studio owner in designing new state-of-the-art audio/video complexes or remodeling your existing facility. So if you're looking for the most qualified acoustical contractor, give us a try. See why the professionals have

RENT FX-AUDIO EFFECTS RENTALS; 2500 N. 77th Ct.; Elmwood Park, IL 60635; (312) 452-5594. Contact: Chris Kirby

J.M. STITT & ASSOCIATES, INC.
Cincinnati, OH

J.M. STITT & ASSOCIATES, INC.; *SD, AC*; PO Box 14585; Cincinnati, OH 45214; (513) 621-9292. Contact: James Stitt. Services/Specialization: Award-winning custom studio and facility design services, including architectural, acoustical, electrical, lighting, mechanical/HVAC, interior aesthetic and ergonomic designs and construction management. We specialize in the latest state-of-the-art LEDE™ rooms, new or refurbished, tailored to your budget, serving the recording, broadcast and AV teleproduction industries. Acoustic and technical consultation including innovative systems design, impartial equipment selection, computer-aided design and

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EXTRAORDINARY AUDIO

Studio Consultants specializes in a select group of exceptionally fine professional audio products, including:

- **AMS AudioFile**—hard disk-based digital recording and editing system
- **API**—all-discrete equalizers and microphone preamplifiers, distribution amps, and other audio modules
- **Bryston**—professional power amplifiers, preamplifiers, and crossovers
- **T.C. Electronic**—digital delay/sampler, automated equalizers, and effects
- **Westlake**—monitor speakers

Also: **Aphex, Audio Digital, Audio Kinetics, Fostex Professional, Rane, Valley International, White Instruments**

Spec sheets, prices, and in-studio demos are available on request. And for short-term needs, **Studio Consultants** rents **API** and **Bryston**.

studio consultants, inc.

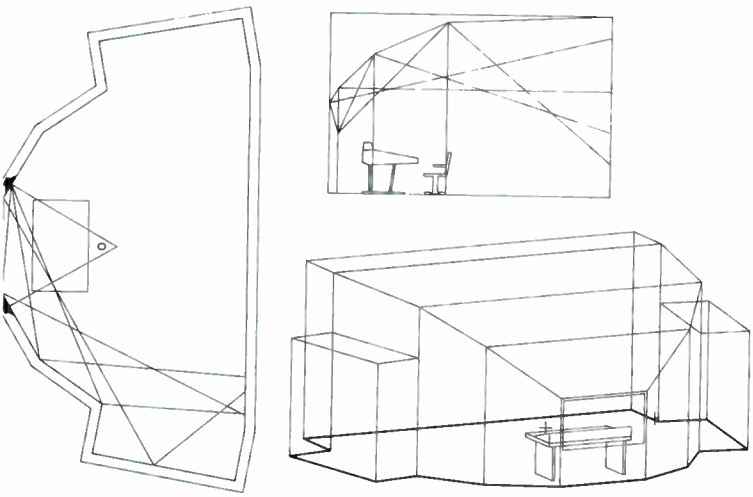
321 West 44th Street New York, NY 10036 (212) 586-7376

Equipment, support, and design services for professional audio facilities and broadcasters.

Circle #074 on Reader Service Card

Design

by: Acoustical Physics Laboratories



Control Room Design

Acoustical Physics Laboratories develops accurate control room designs through the use of computer based mathematical and TEF analyzed scale models. Each design incorporates correct room/monitor geometry combined with acoustical absorption and diffusion to achieve an accurate monitoring environment.

All designs are CADD prepared and are precisely dimensioned in full size architectural E size drawings. Construction techniques and materials are detailed in a written statement of work. On site construction inspections are provided at critical construction stages when required. A final performance certification is performed to verify monitoring accuracy, room isolation, and ambient noise.

Control Room Monitor Systems

Acoustical Physics Laboratories designs high accuracy monitoring systems incorporating time corrected cone and dome drivers in active 3-way alignments. This proven design approach using cone and dome driver technology results in the highest levels of spectral, transient, and spatial imaging accuracy. Monitor loudspeaker designs are available in component form or as complete systems. Custom designs are developed for special requirements.

Acoustical Physics Laboratories
3877 Foxford Dr., Doraville, GA 30340 404 934-9217

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room analyses and Techron TEF™ and other audio measurements. Our design team, each with 15-plus years experience in their respective fields of expertise, possess a unique sensitivity and ability to combine the diverse needs of the owner, client, producer, musician and engineer into a harmonious, successful facility.

STUDIO DESIGN CO./TUBE TRAPS; *SD, AC*; 2247 Glenview Rd.; Glenview, IL 60025; (312) 657-7787. Contact: Sam Lynn.

SOUTHWEST

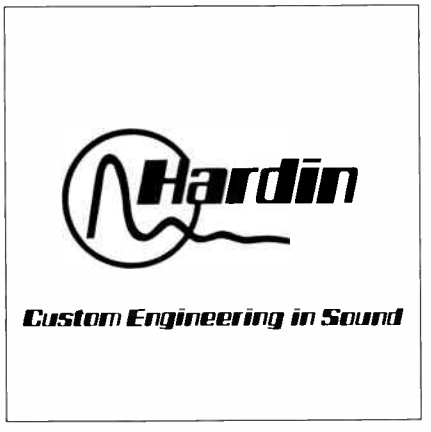
AUDIO SPECIALTIES COMPANY; *AC, SES, EI, MR*; 13416 Brookgreen; Dallas, TX 75240; (214) 239-2230. Contact: Mike Moree.

D.P. AYYAPPAN, CONSULTANTS IN ACOUSTICS; *SD, AC*; 1908 University Dr.; Richardson, TX 75081; (214) 644-2130. Contact: D P Ayyappan.

CENTRAL SOUND; *SES, EI, MR, ER*; 1331 N. 5th St.; Duncan, OK 73533; (405) 255-2109. Contact: Russell Hulme.

EAR PROFESSIONAL AUDIO VIDEO; 2641 E. McDowell Rd.; Phoenix, AZ 85008; (602) 267-0600. Contact: John Gibson, Tim Delaney. Services/Specialization: Sales, service, design and installation of professional recording, audio/video production and music scoring systems and facilities. EAR has been servicing the professional production and home recording market for over 10 years and enjoys one of the finest reputations nationwide for quality service and competitive pricing of audio, video and MIDI products. The company features a "Total Technology" approach to system design by specializing in the full integration of the latest audio/video/MIDI technology. The ability to offer such a broad and diverse range of products along with an experienced sales staff has established EAR Professional Audio/Video as one of the most comprehensive facilities of its kind anywhere. Authorized sales and service for: Otari, Trident, Sony, Yamaha, Tascam, Fostex, JVC, Soundcraft, Adams-Smith, Ampex, Roland, Neotek and over 100 other major audio/video/MIDI product lines.

GABRIEL ENGINEERING TEF® MEASUREMENTS; *SD, AC, SES, EI, MR, ER*; 833 W. Main St.; Mesa, AZ 85201; (602) 969-8663. Contact: Brent Gabrielsen.

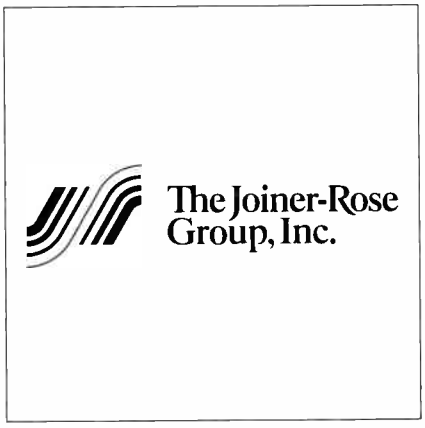


HARDIN ELECTRONICS
Ft. Worth, TX

HARDIN ELECTRONICS; *SES, MR*; 5635 E. Rosedale St.; Fort Worth, TX 76112; (817) 429-9761. Contact: John Cordas. Services/Specialization: Hardin is a full service pro audio dealer serving the recording and reinforcement markets. We stock several grades of Ampex tape in 2", 1", ½" and ¼" sizes with special pricing based on studio size. We also are the headquarters for studio supplies such as reels, boxes, splicing kits, etc., and move cassettes by the piece or the 100-lot case. Product lines include: microphones by AKG, Audio-Technica, Beyer-Dynamic, Crown, E-V, Fostex, Sennheiser, Shure and Tascam, mixing consoles by Soundcraft, Studiomaster, Fostex, Tascam and Yamaha, Akai, Tascam, Revox and Yamaha recorders, speakers by Auratone, E-V, EAW, JBL and Yamaha, signal processing by (among others) Aphex, dbx, DeltaLab, DOD, Eventide, ART, UREI, Valley People and Yamaha, and power amps from Crown, Hafler and Yamaha. We also supply raw cables and connectors in bulk (Switchcraft and Neutrik distributor) with snakes and cables by Conquest, Pro-Co, Wireworks and Whirlwind. Hardin is also the largest Apple computer dealer in North Texas with a variety of MIDI interfaces and software available.

NORTHWEST STUDIO DESIGNERS & SUPPLIERS

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



THE JOINER-ROSE GROUP, INC.
Dallas, TX

THE JOINER-ROSE GROUP, INC.; *SD, AC*; 4125 Centurion Way; Dallas, TX 75244; (214) 392-7800. Services/Specialization: Russ Berger leads the Joiner-Rose Group studio design team, who combine experience in the recording industry and an understanding of studio operations with a broad base of technical skills in acoustical design. Whether in new construction or renovation, Russ employs the latest acoustical insights and practical construction techniques to provide predictable and cost-effective results. From initial space planning through design, construction, inspection and operation, state-of-the-art technology is tailored to the studio owner's needs, budget and clientele. As a vice-president of The Joiner-Rose Group, Russ is a vital part of one of the most respected and experienced full-service acoustical consulting firms in the country. The Joiner-Rose Group maintains a full array of instrumentation, including a TEF™ measurement system. We also offer design services, problem solving and testing in the areas of noise control, architectural acoustics, vibration analysis, video systems, sound systems, rigging, lighting and environmental acoustics.

L.D. SYSTEMS; *AC, SES, EI, MR, ER*; 467 W. 38th St.; Houston, TX 77018; (713) 695-9400. Contact: Rob McKinley. Services/Specialization: Full line equipment and services offered. Professional products include Otari MTR-10/9011, Amek, Tascam, Adams-Smith and others. Complete and functional showroom facility for all products as well as on-location demonstration if desired. Total service support for all products represented. Design and consulting services are available.

SOUND TECHS; *AC, SES, EI, MR, ER*; 109 N. First; Lufkin, TX 75901; (409) 632-8484. Contact: Jon Sprinkle.

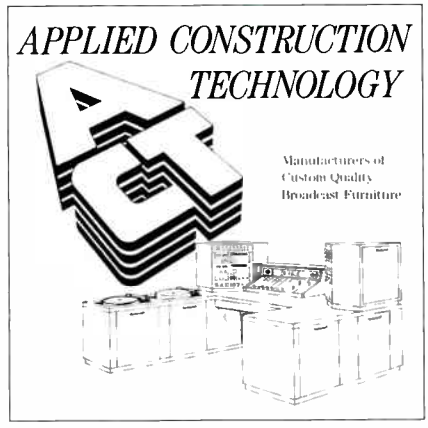
STUDIO SUPPLY COMPANY; *SD, AC, SES, EI, MR*; Dallas Office; 9990 Monroe, Ste. 108; Dallas, TX 75354; (214) 358-0050. Contact: John Alderson, Leland Burns.

NORTHWEST

A.C.E.S./TUBE TRAPS; *AC, SES*; 1909 Judah St.; San Francisco, CA 94122; (415) 661-4143. Contact: Paul Stubblebine.

ADVANCED VIDEO SYSTEMS; *SD, EI, MR*; 1479A Folsom St.; San Francisco, CA 94103; (415) 863-6767. Contact: John Preston.

DAN ALEXANDER AUDIO; *SES, ER*; 2944 San Pablo Ave., Berkeley, CA 94702; (415) 644-2363. Contact: Dan Alexander, Connie Laventurier, Jon Rubin. Services/Specialization: In the recording business since 1976, providing audio esoterica as well as the industry standards to the major recording facilities in the U.S. Thousands of clients include Ocean Way, Sunset Sound, Criteria, A&M, Unique, all three Record Plant Studios, Fantasy, Toto, Prince, The Jacksons, Michael McDonald, Van Halen, Merle Haggard, etc. Dan Alexander Audio has sold more Pultec and Lang equalizers, more LA-2A and Fairchild limiters, more Neumann and AKG tube microphones, more API consoles and more Teletunken 251's than any other used audio dealer on the planet! We buy, sell and trade used audio equipment of all types: recorders, consoles, outboard gear and everthing else. We can get you almost anything you want—and we can save you money! We have just opened a retail store in Hollywood. You can still reach our San Francisco office. Make us an offer we can't understand, please!



APPLIED CONSTRUCTION TECHNOLOGY
Campbell, CA

APPLIED CONSTRUCTION TECHNOLOGY; *SD, AC, SES, MR*; 1077 Florence Way; Campbell, CA 95008; (408) 370-7710. Contact: Gavin M. Bolla. Services/Specialization: Serving all of Northern California from a modern shop in the heart of San Francisco Bay's "Silicon Valley," Applied Construction designs, constructs and installs studio and station consoles and cabinets, acoustically correct control facilities and people-oriented furniture for clients and staff. ACT's journeymen craftsmen work within a number of disciplines using all quality materials and fabrication techniques—whether refurbishing existing facilities or launching a new venture. Graphic design services and system utilization consultation are available. All services are geared for fast turnaround. Work is competitively priced and fully guaranteed.

ARTISTS' ENGINEERING; *SD, EI, MR*; 14444 Skyline Blvd.; Woodside, CA 94062; (415) 851-0388. Contact: Harry Sitam.

ASC/TUBE TRAPS
Eugene, OR

ASC/TUBE TRAPS; *SD, AC, SES*; PO Box 1189; Eugene, OR 97440; (800) 272-8823. Contact: Art Noxon, Mike Nemeth. Services/Specialization: Tube Traps prefabricated studio acoustics. Full-range absorption/diffusion systems for the control room and studio, vocal booths, overdub and drum rooms, even gobos. Call the factory engineers toll-free to help spec your job. TEF™ testing is available as is factory post-processing of your own raw data disks. Tube Trap designers, studio voicers and dealers are in most major cities. History: first developed in early '50s by Dr. Harry Olsen using lumped parameter, "RC" acoustical circuits. Thirty years later Art Nox-

on, acoustical engineer and physicist, developed and patented more complex acoustical circuit devices to provide improved traps for studio work. Tube Traps, now in many models and systems, satisfy almost any pro need, big or small. Tube Traps are best known as the world's first prefabricated, corner-loaded bass trap. Soon to be known as the hottest new sound in town is the QSF™ sampling room. Quick Sound Field - very live, very dry, perfect for the mix. Says who? Pete Townshend trapped in EEL PIE, that's WHO!

CENTRO CORP.; *SD, AC, SES, EI*; 369 Billy Mitchell Rd.; Salt Lake City, UT 84116; (801) 537-7779. Contact: Kurtis Chan

CHIPS DAVIS LEDE® DESIGNS, INC.; *SD, AC*; c/o Paoletti/Lewitz/Assoc. Inc.; 40 Gold St.; San Francisco, CA 94133; (415) 391-7610; (415) 391-0171 FAX. Contact: Chips Davis, Kurt Graffy

DELTASONICS
San Francisco, CA

DELTASONICS, *SES, EI, MR*; 50 Mendell St., Ste. 2; San Francisco, CA 94124; (415) 647-8900. Contact: Don Kruse, Lydia Drake, Steve Raschke. Services/Specialization: Deltasonics is a pro audio/video equipment maintenance and installation firm catering to recording, production and broadcast facilities, corporate needs and high-end residential installations. Services: Deltasonics offers quality service and installation of all major brand audio and video equipment and factory authorized warranty service on Otari, TEAC/Tascam, Crown, D&R and Sony equipment. Custom design and manufacturing is available for clients in need of special circuitry or modifications to existing gear. Our installation staff is proud of its unparalleled experience and attention to detail. Sales: Deltasonics is West Coast distributor for D&R Electronica, a respected European manufacturer of mixing, sound reinforcement and signal processing equipment. Call for an appointment to see one of the new D&R mixing consoles. Customers: quality work and customer satisfaction are the reason we're in business, and many of our customers have been coming back for years. Recent clients include Shaklee, The Golden State Warriors, PG&E, Pacific Bell, First Nationwide Bank, Ketchum Advertising, J. Walter Thompson Advertising, Robert Berke Sound, Atari Games, Merle Haggard, Neil Young, The Tubes, Savage Studios, RLS Acoustics and Saul Zaentz Films

FRANK HUBACH ASSOCIATES
Berkeley, CA

FRANK HUBACH ASSOCIATES; *SD, AC*; 1785 Fourth St.; Berkeley, CA 94710; (415) 528-1505. Services/Specializa-

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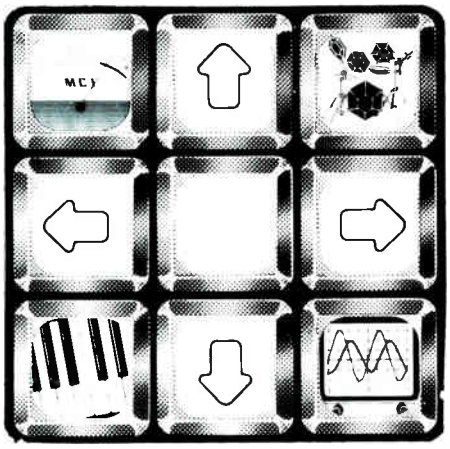
tion: FHA offers a unique blend of experience, skill and instrumentation for the design and testing of all types of studios, performance spaces and listening rooms. We are a professional partnership of consultants in acoustics, vibration and sound system design with no products to sell and no rigid design philosophy. Our partners have backgrounds in recording, electronics, video, live performance audio, music, structural and mechanical engineering and the construction industry. We also have experience as professional musicians and recording artists. FHA's laboratory has the finest instrumentation from Bruel and Kjaer. So, whether your project is large or small, complex or "no frills," you should consider our services: design, design review, HVAC noise control, noise and vibration control, room acoustics, site evaluation, sound systems, specification and testing. Previous clients include The Record Plant, Bill Graham Presents, FM Productions, Jefferson Starship, Alice Cooper and The Automatt.

KIMBER KABLE; *SES*; 2675 Industrial Dr.; Ogden, UT 84401; (801) 621-5530. Services/Specialization: High performance audio cables. New! KC-1 studio microphone cable. Call or write for more information.

LEFT MINUS RIGHT AUDIO CONSULTANTS; *SD, EI, MR*; 510 B S. Murphy Ave.; Sunnyvale, CA 94086; (408) 773-9793; (415) 960-4260. Contact: Marty Preece.



LEO'S AUDIO AND MUSIC TECHNOLOGIES
Oakland, CA

LEO'S AUDIO AND MUSIC TECHNOLOGIES; *SD, AC, SES, EI, MR*; 5447 Telegraph Ave.; Oakland, CA 94609; (415) 652-1553. Contact: Bob Ulius, Ron Webb. Services/Specialization: Sales, service and installation of Sony Professional Audio products, Tascam and Tascam ATR series equipment and Apple-based digital workstations. Virtually every major brand of professional recording, broadcast and sound reinforcement equipment is represented by Leo's. Extensive inventory of keyboards, synthesizers, computers and software for studio and stage use. Leo's maintains four showrooms, including a working 24-track control room, and is uniquely able to demonstrate the complete product lines of over 120 manufacturers. Our sales staff is particularly attuned to the marriage of multi-track audio, computers and keyboards. Factory-trained service is available on most product lines.

LISTENUP PROFESSIONAL DIVISION; *SES, EI, MR*; 999 S. Logan St.; Denver, CO 80209; (303) 778-0949. Contact: Norm Simmer. Services/Specialization: ListenUp is a full-service pro audio/video dealer that has been serving the Rocky Mountain region for over 15 years. You'll find everything you need at consistently the lowest prices. ListenUp represents more than 100 manufacturers like: Allen & Heath, Auratone, Ampex, AKG, Biamp, BBE, Bose, Cetec-Vega, Crown, DeltaLab, DOD, E-V, Eventide, Fostex, Furman, Hafler, HME, JBL, JVC Klipsch, Lexicon, Nakamichi, NEC, Neumann, Numark, QSC, Shure, Soundcraft, Tascam, JREI, Yamaha and more. Our service department is factory trained, and our analysis equipment includes: Crown/Techron TEF™ System-12, IVIE RTA and the Sound Technology tape recorder test system. Our experienced and knowledgeable sales and technical staff, and the finest selection of products, have made ListenUp the premier professional dealer in the Rocky Mountain region.

LUDE BROADCAST ENGINEERING; *SD, EI, MR*; 458 Brannan St.; San Francisco, CA 94107; (415) 543-1300. Contact: Karyn Cap. Services/Specialization: Lude Broadcast Engineering is a design and installation firm providing high-quality, cost-effective audio-for-video facilities of all sizes. Services include designing operator-friendly systems using existing equipment, or consultation in specifying the appropriate new hardware. Custom equipment modifications and design is also available. Regardless of the size of the facility, Lude

NORTHWEST STUDIO DESIGNERS & SUPPLIERS

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

LUDE BROADCAST ENGINEERING
San Francisco, CA

Broadcast Engineering installs all systems with logical design, impeccable craftsmanship and complete documentation. Specializing in video post-production, audio sweetening, broadcast control and mobile units, recent projects have ranged from state-of-the-art video disc pre-mastering edit systems to modest cuts-only edit suites, and from mobile EFP units to broadcast studios. Clients have included commercial and non-commercial television stations, corporate media centers, educational and government institutions, production houses, equipment manufacturers and cable TV operators.

McTECH ASSOCIATES
Oakland, CA

McTECH ASSOCIATES; *SD, AC, EI, MR*; 484 Lake Park Ave., Ste. 341; Oakland, CA 94610; (415) 848-7917. Contact: Mack Clark. Services/Specialization: McTech Associates offers audio design, engineering and technical support services for the film, video and recording industries of Northern California. We serve commercial recording studios as well as private recording and pre-production facilities designed around the professional musician. Our ever expanding and updated expertise enables us to assist our clients make the most informed decisions regarding the latest developments in studio design, TEF™ analysis, consoles, interfacing, MIDI systems, synchronization, digital equipment and more. We provide technical support to suit your style of operation, whether you require a modification, renovation or complete system design. We are grateful for the good faith and confidence of our clients. Different Fur, Frankie Beverly, Atlanta Productions, One Pass Video, Solid State Logic, Lucasfilm, Groupe Andre Perry, Steve Smith, Starlight, Spark, Zoetrope and others.

MICROAUDIO INC.; *SES*; 4438 SW Hewett Blvd.; Portland, OR 97221; (503) 292-8896; (800) 445-1248. Contact: Eugene B. Rimkeit.

MILOVICH GENERAL CONTRACTING; State License #396429; 140 Norlyn Dr.; Walnut Creek, CA 94596; (415) 285-1246. Contact: Steve Milovich. Services/Specialization: M.G.C. specializes in complete audio and video studio construction, including foundation work, isolated floor and wall systems, interior acoustical treatments and cabinetry installation. Whether your design involves an existing space or new construction, M.G.C. can accommodate your needs. References include: San Francisco Production Group and Robert Berke Sound, also of San Francisco, both of which were designed by RLS Acoustics. M.G.C. services the greater San Francisco Bay Area, although further locations may be considered. Please call to discuss your plans.

RICHARD J. MOORE, PH.D., ACOUSTICS & TECHNICAL AUDIO; *SD, AC, EI, MR*; PO Box 2206; Novato, CA 94948; (415) 897-6462. Contact: Richie Moore, Ph.D. Services/Specialization: Studio design, acoustics design and consultation, equipment evaluation and installation and maintenance from a musician and mixer's point of view. Over 20 years experience as a mixer and producer, with the past ten years specializing in the design, construction and maintenance of musicians' studios. Small studios are a specialty. Use of acoustic CAD programs called ACOUSTICALC work out most problems in room design. My goal is systems that work if I were mixing myself. Some of the studios I have done include Studio D Recording and Gate Five Studios in Sausalito, CA, R.O. Studio and ATR Studios in Contra Costa; and home studios for Johnny Colla and Bill Gibson of Huey Lewis and the News and Johnathan Cain of Journey. We don't sell equipment, so studios are put together to the taste of the client. After all, in recording, it is "how it feels."

MORGAN SOUND, INC.; *SES, EI*; 2004 196th SW; Lynnwood, WA 98036; (206) 771-7257. Contact: Charlie Morgan. Services/Specialization: Specializing in Sony/MCI sales and service. Complete listing of support electronics and equipment for sound reinforcement and studios. Rental contacts available for Sony Digital Recorders. Outboard processing and microphones available for rental, call for quotes. Complete repair facility on-site for electronics and speakers.

PAOLETTI/LEWITZ/ASSOCIATES, INC.; *SD, AC*; 40 Gold St.; San Francisco, CA 94133; (415) 391-7610; (415) 391-0171 FAX. Contact: Chips Davis, Kurt Graffy. Services/Specialization: Chips Davis and Kurt Graffy lead the Paoletti/Lewitz/Aslnc design team for studios, control rooms and post-production facilities. Chips was the recipient of *Mix* magazine's 1987 international award for Technical Excellence and Creativity in Acoustics and Studio Design, an accolade he duly deserves, having pioneered the LEDE® (Live End/Dead End™) concept which is now commonly applied to studios and control rooms by most knowledgeable designers. Our designers have extensive hands-on experience evaluating sound environments and mixing for records, television and live performances. They are also highly recognized as authorities on the practical use of acoustic energy control and TEF® (Time Energy Frequency) measurements for recording, broadcast, post-production and home listening environments. Chips is frequently sought after to design, evaluate and improve studio facilities based on clients having experienced sound produced in rooms which he has designed. Paoletti/Lewitz/Associates Inc. has provided acoustical and audio visual consulting services on more than 1,200 projects throughout the United States and abroad during the past eleven years. A broad-based staff of seventeen have backgrounds in architecture, mechanical and electrical engineering, theater and audio. A fully equipped laboratory includes highly sophisticated instrumentation for the measurements and evaluation of sound.

PERFORMANCE AUDIO; *SES, EI, MR, ER*; 2358 S. Main; Salt Lake City, UT 84115; (801) 466-3196. Contact: Klay Anderson.

MICHAEL PFOHL ASSOCIATES A.I.A./A.S.I.D.; *SD, AC*; 1128 Alder, Ste. C; Eugene, OR 97403; (503) 342-2844. Services/Specialization: Architectural, ergonomic and acoustic design services for audio and video facilities—currently developing the most innovative concept in the field, the "MIDI substation," which will be a valuable extension to the recording industries. The evolution of the traditional recording studio into a new, large scale, multiple user, multiple workstation facility is now on the horizon. The digital realm enables satellite substations, connected via modem, to exchange information and will further unify the audio and video professionals, while broadening the spectrum to include amateurs, students and home enthusiasts. This new collaboration will be one of the most significant design-related issues of the 1990s, concerning the technical education, training and professionalism of future leaders in the field. Architectural services range from

site evaluation through material selections, the use of specialized acoustical analysis equipment, the latest computer-aided design hardware and last but not least, award-winning designers' Portfolio upon request

PRO MEDIA; *SES, ER*; 3563 San Pablo Dam Rd.; El Sobrante, CA 94803; (415) 222-0307. Contact: Ellen Goldstein

DENNIS RICE STUDIO SERVICES; *SD, AC, EI, MR*; 1907 Ardith Dr.; Pleasant Hill, CA 94523; (415) 689-6718. Contact: Dennis Rice

RLS ACOUSTICS

RLS ACOUSTICS
San Francisco, CA

RLS ACOUSTICS; *SD, AC*; 300 Brannan St., Ste. 610; San Francisco, CA 94107; (415) 541-0818. Contact: Randy Sparks Services/Specialization: At RLS Acoustics, we provide quality design, engineering and consulting services. Whether you're expanding existing facilities or starting a new organization, we'll work directly with you in the development of your concept. Reinforcing your ideas with solid engineering principles and innovative design solutions, we can build a strong foundation for your successful venture. Our experience in the design and use of technical facilities can help you avoid costly mistakes. Proprietary engineering software, along with our CAD system, enables our personnel to arrive at design solutions quickly—and save you money in the process. If you're interested in creating a state-of-the-art audio control room, designing a recording studio with a variable acoustic environment, incorporating accurate stereo audio into your video production suite, installing an audio-for-video synchronization system, or anything in between, call us and we'll help develop your ideas and turn them into reality. Recent projects include: Audio suite and film-to-tape facilities for One Pass, Inc.; video production facilities for Tandem Computer; video production facilities for Apple Computer; conference facilities for EPRI, studio for Bay Records; production facility for First Nationwide Bank.

charles m. salter assoc., inc.
consultants in acoustics
architecture engineering the environment

CHARLES M. SALTER ASSOCIATES, INC.
San Francisco, CA

CHARLES M. SALTER ASSOCIATES, INC.; *AC*; 930 Montgomery St.; San Francisco, CA 94133; (415) 397-0442; (415) 397-0454 FAX. Contact: David R. Schwind, Elizabeth A. Cohen, Thomas A. Schindler, Steven J. Thorburn. Services/Specialization: A full range acoustical consulting firm providing services in the following areas: Architectural acoustics: achieving desired acoustical qualities in buildings such as performing arts centers (concert hall, theaters, opera), amphi-

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SO. CALIFORNIA STUDIO DESIGNERS & SUPPLIERS

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

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theaters, recording studios film production and post-production facilities, radio and television broadcast facilities. Engineering acoustics: controlling noise and vibration of mechanical ventilation systems, plumbing systems, power generation electrical transformers and transportation systems; technology assessment. Audio-visual system design: reinforcement of music and speech in theaters, entertainment and performing arts facilities. Electronic enhancement of room acoustics. Design and specification of film, video and computer music systems. Research in music perception, psychoacoustics and measurement/recording techniques. Environmental acoustics, assessing environmental noise sources due to transportation sources, construction projects, power plants. Expert testimony/public presentation: communicating technical information at governmental hearings; expert testimony in judicial proceeding. Clients/projects: Apple Computer, Disney Pictures, Dolby Laboratories, Los Angeles Philharmonic, Lucasfilm Ltd., Sundance Institute and Todd AO/Glen-Glenn.

SELWYN CO.; *AC, SES, EI*; PO Box 610786; San Jose, CA 95161; (415) 881-2738. Contact: Greg Gardner

SOUND ADVICE INC.; *SD, AC*; PO Box 278; Cazadero, CA 95421; (707) 632-5911. Contact: Tom Kraus.

TRAX AUDIO; *SD, AC, SES, EI, ER*; 545 W. 500 South, Ste. 150; Bountiful, UT 84010; (801) 298-3280. Contact: Jeff Ostler, Gaylen Smith.

WILSON, IHRIG & ASSOCIATES, INC.; *AC*; 5776 Broadway; Oakland, CA 94618; (415) 658-6719. Contact: George Paul Wilson. Services/Specialization: Wilson, Ihrig & Associates, Inc. (WIA), one of the nation's leading acoustical consulting firms, has been providing acoustical consulting services since 1966. WIA has extensive experience in the acoustical design of all types of recording and performance facilities. Our services include the measurement, evaluation and control of noise and vibration, HVAC noise control, sound systems, site evaluation, room acoustics, specification and testing. WIA maintains an extensive array of precision measurement and laboratory analysis equipment for performing all types of acoustical and vibration measurements. WIA is dedicated to practical, cost-effective solutions and offers services ranging from a few hours of consultation to extensive project participation.

SOUTHERN CAL

ACOUSTIC SCIENCES OF CALIF.; *SD, AC, SES, EI, ER*; 6709 Ethel Ave.; North Hollywood, CA 91606; (818) 763-9587. Contact: Richard Lomax

ADVANCED STUDIO SYSTEMS; *SD, AC, SES, EI, MR, ER*; 15911 Acre St.; Sepulveda, CA 91343; (818) 892-9810. Contact: Nicholas Spigel, Alexandra de Guzman. Services/Specialization: Advanced Studio Systems is a full-service company specializing in studio design, sales and installation. From conception, layout and planning consultation, to facility completion, personal attention is given to tailor each system, thereby meeting the client's individual needs. We maintain a full staff of qualified technicians for maintenance and repair of audio and video facilities and equipment modification. East and West Coast recording studios available with state-of-the-art equipment, including SMPTE interlock, Synclavier and programmer.

AEA; *SD, AC, SES, EI, MR, ER*; 1029 N. Allen Ave.; Pasadena, CA 91104; (818) 798-9127. Contact: Wes Dooley

AMEK CONSOLES; 10815 Burbank Blvd.; North Hollywood, CA 91601; (818) 508-9788. Contact: Sue Jones.

Photo courtesy Different Fur

SOUND RESEARCH ASSOCIATES
San Jose, CA

SOUND RESEARCH ASSOCIATES; *SD, AC, EI, MR*; 1650 Zanker Rd.; Goble Bldg., Ste. 120; San Jose, CA 95112; (408) 436-6040. Contact: Tom Paddock. Services/Specialization: SRA offers a wide range of services for the recording, broadcast and performance industries, including acoustical, mechanical, electronic, grounding and power system design. SRA specializes in innovative and cost-effective engineering ideas, and our experience and expertise in the fields of acoustics and electronics is your assurance that your design will be accurate as well as aesthetically pleasing. SRA features CAD-generated, fully documented project construction drawings and specifications. SRA is experienced in the latest LEDE® control room design and we offer computer-designed diffusor and absorber systems, as well as TEF™ analysis. SRA consulting services include ground-up studio planning and development, acoustical and electronic redesign, small studio evaluation, room tuning, etc. We would like to acknowledge our clients for their support and confidence in our services: Huey Lewis and the News, The Grateful Dead, George Winston, The Tubes, Todd Rundgren, Different Fur, Joan Baez, Windham Hill, E-mu Systems, Mickey Hart, Stanford University, CBS (*Twilight Zone*), and One Pass Video, among others.

AMOS STUDIO DESIGNS
Northridge, CA

AMOS STUDIO DESIGNS; *SD, AC*; 18901 Malden St.; Northridge, CA 91324; (818) 701-0761. Contact: Ron Amos. Services/Specialization: Amos Studio Designs is an acoustic design, engineering and construction firm specializing in every phase of studio building. I can develop a working set of plans for you, or I will build it for you, from a vacant lot through every phase of construction to a complete studio that is everything you ever dreamed of. I also do remodeling and acoustic consulting. Do you have a room that isn't acoustically right? Does your studio need to be fine tuned to visual and audio perfection? Then please call and make an appointment. Please feel free to inquire for more information and references. I have just touched on a small portion of the services I offer. Amos Studio Designs Lic. #511404, 18901 Malden St., Northridge, CA. 91324, 818-701-0761.

AUDIO RENTS INC.; *SES*; 7237 Santa Monica Blvd.; West Hollywood, CA 90046; (213) 874-1000. Contact: Allen Byers, Jerry Cannon. Services/Specialization: Equipment for rent, specializing in film, TV and recording. Inventory includes: digital reverbs, digital delays, noise reduction systems, time compressors, equalizers, microphones, etc. Please call, and we will send you a rate card.

BBN LABS; *SD, AC*; 21120 Vanowen St.; Canoga Park, CA 91303; (818) 347-8360. Contact: Paul Jensen, Mark Rothermel Services/Specialization: We offer design services for recording studios and control rooms, radio and television studios, scoring stages, Foley stages, film and video post-production facilities, including acoustics, noise control, space planning and electronic systems. We will provide acoustic and electronic testing and evaluation of existing and new facilities including reverberation time, sound distribution, time delay spectrometry, sound isolation, HVAC noise, electronic noise and distortion. We offer independent laboratory evaluation and certification of acoustic and electronic performance of equipment. Recent projects include remodeling of scoring stage and control room for Walt Disney Productions, Burbank, studios for KOIN-TV, Portland, audio-visual studios for National Geographic Society, Washington, Dallas Communications Complex, Irving, Texas. BBN is the world's largest acoustical firm, with offices and laboratories in Los Angeles and Boston.

THE BERTECH ORGANIZATION; *SES*; 14447 Calila St.; Van Nuys, CA 91401; (818) 909-0262. Contact: Lee Berman.

BOTO DESIGN, INC.; *SD, AC*; 321 Hampton Dr.; Venice, CA 90291; (213) 396-3108. Contact: Bret Thoeny, Isabel Wyatt Services/Specialization: Architects and construction managers specializing in the design and construction of recording studios, video post-production and film stage facilities. Recent clients include: Prince, Paisley Park Studios, Minneapolis, Jackson Browne, Los Angeles, Electric Lady Studios, New York, Britannia Row, London, Visual Eyes Digital Post, Los Angeles, Maryland Public Television, Baltimore. More than 100 projects completed worldwide. In-house services include: architecture, engineering, acoustical design, interior design/colors/materials and space planning.

JEFF COOPER ARCHITECTS, A.I.A./SYNERGY GROUP
Calabasas, CA

JEFF COOPER ARCHITECTS, A.I.A./SYNERGY GROUP; 4766 Park Granada, Ste. 106; Calabasas, CA 91302; (818) 887-9100. Services/Specialization: Architects and builders for the entertainment industry. Specializing in: recording studios, film studios, video post-production studios and theaters. Clients include: Directors Guild of America, MCA-Universal Studios, Burbank Studios, Warner-Hollywood, Capitol Records, Polygram Records, Mann Theaters, Cannon Films, Columbia Pictures, Lucasfilm, Steven Spielberg. Plus UCLA, Australian Film and Television School, others. Services: Architectural design, acoustic consulting, electrical, mechanical and audio engineering, interior design, cost estimating, construction management. The new 1986 edition of *Building a Recording Studio* by Jeff Cooper is available through this office.

DESIGN FX AUDIO; *ER*; PO Box 491087; Los Angeles, CA 90049; (213) 838-6555; (800) 441-4415. Contact: Gary Ladinsky Services/Specialization: Design FX Audio is a digital audio rental company. We specialize in state-of-the-art effects and digital recording equipment including Sony and Mitsubishi digital multi-track machines. Our staff is comprised of music professionals able to help access equipment needs and to answer technical questions. Design FX Audio provides fast, efficient 24-hour service at competitive prices. We cater to the recording, film and video fields. Contact: David Rick or Gary.

FERRA TECHNICAL SERVICES; *EI, MR*; 6550 Wilkinson Ave.; North Hollywood, CA 91606; (818) 761-8305. Contact: Bob Ferra.

FERROSONIC; *MR*; 19426 Weiser Ave.; Carson, CA 90746; (213) 638-6490. Contact: Glen Rewal Services/Specialization: FerroSonic maintains a complete head relapping facility in Carson, California, which can accommodate heads from ⅛" to 2" in all track configurations. All heads received by FerroSonic are recontoured by a revolutionary new computerized process. This new process allows us to achieve greater accuracy and consistency than ever before possible. This process is exclusive to us and was the product of years of development. Final lapping and polishing is done by hand to insure outstanding mechanical and electrical characteristics. All relap data is recorded in a lab report and is sent with all orders received. Call for price and delivery information. 24-hour service available.

GEFEN SYSTEMS; *SD, SES, EI, MR, ER*; 5068 San Feliciano Dr.; Woodland Hills, CA 91364; (818) 884-6294. Contact: Hagai Gefen.

LAKESIDE ASSOCIATES, INC.; *SD, AC, EI*; 1540 E. First St., Ste. 243; Santa Ana, CA 92701; (714) 836-6496. Contact: Carl J. Yanchar.

MUSICIANS REPAIR SERVICE; *SD, AC, SES, EI, MR*; 3089 54th St.; San Diego, CA 92105; (619) 583-7851. Contact: R. Conrad, M. Krewitsky Services/Specialization: MIDI studio system design and maintenance, MIDI updates, retrofits, recording systems, design maintenance, speaker reconing. Musical electronics calibrations and modifications. Factory warranty service for more than 100 brands. All major lines for MIDI studio, recording and live performance. Microphone and speaker specialists.

OMEGA INTERNATIONAL; *SD, SES, EI, MR*; 2691 Richter Ave., Ste. 116; Irvine, CA 92714; (714) 553-0564. Contact: Kin D. Jones.

PERCEPTION INC.
consultants in acoustics

PERCEPTION INC.
Los Angeles, CA

PERCEPTION INC.; *SD, AC*; PO Box 39536; Los Angeles, CA 90039; (213) 857-4912. Contact: G.L. Augspurger Services/Specialization: Perception Inc., headed by well-known acoustician G.L. Augspurger, has established a reputation in the recording industry for innovative studio designs that work. Current projects include a totally new Control Room A at Electric Lady Studios in New York, a new Foley stage for Lorimar Telepictures, production studios for station KZST in Santa Rosa, video production facilities for Southern California Edison, new custom monitor speakers and control room remodeling at Devonshire Studios in North Hollywood and four screening rooms in California and New York. New developments in loudspeaker system design are also underway, including proprietary "phase-lock" subwoofer topology. The company provides professional consulting and design services to architects, builders and studio owners as well as extensive acoustical testing capabilities.

PROGRESSIVE AUDIO VIDEO; *SD, AC, EI, MR*; 534 N. Gardner St.; Los Angeles, CA 90036; (213) 653-1526. Contact: John Musgrave.

PS TECH; *SD, AC, EI, MR*; 3960 Laurel Canyon Blvd., Ste. 118; Studio City, CA 91604; (818) 762-9500; (517) 782-4263. Contact: Pat Schneider Services/Specialization: Recent acoustical design/installations include a Neve 8048 and Studer A800 for United Sound, Detroit, MI, a Neve V Series and Studer A80 at Pearl Sound, Canton, MI and a Sound Workshop Series 34 and Soundcraft Saturn w/Dolby SR at Jungle Studios, Lubbock, TX. Past consultation/installations include a Trident 80B/MCI J-24 for Selah Record (The Winans), Detroit, MI, Soundcraft 2400/Soundcraft 760 Mkiii for Earl Klugh Inc., Bloomfield Hills, MI, MCI JH-500/MCI JH-24 at Studio A, Dearborn Hts., MI, Allen-Heath CMC24/MCI JH-16 at Interactive Sound, Bergenfield, NJ. Soundcraft 600/Tascam MS-16 for The Tracking Station, Ferndale, MI, TAC Scorpion/Tascam MS-16 Soundstar, Canton, MI. Many years of experience maintaining the following equipment consoles – MCI/Sony, Neve, Flickinger, Soundcraft, Sound Workshop, Trident, Neotek, TAC, Tascam, Allen-Heath, Pulsar, Ramsa, Fostex, ACES; tape machines—MCI/Sony, Soundcraft, Studer, Ampex, Tascam, Otari, Fostex, ACES.

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VJ ELECTRONICS, INC.; *AC, SES, EI, ER*; 22127 S. Vermont Ave.; Torrance, CA 90502; (213) 533-5980. Contact: Gary Ford.

WESTLAKE AUDIO; *SD, AC, SES, EI, MR, ER*; 7265 Santa Monica Blvd.; Los Angeles, CA 90046; (213) 851-9800. Contact: Chris Carry.

WIZARDZ SOUND AND LIGHTING SYSTEMS; *SES, EI, MR, ER*; 620 W. Santa Anita St.; San Gabriel, CA 91776; (818) 284-2124. Contact: Mark Cruz Services/Specialization: Wizardz is a franchised dealership for Eastern Acoustic Works' SCD 6000 Reference Monitors, as well as the full Eastern Acoustic Works line. Also available are the unsurpassed Hill Audio Amplifiers with 100 to 3,000 watts of clean, dependable power. Included in the Hill line are the Multi-Mix rack-mount mixer and Modular Recording Consoles. From Kimber Kable to Mogami to Biamp to Hill to you! Wizardz provides some of the world's best equipment.

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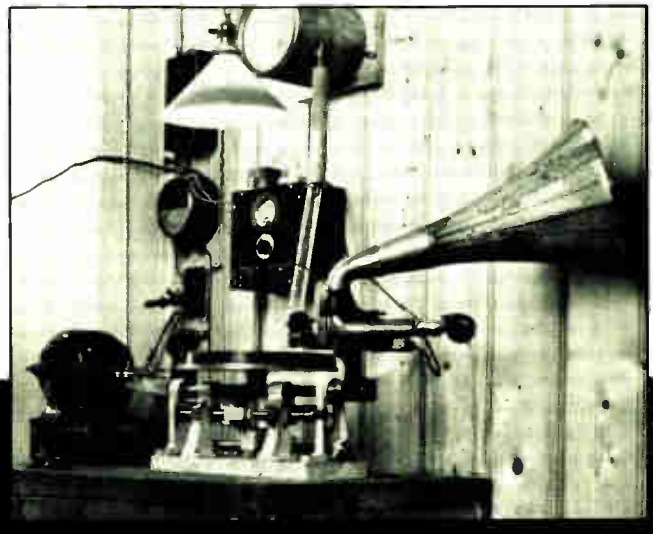
GROWING UP

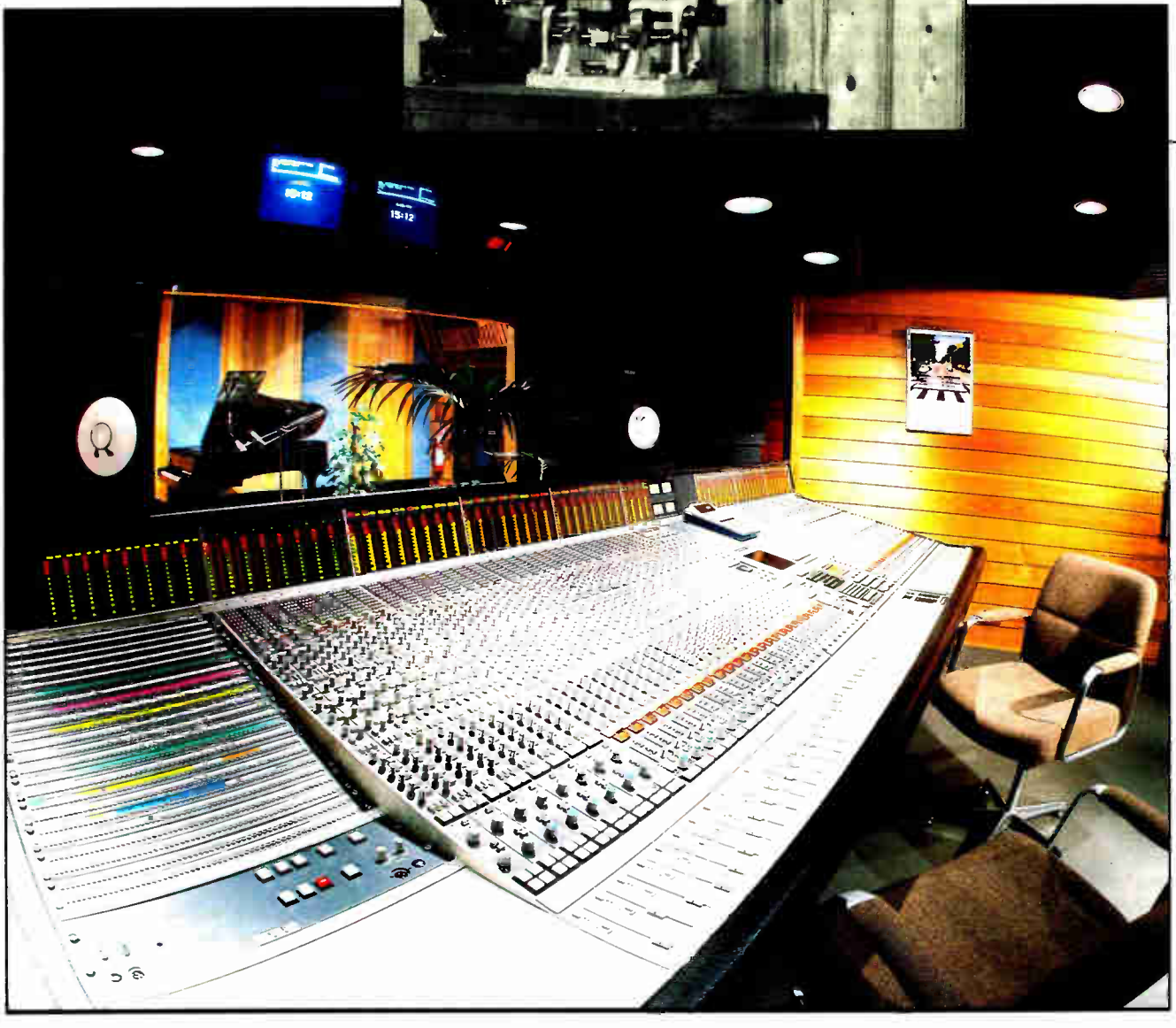
As the Australian sound recording industry powers into its 85th year of continuous operation, little outward trace remains of what was possibly the most important formative factor in its early development—geographical isolation. Australia's studios today are world-class facilities in terms of equipment, local expertise and service. They have



(Left) Early recording machine at EMI Studio, 1930.

Studios 301 (EMI) control room, 1960 (bottom right, page 101).

(Below) Studio B of Studios 301 in 1987.



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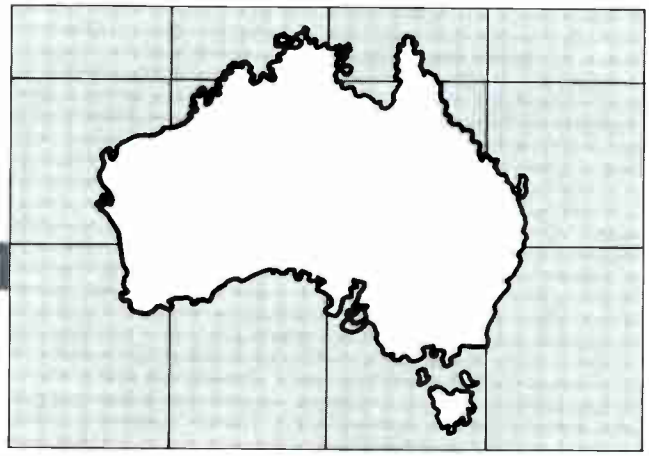

by Gail Cork

THE STORY OF SOUND RECORDING IN AUSTRALIA

given birth to a long list of international hits, not only by Australian artists like INXS, John Farnham and Icehouse, but also overseas performers who have chosen to record here, such as Duran Duran, Simple Minds, Elton John, Manhattan Transfer, Nancy Wilson and Stevie Wonder.

Business is brisk and exciting at the glamorous top end of Australian recording. It is only when you look more closely at the middle and lower end of the industry that you still see the crippling problems inherent in operating a recording studio in a tiny market far removed from the "main action," where freight and import duties more than double the cost of keeping up with technology. Of some 160 studios listed in *Sonics* magazine's studio directory, perhaps half a dozen could lay claim to world-class standard, most notably EMI Studios 301, Rhinoceros and Paradise in Sydney and Metropolis, and Platinum in Melbourne. Beneath them is an upper plateau of perhaps a dozen studios, nationally recognized as good, even prestigious facilities. The reputation of these studios often rests more on the credits of their owner/operators than their range of technological gadgetry, which is of a high standard, if not always state-of-the-art. They include Alberts (Peter Dawkins, Wyn Wynyard and Bruce Brown), Trafalgar (Charles Fisher), Honeyfarm (Rick Turk) and Blue Harbour (Louis Shelton). That leaves something in excess of 100 studios around the country, most of which operate on a tiny budget, gamely surviving on jingles, voiceovers and the odd album or soundtrack.

No one pretends it's easy to open a studio in Australia and keep it open. Because margins here so often run perilously close to the bone, even a studio which is fully booked all the time is not guaranteed to make a profit.

Basically, if you're in the studio recording business in this country, you're in it for love or convenience or habit. You don't expect it to make you rich.

Catching up with the rest of the world has been a long and often thankless struggle for the handful of pioneers whose early efforts helped the fledgling industry to its feet. Rock archivist Glenn A. Baker puts the "official" start of sound recording as an industry in Australia at 1903 when the Australian, Empire, Entertainer and Federal imprints began producing indigenous recordings of big bands and vaudeville-style performers on wax cylinders. After an early boom period which saw more than 100 local releases on the Australian label alone, music recording went into hibernation and almost disappeared during the Great Depression of the early '20s. Australia's first recording studio was opened by the Columbia Gramophone Company (later to become EMI), on October 14, 1926. It was a mono studio with a single wire recorder, attached to the company's fine new factory, which produced gramophones and records at Homebush, west of Sydney, where EMI's mastering, pressing and duplicating plant still stands. Two years later, an historic recording was made of the arrival of Charles Kingsford-Smith and Charles Ulm on their pioneer flight from America to Australia. Another milestone was the first landline recording of the running of the Melbourne Cup in 1932 (the Melbourne Cup is still the biggest event in the country's sporting calendar). Gladys Moncrieff, Larry Adler, Enrico Caruso, a young Tex Morton and legendary radio personality Roy "Mo" Rene were among the stars who recorded at Columbia in the '30s.

In 1936, Featuradio Sound Productions opened for business, supplying ten-inch transcription discs. It went on to become the Australian Record Company, acquiring the rights to the powerful Capitol Records label in the early '50s, and finally becoming part of the international CBS empire in 1960. These and other early studios, mostly operating out of radio stations, were set up primarily to record radio soap operas, for which the demand at the time seemed insatiable. Panel operator Mel Mayer earned his reputation as an expert in special effects the hard way, without the help of today's vast sound libraries and electronic gadgetry. If the script called for a body to fall on the floor, he would fall on the floor. "When I went for my National Service medical, I was so covered with bruises —after a full day of Larry Kent shows, which had about a dozen murders each—that the doctor refused to believe my explanation and rang the company the next day to verify it," he recalls. (After 35 years, Mayer still works at CBS, making him the company's longest-serving employee.) Another regular face behind the controls of those often dull and interminably tragic soaps was former manager of EMI Studios 301, Bill Ramsay. One series he remembers clearly was "A Right To Happiness," in which it took one of its characters 18 months to have a baby. Ramsay's career had begun in the early '40s at Radio 6PR in Perth, where recording was still done on an ex-BBC Marguerite disc-cutting system, brought in when the station opened in the early '30s.

By 1939, the record business in Australia had come back to life. A shortage of overseas material throughout the war years proved a stimulus to local recording, resulting in a proliferation of shellac disc releases from the Macquarie label (Australian Record Company) and EMI (Columbia HMV), featuring such performers as the Horrie Dargie Harmonica Band, the ABC Dance Band and a smattering of early trad jazz bands. By the end of the war, the local industry was thriving. In Melbourne, studio pioneer and jazz lover Bill Armstrong remembers his first recording job—a concert at the Fourth Annual Jazz Convention in 1949, recorded on wire. "By the time I started my own business in 1950, the recorder was still a magic thing," he says. "We used to record conferences, weddings, parties—it was a big event to hire someone with a recorder and play it back. Soon afterwards, I started the Paramount record label and produced about four 78s of Smacka Fitzgibbon with Graeme Bell. That was in the mid-'50s when, if it didn't sound American or British, radio didn't want to know about it."

It was not until the mid-'50s that Australia's sound recording industry really began to take shape. The arrival of television heralded the rapid and inglorious demise of the radio soap. Although jingles and commercial voice-overs were providing more and more work for local studios, they needed something more to fill the gap. Popular music came to the rescue. In 1955, just three years after opening, Festival Records trumped ARC and EMI by introducing Australia to the 45 rpm single, in the form of Bill Haley's "Rock Around The Clock" and "A Man Called Peter," by local singer Darryl Stewart. The former soon sold 150,000 units, giving Festival a head start in the rock and roll explosion that promptly followed.

In 1957, the label signed "The Wild One," Johnny O'Keefe, the first Australian rock and roll performer to get a recording contract. Under the guidance of Robert Iredale, arguably Australia's first engineer who was also a producer, O'Keefe became a legendary figure in Australian rock and roll. It was largely thanks to Iredale's entrepreneurial and producing talents that Festival fiercely held its advantage until the mid '60s, recording and breaking the majority of local acts, including Billy Thorpe and the Aztecs, Ray Brown and the Whispers and Normie Rowe.

EMI and CBS eventually caught up and surged ahead, with the Easybeats and The Groop respectively. Engineer Bill Ramsay recalls some of the early rock and roll recording sessions at EMI. "We used to have to imitate the overseas recordings any way we could, with the equipment we had. We all used to listen over and over again to the record. Then the musicians would imitate the style, and I'd imitate the sound until we got it sounding the same."

SPOTLIGHT ON TWO SOUTHERN INDUSTRY STARS

by Phil Tripp

If anything, Australia is a land of contrasts, from the desert of the Red Heart to the sun-drenched beaches; from the lush virgin rain forests of the Top End to the last mountain wilderness of Tasmania; from the bustling urban landscapes of Sydney and Melbourne to the dreary flatness of the near-endless Nullarbor (translated "no trees"). It's a country the size of the U.S., which suffers from a "tyranny of distance" between the six major cities separated by an average of 1,000 miles each, as well as from the incredible across-the-pond hops to the major

—CONTINUED ON PAGE 109

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Recording live rock shows for ABC television brought its own special problems in addition to achieving the required sound. "The sound part was the same, except we had to work with cameras. Because it was a new medium, the producers could only equate it with film production. It was in the days of Fred Astaire and Gene Kelly films, where you never saw a mic. The hardest thing was getting across to the producer that this just wasn't possible for live television. They wouldn't allow a microphone in the shot. That was okay for drama, where you could hide mics in flower vases, but not for live music. We had to learn boom techniques literally on the job. We did lots of silly things like having the boom too far away so the singer was drowned by the orchestra. Because the sound was sacrificed for the sake of the picture, the show often sounded terrible."

In Melbourne, in the late '50s there were still no studios with good recording quality. When business nose dived for Bill Armstrong in 1956, he went to work for W&G Records, the first company in Australia to manufacture microgroove records. W&G took over his order for a Neumann lathe, and Bill set up its cutting room, remaining with the company as an engineer until 1960. When it came to live recording, he had no choice but to hire a hall and record on location.

To meet the growing demand in the early '60s, a group of enterprising lawyers converted an old theater into a sound and film recording studio. After a couple of difficult years, Telefil, under Bill Armstrong's determined management, was doing a roaring trade, recording 50% of all radio and film soundtrack commercials out of Melbourne, as well as pre-recording some of Australia's earliest television variety shows, including "Sunnyside Up" (the show which launched Olivia Newton-John) and "The Johnny O'Keefe Show" when it came to Melbourne.

If recording in Melbourne was a little slow to get started, it soon caught up during the '60s. 1965 saw the opening of Bill Armstrong's 18 x 30-foot studio, which before long was recording not only artists for the early TV shows "Go" and "Kommotion," but also the lion's share of Melbourne's commercial market, and up to 80% of all records hitting the charts in Australia, including The Easybeats, fresh-faced Johnny Farnham and all the artists on the prestigious Fable label.

Rhinoceros Recording, Australia.

Expansion was rapid for Armstrong's studio. From its original little cottage, the company soon spread into other properties on the same street. By 1971, Armstrong had five studios and employed about 20 people. He had beaten EMI to 4-track and was the first to introduce 8-track recording. "I bought some land behind us, which meant buying five houses separately. But when I'd completed that, we did a feasibility study and found it still wouldn't be big enough because we'd expanded so quickly."

Finally he found an old grocery warehouse, covering 9,900 square feet, and littered with remnants of old stock and memorabilia from Melbourne's crumbling Croft's grocery empire. Bill took a bank loan to develop the site and moved in December, 1972. The new building housed Australia's first 16-track machine, the locally built OPTR 16-track, the development of which Bill himself had financially backed. Sadly, the vision began to sour in 1973 when the company, over-extended, fell into financial difficulties. The Alberts group, already a strong force in recording in Sydney, became a 40% partner, but the studios were sold to the giant David Syme group in March 1974. By that time, Bill Armstrong had grown tired of the unpredictable nature of the studio business and taken his talents to radio.

In Sydney, EMI continued to consolidate its place at the forefront of the recording industry, along with its main Sydney rivals, AWA, Natec and Alberts. In 1954, it had moved its studios to the eighth floor of Emitron House in the city, for the convenience of artists and clientele. The new studios opened in a blaze of glory, proudly boasting the most modern premises and equipment in the Southern Hemisphere, with three studios for recording, as well as facilities for transfer from tape to wax or lacquer master, ready for manufacturing. Among the early mile-

—CONTINUED ON PAGE 169

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—CONTINUED FROM PAGE 102

cities of the world.

Australian recording artists and the studios that record them, not to mention the many creative people from the film industry, have all faced the challenge of surmounting the myriad obstacles inherent in operating from Down Under. And there's another segment of the Australian entertainment industry that has had to overcome the hurdles of distance and time zones to make an impact on the world. These are the home-grown companies that don't get the acclaim of their musical and film counterparts, but have made their mark on the audio business by product innovation and determination to crack international markets. Brands like Perreaux and Jands are making their name in amplification with designs that have withstood the rigors of the Australian road environment. On the acoustic front, Maton guitars are attaining a global reputation.

But the shining stars from the land of the Southern Cross have been taking digital technology to new horizons. While 10-year-old Sydney-based Fairlight Instruments manufactures the acclaimed Computer Musical and Computer Video Instruments here, Melbourne-based Disctronics has a history of only a little over a year since it opened its first state-of-the-art compact disc plant. That company has purchased three other facilities in the U.K. and U.S. to become the world's third largest CD manufacturer.

The Dawning of Fairlight

The Fairlight story began in the late '70s when Kim Ryrie—who, as a 15-year-old schoolboy, had convinced his publisher-father to launch a new electronic hobbyist magazine, *Electronics Today International*—created an analog synth DIY construction project which became the ETI 4600. He subsequently teamed up with an old school friend, Peter Vogel, and fellow electronics designer Tony Furse, to begin work on a digitally controlled digital waveform generator which was dubbed the QASAR.

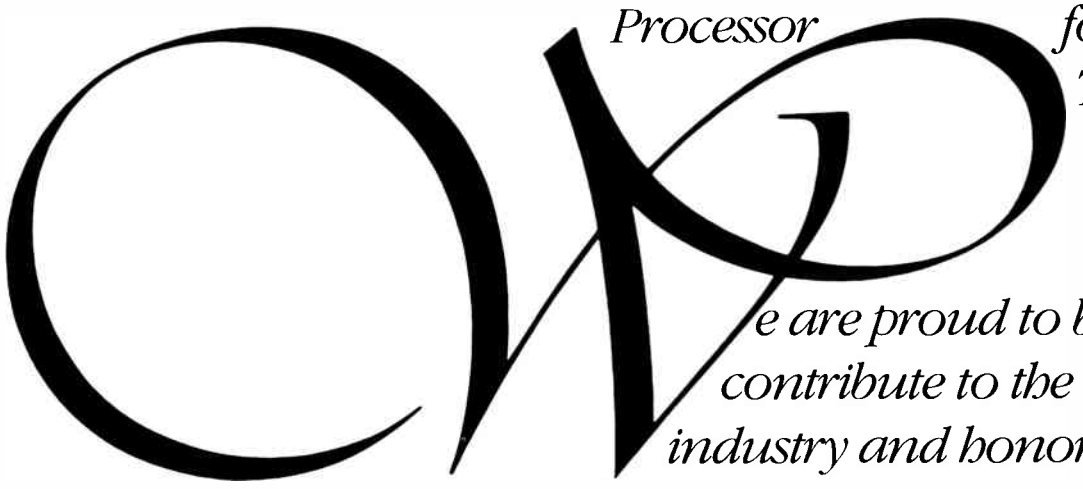
Setting up shop in Ryrie's grandmother's basement, they created a unique instrument. Computer-driven, it provided several musician-friendly aspects, including a velocity-sensitive piano-style keyboard, a light pen with an interactive graphics display, and a sampling and waveform modification capability that enhanced creativity at the same time it opened up galaxies of sounds.

But Australia was light-years from the rest of the musical instrument world, and though the first Computer Musical Instrument created earth-shaking sounds, it was a quiet revolution until one fateful day. Bruce Jackson—one of America's top live sound engineers and an expatriate Aussie whose credits include Elvis Presley and Bruce Springsteen—came home to visit his mother and decided to check out his boyhood friends who were resident in the basement next door.

He was so taken by what he saw

—CONTINUED ON PAGE 111

The men and women of Alesis wish to thank the TEC Awards Nominating Board for nominating the HR-16 Digital Drum Machine and MIDIVERB II Digital Signal Processor for the 1988 TEC Awards.



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ALESIS

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—CONTINUED FROM PAGE 109

and heard that he spent the next year promoting the CMI to the music industry in the U.S. When top composers like Stevie Wonder embraced the CMI, Fairlight's success was guaranteed, and the company has gone on to expand the CMI into its present incarnation as the Series III. In addition, it has created a new market in the video field with its innovative and inexpensive Computer Video Instrument.

It would take megabytes to explain the advances made in the Fairlight products over the years, but some of the most recent innovations for the Series III include an array of software and hardware modifications that appeal to both recording pop musicians as well as film and television composers.

Their new system for audio/post-production, MFX, was created specifically to facilitate the process of coordinating sound effects and music for film and video production. With Cue List time code-oriented event sequencing capable of triggering any Series III event at a specific moment, MFX elevates the Series III beyond the "audio workstation" status to which many of the newer hard disk-based audio/post devices lay claim.

The new version 5.4 enhances the Series III and yields improved sampling features, including selectable sample rate by key number, sampling audition and continuous sampling. It supports a new 800MB optical WORM drive, which offers the user a new generation of easily accessed sound libraries.

Disctronics: High-Tech Hurdler

The quick rise of Disctronics to prominence in the compact disc field over the past year has a number of similarities to the longer running Fairlight saga. Both had to overcome the hurdles imposed by distance from world markets, the ability of Japanese high-tech companies to capitalize on technological advances with production and delivery speed, plus the marketing advantage that the U.S. and U.K. companies had in their own territories.

But through a technological superiority spawned by a Class 100 clean air standard and production acceptance rates averaging 95% in their original factory, coupled with financial leverage, Disctronics soon became a force to be reckoned with on the world market. Within months of opening their Melbourne plant, the company announced purchase of the compatible Disctec facility in Southwater, U.K., followed in November by the acquisition of the Anaheim, California and Huntsville, Alabama operations of Laservideo Inc.

This move placed the company just behind Sony and Philips in terms of annual capacity. Rather than calling itself the third largest in the world, Disctronics prefers the label of largest independent manufacturer of CDs. The acquisition of U.S. and U.K. plants also gave the company the competitive edge on delivery that it needed to counter other manufacturers. That, together with its acknowledged excellence in product quality, has enabled Disctronics to become a supplier of preference for audiophile clients as well as the indies.

New Optical Horizons

But Disctronics was never planned to be exclusively an audio compact disc manufacturer. From the beginning, the concept was to have a plant that was engineered to projected CD-ROM data optical storage standards, providing not only the environment for superior audio product, but the capability of producing for the computer market.

An added dimension to its growth has been the penetration into the emerging CD-V (Compact Disc-Video) product area. Disctronics recently introduced the first commercial PAL CD-V, featuring rock artists The Bezykina Twins' "Moscow Nights," from the Russian record company Melodiya. The company has just completed tooling for NTSC CD-V capability and will soon be manufacturing the tiny CD singles from all its plants. New efforts are under way at the R&D facilities in Anaheim in the somewhat neglected product area of videodiscs as well.

But the key weapon in the Disctronics arsenal is service-oriented.

—CONTINUED ON PAGE 112

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It's become a global company rather than just an Australian manufacturer with overseas factories. Turnaround time and delivery commitments are of critical importance to record companies for release scheduling and supply. To cater to these needs, Disctronics has a globally linked computerized tracking system for orders, which allows for sharing of production in different factories to achieve international on-time delivery in a variety of markets. And their servicing of clients has expanded beyond the audio sector to data storage in a clockwork growth plan that is as precise as their production parameters.

These two companies serve as examples of Australia's ability to assume world prominence in contrasting fields, while overcoming the limitations of its remoteness from the main markets. In a country of only 15 million people, it's a mighty accomplishment. ■

—by Phil Tripp

INSIDER · AUDIO

—CONTINUED FROM PAGE 21

"Experience with the Acoustical Control System ACS" by A.J. Berkhout, D. de Vries, J.R. Hemingway and A.J. Griffioen described the characteristics of reverberant fields, experiments using the ACS system and the system's relation to RASTI scores. "Electronic Architecture: The Musical Realities of its Application" by Chuck McGregor discussed the decidedly nonscientific criteria of designing electronic architecture for musical acoustics.

The eleventh session contained five papers describing sound reinforcement for mega-events: "The Role of Wireless Equipment in Large-Scale Sound Reinforcement" by Steve Barbar, "Design and Practical Considerations for a Portable Festival Sound System Used in Africa" by David Scheirman, "Personnel, Tactical and Technical Considerations for 300 Sound Events at the 1987 Summer Special Olympics" by William Reventos, "Distributed Sound System for Outdoor Papal Mass Sites" by James Brawley, and "Logistical and Design Considerations for Multi-Venue and Large-Venue Reinforcement Systems" by Larry Estrin.

The conference concluded with a single paper in the twelfth session, entitled "Sound Reinforcement in the Year 2000" by Clifford Henricksen. It summarized the industry's historical role and forecast future demands from new technology and music.

The Sixth AES Conference was a consolidated look at a diverse topic. Conference chair Ted Uzzle and his session chairs successfully solicited authors able to speak from authority in their areas of expertise. Moreover, the flow of information was balanced, without an excess of commercial interruptions. Certainly, those who attended profited from the sessions, and others in the industry eagerly await the published proceedings. ■

A former AES papers chairman himself, Ken Pohlmann currently heads the music engineering department at the University of Miami.

***Editor's note:** The information presented in the papers at the Sixth AES Conference will be published in a single proceedings volume, slated for release this fall. Contact the Audio Engineering Society in New York at (212) 661-8528 for more information.*

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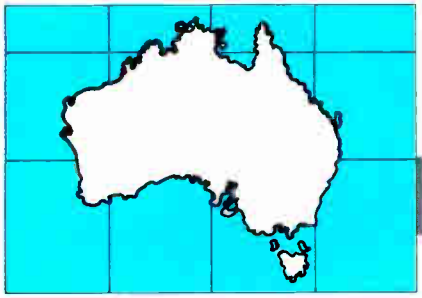

STUDIOS 301

62 AND NEVER FELT BETTER

(Right) Studio A in 1974, with the 16-track "Abbey Road" console and Studer tape machine.

(Below) Studio A—Engineer Bill Ramsay operates the first transistorized desk in Australia, circa 1960.

by Gail Cork

EMI Studios 301 is celebrating 1987/88 with record profits. That the studio complex is looking stronger than ever before in its 62-year history must come as welcome news to the U.K. heads of a major music company whose share of the Australian record market has dropped by more than two-thirds since 1982. Happily, the fluctuating fortunes of the record business have gone largely unnoticed by the company's Australian studio operation. For the past several years, 301 has ranked consistently among the most profitable in EMI's global studio

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EQUIPMENT LIST STUDIOS 301

STUDIO A
Floor space can accommodate up to 50 musicians. Equipment: Neve 8078 40-channel console and dual-interlocked Studer multi-track recorders.

STUDIO B
Accommodates up to 20 musicians. Features a variable decay isolation room with slate floor and wall treatments for acoustic flexibility. Equipment: SSL 4056E console with 48 mono channels plus eight stereo modules, providing a total of 64 inputs. The SSL synchronizer controls up to three machines, including the dual Studer multi-track recorders.

STUDIO M
Mixdown suite. Able to accommodate large and complex keyboard computer setups as well as rhythm sections and small ensembles. Equipment: Neve 8078 console fitted with 40 channels of Necam automation. Dual-interlocked multi-track recorders.

STUDIO D
Convenient walk-through design, for smaller sessions. Equipment: Soundworkshop Series 34 automated console and 24-track recorder. The complex also has two Mitsubishi X850 32-track digital tape machines which are fully transportable. Facilities for recording music to image are available in all four studios, using either Adams-Smith (Studio B) or Q-lock synchronizers. Mixdown for Dolby stereo film can also be done, using the DS4-2-4 monitor matrix, available on request.

MASTERING & POST-PRODUCTION
Lacquer disc cutting, CD master preparation, digital editing, multiple real-time cassette dubbing, tape format conversion. Equipment: Neumann lacquer lathe with "Maxicut" available in creative studio atmosphere. For CD preparation and digital post-production, the Sony PCM 1610/1630 system is available.

network.

The fact of being a tiny cog in a huge wheel has little bearing (no pun intended) on the virtually autonomous day-to-day running of Studios 301. Far from projecting a cold and impersonal corporate image, there is a welcoming, almost homelike atmosphere about the place. It is reflected in the many personal touches, from the two areas of wall-to-wall photos (mostly of studio parties), to the well-stocked kitchen. In the lounge upstairs, the tedium of long intervals between sessions is relieved by a television and video, pinball machines, a second kitchen and a pool room. 301 believes in pampering its clients.

Only 15% of the studios' business comes from EMI's A&R department. The rest is taken up by other major record companies (such as WEA and CBS), advertising agencies and film companies. General manager Martin Benge says the relationship with Thorn-EMI has many advantages for the studio operation. "EMI has a long history in the music business. The depth of knowledge that comes from that is something you can't put a value on. The flow of ideas between EMI affiliates around the world is a big plus. Of course there's also the financial advantage. We regard Thorn-EMI as our bankers. There is financial backing there for major purchases; however, we have to put up the same proposition we'd need to present to our bank if we were a small independent business. It has to be watertight."

In terms of reputation and prestige, Studios 301 had a head start on other studios. It was the first in Australia and is still the most widely known. Since the first single studio opened in 1926, the business has survived through one relocation and three major rebuilds, the most recent spreading over the past four years. Studios 301's uniqueness as a comprehensive facility—encompassing every aspect of the industry from mastering to custom pressing and even distribution—has been eroded in recent years with the closure of the Custom Records department and the relocation of the main mastering facility to EMI's pressing plant at Homebush. Although the changes have diminished the scope of Studios 301, they have had a positive effect on the actual studios. "The changes allowed us to focus more on the core of the business, which is music recording. When we were also running a big mastering department and Custom Records, people's energies were divided into different areas. This year's figures suggest we've made the right moves," Martin explains. Notwithstanding the changes, 301 remains a more comprehensive facility than most, still offering disc-cutting, CD master preparation, multiple real-time cassette dubbing, tape format conversion and audio post-production facilities. The studio complex now comprises four 24-track music recording studios (three with the capacity for dual 24-track) and a smaller studio for post-production. "After four years of building, we've got the facility to the point where it's what the customer always wanted but didn't always get for one reason or another," Martin says. "People who use the studios now are usually delighted with the results."

The rebuild has brought some major acoustical modifications, designed to bring the studios up to date with changes in recording styles since the '70s. Rather than artificially contrived dead rooms which absorb all stray sounds, the studio environment now relates more to the "real" world, acoustically. "We've entered an era of working in rooms which sound more like the kind we listen in at home, where people can play an instrument and actually hear something coming back," Martin explains. Much of the work was designed in-house by 301's full-time technical team with input from engineers who regularly use the facility. Tough decisions were, as always, shared with everyone involved. Martin's philosophy is that everything is up for discussion. "Although I have to take the blame for things that go wrong, we're all in this together. As long as you involve everyone in the decision making, your decisions will be well-supported," he says. The biggest decision made last year was to go to 32-track digital. Two Mitsubishi 32-track tape machines are about to be installed at a cost of $200,000 each. The decision was not made lightly. Not only did it involve spending a huge amount of money, it also begged the question of how 301's compatibility with other local studios would be affected. Only one other local studio is known to be looking at the digital 32-track. Other major studios like Alberts and Metropolis made their decision on digital multi-track earlier and went with the Sony 3324 option.

The second major decision last year

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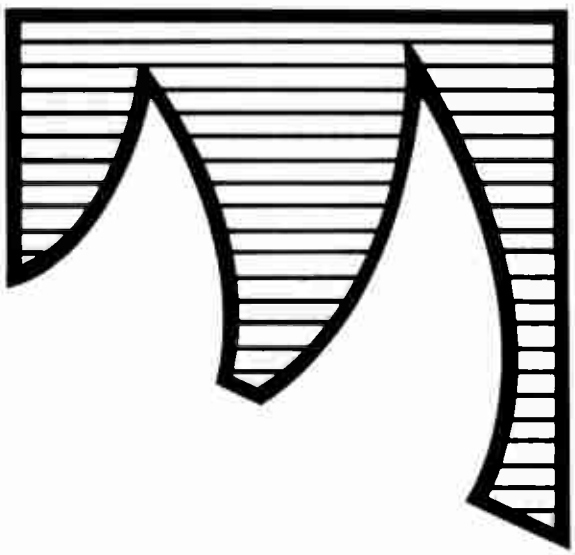

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was to keep two Neve consoles in Studio A and the mixdown suite and put the money towards the new digital equipment. In deciding to keep the popular 10-year-old consoles, however, a commitment was made to improve them. Both have now been extensively refurbished and modified in a massive exercise which involved taking them completely to pieces, replacing many parts, and rewiring connectors and switches. The result is more powerful consoles.

The combination of both Neve and SSL consoles gives Studios 301 a marketing edge over other local studios. While the SSL is more popular for rock music, the Neve is also highly regarded and frequently requested. Another special feature at the complex is the in-house maintenance and technical department. "Most studios can't afford to employ people whose job is purely to look after equipment and develop systems," Martin says. "But I can't imagine how a studio like ours could operate without that. Problems are inevitable. If you have someone here to solve them on the spot, it makes it much easier. It means that clients who are paying upwards of $100 an hour can use the time to maximum benefit."

Although Studios 301 has been used by many international artists during tour stopovers, it is not common for U.S. or U.K. artists to travel to Australia specifically for a recording project. In spite of comparable facilities, much lower studio rates and a favorable exchange rate, the simple fact of being an 18 or 25 hour plane trip away from home base has so far proved a major deterrent. One welcome source of business in recent months for Studios 301 has been Japan. Australia holds two big attractions for Japanese producers of Western-style music—cheaper rates and plenty of world-class session players. "Imported artists do very well in Japan but they don't have a very big local base for recording Western music. They like what they get here and it's only eight hours away," Martin explains. He understands better than most the importance of tapping into an international market and making sure that clients leave with the feeling that they would like to return. "Music is becoming more and more of a global industry. It's very important that we keep working to overcome that problem of distance. That's the only obstacle left to our ability to compete in an international marketplace." ■

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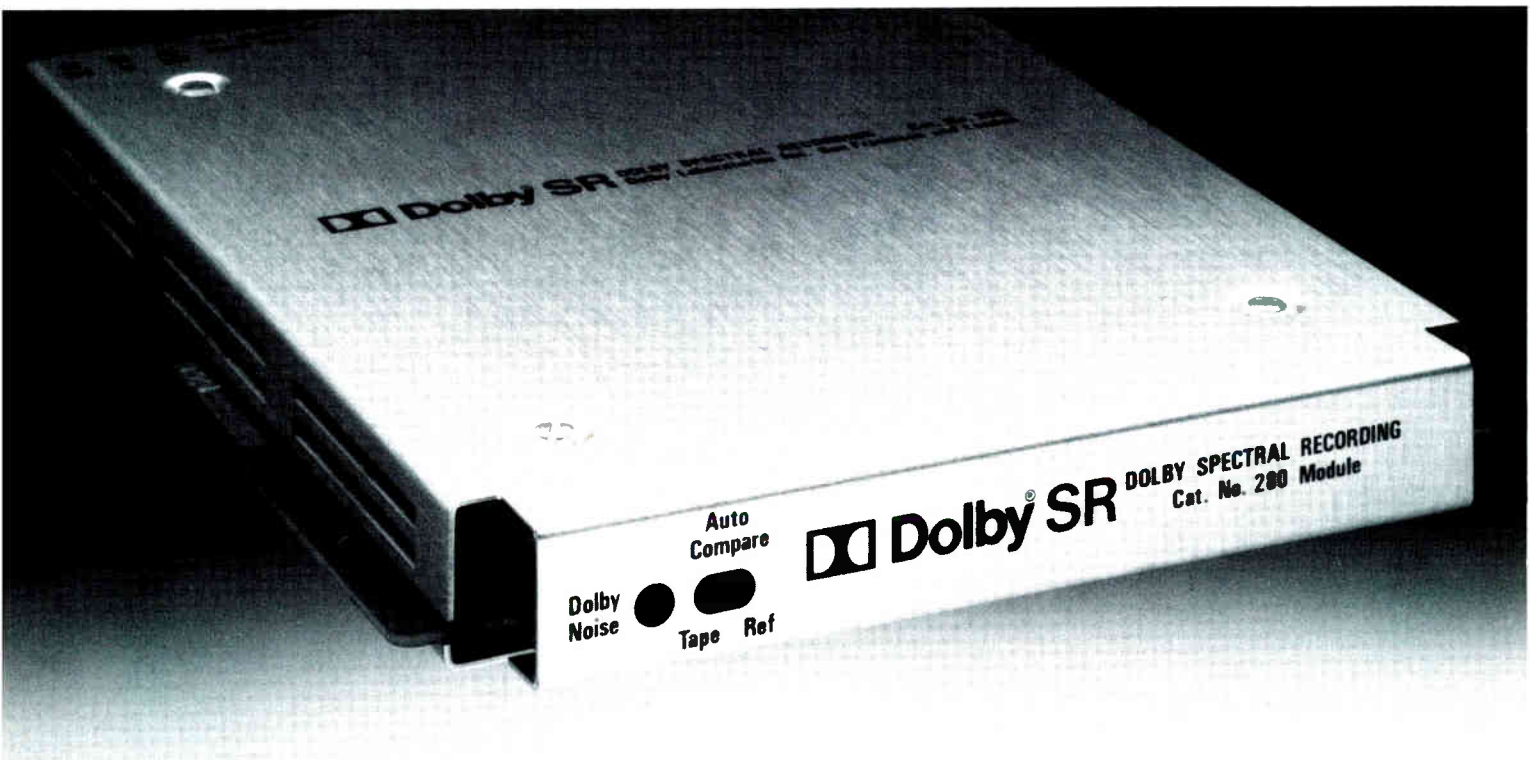

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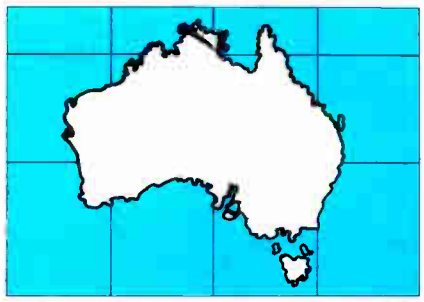


by Gail Cork

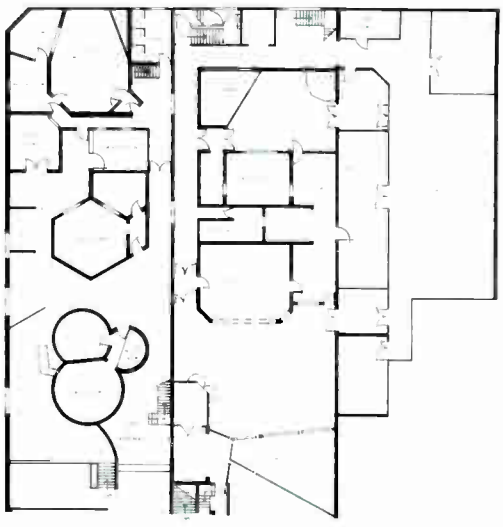
John Farnham is mixing his new album in Studio 3, Paul McNaughton is recording in Studio 1 and the Everly Brothers are in 2. Studios 4 and 5 are busy with the usual agency work and the mobile studio is at Expo '88 in Brisbane, recording a live television special of Julio Iglesias. Tom Kehoe has every reason to smile. As music production manager ("for want of a better term") of Metropolis Audio in South Melbourne, he is responsible

for making sure the three music studios, two voice-over studios and the 24-track mobile unit which comprise the complex are kept busy. On days like today, he knows he's doing something right.

This particular week is a special one for Metropolis. It sees the opening of Studio 3, with the extraordinary rotating SSL 6000 console in place. Primarily a mixdown room, the revolutionary design of Studio 3 allows it to cater equally to the different requirements of rock and roll and film sweetening. Working on the premise that rock engineers like their monitoring fairly close, while film engineers prefer their 3-channel monitoring at a distance, the designers came up with the idea of putting monitoring at both ends of the room and rotating the desk. Although the main focus of interest, the desk is not the only remarkable feature of the new room. The first thing you notice is its stark neatness. The control room is free of tape machines and no leads clutter the floor space. Keyboards plug into the "stalks of life," two columns which fold out of the floor and carry 48 direct feeds, AC mains and MIDI connectors. The MIDI information is then sent to an electronic MIDI patch bay,

(Left and above) Studio 3 and John Farnham with his producer and engineers.

Metropolis Audio - Studio Floor Plan



where all of the data can be redirected, eliminating the inevitable tangle of patch leads from synth to synth. The 48 square meters of floor space easily accommodate a large selection of keyboards and sequencers. Three video monitors are used for vision from U-matic, domestic or one-inch video machines, while at the other end of the room is a screen whose input comes from a video projector mounted in the ceiling. On one side are two additional video monitors which display the tape synchronizer information and vision output from the console. The acoustic design of all areas, including the bluestone and timber overdub booth, incorporates Helmholtz resonators, membrane LF absorption and Schroder diffusers.

The result is a totally integrated electronic music and video environment of which Metropolis is justifiably proud. It was only fitting that an artist of John Farnham's stature should be the first to use it. He has used Metropolis almost exclusively for his recent recording projects. Tom Kehoe recalls the final critical days of building when it seemed Studio 3 would not be finished in time for Farnham's new album schedule. "The last week and a half we had our facilities manager and a couple of maintenance technicians here at 7 a.m. on Saturday. They left on Monday at 6 a.m. They just worked straight through. They were falling asleep for a couple of hours under the consoles, waking up and going again. It's that sort of commitment which makes this a great place to work. It's easy for me to say, 'Right, John Farnham's starting in there on Monday.' It's got to be ready. They don't tell me to put him off for a week. They do it, because they're professionals. They don't want to go home at the end of the day with the feeling they could have done it better."

The opening of Studio 3 has overshadowed another important recent addition at Metropolis, namely the new live room in Studio 1, which can be changed to create rooms of any combination of size and shape. With time once again of the essence, the live area was built in just five weeks, without disturbing work in the other studios. "People here do tend to get involved from the ground up," smiles Kehoe. "For instance, we had a team of builders working a 12-hour shift at night and another team of staff working on it the other 12 hours."

Kehoe's words capture the team spirit that you feel the moment you set foot in Metropolis. There is also a sense of things happening. It's by no means unusual to see people running. The prevailing atmosphere, however, always seems cheerful and relaxed. Reward for effort comes in the form of high praise from people who use the studios, among them a steady stream of "name" producers flown in from the U.S. or U.K. for local projects, including John Boylan (Little River Band), Nick Launay (Big Pig), John Petoka (Go 101), David Kirshenbaum and Julian Mendelsohn.

The complex has no "boss" in the conventional sense. Joint owners, Roger Savage, Ernie Rose and Ian "Mack" McKenzie—a trio whose combined credits could easily fill the rest of this article—are usually absorbed in the creative "hands on" end of the business, recording and producing much of the cream of local recording projects and film soundtracks. Roger Savage for example, has an unequaled track record in his specialized field of soundtracks for film and television, of

which he has recorded and/or mixed more than 40, including *Crocodile Dundee, Mad Max I* and *II, Mad Max Beyond Thunderdome, The Man From Snowy River* and *The Return Of The Jedi.* His contribution to Australian film production has been recognized in an Advance Australia Award and the inaugural Byron Kennedy Award for continued pursuit of excellence. Ernie Rose and "Mack" McKenzie have also earned themselves a prominent place among Australian engineer/producers, recording a long list of top national and international artists. Like any good studio the strength of Metropolis comes down to people. As Tom Kehoe says, "A nut is a nut and a bolt is a bolt. It's the people who are using them that make the difference."

Entrepreneurial freedom is another

METROPOLIS "NUTS AND BOLTS"

Five studios and one mobile unit.

STUDIO 1 24/48-track. Studio size: 18m x 13m. Control room: 7m x 5m. Tape machines: MCI/Sony JH24, Sony PCM-3324 digital ½", ¼" ATR 2-track, Ampex MM1200, Sony PCM-1610, Sony PCM-F1. Console: SSL 6000 E Series. Monitoring: Sierra-Eastlake design with JBL components, Auratone, Yamaha NS10, AR185.

STUDIO 2 24/48-track. Studio size: 10m x 6m. Control room: 5m x 4m. Tape Machines: Same as Studio 1. Console: Harrison 3224 w/Allison Research computer mixing. Monitors: Same as Studio 1.

STUDIO 3 24/48-track. Studio size: Overdub booth. Control room: 7m x 6m. Tape machines: Same as Studio 1. Console: SSL 6000 E Series (48 in 48 out). Monitoring: Tri-amplified, time-aligned and phase-coherent monitoring, using JBL bass drivers and ferrofluid-cooled soft dome mid-range and high frequency drivers. Dual-end monitoring.

STUDIO 4 24-track Voice Production/Sweetening Studio. Studio size: 5m x 4m. Control room: 5m x 5m. Tape machines: Ampex MM-1200-24, MM1200-8, ATR 100 4-track, Revox 2-track. Console: Sound Workshop Series 40, 32-channel. Monitoring: Tannoy, Auratone.

STUDIO 5 24-track Voice Production Sweetening Studio. Studio size: 5m x 5m. Control room: 5m x 5m. Tape machines: Ampex MM1200, Sony APR-500 ¼" with center track time code. Console: 28/24 Harrison Series. Monitoring: Tannoy, Auratone, Yamaha NS10.

MOBILE UNIT 48-track. Tape machines: 2 x Optro 24-track, on request, MCI/Sony JH24, Sony PCM-3324 digital multi-track, Sony PCM-1610 mastering, Sony PCM-F1 mastering. Console: Harrison 40/32 Series C. Monitoring: Tannoy Little Reds, Auratones.

All studios are equipped with a comprehensive range of outboard gear.

time value. Or you can input the distance in feet and the R2D3 will calculate the rest.

The SC31 Graphic Equalizer is a powerful signal processing tool designed for professional use. It features 31⅓ octave-centered bands of equalization with selectable 6 dB or 12 dB of boost and cut.

And like all Audio Logic products, these two workhorses are built to withstand years of punishing treatment on stage, in the studio, the stadium . . . anywhere quality professional audio equipment is a must.

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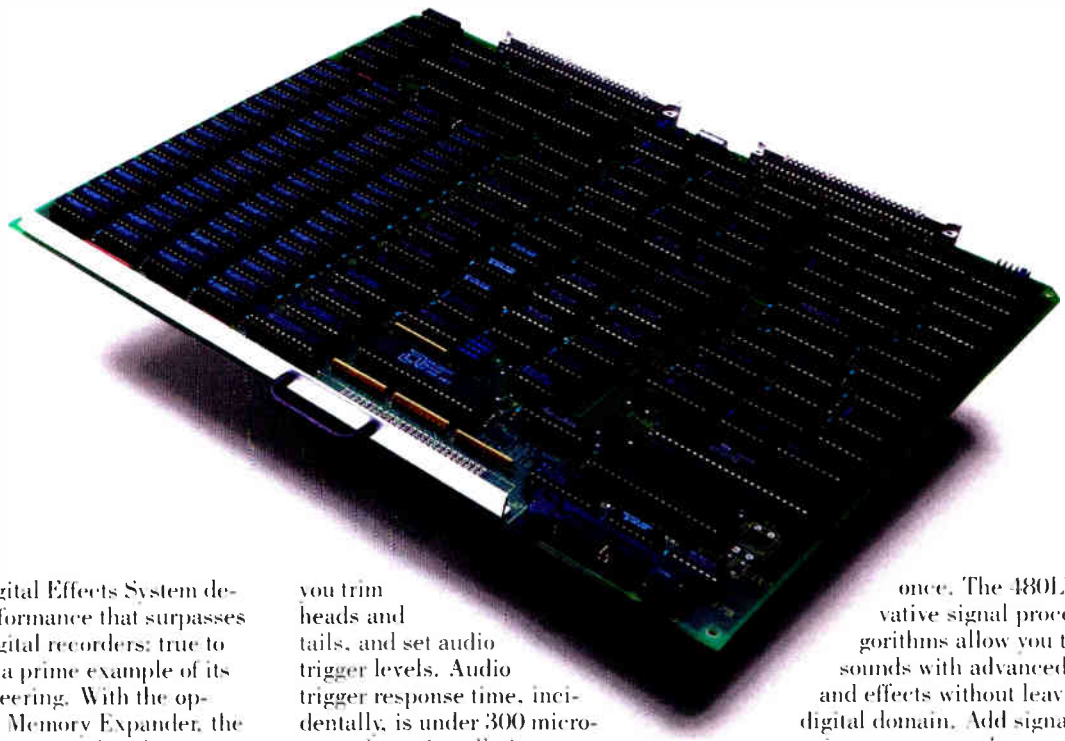
AUDIO LOGIC

EXPANDING THE SYSTEM

The 480L Sampling Memory Expander. Accurate sampling in phase-locked stereo: a Lexicon applications brief.



The 480L Digital Effects System delivers audio performance that surpasses conventional digital recorders: true to life sampling is a prime example of its advanced engineering. With the optional Sampling Memory Expander, the 480L becomes an astonishingly practical way to copy or move several seconds of audio from point A to points B and C.

Until now, "flying in" or "slipping" vocal and instrumental overdubs meant tradeoffs. Two-track tape is clumsy and degrades the signal; DDLs with long memories are better, but not by much. Now, with the 480L's optional Sampling Memory Expander, you can digitally record 10 seconds of true phase-locked stereo or 20 seconds of mono at a 48 kHz sampling rate. 18 bit equivalent A/D conversion produces a typical dynamic range of 98 dB, with a bandwidth of 20 — 20,000 Hz: output doesn't get any closer to input.

If you're using a digital recorder that's Sony 1610 compatible, the Sampling Memory Expander and the 480L's digital I/O interface can reproduce the original performance at any location on tape without leaving the digital domain. Slip syncing, copying and time shifting of audio segments is faster and cleaner than ever before.

You control sample recording, editing, processing and triggering from your work position using the 480L LARC. Varying up to six parameters at once, you trim heads and tails, and set audio trigger levels. Audio trigger response time, incidentally, is under 300 microseconds — virtually instantaneous. Sampling Memory Expander enhancements include Record Trigger to trigger sampling automatically from audio input, Time Variant Record, and sound on sound digital recording in sync with the original sample. Lexicon Dynamic MIDI® lets you assign MIDI controllers to sampling parameters, for new dimensions of real-time or sequenced control.

Sometimes even the most accurate replica isn't exactly what you're looking for: if so, the 480L will take you beyond imitation into creative sampling. Play samples faster or slower (without changing the sampling rate), backwards or forwards, even both at once. The 480L's innovative signal processing algorithms allow you to enhance sounds with advanced reverbs and effects without leaving the digital domain. Add signal processing as you sample, or process a "dry" sample on playback with digital wet-dry mixing.

The 480L digitally integrates sampling and signal processing because it's designed as a comprehensive audio production tool: a system. And sampling is only the first of many directions in which this Digital Effects System can grow. We're continually examining the possibilities, and as your needs develop we'll implement new tools to meet them. Now is the time to call your Lexicon Advanced Products dealer for a demo of the new production techniques the Sampling Memory Expander makes possible.

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plus at Metropolis. The company shares a strong sense of history with AAV Australia, the giant video and duplicating facility owned by Syme Electronic Communications and housed in the same building. Both began life in 1965 as a tiny single recording studio owned and operated by Bill Armstrong. Together, the Metropolis/AAV complex is a vast operation, offering probably the most comprehensive video/audio production facility in the Southern Hemisphere. Although business from one company frequently overflows into the other, both are separately owned. It is a situation which makes for maximum support and minimum interference in the decision making process. "It means we can react to the market a lot quicker than we would if we were attached to a multi-national," Kehoe explains.

Notwithstanding, Metropolis faces the inevitable daily challenge of juggling rapid technological advances with available budget. Margins are lower here than in the U.S. or the U.K., a point Tom Kehoe illustrates with the example of the Sony 3324 digital multitrack. "Because of import duties and the strength of the pound sterling, the machine cost us much more than it would have had we been in London. Yet in London, it is 500 pounds a day and in Australia, $250 a day because our market is so much smaller. The market always dictates how much you can charge."

Kehoe has adopted a practical approach to the situation. Rather than continue the futile exercise of trying to generate more dollars from the studios, he has gone "outside the walls," developing the more profitable area of consultancy. "There is such a lot of talent at Metropolis," he says. "Not just engineering talent, but talent and experience which go well beyond the recording studio environment. I don't look at Metropolis as just a recording studio. With the people here, if we wanted to, we could put on shows, mount productions, do installations. The way to generate more dollars into the place is not by packing more and more equipment into a studio that is already earning as much as the market can stand, but by selling people's knowledge and experience in the wider community. Once again, it gets back to people. With all the technology in the world, the team Ernie has pulled around him would still be Metropolis' greatest asset." ■

ATLANTIC'S 40TH ANNIVERSARY PARTY

by Dan Daley

SHOWCO DEBUTS THE PRISM AT THE GARDEN

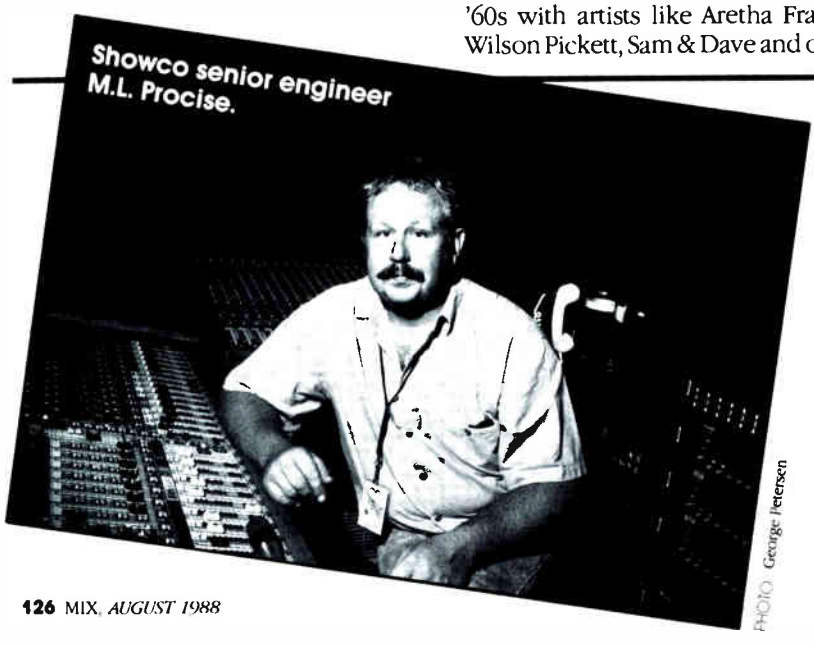
Atlantic Records gave itself a birthday party at New York City's Madison Square Garden —a 13-hour marathon last May 14th with enough guest artists in attendance to blow out 40,000 candles. And Showco was on hand to make sure everybody heard everything.

Throughout its 40-year existence, Atlantic Records always had a sound of its own. From the opening chords of the label's first hit, Stick McGhee's "Drinkin' Wine Spo-Dee-O-Dee" in 1949, through its pioneering efforts to build and establish soul music in the '60s with artists like Aretha Franklin, Wilson Pickett, Sam & Dave and others, company founder Ahmet Ertegun's dorm room dream became a reality that helped to shape the industry as it is today.

From being the premier R&B label in the '50s and then a major exponent of soul, Atlantic branched out into the pop market with blue-eyed soul acts like the Young Rascals. As the rock waves of the late '60s became dominant, Atlantic rode them like a Malibu surfer; Vanilla Fudge and Iron Butterfly debuted on the label, as did their more durable British counterparts, Cream, Led Zeppelin and the Bee Gees.

Throughout the '70s, Atlantic's roster became broader and more eclectic, with Crosby, Stills & Nash, Genesis and the Manhattan Transfer. The '80s have seen Twisted Sister, AC/DC, Ratt, Debbie Gibson and the solo careers of Lou Gramm and Robert Plant.

The sounds have changed from 1949, yet there is still a consistency to Atlantic Records in terms of approach and dedication, perhaps because it's the last of the major labels still to be headed by its founder. Even though Atlantic is a cog in the massive wheel of Warner Brothers, it still retains a personality that defies the anonymity of corporate corridors and suites. So when Atlantic Records decided to throw its own 40th anniversary party,



Showco senior engineer M.L. Procise.

PHOTO: George Petersen

consistency in sound had to be a major factor.

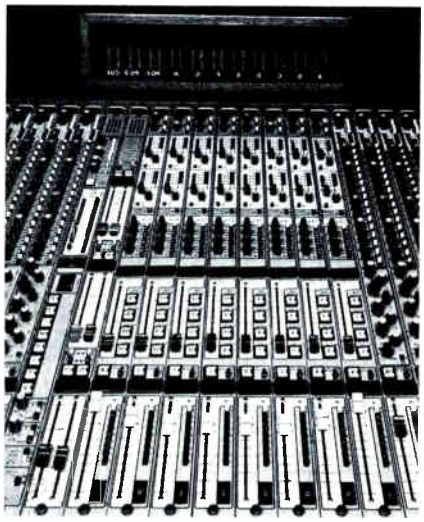
Enter Showco.

"Friday The 13th—Jason Breaks A String"

On the day before the show—Friday the 13th, no less—the Garden was ringing from soundcheck after soundcheck. There was no time to ponder the implications of triskaidekaphobia with over 30 major acts to run through. Showco point man Mike Ponczek roamed the cavernous arena—home of the New York Rangers and Knicks—making sense out of the potential logistical nightmares that a production of this proportion could induce.

But if Atlantic was celebrating 40 years of music, then Showco was putting its own prestige on the line with its own pride and joy: the Prism sound system. Five years and six figures in the making, the Prism system has been honed on a few tours in the year and a half since it debuted, specifically Genesis, Peter Gabriel, Eric Clapton, Boston and James Taylor.

"We're very proud of it," says M.L. Procise, Showco's senior engineer. "It's different in that it's an integrated system, versus a conventional system where someone tries to build the world's greatest cabinet or other component. Every single piece, from the screw to the last speaker cabinet, is nothing by itself, but together it's the Prism. One piece doesn't work without the others."



Showco's Harrison HM-5 console features 16 aux sends, 4-band parametric EQ and VCA grouping.

The Prism is now the leading Showco system and the company is replacing most of its other systems with the Prism.

The avuncular Procise (the M.L. stands for Martin Luther; also the name of his father, grandfather, and son) has been with Showco for 13 years. He started out doing Genesis' monitor mix, then moved on to the Saturday Night Fever tour with the Bee Gees. His credits also include the 1979, 1981 and 1984 Jacksons tours as well as a bunch of Beach Boys shows in between. He's also been doing ZZ Top since 1983, and worked on the last Boston tour. "Audio has always been my hobby," he says. "I found out early on that my talent didn't lie in being a musician, so I homed in on audio."

Procise (who incidentally went to high school with *Mix* editor-in-chief David Schwartz in Fort Wayne, Indiana, he says—sort of proudly), speaking in his acquired Texas drawl, is garrulous in his praise of the Prism. But a lot of the actual innards of Showco's baby are still under wraps. "It took us a lot of time and a lot of money to build," he says of the proprietary aspects of the system. "We had to do our own

analysis programs and our own modeling programs in the process."

The research and development, led by Showco vice-president Clay Powers and independent acoustical engineer James Brawley, was long and arduous, according to Procise. "The reason it took so long was that we are very proprietary about the system. Its specialness comes from the fact that it doesn't exhibit the problems that other P.A.s exhibit."

P.A. Objectives

"Our only objective when we designed the Prism was to build a system for the venue," says Procise. "We had three primary design goals: we wanted to design a P.A. in which we had total control of the radiation pattern, resulting in more even coverage, better projection and more direct sound.

"Secondly, we wanted to design an integrated system that had linear response, meaning what goes into it is what you get out of it, from the crossover inputs to the loudspeaker outputs. That translates into a very neutral sounding system.

"Number three was to design a P.A. system that had more direct sound versus reflected sound. We don't feel reverberation in the hall at high SPL is the problem, but reflections created by uncontrolled waveforms of conventional systems are. A huge problem that conventional P.A.s exhibit is the effect of interference from multiple transducers operating in the same frequency band. Conventional systems have in their design a cabinet that sounds great to [their manufacturers] and they force an ever larger number of these cabinets into an acceptable array. Some of the resulting problems are interaction and diffraction problems in the house, phase cancellation in general with comb filtering throughout the hall. This system doesn't have those problems.

"The result of reaching our design goals is tonal balance, sonic accuracy, linear power response and uniform sound to any room."

The first Prism P.A. system cost in excess of $1 million, Procise estimates. Currently, Showco has over four 360-degree systems on the road. The system at the Atlantic Records celebration was a 270-degree system, since the stage was located at one end of the arena, with no seating behind the stage. The 360-degree system uses 78 PSA-2s and 40 MicroTech 1200s.

The components of the Prism are impressive. All amps are Crowns, including the monitor amps. The consoles were built by Harrison to Showco's design specifications. The model HM-5 has 32 input channels, 16 line level return channels, 16 effects sends, eight stereo subgroupings, eight VCA subgroupings, eight programmable mutes, a four-band parametric high-pass filter EQ, an impressively large bandwidth capability, four group send matrixes, two separate cues, and a fully balanced 72-point patch bay. Three of them were manned at the Atlantic show by Procise, Craig Schertz and Tony Blanc.

One of the key physics to the Prism lies in the fact that the system has no transducer stress; Showco's engineers so overpowered the system that no component or set of components operates out of its own linear range. The result is that it delivers more electrical power to get more acoustical power, which in turn results in less distortion.

The system itself even looks distinctive: the large front array curls back at the edges for the audience side fills and the cabinets are mounted flush against each other. The lack of gaps between the columns prevents diffrac-

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STUDIOFEX is a highly organised modular effects system covering a wide range of contemporary effects and signal treatments. The system is based around a 4U high 19" rack mounting mother unit into which 11 plug-in modules may be fitted.

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—CONTINUED FROM PREVIOUS PAGE

tion effects, Procise points out.

The actual cabinets were built by Showco, although Procise is reluctant to say what they're loaded with. "It's important that we protect the mystique," he says. "People are starting to take notice of the P.A."

There are huge logistical advantages to the Prism system, too, Procise claims. The arrays are 11 feet wide and 20 feet tall, with eight columns per side, and each cabinet weighs 200 pounds, about half as much as most others of similar capacity. "That's a huge savings in truck and rigging weight," he says. "The number of cabinets per side is 32 hanging in the air, four front-fill cabinets and six sub-bass cabinets. The rear array [not used at the Atlantic show] is three high and four wide. That's an additional 12 cabinets, so the total system as used today is 64 hung speakers, eight front-fill speakers and ten sub-bass speakers."

Transporting the system to New York required "one and a half trucks," Procise caged. "For a tour you might fit it in one truck, depending on additional board groups and monitors."

Riggers are apparently pleased with the system's ergonometric features. It takes only one pair of two-ton motors per side to hang with a cable pick behind the system with one-ton motors. The whole 360-degree system requires only eight rigging points as opposed to the usual 16 to 24 points.

The monitor sub-system has 39 floor wedges of different varieties. The monitor system's flexibility played an important part in keeping the Atlantic show as close to on-schedule as something this complex could be.

Because of the number of acts and the fact that they each averaged three songs apiece, a rotating stage was used and divided into an A and B side. As one act played on one side, the other side was prepped for the following act. Vocal microphones were placed on the stationary stage apron.

The A side of the stage used the Harrison SM-5 console, operated by Randy Piotroski at the show and designed by Showco along with input from Clair Brothers Sound. Both companies bought a large number collectively to keep the individual unit cost down and thus each company had input into its design. The SM-5 has the same EQ section and preamp section as the main HM-5 console, but it also features a 16 X 16 matrix providing 32-output capability with 16 discreet sends and 16 semi-discreet sends.

The two main monitor boards have extender channels which bring their capability up to 48 channels each. Each board sends its first six-channel mixes (stereo side-fill, overhead cluster mixes and three wedge mixes) to a Yamaha 2408 board. Monitor board A goes into the first six inputs of the 2408; monitor board B, run by Pete Buess, fills up channels seven through 12 of the Yamaha console. These 12 mixes are then sent, at unity gain, to the monitors for both stages.

Procise ventured his opinion of Madison Square Garden as a music forum in terms of his experience with numerous others over the last 13 years. "It's a good room," he says. "It's fairly ambient so you have to not let it get too loud. The problems come more from the reflections in the mids and the highs in the room than the lows. It's a very reflective room, but I still consider it a great room to work in. There is an incredible vibe here on one hand, but in a lot of ways it's just another arena."

You Get Your Own Zip Code

The show was being simulcast to HBO starting at eight o'clock, about seven hours into the show. The feeds came from two 48-pair Showco J-Boxes, snaked beneath stage to their own municipality known collectively as Splitsville/Patchworld, whose nominal mayor was patchmaster Phil Gitomer. These patches fed to three splits: one to the monitor mixers, one to the house and one to the recording trucks. One truck was Dave Hewitt's Recording Services (code named Black truck) which did the primary mix; the other was the Record Plant East truck (coded as White truck), with Kooster McAllister doing the mix there. Following the pattern off the revolving stage, each truck was assigned to one side of the stage, although a quick patch could change that if necessary.

The audience microphone setup included two Shure 81s and four Sony 535s fanned out in a V-shaped setup.

Remote Recording Services's mixer Fritz Lang—who will make a joke about having the same name as a certain legendary silent picture director before you get a chance to—mentions that his truck's feed to the Unitel/HBO truck has some limiting and EQ effects on the signal. "They got the audience mix separate from us," says Lang. "Patching is pretty wild on this show. It's taken us two days to set up the patches, and we *still* don't know if it's right. This is 'Friday the 13th—The Rock Concert.'"

Gitomer points out that the house band [Paul Shaffer and the *Late Night with David Letterman* band] which played with many of the R&B acts, has separate consoles. A hardwire mult from the monitors is looped back into splitter boxes in the normal 48-channel sequence to the trucks. "Either truck can access either stage," says Gitomer, "but neither stage goes to both trucks at the same time. But it is available on a quick change. It would take about five seconds to make the patch. Whenever [the house band] comes around we have to have the ability to route that to the Black truck."

A TV monitor near Gitomer's station transmits input and microphone lists compiled by Bernie Bernil to various stations. Procise says Showco will occasionally use FAX machines at outdoor shows where distances between points are greater.

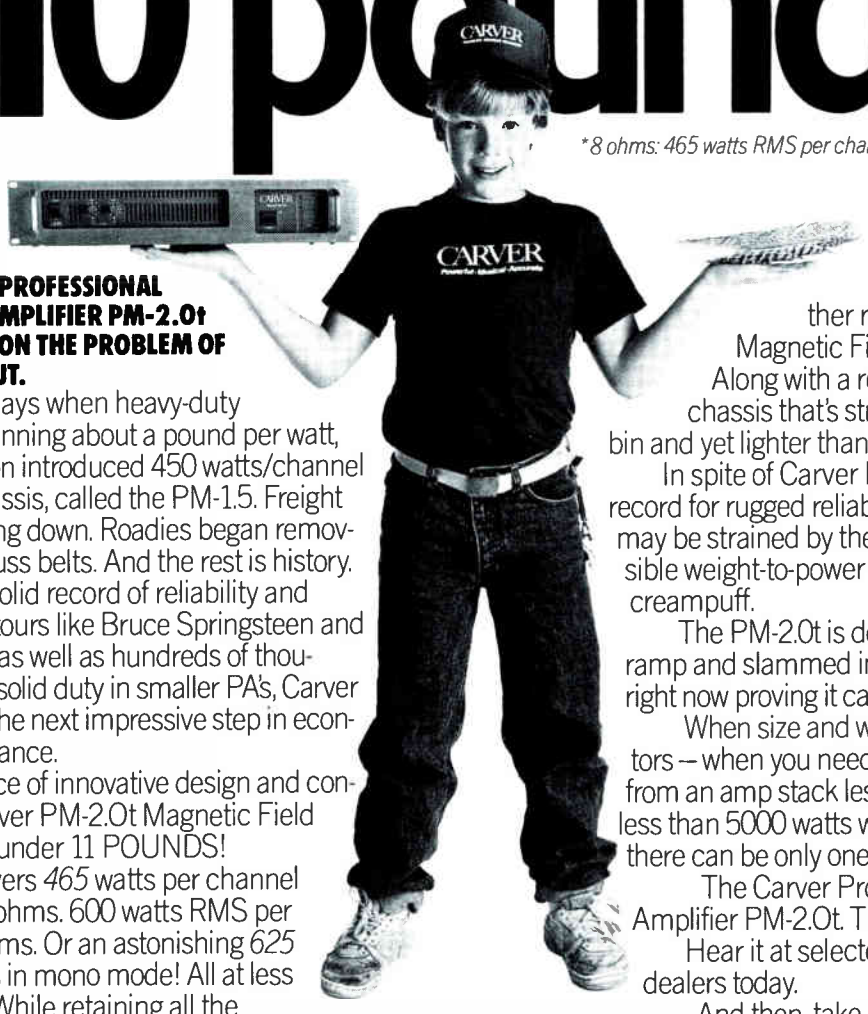
"It took us a couple of days," he says, "but we finally hammered out a basic input list and we make all the bands conform to it. That way we cut down on the confusion.

"On a gig like this, the act that presents the most problems is the one with the most number of inputs. You need to make it as simple as possible." As an example he cited the case of Foreigner, in which a normal 60- to 70-input setup was reduced to 24. Showco's vice-president of sound, Craig Schertz, took Genesis' normal 70 inputs down to 20 inputs. Procise says the Prism system is easily human interfaceable. "It's neutral and that lets you make it sound any way you want. We got perfect transient reproduction, and in achieving that, anyone should be able to go to the console if they're competent and do their thing. A good mixer, one who can focus on the source information, is important to the peak performance of the Prism. The system is so accurate that bad input source becomes more apparent." ■

Dan Daley is available for parties. The inflatable version is less, though.

465 watts 10 pounds.*

*8 ohms: 465 watts RMS per channel, 10 lbs., 12 oz.



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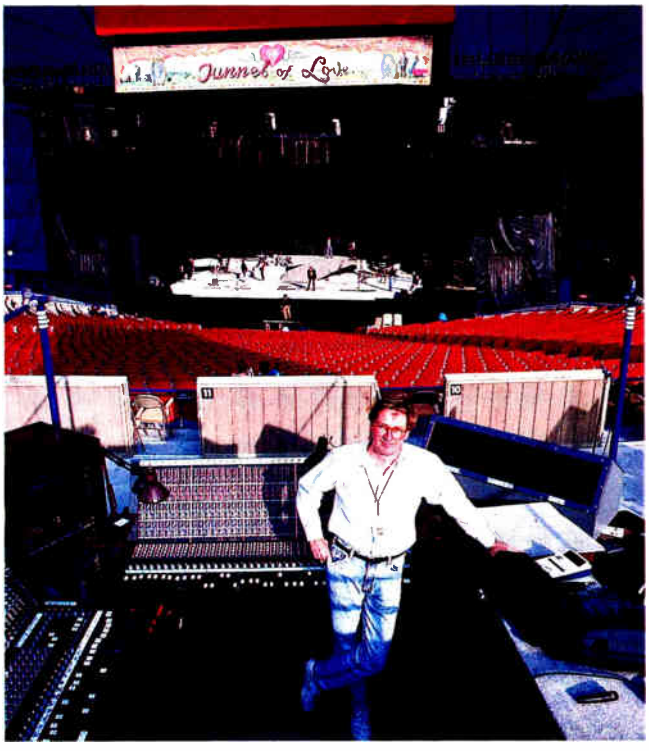
by Mark Herman

BRUCE JACKSON

THERE'S MORE TO THIS RESPECTED TEC AWARD WINNER THAN MIXING BRUCE SPRINGSTEEN

Australian native Bruce Jackson has been active in the sound reinforcement industry for over 20 years. His background spans such audio fields as pioneering sound company ownership, major tour mixing and engineering and equipment design and manufacturing. As an active owner of Apogee Electronics, the 38-year-old sound reinforcement veteran has entered the world of high-quality digital devices and made an impact with his linear phase, anti-aliasing low-pass filters. He still keeps up his live mixing chops as independent engineer for Bruce Springsteen's tours. In addition to mixing the house, he takes responsibility for designing the overall sound system and determining the equipment needed.



I spoke with him before a recent Springsteen "Tunnel of Love" concert at the Shoreline Amphitheatre in Mountain View, California. Jackson gave me a quick rundown on the Clair Brothers P.A. before we settled down for a few questions.

What is your favorite live mixing console?

The one I use all the time is the Clair 32-channel console that I helped design when I was with Clair Brothers

Left: Bruce Jackson at the Shoreline Amphitheatre house mixing position. Note the two Clair Brothers 32 x 12 x 6 house consoles and the Audioscope video meter on the right. Right: Bruce Springsteen at Shoreline.

PHOTOS: DAVE EPOR

around 1975. It is kind of limited these days, but comfortable to use because I've worked with one for so many years now. After doing something so long, you tend to get set in your ways. Since I helped design it, I'm very familiar with the EQ and controls.

Were you working for yourself or Clair Brothers at that time?

I was independent but working closely with Clair. I originally had a sound company in Sydney, Australia called Jands. "J" stood for Jackson and "s" for my partner Storey. We started in 1967 with sound, lights, and manufacturing. Jands made P.A.s, guitar amplifiers, guitar speakers, strobe lights, and a whole lot more. After selling Jands, I hooked up with Clair Brothers in the early '70s, then went back to Australia and started another sound company, Clair Brothers Australia, of which I was half owner. That later became Artist Concert Tours. After selling out of Clair Brothers Australia, I came to the U.S. with a prototype of a board that I'd developed in Australia. Ron Borthwick of Clair Brothers and I put a lot of the prototype ideas into what became the Clair console.

Was Jands one of the first sound companies in Australia?

Oh yeah. We pioneered the whole sound thing and became the foremost audio company on the continent. Nowadays Jands controls the touring business almost completely in Australia.

How many tours would you guess you've been on, and which ones stand out?

It would have to be over 50 tours. Playing Madison Square Garden with Elvis Presley in 1971 or '72, the first time Elvis played New York City. I was 22 and mixed front of house *and* monitors. I can remember how nervous and excited I was. I got the chance to mix because Al Pachucci, the mixer from RCA, was recording in the Record Plant mobile truck for a movie and an album. Another would be Bruce Springsteen's '84-'85 'Born in the USA' stadium tour in Europe. It was great because it was outdoors, in Europe, with good shows, good weather and a lot of fun.

What is your favorite effect or device?

There is no special one, I like all the good toys. If I had to pick one right now it would have to be Eventide's new H3000 Harmonizer. I have serial number one. Some Eventide products have had questionable reliability in the past, but this model has worked reliably since I plugged it in months ago, and it really sounds great. I like it so much that I just ordered another.

Which venue do you like overall?

The Brendan Byrne Arena at the Meadowlands in New Jersey. It has a good balance of acoustics and facilities. A good local crew makes a difference, too.

Concerning sound reinforcement, what are the differences from ten

years ago?
It is easier now. Everything is much more sophisticated, and better engineered to go up reliably. The fact that it is more reliable means my life is less filled with grief. Along with reliability comes consistency. I don't think technologically that the industry has come that far in ten years. It has made a lot of nice little steps, but nothing spectacular.

Got any advice for upcoming sound engineers?
Work your way up and get plenty of experience with things going wrong around you. Do it the hard way—by experience. There is no easy way. If you take a school course, make sure to go out and get a lot of practical experience at all levels. You can't just walk into the mixing position and hope everything is going to work well. You need an intimate knowledge of all the elements and know that they are all working in your favor.

You have a successful manufacturing company, and engineer sound for major tours. How do they mix?
Well. I like my current lifestyle in that I can have a company, do electronic design, manufacture products, and still be able to go out and do the occasional tour and keep my hand in it. That way, I get a good sense of what is needed from a practical point of view as an operator, and when I wear the other hat as a designer I can turn the practical experiences into new products. It is a nice balance. I don't get burned out on the road because as soon as I begin to, it's time to get off the road and change hats.

Where is home now?
Los Angeles. I eventually plan to return to Sydney, it's great there.

How about filling us in on your company, Apogee Electronics?
After the last Bruce Springsteen tour, my then girlfriend Betty Bennett (who now is my wife and who used to be president of Soundcraft) and I decided that we would start a company in the audio area. At that time the aim was to produce digital audio products for the live sound industry. We started off distributing other people's products in addition to developing our own. The first thing we distributed was a studio monitor from England made by Roger Quested. In addition, we took on the Audioscope video-based metering system. In fact, I'm using one on this tour. At the same time, we were furiously experimenting and developing a new product, along with Swiss computer whiz Chris Heidelberger. While playing with some different ideas for new products, we discovered a basic flaw in all digital systems and developed our first product. A lot of people complain about digital audio sounding harsh, hard and unnatural. They blame it on digital as if it is some sort of inherent thing. In our experimentation, we found out that it is, in fact, due to the anti-aliasing and anti-imaging filters that are crucial building blocks designed to stop the high frequencies past a certain point from going into the digitizing process. If you get too high in frequency, you get this problem called aliasing. It is the high frequency sound interfering with the sampling frequency. The filters that existed were based on theory and textbooks. No one had done much experimentation or checked out different ways of looking at it. That's what we did and found that, yes indeed, the filters make a radical difference. If you make the filter right, that harshness and unnatural sound goes away, and it sounds smooth, natural and warm like people want it to be.

We then set about to shrink the design down to a very small dimension, using surface-mount techniques. Everyone liked the first few produced, so we set up to manufacture them big-time. Now we've made over 5,000 of them and they're still selling. Nearly every major mastering facility has some, and many digital multi-track tape recorder owners have changed their machines over. If you listen critically, you can really hear the difference with the Apogee filters.

What products does Apogee offer now?
The Apogee 944 Series filter is our main item, a basic building block. We also sell as OEM to other companies. For instance, it is designed into the new SSL digital recording console. There is a new 1000-EIAJ enhancement module that fits inside the Sony PCM-F1, 701, 601, 501 and Nakamichi DMP 100, digital audio processors. And we have a mastering standard, A/D converter box that is used for high-end CD mastering. We also still distribute the Audioscope monitors.

I noticed the Audioscope is placed next to the house consoles. What is it all about?

Jackson with the Clair 32-channel console he helped design.

It gives you, the mixer, graphic information of what is going on, right in front of your face. I can glance over and see what anything is doing anywhere.

There are many areas in these consoles that aren't metered effectively. Each channel has a meter beside each fader that has peak and average level, but things such as the bus sends, returns and submixes aren't metered that well. That is what this machine picks up. There is 1/4 dB resolution for every meter on the screen. Each monitor is a 32-channel meter that you can stick on anything. The Audioscope used for this Springsteen tour and owned by Clair Brothers has three monitors inside, for a total of 96 meters.

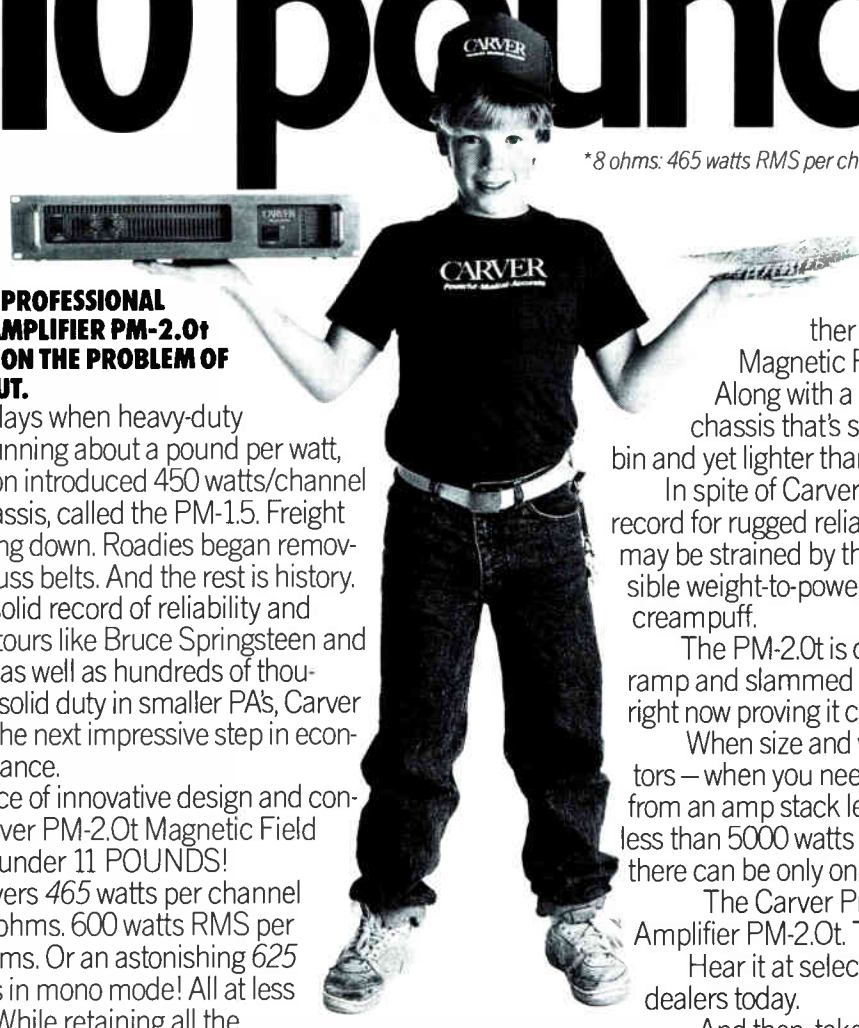
How do you configure the Audioscope meters?

They are hardware jumper-programmable. The display is configured to meter the various amplifier levels by changing color in the caution range and again at clip levels. With the video in my peripheral vision, it is easy to know how hard I am driving the system. We are working on several projects. Ultimately, I hope they will lead to interesting things for the live area. Apogee isn't trying to take on the big companies and compete with them. We're in our own little niche market. ■

Author Mark Herman owns Hi-Tech Audio, a sound reinforcement company specializing in console rentals.

465 watts 10 pounds.*

*8 ohms: 465 watts RMS per channel, 10 lbs., 12 oz.



HOW THE CARVER PROFESSIONAL MAGNETIC FIELD AMPLIFIER PM-2.0t SHEDS NEW LIGHT ON THE PROBLEM OF WEIGHT VS. OUTPUT.

Back in the days when heavy-duty amplifiers were running about a pound per watt, Carver Corporation introduced 450 watts/channel in a 21-pound chassis, called the PM-1.5. Freight bills started coming down. Roadies began removing their hernia truss belts. And the rest is history.

Now, with a solid record of reliability and sound quality on tours like Bruce Springsteen and Michael Jackson as well as hundreds of thousands of hours of solid duty in smaller PA's, Carver has advanced to the next impressive step in economy and performance.

A tour de force of innovative design and construction, the Carver PM-2.0t Magnetic Field Amplifier weighs under 11 POUNDS!

And yet delivers *465* watts per channel 20-20kHz into 8 ohms. 600 watts RMS per channel into 4 ohms. Or an astonishing *625* watts into 8 ohms in mono mode! All at less than 0.5% THD. While retaining all the speaker and amplifier protection features that have made the PM-1.5 one of the safest and most reliable designs ever offered. Without skimping on the little extras such as soft start-up, LED power monitoring and proportional-speed fans.

Carver did it through further refinements in their patented Magnetic Field Coil power supply system. Along with a remarkable monocoque-style chassis that's strong enough to support a bass bin and yet lighter than an outboard signal processor.

In spite of Carver Professional Division's track record for rugged reliability, we know your credibility may be strained by the PM-2.0t's seemingly impossible weight-to-power ratio. Suffice to say, it is no creampuff.

The PM-2.0t is designed to be tumbled down a ramp and slammed into place. It's out on the road right now proving it can take this kind of punishment.

When size and weight are critical economic factors – when you need to deliver 24,000 watts RMS from an amp stack less than six feet high – weighing less than 5000 watts worth of the competition, then there can be only one choice.

The Carver Professional Magnetic Field Amplifier PM-2.0t. The sound is magnificent!

Hear it at selected Carver Professional dealers today.

And then, take a load off your bottom line.

***8 ohms: 465 watts RMS/chan. 20-20kHz with no more than 0.5% THD**
4 ohms: 600 watts RMS/chan. 8 ohm mono: 625 watts RMS/chan. 4 ohm mono: 1000 watts RMS/chan. IM Distortion: less than 0.1%. Response: -3dB @ 5Hz, -3dB @ 80kHz. Gain: 29dB. Slew Rate: 25V/uSec. Damping: 200 @ 1kHz. Noise: Better than 110dB below 465 watts. A-weighted. Dimensions: 19"W x 3.5"H x 12.25"D. Weight: 10 lbs. 12 oz.

CARVER P.O. Box 1237, Lynnwood, WA 98046

POWERFUL MUSICAL ACCURATE

Distributed in Canada by: evolution technology

Circle #004 on Reader Service Card

by Lou CasaBianca

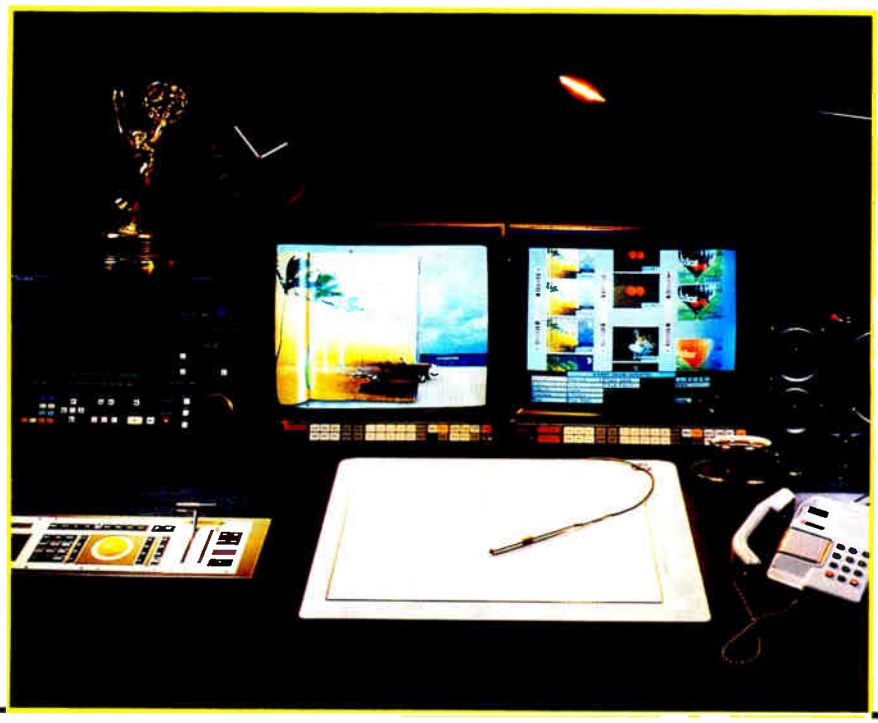
NEWS FROM NAB

This year's NAB (National Association of Broadcasters) Convention in Las Vegas was another industry event supporting the continuing wave of digitally based products moving into the audio and video production environment. While, to this observer, there were no spectacular knockout devices released, the converging of digital audio and digital graphics for radio and television stations seemed to set a new qualitative baseline for broadcasters. The following are some of the standout software and hardware items released for your review.

Truevision

One of the most important new video graphics tools released at the convention was the Truevision 2-megabyte version of the Vista Videographics adapter. Used alone or with 3-D software like *Wavefront* and *AutoCAD*, the Vista technology brings the creative and technical possibilities of high-quality image capture power and 32-bit architecture into a cost-efficient price level. Combining high-resolution video-capture and display capabilities, the Vista 2M digitizes a standard video signal in real time and full color, while generating a high-quality analog video signal. The board, which will be available for MS-DOS AT compatibles and the Macintosh II, is based on the Texas Instruments TMS 34010 graphics processor and operates at 32, 16 or 8 bits. The 2M lists for $4,250, with a 2-megabyte upgrade available at $2,000.

Topas is 3-D object processing and animation software for the PC and Mac-



A digital production center comprised of Quantel's Harry, Encore and Paintbox video processors; Sony DVR-1000 digital video recorder; and digital audio editing via the new HarrySound systems, developed by SSL, Quantel's sister company. HarrySound uses on-screen faders and meters to simulate console hardware.

VIDEO · NEWS

—CONTINUED FROM PREVIOUS PAGE

intosh. It automates the creation of 3-D solid models and video animation sequences for professional applications in graphic arts, industrial design, presentation graphics and video production. With Topas Modeler or Pro-Modeler, you can create, edit and render full color, smooth-shaded 3-D solid objects and even map video-captured images as textures on the objects. With Topas Animator you get the Pro-Modeler plus a professional keyframe animation module. All aspects of your models can be animated, including camera, lighting and object attributes, and you get support for industry standard video tape controllers (Modeler, $2,995: Targa 16 only; Pro-Modeler, $4,995: Targa and Vista; Animator, $11,995: Targa and Vista).

RIO, Resolution-Independent Object software, available for presentation graphics, can be created by combining high-quality text and geometric objects with video-captured color images. Special effects include emboss, drop shadows and translucency. Pop-up menus make it easy to produce images in a matter of minutes for output to the screen, or for high-resolution hard copies, to digital film recorders, color printers and laser printers ($1,250: Targa 16, 24, 32; $1,995: Vista).

The RIO Production Center is designed as a companion package to RIO, handling the professional production of high-quality color slides, prints, transparencies, and draft copies of RIO scenes and Targa images. It supports digital film recorders (including the Matrix PCR/QCR), color scanners, color thermal transfer and ink jet printers, and PostScript devices ($1,250: Targa 16, 24, 32).

Business and scientific graphs and charts in over 32,000 colors can be created with *Imagestation*. Sophisticated data analysis and impact can be added by incorporating freehand drawing or video-captured color images ($1,250: Targa 16). *CAD Driver* can be used to create and merge AutoCAD drawings with live or captured video images ($225: Targa M8, 16, 24, 32). For more information contact Dennis Collins, Truevision, Indianapolis, Indiana.

Quantel

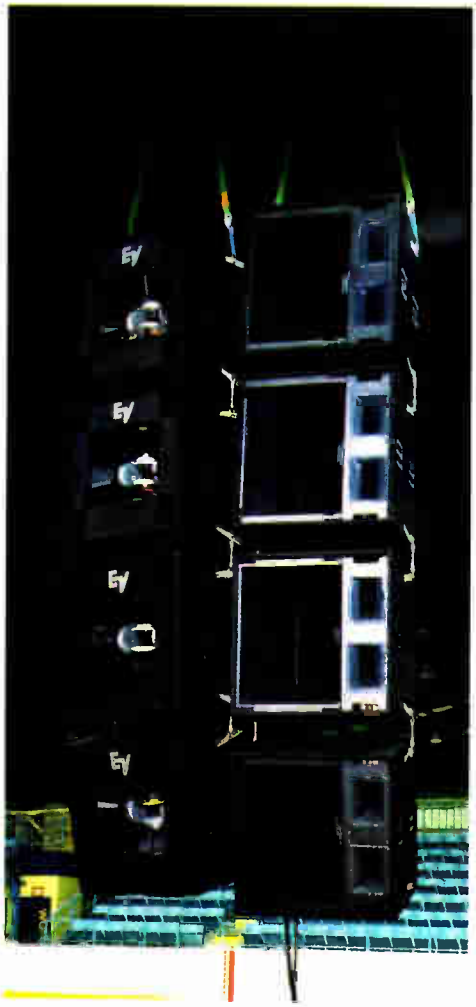
Quantel, developers of video post-

Large scale concert sound reinforcement has a smaller future.

MT-4

Concert Sound System

50,000-Watt Array



Manifold Technology™ delivers...twice the output in half the space!

Concert sound is getting smaller. System size, that is, not tour dollars! In fact, the high-level sound market is stronger than ever. But high transportation and setup costs are forcing lighter, smaller and more efficient speaker systems. While audiences demand better fidelity.

That's why we've made Manifold Technology *systems twice as loud in half the space.* The two-box, 4-way active MT-4 uses 4 (four!) drivers in each bandpass for unequaled acoustic output. Now, your system can be one quarter the size or four times as loud compared to other designs.

The MTA-42 Manifold Technology adapter combines four compression drivers without added distortion. And without the phase cancellations of Y-adapters! That's 4 supertweeter and 4 upper-midrange compression drivers on identical 60° × 40° constant-directivity horns. To complete the MTH-4 "high" box, four DL10X woofers use proprietary phase plugs to provide seamless vocals from 160-1600 Hz. The result is flawless 138-dB midbass at 1 meter!

The MTL-4 "low" box combines four 18-inch woofers in an ultra compact 36″ × 36″ × 30″ cabinet. More efficient than horn-loaded subwoofers, Manifold Technology design prevents woofer "bottoming" even at 40 Hz with 1,600 watts input!

High output plus high fidelity

To produce high-level sound, most concert systems aim many horns at the same seating area. Unfortunately, this approach causes peaky frequency response, decreased sensitivity and ragged coverage patterns. With four drivers on each horn, a large-scale MT-4 system has fewer independent sources. For fewer phase-cancellation problems. Frequency response is smoother, sensitivity increased, and coverage perfectly constant.

A flying system that's second to none

MT-4 cabinets are optionally equipped with a unique two-point flying system that allows true point-source arrays. Tilt angle adjustment is easy because track positions are pre-engineered for popular array configurations. Trial-and-error guesswork is a thing of the past. Nothing is as easy as an MT-4.

You don't have to wait for the system of the future. It's here now! For a free MT-4 brochure, see your EV Professional Audio Dealer or write: Electro-Voice, Inc., Dept. MIX-4, 600 Cecil St., Buchanan, MI 49107.

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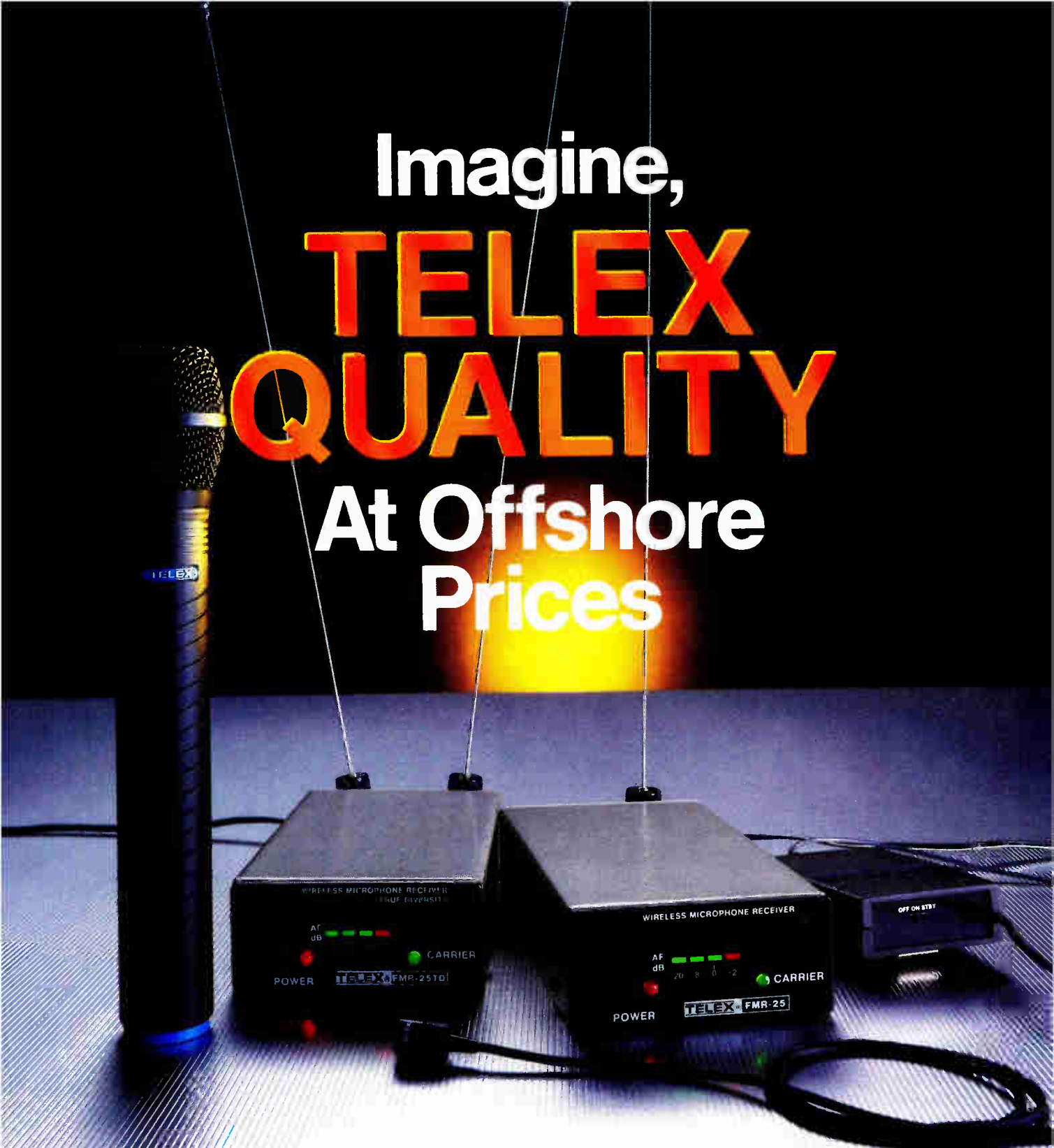

The Best of Both Worlds

It's now available with the new FMR-25 Wireless Microphone Systems made in the USA. For a list of important features that exceed the competition and a price that doesn't, call or write Telex Communication, Inc., 9600 Aldrich Av. So. Minneapolis, MN 55420

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production systems, introduced Harry-Sound. Developed by Quantel's sister company, Solid State Logic, Harry-Sound shares pen, tablet and menu control with Harry (digital video manipulation and storage companion for the Paintbox) for integrated digital audio editing. HarrySound uses on-screen faders and meters to simulate mixing console hardware. As the editor moves the stylus from rear far left to near far right, the audio signal pans and levels increase in sync with on-screen images. The system features 6-track/reels, random access, digital quality 48 kHz at true 16-bit, zero generation loss, with cut, crossfade, offset, gain profile and mix capabilities.

Graphic Paintbox bridges video techniques, speed and creative skills with print quality output, a fact that video houses are already taking advantage of to expand into the print market. The graphic Paintbox allows for the compositing and manipulating of high-definition images in a digital environment.

Quantel's Encore is now available with Head-Up Display effects and motion control. All operational menus and parameters are displayed on-screen, Paintbox-style. Ease of use allows the operator to concentrate on creative decisions, with control via trackball, joystick or pen and tablet. Encore provides full-motion control emulation, corner pinning, track and rail, and transparent drop shadow effects.

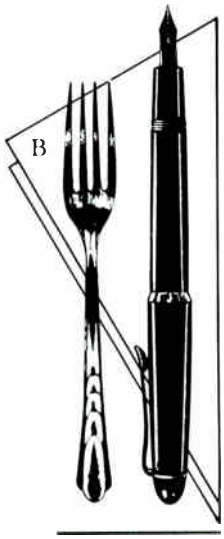
Carousel Ramcorder, a dedicated real-time, random-access storage device, works in conjunction with Paintbox. It can simultaneously read/write and operate in the 4:2:2 component digital video environment. Operational menus are fully integrated with Paintbox and controlled with the same pen and tablet. Carousel also sports a transparent Paintbox interface. For further information on any of Quantel's products, contact Quantel at 655 Washington Blvd. Suite 602, Stamford, CT 06901, (203) 348-4104.

Lou CasaBianca is involved professionally in advanced music, film and TV production, interactive authoring and visual design, and computers in media production. He heads the New Media Learning Center in San Francisco.

by Mr. Bonzai

ROGER LAGADEC

DR. ROGER'S NEIGHBORHOOD: THE SONY CORE



I first met Dr. Roger Lagadec a few years back at the AES Convention in New York when he was Studer's digital products manager. I expected a stuffy techno-nerd, but instead found a man whose interests span art, music and literature, as well as the technology that is reshaping our 20th-century modes of expression. He's an excitable guy, and his eyes frequently light up and sparkle as he peppers his speech with "extraordinary" and "astonishing." In addition to discussing the workings of professional audio, he introduced me to the music of Andreas Vollenweider and a remarkable book, *Riddley Walker,* by Russell Hoban. The music evokes the ethereal mysteries of ancient Europe, and the book tells a tale like medieval folklore from the future viewpoint of post-nuclear holocaust. The survivors, after hundreds of years, have a word: "puter." It is derived from an ancient word, "computer," and they understand it as myth, a symbol of the lost days of glory and enlightenment.

I think it is significant that when Dr. Lagadec was testing digital frequency sampling conversion, he used a recording of Vivaldi's *Nisi Dominus.* He told me, "It was tremendous, because all of a sudden I heard the music and there was no difference—I recognized everything coming out of the record, a record that I knew so well, one which meant so much to me."

In our conversation, the Swiss-born

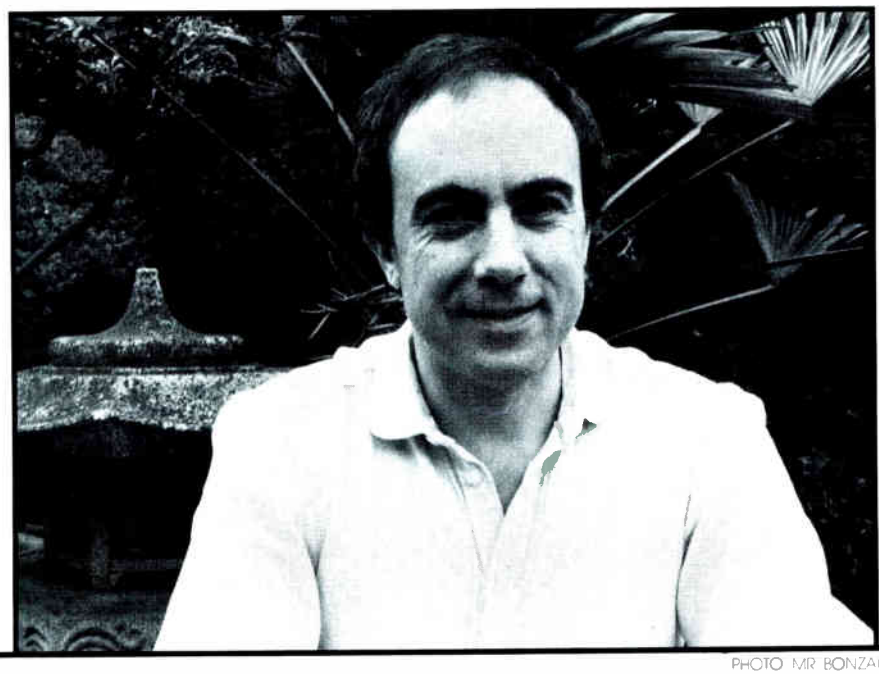


PHOTO: MR. BONZAI

Dr. Roger Lagadec, general manager of Sony Audio Products Division, in his garden in Atsugi, Japan.

How to make a living as a recording engineer.

It's no wonder that being a successful recording engineer is so appealing. In the magic environment of the studio, today's top engineers make a very good living by knowing how to bring music to life.

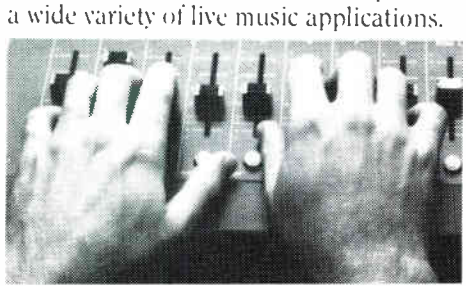
If you're serious about becoming an engineer whose services are constantly in demand by the music industry, there's something you should know. More than ever before, the hottest engineers will be those with the skills of both a technician *and* a musician. And now there's one place where you can develop your technical and musical awareness hand-in- hand—at the acclaimed Grove School of Music in Los Angeles.

Grove's new Recording Engineering Program is an intensive one-year course of study that gives you an exceptionally well-rounded approach to making music sound better. Grove instructors are working professionals based here in the entertainment capital of the world, where opportunities are at your doorstep in more studios and concert halls than you'll find anywhere else. Students from more than 30 countries have found the Grove School to be the most *practical* place to launch their music careers.

1. Meet the versatility challenge.

Every recording, mixing and sound reinforcement situation is different. That's why the Grove program gives you such a broad range of experience, getting you comfortable engineering everything from 5-piece rock bands to 18-piece big bands to 40-piece orchestras.

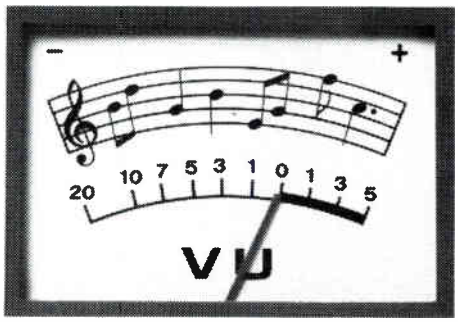
You'll work with a full spectrum of acoustic to electronic music, from Top 40 to film and television scores. And you'll learn sound reinforcement techniques for a wide variety of live music applications.



2. Get consistent hands-on experience.

There's no substitute for learning by doing. So you'll regularly have projects in Grove's two in-house studios, as well as taking advantage of the program's ongoing access to state-of-the-art 24-track facilities in the Los Angeles area.

To get the most from your time in the studio, you'll cover your technical bases with courses in acoustics, electronics, studio installation and equipment maintenance. You'll also learn studio management procedures to help prepare you for the business end.



3. Hear music through a musician's ears.

The most talented engineers are usually musicians as well. The Grove program is designed to insure that you'll *understand the music* you're recording, and that you'll be able to *effectively communicate* with musicians on their own terms. Grove's outstanding courses in eartraining, harmony, sightreading and rhythm section arranging will result in some great advantages for you when you're behind the board.

4. Prepare for related opportunities.

Successful engineers often expand their careers into related fields like record production and music video. Grove offers professional workshops in both these areas, as well as many others ranging from Songwriting to Synthesizers to Drum Machine Programming. You can build these into a customized course of study, and we'll help you tailor a complete package to fit your personal career goals.

5. Get a competitive edge.

The Grove Engineering Program begins each January and July. You may qualify for financial aid. And if you're concerned about getting a college degree, our accredited courses can be part of your B.A. in Commercial Music through our affiliation with Laverne University.

So if you want to make a living as an engineer, we'll send you more information. Just send us the coupon below to see how you can get a competitive edge, or call us at (818) 985-0905.

Grove School of Music.

Mail coupon to: **Grove School of Music**
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Mix 8/88

☐ I'd like to know more about the Recording Engineering Program.

☐ I'd also like more information on the other programs checked below:
- ☐ Songwriting Program
- ☐ Synthesizer Program
- ☐ General Musicianship Program
- ☐ Vocal Program
- ☐ Keyboard Program
- ☐ Guitar Program
- ☐ Bass Program
- ☐ Percussion Program
- ☐ Composing and Arranging Program
- ☐ Film Video Composition Program

Circle #024 on Reader Service Card

Lagadec spoke intimately and with praise of his relationship with Willi Studer and also revealed his admiration of the work being done by the Japanese. Perhaps it was a forecast. At any rate, our next meeting took place at the L.A. AES two years ago, after he had recently joined Sony. He welcomed my offer to escape the confines of the convention and came up to the Bonzai hideaway in the wild hills of Hollywood, where Mrs. Bonzai prepared one of his favorite dishes: *natto tempura* (fermented soybeans, battered and deep-fried). We drank sake, listened to music and discussed the world of art, politics and nonsense.

On our recent visit to Japan, Dr. Lagadec—let's call him Roger—insisted that Keiko and I stay at his home in Atsugi. We called from the Bullet Train to announce our arrival time, then waited at the station, expecting him to drive up in a chauffeured Mercedes. Instead, he arrived on foot, hoisted a suitcase, and we walked the ten blocks to his home. Roger doesn't drive and doesn't even know how. Luckily, he lives near Sony's world headquarters and can walk to work each day.

In the evening, Roger played CD-DJ and jumped from Penguin Cafe and The Art of Noise to Franco Battiato to Vivaldi and Georges Brassens. Listening to Brassens' rendition of a bawdy old French folk song, Roger translated the story of a nearsighted, horny gorilla that escaped from the zoo and mistook a judge in flowing robes for the object of his affections. The song ends humorously with no police report and no complaints from the magistrate, who cried "mama" as the interlude climaxed.

Much of our week in Atsugi was spent at Roger's home with his wife, Claudia, and their two-year-old son, Alexandre Ichiro (a Japanese name meaning "first" and often given to the first son). Life at the Lagadec home is an adventure in international relations. Alexandre's small vocabulary includes Japanese, French, German and English. When the phone rings (at all times of day and night), Roger can be heard conducting business in any number of languages, including Japanese. During our stay, he was proud to tell us he had just given his first company speech in Japanese, without cue cards.

I never visited the Atsugi plant. Our prime time was spent at home, swapping culture nuggets and exploring the possibilities of our shrinking world. Roger is a unique character in the techno-theater of worldwide media and communications. It's refreshing to find a person in a position of power who appreciates the reason for all this technology.

Bonzai: What is your position with Sony?

Lagadec: My title is general manager of the Audio Products Division, the division that makes professional audio products. I'm responsible for its product policy, its technical policy, and for making sure the right products come out on time at a reasonable price.

Bonzai: This move must have been a major change in your life—from Switzerland to a new home in Japan. Can you paint a picture of your life now?

Lagadec: If you observe the living situation in Switzerland, then move to Japan and look at it keenly and carefully, you start noticing subtle differences—like the fact that you are illiterate. You can't read signs, you can't read documents. It certainly brings you down to size. You can walk across Europe and read everything. Even if you can't speak Spanish, you can probably read a Spanish newspaper, or a French or Italian paper. Here it's different: you can look at the pictures, and that's about it.

And you become very, very visible. Even if I just came here as a student, I would be extraordinarily visible. Working as an executive within a company is *very* visible. Do the job right and people will appreciate it; do it wrong and you will have an excuse: you are not Japanese, but this excuse will hold only once.

Bonzai: Can you point out any specific changes that have come about as a result of your position at Sony?

Lagadec: I believe that *the* major change took place before I was aware of it. Within the company, following their own guidelines, they decided they would become more international. They must have decided I would be a good subject for the experiment.

Bonzai: This is an unusual situation for a Japanese company, isn't it?

Lagadec: Highly unusual. Of course, there have been Western people who have grown up here or perhaps decided to emigrate, and have set up their small business here, and become successful as consultants. But there are very few people who have had a high profile in a large company. It's not exactly a first. There was a famous person called Demming who was the pope of quality control. He was an American in the car industry who had far more recognition in Japan than he had in America. But that was a long time ago, and in recent years, especially in a multinational company, I am not aware of anybody in such a position as mine.

I believe the major change was a kind of wager made by Sony before I was given this position. If I look back —I have been in this new job of run-

Claudia, Alexandre Ichiro and Roger Lagadec. Atsugi, Japan.

PHOTO MR BONZAI

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APC1000

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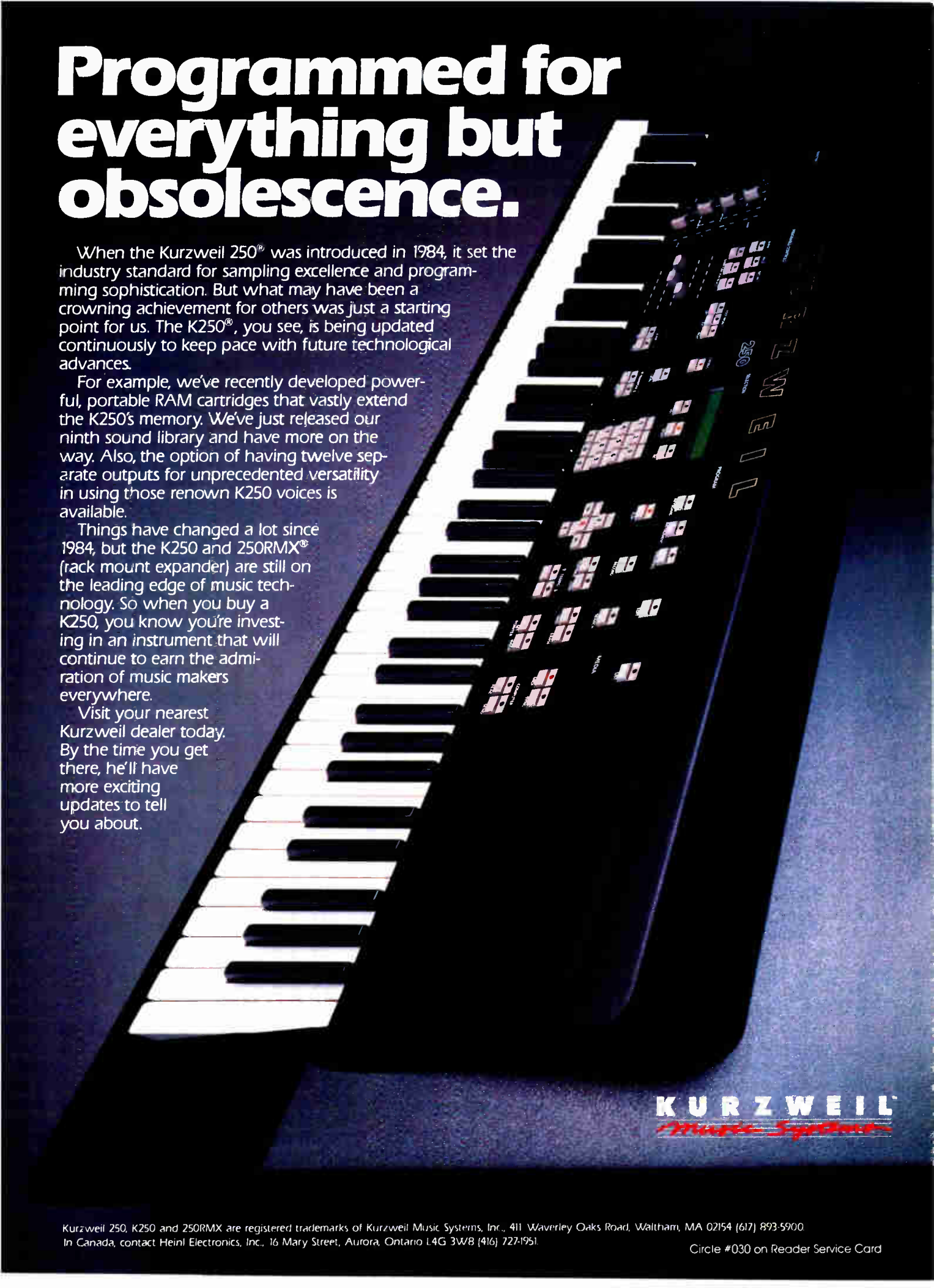

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ning the division for ten months—the fact that I am still at it, proposing changes and having those changes implemented, is a sign that it has been reasonably successful, otherwise they wouldn't let me continue. With a fair amount of courage, they gambled on me and it seems to have worked out. It's not a change I made myself. It had been decided by the company as part of overall policy, and I'm just happy that after ten months, the experiment is continuing.

As for other major changes, that's more difficult to say. You're given responsibility for a group, and of course you try to give it your own direction, but it's never entirely yours. You look at what is possible within the group, and you try to focus their strength and attention, eliminate things you think are redundant. The Japanese speak of the "vector," and they describe a division as having many small vectors pointing every which way. The job of management is to combine those vectors, point them basically in the same direction, and make one very strong vector. It's not really *your* vector; it's many vectors that must be arranged.

Bonzai: As far as the effect and the results—can you give us an idea of what to expect from Sony in the next six months?

Lagadec: Let me backtrack and say more about the changes first, because it's very much linked to this question. Because Sony spans such a wide spectrum, from My First Sony to the Walkman to portable CD players to multitrack recorders to stupendous new video products and so on, there is the expectancy that Sony can do absolutely everything. And there is no reason for Sony to have any weak point in its diversity, because it is big, powerful Sony. Reality is different, of course. Sony has those very many vectors from consumer to professional—a very wide spectrum. But they have to be combined. Combining them is the key role of management. I was concerned in the past from a different point of view, from the point of view of a competitor who always had admiration and respect for a company with a particular character. I am interested in potential being fully realized. I believe it's changing for the better in that wide range of technologies that Sony has—the horizontal view of it.

There is a long chain of events that takes you from pure ideas to prototypes to products to shipping, marketing, distributing, to selling to servicing. In that chain, where it is incredibly difficult to control the impact you have, there has been progress. You can now see the message of pro audio more clearly in America. You see more promotion, more market penetration, more market share in all those famous format battles, for example. It's a slow, gradual, progressive change.

I have this picture of what the division is trying to do as a long chain of buying and selling. The gorgeous idea of an engineer has to be sold to people whose responsibility it is to make a product. If those people don't want it to be a product, you can forget it. Even the smart inventor has to be a salesman. It's a job of selling, and the group of engineers whose responsibility it may become to make a product must sell the idea to their management and the planning department. They must convince them that it is reasonable to spend a large amount of money making this huge piece of junk into a viable product, which is a long process. And then you have to sell it to production and to the sales companies, because

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—FROM PAGE 161, MADI

serial transfer to digital audio data between different machines. Most of these have been introduced by individual manufacturers as a part of their own marketing strategies and have not received widespread acceptance. The only exception to this is the AES/EBU Twin Channel Format, which has begun to appear on an increasing range of equipment. However, all the standards that have appeared to date can carry at most a pair of signals on a single cable. The problem with such a twin channel system can be seen by considering the interconnection of a multi-track tape machine to a digital console.

For each pair of tracks on the tape machine, two cables will be necessary between it and the console: one for send from the console and one for return to the console. At the transmitting and receiving ends of these cables there will be extensive circuitry to encode and decode the data. All of this adds up to more expensive products that are more difficult to use and maintain.

The obvious solution was a method of sending multiple channels of data between equipment along a single cable. Any standard proposed must be cheap to implement, easy to understand and acceptable to the pro audio industry as a whole, so it will be widely adopted as soon as possible.

The process of defining such a standard and getting it universally accepted was a more difficult question. The Audio Engineering Society, the obvious forum for such work, has performed a sterling service to the audio industry by defining and standardizing the AES/EBU Twin Channel Format. This allows the transmission of two mono signals or one stereo signal down a single length of shielded, twisted pair cable. One frame of data is transmitted during each sample period, comprising two subframes, each of 32 bits in length.

Fig. 1 shows the format of data within a subframe. The first 4 bits indicate whether the sample contained in the subframe is from Channel A or Channel B, respectively corresponding to Left or Right, where the two signals are a stereo pair. The following 24 bits contain the audio sample, with the most significant bit of the sample always aligned at bit position 27 within

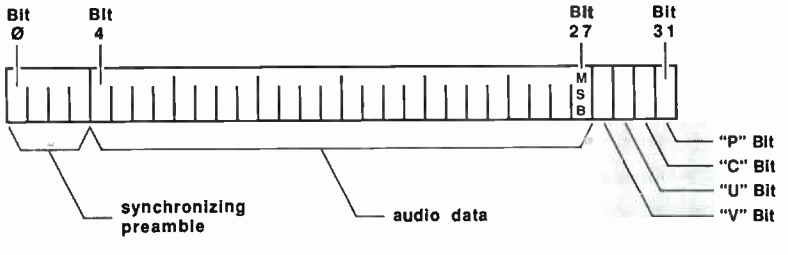

Fig. 1: Format of an AES/EBU channel.

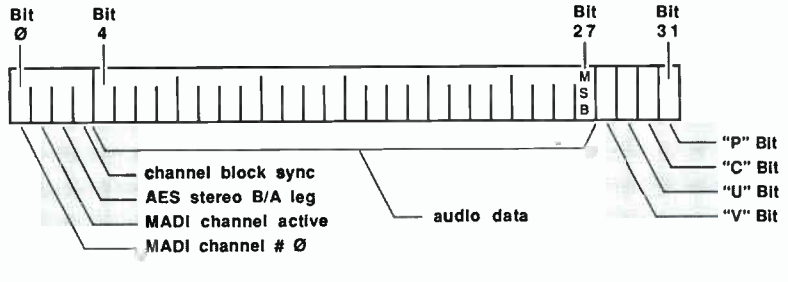

Fig. 2: Format of a single MADI channel.

ILLUSTRATION BY CHUCK DAHMER

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they are basically the only customers of a division. The sales companies have to sell it to the people who run studios—another layer of sales. And the people who run the studios have to sell it to the artists who will rent time in the studio. And it continues. The artists have to sell what they've done to the record companies, which have to sell it to retail stores, which have to sell it to individuals who will probably try to sell something to their friends.

It all starts as a gleam in the eye of an engineer and hopefully ends up as a gleam in the eye of the final customer. It's difficult to say in advance that what you do will finally have success. But it's important to understand all the layers, and that a Japanese company—which works much in its own way, with its own character and has to sell to strange sales organizations headed by people from another race and culture, who have to sell it to other people—may sometimes find it more difficult than it is for American product makers, who sell to people they know intimately. In that area it's important to improve the way engineers communicate among themselves and how they communicate to the outside world—very often a non-Japanese world.

Bonzai: Let's talk directly to the professional, the studio owner, the engineer. What message do you have for them about where we are now, the past, and what they can expect?

Lagadec: Having established a market of high-end audio, professional digital audio, we feel strongly committed to it. There is no question that people who have bought, say, a PCM-3324 24-track digital machine are going to be able to buy a new 24-track machine from Sony that can read those same tapes, and edit them and play them back and so on, for many years. It may not be 25 years, because technology has its own pace, but in the case of the 24-track, for example, it will be sustained for many years. It has been established. It is a worldwide de facto standard. Of course, technology will progress. We'll see more channels, more features, more formats. We'll see radical new products, I'm sure. But one of the lessons of working in professional audio as compared with consumer audio is that you cannot live with 20 different formats.

If you look at, say, consumer video, just look at the range of capabilities of Sony in consumer video. Now it has become the only company that spans all the major formats—Beta, VHS, 8mm. For 8mm a new version has been announced, with advanced performance. For Beta, there are several versions. For VHS, there are many. If you look at the various formats, including PAL, SECAM, NTSC, you come up with more than 20, maybe 30 or 40. In professional audio, that's just not possible.

At some time you have to freeze your choice, and then you have to face your responsibility. This also means keep it as is. Improve it if it is upwardly compatible, but be steady, on course, have the consequent vector, establish your policy and follow your policy. Don't be discouraged by short-term difficulties. Don't be discouraged if you have competition. Don't be overawed if you have newcomers, because you are a strong company, you have a strong backup. The core of your company is audio. If you lose this sense of consistency and sense of continuity, you will lose your market. I'm confident concerning the new products that will come and that we will learn more and more to utilize the technical potential of Sony, how to bring those vectors in line and how to get this message to the market.

Bonzai: C'mon, let's have some earth-shaking news about what we can expect in the near future from Sony.

Lagadec: One of those irritating habits I have is to answer questions with negatives, and double and triple negatives. So if you ask me very candidly, "Is Sony interested in disk recording?" and if I told you no, of course not, Sony is not interested in disk recording for professional audio, you would know that I am lying through my teeth. But it's an important statement in a sense. It focuses on what is obviously not true.

We have one of the world's strongest companies in optical recording and we are aware of digital audio. We are aware that at some time, when it becomes economically viable, the two will combine and we will record and playback using disks. But this is an area where things will take a fair amount of time, because making a format, any kind of format, is a formidably expensive enterprise. When you have to invent the media together with the format, and that is the case with the

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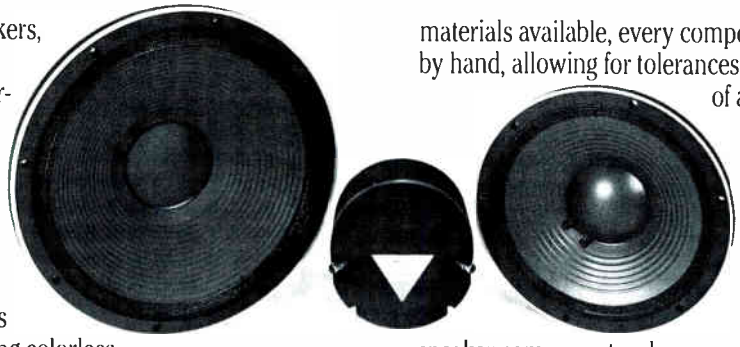

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disk, it is a many hundreds of millions of dollars wager. It is expensive, and unless you can find a very large market for it—the professional audio market is not a very large market—then economically, it is just not viable. So you have to find ways of combining, or covering the requirements of, say, computer people and audio and video people. Then you have a large market, and you can make a product. So if you look at today's requirements, they are not very big yet. Digital audio is just starting, and entering professional audio was difficult enough for Sony, like it is for all companies. Entering professional audio *and* introducing digital audio was very difficult. Completely changing the technology by introducing disks is just too difficult at the present. It has to be done one step at a time. I am confident that disks will come, but I'm also extremely confident that whatever solution is being touted today by small companies as the ultimate is totally incidental. It will not be the mainstream. The mainstream is too expensive for small companies. And we are a large company and we will be in the mainstream.

The workstation is a gorgeous idea. I believe we are at the stage today similar to the developments in the '70s at the Xerox Palo Alto Research Center when it was the seminal place for the future of personal computers. Many of those ideas were finally used, for example, in the Apple Macintosh. Many of the advanced concepts of good personal computers were crystallized at this Xerox center. I believe that today's audio workstations, remarkable as they are, are very much at the same stage as a prototype at the Xerox center at that time. It takes more time until it becomes widely used. If the workstation continues to be a stand-alone machine, if it does not base itself on the worldwide currency for exchanging audio via tape or disk, I believe it will remain just a pleasant working tool for limited applications.

Bonzai: What about the multi-track?

Lagadec: Well, in a sense, the story of the Sony multi-track is rather boring in that it is a very straightforward story. We have more than 400 24-track DASH machines on the market. It is clearly the dominant format worldwide, and as I mentioned before, for several years we will make machines in exactly the same format, which can read and edit the tapes. You will be able to read the tapes from new machines on old machines and vice versa. It is the same with analog 24-track—you cannot change the format every three or four years. You have to keep it steady and make sure it becomes a worldwide currency.

Almost two years back, at the AES in L.A., we showed the basic technology for going from 24 to 48 tracks. Two years is a reasonably long time, and it will be natural for Sony to show how serious they were with this development of 48 tracks on half-inch tape with both-way compatibility. It is a matter of professionalism and seriousness. Maybe it was a little early to show such advanced technology, because showing a set of heads is not the same as showing a recorder. But going to more tracks is a reasonable trend on the market, and in much the same way as I can say that 24 tracks will be on the market for many years to come, I'm sure that in the not-too-distant future, Sony will enter the 48-track area. In the 48-track area, you will find the same principles, the same guidelines—upward compatibility in the case of 48, because both-way compatibility does not work. The 24-track machine can only play 24 tracks out of 48, but there will be upward compatibility, and this 48-track format, when it is entered on the market, will be there for a long time to come.

Bonzai: What will happen with DAT?

Lagadec: It's difficult for me to tell you a lot about DAT in the consumer area. DAT has been dominated by controversies. I believe there is a key issue of whether or not copying of software, copying of the intellectual property of others, will be allowed or not. It is a big economical issue, and it is a cultural issue. Mingling this major issue with the incidental, poorly thought-out, narrow-minded, specific solution called "copy code" was extremely detrimental. I'm afraid that copy code, because of its clear technical deficiencies, as was confirmed by the National Bureau of Standards, may have diverted people's attention from the fact that a major cultural and economical issue is at stake. Extremely detrimental in my view, because they may have pursued the right target but used absolutely inadequate tools. This, of course, has had impact on the public discus-

sion and perception of DAT. I think DAT is a lovely product. Of course it will sell. On the other hand, whenever a new technology is introduced, it is touted as the ultimate and it means that market expectations are much higher than they would be if based on common sense.

If you look at the Japanese market development of DAT, for example, the numbers are reasonable. It is an expensive product, which has a tough case against the compact cassette because it is a little smaller and sounds better, but is not enormously different, whereas CD was enormously different from the LP. So, because competition is more difficult against the compact cassette in terms of numbers, costs, ease of use and so on, market penetration of DAT is naturally slower than it was in the case of CD. But it's a product that will be here for many years to come, and it will prove itself.

Bonzai: Let your imagination go wild with a vision of a new audio/video production system. What can we expect?

Lagadec: Professional products are tools, and tools are made for human hands and eyes and ears. A professional product is a product that helps you write more smoothly, think more easily, remember better, be more creative, earn more money, and so on. Those creative tools have their own limitations. They are made for human beings.

The real challenge will be how much intelligence you will put into it so that with a few buttons that are self-explanatory, for example, you will be able to control complex operations. This, I believe, is not an area of technology. It is an area of experience, creativity, common sense. A Nagra recorder is a gorgeous tool because it has the correct feel under your hands and does what you want it to do. You could not make it five times smaller. The thing that gives it its rightness, the right touch, is linked to your hands.

Make the products modest. Make the products obey the human eye and ear and hand, and bring them in line with common sense. That will be the real challenge and I'm sure that within Sony this is well understood. We cover all those layers—from the very professional to the consumer.

Sony is a communications company, an electronics company, a media company, a hardware and software company. Sony is making records with CBS. Sony is making tools for the Bertoluccis of this world. Sony is making tools for the Mr. Bonzais of this world. And we are making tools for Alexandre, who is two years old now and will have his first Sony soon enough, I'm sure.

Bonzai: Back in the dawn of mankind, one person in each tribe was recognized as the storyteller, who essentially re-created reality that had some meaning for others.

Lagadec: I'm sure they still exist. But let's look at personal computers. We hear about the paperless office. The real trend today is not the paperless office, it is the officeless paper. It is paper you carry around with you, because you have generated a lot of it and so have others. Give people personal computers and laser printers and do not give them the sense to focus on what is important, and they will just generate mindless paper. It was the case with the Xerox machine. It is the case with the personal computer and in the same sense, if you have nothing to say and you want to say it with a video recorder, you will generate a lot of tape. If you have nothing to say and they give you a throwaway camera, you will throw away a lot of cameras, and the market will thrive. But the real storytellers, the Russell Hobans of this world and the Salman Rushdies of this world, come out finally with a couple of hundred pages and it is all there. Concentrated, crystallized, focused—their message. The storyteller crystallizes the thoughts of his family, his tribe, and gives the words a purer meaning, as the French poet Mallarme wrote about Edgar Allan Poe: *Donner un sens plus pur aux mots de la tribu* (To give a purer meaning to the words of the tribe).

This person who can crystallize things—this genius, this creator—has nothing to do with media. Give him a primitive camera and he will be a Brassai, a Lartigue, a Capra. Give him a gorgeous camera and he'll be a Truffaut. Give him a fantastic high-definition camera and maybe he'll be a Japanese genius we don't know yet. It does not really matter, because the artist will use the tools he has. The tools should just not be in the way. ■

Mr. Bonzai, a 15-year veteran of the music industry, is former manager of a major Southern Cal recording studio, and author of Studio Life: The Other Side of the Tracks *(Mix Publications).*

NEW PRODUCTS

D&R Split Console

The Stylyx mixing console from D&R USA (Arlington, TX) features digitally controlled, analog circuitry and a unique modular design. Utilizing a 31 mm module width and a selection of various modules, it allows users to tailor a comprehensive, customized console. The Mic/Line Module, Stereo Line Module, Subgroup Module (two subs out and two tape/effects returns), Master Section, Meter Bridge (LED bar arrays), Rack-Mount Power Supply and the Automation Module can each be purchased separately and installed at any time. Also available is

the Stylyx automation package, a soft-muting system that can be manually or sequencer controlled, or activated via time code from a multi-track. It can store up to 100 setups and is capable of managing MIDI gear.

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Dynacord Reverb/Effects Processor

Dynacord's DRP-20 digital reverb and multi-effects processor is a two-space rack unit featuring 32-bit, floating point processing. Its two-channel operation allows accurate stereo imaging; all effects work in stereo, in combination or in a dual-mono configuration. According to Dynacord, the MIDI-compatible DRP-20 has an intelligent, easy-to-use design with logical real-time editing. Other features include 128 user locations, 100 factory presets, 92dB S/N ratio, 15 reverb structures, reverse reverb, 15 reflection clusters, five rooms, super chorus, echo, flanging, doubling, multi-tap effects, automatic and triggered freeze, and programmable gate. It all comes with a two-year warranty. The DRP-20 is distributed by Drum Workshop of Newbury Park, CA.

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Penn Sound Barrier

Penn Fabrication (Hawthorne, NJ) has developed a high-performance acoustical treatment they call "Sound Barrier." Made of high-density, flame-retardant polyester, the sound-absorbing panel is available in decorator and custom colors. Special non-bridging paint minimizes the risk of cracking, fading or loss of acoustical properties. The panels are said to accommodate fire code requirements, and their small, lightweight size makes installation fast and easy. Measuring 16 x 16 inches, the panels are available in 2-inch, 3-inch or 4-inch thickness, with varying sound absorption coefficients. They're sold by the box (16-28 panels per box), which range in price from $74 to $83, depending on quantity ordered.

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Gold Line RT60 Meter

Gold Line's (W. Redding, CT) RT60 meter is a portable, self-contained tool for measuring a room's reverb time. The GL60 meter indicates how long it takes for sound to stop reverberating and decay by 60 decibels. Since frequencies decay at different rates, the GL60 meter measures reverb time at 125, 250, 1,000, 2,000 and 4,000 Hz rates. Three sensitivities are provided for matching to ambient noise levels and room size. The GL60 displays measurements from 0.1 to 10 seconds, in hundredths of a second. Powered by two 9V batteries, the GL60 includes a built-in microphone and is activated by the sound of a sharp handclap. Suggested retail is $399.95.

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Energenius CS3200

New from the Eneractive Group of Elkhart, Indiana, is the Energenius CS3200, a UL-listed, alternate power and electrical distribution system, intended to back up sound systems during AC power loss. The unit also provides an AC power distribution system in an eight-space, rack-mount enclosure, so AC mains breakers can be located in or near audio racks. The CS3200 operates from standard 12 VDC batteries and features an 80-amp "quick restoration" automatic battery-charging and maintenance system. The unit is designed specifically for audio applications, with total isolation of AC common and chassis ground to eliminate ground loop problems.

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Mogami OFC TT Patch Cords

Mogami bantam patch cords incorporate high-conductivity OFC (oxygen-free copper) conductors to deliver maximum definition, detail and transpar-

ency in a quad-balanced configuration. Each super-flexible cable has a durable, nickel-plated bantam TT (tiny telephone) TRS connector designed to resist corrosion and eliminate the need for polishing. Supplied with each cable is a set of interchangeable color rings for easy cord ID. Mogami bantam patch cords are available in black, blue or green, and are sold in 1.5-, 2-, 3-, 4-, 5-, and 6-foot lengths. Gold-plated connectors are optional.

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ART MultiVerb

MultiVerb, the newest budget-conscious, multi-effects device from Applied Research & Technology (Rochester, NY), offers four simultaneous effects in a single-rack unit. Its 200 memory locations can store reverb, arpeggio effects, reverse gates, pitch shifts, doubling and imaged doubling, digital delay, chorusing and EQ multi-effects (all digitally processed at the 16-bit rate); or MultiVerb's 100 on board factory presets can be selected and stacked. Other features include pitch transposition, easy-to-use keypad, 32-character LCD display, battery backup, preset select footswitch jack and full MIDI compatibility.

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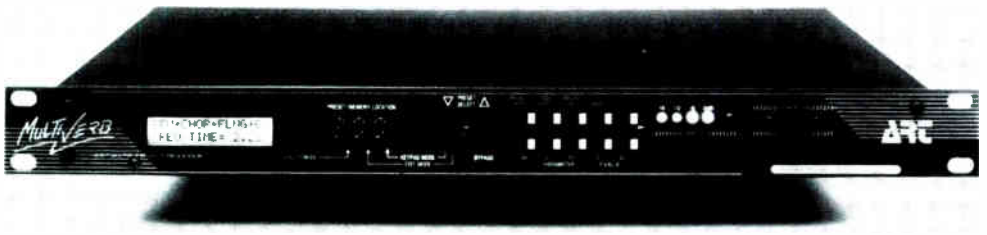

Akai S1000 Sampler

The S1000 16-bit stereo sampler is Akai's new top-of-the-line entry, a multi-timbral, 16-voice device that provides stereo inputs and outputs. Its sampling rate is 22.05 kHz or 44.1 kHz (23 seconds mono, 11.5 seconds stereo). A large, backlit LCD display shows text and graphics (including waveforms with a "zoom-in, zoom-out" feature). The S1000's standard memory is 2 megabytes, expandable to 8 Mb. Sample and program editing functions are easily accomplished with labeled pushbuttons, and eight additional function buttons call up submenus. The S1000's two envelope generators have depth and velocity controls, and looping is achieved graphically with up to eight possible loop points. Stereo panning can be modulated by an LFO or by MIDI velocity, aftertouch or modulation wheel. The S1000 also includes time compression to alter the playback speed of a sample without changing its pitch. The S1000 completely supports MIDI, to the point of providing a MIDI input monitor showing which channels have MIDI activity.

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Korg's DSM-HDK Retrofit adds a SCSI port to the DSM-1 Digital Sampling Synthesizer Module for interconnecting up to seven hard disks to the unit. Contact your local Korg authorized service center for details...

Alpha Wire's High Performance series of wire, cables and accessories for audio, video and broadcast applications (including their high-density, low-loss Starquad mic cables) are described in a new catalog. Call (800) 52-ALPHA or (201) 925-8000 for a free copy...

Editron's PCM Synchronization Kit is a modification allowing the synchronization of the Sony PCM-501 digital processor to an external source, so the digital storage VCR can operate as a slave for editing, multi-deck recording and other production tasks. Call (213) 464-8723...

Rapco's CD-100 Cable Doctor is a compact, battery powered tester for balanced or unbalanced, ¼-inch, XLR or phono cables. The $39.95 unit tests for shorts, open circuits and phase reverses, and is available through all Rapco Cable dealers...

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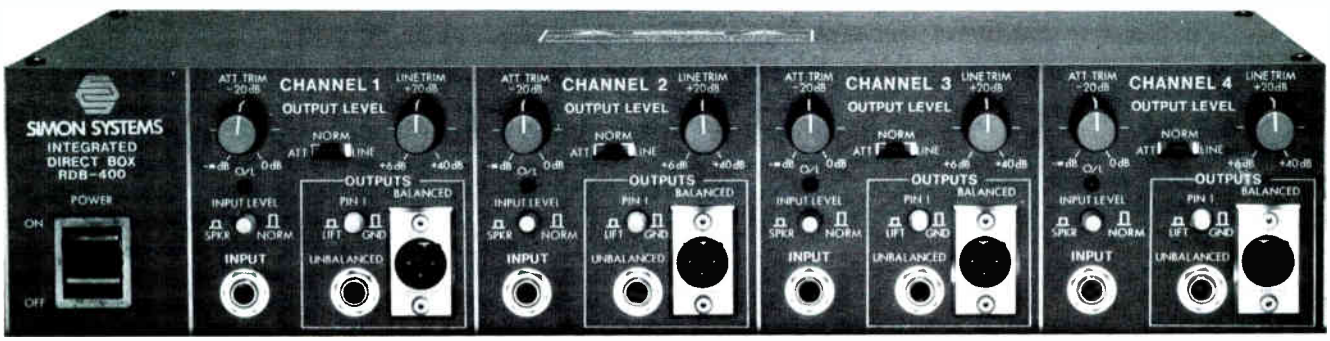
by John Schroeder

SIMON SYSTEMS

RDB-400 INTEGRATED DIRECT BOX

Have you ever been frustrated by situations where your stock direct box just doesn't cut it? Maybe you can't get enough level out of it or your input is a little too hot for it to handle. If this is the case, Simon Systems' new RDB-400 4-channel integrated direct box may be the answer. This versatile unit is a two rack-space box housing four identical and independent direct box circuits with a variety of handy and unusual features, some that even allow it to serve in ways not normally associated with direct boxes.

First of all, like any other direct box, the RDB-400 accepts a quarter-inch unbalanced, high impedance input at line level or below, but its "input level" switch engages a 26 dB pad which allows it to accept high level



RDB-400 TECHNICAL SPECIFICATIONS

Frequency Response: 10 Hz – 150 kHz. +0, –.5 dB

Total Harmonic Distortion: < .005%

Equivalent Input Noise: –108 dBm

Slew Rate: 5.88 volts/μsec

Transient Response: .3 μsec, no overshoot or ringing

Input Impedance: 1 MΩ (10.56 kΩ speaker level pad)

Output Impedance: 100 Ω unbalanced, 100 Ω balanced

Max Undistorted Output: 9.2 VRMS into 600 Ω or greater

Attenuation Range: 0 dB to –infinity in 41 detented steps

Gain Range: +6 dB to +40 dB, center detent at +20 dB

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Key to achieving reliability in amplifiers as powerful as the **Macro-Tech Series** and **Micro-Tech**® **Series** is successfully protecting circuits from overheating or overload.

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The brute force of the MA-10,000 carries through the entire line of **Macro-Tech Series** and **Micro-Tech Series** amps. MA-2400 - 2680 watts* output. MA-1200 - 1605 watts* output. MA-600 - 1140 watts* output. MT-1200 - 1605 watts* output MT-600 - 1140 watts* output. **Micro-Tech Series** amps are the worldwide industry standard - the 'workhorse', and are now joined by the versatile super power **Macro-Tech Series**. All backed by the best warranty in the business.

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speaker inputs from amplifier outputs as well. This might be nice for taking a speaker output from a guitar amp for recording direct, especially if it's a tube amp with desirable overdrive characteristics. A fast attack/slow decay peak-detecting LED circuit monitors the output of the input stage and is designed to indicate when the input is within 2.5 dB of clipping, and when nothing is inserted at the input, the signal lead is grounded to minimize output noise.

The output features of the RDB-400 are what really set it apart from conventional direct boxes, and these are controlled by the status of the "output level" switch. In the "normal" mode, the output level is identical to the input level with virtually no insertion loss. When switched to "attenuate," the output level is controlled by a detented trim pot offering 41 increments of attenuation, which would surely eliminate any problem of mic preamp overload at the console. The "line" position allows for variable output gain from +6 dB to +40 dB with a center detent around +20 dB, a handy feature in case it's necessary to patch straight to line level inputs, if not just for bypassing noisy console mic preamps. It also allows for setting levels to tape without using a console. Outputs are provided in standard balanced XLR format (pin 1 = shield, pin 2= high, pin 3= low) as well as unbalanced quarter-inch. A ground switch disconnects the shield at the output to avoid loops.

The design and features of the RDB-400 are basically the same as Simon Systems' DB1-A single-unit direct box, with the addition of variable rather than fixed output gain and attenuation. Following current design trends in mixing consoles, the unit is completely transformerless, relying on operational amplifier configurations for its buffered preamp at the input and active differential driver feeding the outputs. For this reason, when using the XLR outputs in an unbalanced mode, the low pin should be floated for optimum performance.

Rather than utilizing phantom power or batteries, the unit is AC powered, which shouldn't really be a problem since it's designed for rack-mounting. Simon's reasoning is that the 6.8k isolation resistors typically used in phantom power supply designs limit the amount of current that can be drawn which, in turn, would have limited the design possibilities of the RDB-400. Besides that, phantom power might not necessarily be available in some situations where the box might be used, and batteries are seldom appropriate for rack-mounted gear.

The RDB-400 electronics, composed of quality off-the-shelf components, are housed in a sturdy matte black welded metal chassis weighing six pounds. All controls and connections are accessed on the front panel of the unit, while four additional balanced XLR outputs are provided on the back, an obvious necessity for rack-mounting and wiring to a patch bay. Inputs on the back might also be helpful in a situation where the box is being used as part of a synth rack where sound modules are permanently wired up to it, but probably wouldn't be particularly useful in many other instances. At nearly a foot, the chassis is about twice as deep as it needs to be, but

that might be due to an effort to isolate the two-inch diameter toroidal power transformer mounted in the back. The potentiometers employed in the design are unsealed, which, if they collect dust, could become noisy during rotation. This may not be likely since the case doesn't have any ventilation holes, nor should it be a problem once a desirable setting has been achieved.

This unit pretty much met all the specifications, with a few clarifications. For one thing, equivalent input noise will vary according to the output impedance of the input device, which Simon didn't specify; however, assuming 10 kΩ, it's 108 dBm spec is correct. The maximum undistorted unbalanced output we could get was 7.8 VRMS and balanced output of greater than 14 VRMS, providing tremendous headroom. The balanced outputs were 6 dB higher than their inputs since they draw from both sides of the differential amp.

When put to use, the RDB-400 performed as expected: it sounded very clean and quiet, and proved to be extremely versatile. It's certainly nice in a control room where synth tracking is often done since it eliminates a lot of cables and little boxes on the floor, and it would clearly be at home in a synth player's rack as well. The variety of features allow it to be used for some other interesting applications such as preamplification, variable attenuation, signal buffering, and conversion from -10 dB to +4 dB and vice-versa. By chaining one unbalanced output to the next input, and so on, the RDB-400 will also serve as a distribution amplifier. The factory also offers optional configurations such as pin 3 high at the outputs or 230V AC operation, and warrants the unit to be free from defects for one year. At $995 for four direct boxes, this device may seem a little expensive, but it's pretty much the last word in direct insertion versatility; if you're plagued all too often by feeble direct box performance, Simon Systems' RDB-400 may be a simple solution to your problems. ■

SOLID STATE LOGIC'S COLIN SANDERS

by David M. Schwartz

Colin Sanders, founder of Solid State Logic, started the company in 1969, originally to build electronic relays for pipe organs. Over the next ten years, however, the company progressed into the leading ranks of audio console manufacturers, building recording desks with price tags that make a Rolls Royce look like an option.

Two years ago, Sanders merged the company with a group of four other principal companies, all trading together publicly on the London financial market under the banner of UEI. His SSL shares instantly became worth over 30 million British pounds. Today, Sanders remains as chairman and chief executive of SSL and says of the new corporate structure, "In each case the founder wished to stay with the business, yet wanted to gain the benefits of being part of a publicly quoted company. In essence, we all wanted to stay in engineering but receive the advantages of having our shares marketed. I feel the merger works well, as we can concentrate on our business without having to spend our time talking to stockbrokers."

He is still very much involved in SSL, most recently helping to bring the 01 to life, SSL's entry in the digital audio workstation horse race.

• • •

Mix: Tell us about your early interests in audio.

Sanders: I was a twin in Oxford, England, in 1947, and I recall always being interested in the combination of music and technology. I built my first mixer when I was eight, and had made ten by the time I was 15. These were simple things with bits of timber, aluminum and pots from old radios.

Mix: How did you integrate your interests with your schooling?

Sanders: I was given a lot of encouragement in school to get on with what I wanted. Several of the masters would let me out of afternoon games, for example, and let me work on the production of school plays and concerts. By the time I was 16, I had plenty of experience in handling stage lighting and the recording of concerts and plays. After completing my schooling, I joined the Low Temperature Physics Laboratory at Oxford University and helped develop electronics for a variety of projects, including superconductivity control systems that led to today's body scanners.

Mix: What was your early recording experience like?

Sanders: I built my first tape recorder as a teenager and paid for its parts by making records for the local Oxford college choirs. When the very early Revox tape recorders were becoming available, I knew I'd never be able to afford one, but I wanted to build something like it. After the first recorder, I sold it to make a better one. I must have made about a half-dozen tape machines—none as good as a Revox!

Mix: What did you learn from these building projects that stayed with you as a manufacturer?

Sanders: I gradually learned that the only way to make excellent electronic products is to invest a lot of time, money and effort into their development. A great deal of thought, energy and engineering has to be put up front. Then you must sell enough of them to pay for their development. And the more users you have, the more feedback you get. If you build one-offs, products are never really finished and rarely documented.

Mix: What was your first job in the industry?

Sanders: I guess my first real job was forming Acorn Records, a small label. We found a niche in popular English folk groups and another in theater organ music. The records even sold quite well!

Mix: What led you to start SSL?

Sanders: During the time I had one foot in school and the other in recording projects, I took on a little freelance work designing a valve amplifier for the British division of Hammond Organs. They were planning to make an electronic organ that looked and sounded like a pipe organ. I went to see their factory and was intrigued to find their large group of craftsmen—who were skilled in fine crafts like pipe building and timberwork—spending much of their time wiring mechanical relays

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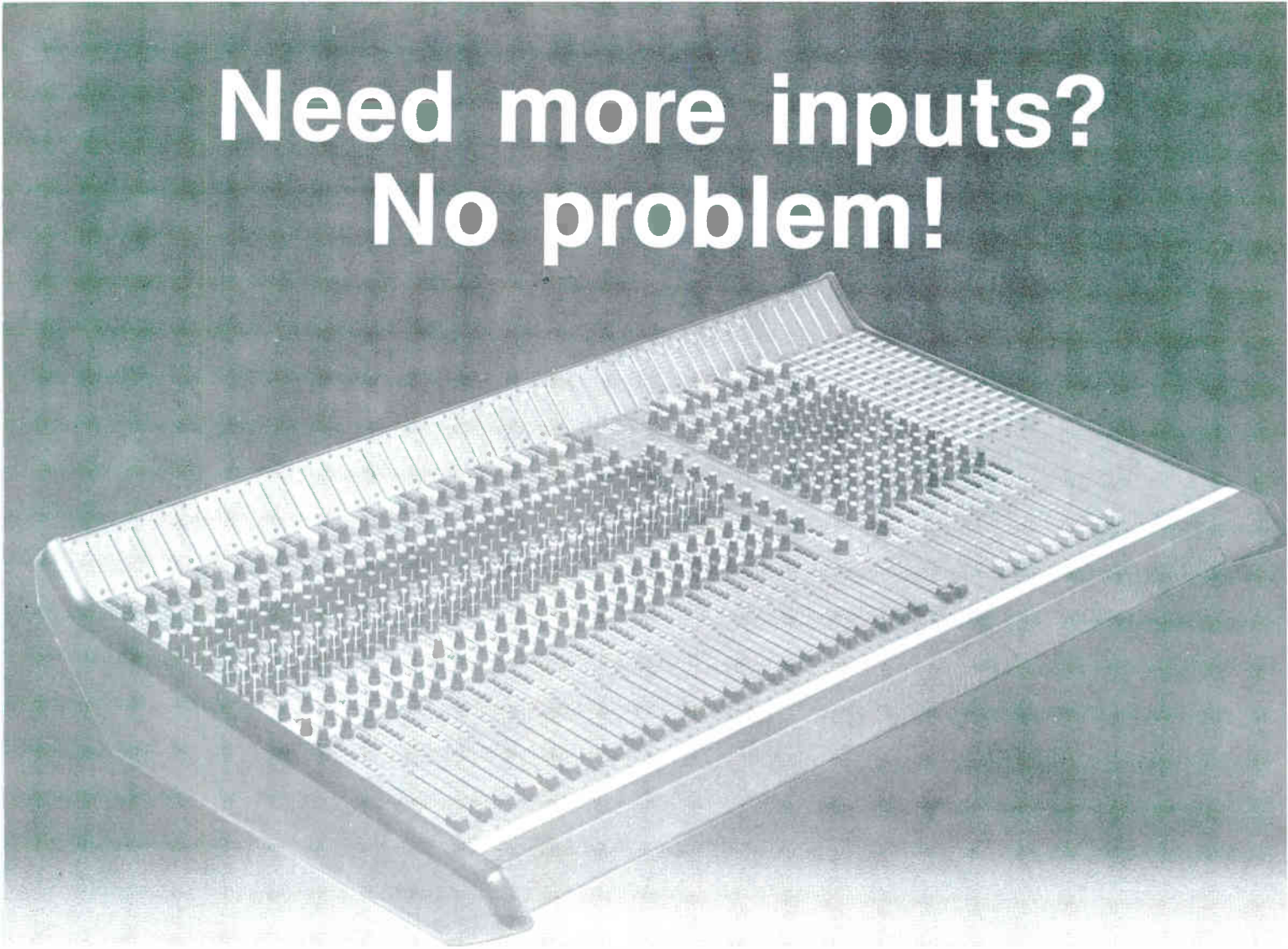

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and multi-position switches. I mentioned that they could save time by using diodes and transistors, and that this would allow the craftsmen to devote themselves to their real craft. As a result I was asked to design the electronics for an organ they were building for Glasgow Cathedral.

I worked on this project into the early hours of the morning every night for months. By applying electronics, I saw a business in making the organ builder's job easier. Solid State Logic started in 1969, the first products being electronics for pipe organs. The pipe organ division is still part of SSL, although now a relatively small team within the company.

Mix: What led to the first console?

Sanders: Our motive for building the first multi-track console, the predecessor to the SL 4000, was that our recording business wanted to go 24-track, and we wanted a desk with features we couldn't find on existing models. We had the luxury of being able to afford to build our own, because our pipe organ and record businesses were earning reasonable profits.

Mix: What were some of your design parameters on that first board?

Sanders: We soon realized that to design what we wanted, to do it well, we had to build our design for other people—to justify the development costs. In 1975, we built, I believe, six of the first model, these having from 16 to 40 inputs. Throughout the desk there were then non-standard features, like multi-track remotes on each channel. We adopted an in-line console design with dynamics and equalization in each channel so the engineer could try out effects and decide right then whether he or she needed them.

Mix: Did you think of yourselves as console manufacturers at that time?

Sanders: We were thinking of small numbers of consoles. The motivation wasn't to make a good-selling desk. It was to design a desk that we really enjoyed working on. Our goal became to build the best desk in the world. I'm sure if we'd had a team of consultants in to see if we were doing the right thing, they'd have all said "no." What we decided to do was based on a host of inputs, including features from every desk that any of us had ever worked on or seen and our experiences at 3 a.m. with a lousy vocal! I don't think there's anything wrong in taking features from other manufacturers. Indeed, we're flattered that so many other manufacturers have adopted our own ideas. It's good for the industry that desks evolve and new features get added from a composite of inputs.

Mix: In today's world of console building, how do you decide how much effort to put into analog and how much into digital technology?

Sanders: For the last 15 years, digital has been five years away, and at last it's getting closer. I think the industry is beginning to take a much more balanced view of the merits of analog and digital. Ours tends to be an emotional industry, so any new advance is met with either raging enthusiasm or manic depression, followed by an interim period as the truth develops. Perhaps as the industry grows and matures, that will happen less.

Mix: As you move from analog to digital, do you find differences in the way your products sound?

Sanders: The 01 sounds virtually indistinguishable from the latest G Series console. There is more difference between the G Series and the E Series consoles due to the equalizers and the many sonic improvements we've

—CONTINUED ON PAGE 165

"The motivation wasn't to make a good-selling desk. It was to design a desk that we really enjoyed working on."

READY FOR MADI?

A New Digital Interface Standard Debuts

by Mark Crowne

One of the most talked about events at the March AES Convention in Paris was the joint launch of a newly proposed standard for the interconnection of multi-channel digital audio equipment. The initiative not only directly answered many of the questions and objections countering the widespread adoption of digital production techniques, but, significantly, was proposed by a group of companies better known for their commercial rivalry than their ability to cooperate.

MADI (Multi-channel Audio Digital Interface) is a new method of transferring signals between professional digital audio equipment in the studio. The result of open communications between the UK operations of four well-known names in the audio business—Mitsubishi Pro-Audio Group, Neve Electronics International, Solid State Logic and Sony Broadcast—MADI allows up to 56 channels of digital audio to be sent down a single length of BNC-terminated cable over distances of up to 50 meters.

The Origins of MADI

It has been widely recognized for some time that one of the major obstacles to the more widespread adoption of digital audio technology is the problem of interconnecting equipment made by different manufacturers. Until comparatively recently, the only widely used digital recording equipment comprised multi-track tape machines and outboard effects boxes. Since these were usually used in conjunction with an analog-based recording console, the production of finished recorded material would inevitably involve repeated conversions of the signal from analog to digital (and vice versa), resulting in reduced audio quality of the finished material.

With the arrival of the new generation of mixing and editing equipment such as the SSL 01, Neve DTC, AMS AudioFile, NED Synclavier and others, the possibility of performing all stages of the production of a recording in the digital domain became apparent. In a suitably equipped studio of the near future, it will be possible to perform a single analog-to-digital conversion on the original signal source, feed it to a digital mixing console for treatment, store it on a digital multitrack, do the final mix on a mixer/editor and dump to an accepted digital format for CD mastering. All of the interconnections in such a system must remain in the digital domain to prevent the degradation brought on by multiple analog-to-digital and digital-to-analog conversions.

The major obstacle to overcome in achieving this goal is the problem of interconnecting digital equipment from different manufacturers, and there have been several previous attempts to define a standard for the

—FROM PAGE 161, MADI

serial transfer to digital audio data between different machines. Most of these have been introduced by individual manufacturers as a part of their own marketing strategies and have not received widespread acceptance. The only exception to this is the AES/EBU Twin Channel Format, which has begun to appear on an increasing range of equipment. However, all the standards that have appeared to date can carry at most a pair of signals on a single cable. The problem with such a twin channel system can be seen by considering the interconnection of a multi-track tape machine to a digital console.

For each pair of tracks on the tape machine, two cables will be necessary between it and the console: one for send from the console and one for return to the console. At the transmitting and receiving ends of these cables there will be extensive circuitry to encode and decode the data. All of this adds up to more expensive products that are more difficult to use and maintain.

The obvious solution was a method of sending multiple channels of data between equipment along a single cable. Any standard proposed must be cheap to implement, easy to understand and acceptable to the pro audio industry as a whole, so it will be widely adopted as soon as possible.

The process of defining such a standard and getting it universally accepted was a more difficult question. The Audio Engineering Society, the obvious forum for such work, has performed a sterling service to the audio industry by defining and standardizing the AES/EBU Twin Channel Format. This allows the transmission of two mono signals or one stereo signal down a single length of shielded, twisted pair cable. One frame of data is transmitted during each sample period, comprising two subframes, each of 32 bits in length.

Fig. 1 shows the format of data within a subframe. The first 4 bits indicate whether the sample contained in the subframe is from Channel A or Channel B, respectively corresponding to Left or Right, where the two signals are a stereo pair. The following 24 bits contain the audio sample, with the most significant bit of the sample always aligned at bit position 27 within

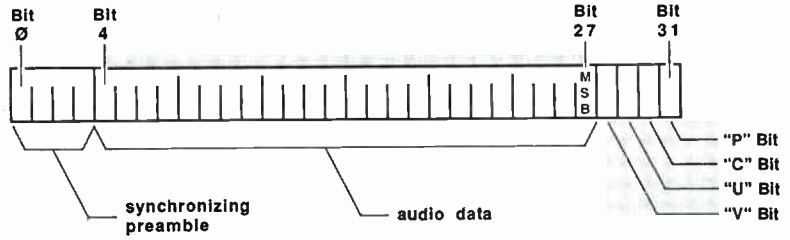


Fig. 1: Format of an AES/EBU channel.

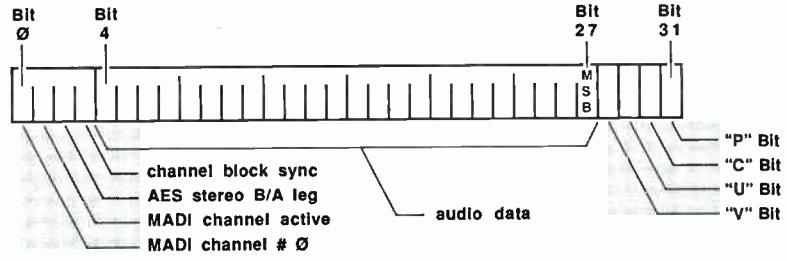


Fig. 2: Format of a single MADI channel.

ILLUSTRATION BY CHUCK DAHMER

the subframe. When the sample being transmitted is less than 24 bits long, unused bits are set to zero. The trailing 4 bits all have special meanings. The "V" bit is a flag to indicate that the subframe contains valid audio data. The meaning of the "U" bit may be defined by the user. The "C" bit—when correctly assembled into a block of data over a number of sample periods—indicates sample rate, professional or consumer use, pre-emphasis, etc. The "P" bit sets the parity of the subframe to even, allowing the receiver to check for errors that might have occurred during transmission.

The Digital I/O Working Group of the AES had been considering multichannel interfacing for some time, but progress was limited by the small number of meetings that could take place at conventions and conferences.

The manufacturers who became involved in the MADI collaboration had begun to feel customer pressure to produce equipment that could be interconnected more easily and cheaply. Contacts were established between the engineering departments of Solid State Logic, Neve Electronics International, Sony Broadcast and Mitsubishi Pro-Audio Group in the UK, and a meeting was convened to discuss possible answers to this problem. The reason for these particular companies and not others being involved was not a sinister attempt to form a new axis within the pro audio industry, but more of an accident of history. Contacts were made between people who knew each other, and it was decided to limit the size of the group to two tape machine manufacturers and two console manufacturers in the interests of achieving results within the shortest possible time.

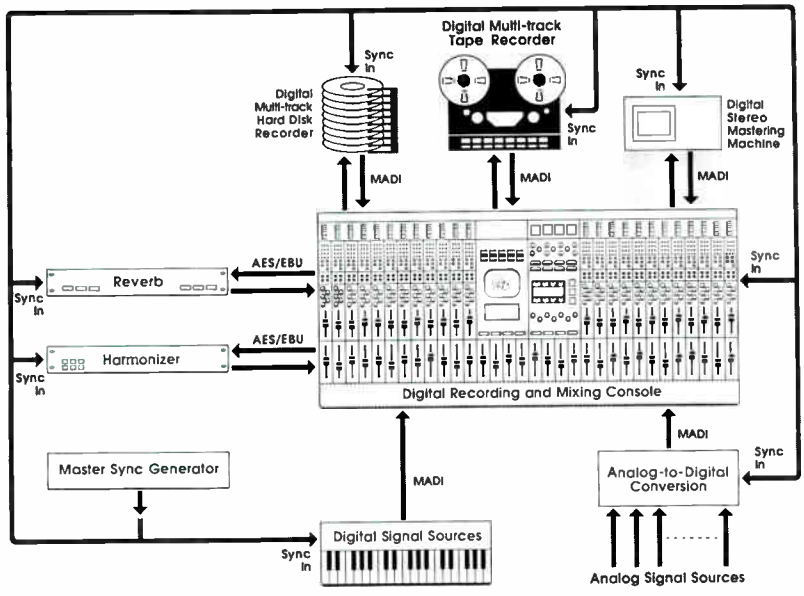
It was decided that the members of the group would attempt to fully specify a multi-channel interface that could be easily and cheaply constructed and would attack as many of the signal interconnection problems as possible. The results of this exercise were to be a document that would be handed to the AES for consideration as a recognized standard, together with a hardware prototyping exercise that would produce prototype units to be displayed at the Paris AES Convention at the beginning of March 1988. It was also decided that information concerning the implementation of the interface would be freely available to other manufacturers and users in order to promote widespread adoption of the interface. No proprietary hardware or software rights belonging to any of the MADI Group would exist in connection with the design of the interface.

Further meetings between the participating companies were held in the autumn of 1987 to determine the exact form of the interface. It was decided to base the data transmission format on that of the successful AES/EBU Twin Channel Format, in the interests of building on previous work rather than "reinventing the wheel." The form of the document to be presented to the AES was determined in parallel with the design work going on in each of the companies to implement the interface in one of their own products. A presentation of the completed document was made to members of the AES group working on Digital I/O toward the end of 1987, at which it was agreed that the MADI Proposal would be discussed at a full meeting of the committee at the forthcoming Paris AES Convention.

The MADI Proposal

What emerged from the discussions between the members of the MADI Group was a proposal for a serial multichannel digital interface capable of carrying 56 channels of audio data of up to 24 bits resolution per audio sample.

Comparing the MADI format shown in **Fig. 2** with the previous diagram of the AES/EBU data subframe shows that the MADI channel data format is almost identical, the only exception being the first 4 bits. Bit 0 in the MADI format becomes a flag to indicate Channel 0—the first to be transmitted in a new sample period. This allows the receiver to correctly decode the following channels. Bit 1 indicates whether the transmitter of the data regarded it as valid. Bits 2 and 3 are used to encode the three possible 4-bit preambles transmitted at the start of an AES/EBU subframe. The remainder of the MADI format is identical to that of the AES/EBU subframe. This means that a MADI link can be arranged to be transparent to AES/EBU information: data can be converted from one format to the other and back again with no loss of information. However, the electrical characteristics of the two interfaces are completely different: AES/



The MADI protocol simplifies signal flow in the all-digital studio.
ILLUSTRATION BY CHUCK DAHMER

—FROM PAGE 164, MADI

EBU is a 3 MBit/S serial signal carried on shielded twisted pair, whilst MADI is a 125 MBit/S serial signal carried on coaxial cable.

The interface is implemented as a point-to-point link from transmitter to receiver. Hence, for a connection between a console and tape machine two cables carrying data are necessary, one for the sends from the console and another for the returns.

All MADI installations will support cable runs of up to 50 meters without any requirement to match cable lengths. With special care, the interface could be made to work over distances considerably longer than this.

The hardware required to implement the interface is based on standard chips produced for high-speed computer networking and is thus cheap and readily available. This will lead to a massive reduction in costs for both manufacturers and customers. This cost will be both in the form of cabling savings and also hardware savings within the equipment itself.

The cable required to implement a MADI link is standard 75-ohm BNC-terminated video coaxial cable of the type already found in many recording studios. For longer cable runs, a fiber option is envisaged for data transmission, but this is not yet defined.

The MADI Proposal can support a common sample rate for all the channels on the link varying from 32 kHz to 48 kHz. A facility to operate at ±12% of these nominal sample rates is provided. Higher sample rates can be accommodated by running the MADI link at a sub-multiple of the desired sampling frequency and using two consecutive MADI channels on the link for sample data. A few channels of digital audio could be transferred from one unit to another at greater than real-time rates using a similar method.

Digital equipment operates with reference to an internal clock running at the sample rate of the system. In order for a large number of digital systems to work together, all of the individual clocks of each piece of equipment must be synchronized. In many applications to date, only a few pieces of digital equipment have been used together, and it has been possible to arrange the synchronization of these experimentally. With an increasing amount of digital equipment being found in studios, a more rigorous approach to the synchronization of sample clocks is necessary. The MADI Proposal takes account of work done within the AES on the synchronization of digital audio systems and employs a distributed master synchronizing signal fed separately to all interconnected equipment. This is similar in concept to a video house sync, but does not have such stringent requirements for plant timing.

The diagram on page 29 shows what might be a typical installation of MADI equipment, comprising a digital mixing console, analog-to-digital conversion system and a variety of signal storage and processing devices. Each link shown between equipment consists of a single length of coaxial cable carrying up to 56 channels of audio. In addition, each separate piece of equipment has the house master synchronizing signal distributed to it. It is quite conceivable that MADI could prove cost-effective, even in links carrying substantially less than 56 channels of data.

The Industry Reacts to MADI

At the Paris AES Convention, the AES Working Group on Digital I/O received a demonstration of two pieces of equipment communicating over working prototypes of the interface. At a full meeting of the Working Group, it was decided the AES would put forth the MADI Proposal for standardization by the appropriate international organizations. It was warned that this process would take a number of years, but the members of the MADI Group made their intention known to implement the proposed standard in their products at the earliest opportunity, without waiting for the standardization procedure to be complete.

On the Convention floor, the reaction of both users and manufacturers to the MADI initiative was almost universally favorable, with almost all the world's manufacturers of digital pro audio gear collecting copies of the MADI document and promising to evaluate it for use in their own products. The working demonstration of the interface proved a major factor in achieving this level of interest. The Convention also saw the launch of the first product to incorporate MADI as a standard feature: the Solid State Logic 01 Digital Production Centre.

The future of MADI now rests firmly in the hands of the buyers of digital pro audio equipment. If you believe that it is an important step toward a mature industry, then ask your suppliers when they will be producing equipment supporting this new initiative. Any manufacturers wishing more information on the standard and its implementation should contact any of the four companies participating in the MADI Group. ■

Mark Crowne is a design engineer working for Solid State Logic in the UK.

—FROM PAGE 160, SANDERS

made to the G. In the 01, we've developed really transparent A/D and D/A converters. Everyone talks about the number of bits; it's actually much more important how the bits are handled. Low-level linearity is far more important, we believe, than the absolute resolution. And oversampling helps a great deal by relaxing the criteria for filters in an elegant way.

Mix: Are you as enthusiastic about life in the digital domain as you were about the top end of the analog world?

Sanders: Very enthusiastic, especially since it is now possible for different manufacturers' machines to talk to each other. I think the adoption of MADI, a standard that was proposed by SSL, Neve, Sony and Mitsubishi for a protocol of sending up to 56 channels of digital audio through a single 75-ohm coaxial cable, is one of the most exciting recent developments. MADI is very simple—each channel gets slotted into a different place in the data stream.

MADI has been formulated by a small number of engineers from each company. There's been no politics or economic pressures. Perhaps because there's no real commercial axe to grind and it's cheap to do, it feels exactly right.

Mix: What are some of the immediate benefits of this standard?

Sanders: For us it means, for example, that you could go from any multitrack digital recorder and send any of the 32, 24, 48 tracks or whatever to the 01 on one coaxial cable. Once in the workstation, those tracks could be manipulated and then bounced back to the multi-track, all in the digital domain.

Mix: Besides the financial gain, why did you affiliate with UEI?

Sanders: A major motive for going the UEI route was because the five principal companies are able to do things together that they couldn't do by themselves. In some circles, it is called a club of entrepreneurs. It works well because we meet regularly and can bounce problems off each other, but we retain our individuality. And we get on with running our own businesses in between.

Our relationship with Quantel, another member of UEI, is particularly rewarding. At NAB we launched HarrySound, our second digital product, which provides sound editing for Quantel's Harry, the digital video editing system. HarrySound uses the same tablet and techniques that are used for video editing, and it can be interfaced to Harry or used as a stand-alone product. It is a classic example of synergy between associate companies.

Miles 33, another member of the group, makes electronic text publishing systems. They've had a similar cooperation with Quantel. We can now take a picture from Quantel's Graphics Paintbox and squirt written information onto the screen—text and graphics and sound, all beginning to merge from the same database.

Mix: Now that your company is so specialized, do you find yourself slipping behind the skill levels of your employees in order to keep up on the breadth of the business?

Sanders: We have a fantastic team at SSL. In all fields we've got people who are better at the job than I ever was. At one time I thought I would be worried about that, but now that it's fact, I'm actually delighted by it. ■

David M. Schwartz is editor-in-chief of Mix *magazine.*

SOUND RECORDING FOR "THE LAST EMPEROR"

AN INTERVIEW WITH IVAN SHARROCK

by Nicholas Pasquariello

On the day before he won the Academy Award for Best Sound, location mixer Ivan Sharrock felt his chances for winning the top sound film award to be "very mixed." *The Last Emperor* capped a nearly 30-year career that began at a British Broadcasting Corporation documentary unit—where, as he puts it, if you didn't get the sound, you didn't get the picture—and included early training as an electronic engineer.

During the mid-'60s, he traveled the world recording sports remotes—in Britain they're called "outside broadcast"—and foreign affairs sound tracks for Alan King Associates, the National Broadcasting Corporation (USA), National Educational Television (USA) and the Canadian Broadcasting Corporation.

Among Sharrock's main feature credits are *Ishtar* (1986), *Spies Like Us* (1986), *Greystoke* (1985), *American Werewolf in London* (1981), *The French Lieutenant's Woman* (1981), *The Dogs of War* (1980) and *The Shining* (1980).

When he and his crew arrived in China to work on *The Last Emperor,* they initially found accommodations difficult. After being put into a depressing, late '50s, Russian-built, monolithic hotel in downtown Beijing, Sharrock's wife discovered an I.M. Pei-designed hotel 45 minutes from the Forbidden City in an idyllic place called "The Fragrant Hills." The daily commute was a long one, but well worth the rural change of pace it provided.

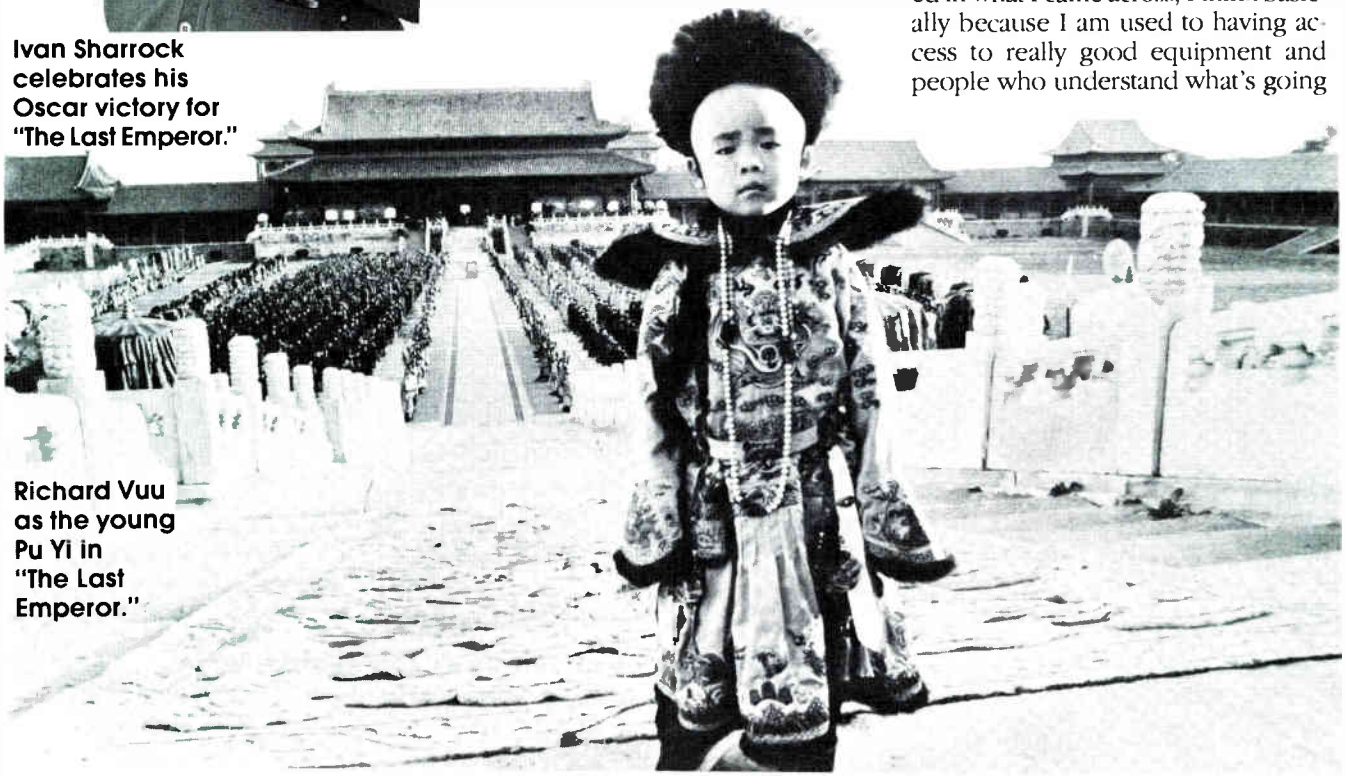
For four months of location recording, Sharrock's crew consisted of himself and two sound assistants, who were alternately British or Chinese. To be sure of having everything with him halfway around the globe from his London home base, Sharrock brought 79 cases of hardware valued at about $160,000 and weighing over 2,000 pounds. For maximum flexibility, especially in situations where no setup was possible, Sharrock used Schoeps stereo microphones with windscreens. On his stereo Nagra he customarily uses 7-inch reels, assuring that he will virtually never leave the camera crew waiting for him to change reels. His tape stock of choice is Agfa-Gevaert PEM 468, which he finds has excellent non-print-through capabilities.

Ivan Sharrock celebrates his Oscar victory for "The Last Emperor."

Mix: What did you do to prepare for this shoot?

Sharrock: I knew we were going to be in China from late July (1986) until the middle of November, and then coming back to Cinecitta studios in Rome, shooting there and on location in Italy possibly for another two months.

So I went to Rome to sort out what transfer and sound facilities existed there, and was extremely disappointed in what I came across, I think basically because I am used to having access to really good equipment and people who understand what's going



Richard Vuu as the young Pu Yi in "The Last Emperor."

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on. It wasn't just the language problem, it was the way things were done. I happen to record twin-track and transfer it to triple track [35 mm] on most of the movies that I do. I use a stereo Nagra and transfer the left track to track two on a triple track, the right track to track three, and a combined track for rushes and editing to track one.

At Cinecitta I discovered that yes, they could triple track. I said, "All right, where is the machine you would be doing it on?" They said, "We'll put a chair in here, and the stereo Nagra is set up on the chair." This was in the sound projection area of one of the dubbing theaters, with the noise of projectors and everything else going on around! It wasn't the sort of little transfer suite that I am normally used to.

Well, I went back to the producer of *The Last Emperor* in London and said, "I would suggest that we take our own transfer machine to China and that one of my crew do the transfer on location; it will save you the transportation costs of sending the sound back. If there is a problem, we will know what it is immediately, we are here—there's not going to be a communications or customs problem. And we'll take all the 35mm stock with us." Which, indeed, is what we did.

I took a transportable Magnatech 35mm triple track deck to China. It's a machine that uses 35mm full coat "between the perf" or clear edge stock. I've taken these all around the world and used them, for example, on *Ishtar* in Morocco and on *The Dogs of War* in Belize.

The editors had their complete soundtrack on track one anyway, so it would play on any normal "set mag" projectors. You didn't have to have a triple track projector when they were showing rushes.

We had portable projectors with us, but at the Beijing studios we were using some very good Chinese projectors called Pearl River projectors. I was very impressed with the quality of the picture and sound.

Now I had to work out what we would be needing in China, because we would be going there for so long, and obviously once one is there, there is no way you're going to get any other equipment there in a hurry. We had to prepare and get everything there in one go.

> "Bertolucci creates the whole idea of the image from every aspect, including—very much—sound."

Mix: What else was involved in the pre-production planning?

Sharrock: I got a very experienced crew, who have been with me a long time. I had a lot of difficulty in persuading the producers to budget two assistants for me. They were quite sure—again, I think, because of the Italian connection—that one could do a picture like this with just one assistant. [Because of the common Italian practice of shooting picture without live sync recording, Sharrock had some difficulty convincing the producer to allow for a second sound assistant.] I was adamant in pointing out that [director] Bernardo [Bertolucci] was going to shoot with two cameras a lot of the time, which can make it extremely difficult in booming. I was obviously going to need a multi-mic technique simply to cope with two cameras. Under their initial budget, there would have been only two of us.

I did persuade them, but not until I got to China. It was a very tricky thing with the producer and the Italian production, who were handling the money. It was quite hard to persuade them that this was necessary, which I found quite frustrating. I've not had this situation before.

Mix: How did you work with Bertolucci?

Sharrock: Bertolucci is extremely sound-conscious. He takes his inspiration from the day. He moves the camera a lot. He designs the first shot, and from there he will then design the second shot. It's not as if he comes in and says, "Right, there's a wide shot here, we'll then go into a couple of close-ups on that line, back to a two-shot and out." He doesn't work that way.

So it was very difficult to know what his next shot was going to be. You might be on an extremely tight close-up at the end of a long track, having started on a 20mm or 18mm wide angle encompassing a complete ballroom and ending up on somebody's tight head, and the next shot would be back on 18mm again.

We never knew where we were going, so what we tried to do was keep the sound very fluid so you didn't end up with horrendous cuts.

What it did necessitate a lot of the time were hidden microphones, some radio mics. We usually got away with fixed open mics or boomed mics—either under or over.

Vittorio's [Storaro, cinematographer] lighting was very easy to deal with: it's a very soft lighting. If one was doing an interior, there were very few lights in a room; everything was outside, as if the light was the natural light of that room, maybe with the odd lamp bounced on a little poly to get a little fill.

One of the advantages of this lighting technique is that there were no shadow problems.

The biggest problem that we had all the time was the way that Bernardo would design a shot: there would be no cut-ins on a lot of his shots. You might be on an 18mm with somebody right down to the far end of the room. Often I found myself mixing as that person approached—you'd come across from the radio mic across to the open mic as they got into a tight two-shot.

Mix: How would you sum up your working relationship with Bertolucci?

Sharrock: We got on extremely well; we were very sympathetic. He is a man who first and foremost is a poet and a filmmaker, as opposed to a director. He has extraordinary facets to his directorial abilities inasmuch as he creates the whole idea of the image from every aspect, including—very much—sound. He's an incredibly sound-conscious director. He is possibly the only Italian director who insists that everything be as it should be on the day [of shooting]; he will not turn over [roll film] unless the sound is right. ■

Nick Pasquariello is a San Francisco-based freelance writer and filmmaker.

—FROM PAGE 104, AUSTRALIA

stones was a stereo recording of Don Burrows Allstars in 1958 and Australia's first fully transistorized mixing console (designed and built by EMI in Sydney in 1962). That EMI was relatively slow to adopt 4-track (1965) and 8-track (1969) did not appear to seriously hinder its strong position in the market. When the digital era arrived, the company was the first to produce a fully digital recording, Kerrie Biddell's jazz ensemble, Compared To What (1979). In 1983, they also recorded what was to become the first CD release by an Australian artist—*Carnarvon*," a hauntingly beautiful, ambient album by electronic composer, Andrew Thomas Wilson.

No history of Australian sound recording would be complete without some mention of the vital pioneering role played by the Australian Broadcasting Corporation. As a national institution, the ABC is as much a part of Australian life as "Waltzing Matilda." It gave the country its first radio broadcast, its first television broadcast and its first (and by far its biggest) national radio and television networks. ABC broadcasts are now accessible to every Australian, no mean achievement in a land as vast and as sparsely populated as this one. Another company which, although not directly related to recording, has focused much global interest in Australian digital technology, is Fairlight Instruments [see "Spotlight on Two Southern Industry Stars" sidebar]. Formed in 1975, the company is now a world leader in computer music and sampling technology.

Although by no means Australia's only two world-class studios, EMI Studios 301 and Metropolis (which began life as Bill Armstrong Studios) continue to dominate the Australian recording industry in terms of size and prestige. Friendly but tough competition between the two has been one of the driving forces behind the rapid development of recording in Australia since the mid-'70s, with both studios boasting their share of "firsts" and big international recording projects. In 1988, as Australia celebrates 200 years of white settlement, it is fair to say that its sound recording industry has finally come of age. Nevertheless, there are those who are not altogether happy with the state of the art. Among them is Bill Ramsay. Sitting in Studios 301 in front of a splendid SSL 4056E 48-track desk, and surrounded by dazzling technology, Bill still feels a fond affection for the way things used to be. "You see this console with slide faders and knobs all the way up. Take a magazine and look at a console on every page. Every one of them looks the same. You used to go into one man's studio and you saw his idea of a console. All the parts would have been built by him. You'd put a lot of yourself into it. Today, it's very high tech, but it's the same high tech that everyone else has. In the early days at EMI, natural acoustics were really all you had to work with. Things now sound the same to me, particularly with electronic drum machines and the like. They're absolutely marvelous in that you get a perfect drum sound every time. That's probably what's wrong with them." ■

Gail Cork is former editor of Music Business, *Australia's music trade magazine. She has worked in the music industry for eight years (including four at Studios 301) and has written extensively on the subject of recording and songwriting for a number of Australian and overseas publications.*

by Craig Anderton

STATE OF THE SOFTWARE

Music software companies have always had to fight a bit of an uphill battle. Initially, they started off with the difficult task of having to explain what music software was, and convincing a skeptical group of musicians and dealers that software could be a musically valid tool. Matters have improved somewhat since the early days, and there have been successful music software products. Still, some serious problems persist.

This was brought into focus as a result of my position as editor-in-chief for *Mix*'s sister publication, *Electronic Musician*. We get letters from time to time complaining about a manufacturer's products, or perhaps about poor service from a repair department. In the past year or so, though, there has been a cluster of letters complaining specifically about software companies—everything from lack of support, to quality of product, to pricing, to copy protection, to unexplained crashes. These complaints, interestingly enough, are not directed at one or two manufacturers, but rather, indict the entire industry.

I think it's time that we faced a few facts, for the benefit of both software companies and consumers. Software companies are failing to deliver the goods in some key areas and need to clean up their acts. Consumers, on the other hand, need to be far more understanding of the problems faced by music software manufacturers in the late '80s.

Usually, complaints about programs arrive in batches. For example, as soon as a new version of a program comes out, or an existing program is ported over to another computer, we can expect to see a lot of complaints about the program. Why? In the case of a new version, new functions have often been "grafted on" to existing code. As the number of features in a piece of software multiply, the possibilities of running into a bug increase geometrically, and testing out all these possibilities becomes increasingly difficult. At some point, though, the software manufacturer has to release the program and hope that any problems are caught before too many copies have been shipped. In effect, users *are* acting as Beta test sites. A lot of customers get very indignant about that, but consider the reality—every person's system is different, and a manufacturer simply cannot test for every possible circumstance. This is an example where both sides need to show some understanding: companies need to be conscientious about immediately setting to work on fixing a bug as soon as one is reported; consumers have to realize that no software company can anticipate all possible problems.

Regarding the porting of programs, this is not as easy as it may seem, and errors can creep in. But the porting of programs also raises a deeper issue: the existence of so many viable computer systems. The music software market may be large, but it suffers from being split many ways—principally between the Macintosh, IBM, Atari and Amiga computer families. Designing programs for one computer just isn't enough to keep a company afloat any more, and we're seeing a lot of porting of programs from one computer to another. While in the short term that's good—we should all be

able to enjoy any type of software, no matter what computer we own—in the long run, having to duplicate so much effort is destructive. Companies have to promote the ported programs to different markets of computer users, and the time invested in reengineering a program takes away from time spent on new product development or customer support. (It also complicates life as an editor; manufacturers want to see reviews appear on ported programs, even if they are functionally virtually identical to programs previously released for other computers.)

A lot of complaint letters also seem to come just before a new version of a program comes out. It is a law of nature that "everything takes longer than you think," but apparently, this is something software companies disregard just about as much as—well, the rest of the world. Once the word goes out that a new version will be out in "six to ten weeks," the problems begin. If people just bought the program, they feel ripped off—the "why didn't I wait" syndrome. If they've owned the program for a while and are considering moving on to something else, the promise of an update may keep their support a little longer—but these people become increasingly impatient when six to ten weeks becomes six to ten months, or in some cases, never. Then if the new version comes out and *doesn't* fix that irksome bug, they're really upset.

The way around this problem, of course, is for manufacturers to not release a product until it's ready, *and to not promise features they can't implement properly.* But the world is too competitive for that, so we end up with a game of "chicken," where companies promise more goodies in the future to counteract the claims of another company that's promising a different set of goodies for the future. This is a dangerous game, though, and one that companies would do well to avoid if they want to retain their credibility.

The remaining batch of complaints usually involves copy protection. Just as the copy-code notch proposed for CDs messed up the sound of the mu-

BIG PIG
LET THERE BE DRUMS!

by Iain Blair

First, there's the name. BIG PIG. It's the sort of moniker that automatically hogs the headlines—and generates endless bad puns along the lines of "New Aussie Band Brings Home the Bacon."

Of course *Bonk*, the title of the group's debut album on A&M, doesn't help matters much either. "It's a sound word that kind of encapsulates the percussive nature of the band," explains founder-drummer-vocalist Oleh Witer with a sly smile, "But it's also a play on words—'bonk' is a British and Australian expression for the sexual act."

But the music contained in Big Pig's *Bonk* is no joke. With three drummers—and *no* guitars—the band has fashioned a record that jumps right out of the speakers with its energetic mix of R&B, blues and gospel influences filtered through a late-'80s tribal pop sensibility. It's an ebullient, unusual sound that is already gaining the Aussie seven-piece a large following both at home and in America.

Leader Oleh Witer first dreamed up the Big Pig concept three years ago while living in London. "I'd moved there from Melbourne, Australia, where I'm originally from, and the whole idea was partly a reaction to the same old rock format everyone was into," explains the soft-spoken singer at his record company offices.

"I was sick of seeing all these bands with guitars doing the same stuff and all sounding the same, and I was bored with joining groups that would all collapse just before we signed a record deal. So I started thinking about a different way of doing it, and how I could incorporate all the musical influences I really loved—everything from a capella gospel to early blues—with really energetic drumming."

A visit to a London performance by the all-drum Japanese Kodo troupe convinced Witer that his unlikely aural cocktail was a possibility, and after spending six months writing material and auditioning players, the first Big Pig lineup emerged.

"I think it was *nine* singing drummers—or nine drumming singers," he reports. "Basically, the lineup kept changing as we experimented with ideas and sounds. In the early days, it was really just percussion and singing, with mainly early gospel, church feels. It was only later that we added harmonica and keyboards."

With the basic dynamics established and the foundations in place, the group played around the London scene and made some well-received demos

— CONTINUED ON PAGE 176

Big Pig (L to R): Adrian Scaglione, Tony Antoniades, Tim Rosewarne, Oleh Witer, Sherine, Neil Baker, Nick Disbray

TIMBUK3: TAKE 2

by Holly Gleason

"It wasn't until we'd gotten our own equipment and had owner's manuals lying around that I could really begin to grasp the concept of programming, timing and stuff," Barbara K., the distaff side of Timbuk3, says about the new maturity of their sound. "So, I got more involved in that aspect and was real excited about the ability to program a more human feel into different things.

"Also, it was a challenge trying to figure out how to synchronize a live pass-through. You know, you have your basic programming, then you need to synchronize different little things on top of it—like drum fills and things. And I do think we've matured in that respect."

When Timbuk3 burst on the scene with the percolating "The Future's So Bright (I've Got To Wear Shades)" last year, everything about the guy, the girl and their beat box (their touring "band," on tape) seemed unorthodox. They had a pop sensibility that launched them into the Top 40, a smart alecky attitude that made them music biz outsiders and a slightly skewed viewpoint about life.

Or, as Pat McDonald explains, "What really grosses me out is all the people who throughout the '70s were trying to say, 'The '60s are dead. Now, you've got to be into money and vote Republican because the '60s are dead. Now you've got to

Barbara and Pat of Timbuk3

become ruthless and greedy because the '60s are dead.'

"There's a definite dichotomy out there, and the best way to reconcile it is writing about it. For Barbara and me, music is our way of bringing the idealism and the everyday struggle together."

"But I don't think it's necessarily moralizing," Barbara continues, "I think it's more like, 'Look at that incongruity. Boy, isn't it strange, this attitude or that.' "

Like the programming, the characters who appear on *Eden Alley* have far more depth than their *Greetings From...* predecessors. Barbara K. is especially pleased with "Reverend Jack And His Roaming Cadillac Church," about a lusting couple seeking fortune and fame on *Dance Fever,* and the high-tech post-nuclear family whose son spends his time trying to "Sample The Dog." As she says, "I think these characters really dance through this record."

But where that post-nuclear family's gone high-tech, Timbuk3 is striving to keep their technological involvement as simple as possible. To that end, Pat McDonald even investigated the feasibility of employing CD technology for their beat box's rhythm parts.

"Our rhythm tracks are basically drum machines, sound effects and the bass track," he says. "The thing that really has to be recorded is the bass since I play a Fender Precision bass on most of the tracks, and obviously I can only play one instrument at a time onstage.

"So, the idea was to get a stereo CD made where we'd have the bass on one side, and then have a sync code, like a MIDI or a SMPTE code, on the other to drive the machines and stuff. That way, we figured we'd be able to constantly upgrade our drums, because no matter what we were plugging in, they'd all be driven by the same sync code. We could keep working on our rhythm tracks instead of being married to what we've got.

"It would have also

—CONTINUED ON PAGE 178

WAVESTAR
OUTER SPACE ON A BUDGET

by Bruce C. Pilato

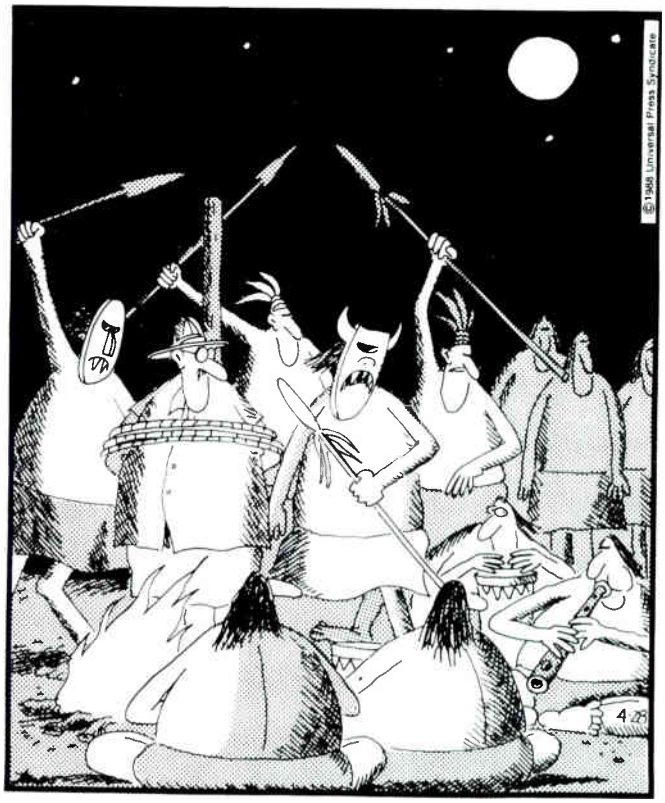
At a time when more and more electronic new age recordings are utilizing the most sophisticated and technologically advanced equipment, Wavestar, with their debut Audion-Jem Records album, *Moonwind,* bring a strong case for the argument that good records can still be made today on very small budgets.

Featuring a wealth of ambient moods and a musical style that is reminiscent of early '70s Pink Floyd and Tangerine Dream, *Moonwind* is a remarkably good sounding record, especially considering it was recorded in a makeshift 8-track studio on what the group calls "ancient" equipment.

Hailing from Sheffield, England, the duo—consisting of John Dyson on synthesizers and guitar, and Dave Ward-Hunt on synthesizers and sequencers—is an unlikely team to be making this kind of record. For one, neither was a professional musician or had ever played in a band before making their first recordings four years ago. Secondly, everything they've learned about instruments and recording they learned on their own, through trial and error. And thirdly, at a time when

—CONTINUED ON PAGE 178

THE FAR SIDE By GARY LARSON



Suddenly, throwing the festivities into utter confusion, Ujang begins to play "Stardust."

– BIG PIG, FROM PAGE 174

before Witer was forced to return home to Melbourne. "My visa ran out, so I went back, refined the concept, and then started looking around for other musicians to experiment some more with," he explains.

Percussionist Nick Disbray, who'd been in the original London lineup, had also returned home, along with vocalist Sherine, a Ceylonese singer who had witnessed Big Pig's first British gig in 1985. Together the three recruited two more drummers—Adrian Scaglione and Neil Baker, harpist Tony Antoniades and keyboardist Tim Rosewarne.

"Bringing in harmonica and keyboards balanced it all out," comments Witer, "and it still kept our sound from becoming format rock and roll. Staying fresh and also *looking* different was also the idea behind the Big Pig uniforms [onstage the band appears in black aprons]. It just seemed a bit silly to play our sort of music and wander out in jeans and sneakers. So we decided to wear these uniforms because our act is so physical. Of course, now we've been called everything from Romanian blacksmiths to an Albanian gymnastics team."

With the final lineup in place, Big Pig made their concert debut in February 1986 and almost immediately began planning the release of a self-financed, independently distributed EP. "It was just three tracks, but we were able to control all aspects of it, from doing the art work to pressing it and getting local airplay," explains Witer. "That's very important to us."

The band approached their debut video in the same spirit, shooting it quickly and cheaply from their own van and editing it with a friend to preserve the unique Big Pig vision. This time, to Witer's relief, the combination of EP and video hit jackpot, and the group was quickly signed up by Mushroom Records, the largest independent record company in Australia.

This deal in turn led to their A&M signing late last year and the recording of *Bonk*, which was produced and mixed by Nick Launay at Metropolis Studios in Melbourne, Rhinoceros Studios in Sydney, and Townhouse Studios in London.

"It took about three-and-a-half months to do, and we used the three EP tracks—'Hungry Town,' 'Money God' and 'Devil's Song'—as the basis for the album after we'd reworked them," explains Witer. "All the tracks were first recorded in Australia, and then we mixed the album in London.

"The biggest problem in recording was successfully integrating all the percussion parts so that nothing got lost in the mix," he continues. "It would be possible to play all the songs live in the studio, like a gig, but the problems of miking make it very difficult, so we built up each track bit by bit, first programming a drum machine, and then replacing those parts with live drums.

"By using the drum machine feel as a foundation, it becomes much easier to record complex patterns, and once you get past the high-hat, kick drum and snare, it all becomes a lot more fluid and a lot more human. We always fought against the idea of sounding too robotic just because so much of Big Pig's sound is based on rhythms."

Witer is also quick to stress that the band relies very little on technology or such obvious tools as sampling. "We're *not* electronic, and while there's some

– CONTINUED ON PAGE 178

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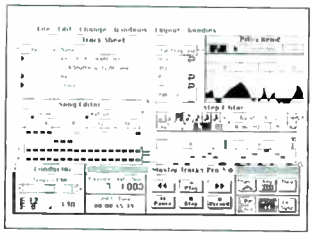

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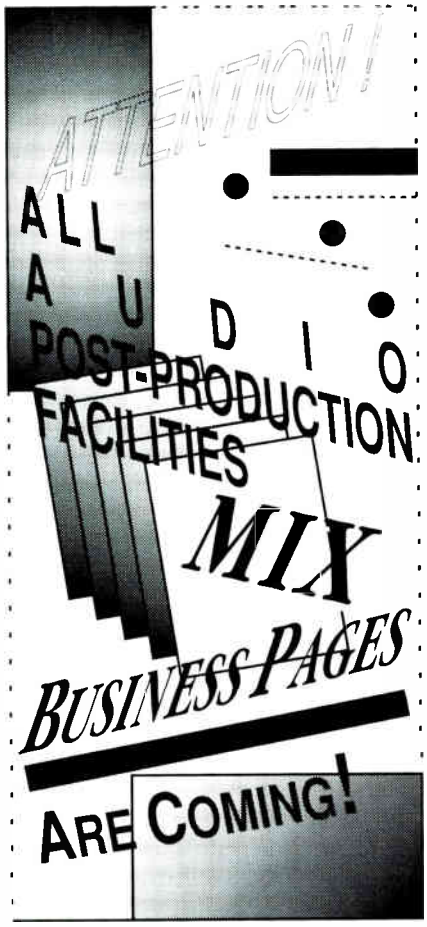

MUSIC · NOTES

—CONTINUED FROM PAGE 176

sampling on the album, it's not what you'd expect. We were sampling stuff like cellos, and anything we did like that was purely to supplement our natural acoustic sound," he reports.

"The main thing to remember is that we're very much an ensemble, a *band*," continues Witer. "And we're a *pop* band, not a rock group. Our songs are pop songs. Just because there are three drummers and two percussionists, people shouldn't get scared."

It doesn't look as if radio or fans *are* scared of Big Pig in America. *Bonk* has already made well-deserved noises on the charts, and the band hasn't even toured here yet. All that's about to change, however, says Witer. "The response has been so incredible that we *have* to tour now, and soon. So we're planning to start off in Europe, and then tour the States later this summer and fall.

"After that, we'll probably go to Japan, and then perhaps do a tour back home," Witer continues, before pausing and adding softly, "Right now, it's just a step at a time—we don't want to pig out." ■

—TIMBUK3, FROM PAGE 175

offered us better fidelity. But unfortunately, we'd have had to bring a lot more gear out on the road, bring things that might not have been very dependable when you get into a live situation, which we can't afford to do."

Instead, they've opted to use a Tascam 4-track until they can work out the CD's logistics. This way, they're able to put drums on two tracks, bass on one and monitor cues on the one remaining. For insurance, they bring along an extra Tascam 4-track.

With their success, the pair is very interested in improving their overall sound. As McDonald says of their original rhythm tracks, "Before we'd done any albums, a lot of the rhythm tracks we'd use live were pretty crude: the bass part would have mistakes in it and everything. Some of the sounds themselves were pretty poor. But, in the situations we were playing in—little bars—we liked it, and it really seemed to work well.

"I think it's a matter of knowing what works in any given situation. Certainly we'd never put something sloppy on one of our albums. In fact, we always work really hard on the rhythm tracks when we're in the studio—maybe because we're aware of what we've used in the past."

The duo and their beat box have come a long way from the time when they played on street corners for tips in Manhattan and later, Austin, Texas. If anything, though, the pair likes to learn from and assimilate what they've already done into their current projects.

With "Shades" having gone Top 20, it would've been very easy for the pair to graduate to bigger studios, more technology and, in turn, an even greater slickness to their sound in search of more success. Yet, *Eden Alley*, like *Greetings From...* before it, was recorded in producer Dennis Herring's basement, with the rhythm tracks brought in from the McDonalds' home.

This time, though, the trio moved from 16-track to a 24-track.

"We took our time with this record," Pat McDonald explains. "I think that's the *biggest* difference. With our first record, it felt like a dance you do when there's someone shooting bullets at your feet. This time, we felt like we were less under fire, so I think the project bred its own pace."

And out of that pacing came slower, more thoughtful tunes like "Sample The Dog," "Easy" and "Welcome To The Human Race." Could it be that Timbuk3 is growing up and making more adult-sounding records?

"I don't know if I'd go that far," McDonald demurs. "Our live sound was basically street music, skiffling sorts of things that were rather thin sounding. We just wanted this record to be a real big, loping thing rather than this cute, upbeat, quirky thing."

Barbara K. is there for the hand-off, concurring, "I'd like for people to see and realize that we're more than just some perky little duo. We're writing songs that say something that's important to us—and it may be important to them as well." ■

—WAVESTAR, FROM PAGE 175

most of the electronic music industry is up to its neck in MIDI technology, these guys didn't use any MIDI applications at all on their record. They made it the old-fashioned way.

It wasn't that Wavestar has any particular bone to pick with modern technology; in fact, they have every inten-

tion of getting into it and using it to the fullest. For Wavestar the problem has been one of financial restrictions, but they decided not to let that stop them. They took what they had and learned to be innovative.

"Up and down the U.S. and the UK there are lots of people who are in the same position that we were, and we just want to let them know that it *can* be done," says Dave Ward-Hunt. "You don't need to spend hundreds of thousands on a 48-track digital recording studio to be able to present your music in an acceptable form to the public."

Recorded on an 8-track Tascam 38 deck with no noise reduction, and then mixed on a Sony PCM-F1 digital 2-track, the album features an unusual hodgepodge of instruments sent through a mongrel modular system built by Ward-Hunt.

Keyboards used on the record include an Italian-made Siel Orchestra, which Dyson describes as "a very inexpensive dinosaur polyphonic synthesizer that we modified," and older units by Korg and Roland. The Yamaha DX7 is the only thing they used that one would expect to hear on most current electronic music LPs.

Aside from the financial considerations, the two also say they simply love the older analog sound. The noise level, however, is a different story. "Yeah, that's a constant battle," says Dyson. "But you learn to handle these problems by the very nature of being faced with them and knowing that you *have* to overcome them. So, that becomes a learning process."

With their engineers, Neil Thompson and Paul Ward, who they give much of the credit for the album's good audio quality, the group addressed the noise problem by placing a Symetrix 511 dynamic noise reduction unit across the stereo 2-channel imagery, just prior to going to the Sony digital. They also used an Aphex Aural Exciter to bring back some of the high end lost by the 511.

"We were really amazed when we were able to hear the quality of the music on the CD," says Dyson. Adds Ward-Hunt, "To do what we did you have to work hard and ask a lot of people for their help, but it can be done."

Dyson, 39, and Ward-Hunt, 46, often wonder themselves how they ended up together making records. Neither had any musical background, and Ward-Hunt, who spent years in the British Army traveling the world, had never even heard music from a synthesizer until a friend played him a Tangerine Dream album in 1975.

"I had played some piano and organ," says Ward-Hunt, "but it wasn't until I heard Tangerine Dream's *Phaedra* album that I discovered synths. The problem was, back then you were talking telephone numbers in dollars when it came to buying one! So, I went ahead and built my own."

Ward-Hunt went on to build several electronic keyboards and a makeshift 4-track machine made from a single cassette deck with two sets of auto-reverse heads. Eventually, he joined a local club of electronic musicians and there, in 1983, he met Dyson.

In 1985, the duo played their first gig at an electronic music festival in Europe and received enough acclaim to allow them to start recording. Last year, they were discovered by Larry Fast, who immediately signed them to his new electronic music label, Audion.

In the future, Wavestar is hoping to tour the U.S. and eventually settle into making film soundtracks. ■

by Robin Tolleson

BOBBY McFERRIN

THE HUMAN SAMPLER IN SESSION

Bobby McFerrin has set some lofty goals for himself since taking off into the world of vocalese in the late 1970s, and he's reached most of them—gigs with Weather Report, Joni Mitchell, John Scofield and Jack DeJohnette, the Tandy Beale Dance Ensemble, Grammy Awards and world tours.

Since putting a stun gun on jazz fans with solo vocal explorations on *The Voice* (Elektra Musician, 1983), he's gone even further in turning the stage and studio into his playground. His one-man big band version of the *Cosby Show* theme for this season is brilliant. He won a Grammy for his innovative musical interpretations of Kipling's work (aided by Jack Nicholson's narration) on the Windham Hill children's release, *The Elephant Child*. Technically, his new solo, all-vocal venture, *Simple Pleasures*, is a leap past anything he's done so far. Stylistically, it's a look back to Bobby's rock and gospel roots.

"I sat down with my manager, Linda Goldstein, one day, and we started thinking about these old pieces and talking about how good '60s rock and roll was. The next thing I knew we had written down around 40 tunes," McFerrin recalls. "I just went to the studio and started experimenting with some pieces. Out of it came this record."

"Good Lovin," "Suzie Q," "Drive My Car," "Them Changes" and "Sunshine Of Your Love" made it from McFerrin's storehouse of classics, along with five originals, which he completed during the sessions when the inspir-

PHOTO: STANLEY GREENE/87

ation hit him. There were large holes in all of them that required work in the studio.

"Come To Me" had a snaking, Prince-like rhythm track, but the heartfelt gospel message was added later. As the leader recalls, "I told everybody to take a break, and an hour later I had lyrics. Lots of things happen that way. I was definitely in a gospel mood. I even took my Bible to the studio everyday and had it open. I was thinking of Sweet Honey in the Rock when I wrote that, thinking of their voices. I kind of heard them singing it when I was doing it.

"I start with the basic tracks. I basically do the bass line first, which means that I have to sing the song to myself as I'm doing it, sort of working on the form as I go along. And then after that, it's up for grabs. It could be an ad lib track, could be a percussion track, or in the case of 'Come To Me,' I *heard* the harmony so I wanted to get that down first before I did the percussion and ad lib thing.

"On 'Simple Pleasures,' the bass line was jumping all over the place. It pretty much has the harmony and everything in that, and then I just sang the lead vocal on top of that. That was all ad libbed," the singer explains. "The way the verse came out—'I like to get up early in the morning'—just came out. I didn't have any set lyrics or anything on paper. That's just the way my day starts."

McFerrin enjoys the studio but tries not to go overboard. In fact he tries to do a little mixing down of his own to simplify things, and for economy's sake. "There were instances where I would put down two or three tracks and then take the essential parts out of those tracks and make one track out of them," he says. "The tendency with multi-tracking for me is to do too much, because I keep hearing parts. I have to resist the temptation to keep adding on. And so just to make things simpler, if after doing two tracks, I figure I can do it on one, that's what I'd do."

Simple Pleasures began in November of 1987 at the Power Station in New York and was completed on New Year's Eve. Chris Tergesen, who'd engineered McFerrin's *Cosby Show* theme, was once again behind the board, and the singer and Linda Goldstein produced. The operation moved nearer Bobby's San Francisco home, to Fantasy Studios in Berkeley, for the heart of the recording. They went back to the Power Station for touch-ups and mixing, and they mastered at Sterling Sound in New York.

According to Tergesen, few electronic effects were used on McFerrin's voice. On the intro to "Them Changes" it sounds like a nice flange effect on the voices, and there are some harmonizing, pitch-doubling effects in there to fatten up the basic tracks. Some delay echo and sting is used. The most obvious effect is Bobby's "guitar" solo on "Sunshine Of Your Love." "We took an old tube limiter and put it right on the microphone and turned the pot as far as it would go, loud," Tergesen says. "When he breathed in, the meter went *bang*, off the pin, and stayed there until the song was done. I turned it down in another gainstay. So it's on the tape at correct levels, but it had passed through this tube system, and tube electronics distort with even harmonics, which the ear likes. We asked the tube limiter to distort plenty for us. He heard that in his headphones as he performed the solo and put it on the tape. That's on the multi-track, sounding just the way you hear it."

Simple Pleasures is a clear, sparkling recording. Tergesen chose to bypass the Power Station's SSL console and passed McFerrin's mics through Neve EQs and microphone preamps everywhere on the album. However, it was mixed on an SSL with Total Recall to a Studer digital 2-track. "It's all digital, digital multi-track, digital two-track, so there's no tape hiss at all," Tergesen notes. "There's no analog involved. Most of the time we used an old tube mic, a Neumann U47. So there was a little bit of vacuum tube presence, but it wasn't really hissy, and pretty silent. But more times than not the sound that comes out of his mouth is quite soft, so I didn't feel like there was any alternative but to go digital."

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there. And then he'd slap it good and hard. That was often an enormous sound relative to the sound he was making from his mouth.

"On 'Sunshine Of Your Love' he took his shirt and socks off, put his socks on his hands and clenched his fists. And he's beating his chest like rock and roll double bass drums." Other than handclaps and chest-beating, McFerrin did all percussion orally, and it's some of the best mouth drums ever recorded. The hi-hat on "Suzie Q" is very strong.

The singer maximizes all his available sound banks. He uses his inbreaths for percussive slices of sound, and at times there sounds like an entire "gasp track" on tape. McFerrin says, "On 'Them Changes,' after the solo I do three quick inhales when I go back to the verse. 'Well my mind is going through them changes—ah, ah, ah.' Those three gasps really worked out. It's funny, because lots of those things that I do, I forget that I do them until we play them back. I think improvisation is so fascinating, because you don't really know what you're doing until you've done it. I didn't even realize I had done those gasps like that until the engineer pointed them out and said he liked that part."

Tergesen enjoyed utilizing McFerrin's fine mic technique: "On some solos we set up two identical microphones about four feet apart, one mic on each track, and each track on a different side of his headphones and in the speakers. So when he stood in the center and sang, it would come out the center of his headphones and go on both tracks equal level and come out of the center of the speakers. But if he leaned, or took half a step left or right, it would shift. So he was doing scatting solos and started playing with that. He messed with it a few minutes to get the feel of it and then did these solos between the two mics. He would sharpen and flatten himself and bring himself close to the mics and far from the mics as he was going left to right, so that it was this whole depth and Doppler effect happening."

Tergesen, who has engineered for Roberta Flack, Melba Moore and Kashif, and has done TV work on *Saturday Night Live, A Different World* and *Cosby*, suggests that a sharp eye be kept on McFerrin while cutting tracks. "He would often form postures, just assume a certain posture for a certain sound," he says. "And we'd send the assistant out to drop the microphone so that he could be in this posture and still have his mouth close to the mic."

Engineer Howard Johnston worked with McFerrin on *The Elephant's Child* and *How The Rhinoceros Got His Skin & How The Camel Got His Hump* at Different Fur in San Francisco. "Bobby will find little resonant spots [in the room]," he says. "Theoretically, it should drive engineers crazy, but it doesn't because he's so great about it. He'll find some resonancy, or run to a certain place in a corner of the studio to sing something. For him that's just part of the vocal," says Johnston. "To record him is challenging, because it could be from a whisper to a scream. You have to be ready at all times. And tape rolls, whether you're ready or not, because it's the moment that's most important, not how it was recorded. You have to be prepared to record at all times. You don't want to have something that sounded good slip by you."

McFerrin sometimes tries for effects and doesn't quite get what he wants. "Like anybody, some things work and some don't. Usually they work pretty quickly," reports Johnston. "That's what makes it such a challenge to record. Sometimes even trying a sound out is the most creative it can be. Then you say, 'Yeah, that'll work,' and go back to try to do it, and it doesn't sound the same. So that's why you should always record. You can always erase, but it's better to go ahead and record."

Johnston also miked McFerrin with a tube mic, a Neumann M269, and sometimes used an SM69 condenser. "He has great mic technique, but you're always caught with, 'What is the ideal way to capture him?' For him it's hard, because he wants the mic to disappear, he wants everything to disappear, and he has the skill to do that. Sometimes I'd mic in stereo and sometimes not, but I'd usually run two microphones anyway, two Neumanns for recording the music."

As they worked on the children's recordings, the singer had a copy of the script and a tape of Jack Nicholson's narration to interact with. "He would sometimes put a track down that would never be used, just an idea track, and he'd work off of that. And two ideas later he'd hit something," says Johnston. The engineer also marvelled at McFer-

rin's capacity for remembering parts he'd just recorded: "Say he puts down a scratch vocal track, then wants to go back and put something on top of that. He'll make three or four more passes and hit it right at the same spot, do things at the same time each pass through. After a while you realize that if it is extemporaneous, it really is very, very good synchronicity."

Co-producer Mark Sottnick might give McFerrin a suggestion about a part, or show him a drawing of one of the scenes, but according to Johnston, the singer comes up with most of it on the spot. "I'm not privy to how much he has in mind when he comes in, but basically I think it's just exactly how Bobby interprets it at that moment. There was a plant in the studio, and there was an occasion where Bobby just started singing through the plant and brushing against the leaves making a swishing sound. He plays the room, just like he does in live concert."

"I do those things to help get into character and to find sounds," says the singer. "On one track I played leaves; they had a leaf track. And at another point there's a snake, and I played my car keys. So I'm just trying to find things around me, organic sounds. The way the technology is, a lot of keyboard players have their samplers and things, and I guess I'm trying to sample my environment."

"When we did the *Cosby* theme together, we recorded analog," says Tergesen. "If you've been around an analog session, when the tape machine goes from play to stop you hear it slur off the speed. Bobby would hear that thing go off and stand there waiting for the tape to rewind, emulating that sound. It's instant recollection. Put anything into his ears, and he can duplicate it right on the case."

As much fun as McFerrin has on the live stage, leading crowds in song, vocalizing complete scenes from *The Wizard Of Oz*, it's obvious he likes the opportunity the studio gives him to create on a more full musical level. His last album was called *Spontaneous Inventions*, and his new efforts are no less of-the-moment. "That's just the way I work," says the singer. "I wait until I'm actually *in* the studio before I do some things." ■

Robin Tolleson freelances for Mix, downbeat, Musician *and is associate editor for* Drums & Drumming.

by Philip De Lancie

MORE ON THE 45's FALL

AND PROSPECTS FOR NEW FORMATS

Last month's After-Mix presented the views of three music industry representatives on the role of the seven-inch 45 in the prerecorded music market and the viability of various configurations that might fill the gap as 45 sales continue to wane. Examination of the issue continues here with comments from music industry consultant Marc Finer and music retailer Russ Solomon, past president of the National Association of Recording Merchandisers (NARM):

Marc Finer, President, Communications Research

The single is basically a taste of what an artist's repertoire is. In particular it is designed to focus on a hit, a release that represents the best product of that artist as far as potential sell-through or artistic quality is concerned. That is what the single has traditionally been in the era of the 45 and the LP. Many of us now in our 30s and 40s grew up with our first taste of an artist's music being a 45, and then graduated as we

PHOTO: GEORGE PETERSEN

grew older into a collection of albums representing the entire works of particular artists.

I believe that most labels still believe in the viability of the single concept, but they are also very realistic about the fact that the 45 vinyl product is no longer a feasible one. Primarily that's because the direction of music purchasing has changed so much in terms of configurations of choice. No longer is the industry looking to the LP as a growth potential area, but more to maintaining growth momentum in the cassette, and expanding the sell-through of CD and other digital media in the future. So, in the digital era, there is a need to expand the market to customers who have not yet become acquainted with the benefits, in terms of both quality and convenience, of the CD. Consequently, the industry has to decide what its goal is in the future in terms of promoting artists via the single configuration.

Up to this time, the industry has been presented with several choices. One emerged about two years ago, the cassette single. That was first promoted heavily in early 1987. Some of the labels, not all, got behind the configuration, which I guess was designed to address in cassette form the benefits of a promotional hit product to customers who are young. My own feeling is that it is too late. The cassette as a medium has been out for almost 25 years, and it was popular long before the labels got behind it in an aggressive fashion. So now, with cassette sales well over 400 million in album configuration, I don't think there is a need to focus on the cassette as a single promotional area in order to expand sales in the cassette medium for an artist. Everyone 12 to 25 is already buying cassettes right now. There is product potential out there in the cassette because of its popularity, but my feeling is that the industry must have a two-fold purpose in this digital era with respect to the single concept. One, of course, is the traditional promotion of an artist and that artist's work with a current hit. But the second is to expand the interest of the younger customer in new formats to which the industry is already committed.

Five years ago, the average 12- to 25-year-old purchaser didn't know what a CD was. Most, if not all of them, know what it is today. But they have a rap against it: it's overpriced. It doesn't justify the additional expense, which can be up to twice that of a cassette. The appeal of the cassette is based on three things: versatility, with car, home and portable use; convenience, in terms of easy pocketability and transportability of design; and good sound quality, now that it has evolved with Dolby and Type II tape into a high-fidelity product. So why do we need the CD? Well, CD is the ultimate in quality available right now in the marketplace, and it also offers the benefits of convenience and wear based on laser design. The adults who are 25 to 45 have bought CDs in record numbers because it is the best quality, because it is a status item, which we can never dismiss too lightly as a factor, and it has the convenience benefits. But the people who are younger don't buy with the same value structure as adults. Status is important to them too, as are sound quality and convenience. But everyone who has studied the youth market notes that young people buy primarily based on three important factors: price first, promotional hits second and portability third. CD has the convenience, it has the quality, and it certainly has the portability, but it does not have the value in terms of price compared to the product already locked into the minds of these target younger customers. So promoting not just the music, but the best format for that music, should be a prime purpose of the new single in the digital era. That is why I feel that the industry should be addressing, for its long-term benefit, the CD-3 format.

The three-inch CD is preferable to others for a number of reasons. One, it is easily differentiated by the consumer and the retailer at retail. Two, it is

small enough and flexible enough to format a number of different ways, whether it be for dance remix, for two or three hit songs, or for a unique compilation as a sampler. This will allow it to be positioned alongside the album-length CD without it being a product that would act in a cannibalistic fashion against it. And last, but not least, I think it's a real sexy, cute little item, which you can never dismiss in the marketing of music. And that will appeal to the younger market much more readily than the five-inch CD.

I think that for both the five-inch CD and the cassette, the use of the same size format for both album length and singles products can be a highly confusing thing. Some of the stores I've been in put the cassette single near the cassette section. I look at the two configurations, one selling for about two dollars and the other for six, seven or eight dollars. The cassettes look the same, and I think a lot of consumers wonder about the difference. On the other hand, when you see something that looks similar, but is differentiated as being a smaller version, a little brother, a junior version of the full length, the fact that there is less time is much more easily communicated.

No one should expect the music retailers, the hardware retailers and the consumer to simultaneously embrace CD-3, CD-Video and a five-inch CD single, which is what has been used in one or two European countries up to this point. For the sake of the industry, we should take this concept of extending the CD line one step at a time. The three-inch is the most readily addressable extension to take first. CD-V, while interesting, seems to be far too cost-prohibitive, and it would be difficult to communicate the benefits of five minutes of video to the vast majority of consumers who are not in the market right now for an expensive combi player. The five-inch CD is too confusing for the reasons I already described.

The average going price for the CD-3 should be between three and five dollars, depending on the type of music and formatting each label does with it. I have heard a wide variety of possibilities for it. For example, CBS announced at the NARM convention that they are going to have one group of CD-3 titles which will be hit music, with two cuts on it. Another will be what they call "Mix Masters" with a long play dance single. And another will be Hall of Fame Classics, with two or three cuts. A&M is taking a different tack. They are going to come out with one hit song and two bonus tracks unavailable on album releases. Classical labels like Delos are putting together short classical works. In the classical market there is a need to distinguish one label's offerings from another. What Delos is doing, and other labels are bound to follow, is to provide a sample or short movement of one of its works as an entire offering. I believe they retail that at about four dollars. So there are a number of ways to take the three-inch disc and differentiate it from the five-inch market.

One obstacle at the moment is the installed base of up to eight million households of CD players that for the most part do not have three-inch compatibility. But that is being addressed by three or four different accessories manufacturers who are offering adapters. The adapter is something that the committed CD customer will pay for. And it will not be much of an issue in the future, because since the Philips-Sony release specifications for the three-inch product came out last December, every hardware manufacturer's products announced in the last few months have been three-inch compatible. So there are probably already 50 to 60 new players available that are compatible.

"CD-3 will emerge as the stronger vehicle because it offers the labels more marketing potential than just promoting their hits. It's promoting their future."
—Marc Finer—

The most important area of all will be education and consumer awareness, which will be achieved through the cooperation of the hardware manufacturers and the music labels working with the retailers, much as we did earlier with the Compact Disc Group. I believe strongly that the CD Group was one of the reasons why CD got off the ground as quickly as it did. Everybody was talking the same story and communicating the same thing. Already there has been some talk about informally working together. There was a meeting in April with 22 labels discussing their needs in terms of marketing this new format. I expect to see more of this type of dialog in the future. There will be a duality in the market between the cassette single, which is already out there with some type of product support from each of the labels, and CD-3. But my feeling is that in the future CD-3 will emerge as the stronger vehicle because it offers the labels more marketing potential than just promoting their hits. It's promoting their future, the future of their CD technology.

Russ Solomon, President, Tower Records

The principal purpose of new pop singles in this day and age is as a vehicle to promote an album and to control the songs that get radio play in an orderly manner. Oldies are, of course, a different item; they just go on forever. But generally it is the interrelationship between getting the record on radio and getting some sales history to keep it on radio that is the basic purpose of the single. The record companies concentrate on getting one particular song out of an LP on the radio. If the radio picks it up, the radio people wonder whether or not the public likes it, so they ask the retailers whether or not it's selling. If it is selling, that perpetuates the playing, which leads to album sales.

From our viewpoint as retailers, the single is an item, and a good item because we sell a lot of them. We always have sold a lot of them, and we don't see any significant change, oddly enough, in our sales of them. I think mainly that is because we have always carried a lot of them. Tower carries just about all the singles that come out, and we maintain them, so they sell pretty well. There is a little diffusion as to what is selling nowadays. If the same item is available in 12-inch, the 12-inch might become a bigger component of the actual sales than the seven-inch. But if you look at record retailing

as a whole throughout the country, there are a lot of places that sell records that don't sell singles at all anymore. For instance, the rack locations don't sell very many singles. And a lot of chain stores have cut way down on the number of singles they carry, and they keep them hidden and that sort of thing. So if you are talking about overall RIAA sales figures, that does affect it.

At the same time, you have fragments in the market. You have the jukebox market, for instance, which still uses singles, and that is potentially a large part of singles sales. How are you going to service that industry? You've got to have a 45 for them, because that's what they play. And you have a certain number of people who don't want to spend a lot of money, but still want to buy some music. They may be using 45s to record on their home tapes. It's an easy way to make up a tape without having to buy the album. Then there are the people who are collecting oldies. They are also buying new singles, because new singles become oldies after a while, if they are any good. So you have a significant collector's market out there. There are just a whole variety of uses that people have for singles.

I don't necessarily see a replacement right away for the 45. But if there is going to be a replacement, I suppose that if you think about who is really buying singles, it is more than likely going to be the cassette single. There is some healthy action now in the cassette single. And I think that will grow as time goes on. The three-inch CD may have some effect, depending on programming, but that will require a lot of development for a while. They need to get it out timely and at the right price—a motivating price. But I don't see how they can do the same thing with a three-inch CD that they can do with a seven-inch single that costs them 20 cents to make. You can get the seven-inch vinyl out into the marketplace fast at a very low cost, even though you have to take some back. You can't do that with a CD, and you can't do it really successfully with a cassette. So I think we are going to have all four forms, if you count the 12-inch vinyl.

CD-Video will take a long time before it becomes a real factor in the marketplace. First of all, they have to issue them, and second of all, there have got to be some players out there for it. That would be a start. So I don't think we have to worry about that having a significant impact on the market. And the cost of the five-inch CD-Audio, with just a couple of songs on it, is a little higher than the record companies want to play around with. People aren't going to buy the damn things at five or six dollars apiece, that's for sure.

Coming back to the fact that you might have four singles-type formats coexisting, we say as retailers that we don't want to have to deal with so many different configurations. But we have been living with multiple formats since 1950, when LPs, 45s and 78s were the three formats. Then stereo and mono came along, and then quadraphonic. We live with them. We may not love it, but we live with them until the market peters out on them. At one time we had reel-to-reel tape, and then we had eight-track tape. So despite the problems it creates in terms of space and investment and all that, it is something that you accommodate if a market develops in it. I think that is basically the attitude that everybody has. If you take the position that what we are fundamentally in is the music business, and the video business as well, then the sound carrier or the video carrier is incidental to the music or the video that we are selling.

As far as a preference among retailers for a replacement format, there doesn't really need to be a consensus. The problem is really at the record company level, not at our level. We just go along with whatever the market is telling us to do. I don't think that we have a real interest in influencing the direction the record companies take. Retailers try to tell the record companies all kinds of things, but what the record companies need is what they need. They will tell you over and over that they would like to get rid of singles entirely, that they lose money on them. So, if they didn't have this abiding need to use the single as part of their marketing scheme to promote a record, they would throw singles out. But they really have no significant substitute for it on the horizon. ■

Contributing editor Phil De Lancie reports regularly on topics relating to record mastering and manufacturing, tape duplication, CD replication, storage and formats. He's also a mastering engineer at Fantasy Recording Studios in Berkeley, CA.

FEEDBACK

Brain Power

I was quite amused by the "Fast Lane" article by Stephen St. Croix in your May 1988 issue. I feel compelled to relate to you the 1974 concert I performed, which featured an early effort of the same technology that Mr. St. Croix alludes to in the article.

To fulfill my Bachelor's degree in Multimedia at Indiana University's School of Arts and Sciences, I created a multimedia show featuring live music using voltage-controlled lighting and audio equipment. While all of this predated MIDI by a decade, I was familiar with the work of Manford Eaton, who was, at the time, the leading expert on the subject of bio-music. I focused on the use of EEG equipment for the purpose of tapping my emotions for use as an alternate controller for analog synthesizers and lighting consoles. Having trained extensively in biofeedback, I was adept at controlling and inducing alpha and theta brain waves. The most intense performance came at one rehearsal, when, as I was tweaking the controls of the synthesizer, my peripheral vision caught a pleasing swirl of colors for the auditorium lights under brainwave control. As I turned to look into the auditorium from the control room, my emotions began to peak, as I was getting increasingly more emotionally involved with the music and visuals. The more excited I got, the more interesting it all became. Finally, I stopped working altogether and just gazed into the room, transfixed on the visual and aural display happening before my eyes and ears. I must not have even blinked an eye for five minutes, for fear of interrupting this mesmerizing process. When it finally ended, I had an overall euphoric feeling much like Mr. St. Croix described.

I concluded that the emotions were, in fact, a useful aid in dressing up a performance, and that happy thoughts created animated, wide-ranging changes in both sound and lights, while sad thoughts provoked more somber timbres and muted lighting. After further research, I learned that this method would ultimately be limited due to the fact that once a person becomes adept at entering different brain wave states, the individual's brain tends to seek a dominant frequency to center on each time the brain enters alpha or theta (in this case). As such, I realized that further sophistication on the part of the processing equipment would be necessary, and that, I might add, was extremely difficult in 1974. Today, it would seem, it is a different story.

Donald L. Tavel
Indianapolis, IN

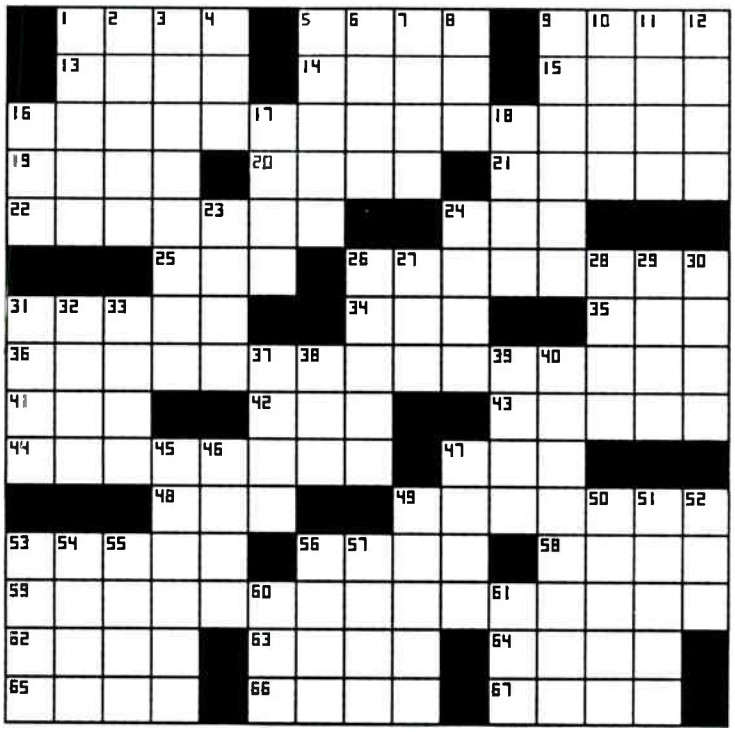
"New Age" Gets Some Respect

Thank you for your article on new age music (May '88). It seems that just about every article published these days on the subject comes from ignorance, consisting mainly of stereotypes about "yuppie Muzak" and interviews with artists who insist that they are not new age. Because writer Randy Alberts was willing to explore a deeper understanding of this fascinating musical genre, his article had a valuable perspective that went far beyond the usual derogatory comments about mindless doodlings typical of new age music articles.

I hope that you continue to publish information about work being done in the field. New age music is enriching the lives of a lot of people and will do so even more as people get a clearer understanding of what it's about.

Donna Zerner
Los Angeles, CA

MIX WORDS



A RARE MEDIUM

ACROSS

1. Tack
5. "Sixteen Tons" site
9. Exec
13. Wolf or star
14. Top quality
15. N. Scandinavian
16. Long standing kiddie show
19. Arrow poison
20. Musical pause
21. "..._____ ____ of the National Emergency..."
22. Movie awards group
24. River isle
25. Certain agcy.
26. Personality or tape
31. Home of the Ton Ton Macoo
34. Vane init.s
35. Latin verb
36. Film audio plus dialogue
41. French king
42. Be merry and drink partner
43. Map part
44. Certain movie effects
47. Common street abbr.
48. Preceeding a wife's name
49. Churches for matinee idols
53. Sneak off
56. French state
58. Roue
59. Memorable movie
62. Word of assent
63. Expanding pattern
64. Spanish canal
65. "Get the ___ out!"
66. Clairvoyant
67. Greek priest

DOWN

1. French mountain
2. ___ ___ calf
3. Come before
4. Fed. narc org.
5. Carrot for most donkeys
6. Signs
7. Straight, as whiskey
8. Noun ending
9. Wyoming river
10. Unusual
11. Great tale
12. Give a handicap
16. Spy org.
17. "___ la Douca"
18. Volume control
23. Record label
24. Like wine and cheese
26. Market section
27. Girl's name
28. Hardy heroine
29. "___ ites!" (Rasta cry)
30. Word ending meaning cook
31. A sandwich
32. One dandy
33. Weight loss exclamation
37. Afternoon affairs
38. My gal, of song
39. Bearing
40. Heading to sea
45. Loom
46. Team
47. Marrow
49. Provide the food
50. The big speakers
51. Tie ___ ___
52. But, to Brutus
53. On a Par, in Paris
54. ___ Linda, transplant hospital
55. Singular entity
56. French being
57. "...'tis of ___"
60. "___ My Party"
61. Avionics abbr.

Solution to June Mix Words

N	E	E	D	■	A	M	O	S	■	S	T	R	U	M
O	L	L	A	■	M	I	L	E	■	E	R	O	S	E
T	R	U	C	K	A	N	D	T	R	A	I	L	E	R
R	O	D	E	O	■	■	E	T	A	■	A	E	R	■
E	Y	E	■	N	E	T	■	E	G	A	L	■	■	■
■	■	■	B	A	S	S	T	R	A	P	■	A	M	P
S	T	O	L	■	T	A	R	■	■	E	E	R	I	E
R	E	M	O	T	E	R	E	C	O	R	D	I	N	G
A	L	I	C	E	■	■	N	A	V	■	E	L	K	S
S	E	T	■	R	O	A	D	M	A	P	S	■	■	■
■	■	■	S	M	U	T	■	E	L	A	■	A	B	C
■	O	N	A	■	T	R	A	■	■	S	A	L	L	Y
S	N	A	K	E	S	A	N	D	C	A	B	L	E	S
P	E	T	E	R	■	M	O	O	D	■	B	E	S	T
A	R	O	S	E	■	P	A	S	S	■	E	N	T	S

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NEXT IN MIX

SEPTEMBER

- Southern California & Hawaii Studio Directory
- Special L.A. Recording Supplement
- Radio Technology Update
- Studio Business Operations

OCTOBER

- Audio For Video & Film
- Canadian Studio Report
- North Central Cities: A Special Supplement
- Corporate Music Videos

AD CLOSING:
AUGUST 8
MATERIALS DUE:
AUGUST 15

NOVEMBER

- AES Issue with Expanded Distribution
- New Products Directory
- Ethics in the Recording Industry
- HyperMedia Update

AD CLOSING:
SEPTEMBER 8
MATERIALS DUE:
SEPTEMBER 15

ADVERTISERS INDEX

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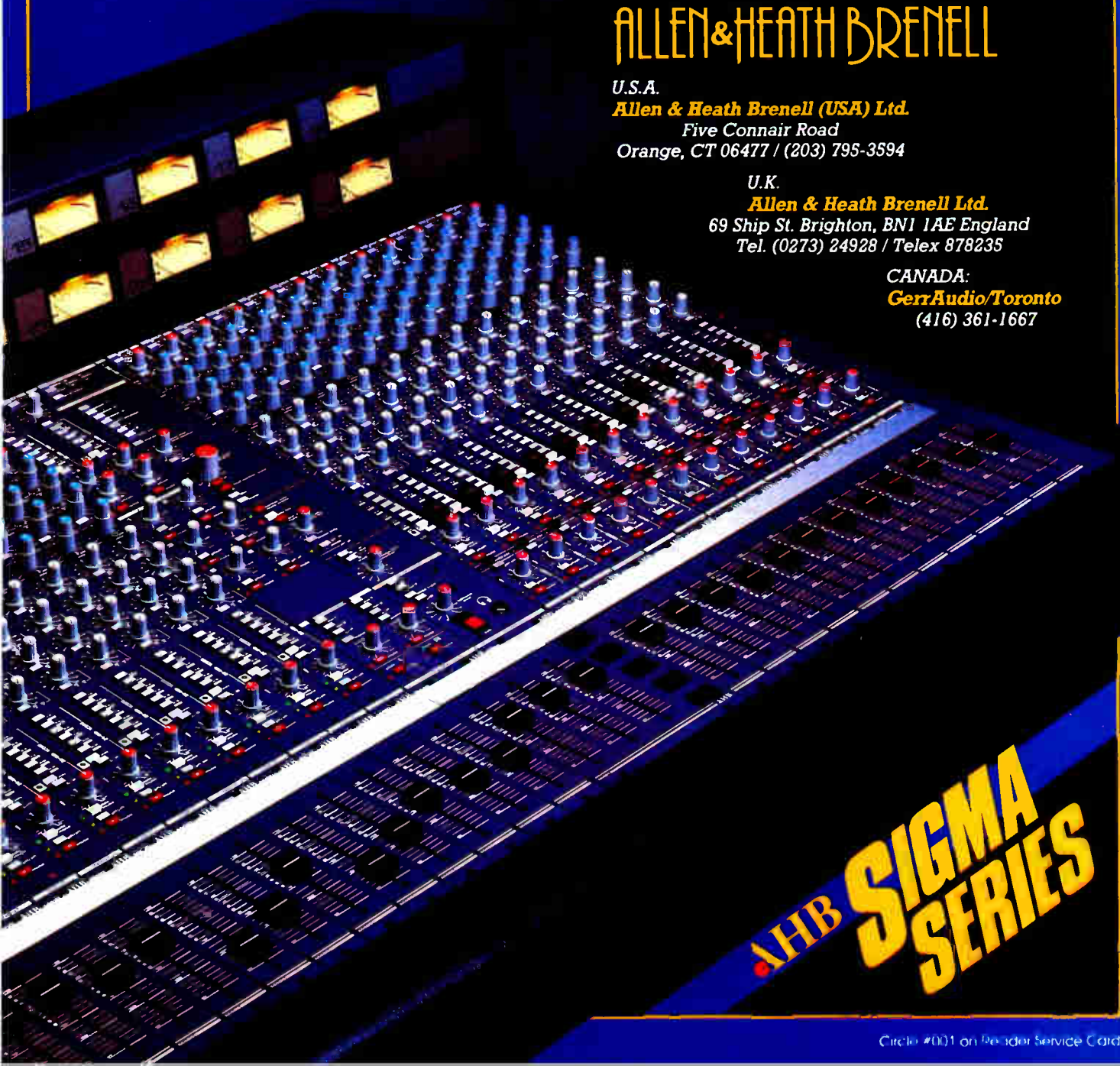

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It Takes More Than A Little Neodymium To Change The Face Of Driver Technology.

Hailed as the catalyst for a new generation of high performance compression drivers, the rare earth compound neodymium showed up in our R&D lab shortly after it was first formulated. But its extremely high cost and sensitivity to heat had to be overcome before neodymium could live up to its full potential.

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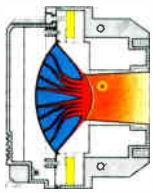

JBL's 2450J Neodymium Compression Driver with Coherent Wave™ phasing plug provides in-phase combining of sound waves for extended high frequency performance. JBL's patented diamond surround titanium diaphragm with new embossed dome greatly reduces distortion and damage at high SPL.

This new design, a phasing plug with annular apertures of constant path length, uniformly directs sound through to the throat providing in-phase combining of sound waves for extended high frequency performance. This new technology is combined with our patented diamond surround titanium diaphragm, incorporating a new embossed dome, to reduce the possibility of distortion or damage at high SPL.

2450J

The 2450's smaller size translates to tighter spacing of horn arc arrays, more even and precise coverage and greatly reduced requirements for delay. Plus, the 2450 nets out at a mere 4.8 kg (10.5 lb). The benefits of this dramatic weight reduction include lower shipping costs to the site or on the road and significantly less load bearing requirements for both structures and rigging. With built-in mounting points, the 2450 will take much less time to install.

Yes, it took more than a little neodymium to change the face of driver technology. But we're confident you will find the breakthrough results were certainly well worth the wait and the effort.

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