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The Electronic Cottage Moves Upscale

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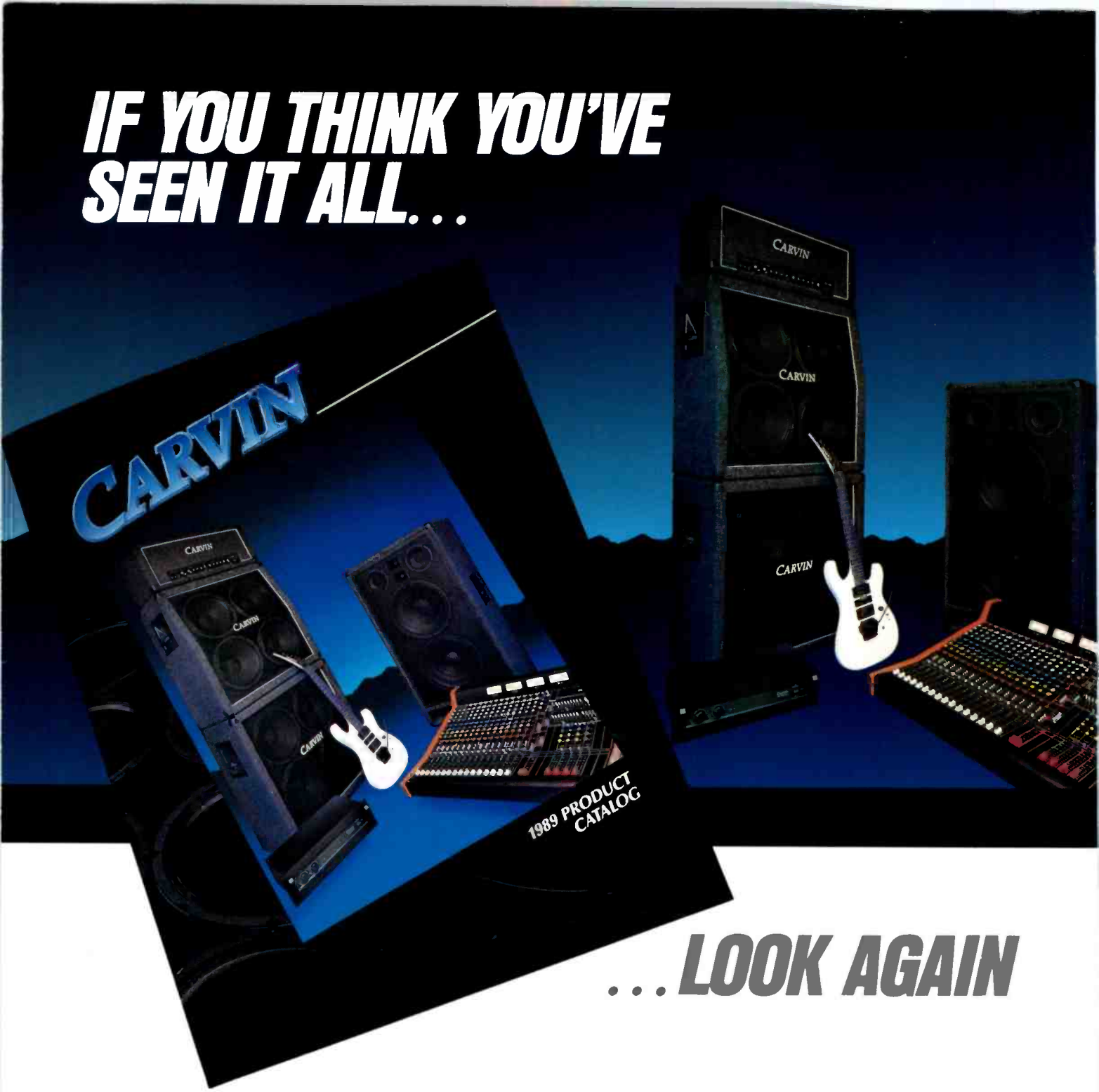

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JANUARY/FEBRUARY 1989 VOLUME 23 NO.1

db

THE ELECTRONIC COTTAGE

the broadcast engineer

the recording engineer

the sound contracting engineer

see page 44

About the Cover

● On our cover, four home-working-artist-engineers who are featured in *The Electronic Cottage Moves Upscale* beginning on page 16 and continuing to page 36. The cover shot features Richard Del Maestro at the top and clockwise from there, Suzanne Ciani, Claudia Marx, and Robby Kilgore and Mary Kessler.

Photo credits for the cover shots are Charles E. Smith (Del Maestro) Diane Rubinger (Ciani), Yetta Rosenblum (Marx), and Randall Wallace (Kilgore-Kessler).

Editorial

The Electronic Cottage

In the last several years, **The Electronic Cottage** has become the most important and fastest growing aspect of the professional audio recording scene.

We are grateful to noted author Alvin Toffler, who coined the term and the concept in his book *The Third Wave*. Mr. Toffler gave **db Magazine** permission to use both the phrase and the concept in our publication.

In a nutshell, he, and we at **db** believe that in the near future all work will be again a "cottage" industry from the most sophisticated to the mundane.

What then, are we doing with that term and concept?

The four stories that form **The Electronic Cottage Moves Upscale!** in this issue are a good example of just how diverse **The Electronic Cottage** can be. Each one is using it differently, either as part of a larger picture, or complete unto itself.

Suzanne Ciani is a major musical talent who uses her **Electronic Cottage** to prepare material for completion in a major studio. ***Robby Kilgore*** and ***Mary Kessler*** are sound designers using their audio equipment for film and TV. ***Town Crier Recording's Claudia Marx*** rolls a whole recording company into her **Electronic Cottage**. Finally, former musical child-prodigy ***Richard Del Maestro*** now looks to the **Electronic Cottage** to expand his musical ideas. Four case studies of today's **Electronic Cottage** in professional audio work.

As the recording industry continues to change, the focus of many major studios has also shifted to post production or other aspects of the recording field. As these shifts continue, and they will, **db** will be there to cover them just as it has since 1967. As a guide to our beliefs for 1989 please look at our Editorial Calendar (page 6) and see what an exciting year it will be.

To all our readers, a happy new year! L.Z.

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Calendar

• Upcoming workshop for **SYNERGETIC AUDIO CONCEPTS** is:

Concert Sound Reinforcement (Los Angeles Area) January 17-19, 1989

Contact: RR #1, Box 267, Norman, IN 47264, (812) 995-8212.

• **EDS '89** (Electronic Distribution Show and Conference), the national forum and marketplace for electronic distribution, will be held at the Las Vegas Hilton Hotel, in Las Vegas, Nevada. Conferences and seminars start on Monday, May 8, and exhibits open on Tuesday, May 9 through Thursday, May 11. The annual event is sponsored by the Electronic Industries Association/Distributor Products Division (EIA/DPD), the National Electronic Distributors Association (NEDA), and the Electronics Representatives Association (ERA).

Information about EDS '89 is available from the Electronic Industry Show Corporation, 222 South Riverside Plaza, Suite 2710, Chicago. IL 60606, (312) 648-1140.

• **Pro Audio Asia '89**, the international trade exhibition for professionals in the broadcast, recording, public address, installation, contracting, and duplicating industries, will take place from July 6-8 1989 at the Hong Kong Exhibition Centre in Hong Kong.

• The **Winter NAMM** (National Association of Music Merchants) will take place on January 20, 21 and 22, 1989 at the Anaheim Convention Center in Anaheim, California.

• The **UCLA Extension** Department of the Arts will present four recording engineering classes this winter. The classes are *Recording Engineering Practice I, From Fixer to Mixer: Studio Operation and Maintenance, Audio Signal Processors: Effects Devices—A Workshop*, and *The Merging Technologies of Audio and Video: A Production Workshop.*

For further details about these classes or UCLA Extension's nine-course Professional Designation in Recording Engineering program, call (213) 825-9064, or write PO Box 24901, Los Angeles, CA 90024.

• A four-week program, comprised of eight accredited graduate level courses in acoustics and signal processing, will be offered in June 1989 by **Penn State's Graduate Program in Acoustics** in cooperation with the University's Applied Research Laboratory (ARL) and the Research Center for Acoustics and Vibration Engineering (RCAVE). Courses offered include *Fundamentals of Acoustics, Underwater Sound Propagation, Digital Signal Processing, Electroacoustical Transducers, Acoustical Data Measurement and Analysis, and Intensity Technique.*

For further information contact: Dr. Alan D. Stuart, Summer Program Coordinator, the Penn State Graduate Program in Acoustics, PO Box 30, State College, PA, 16804, (814) 863-4128, or Mrs. Barbara Crocken at (814) 865-6364.

Department of Corrections

• In our November/December feature *A Bite of the Big Apple*, several corrections should be noted in the section (beginning on page 18) *Maximum Potential*. On page 21 toward the bottom of the first column, EBN is talking about soon having 1520 megabytes, not 400 as stated. In the Equipment List for that section located on pages 22 and 23, two errors crept in. Under *Consoles*, the Roger Mayer unit is all discrete, has no ICs; under *Miscellaneous*, it should be Roger Powel's Texture (sequencing) software.

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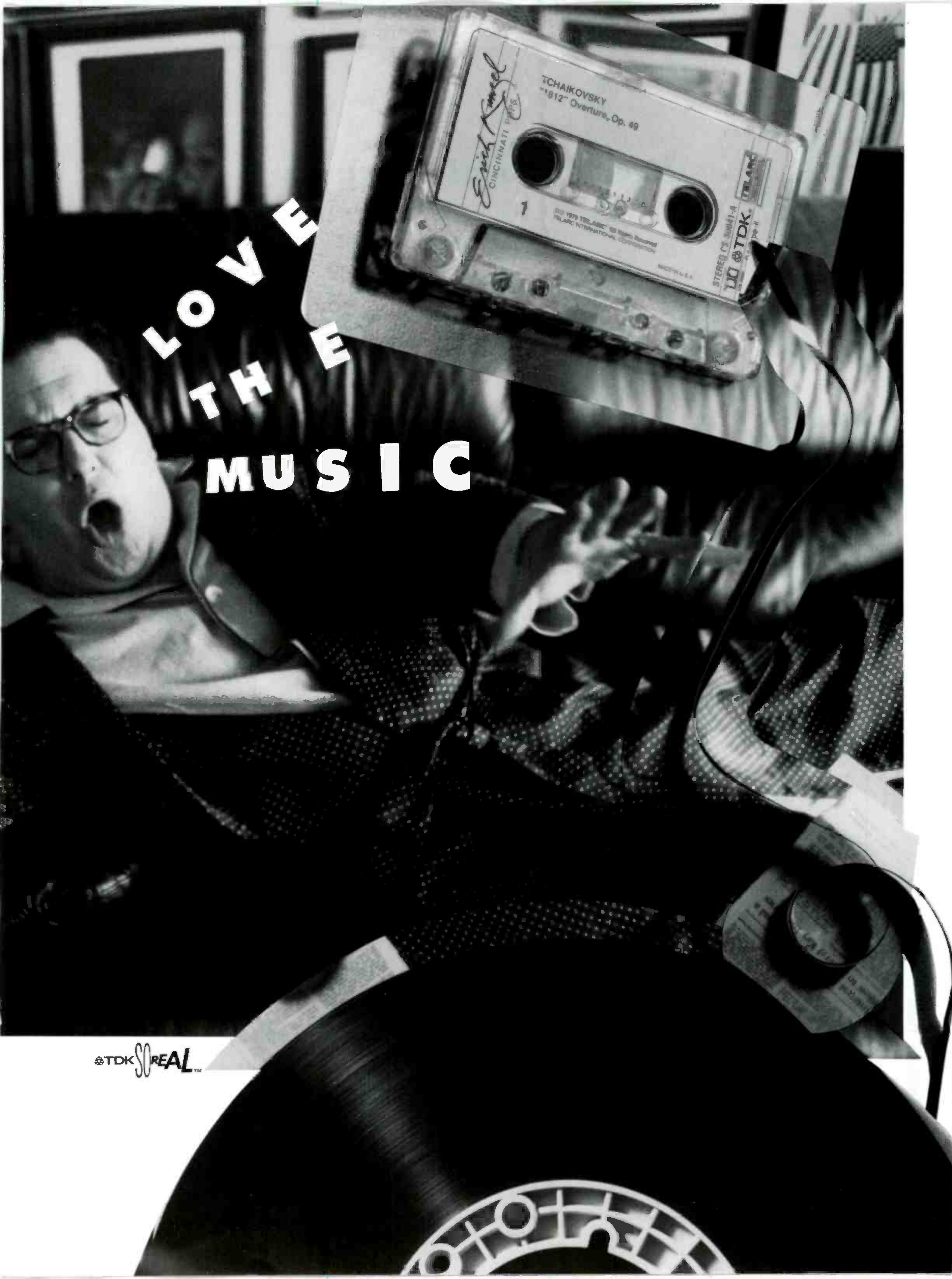
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1989 Editorial Calendar

JAN/FEB ..... db Looks at the Electronic Cottage going upscale!
A broadcast report on the Seoul Olympics
• GUIDE: Speakers: performance & monitor

MAR/APR ..... db Looks at the Sound Reinforcement Scene: theory, layout, and construction
• GUIDE: Power Amplifiers

MAY/JUNE ..... db Looks at The Windy City
• GUIDE: Consoles & Mixers

JULY/AUG ..... db goes on tour with the Major Touring companies
• GUIDE: Tape, tape recorders and accessories
Microphones

SEPT/OCT ..... db looks at the Boston Recording Scene
• GUIDE: Signal Processing Equipment, Part I

NOV/DEC ..... db Looks at The West Coast & Hawaii
• GUIDE: Signal Processing Equipment, Part II
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Broadcast Audio

RANDY HOFFNER

From Seoul in Stereo: The 24th Olympiad

Coverage of the Olympic Games for United States television is always the ultimate in remote broadcasting because of the sheer magnitude of the event. The use of an O.B. van or two will suffice for the average sports remote, but the Olympics is in a class by itself. Some 25 or so competitive venues, plus the several anchor positions, studios, and other origination points involved in the 24th Olympiad required no fewer than 40 O.B. trucks, and a lot more. Such events as marathons and cross-country bicycle races necessitated special coverage techniques and equipment such as helicopters, electric motorcycles, and other special-purpose vehicles with arcane types of microwave transmission equipment to return their signals to the Broadcast Center. In addition to live coverage, a vast amount of video tape production was required before, during, and after the 17 days that the Games were played.

The Olympic Games unquestionably constitute a major sports event, but they also generate news stories, and electronic journalism and other mobile coverage resources are an integral part of the Olympics equipment retinue. Vivid memories the Seoul Olympics include the morning that the Ben Johnson story broke, resulting in the transformation of the by-then routine chaos of normal coverage of the athletic events into the very un-routine chaos attendant to coverage of a major news story.

FIRST STEREO OLYMPICS

Because the Seoul Olympics were presented to the United States television audience by NBC, it was only fitting that they be accompanied by stereo sound. Stereo, of course, added a new factor to the coverage of an Olympiad. As anyone involved in television audio knows, stereo production implies far more than the simple addition of a second audio channel.

The heart of NBC's Olympics production and broadcast system was the NBC broadcast plant located at the International Broadcast Center on the Island of Yoido on the Han River in Seoul. The NBC broadcast center at the IBC, along with NBC facilities at the venues and anchor positions, constituted a temporary television plant second in size only to the Host Broadcaster, the Korean Broadcasting System, which was supplying pictures and sound not only to its own networks, but also to all the broadcasters of the world. The NBC facility at the IBC occupied about 55,000 square feet, and housed a technical plant that was the third largest NBC technical facility, behind NBC broadcast centers in New York and Burbank.

The NBC production and broadcast plant at the IBC consisted of four large edit suites, eleven small edit rooms, two studios, two control rooms, a state-of-the-art graphics facility, a Transmission area to handle the myriad of feeds into and out of the Broadcast Center, and a core plant to integrate entire system.

The first all-stereo Olympics was also the first Olympics covered using the M-II half-inch professional video tape format. NBC's coverage relied on the M-II format, which incorporates a number of advances in audio recording on video tape. The format has four audio tracks in addition to dedicated longitudinal and vertical interval time code tracks. A stereo pair of longitudinal audio tracks incorporate Dolby "C"

Figure 1. NBC's building at the International Broadcast Center in Seoul, Korea.

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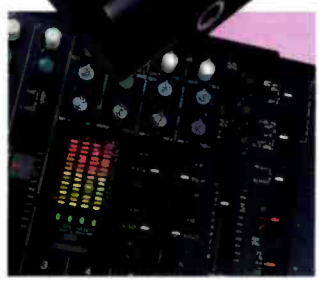
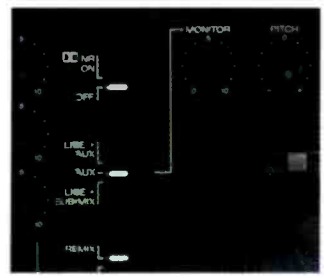
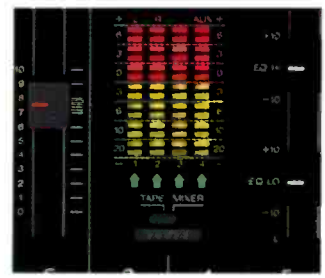
Sub-Mix Section. The X-26 sub-mix section allows you to adjust pan and gain for either tape or source on each of four channels. You'll find many uses for this 4 x 2 sub-mixer, which is very useful for overdubbing.



Mixing Flexibility. Six inputs, Master *and* Monitor Stereo Outputs, Stereo Effects Receive and Tape Sync Out give you plenty of mixing flexibility. Stereo Effects return is an especially nice feature for all mixing applications.



Monitoring Flexibility. With the X-26, you can monitor the main stereo buss, the aux buss (effects send) and the sub-mix buss. You can monitor the logical combinations, too.



Metering Flexibility. The X-26 allows you to switch the 4 meters between Tape (Tracks 1-4) and Mixer (Stereo L + R and AUX Send). You'll be able to see everything from input to output. What's more, multi-color LEDs also indicate tape mode and recording status.

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Figure 2. Seoul Earth Station Number 1.

noise reduction. This, along with M-II's metal tape result in longitudinal audio tracks that deliver 15 kHz frequency response and appreciably better noise and distortion performance than their counterparts in one-inch video tape systems. The second stereo pair of audio tracks are frequency-modulated carriers that deliver 20 kHz frequency response and even better distortion and noise performance than the longitudinal tracks. The video tape recorder complement at the NBC broadcast center included machines of other formats for archival material and tape interchange, but Olympics production and broadcast relied on about 100 M-II machines.

CD, TOO

The first all-stereo Olympics was also the first CD Olympics. The primary format for the music library which was created specifically for the event was the compact disc. The library consists of 35 hours of music, which was recorded on a set of 30 CDs. Each edit facility, control room, and venue audio facility was provided with a set of the CD music library.

Production facilities included four identical large edit suites, one of which was assigned to each of the four daypart programs. Each large edit suite included seven video tape machines. The heart of the large edit suite's audio section was a mixing console with 24 stereo line inputs, six microphone inputs, and eight stereo line outputs. Other audio equipment included an eight-track audio tape recorder with time code chase capability, a stereo audio tape recorder with center-track time code, an audio cassette deck, a compact disc player, and two audio cartridge recorders, plus a full complement of outboard audio processing equipment. Audio phase monitoring was of course included in all edit rooms as well as the Transmission area. A high degree of versatility was built into the large edit suites. Each could be used as a control room in its own right, and each video tape machine in the large edit suites had its own routing switcher output, enabling it to be used for direct recording independent of activity in the edit room itself.

THE EDIT ROOMS

Each of the eleven small edit rooms was devoted to a smaller-scale task, such as news editing or editing work for a particular Olympic event—swimming, for example. Each of these rooms had either three or four M-II machines and a small stereo audio console which could be operated under the control of the video switcher. Each also had a compact disc player and an eight-track audio recorder with time code chase capability. An interesting aspect of the small edit rooms was that they took advantage of M-II's component video recording format by keeping all video signals within the room in component form, translating to or from composite NTSC video only when signals entered and exited the room. In this way, component editing and dubbing reduced generational video quality loss. Each small edit room could feed the plant routing switcher directly. As in the large suites, each video tape machine had its own routing switcher output, enabling several jobs to be done at once in a given room.

In addition to the edit rooms, a central video tape area composed of some 24 machines provided additional production capacity and on-air playback, as well as archival recording of all programming.

Each stereo venue delivered four audio signals to the Broadcast Center. A stereo NBC unilateral or "full mix" audio feed contained natural sound, announce audio, and music; while a stereo international sound feed was composed of natural sound only. The presence of two stereo pairs from each venue produced the necessity for more than routine care to be paid to inter-channel phasing. It was not sufficient to assure relative phase between left and right stereo signals. In order to facilitate fading from unilateral to international sound, relative phase integrity among all four audio paths had to be assured.

THE PATH TRAVELLED

The video signals from most venues travelled to the broadcast center via fiber optic links, and the audio was sent on digital T-1 circuits, assuring the preservation of high audio and video quality. Some few venues were linked to the Broadcast Center via microwave paths that lacked the capacity for stereo. In such cases, their monophonic audio was passed through stereo synthesizers to add a dimension of width to their sound fields. In this way, a more consistent sound was produced when this audio was juxtaposed with the true stereo that accompanied most Olympics programming. The in-

Figure 3. The author (second from left) and friends.

MEYER SOUND

Sound Thoughts on Live Performance

"Creating the subjective experience of live performance sound belongs to the artists and sound designers. Our creativity comes in building speakers and systems that give the truest possible account of what the performers produce."

John Meyer, Founder and President, Meyer Sound Laboratories

John Meyer's involvement in loudspeaker design began in 1967 when, as a technician for a Berkeley, California Hi-Fi supplier, he set out to discover why a leading manufacturer's drivers kept tearing themselves to pieces. Further investigations convinced him that the market sorely needed a class of rugged professional speakers that would maintain their characteristics over time.

Research in Switzerland in the early seventies secured his knowledge base. In 1972, Meyer developed the JM3 all horn loaded tri-amp system with rigging, which was the standard for Broadway shows until the introduction of the UPA in 1980. From 1973 to 1979, Meyer sought out the best available parts and designed the first Ultra Series™ reinforcement speakers. In the decade since, John Meyer has established Meyer Sound Laboratories at the forefront of professional reinforcement technology.

Meyer Sound has devoted itself to designing, manufacturing, and refining components that deliver superb sonic reproduction and expand the artistic possibilities of professional sound reinforcement.

Meyer strives for professional sound quality that is predictable and neutral over an extended lifetime and across an extended range. Even after extended use, Meyer Sound performance is never compromised.

As a consequence, Meyer Sound products have earned a reputation for the highest reliability in the industry. All are guaranteed to meet or exceed specified performance levels when properly installed.

"The general public's sophistication keeps growing. Soon, if we have our way, the audience will demand the same accuracy in live performance that they get from home recordings."

Instead of second-guessing the tastes of the market, Meyer produces sound systems that most truly represent the character of the signal they receive, leaving artistic control where it belongs—with the artists and sound designers.

Meyer takes a conservative view of exotic loudspeaker materials, preferring to use proven materials in new, more elegant ways.

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Meyer originally intended to be solely a manufacturer of high-quality, rugged and reliable loudspeakers, expecting others to pioneer and perfect testing equipment. But the need to accurately measure the performance of Meyer components individually and in arrays outgrew the quality and resolution limitations of available testing equipment.

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Figure 4. NBC's Anchor Pagoda at Olympic Park.

ternational sound feeds provided by the Host Broadcaster were also monophonic, and they were passed through synthesizers for the same reason.

A routing switcher of major proportions was required to service the enormous number of sources and destinations involved in the NBC Olympics coverage. The switcher used for this task is a product of the 3M Corporation. It employs C-mos hybrid switching technology, resulting in a small physical size for its switching capacity. In fact, the physical size of this switcher is said to be limited not by its electronic circuitry, but rather by the space required for input and output connectors.

The switcher operated under the control of several embedded microprocessors, with overall system control being handled by a redundant pair of supervisory computers. A major feature of this switcher was the ease with which its configuration could be altered with software modifications.

The routing switcher had a number of levels, each of which actually constituted a separate switching matrix. The audio matrix itself consisted of 192 stereo inputs by 288 stereo outputs, and of course there were video, key signal, and time code matrixes as well. The configurational flexibility of the router permitted two stereo audio pairs to be subselected along with a given video source. In this way, the stereo audio matrix appeared to the user to have four audio levels rather than two. The router normally operated in an audio-follow-video mode whereby calling up a source produced the appropriate video and four associated audio channels, but the audio signals could readily be broken away from video if desired by the user. When recording from an athletic venue, full-mix audio was recorded on audio 1 and 2 of the M-II tape, while natural sound only was recorded on audio 3 and 4. In this way, both audio signals were available for use in later production.

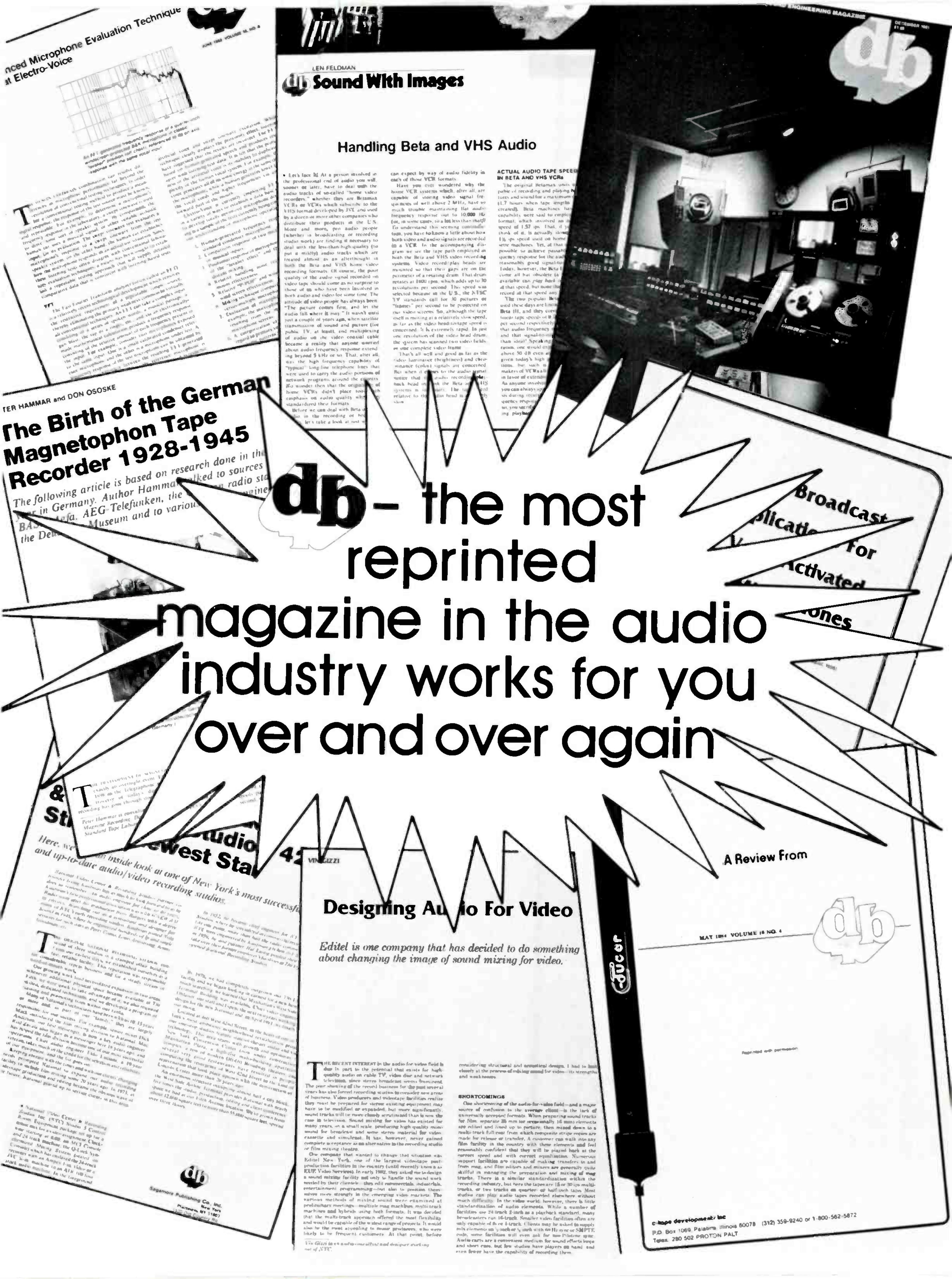
Incoming video feeds passed through frame synchronizers and remote-controlled processing amplifiers, and incoming audio feeds passed through audio delay units which compensated for the video delay introduced by frame synchronization, and through distribution amplifiers with remote gain controls. Audio and video adjustments were incorporated into a system which enabled a Transmission operator to adjust the levels and other parameters of incoming signals from a console position. A special quality control matrix, part of the routing switcher, permitted the Transmission engineer to observe incoming audio and video signals before processing, after processing, and after passing through the main routing switcher.

Figure 5. Control Room "A." The monitor wall gives an idea of the complexity of the coverage task.

Two large control rooms were used for the integration and on-air production of Olympics programming. These identical rooms were used alternately for the four daypart programs. That is, the Prime Time programming emanated from Control Room "A," the Late Night show followed from Control Room "B," and so on for the early morning and the afternoon segments. The two audio control rooms were definitely state-of-the-art, being built around fully-loaded SSL 6000 consoles. Each console was supplied with audio signals from 16 routing switcher outputs, microphone feeds from the two studios, from each control room's dedicated announce booth, and from the four stand-alone announce booths that could be used by all edit rooms as well. The equipment roster of each audio control room was fleshed out with two stereo audio tape recorders, a compact disc player, a host of outboard processing equipment, and of course the ubiquitous stereo phase scopes. The main stereo output of each control room was available from the routing switcher, and also via a direct feed to Transmission for feeding outgoing program circuits.

CROSS-WORLD TRANSMISSION

If you are beginning to think that nothing about NBC's coverage of the 24th Olympiad was simple, you are right. With the production and on-air integration systems covered, there remained the problem of transmitting the excellent video and stereo audio signals produced at the International Broadcast Center back to the NBC broadcast centers in New York and Burbank for distribution to the NBC affiliate television stations. It is difficult to get very much farther away from New York City than Seoul without leaving the planet; they are literally on opposite sides of the Earth. The primary video feed was sent on a fiber optic link from the Broadcast Center to "Seoul Earth Station Number 1," a portable Ku-band uplink located in the IBC parking lot. From Seoul 1 the video signal and an accompanying mono audio mix were uplinked to an Intelsat Ku-band satellite. These signals were subsequently downlinked at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an earth station at Santa Paula, California, and re-uplinked to NBC's SkypathTM satellite system using another portable uplink. This marked the first use of Ku-band technology for television in Korea, but NBC is certainly no stranger to the technology. The Ku-band Skypath system has been used by NBC for networking for the past several years. Of interest is the fact that Seoul 1 was shared by the Japanese Broadcasting System (NHK), both for their regular coverage and to transmit experimental high-definition pictures of the Opening and Closing Ceremonies and other selected segments back to Japan. NBC's secondary video signal and its accompanying mono audio mix were sent via a fiber optic link to an earth station at Kumsan, Korea, where it was uplinked to an Intelsat C-band satellite. These signals were downlinked at Triunfo Pass, California, and sent on a microwave carrier to NBC's Skypath uplink in Burbank.

It was impractical to incorporate more than a single audio path on these international transmission systems, so Olympics stereo had to be sent back to the United States in another way. It was sent on one of three AT&T T-1 carriers NBC used for its Olympics coverage activities. A T-1 circuit is essentially a two-way digital trunk line which provides a 1.54 megabit per second data stream in each direction. The T-1 circuits used by NBC were configured to provide two 15 kHz digital audio paths, plus coordination intercom circuits, data circuits, and tie lines connecting NBC's Seoul and United States telephone networks. The T-1 circuits were handled end-to-end by AT&T and local telephone operating companies, and terminated at NBC facilities in both New York and Burbank.

Once audio and video were recovered at the two U.S. broadcast centers, there remained the problem of re-establishing audio/video timing for proper lip-sync. The sheer fact that the audio and video signals travelled different paths on their way to the United States virtually guaranteed a timing discrepancy between them. The stereo audio was subjected to digital processing, delaying it slightly, but the video processing delay introduced by the frame synchronization that was required to properly time the video signal to the Network plants resulted in the audio leading the video by some number of milliseconds. The solution to this problem was to pass the stereo audio through a digital delay device at each destination. With the help of special test tapes, the audio delay unit was adjusted to establish proper audio/video timing. A portion of the setup routine that preceded each daypart segment's transmission to the United States was to check and adjust audio/video timing.

The large-scale undertaking just described would not have been possible without a sophisticated communications system to permit all the personnel involved to coordinate the effort. The communications system used for the Olympics coverage was a McCurdy 9400 Digital Intercom designed for the purpose. The system consisted of a 400 by 400 computer-controlled switching matrix. In addition to being accessed by control panels throughout the IBC, the McCurdy system was interfaced to the telephone system, to the two-way radio communications systems, to coordination circuits between the broadcast center and each of the venues, and to the NBC technical communications systems in New York and Burbank. In this way, it could be used by anyone involved in the effort to communicate with anyone else. It virtually replaced the telephone instrument for in-house communications, and for coordination with the personnel back in the States.

A COMPLEX PRODUCTION

The technical facilities used by NBC for coverage of the 24th Olympiad in Seoul took several years to plan and a number of months to build, and the inclusion of stereo audio added to the complexity of the task. The production and broadcast systems at the International Broadcast Center constituted a state-of-the-art television technical plant. The extent of the effort may be inferred from a few statistics: it involved around 100 video tape recorders, over 1000 video monitors, and about 1200 people in Korea. The result of all this hardware and human effort was that the U.S. television viewer could sit back and enjoy all the Olympic action with the enhancements of stereophonic sound and excellent pictures from the other side of the world. The viewer needed not be concerned with the extensive planning, construction, and creative effort that went into producing the 180 hours of Olympic programming presented to the American public. db

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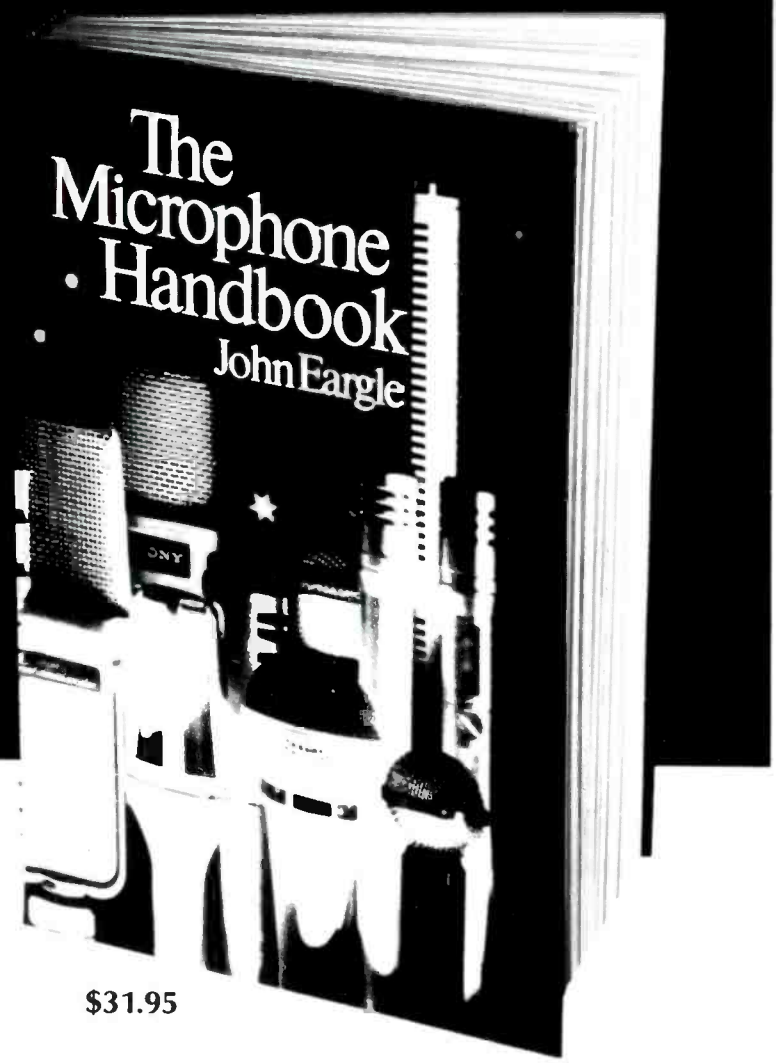

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THE ELECTRONIC COTTAGE MOVES UPSCALE

Performance In Her Blood

When I was studying electronic music (SUNY Albany, N.Y.) I assisted the renowned electronic engineer/designer Don Buchla in a demonstration of his revolutionary synthesizer system.

COREY DAVIDSON

I remember two white road cases which I helped Mr. Buchla set up. The unit was truly extraordinary for it was capable of producing *grand gesture* via the utilization of one of the first micro processor interfaces. This interface design enabled the synthesizer to be repatched by simply playing different successions of keys—in real-time! To date, that system is considered to have been a milestone in the development of synthesizer technology.

My fellow students and I were interested in knowing the availability of this instrument.

Don Buchla told us, "This unit is a prototype—one of a kind, and has already been purchased."

We were all curious as to which electronic musician this piece belonged.

Don told us, "The instrument belongs to Suzanne Ciani, who has allowed me to demonstrate the unit to the university community until it takes its permanent home with her."

A SYNTHESIS

That was the first time I had heard of Suzanne. As the years progressed Suzanne Ciani became synonymous with the new wave of electronic music composers that were finding their way into commercial advertising and scoring.

Suzanne says, "You can spend a whole lifetime becoming a great keyboard player, spend a lifetime becoming a great composer—spend a lifetime becoming a great technical person. When you start to combine all those things, you become part of an entirely new area. I'm not the piano prodigy, nor the electronic genius, but I am a synthesis of all of these."

Suzanne Ciani, the electronic music warrior, has been shooting at the walls of convention since her inauguration into the electronic music community some fifteen years ago. Her views and philosophies grab at the very heart of the technological issues facing music today. With a relentless commitment to live performance, she has innovated some of music's most sophisticated systems—all for the sake of her audiences. In a candid interview at her Ciani Musica studios in Manhattan, N.Y., she tells us about the course of development that has moved her *Electronic Cottage* 'upscale.'

"My early performance/composition days, which were based around the Buchla, were thoroughly prepared and choreographed. I would spend a couple of months developing the piece. The piece, in turn, was based upon tonal material. I used a lot of sequences and we had this powerful device called 'the arbitrary function generator,' which allowed you to play many sequences at once in any direction. You could access the notes in the sequence in any direction: obliquely, retrogrades, etc. You could even access individual notes and move them anywhere. This was, in essence, a very structured improvisation. That was why months were spent developing material, becoming familiar with the processes, and the performance usually added an unexpected element of surprise. The arbitrary function generator enabled the live performance/selection of sequences, transposition and elaboration of the music. The nature of the performance consisted of switching functions, moving filter settings, and setting up key groups of things so that a key on a touch-plate wasn't to initiate a note—it was to change a set-up. One key would have commands such as, stop, start, transpose, envelope modulation of filters, oscillators and so forth. There was never one thing happening with a *gesture*."

"Having started at a time when nobody was really aware of what synthesizers were, there was already a built-in gap in communication. That was frustrating. People would enjoy the music, but they didn't understand that it was an absolutely live performance. The audience would hear all of these magnificent new sounds, but they thought that it was pre-recorded—a tape. Even upon an explanation, there still was no shared language. When I came to New York, I wanted to make records. I hadn't recorded those early live performances with any regularity. I did, however, have some tapes of my live performances that I brought to some record companies. They weren't at all prepared for this kind of music—they had to hear vocals, guitars, etc. They didn't want instrumental music, never mind something like what I was doing that they had never heard. That's how I got into commercials."

"In commercials, the needs were different and the people in control

were different. They wanted something new, different, and exciting because they didn't have musical pretensions. So I had an environment in which I could create. Underneath all of this is the need to make a living. If you are an artist and you paint something, you have a lot going for you because you have something to sell. If you are in music, you have nothing that is tangible. As a musician, you might play in art galleries and museums. You might get some small grants, but there really was no financial support system. The commercial world was excited by this new-founded aesthetic. I would bring this bizarre contraption into the studio and set it up with all those wires and knobs—it was fascinating. This was the beginning of the wave of technology in music."

ON THE ROAD

At this time, most synthesists were somewhat permanently set-up in a studio because the gear really didn't lend itself to being transported. How about you?

"The road cases were part of the commitment to be out in the world. The early electronic musicians had their own home studios. I put my Buchla in road cases so that I could go out to the studios and be where all the musicians were, and be one of them."

Were your first live performances with conventional instruments?

"I started out in live performance electronically. I started to synthesize my classical background, which was keyboard oriented, with my pure synth language. My first album, Seven Waves, were pieces that were actually written on conventional keyboard and then realized and orchestrated through synthesis—the Buchla and whatever else was available. Even then, the instruments were always changing, so each album had its own set of instruments. What is common to them all is that they are, in core composition, keyboard related, which allows me now to perform. So the problem of performing live is somewhat solved."

"Today I have the best of both worlds—the pure electronic domain assisted and organized by a computer, coupled with the instrumental interface of the keyboard. There is a challenge getting a piece to happen live. When you're in a recording studio, you've got a multi-track machine and you've got layering possibilities. You can use one instrument any number of times. When you go to live performance, you have to discipline everything to happen simultaneously. You need to choose a configuration of instruments that you can maximize—that will fit in a road case. The gear that you choose is part of the evolution of process, and then you've got to commit to it, which is tricky in technology because the instruments are always changing. If I've spent 2000 hours programming Seven Waves into my computer with my TX816 (Yamaha's FM synth modules), and I've designed 100 sounds and three years later those instruments change—I have a problem."

The first album was done so long ago that none of that equipment exists anymore.

Which pieces of equipment have been instrumental in enabling the micro-levels of live performance control?

"When I first started out with this live performance set-up, every channel of the 816 had an SPX90 (Yamaha's multi-FX processor). Every single

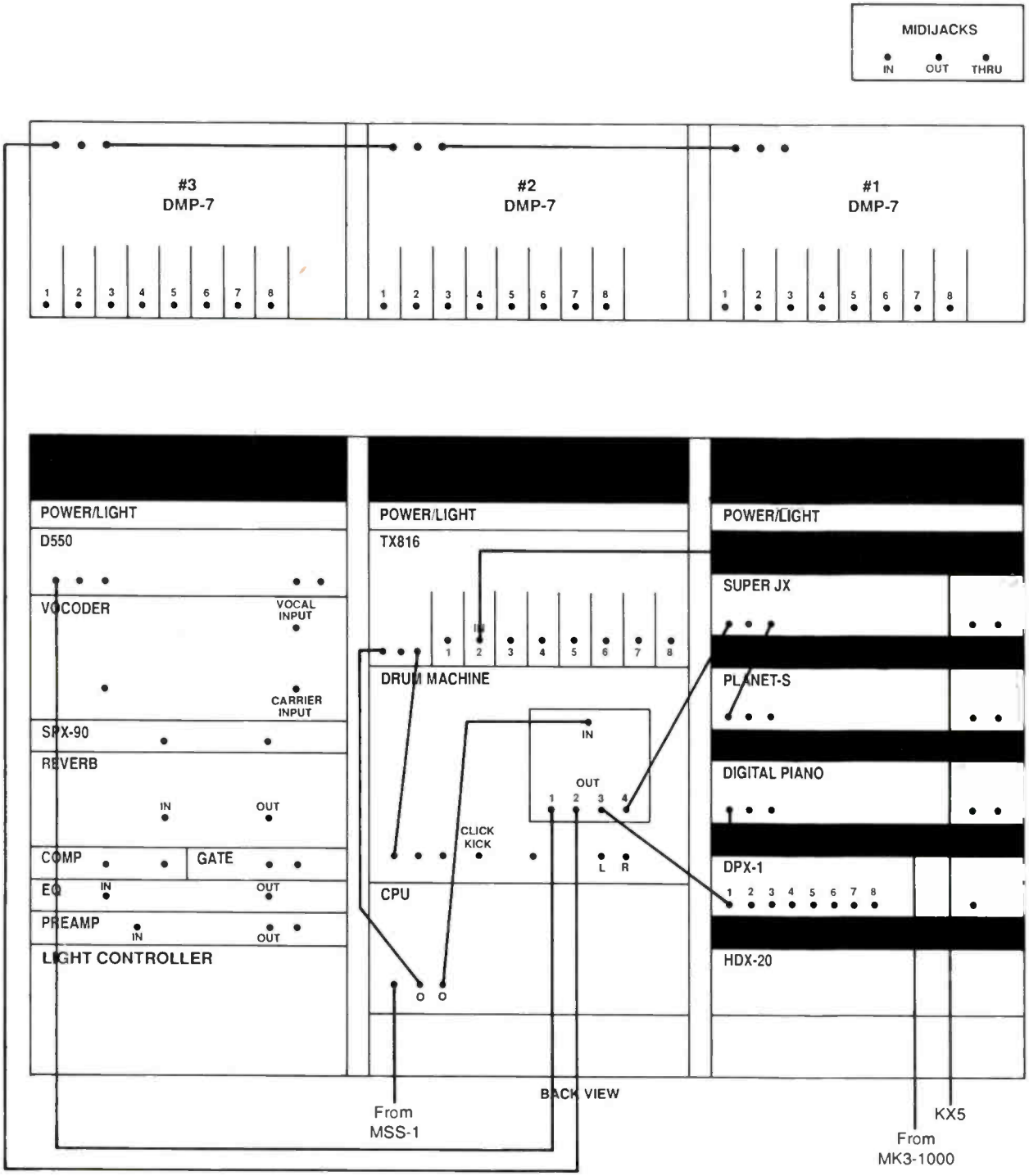

Figure 1. CONRAC—Summer '88 MIDI routing diagram.

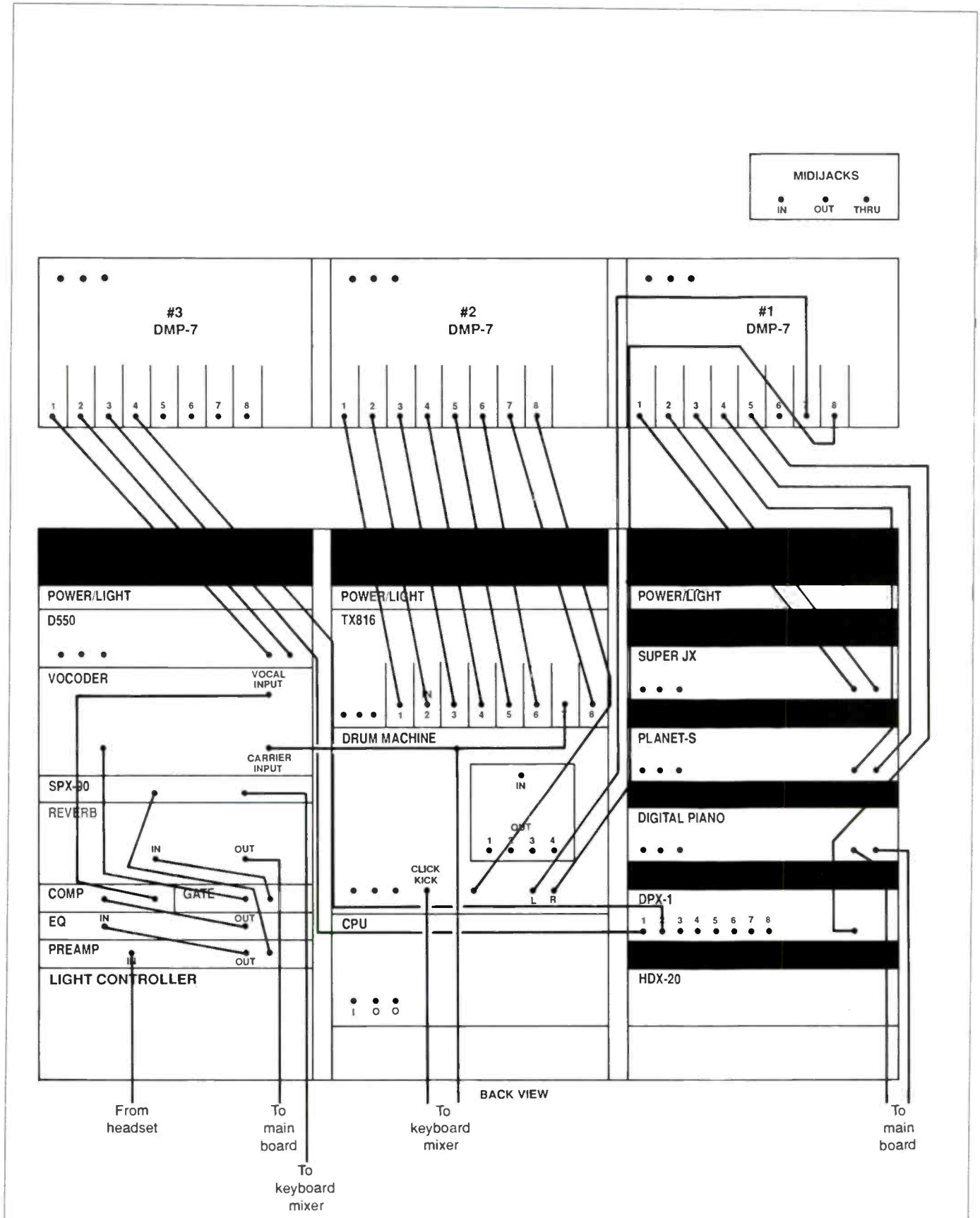

Figure 2. CONRAC—Summer '88 audio routing system.

Figure 3. The studio control room, a south view. Photo by John William Farrell.

sound that was called up in the TX816, through MIDI, called up its own unique program in the SPX90. Not only could I have processing, but could specify a level—a mix level for that particular sound. This required a lot of programming and hardware. In essence, I created a digital mix. My music needs many levels of control that create many subtleties that could not be handled by a live mixer. The processing is part of the sound. How do you control all of these things. At first I did it with the SPX90s. When the DMP7 (Yamaha's controllable digital mixer) came out, again it was a matter of remixing all of the materials. Every time the next layer of technology comes out, it's a whole redo. It is a heavy commitment to do this."

What happened to the SPX90s?

"They're gone. The effects are available in the DMP7 and that's one of the nice things that occurred when the transition was made. The programs are virtually identical. So if I had a specific delay or specific reverb or stereo echo or spacial panning, it's even better now because the SPX90s could only perform one process at a time. Now with the DMP7, I can have three simultaneous processes at one time, not to mention the introduction of dynamic moves at the faders—still controlled through MIDI."

"I use three DMP7s (8 channels apiece) that are controlled via only two MIDI channels. One DMP7 responds to note commands, one responds to controllers, and the third one has its own MIDI channel. Up until now there has been only 16 MIDI channels available. That required great discipline in the management of MIDI information. For me, two channels are immediately eaten up by the DMP7s, one reserved for lighting controls, one reserved for my dress (Suzanne's electronic, light-up, music-interactive stage wear), and what's left is for the instruments. Now that more MIDI channels will become available, my next challenge will be spreading out those MIDI channels."

THE CONRAC SYSTEM

How far back into your repertoire do you take your live performances and how do you circumvent the problems of designing sounds that were realized on non-MIDI synths?

"The first album was done so long ago that none of that equipment exists anymore. All those analog sounds had to be designed in my digital equipment. In realizing the last album, since I already had the performance system in place, I was able to write into the CONRAC system, which is my live performance system in a roadcase."

What is in the CONRAC?

"The CONRAC is about 22 rack spaces high, double width, with an AT computer, TX816, D550, Super JX, Planet S, an Oberheim HDX20, Bode vocoder, compression, EQ, preamp, dedicated reverb (for the vocoder), and a drum machine. When I started out, I used two AKAI S900s and the load time was so long that it totally determined the sequence of the pieces. Now the HDX20, with hard disk, can be loaded from MIDI. So now I can load a bank with a MIDI command and it's very fast, which has cleaned up my act and given me much more flexibility."

"When I first started there was no way to sequence the pieces. I now use Super Key, a program for the computer that allows you to assign multiple key strokes to one key stroke. If I hit, say, control-F1, it will do all the moves that it takes to load in a piece. Many of the pieces have to be set for external synchronization if they're going to be synced to the video. The Roland SBX80 synchronizer only loads with a cassette tape and it only holds one song, so you can imagine in a performance, trying to load this thing up with a cassette tape and there's a chance that it doesn't take the load—that's incredible pressure. Now, I use the Yamaha MSS1 which holds 10 songs."

What is the next step? Going truly tapeless?

"It's tapeless now."

I mean tapeless as in totally sampled, as if recorded. Let me rephrase—what's the real thrill of this kind of performance if you are essentially data-crunching live, which is another way of saying: recorded?

"Part of the thrill of performance for me is being able to communicate the music as I hear it. I'm not happy just playing a single keyboard. It lacks the hierarchy and levels of refinement that I want to convey. I am very happy as to how clean and beautiful it is when controlled, treated, and presented digitally—live. When you're sitting down at a console and mixing an album, you think differently. When in the studio, there is the aspiration to a level of perfection that says, 'this is going to last forever.' When you're doing live performance, the mentality is very different. You are thinking *live*, excitement, energy, directness, the whole physical sound environment, and an element of surprise of an audience response. CONRAC is a live performer. It is not a recorder. It is unpredictable, totally changeable at all times. The other aspect is that I utilize live performers—a percussionist and a Lyricon player."

"The beauty of CONRAC is that it is totally flexible. It's always evolving. I

Figure 4. The studio control room as above but a west view. Note the windows high above New York's streets. Photo by John William Farrell.

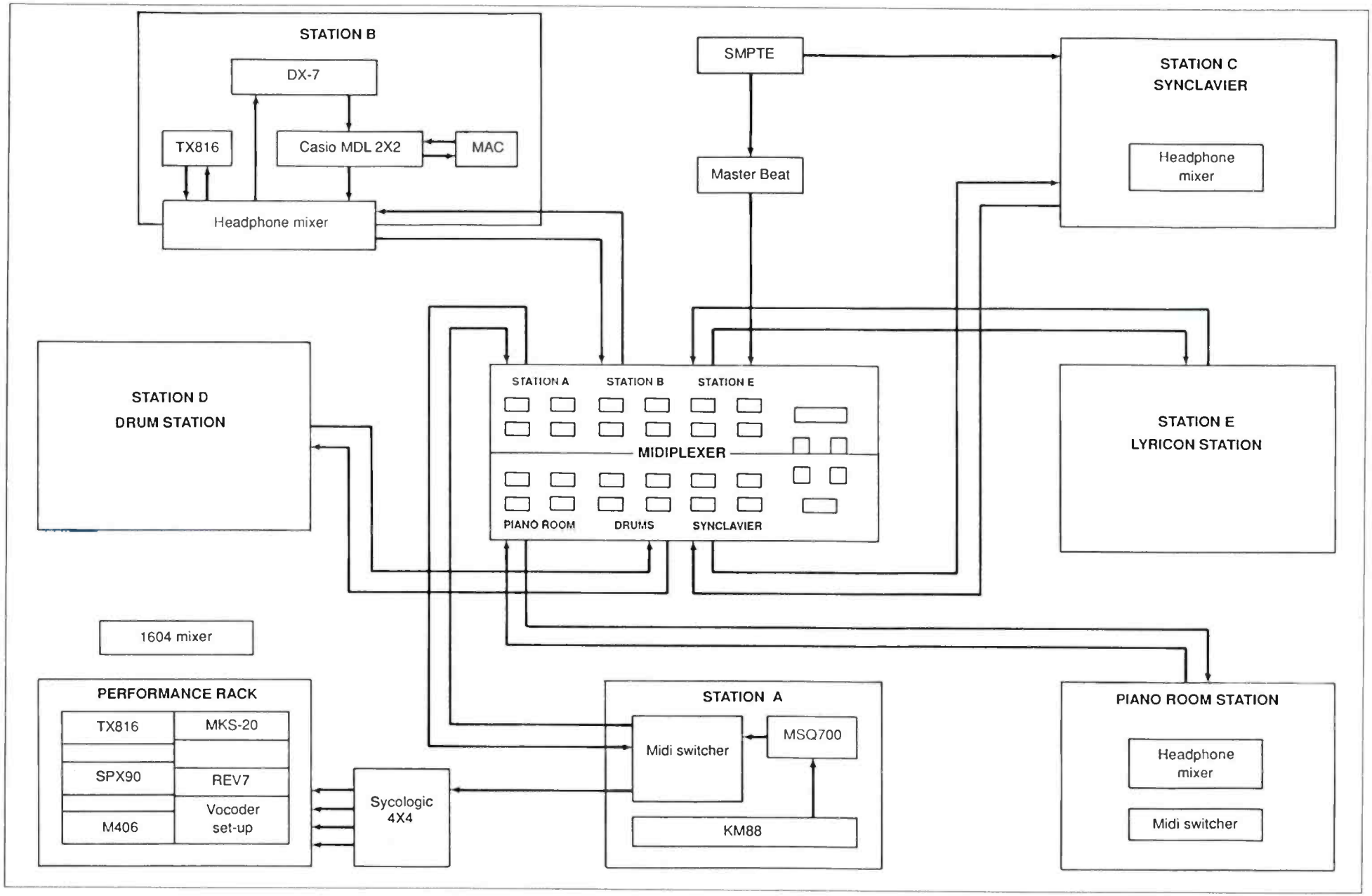

Figure 5. The studio flow chart.

Figure 6. Suzanne Ciani in concert. Photo by David Lawrence. ©1988.

can go in anytime and change a sound—tailor it to a different acoustic space, highlight an instrument. For instance, if I add more players, I simply mute tracks. If I have someone playing the horn tracks, I don't need it in the synths. It's never finished—it's always in progress. The vocoder is another truly live interaction. I love using voice. In synthesis, I've always used my voice. To use the voice as a controller offers very dynamic and expressive elements. Expression is the hardest to get. The voice is probably one of the purest, interactive instruments known and is certainly an integral part of my performances."

The beauty of CONRAC is that it is totally flexible. It's always evolving.

If you have established such an elaborate hierarchy of control over the sound and performance, isn't your kind of performance a coffee break for a live sound engineer?

"Yes."

So in terms of reinforcement, do you have many options available such as quad or surround?

"Right now I'm not working in quad. The Buchla had spacial locators and programmable panning for quad, but quad died. The current instruments have virtually nothing to do with quad. What we need for that is a whole new theater design and we haven't gotten there yet. Years ago, I was supposed to do a concert in Alice Tulley Hall (New York City) and I told them that I needed to set up four speakers. They told me that I couldn't. I said that I would not do the concert and I spent two weeks arguing with the theater management. It was already an imperfect situation because of the proscenium design of the theater. So I spent a couple of years trying to design and build a theater for sound. I started a corporation called The Electronic Center For New Music. I talked to manufacturers and speaker companies in an attempt to realize the possibilities."

What happened with that idea?

"Nobody would listen to me—I wasn't famous. Things don't move as fast in real life as they do in your mind."

THE LIVE FRONTIER

How do you respond to those who insist that, because of technology, the live performer is a dying breed?

"That's why I'm so interested in it. It's more of a frontier than ever—especially in the areas of technology. It takes a firm commitment. One of the problems that people have is that they get so wound up in the studio that they can't perform the stuff live because it's never performed in the first place. Studio techniques go into making records. If you take that into account in your production process, you have a much greater chance of crossing over into live performance. The irony is that in a live performance you're only reaching a handful of people. In a video, you're reaching millions. So live performance is not at all practical, but it is exciting. Performance is a way to bring yourself back in contact with other people. There's nothing that can replace the phenomenon of performing live, in front of an audience."

I asked Suzanne if she had any thoughts as to how music students might become stimulated to pursue live performance when much of today's equipment and processes seem to suggest a studio lifestyle. Suzanne's perspective on live performance has great relevance to the music students of the future.

"The essence of performance is what you have to say to somebody and whether, in fact, you are *present* in your music. I've noticed that with the recent upsurge in instrumental music, many musicians believe that they have been given an outlet for virtually anything that they want to say. In effect, many have been misled by this notion. Singers have always been very popular because 'the person' is the performance. This concept holds true for instrumental music. Processes can detract from the persona of an idea. Nowadays, with all of this gear that makes processes available to a musician, anyone can make instrumental music."

John Cage calls this 'the democratization of music'—the increased availability of musical instruments and processes.

"I love everything John Cage says. He's brilliant."

How do you feel about the laymen becoming musically involved overnight upon the purchase of a MacIntosh computer and a couple of synthesizers?

"The reasons why rock and roll took off was because everybody had a guitar. Maybe they didn't know how to play it very well, but they had one. Suddenly they could identify with music on a creative level. This is a good thing for the music in which we are now involved. Now, people can hear music that is created in this way. For years, I did electronic music, and nobody could hear it because there was no vocabulary. Now that people are at home, playing with their drum machines and computers, they have a listening experience that they didn't have before. I think that's healthy for creativity and the future of music."

THE ART OF THE MATTER

Besides the musical background and training, to what processes do you attribute the successful presence of your persona in your music? Has the introduction of digital dynamics and processing assisted you in accomplishing your long-range creative goals?

"You have somewhat described exactly what has happened to my music. In naming the album called *The Velocity Of Love*, velocity and sensitivity were the key elements that helped to shape the aesthetics. Years ago, in the Buchla days, we had velocity-sensitive keyboards, but in a normal sense, that kind of control was not readily interfaceable. When working with electronics, you are forced to work within the limitations. The restrictions that are dictated by equipment, force you to become clever. The limitations become an inspiration. So when many of the limitations are removed, we tend to get lazy."

Technology has presented us with a new problem—the availability of process and technology has, in some cases, lessened creativity.

"In the past, when you walked up to a new instrument, you had to make it speak. To create a sound, you had to initiate it, adjust it, etc. and you came up with something unique. Now, even though some of the instruments have fabulous sounds, they have become more difficult to edit."

I can sit at the Synclavier and be playing the instruments on the other side of the room.

A good example of this is what has happened with the Yamaha DX-7. With all its complexities, many people simply trade sounds that have been created by a relatively small number of people. Most DX-7 owners who have somewhat of a background, simply edit existing sounds that aren't too unlike the original. Yet the DX-7 is a deep and complex synthesizer that is capable of tremendous parameter changes.

"Yes! The sad fact is that many of the instruments have alienated the users. They are not inspired to create new sounds for 2 reasons."

"1) There are so many sounds that are readily accessible and"

"2) Many of the new instruments no longer have the immediate feedback of large-gesture parameter changes. Taste is as much a part of the artistic process as anything. A careful distinction should be made between *craft* and *art*. A craft is often the result of the redundancy of process—such as a rope plant hanger. A great deal of skill may go into a craft, but that doesn't make it art. Art is a matter of taste, choice, and process."

Suzanne has emphasized the accurate documentation of all of her instrument settings and control levels. This means the careful management and storage of data files, diagrams, and musical notations.

"The DMP7 information is all stored on cartridges. I use a program called Pro-Lab that stores my sound files for everything. All my settings for the drum machines, the DMP7s, and the sequences are backed up with auxiliary files. When you have vast amounts of work that is stored, the possibility exists that it could be lost. So I have three complete sets of everything. I keep one in the road case, one in the office, and one at home. The nightmare comes when you have to update because I refuse to break my rules—data is never stored all in the same place at the same time. If I'm doing an update, I have to take home one set, bring down the other set, update, bring that one home, etc."

COTTAGE DESIGN

What are the design philosophies behind Ciani Musica?

"The studio is set up as a multiple-user MIDI environment. There are five work stations and they're all connected to a central MIDI-plexer. This allows any workstation to control any other workstation. I can sit at the Synclavier and be playing the instruments on the other side of the room. In production, I typically work with two or more people at the same time to facilitate production. We had a special headphone mixer designed so that you can sit in private at your own workstation and develop a sound. You can also mix-in the sound from any other workstation—in stereo. A station can be isolated from the system so that it is independent, or become part of any number of the other stations so that they can be blended together. One station might be just for drums. Another station might be just for our Lyricon player. Another, mainly Synclavier. Another, mostly modular synthesizers—the usual stuff. Another station is predominantly computer oriented. We use both MacIntosh and IBM computers in the system. The vocal booth and client lounge are MIDIed too, which should become a customary part of studio wiring."

"Everything is interlocked, in time, with the Lynx synchronizer, including the interlock between the 24-track machines, 24-track to the Synclavier, or whatever. The big video screen doubles as the screen for video in post, and for working with the Synclavier and computers on a large scale. You lose your eyes working with computers on those small screens, so the big-screen monitor makes it a bit more comfortable. Any number of systems are used here. We employ many composers and some of them work at home on MacIntosh, some work on IBM, so we're not locked into any one type of software. We're kind-of-a clearing house for all kinds of software and interfacing."

"With technology, there is no absolute solution. The best that you can hope to achieve for a studio design is flexibility. We have a system that allows for flexibility. I can change all the synthesizers at any station, I can bring my concert rack in and with one MIDI cable, it becomes available to the whole room."

EQUIPMENT LIST

Synthesizer and Sampling Systems:

Synclavier digital music system

Yamaha TX-816, DX-7 w/ E system, DX-7, KX-88 keyboard

Roland D550, Super Jupiter, Planet S, MKB-1000 keyboard controller, S-50 w/SYS 503 and Vers. 2.0, MKS-20 digital pianos

Emax HD sampler

AKAI S900

Sequential Circuits Prophet V

Drum Machines:

Linn 9000 w/sample to disk and Forat sync mod

Linn drum

Roland TR-707

Signal Processing:

Lexicon 224XL digital reverb

dbx 160X compressor/limiters

Yamaha REV-1 and REV-7 digital reverbs, SPX-90 digital effects processor, D-1500 digital delays, GC2020B gated-compressor/limiter

Eventide SP 2016, H949 Harmonizer

Drawmer gates (2)

Ursa Major MSP-126

UREI 1176 LN compressor/limiter

Marshall time modulator

Symetrix TI-101 telephone interface

Computers:

IBM PC (2)

Mellotron AT

MacIntosh

Amiga 1000

Apple IIe

Synchronizers:

Timeline: Lynx synchronizers

Southworth JamBox 4+

J.L. Cooper PPS 1

Roland SBX-80

Garfield Electronics Master Beat

Hardware Sequencers:

Synclavier digital music system

Roland MC-500

Linn 9000

Consoles:

AMEK Angela

Penny & Giles faders with Mastermix automation

Yamaha DMP-7s automated digital MIDI mixers

AKAI MG-1214

Tape Machines:

Otari MTR-90-2, MTR-90-1, MTR-12, MX 5050 1/2-inch, MX 5050 1/4-inch

Revox A-77

Tascam 122B cassette deck

Denon MR-3s

Nakamichi BX-125

Suzanne's albums *Seven Waves* and *Neverland* are available on the Private Music label at 220 E. 23rd St., New York, NY 10010, (212) 684-2533.

Velocity of Love is on RCA Red Seal, 1133 Ave. of the Americas, New York, NY 10036, (212) 930-4000.

22 Music Inc.

These days there is so much prepackaged sound that many musicians and sound designers simply sort through vast libraries of sounds that have been pre-programmed by any number of designers.

COREY DAVIDSON

When Herbie Hancock designs sounds for a synthesizer, or Joseph Zawinul, or Philip Glass, chances are good that they will appear, along with many others, in one huge sound library for that one synthesizer. Great. Right? Not according to Robby Kilgore and Mary Kessler of 22 Music Inc.

A SONIC IDENTITY

Robby and Mary specialize in sound design. They are not interested in stock, factory, or anyone else's sounds. Together they take the time and effort to tweak in the kinds of sounds that have become part of a sonic identity for *Madonna, The Rolling Stones, Hall & Oates, Michael Brecker, Chaka Khan, Cyndi Lauper, Dave Sanborn, Grace Jones, Paul McCartney, Tina Turner, David Bowie, Diana Ross, Bob James, James Taylor, Shannon, Steve Winwood*—and the list goes on and on. Their studio has evolved from a small, synthesizer demo-studio, to a full-blown professional *Electronic Cottage* that can generate record-quality product. In our frank and sometimes controversial discussion, this successful team shares their views and experiences that helped move their *Electronic Cottage* 'upscale.'

I've completed many interviews, however this one was certainly unique. Robby and Mary are, artistically, so intertwined that there were many times that one of them would start a sentence, and the other would complete it. If I didn't know better, I'd think they were joined at the hip-hop. There is no doubt that these two artists have truly combined their creative skills in a powerful, complementary fashion, and it's no surprise that they are in such demand. Their combined industry involvement spans the studio, live, and compositional experience, not to mention research and development of new instruments.

Robby: "The digital, pre-programmed D-50 madness is a symptom of the decline in sound design."

Mary: "I think the problem really started with the DX-7. In a way, we are observing the end of programming. Who programs anymore? People are just sifting through 8 million banks of sounds and using whatever sounds quickly suit their fancy. Maybe they change the release or sustain, but the art of design has suffered."

Figure 7. Robby Kilgore and Mary Kessler relax in their studio.

Robby: "A few years ago there was no way around actually doing the work. Sounds were gotten from blank instruments—those people are at an advantage because they really know what it takes to make up a sound. Records are sounding more and more alike because the individuality of sound characters has been diminished. There are people out there that call themselves programmers that can't create sounds from scratch on analog gear. Even those people who have the working synthesizer knowledge, have difficulty programming synthesizers that use data entry processes as opposed to synthesizers that can have simultaneous parameter control—reach for a knob, twist it and get an immediate change that makes sense. I think the fresher sounding records are coming from a low-tech, rap/street music sector."

A STARTER KIT

db *would like to know a little about your backgrounds.*

Mary tells us, "I came to New York from England, played in many bands (1983/84), and started to write pop music while strengthening my synthesizer skills. I obtained one of the earlier Prophet V synthesizers (1978), which was a good introduction to hybrid/analog synthesizers. I was classically trained from an early age, however, my concentration was woodwinds. I was never a keyboard player in school. I rebelled against the classical environment because it didn't satisfy my creative needs. My first little shop where I started writing was in The Music Building on 8th Avenue, N.Y.C. People like Madonna and The System came out of there—a totally dismal, run-down, disgusting place. Fortunately, my pop writing skills were recognized and I landed a position as a staff writer for CBS, which is now SBK

and I'm still there. My interest in electronic instruments was increased with exposure to recording sessions and working in pre-production. I knew that production was what really interested me and I kept expanding my recording and synthesizer knowledge until I felt somewhat independent. Writing has been a great support, but I wanted to be producing."

Figure 8. Keyboards, et.al. The box of floppies on the floor are for the half-hidden (extreme left) Macintosh.

It was one of the first studio MIDI keyboard rigs in New York...No one in the area was using MIDI in the studios...

Robby tells us, "I'm the youngest in a very musical family. Everybody in my family plays something. When I was six, I wanted to play guitar like my brother, so I took lessons for a little while but my teachers dropped me as a student because I was pretending to read music. I had a good ear and actually managed to fake it for a little more than a year, up until the pieces got too difficult to continue the masquerade. I dropped out of lessons and continued to monkey around on my own. My oldest brother worked in a Scully 12-track studio called *Apostolic*, a cutting edge studio that hosted very progressive artists like Frank Zappa, Larry Coryell, and John McLaughlin, etc."

"My brother would bring home work tapes of these sessions and at 10 years of age, I started listening to this heady kind of music that my brother was engineering. I rekindled an interest in music training and became a member of my high school jazz band. After high school, I went to North Texas State where I studied composition, mostly in jazz. I was actually learning more from my classmates and people around me, rather than from the instructors. I spent a couple of years playing all over the country in a top-40 band that I had put together."

He continues, "Coincidentally, my first synthesizer was a Prophet V, an instrument that we all believed to be an excellent starter kit for anyone who was interested in programming sounds. At that time there were no sequencers that could synchronize to other equip-

ment—at least none that were commercially available. Back then, if sequencers were to be used, they usually had to go to tape first. The disco boom was just winding down, however, many recordings were being done with drum loops (loops of recording tape that often extended for many feet, winding in and out of rooms throughout the studio), so I was the last in the session line-up to record. I built up a clientele doing those early synthesizer sessions and the first big project I got was Shannon; Let The Music Play. I generated that record from top to bottom—played all the instruments. As the result of that record's success, I became known to other successful artists and embarked on a career as a player/programmer."

How did you two meet?

Mary: "I was a receptionist at Unique Recording Studios, here in Manhattan—my last job before becoming a writer. They were great to me and let me explore some of the keyboards and processors in order to familiarize myself with new equipment."

Robby: "The studio, at that time, attracted some of the industry's strongest producers. Some of these people would show up on their days off to play with a new piece of equipment as it became available to the studio. It was a very exciting time."

Mary interjects, "It was one of the first studio MIDI keyboard rigs in New York."

Robby continues, "No one in the area was using MIDI in the studios—MIDI had just become a reality a few months prior and so it was a time of pioneering. That's where Mary and I met—at Unique."

Mary: "Robby and I started working together on a Malcolm McLaren production. Malcolm claims to be the creator of The Sex Pistols and is a very controversial figure. After he allegedly created the Sex Pistols, he then became deeply involved with Adam And The Ants, Boy George, Bow Wow Wow (a group that he managed). He is well known for his ability to combine seemingly unrelated styles or genres, and mix them up, thus creating a new entity."

Robby: "I was working extensively on McLaren's '*Fans*' record. This album was Malcolm's experimentation in combining various operas such as Carmine, Madame Butterfly and Turendot, with modern street/rap elements. On one of the cuts (Madame Butterfly), rappers rapped the stories from the librettos (lyrics from the opera) along with opera singers singing over the top."

Mary: "Then Malcolm approached Robby with an idea, which was to be included in a new album—Strauss waltzes combined with R&B. That record isn't out yet, but we'll play you some roughs before you leave if you like."

Well, we're not completely tapeless here, but we use the 8-track for SMPTE to control everything, then we have 6 tracks left to add anything else

This concept was so intriguing that I asked Mary and Robby to describe a bit more about it.

Robby describes the forthcoming McLaren project, "What Malcolm did was to get all the first-chair players in London to form a 60-piece orchestra, booked a session at Abbey Road Studios, and they played excerpts from famous Strauss waltzes to a click track."

Robby: "Most of these 60-year-old players couldn't stand playing to a click track because they believe it to be totally un-musical in a classical sense. In classical music, time is more elastic. But somehow, in a three-hour session, he got all these pieces done on digital. Then the idea was for Mary and I, as producers, to take those pieces and compose R&B pop music underneath the orchestra tracks."

Mary: "We were the third producers on the project. Two others had already been fired because they believed it to be an impossible project. After all, think of waltzes, which are at 3/4 time, at 192 beats per minute—"

Robby: "—waltzes have very little mathematical correspondence to a disco/dance-type, 4/4 beat. Malcolm had no preconception as to how it was going to sound. So, it wasn't so much that we would have these pieces that we had to write continuous music under—we could hack them up anyway we wanted."

Mary: "Which we did. Jeff Beck (guitar) and Bootsie Collins (from Parliament And The Funkadelics) plays on the record, which is amazing."

Robby: "We did stereo samples, with Clive Smith, a brilliant programmer, on the Fairlight III system. With Clive, we accomplished gigantic stereo samples that would take long periods of time to *crunch* because they were 2-minute long stereo samples. We took the useful portions of what we thought was interesting, like phrases, and isolate different events. We spent a month at the MIDI programming room at Unique (New York). Eventually we would take things to tape. Then, in some cases, we were actually cutting 2-inch tape to change form so that things would overlap across splices in order to hide some of the construction. Previously, I had done another record where the lead vocal was recorded first with no concept of what the music would be underneath it. The task was to write and tailor the music so that it appeared to have been done the other way around. The music has to be totally subservient to the vocal."

Mary: "But with this project, it was even more difficult because of the timing problems. Then there was the whole orchestra that had to be EQ'd from the double basses, right up to piccolos etc."

Robby: "Nightmarish!"

Mary: "To sum it all up, on this forthcoming album cut, you've got black R&B singers singing the lyrics from The King And I, over Strauss waltzes with a Bootsie funk-beat, and Jeff Beck playing guitar. After making a record like that, it's a relief to do a normal dance record."

Robby: "The record is currently being finished with Phil Ramone and Dave Stewart (from the Eurythmics). I'm not surprised that it's not finished yet."

What else have you been up to?

Robby: "Jack Hotop (clinician/product specialist for Korg products) and I went to Japan some months ago to work on the Korg M1 digital workstation, which is now out. We spent 10 days sampling into an NEC computer in order to design sounds for the instrument. Some of those sounds are in the instrument as part of the factory sounds."

COMPLEX PROCESSING

It has been predicted that the M1, may be a turning point for synthesizers and will have great impact on the availability of complex processing.

Robby: "There is no doubt that the M1 is an amazing instrument. However, I don't believe the M1 to be a singular, definitive answer to an all-encompassing instrument. It might initiate a trend for a while, but I'm sure this is still the tip of the iceberg."

How are you compiling material at your studio?

Robby: "Well, we're not completely tapeless here, but we use the 8-track for SMPTE to control everything, then we have 6 tracks left to add anything else."

I see the Mac in the corner and a AKAI-Linn sequencer. How is their use distributed?

Robby: "We used to use Performer (on the Mac) exclusively. Now we don't use it very much at all. There are things that you can't do on the AKAI-Linn that are easily accomplished on Performer such as ramping data and global manipulation of data."

Mary: "Performer is very sculptural—you can take, for instance, velocity and ramp it, change the curve of rate changes, etc. Especially for people who aren't proficient players, something like Performer is fantastic. As far as *feel* goes, the AKAI-Linn is much more to our liking. The AKAI has an integrity of feel that the computer doesn't quite have."

Robby: "The AKAI-Linn has fewer editing capabilities, but as long as you can play it into the machine, it's much easier. The reason why we don't mind losing that sculpting ability from Performer, is because if the take isn't right, you just play it again. We can both play proficiently so, we use sequencers mostly because we don't have extensive tape machine abilities. We don't use sequencers to compensate for a lack of keyboard technique. The AKAI-Linn sequencer is really more to our liking. I'm used to playing parts that some other people might do on a sequencer. Daryl Hall refers to me as the 'human sequencer.'"

Mary: "There are things you can do with Performer software (for the Mac) that are very exciting. You can send out drum data to samplers and trigger vocal samples and words. So, when you start sending completely inappropriate data to other instruments, you get amazing effects. A lot of the street records explore that process."

Mary: "The other good thing about the AKAI-Linn, for us, is that Robby and I both had 2 AKAI S900s for two years. In that time we built up a huge sound library for drums. Those samples are compatible with the MPC60 through MIDI dump."

Although a solid music background certainly can't hurt one's abilities, Robby believes his musical training in no way facilitated his abilities to work in the pop music genres.

Robby: "It took me a long time to forget what I had learned in music school. There is a snobbery that exists in that academic community that has successfully stifled the creativity of many potential talents."

Mary: "Although I was classically trained, the moment of truth for me was when I admitted to myself that I loved, as an example, a particular Lionel Richie tune, or Barry Manilow tune. That was the moment in which I began writing good pop."

Robby: "When you develop an appreciation for a simple tune that has mass-appeal, you can begin to understand what popular music is all about."

Mary: "There is a new musical ethic taking shape in the street music sectors. You now have kids, that for the first time have access to high-tech equipment. That's an exciting aspect to what is happening in technology. At

first, it was the people with lots of musical training who had their hands on the technology. Now the technology is filtering right down to the street. It's lovely, what happens when people with no musical preconceptions get their hands on music tools."

Robby: "There are a lot of people that are really threatened by this phenomenon. There are endless battles and letters to the editor about patches. The patch wars that, just a short time ago, existed for instance with DX-7 cartridges. People were very threatened. So now, everybody has access to these sounds. People can have my patches. I know that I'm going to do something different with them than they will. But the bad thing that has occurred with the abundant availability of pre-existing sounds, is that nobody programs."

Mary: "The art of getting *cool* sounds is becoming obsolete. I think digitally-controlled synthesizers have alienated many users by making them with only one fader with which to program the unit. It's all too intellectual—especially in a session where you have to do it quickly."

Robby: "The learning curve has become much slower. You have to own one of these instruments in order to be proficient enough to program it in a session. For example, the Voyetra, an amazing sounding synthesizer, is very cryptic to program and I would avoid using one on a session because programming it is too tedious."

Mary: "Musically, the mainstream of pop records have become more and more homogenized. Brilliant things will come about in the future because there has been an increase in the number of births, and many of these kids will be coming into creative areas with no preconceptions. At this time, digital synthesis has been a contributing factor to the *safeness* of music for the past few years. I think digital synthesis is brilliant, but it's not as available as it should be. It's interesting how street records and rap records have embraced sampling to a much greater degree. Sampling enables one to grab a sound from the environment, change it around, and put it to use quickly."

Possibly the new music concrete of tomorrow.

Robby and Mary: "Yes..yes."

TECHNOLOGY AND THE JOB MARKET

With such an increased availability of technology, what does the future have to offer the professional musician/technician who has spent half a life building a foundation, and how do you think this techno-effect will affect the job market for the professional musician if so many are doing it?

Mary: "Everybody can write, but not everyone's a novelist. Whether or not one is musical is the question. I have no terrors because my particular warped or idiosyncratic vision is totally irreplaceable. It's great that people can have these tools. Children can have little synthesizers or violins to scratch away on, or both! The musical people will continue to be musical, and the non will remain non. The more the merrier. The more people have it (technology), the more people will have the chance to communicate, and music is one of the best possible ways to communicate."

Robby: "The increased technology has affected the type of work that I'm now doing and the kind of involvement that I have on a session. Many artists who already have their record deals, don't believe that they need programmers, and technically, they don't. However, I feel that the musical quality of records have somewhat suffered—that's the homogenization that we talk about."

Mary: "It's the high-end (the expensive end) of music that is suffering. The low-end/low budget creativity is excelling. In Europe there is an explosion of American street music. It's almost like a return to dance/disco values. If you think about it, it is the dance genres of music that really nurtured synthesis. When many rock artists were rejecting synthesizers in the late 1970s, it was the cheesy disco records that allowed for the blatant appearance of synthesizers. But, we should talk about technical things, shouldn't we?"

Robby: "This studio is for preproduction, but we can take the work that we do in here, to any other studio—we're compatible. Because of the proliferation of low-scale records, we can run down a session nearly to the final product. Just short of the final stages (mix and mastering), we move to a more upscale facility."

Mary: "Actually, we're over-qualified to do some records. If we get a great vocal in our studio, I would have no objection to the use of a vocal that we got in here."

Robby: "Using a vocal take from our studio and transferring it to an out-of-house facility is quite simple. We've got SMPTE on track 8 of the 8-track machine, which, in turn, controls the machines. But once you go to a more upscale studio, simply stripe new SMPTE and use it to control the 8-track or you could bounce the vocal off of anything. You could bounce it off of one side of a DAT (the other side being code)."

Mary: "SMPTE certainly makes it much easier. We've had to fly things individually where there was no SMPTE on the demo."

Robby: "On the Malcolm McLaren stuff, there isn't a single non-synthetic sound that happens in the place where it's actually recorded. Everything was flown—one way or another. In working with an artist that we are currently developing, we'll do his lead vocal here. Usually before we do the leads (vocal), we do all the background vocals on the 8-track, then sample those. We have six samplers here and that's enough to do both versions of a chorus and a bridge, background vocals, and fills on the out-chorus. Then we start with a clean slate again to do lead vocals. If the SMPTE is originally printed with the SBX80 which, in turn, controls the South-

worth Jambox software, you can have fractional tempos such as 120.1 BPM or 120.2 BPM etc."

NOT ALL NEW

What kinds of things are you doing with the older instruments, like the ARP 2600, to make them relevant and useful?

Mary: "We make all sorts of sounds on them, then sample it. The Oberheim OB-1 is monophonic and can get some great sounds. Once an instrument, like the OB-1 or the 2600 is sampled, it becomes a perfectly believable polyphonic instrument. Sampling, in effect, makes useless instruments useful again—it's great."

We've bypassed many of those problems by simply mixing down to DAT.'

In using the older monophonic synthesizers for say, bass sounds, couldn't you use MIDI to CV and GATE conversion to drive them?

Robby: "Well, we prefer not. That kind of interface reacts too slowly for our work. We'd rather not be bothered with off-setting individual instruments to compensate for the lag. When working with Michael Brecker, he used a Stinerfone, a MIDI saxophone controller with pitch-bend, breath control, 8-octave range, vibrato and more. We used it with an Oberheim X-Pander, a matrix-control design instrument. So any of the Stinerfone functions could be assigned to the X-Pander in any number of configurations. On one patch, his pitch-bend can be pitch-bend, but on another patch, it could be something else like pulse-width modulation or filter-modulation, or whatever. But, when you're sequencing, it's too much of a hassle to be off-setting individual synths."

What's the way around that problem?

Mary: "MIDI."

Unfortunately, MIDI isn't available for all of the older designs.

Robby: "There is no way around the problem for some applications. Here, we don't use CV and Gates. We play it live."

Mary: "With the older synths, sampling is the lifesaver."

Robby: "Sampling a monophonic synth like the OB-1 gives you an advantage even for monophonic bass lines. Tuning becomes much more stable. It was common, on the older analogs, for the keyboard temperament (volt per octave) to be adjusted from time to time. Once these old analogs are sampled, the keyboard temperament becomes perfectly stable because you are now using the sampler's digitally controlled language."

How important is the DAT to you?

Robby: "We have a portable DAT which makes an excellent sound collecting device for sampling. In the hands of a musician, it's a wonderful tool. No matter how careful we were with EQ and levels in pre-production, there was almost always a translation problem when we would take the product out of here, and bring it out into the world to introduce it to the industry."

Even things like the slightest speed inconsistencies can drastically affect a listener's response to the product.

Robby: "If you're at a dance tempo at 118, and an A&R person plays it on his cassette machine which reproduces it at 121 or 114, you're product is in jeopardy. The difference between 121 and 114 is enough to make or break a hit record. We've bypassed many of those problems by simply mixing down to DAT."

Mary: "Sometimes we actually take the DAT to people's offices and plug it right into their listening system."

Be on the lookout for Robby Kilgore and Mary Kessler's work—two sound designers who strive to bring their artists a sonic identity.

EQUIPMENT LIST

Console:

(2) Soundcraft Series 200B mixing boards

Tape Machines:

Tascam 38 8-track
Sony portable DAT recorder
Pioneer D1000 DAT recorder

Outboard:

dbx 160X
Lexicon PCM42
(2) Roland SDE 1000
Roland SDE 2000
Yamaha REV7
(3) Yamaha SPX90

Amplification:

Yamaha 2100 power amplifier
QSC 1400 power amplifier
JBL 4408's monitor
Yamaha NS10s

MIDI gear:

MPC60 Linn/AKAI sequencer drum machine
(4) AKAI S900
Arp 2600
Casio CZ101
JL Cooper MSB 16/20
JL Cooper MSB-1
Korg DSS1
Korg M1
OB1
Oberheim expander
Prophet 5
Prophet VS
Roland D50
Roland Juno 106
Roland Jupiter 8
Roland MKS20
Roland SBX80 sync box
Yamaha DX7
(2) Yamaha TX7
(2) Yamaha TX81Z

Computers:

MacPlus with 20 Meg Apple hard drive
Southworth JamBox 4
Opcode Studio Plus Two
Amiga (1.5 Meg Ram) with 20 Meg Jasmine hard disk

TOWN CRIER RECORDS—A Distinctive Label

Jazz has been the underdog of music throughout its history, but has also been somewhat overlooked in terms of recordings. Part of the reason is the fact that record companies, for the most part, do not establish the kinds of budgets for jazz recordings and promotions as they do for the more popular forms of music.

COREY DAVIDSON

Dilemma: What can be done in order to achieve a higher standard for the recording and duplication of live jazz?

Possible solution(s): Utilize the available digital technologies in order to take advantage of the character of live jazz as it might exist in acoustically-special environments. Look towards the real-time duplication of this special kind of music to maintain the best sonic integrity.

Claudia Marx not only uses the digital mediums for the documentation of live jazz, but also duplicates the product directly from the digital master in real-time—directly to the cassette that the consumer will play. This kind of operation probably offers the best quality control that is currently available in this area of music. The most amazing part of it is that she's doing it in an *Electronic Cottage* that has moved 'upscale' which has culminated in the establishment of her own record label!

IN THE BEGINNING

"I always liked and listened to music—all kinds—mostly classical. Although I began as a French major, my professional experiences were in the music industry. I began working in the record industry as soon as I graduated college. It started out as a secretarial job at a small classical label called Connoisseur Society Records—that was about 12 years ago. It's quite possible that I was hired by that label because I was the only applicant that could spell Dvorak and Tchaikovsky. Anyway, this label was well known for audiophile/high-quality recordings of a slightly off-beat repertoire. I stayed there for a while, until I felt that I had to move onto other areas. I left the company but returned, only to move up to a new responsibility—I was now back and in charge of production."

Figure 9. Claudia Marx prepares to insert a cassette into one of the Nakamichi recorders.

Figure 10. Sony F-1 equipment serves for the recording and the mastering.

"Meanwhile, I became even more interested and motivated now that I could see, first-hand, the whole operation of such a label."

What exactly were your responsibilities as head of production?

"I was in direct communication with the pressing plants, plating and mastering facilities. Basically, my job was to oversee the record jackets, which meant working with printers and typesetters, farming out the liner notes to appropriate people, and seeing that the graphics were in place. My interests stimulated my attendance at recording sessions and eventually I became a retail representative."

You must have explored nearly every aspect of the record business.

"Just about. It was really like getting an M.A. in the record business. After the work at Connoisseur, I worked at RCA records for a while in the rock and roll publicity department. I wasn't hired in classical music because they didn't need anybody at the time. I was directly under the fellow in charge of rock publicity, but his office was right next door to a man named Elliot Horne who was the jazz publicist—what little jazz went on there. I became friendly with him for I was much more interested in jazz music than rock and roll."

"Little by little, I got quite interested in jazz. Elliot Horne, a warm, friendly man, took interest in my interest and helped me cultivate an understanding and appreciation. Eventually I left RCA and, in 1983, went to work for MacDonald Moore at New York Digital Recording. At the time, he had just become one of the first east-coast owners of the Sony 2-track digital system. That was pretty exciting for it was the beginning of the digital era in the record industry. After N.Y.D.R., I worked at Vanguard Records, in charge of production. At that time Vanguard had a very limited interest in jazz."

How did the digital recordings at that time measure up to your listening standards?

"I didn't think they sounded very good. They sounded strange. It was probably a combination of the many factors that were still being explored then. The filtering, in conjunction with the fact that people (engineers etc.) had not readjusted their thinking for a new storage medium. Many of the early digital recordings sounded unnatural and digital had a bad name for a while."

"Now, all my recordings are digital. I don't think many people in this world could tell whether they are analog or digital—the fact is that they are really clean recordings. My exposure to engineering and technology helped to further expand my kno+wledge of the recording business."

ON HER OWN

When did you decide to form your own record label?

"After Vanguard, it gradually began to dawn on me that I had most of what I needed to know in order to start a label. I had the production aspects. I had attended many recording sessions. I had technical knowledge, although I'm certainly not an engineer. I had a strong background in sales and publicity—I basically felt that I was well equipped to deal with the whole business. My interest in jazz remained strong and it was jazz that I wanted to pursue. I started Town Crier Records. Eventually I would like to have a line of classical recordings."

How is prospective material introduced to your label?

"I have made all of the recordings. None of the materials are licensed from anybody—they're all recorded originally by me."

Where do you record?

"None of the albums were recorded in a studio. The Lance Hayward (pianist) quartet and quintet, were recorded live at Eddie Condon's Jazz Club, which no longer exists. There's a lot of audience noise but it's very much in the flavor of that kind of music making."

Even though my type C is carefully aligned, the playback varies once it gets out to the consumers.

How did you set up for those recordings?

"Frantically! The club was in a brownstone-type building. The room in which we recorded was a very long, narrow room—like an alley—a terrible place to make a recording. The club had a great atmosphere and many renowned musicians hung out there. There was a very relaxed feeling at Condon's which is getting harder and harder to find in New York clubs. Condon's was known as a Dixieland club and on specified nights they would have other forms of jazz. Lance Hayward didn't play there very often, however I had heard that the club was selling its space to the New York Hilton. So the club's days were numbered."

Figure 11. Overall view of the Sony mastering and Nakamichi real-time recorders.

"Everybody in the jazz world was upset about the club's extinction. With all the acoustic imperfections, there is something about live recording that you would never get in a studio. I decided to approach those recordings at Condon's like a documentary. The recordings were made in the course of two Sunday nights. There was nowhere to set up the equipment. We used the Sony F-1 system with 2 Betamax machines, and the talented Tom Lazarus engineered the recordings. We had a card table for the equipment. The equipment ended up downstairs between the men's and women's rest rooms—a three-foot square area. We used a combination of contact and regular microphones for all of the instruments. These channels were mixed down to 2 tracks so whatever decisions were made that night could not be changed or remixed later on. Technically, it was almost impossible. Many told us that we would not come away with an effective recording."

"In fact it is a great recording. Of course, it's not ideal, or even as good as the other Town Crier albums, but it certainly captured the moment and some phenomenal performances."

How did you arrive at the system that you are using to duplicate?

"The investment that you have to put into making LPs is really very close to what has to be spent in order to make compact discs. Given the direction that the music business was taking, it was more appropriate for me to wait until I could afford to make CDs and in the interim, make the highest-quality cassettes. At Connoisseur Society Records, we had worked with a similar process and I have made some adjustments in that system for my own facility."

SLOWER IS BETTER

What's in your system?

"A Sony 501 processor interprets the digital master, which comes from the Betamax, and converts the digital audio into analog sound. The 501 feeds the cassette decks. Dolby noise reduction lies between the 501 and the decks. Dolby type B is most often used although I do use type C for special orders. I have found that there is deviation of the Dolby type C tracking between all of the makes and models of cassette players. Even though my type C is carefully aligned, the playback varies once it gets out to the consumers. We're not using the internal Dolby in the cassette decks. We're completely bypassing them and are using external Dolby so that they're all uniform to each other. These cassette decks are Nakamichi 582Zs. As the music plays, the cassettes take exactly as long as the music to record. If there is a half-hour master, the cassettes take a half-hour to record. That's what real-time duplication is all about. It's very slow and tedious, but it still yields the best sonic results. Most commercially-recorded cassettes are run at incredibly fast speeds and there will almost always be a degradation of the program."

How does the cost of your process compare with other commercial methods?

"This kind of duplication costs about 6 times as much as a standard commercial cassette. The list price of a Town Crier recording is $9.98 which might be high for a cassette, but it is certainly not out of most people's range for a very high-quality recording. They really sound competitive with compact discs—spectacular. There are no extra electronics anywhere between the master and the cassette decks."

NO DEFECTS

What distributes the signal to all those decks?

"As the cassettes are duplicating, a switcher enables us to punch-up one deck at a time and monitor the signal. The original signal goes directly to the decks. The only routing is in the monitor section of the system. Any deck can be monitored at any time, without the slightest glitch. In nearly three years, I have never once had a defective cassette returned to me. Once in a while, we do get a defective one, but it is caught in the duplication process and that piece will never make it to market. So far, the only defects that we have encountered have been tape defects."

Why the Nakamichi 582Zs?

"We chose these decks over other very good ones because we can optimally align each side of each cassette. Every cassette that goes into each of these decks is specifically calibrated for recording."

Are there any other problems that you have experienced that have warranted special precautions?

"I have noticed that in the spring, when the weather starts to change, I get dropout problems. Last year I invested in a huge humidifier to keep the air stable from one season to the next. We were losing enormous amounts of time in production."

"The one curse of working this way is that if you get a dropout two thirds of the way into a side, you have to stop, go back to the beginning, and start all over again. When working with digital audio equipment, steps should be taken to avoid static charges."

This is also very true in other electronic fields.

"Since the addition of a humidifier, those occasional problems have disappeared."

How much product can you turn out?

"We can turn out 400 to 500 cassettes a week. That's not a bad production rate for this operation. I have an engineer who oversees the duplicating. Meters must be watched and program listened to."

Which meters are truth for the duping?

"We never use the meters on the decks themselves. The central Dolby unit has meters which we reference, and the digital has its own meters."

What other advantages does digital provide?

"This is easier than working with analog. You have to align every analog tape that you put up on an open-reel master deck, whereas with digital, you don't have to align the master. You just have to set the recording levels into the cassette decks."

When the musicians get there and start warming up, we start getting specific mic placement and zero-in on sounds.

How might you expand your operation?

"I might just buy more cassette decks so that more could be made at one time. We can presently turn out enough cassettes for what we need, however, we are also becoming a company that sells compact discs. Nimbus Records is our CD pressing plant. They're from the United Kingdom, but they've opened another plant in Virginia."

CHURCHES, NOT STUDIOS

You told us earlier that none of your label's recordings were made in a studio. Where else do you record?

"The other recordings (other than Eddie Condon's) were all recorded in churches. I don't like recording in studios. There are really good studios out there and I'm not saying that they don't exist, but I don't like what goes on musically in studios. For jazz, it's not the most inspirational environment. My label's music is all acoustic music, made with instruments that were made to resonate."

Could you describe your approach to these live-church recordings?

"The engineer will go in 5 to 8 hours prior to the actual recording to set-up. The churches that we use must have some kind of room that is separate from the space in which we will be recording. That separate room usually winds up being the sacristi. Sacristis are usually adjacent to the main sanctuary. We have to bring a lot to these sessions because there is no surplus of auxiliary equipment that would be found in a normal recording studio. We bring everything such as tables for the equipment, speakers, amplifiers, extension cords, cables, and all sorts of back-up in the event there is trouble. So the engineer goes in, runs the cables and aligns the equipment."

"Weeks before the session, I discuss the details of the session with the engineer about the general concepts pertaining to the instrumentation, number of players, the microphones, and the kind of atmosphere that I would like to capture. The engineer sets up the mics on their respective stands, in a non-specific way so that they will be instantly available upon arrival of the musicians. I usually like to get there about an hour before recording so that I can oversee the set-up. When the musicians get there and start warming up, we start getting specific mic placement and zero-in on sounds. In a large/live space, mic placement is extremely critical. Mic placement is re-

ally the only way in which we can control the room's characteristics. Some mics are close to the instruments, and some further away in order to capture the ambiences."

"So I have worked exclusively in different churches in the New York area. The musicians are very excited about it, and the listeners marvel at how life-like the artists sound."

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EXPANSION RECORDS

The subject of this article might very well be a renaissance man of music. He has left virtually no stone unturned in the exploration of self, music history, culture, existentialism, tolerance, alternative musical styles—all the while maintaining a deep concern for the improvement of the human condition as it may exist throughout the world.

COREY DAVIDSON

Richard Del Maestro's studies have taken him far beyond the curriculums of conventional music education. In a beautiful and logical progression, Richard Del Maestro today is keeping abreast of the technological developments and changes that have enabled him to establish his own record label. He is currently playing and producing music masters that are making it directly to the mastering facilities. The interview explains the course of events that enabled Richard to build an *Electronic Cottage* which has moved "upscale."

While attending the AES show in Los Angeles, CA, I completed an interview with a composer who, up until recently, was not very concerned with recording equipment and the ways in which synthesizers and computers interface.

"I was ultimately concerned with musical problems, not recording problems. I left the technical aspects up to the engineers."

So Richard, tell me why you are interested in the AES show this year.

"Actually, I want to see what is going on. I was particularly interested in the Yamaha DMP7s. At the Yamaha demonstration, they had four of the DMP7s synced together for a mixdown of a cut from Michael Jackson's album. You could see the levels changing as the mix progressed. I was curious about automation because it's the next step for an improvement of production in my studio. I've got the Trident series 65, which I would like to upgrade to an automated system. Now I'm weighing out the factors concerning the degradation of signal that can occur with the addition of VCAs in the signal path. These days, I need to know what the technical options are so that I can continue to turn out an industry-standard (or better) product."

IN YEARS PAST

"In 1981 I went to India to study under Saythya Sai Baba, who teaches respect for all religion. During my 5-month stay, I directed a 60-member choir at a Christmas Day concert in front of an audience of 50,000 people. With only nine days to prepare for the performance, I taught the Hallelujah Chorus (from Handel's Messiah), completely from memory, to the choir."

"After moving to San Diego, CA, in 1983, I was commissioned to write a baroque-style ballet score for choreographer Nicholas Gunn. In 1985 I returned to India for the Fourth World Conference of Service Organizations at the time of Sai Baba's 60th birthday, and was part of two huge concerts. At the first one, in front of 400,000 people, I directed a 120-member international choir. Next, I directed a Spanish choir of 60 singers before 750,000 people at a concert that was broadcast on national Indian television."

"In 1986 I founded Expansion Records, and recorded an album called 'Relax,' which was inspired by Lazanov's *Super-Learning* book. The album was sub-titled 'Piano Solos At 60 Beats Per Minute.' I created music at that tempo because it had proven to slow the heart rate, calm people, reduce stress, and increase creativity and learning. (The album has been used extensively at Scripps Clinic, Scripps Hospital, the MacDonald Center for Chemical Dependency and other hospitals.) I also composed music for the meditation sequences of Terry-Cole Whittakers's television and radio broadcasts."

"A video producer heard Relax and had me score a video called 'Less Stress in Five Easy Steps,' narrated by Ed Asner and frequently used in hospitals." (The 45-minute, award-winning video included a 6-minute music meditation interlude that Richard composed and performed on synthesizer.)

How did you become familiar with synthesizers?

"I had wanted a synthesizer for a very long time. When the first Moog synthesizers were becoming available, I sent away for information and in return, I received literature and a demo record. Much to my surprise, the system (that was of interest to me) was large enough to fill a room—and it only had monophonic capability. I continued listening to music that had utilized synthesizers, and tried to maintain an awareness of them. I had not pursued having a synthesizer until about a year and a half ago. Before that, I was an acoustic musician although I had used them (synthesizers) in some recordings—namely on 'Less Stress in Five Easy Steps.' On that project, I used a DX-7 that was overdubbed a number of times. So I had wanted one for a long time, but had not become a collector of synthesizers and had no electronic instruments until recently. I took the plunge, and purchased 7 synthesizers plus a computer, complete with soft-

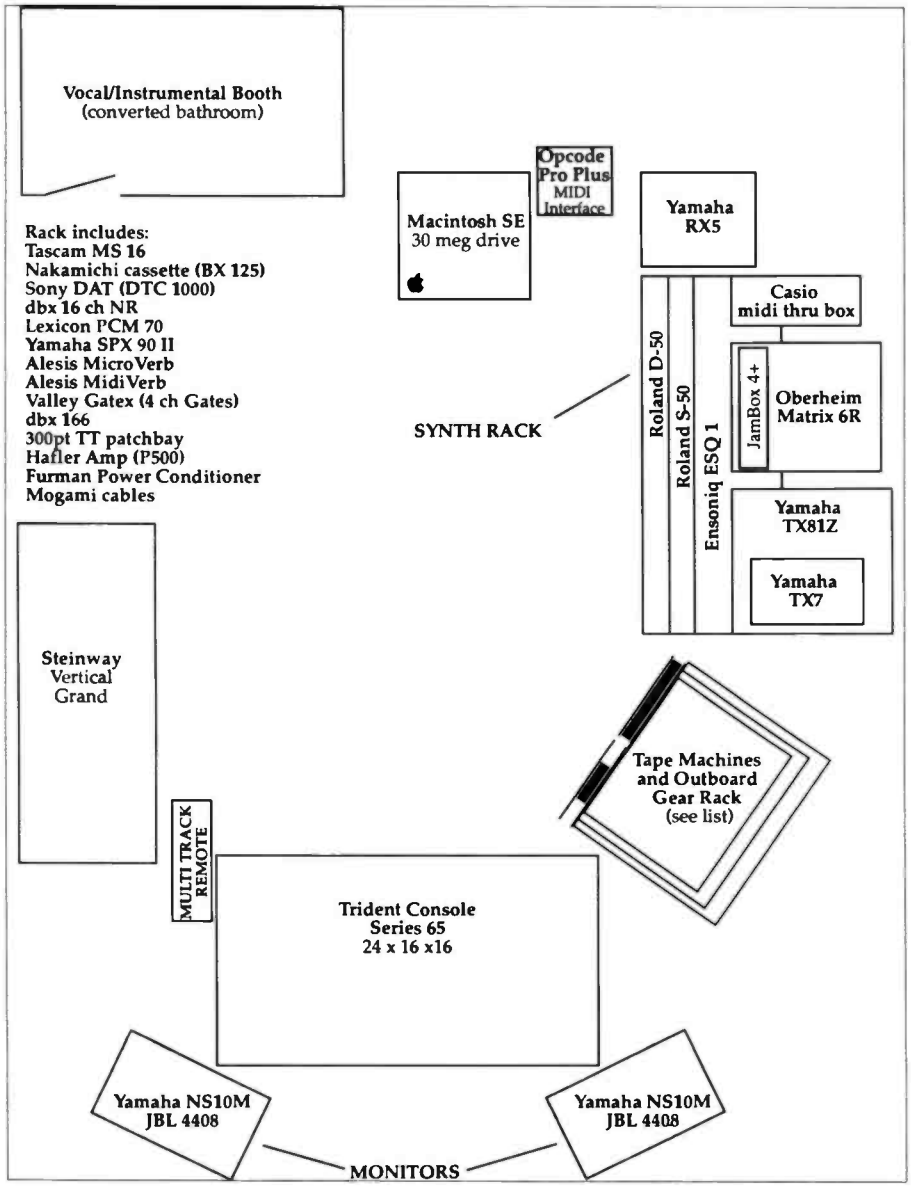

Figure 12. The basic studio layout.

ware. About 10 months ago, I purchased the recording part of my set up, built a studio, and continued to produce my own music. My latest album, 'Language Of The Heart,' is the longest serious work that I have done in my studio. I took a crash course, read all the manuals, and got as much help as possible so that my production level would not slack."

LEARNING THE EQUIPMENT

How comfortable are you with machines?

"At first, it was a nightmare, sitting down with seven manuals and books on recording. I knew I wouldn't be satisfied until I understood how to use and edit each of the synthesizers. There's an amazing learning curve that you go through—all of a sudden you come to a plateau and say, 'Ah yes! It's just another synthesizer.' The reason I did this (the move to high-tech music production) was because I had something acoustic in me to say. I had to fulfill an urge. That urge was to write for a great orchestra. The next best thing was to recreate, in a sense, my own orchestra—the electronic instruments. Now, the challenge is to maintain an effectiveness of my music without sacrificing the acoustic sensitivities. I still think orchestrally, and I still think in terms of acoustic instruments. But I love synthesis. I'd like to explore a more pop/new-age style."

On this latest album, why didn't you use percussion?

"I didn't want to. I had a drum machine staring me in the face, but there is something about electronic percussion that doesn't quite suit my music at this time. My dream is to find a brilliant Brazilian percussionist. I think that kind of element would be an ideal complement to my brand of synthesized music."

How have you actually learned about recording techniques?

"Although I do understand the concepts of recording, I find it more productive to utilize a recording engineer. I hired a professional recording engineer to record for me. First of all, for me, there is a negative feedback loop that becomes counter-productive. When one single-handedly writes the music, performs the music, records the music, and mixes the music, there can be a loss of perspective that decreases the effectiveness of the product. Basically, there is a loss of objectivity. Having someone to bounce ideas off-of is vital. My engineer, Mike Harris came in after I had loaded all of the parts onto the computer. He and I laid each track down, then mixed it. So I acted as the producer. It was wonderful because I had an objective ear that was present and involved in the music. Yet, there was the doubt that my room's acoustics

might be prejudicing our judgement of the final master tape."

What allowances do you make in light of the absence of industry reference acoustics?

"It became clear to me that we had to eliminate as much of the room's sound as possible. The room is not designed as a reference listening space. Near-field monitors were the answer. Upon bringing my final mixes to the mastering facility, I asked Bernie Grundman, of Grundman Mastering, what he thought of the engineering. He said that the 'stereo imaging is nice,' that the 'mix levels are right, and that the equalization was 'very close to a final EQ curve.' I was present for the mastering process and I watched him add just a touch of bottom and top end. That was it. I'm very pleased with the record."

Figure 13. Richard Del Maestro sits at the console, with the keyboards and recorder also close at hand. Photo by Mark Murphy.

AN EXPERT'S OPINION

Unbeknownst to Richard Del Maestro, db contacted Bernie Grundman at his facility in Los Angeles and solicited his comments. We at db believe that these comments clearly indicate the potential, credibility and power of The Electronic Cottage concept.

Mr. Grundman said, "I don't recall the specific sonic details of Del Maestro's album, however, the fact is that there are many smaller studios, *Electronic Cottages* as you say, that are bringing in an excellent quality of product. It's interesting that this is especially true for New-Age music. I suspect that part of the reason for this high quality, particularly in the New-Age areas, is that there is a level of simplicity that prevents the clouding of signal due to processing overkill. We're seeing product from the smaller/home studios, in many cases, that outclasses the quality typically associated with the bigger world-class studios. Many of the smaller studios utilize direct-in recording techniques. This is particularly true for the people that are working with synthesizers and computers. Many home studios are mixing down to DAT, which again helps to maintain the sonic integrity of the product. Of course, in instances where isolation and ambient recordings are necessary, the larger studios are still capable of a superior recording. We are seeing a trend towards the production of industry-standard, quality music that is coming from these Cottage-type studios."

Richard says, "Now that I've been to this mastering magnate (B. Grundman), who has this amazing room with Tannoy reference monitors all over, and a near-perfect listening environment, I know that I can trust what I hear at my facility. The mastering experience has also confirmed my belief that I need to work with an engineer so that I don't become too bogged down with the processes of recording. I do know how to lay down the tracks myself. I know how to EQ. But I'm not going to pretend that I can do it all by myself. Part of the intrigue is working with other people. Also, I have to work within a budget, so it's more cost-effective for me to get it on tape, then have Mike come in and do the final mix. At that time we begin to experiment with effects and signal processing."

Although you have managed to take your music directly from your Electronic Cottage to the mastering house, are you interested in interfacing your system with other studios and facilities?

"That's an exciting idea. I would love to work with tapeless recording and extensive sampling and synthesis. Yes, I want it all, but it's really a matter of budget. There is an endless cycle where one is never satisfied. However, I am very satisfied that I have the incredible facilities at my disposal. I think there is something to be said for being satisfied

with what you have and making the most out of it."

INDUSTRY QUALITY

How did you ensure the industry-quality of your product?

"I knew that I had to eliminate the variables that are so often responsible for translation problems that arise from different recording formats. I know that cassette tapes can misrepresent a final mix. So one piece of equipment that I believed to be essential was a DAT for mix down. I wanted to release a CD and a cassette. I did some research and found out who the top manufacturers were in the country. I negotiated with them. I did a lot of research as to who had what kind of facilities, what their turn around time was, quality, etc. and shopped by comparison. I compared the dollar value of the services that these companies offer. There are tradeoffs. When I was ready to outfit my studio, I spent months pouring over brochures, spoke to engineers, sales people, other musicians and whoever was in a position of experience. I then compared their views and opinions, and tried to apply the information to the criteria by which I purchased the things that I felt were needed."

PERSONAL APPROACH

How did you approach the marketing of your album?

"There is a window of opportunity in the New Age market. I didn't approach record companies with my synthesizer music. I wanted to produce and release my own record. Many musicians are reluctant to try an independent approach because they believe that without a record company's support, the product will never effectively reach the public. I did the same thing when it came time to shop for the manufacturing and duplication of the CDs and cassettes. I know that I wanted it to look like a professional record. You have to use graphics that give it the look of a major label. Of course it should sound like it came from a major label. That's why I took my product to a master like Bernie Grundman—because I wanted to know that it was mastered by someone who could make a final judgement and say whether or not it sounds like a record."

"After the product was mastered, I called various trade magazines and told them what I was doing and that I was interested in advertising in their publication. I decided that Radio And Records was going to be my first ad. I took out the ad and had them send out 100 CDs to all the radio stations who play New Age and jazz music. I then personally called everybody on the list and promoted the product.

For instance, I made 30 phone calls to WNUA in Chicago. I got to know the secretary of the station and finally I got to speak to the fellow that was doing the programming. I discovered that my album had already been on the air for many weeks. There were other radio stations that weren't as receptive. Some stations had lost or misplaced the product. At times it was very frustrating—and very expensive. But I would say; 'No problem, I'll send you another one.' For anyone who's interested in making an album and marketing it for himself or herself, has to be super friendly and super tolerant. You must remember that the right attitude can be a plus—maybe the plus that's needed to get over."

"Whenever I got a positive response from a radio station, I would ask them for a quote. I put the first quote that I got in an ad that ran in Radio and Records. Then I put the quotes together in a promotional sheet and contacted distributors. Every time the list got longer, I revised the list and sent it out to the distributors. Most main-stream distributors will not look at a one-album, one-artist label. I knew that my first album was therapeutic music which wouldn't sell at Tower Records. So I approached the distributors (who were selling to places like Tower Records) with my latest album. I knew that I now had a main-stream product. I now have a network of distributors that are all over the country. I've broken into the record business."

Richard's closing thoughts are inspiring.

"I think there is good news for: producers, independent producers, engineers who like to participate in the evolution of an artist, and business people who want to start record companies from scratch. As an artist, you have to protect your artistic integrity and talent. People shouldn't sign lousy deals just because they want to be on a major label. That's what **db Magazine's** *Electronic Cottage* is about. It's telling people, 'You can do it yourself.' We are living in an age of unprecedented independence and the ability is here for an individual to *produce* with the caliber of a major corporation—and this is just the beginning."

EQUIPMENT LIST

Synthesizers:

Yamaha TX 7, TX81Z, RX5
Oberheim MATRIX 6
Ensoniq ESQ 1
Roland D50, S50

Tape Recorders:

Tascam MS 16 multi-track reel to reel
Nakamichi BX125 cassette deck
Sony DTC1000ES digital audio tape machine (DAT)

Signal Processing Equipment:

Alesis Midiverb II, Microverb
dbx 166 noise gates/compressors
Hafler P500
Lexicon PCM70 effects unit
Valley People GATEX noise gates
Yamaha SPX90 II effects unit

Mixing Console:

Trident Series 65

Monitors:

(2) Yamaha NS10Ms version 2
(2) JBL 4408

Patchbay:

customized patchbay, cables, misc. connectors

Misc. Equipment:

Adcom GFS3 speaker selector
Casio TB1 MIDI thru box
Furman power conditioner and light module
Tristech Audio Technologies (4) Minicubes active transformerless direct boxes
Southworth JamBox 4 plus SMPTE time code generator/reader
Opcode Professional Plus MIDI interface

Computer:

Apple Macintosh SE (two floppies plus 30 meg internal hard drive
Imagewriter II modem at 2400 baud

Software:

Mark of the Unicorn Performer 2.31 professional composer
Opcode Librarian for Matrix 6 editor/librarian for DX/TX
Blank Soundfile for ESQ1 misc discs with library of sounds

Richard Del Maestro's label is:

Expansion Records-Expanse Music P.O. Box 996, Cardiff By The Sea, California 92007

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Recording Techniques

BRUCE BARTLETT

How To Make A Demo Tape With A Recorder/Mixer

• In a previous issue, we covered features found in current multi-track cassette recorder/mixers—what is available, and how the features work. This information should help you decide among the many models available today.

To review, a recorder/mixer or portable studio is a combination 4-track cassette recorder and mixer in one small, portable package. The cassette unit records up to four individual tracks, each track containing the signal of a different musical instrument, or different combinations of instruments. After recording all the instruments and vocals on these tracks, you mix them down to two-channel stereo.

These creative new tools are ideal for making home demo tapes. But why record at home, rather than in a studio, where the sound quality is superior?

For one reason, recorder/mixers are an aid to composing. You can record your musical ideas and mix them to a finished product. In this case, quality is not paramount, ease of expression is. If you've written a song for your band to play, you can perform and record all the parts yourself: rhythm guitar or synth, bass, drums, and vocals. Then you can play this complete recording to your band to show them how you envision your song.

Another benefit: You can practice your recording techniques before going into a professional studio, saving the expense of learning the technology on studio time. Once your skills are perfected, you might even make money recording other musicians.

When you perform a song, you tend to concentrate on your own instrument. But when you hear a tape playback of that song, you can listen to the song as a whole. You can better hear what works musically and what doesn't. It's less expensive to do this experimenting at home than in the studio.

Bruce Bartlett writes Recording Techniques in each issue.

SUPER NECESSARY EQUIPMENT

After you buy a portable studio, are you through shopping? No. Despite the name, "portable studio," such a device is not complete in itself. You also need microphones, mic stands, speakers or headphones, and possibly a delay unit, reverb unit, and compressor for the vocals.

In addition, you must set up a stereo mix whenever you want to hear the finished product. Rather than doing that, you can record the mix onto an external cassette deck or open-reel recorder.

RECORDING PROCEDURES

Once you've chosen a suitable recorder/mixer, it's time to learn how to use it. Let's look at typical operating procedures to make a demo tape.

There are three stages in making a multi-track recording with a recorder/mixer: recording, overdubbing, and mixdown. The rhythm instruments—drums, bass, guitar—are recorded first. Later, vocals and other instruments are added during the overdubbing stage. Finally, all four recorded tracks are combined or mixed to 2-track stereo in the mixdown stage. This stereo mix is recorded onto an external 2-track cassette or open-reel deck.

Let's run through a typical recording procedure for a small rock band.

IMPORTANT: First clean the tape heads and rubber pinch roller with a cotton swab and the cleaner recommended by the manufacturer (usually isopropyl alcohol, available at drug stores or hardware stores). Allow the heads to dry, and insert a high-bias (chromium) cassette tape of C-60 or C-90 length.

Next, set up the musical instruments, place microphones, and plug them into the mic inputs. Connect a cable between each synthesizer/drum machine output and a line input on the recorder/mixer. Some keyboardists run all their instruments into a mixer; you can connect to their mixer output.

Label the mixer input faders according to the instruments they affect. Set the input selectors to "mic" or "line" depending on what is plugged into each input. If there is no input selector, turn down the TRIM control for line-level signals.

Plug in headphones to hear what you're recording. Turn up the headphone volume control. Set the MONITOR SELECT switch to hear the live signals you're recording.

Now plan your track assignments. For example, keyboards can go on track 1, a bass-and-drums mix can go on track 2, vocals on 3, and guitars on 4.

If several instruments are mixed to one track, you can't easily change the mix within that track once it's recorded. For example, if the bass and drums are mixed together and recorded on a single track, you can't change the balance between bass and drums during mixdown (except slightly with EQ). Also, each track is mono. If you want a stereo drum mix, for example, it must be recorded on two tracks.

After the instruments are assigned to their tracks, label each track's meter according to what is being recorded on that track.

You may want to turn up the treble (high-frequency EQ) a little on all instruments (except bass and kick drum) to compensate for losses during recording and to improve the signal-to-noise ratio.

Set the master fader(s) about 3/4 up (at 0, or at the shaded portion of fader travel). Do the same for the input faders in use. Play the instruments one at a time as loud as they're going to be played, and gradually turn down the TRIM controls just until the input-overload (clip) lights stop flashing. Or set the TRIM controls so that the meters peak around 0 maximum. If your recorder/mixer has no TRIM control, simply proceed to the next step.

TRACK	TRACK	TRACK	TRACK	TRACK	TRACK	TRACK
1 A*	1	1 E*	1	1 H*	1	1 J*
2 B*	2	2 F*	2	2	2 HI*	2 HI
3 C*	3	3	3 EFG*	3 EFG	3 EFG	3 EFG
4	4 ABCD*	4 ABCD	4 ABCD	4 ABCD	4 ABCD	4 ABCD
1(A)	1(B)	1(C)	1(D)	1(E)	1(F)	1(G)

Each track with an asterisk* is a live microphone signal. Tracks without an asterisk are already recorded on tape.

Figure 1. Bouncing procedure to record 10 tracks with a 4-track recorder.

Using the input faders, set the recording levels to peak around 0 (or around -6 to -8 VU on VU meters only for percussive instruments). If the VU meters contain peak LEDs, set the record levels so that the peak LEDs flash only occasionally.

Next, adjust the monitor mix for the desired balance heard over headphones. That is, adjust the GAIN and PAN controls as desired in the monitor mixer (which might be called "monmix" or "tape cue"). In some inexpensive units, the monitor mix is set with the "output" knobs in each input module. The monitor mix is independent of the recording levels.

Set the tracks you want to record to "record ready" mode, and set the tape counter to "000."

Now start recording. Have the drummer count off the beat. Do a trial recording while the band plays to check again for input overload and excessive recording levels.

The lead vocalist might sing along with the instruments so that the musicians can keep their place in the music and get a feel for the song. This "scratch" vocal performance is not recorded—the vocals will be overdubbed later.

When the song is done, rewind the tape using the return-to-zero function. Set the input selectors to "tape," "track," or "remix," and play back the recording. Don't expect this playback to sound like the finished product—refining the sound comes later during mixdown.

VOCAL OVERDUBS

After the rhythm tracks for all the songs are recorded, it's time to do overdubs. With this process, the lead vocalist listens to the previously recorded tracks over headphones and sings along with them. You record the vocal on an unused (open) track. Proceed as follows:

1. Connect the vocalist's headphones to a small power amp driven from the cue-mix or monitor-mix output on the recorder/mixer.

2. Set the MONITOR SELECT switch to "bus" for the vocalist's track; set it to "tape" for the other tracks.

3. Set the tape counter to "000" at the beginning of the song.

4. Play the tape and use the monitor-mixer (tape-cue) knobs to blend the pre-recorded tracks with the live vocal-microphone signals. This creates a cue mix—the balance among instruments and vocals heard in the studio headphones. If you have trouble hearing a particular instrument in the headphones, turn it up.

5. Using the return-to-zero function, rewind to the beginning of the song and record the vocal on an unused track. If a mistake is made, the vocal track (or any overdub) can be re-recorded without affecting the rhythm tracks. Other overdubs might include harmony vocals or solos.

PUNCHING IN

You might want to correct musical errors in a track by punching in. Here's how:

1. Set the tape counter to "000" a few seconds before the part needing correction.

2. Play the tape track to the musician over headphones.

3. During a rest (a pause in the track) just before the part needing correction, punch in the record button (or use the footswitch). Record the corrected musical part.

4. Immediately after playing the corrected part, punch out of record mode (or use the footswitch) to avoid erasing the rest of the track.

5. Using the return-to-zero function, rewind the tape and play it back. If necessary, you can re-record the punch.

What if you want to bounce tracks? Let's say you want to bounce tracks 1, 2, and 3 to track 4. If your machine has record/play/send switches, proceed as follows:

1. Monitor only track 4.

2. Set the record/play/send switches to "send" for input modules 1, 2, and 3. Set the switch to "play" for input module 4.

3. Play the tape.

4. Using the output knobs in input modules 1, 2, and 3, mix the tracks as desired and set the recording level to peak around 0 on track 4.

5. When you're happy with the mix, rewind to the beginning of the song.

6. Set the record/play/send switch for track 4 to "record."

7. Start recording. Tracks 1, 2, and 3 will be mixed and recorded onto track 4.

If your machine does NOT have record/play/send switches, proceed as follows:

1. Monitor only track 4.

2. Assign input modules 1, 2, and 3 to track 4.

3. Set all tracks to "play" or "safe" mode.

4. Set the input selector switches for input modules 1, 2, and 3 to "tape."

5. Play the tape.

6. Using input faders 1, 2, and 3, mix the tracks as desired and set the recording level to peak around 0 on track 4.

7. When you're happy with the mix, rewind to the beginning of the song.

8. Set only track 4 to "record ready" mode.

9. Start recording. Tracks 1, 2, and 3 will be mixed and recorded onto track 4.

You can add live mic signals while you're bouncing by plugging them into input 4, and assigning input 4 to track 4. In this way, you can record up to ten tracks on a 4- track machine while bouncing tracks (*Figure* 1). Here's how:

1. Record three instruments on tracks 1, 2 and 3 (*Figure* 1-A).

2. Mix these three tracks with a live instrument signal and record the result on track 4 (*Figure* 1-B).

3. Record two more instruments on tracks 1 and 2 (*Figure* 1-C).

4. Bounce tracks 1 and 2 onto track 3 while mixing in another live instrument (*Figure* 1-D).

5. Record one more instrument on track 1 (*Figure* 1-E).

6. Bounce track 1 to track 2 while mixing in another live instrument (*Figure* 1-F).

7. Record one more instrument on track 1 (*Figure* 1-G).

You can continue this process to add even more instruments, but every re-recording adds noise, distortion, and frequency-response errors.

Do a similar procedure for other track-bouncing combinations, setting up your recorder/mixer appropriately for the desired track assignments.

MIXDOWN

After all four tracks are recorded (maybe with some bouncing), it's time to mix or combine them to 2-track stereo. To begin, on the back of the unit, locate the jacks for output channels 1 and 2 (they might be called "Bus 1 and 2," or "Stereo mix bus"). Plug these outputs into the line or aux inputs of a stereo cassette recorder or open-reel deck.

Set the input-selector switches on the mixer to "tape" (or "track" or "remix") because you'll be mixing down the 4-track tape. Monitor the 2-track stereo mix bus.

Set the master fader(s) (output fader) 3/4 up (to 0 or to the shaded portion of fader travel).

Assign each track to channels 1 and 2, and use the pan pots to place each track where desired between your stereo speakers. Typically, bass, kick drum, and vocals go to center; keyboards and guitars can be panned left and right.

The vocal track occasionally may be too loud or too quiet relative to the instruments, because vocals have a wider dynamic range than instruments. You may want to run the vocal track through a compressor patched into the access jacks for the vocal input module, if these jacks are available. The compressor will keep the loudness of the vocals more constant, making them easier to hear throughout the mix.

Using the input faders, adjust the volume of each track for a pleasing balance. You should be able to hear each instrument clearly. In the Fostex X-15 II, you use the MONMIX controls for this function.

Next adjust the EQ for the desired tonal balance on each track. If a track sounds too dull, turn up the treble or high frequencies. If a track sounds too bassy, turn down the bass or low frequencies, and so on.

Each track can be EQ'd independently. For example, you can add crispness (high frequencies) to the cymbals without affecting the tone quality of the vocals. Or you can remove a "tubby" tone from the kick drum without affecting the keyboards, if they are recorded on separate tracks.

You might want to plug in an external reverb or delay unit to add spaciousness to the sound. This device connects between the AUX send and receive jacks. If your recorder/mixer has an AUX RETURN control, set it halfway up. Using the AUX knobs on the mixer, adjust the amount of delay or reverb for each track as desired.

As you're mixing, be sure to keep the recording level peaking around 0 by adjusting the input faders, with the master fader(s) remaining about 3/4 up. The meters in the multi-track recorder/mixer, and in the 2-track recorder, should all peak around 0.

Once everything is set the way you want it, put the 2-track recorder in record mode and record the mix. Repeat this procedure for all the tunes you recorded. Congratulations! There's your finished master tape, ready to play for others.

If you plan to send the master tape to a tape-duplication or record-mastering house, first make a safety copy of the master tape in case it is lost or damaged. Take care in setting recording levels while copying.

For small quantities of cassettes, you may want to copy the master tape yourself as many times as needed. You'll soon have a number of quality demo tapes which you can send to prospective clients or record companies. db

HOW TO READ THE LABEL

The top line of your label contains information that enables us to find you on the computer. Without that we can't effect address changes or find your entry. The sample below is what most labels look like.

A11725SAG20 0787 9309
Sagamore Publishing Co
203 Commack Rd, Suite 1010
Commack, NY 11725

The first sequence of characters is how we locate you. The next four numbers indicate the issue that you have just received. Finally, the last four numbers *reversed* represent the date of expiry. Just read backwards: 9309 is Sept/Oct 1993.

BRIAN BATTLES

Ad Ventures

Cart Machines

• This business of producing radio commercials would make most of us crazy if it weren't for the money. Let's face it, though, there's also the thrill of turning on the radio and hearing our work. Or at least an approximate semblance of it. We've taken up this subject before, but I still receive mail from recording studio folks who don't have a clear understanding of the audio aspects of radio broadcasting. To give you a clearer picture, this issue we'll take a thorough look at the technical wizardry of broadcasting.

RADIO STATION ROUTE

Radio stations receive most commercials on 5-inch large-hub reels of 1/4-inch tape. The usual format is 7.5 in./sec., full-track mono or two-track stereo with no noise reduction. Upon its arrival, the station's sales department routes it to the production department (sometimes called the continuity department), along with some type of written production order. The Production Director checks the order to note the on-air schedule so he knows what day the spot is to start running and what day it stops. He then assigns a member of the production staff (often a disc jockey) to take the reel and dub it onto a standard broadcast tape cartridge, called a *cart* in radio jargon.

At first glance a broadcast cart resembles an 8-track cartridge. (Remember them?) There's a big difference, though—old 8-tracks ran at 3.75 in./sec., contained their own built-in pinch rollers, and packed the audio into tracks less than 1/32-inch wide. Commercial broadcast cart machines also use continuous-loop tape cartridges loaded with 1/4-inch tape in a plastic shell about the size of an 8-track, except that carts run at 7.5 in./sec. in mono or two-track stereo. Some of today's cart machines are equipped with Dolby or dbx noise reduction circuitry. (I've even heard rumors of PCM-encoded digital cart decks.)

In addition to the one or two audio tracks on the tape, broadcast carts have another track set aside for recording and sensing certain inaudible tones. When recording on a cartridge, the machine lays down a cue tone right at the very start. When the cart plays and the loop of tape finishes running all the way through, the deck recognizes the end and beginning. This causes the machine's transport to switch to the Stop mode automatically. Consequently, the cart always stops right as it reaches the beginning of the commercial, cued and ready for the next play.

RECORDING

The production person assigned to take care of the commercial uses a degausser to bulk erase the cartridge, since most cart decks don't have erase heads. Next the cart is loaded into the deck and is rolled until the splice in the tape loop just clears the record head. Then the operator stops the cart and sets the deck in the Record Ready mode to set the input level. There are regular VU meters or LED displays on the cart recorder that (theoretically) correspond to the VU meters on the production studio's mixing console.

The commercial reel is played, and once the levels are adjusted properly, the operator rewinds the reel to the beginning of the spot and "rocks" the tape back and forth to be sure it's tightly cued to the very start. To begin dubbing the reel to cart, the start buttons on both decks are pressed almost simultaneously, the cart deck's button pushed a split second before the reel-to-reel's. This puts a few fractions of an inch of blank tape down at the beginning of the loop to avoid a phenomenon quaintly called "cart burp". The problem is that as the loop completes its cycle and the machine senses the Stop tone, there is some mechanical inertia that allows the tape to continue rolling a tiny bit. If the audio begins too close to the beginning of the loop, it sometimes allows a momentary "bloop" to go out over the air. In theory, to avert this problem the on-air operator is supposed to turn down the cart machine's pot after the end of the spot has played. In actual practice, however, the hectic activity in the air studio often keeps the disc jockey from remembering to do so.

Another error can happen if the audio is so close to the beginning of the loop that the audio begins sometime before the point at which the cartridge tape stops on the previous play. Second, most on-air personnel, however, can't always be counted on to get the pot down every time. The production person can prevent this when preparing the dub.

After the commercial is copied from the reel to the cart, the latter is labeled. Then it's placed in a rack in the on-air studio or control room. The disc jockey or control operator plays the commercial according to the *program log*, a schedule prepared by the traffic department. The traffic staff takes the sales contract provided by the account executive and schedules the commercials as to correct airtimes and total number of spots to run. This information is compiled, and someone types

out the resulting program log or it's printed out from a computer and placed inside the on-air control room.

CURSORY MAINTENANCE

How does this relate to the task of producing radio commercials? There are many variables in the reel-to-cart dubbing process that have a distressing effect on the sound of your commercial. Radio station production personnel often fail to clean and demagnetize heads on tape decks, defective carts are used, carts are played so many times that things go wrong. Wear becomes noticeable, levels are not optimized, bias and equalization adjustments drift off their standard setting, and so on.

If you operate a recording studio, you are conscientious about keeping your equipment in good shape. You constantly clean and demagnetize your tape machines' heads, tape guides, and rollers, periodically align the heads and lubricate moving parts, check and adjust tension arms, belts, cams, springs, spindles, and levers, calibrate tape deck, console, and processor VU meters, pots, and other controls, and regularly blow dust out of faders, patch bays, and components.

Many broadcast facilities, however, merely concern themselves with the urgency of keeping the station on the air. This means that, due to management philosophy or economic dictates, the audio gear in the studios receives only cursory maintenance. Heads can go for weeks without a good cleaning, alignment may be done once every year or so, levels are validated only when there is a problem, and there may not even be a head demagnetizer (or anyone who knows how to use one) anywhere to be found. The people who operate the equipment at many stations, especially the smaller ones, often have little or no training in the fine points of audio production. They may not know the correct way to clean heads, to set levels, to detect poor quality sound. You'd be surprised at what kind of lousy sounding tapes are allowed to get through to the air studio. Also, most stations use a lot of compression/limiting, so it's imperative to expect this situation when you prepare a spot for broadcast use. How do you put together a tape so it will sound good in this challenging environment? Here are five rules of thumb to keep in mind whenever you submit a tape for use at a radio station:

Rule 1. Don't sweat frequency response. The audiophile's 20-20,000 Hz ± 3dB isn't at issue in the broadcasting environment. FM radio rarely exceeds 50-15,000 Hz and AM rolls off dramatically above 7 KHz. A tape with relatively flat response from about 50 Hz to around 10 or 12 KHz will serve the purpose adequately.

Rule 2. Forget dynamic range. In the first place, all stations run their signal through at least minimal compression and limiting. This means there isn't much dynamic range from the loudest sound to the quietest sound. You're fooling yourself if you think a 90 dB dynamic range audio source (like a compact disc) will yield much range to the listener. As long as you don't pollute your tape with hiss and stray noises, you're O.K.

Don't use EQ to puff up the bass in a jingle or an announcer's voice. This will just muddy the on-air sound. Besides, a hump in your tape's frequency curve could cause the station's compressor/limiters to behave unpredictably. The spot could come out with strangely varying volume levels or may be just plain quiet overall.

Rule 3. Keep it simple. Your commercials should have a clean, uncluttered flavor. Don't get carried away and mix too many instruments, voices, or sound effects. The listener should be able to pick out the message without undue concentration. Bear in mind that people listen to the radio in often less than ideal environments, and the commercial you cut will be competing with traffic sounds, conversation, and other general commotion. If the message doesn't leap out at them, the spot won't get results. Listen to your finished work on a cassette in a moving car. Is the commercial loud and clear, or do you find yourself reaching for the volume control to turn it up?

Rule 4. Repeat the client's name repeatedly. If nothing else, a radio commercial must fix a firm image in the mind of the listener. No advertising copy is effective if the spot ends and people can say, "Golly, what an interesting message. Now, where do I go to get one of those again?" I've heard irresistible jingles that were so catchy, I found myself humming them all day long. Yet, they didn't even have the sponsor's name in them. The producer relied solely on the announcer's copy in the middle to get the name across. It didn't do much good in reaching people like me.

Rule 5. Maintain standards. From a technical standpoint, you lose a lot of control over the way your recordings are used on the radio, since there can be so much variation in equipment and personnel from station to station. Slate the tape with clear instructions. ("XYZ Motors 60-second radio spot entitled 'St. Patrick's Day Sale,' to air from March 5th to March 17th only. Spot preceded by a 1 KHz tone at 0 dB for 30 seconds. This commercial recorded in 1/2-track stereo.") Keep levels consistent, and use a limiter if necessary. Make it easy for a relatively inexperienced operator to dub the spot properly. Label all details clearly on the tape box and on the reel itself (Client name, tape speed/track info, air dates, etc.).

Even if your spot winds up in the production studio of a big-budget station with the latest equipment and highly-trained engineers, they'll appreciate not having to guess at what's on the tape and how to make the most of the superior sound quality and content you worked so hard to produce.

TALKBACK MIC

I just received a letter from Mr. Jibby Jacobs of Singapore (this sets a new long distance Ad Ventures correspondence record). Jibby's a broadcaster with some questions on studio procedures.

First, he asks about "back-masking" to hide secret or "satanic" messages in a pop song recording. The process he refers to is about as satanic as looking in a mirror. Quite simply, you accomplish this by taping a person talking normally, then reversing the tape and mixing the resulting gibberish into the main audio tracks. Anybody with a reel-to-reel tape deck can record the finished song off the radio or a disk and flip the tape to hear what is supposedly being said. Variations include running the backward message tape backward at different speeds, using two messages at once on different channels, pitch-shifting, and other conventional sound processing techniques.

Actually, there has been a great deal of foolish controversy stirred up by the "discovery" of various hidden messages in several popular recordings. Many unfortunate people are mystified by this strangeness of this clever technical trick and regard it as somehow unnatural or evil. Recording artists and engineers who are aware of the credulity of some listeners have ex-

ploited the backward masking concept by tossing weird or silly comments in on their records. This stuff is eaten up by certain persons who allow wishful thinking to let them interpret mundane babble as evidence of attempts at subliminal mind control, secret instructions, or conspiratorial communiques. Most of us have heard plenty about the legendary series of hints on Beatles albums that supposedly claimed Paul McCartney was dead and that the band was advocating drug abuse. I even read someone's assertion that the cacophony known as *Revolution 9* on the "White Album" was the sonic representation of the automobile accident in which McCartney allegedly died. More recently, a paranoid group of hysterical television viewers claimed that the theme song from the old "Mr. Ed" program contains a backward message mentioning Satan.

The boring truth is that 1) the backward messages that do exist within a few recordings are just an easily produced special effect, intentionally planted for the sake of entertainment or to take advantage of easily-impressed imaginations, and 2) just about any recording of the human voice can appear to say strange things when played backwards. Because of the human brain's pattern recognition ability, there is a tendency to make sense out of any hodgepodge of visual or auditory stimuli (this forms part of the validation for the use of the well-known Rorschach ink blot test used by psychoanalysts). This explains why even a recording of a person reading the Pledge of Allegiance or the alphabet can make some people "hear" secret messages. You may dismiss these as the auditory equivalent of optical illusions.

Jibby's next question concerns the amount of use he can expect from a 2-inch 24-track reel of tape. There's really no conclusive answer to how much a reel can be reused before it should be discarded. Ideally, you'd unwrap a fresh spool of tape at the beginning of any serious recording session. Normal friction wears a certain amount of the coating off a tape each time it is recorded or played back. From a pragmatic point of view, however, this erosion is rather negligible for anywhere from one to one hundred passes. Radio stations' budgets generally preclude the one-time use of expensive supplies like 2-inch tape, so management may look askance at the practice of ditching a reel after just one recording, so let's be realistic. My advice is let your ears be your guide, but keep the deck's heads and transport clean as a whistle, and use a high-powered tape degausser to erase the tape before each new recording session. I'd still toss the tape into storage after a couple dozen uses, though. The less passes, the better.

Jibby's final question is about equipment maintenance. He wants to know how often his tape decks should be serviced, as they are in operation up to 14 hours a day, seven days a week. In a utopian world, professional recording equipment should be maintained constantly. Clean heads and guides before each session (or every few hours), demagnetized once or twice a day, and alignment checked at the beginning of each day. Since Jibby says they have only a part-time engineer, I'd say he could live with alignment as little as once per week, with operators cleaning and demagnetizing heads as stated above. If budget is an issue, inform management of the relative savings derived from keeping the decks you have maintained properly for five to ten years or so vs. replacing abused heads or the whole deck at much more frequent intervals due to neglect. Besides, why own and use expensive professional multi-track tape equipment if you're going to let the sound quality degrade over long stretches of use? In that case you may as well buy two or three cheaper semi-pro machines.

It's something like buying a brand-new sports car; I wouldn't bother to buy a Ferrari or a Lamborghini unless my budget also allowed for regular tune-ups and routine maintenance. Going a few thousand extra miles between oil changes, for example, would shorten the life of the car considerably and retard its performance. Like the commercial says, "You can pay me now, or pay me later."

There are a lot of special people I'd like to acknowledge. Greetings and thanks to the following kind folks:

The gang at Trod Nossel Studios in New Haven, Conn...*Dan Duffy* and *Jack Duncan* at National Speaker And Sound in Denver, Colo...*Joan Voukides* and *Darlene Fiscus* of the Radio Advertising Bureau in New York City...*Scott*, *Jesse*, and *Brad* at The DAT Store in Santa Monica, Calif. for providing valuable assistance and an excellent price on a new Sony TCD-D10 portable DAT deck. I'll have more about that in an upcoming article here in **db**.

Tim Hancock of Boulder, Colo., photographer extraordinaire and a great guy to work with...*Dr. Rick Kirschner* and *Dr. Rick Brinkman*, an outrageous pair 'o docs from the wilds of Oregon...*Jeffrey T. Wormley* of Syndicate Sound in Struthers, Ohio...*Dr. Julie White* of San Francisco, the successful businesswoman's leading guru...*Shale and Candace Paul* of *The Delta Group* in Evergreen, Colo. have some exciting business management ideas in the books *Tough/Nice* and *The Warrior Within*...*John McPherson* of Annapolis Valley Radio Ltd. in Kentville, Nova Scotia...*Jim Rodgers* of ABN...*Mr. Network*, *Ivan Misner* of AIM Consulting in La Verne, California...casting agent *Becky Toma*... *Ted Lietle* of *One-Inch Teleproductions* in Denver, Colo...Congratulations to *Jeff Hedquist* of *Hedquist Productions* in Fairfield, Iowa! He has won three awards for his ad "Waltz" (for the client *Stamford Downtown Shuttle*, and the *Rogers Group* ad agency of Fairfield, CT). Two awards were from the *International Radio Festival* of New York, the *Gold Medal* (Best Use of Sound), the *Grand Award* (Best Creative Achievement in Radio Advertising), and one award from the *London Advertising Awards* (Use of Sound)... the *One Minute Manager* himself, *Kenneth Blanchard*, it was a delight working with you at the special seminar taping...and last, but not least, *Career-Track Publications*' ace video producer, *Jon Rees*...

Keep those demo tapes and letters coming: write to me in care of **db Magazine** or at P.O. Box 17386, Boulder, CO 80308-7386.

My How To Produce Great Radio Commercials audio-cassette training course should finally be available by the time you read this. Stay tuned. db

ED LEARNED

Sound Reinforcement In New Zealand And Southeast Asia, Part II

This is the continuing saga of this peripatetic sound man as he travels the world, this time in parts of Southeast Asia.

Friday, September 18, was our day to leave Kuala Lumpur for Penang, and island off the northwestern coast of Malaysia. We welcomed the opportunity to enjoy a relaxed morning, made possible by an afternoon flight and rooms at the hotel airport. Benny and the group gave several interviews, over lunch, to various members of Malaysia's print media before we left to catch our plane. The weather was great, and we were treated to excellent vistas of the Malaysian coast as we made the 45-minute flight. The weather in Penang was tropical: very hot and humid.

PROBLEMS ALREADY

CAS (Cultural Affairs Specialist) Sharifah Zuriah Aljeffri and I sent most of the baggage and the band on to the Rasa Sayang Hotel with Mr. Yeoh Seng Hooi of the American University Alumni Membership (AUAM), our local sponsor in Penang. I elected to travel with the equipment van. It had been five years since I was last in Penang, and the changes wrought by the mainland/island causeway were unmistakable. New condos, hotels, and homes were everywhere; even some of the roads were new, widened to four lanes.

Once outside of Georgetown, the road twisted through thick vegetation, with occasional views of the gorgeous beaches. We were only 1/4 mile from the hotel entrance when our van was stopped by the police. I stood aside while a rapid conversation in Malaysian followed. USIA escort officer Arlene Jackson was in the van behind us; she stopped to add her opinion. It seemed that the driver, van, and all our stuff would have to go to the station with the officers. We were allowed to go to the hotel first, where another conference took place between the police, the hotel manager, and Sharifah, who phoned the police commissioner about our dilemma. It turned out that the police wanted to confiscate all our gear because the van carrying it wasn't licensed to carry cargo, only people. The hotel staff told me that the road along Penang's coast is often used for contraband, and is closely watched by the police. Many visitors have fallen prey to speed traps or confiscated belongings, and often only financial lubrication could spin the wheels of justice. Our scheduled concert at the hotel and Sharifah's influence with local authorities prevented any serious difficulties with impounded equipment, although the driver was fined. With our troubles behind us, we settled in to enjoy this beautiful beachfront hotel. I was taken down to the ballroom to have a look at the concert preparations. The stage was in place, and the sound system was being installed as I arrived. I elected to work immediately rather than wait until tomorrow's scheduled AM setup. I could now take advantage of the hotel work crew and get everything positioned before the dinner tables were put in place.

Power was available from numerous UK-style receptacles located behind the stage.

PENANG VENUE

The Rasa Sayang Hotel Ballroom was a rectangular room, seating just under 400. The stage was set to "play" towards the short dimension of the room. Padded room partitions and thick carpeting contributed to very dead acoustics, with a reverb time of less than 1 second. The Community CS 52 cabinets I had selected were hung from permanent points on the ceiling, which positioned them **behind** the stage. I was very concerned about this, as I felt it might lead to feedback problems.

However, there was no way to move them, so I would have to deal with this problem via equalization. Each cabinet contained 2 15-inch woofers and a high-frequency section. Two Community CS 50B sub-woofers were also in place next to the stage, but as these only handled frequencies below 150 Hz, I had them struck, electing to run the flying cabinets full-range. Control electronics and amplifiers for the house PA were located in a sound booth located

high up on a side wall house right. These could be accessed via xlr connectors located in wall receptacles scattered around the room; I tied my mix output into one of these.

Power was available from numerous UK-style receptacles located behind the stage. These supplied 230 volt 50 cycle power, with functional equipment grounds. I had my stuff up and working quickly, but encountered nasty hum and buzz problems when tying into the house system. We solved this by using a direct box between my output and the house line; the combination of transformer isolation and a pin 1 lift reduced the noise to acceptable levels. Taped music revealed that the flying speakers would indeed have enough low end to carry the room without sub-woofers.

With work out of the way, I could now unwind, and few places are more enjoyable than Penang for that! Saturday was a rainy day, but I still managed to squeeze in some beach time before our 4pm sound check. I quickly found that I could easily get the levels I needed in the PA without feedback by slightly dipping the 1 kHz and 2.5 kHz area (*Figure 1*). The room was so dead that I used more reverb than usual to add some space and warmth to the horns. My only odd problem was with the monitors. As we started the check, Curtis complained that he couldn't hear well enough. Cranking his monitor send to new heights did not seem to work. When I went up on stage to investigate, I found that the mini mic had twisted on its clip, so the "hot" side of the mic was angled away from the trombone's throat, not toward it. We had both noticed occasional dropouts at the previous show in New Zealand, and now we knew why. I taped the mic in place, and reminded both Benny and Curtis to check the position before each show. Whenever possible, I would visit them just before the performance, then again at intermission, to double-check mic placement.

The evening's performance was a short 60-minute set, concluding a special dinner held by the AUAM and attended by young Malayasians who had gone to U.S. colleges and universities. Most spoke English, and I enjoyed chatting with several of them about music and sound. After the performance, I quickly packed up and supervised the crew from Maypack, a Malaysian trucking company, in loading our stuff onto their vehicle, which would drive the gear across the causeway and back to Kuala Lumpur, a trip of about 8-10 hours. Ground transportation for equipment was necessary because the smaller planes that fly between Penang and KL do not always have space for excess baggage or cargo.

Figure 1. Soundcheck at Rasa Sayang Hotel ballroom. Note the PA speakers flown above and behind the stage.

ON TO KUALA LUMPUR

We left the hotel Sunday morning around 10am; yes, properly licensed transportation carried our baggage this time! Our flight from Penang arrived in Kuala Lumpur a little after 1pm, and after a 3/4-hour ride from the airport we arrived in Malaysia's capitol. Kuala Lumpur is located in a specially-designed government area, similar to the District of Columbia in the U.S. It is as modern a city as you'd want to see, with skyscrapers, modern office buildings, and plenty of classy hotels.

We also changed his personal EQ, adding slightly more bass frequencies to the amp, and removing some of the same frequencies from the console's bass input.

BETTER ACOUSTICS

Monday, September 21, was our first of two concert days in the area. I was picked up at 11:30am; Billy Hart joined me, as he wanted to get his drums set up early and play a little bit. Our venue, the Petaling Jaya Civic Center, was outside of the KL government zone, so we were faced with about a 1/2-hour drive through KL traffic jams. I'd worked at this facility before on my Decoding Society trip in 1983 (see **db** Mar/Apr 1985, V19 #2), playing the multi-purpose room for the Malaysian Jazz Festival. This time we would perform in the Civic Auditorium, which seated just over 1000 in theater seating with a small balcony. The acoustics here were far better than the cavern next door; reverb time was a very manageable 1-1/4 seconds, due to the thick seats and a rug-like material on the walls. Sharifah had arranged the use of the in-house PA system, so while I waited for the local tech to show up, I set up the rest of my stuff.

Power was available on UK-type receptacles upstage center or offstage left and right. All outlets could provide 230 volts 50 Hz, but none of my equipment grounds were functional. I chose to tie my transformer input tails directly into a drop offstage left; screw terminals were available to tie in power, and there was a separate ground bar bonded to the drop chassis. There were occasional dips in the voltage of as much as 5 volts, but no spikes were observed. At 1pm, the house tech showed up and tied my gear into the house system. The PA was located high on the side walls in a scrimmed support structure just outside the proscenium, and appeared to be a 2-way design with 15-inch woofers and mid-range horns. This system had no low end below 150 Hz, and was very honky; I found that dipping the 800 Hz-1.2 kHz area

helped smooth out the horns considerably. The house left cluster had some loose components that would rattle sympathetically with certain bass notes. The house tech was unaware of this problem, and apparently could do nothing about it: the PA was positioned so high that there was no way to get at it without a superlift. When we returned with the rest of the group at 6pm for our formal sound check, this "rattle" proved to be the day's big problem. It was particularly revealing when Ray played solo bass: the woofers sounded like they were flapping when he would play two specific notes. Otherwise, it was clean. I decided to try and get the stage volume to do most of the work: by having Ray run his amp hotter than usual, I could put less level through the house PA, and get less rattle.

We also changed his personal EQ, adding slightly more bass frequencies to the amp, and removing some of the same frequencies from the console's bass input. This combination reduced the noise to a point where we could live with it. Ah, the joys of touring sound! The weather had turned nasty before showtime, with monsoon rains accompanied by severe lightning.

Our audience was small (200) but mighty: they greeted each completed solo with enthusiastic applause. We had a chance to greet many of the audience members at the post-concert reception, held in the lobby. Angela Fernandez, one of the reporters who'd interviewed the band at the airport hotel, surprised me by having my picture taken. Apparently, her paper wanted an article on me; we decided to do it prior to tomorrow's concert, which would also be at the Civic Auditorium.

The "stage right" PA stack was actually firing across the downstage area, resulting in feedback problems: there were any number of hot "squeals" while I was watching the band.

PRE-CONCERT LECTURE

Paradise for a touring engineer is having consecutive concerts at the same venue. I spent the morning helping Arlene procure Burmese visas for the group, a process that took several hours, then enjoyed a sightseeing trip around Kuala Lumpur with interested group members. Tuesday's concert featured a much larger crowd, and I was shocked when several came up and welcomed me back to Malaysia; they'd remembered me from the Decoding Society. What memories!

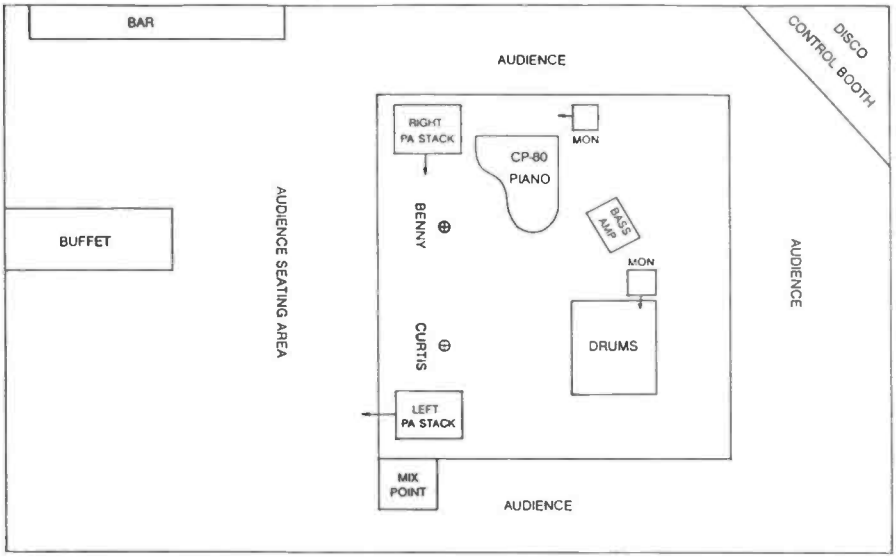
Angela's interview was most interesting: after the usual biographical details, she spoke about problems with sound at Malaysian musical events, and asked for my comments/solutions. She was specifically interested about overall spl at concerts and even balance between instruments.

I tried to get across the concept that different styles of music require different mixing techniques: rock concert levels and concepts of instrumental balance would not work for acoustic jazz, for instance. I think that one of the hardest things to do in sound reinforcement is to mix soft, and I tried to explain the importance of looking at both stage sound *and* PA sound as equal parts of what an audience hears. My bass rattle problem proved a perfect illustration of this point. Our "interview" attracted quite a few interested local musicians who recognized Angela, so I found myself giving a pre-concert lecture on sound. The band was much more relaxed: having become accustomed to the sound of the hall, they played brilliantly. Benny played a beautiful cadenza on "I Remember Clifford," and the All-Stars played a hard swinging rendition of "Killer Joe," one of the few times they played that song on the tour. I continued my conversation with Angela and several interested musicians while I packed up, taking full advantage of all my new-found help. After the show, many of us went over to another hotel to see a local jazz group; a free-floating jam session occurred that went into the wee hours of the morning.

ROAD TO SINGAPORE

Wednesday, September 23, marked the end of our Malaysian visit. We were scheduled to leave for Singapore around noon, but due to cargo capacity, the airline could not guarantee the shipment of our gear on the same flight. The early morning flight to Singapore used an Airbus, a much larger plane, so Arlene and I decided to send the sound and band gear early. I was the logical choice to accompany the equipment, so I was up and gone from the hotel before 6:30am with the Maypack guys. Getting the stuff through airport customs was a snap, and the flight to Singapore was under one hour. Upon arrival at Singapore's Changi Airport, I was met by USIS CAO (Cultural Affairs Officer) Tony Vaughn, his assistant Celene Chandry, and several representatives of Jazz-On Singapore, the jazz festival at which we would perform. After procuring our equipment, I was taken to the Glass Hotel, where all festival artists were staying. After I had settled in, I made a visit to the festival office to start following up on production details. I was most interested in checking out our festival production, so Mah Choon Hong, festival coordinator, arranged to take me over to Rumours, a disco at the Forum Galleria. Rumours was the site of "Jazz-On Lunch," a concert-with-food matinee

Figure 2. The Rumours stage setup for Jazz-On Singapore.



held daily during the festival; we were sceduled to play there Friday.

The set-up at Rumours was a bit odd; the dance floor was the stage, so the "audience" completely surrounded the performance area. The disco PA system could not be used for reinforcement, as it was pointing at the performers, so a separate system had been brought in. These speakers were pointing in only two directions, so large areas of the audience were not even covered.

The "stage right" PA stack was actually firing across the downstage area, resulting in feedback problems: there were any number of hot "squeals" while I was watching the band. PA equipment was comprised of one Cerwin-Vega L-36 bass cabinet and one Cerwin Vega V-31 cabinet per "side." Those were a single 15-inch woofer in a single scoop and a 15-inch woofer/radial horn midrange combination respectively.

The console was a Peavey M-16 MK II, a 16-channel mixer, with DOD 1/3-octave equalizers and a Yamaha REV-7 reverb rounding out the house electronics package. Peavey CS-800 and CS-400 power amps were used for both main and monitor power. A Yamaha CP-80 electric grand was the "house piano." During the break between bands, I got up on "stage" and checked out all the monitors, mics, etc. I introduced myself to the sound people and got a reading on working the room.

I was quite surprised when the sax player from the Jazz Ambassadors, the headline act, walked up and called out my name. It turned out to be Charlie Gabriel, a Detroiter with whom I'd worked in the late J.C. Heard's band. He gave me his assessment of the Rumours sound, which wasn't too good.

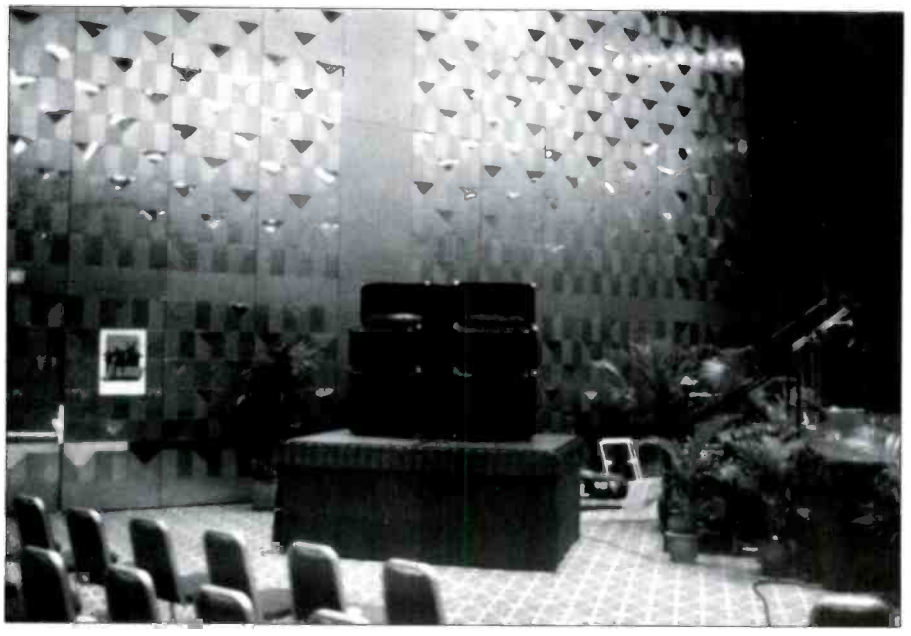
PA AS MONITOR

Around 1:30pm, Tony Vaughn appeared, with Mickey and Ray in tow. The four of us had a meeting over lunch to plan how we'd deal with this difficult situation. I decided I would go with all existing sound equipment, but would use our own mics for announce, sax, and trombone. My plan to keep feedback down was to keep overall level down: often the kick and snare were so loud in the PA that horns or vocals were drowned out. I did not plan on making the same error. Mickey was not pleased at the prospect of playing a CP-80, but the proximity of the piano to the "stage right" PA stack made the use of a mic'd piano problematical. There were only two monitor speakers; I planned on giving one to Mickey and the other to Billy. I figured that with the PA firing across the downstage area, where Benny and Curtis would be, the front line would be able to hear themselves through the PA itself (*Figure 2*). Ray elected to use his own bass amp, but agreed to use the house bass cabinet. We returned to the hotel around 3pm, where I contacted the rest of the group and filled them in. Billy agreed to cut down the size of his set to save stage space, and both Benny and Curtis felt they could deal with the PA-as-monitor situation.

I spent the rest of the day doing what any good visitor to Singapore does: shop 'til you drop. After enjoying dinner with Billy and Ray, I caught the festival shuttle and went over to the Oriental Hotel to check out the concert sound system. Our two evening performances would be at the Westin Plaza; this same system would be moved there tomorrow. The system was provided by Hi-Bino Sound; I looked up house engineer Rais Johari during intermission and gave him our band stage layout and input list for tomorrow. Rais told me that he would be bringing more gear to the Westin, as it was a larger room. One strange detail caught my attention: the grand piano used by the opening act was placed on the floor, in front of the stage. Rais told me that the hotels refused to allow a grand to be placed on portable staging;it would have to be played in front of the stage. This was clearly unacceptable, and I made sure that Mah knew we would have to have it on stage for our performances. She promised to check into it.

I sent Billy back to the hotel while I worked with Mah and Tony Vaughn on our piano problem. The catering manager steadfastly refused to put the piano up for us...

Figure 3. House left PA stack at the Westin Plaza ballroom. Note the mirrored wall surfaces.



After spending most of Thursday morning exploring Singapore, Billy and I were taken over to the Westin Plaza around 3pm to set up for our evening performance. The Westin Plaza Ballroom was very large; with festival seating, it could accommodate up to 2000. The room surfaces were a mirrored hard finish, and this contributed to the worst acoustics of the tour: reverb time was a horrendous 4-1/2 seconds. Hi-Bino Sound was already in place, and I was greeted by Rais and monitor engineer Ahmed Kamsani.

The house PA system was comprised of 2 Peavey 3-way arrays per side; each single array included a FH-1 horn/driver, a MB-2 mid-bass horn, and a MF-1X bass bin (*Figure 3*). These were powered with a Peavey CS-800 amp on lows and mids, and a Daytronics SA-300 on highs. Monitors were

Figure 4. The house mix point at the Westin Plaza ballroom.

Renkus-Heinz 1281 cabinets, with a 12-inch woofer and a 1-inch driver/CD horn combination. The monitor console was a 24-channel Soundcraft 800, with assorted 1/3-octave graphic equalizers. The house console was a 32-channel Soundcraft 800, with Klark-Teknik EQ and Yamaha reverbs (*Figure 4*). I found, as we checked Billy's drums, that any loud sounds were rendered unintelligible by the long reverb and early reflections off the walls. My only option was to keep the mix as quiet as possible, and get the group to play as softly as they could.

I sent Billy back to the hotel while I worked with Mah and Tony Vaughn on our piano problem. The catering manager steadfastly refused to put the piano up for us; it wasn't until almost 5:30pm that we finally reached the hotel manager. After I explained our situation and demonstrated the stability of the stage, he quickly gave his OK; up went the piano (*Figure 5*).

COOPERATION FROM THE BAND

The group arrived at 6pm for our formal soundcheck, and after one number they knew what we were up against. Everybody reduced their stage volume to the absolute minimum; we also instructed Ahmed to keep monitor level low. Benny eliminated all but one up-tempo number from the set, and Billy elected to play with brushes most of the time. With this kind of cooperation from the guys, we were able to salvage some kind of coherent sound from the mush of room reverb. I amplified horns and piano sparingly, cracking the bass through the PA only for solos.

The turnout for the evening's double bill was disappointing; we had less than half a house, which did not help to improve the acoustics. The Singapore All-Stars preceded us, and they had not dealt with the room during their brief sound check. Our set sounded much less garbled, and I received many compliments on how I'd "tamed" the room. Most of the credit should have gone to Benny and the group: their willingness to do whatever it took saved the day. After the show, we all returned to the Glass Hotel, where several of us attended the nightly jam session at the hotel lounge. I snuck away to phone USIA headquarters in Washington and respond to a message I'd received: I had been offered another tour, this time to the Caribbean area. I managed to reach Guy Burton at Arts America and accept the assignment; we both agreed to worry about details when I got home.

Customs clearance was far from easy; all baggage, either checked or carry-on, was x-rayed. Our equipment was hand-searched, and my monitor cabinet grills were removed so the interior of the cabinet could be checked.

Friday was our busiest day in Singapore: we were to give two concerts—a matinee lunch at Rumours, and another evening concert at the Westin Plaza. Billy and I left around 10am to get a head start on the Rumours set-up. We would share the bill with the Indra Lesmana Trio, a fusion-jazz band from Indonesia.

I'd caught the group at the Oriental Wednesday night, and knew that they had a ton of gear, so I wanted to insure room for us on Rumour's small "stage." Indra was a great guy, and very cooperative; with some creative juggling, we managed to get everything up there. Billy was busy playing with Gilang Ramadhan, Indra's drummer, and soon was sharing some of his high-hat tricks, which Gilang was quick to pick up. There were no sound checks at Rumours; it was mix on the fly all the way. Indra's band was **loud**, and easily overpowered the small PA. The electric bass DI buzzed loudly through all this, a problem I attributed to a ground loop. When it came time for our set change, I simply lifted the ground on Ray's bass amp and we had a silent bass, much to the surprise of the sound guys, who had lived with the buzz all week. The place was packed, and the audience was attentive and generous with their applause during the All-Stars' set.

The group played at the perfect level, which enabled me to carry the room without feedback from the stack firing across the stage. Billy poured his energy into a brilliant drum solo on "Without Delay," and Curtis brought a tear to many eyes with a tender reading of "Lover Man." Upon completion of our show around 2pm, it was time to tear down and zip back over to the Westin Plaza, where Billy, Ray and I set up for the evening show. Our opener Friday was the Festival Quintet, and bandleader Eldee Young asked me if I would supervise the mix for his group, something I was more than happy to do. The turnout was slightly better than Thursday's show, and soaked up enough sound that I could think about cracking the drum mics open slightly during drum solos. Benny and Curtis locked horns trading riffs on "Now's the Time," and Mickey played so hot on his boogie-woogie feature "Jam and Boogie" that he got a standing O at the end of the tune! I think he was glad to trade the CP-80 at Rumours for the grand at the Westin. After packing up, it was back to the Glass Hotel for

another jam session, where some serious partying took place.

RIGOROUS SECURITY

Saturday, September 26, involved moving on to Indonesia. We left the hotel around 1pm for Changi Airport and our 3:15pm flight to Jakarta. Customs clearance was far from easy; all baggage, either checked or carry-on, was x-rayed. Our equipment was hand-searched, and my monitor cabinet grills were removed so the interior of the cabinet could be checked. This process was laborious and time-consuming, and we made our flight with only 10 minutes to spare. In my experience, only Hong Kong had more rigorous security searches than Singapore; when carrying large amounts of equipment, allow enough time for the inevitable delay these searches cause. Our Singapore Airlines flight was 1-3/4 hours long, and upon arrival we were met by Perla Manapol, the assistant CAO for Indonesia. Perla and I are old friends; we had worked together in India, where she had been CAO in Calcutta, on several of my previous tours. We gathered up our stuff while Perla handled customs clearance: in Indonesia, that meant getting special papers from the proper ministry. Once outside, we discovered that the equipment truck, provided by the Ministry of Culture, was nowhere to be found. USIA escort Arlene Jackson took the band to the hotel while Perla and I waited for the truck to show up. After a few phone calls the mystery was solved: the driver had gone to the freight area, where he assumed the gear would arrive, and had fallen asleep in his truck! We quickly loaded the equipment and joined the band at the hotel; the equipment was taken to the U.S. Embassy for safekeeping.

That evening, we enjoyed a dinner/reception at Perla's home, where we met local dignitaries and members of the Jazz Lover's Club, who were effusive in welcoming us to Indonesia. I spent some time talking to Brian Batie, and expatriated American musician who was handling our production needs. He gave me a rough idea of what I might expect to see in the way of gear, and it seemed that we might be in good shape. I made sure that he arranged to procure some wire and copper pipe for me; my last trip here had taught me that most venues didn't have grounded power, and I wanted to be prepared to make my own if necessary.

Figure 5. Ready for the Westin Plaza ballroom soundcheck.

Brian came by at 10am Sunday to take me over to the TIM (Taman Ismail Marzuki), site of the evening's concert. I had played the outdoor ampitheater before, but this time would play the Graha Bhakti, a 1000-seat indoor theater. The acoustics here were quite good, with a reverb time of around 1 second. The PA system was quite large; it included an assortment of different cabinets and horns run 2-way. 15-inch woofers in folded horns and 12-inch woofers in Perkins cabinets comprised the low end, while radial horn/Altec compression drivers and piezo tweeters comprised the high end. I had to work with individual amplifier levels to balance this mess up, then tried to EQ the boxiness out. Power came from a power board offstage left, providing a single 220 hot and a fairly clean neutral, but no ground was available. I used some of Brian's wire and tied my ground to a water pipe adjacent to the power board. There were occasional 5 volt fluctuations on the line with no load, hardly surprising as power in Jakarta is far from stable. When I finally finished tuning the system and settled into some loud program music, I discovered that 2 woofers in the house right stack were "buzzing" due to rubbing voice coils or tears in the surround. I pointed this out to the sound crew who assured me that repairs would be completed before our late afternoon sound check.

While we were deprived of a concert for the people, we took solace in the fact that we were going at all, considering the circumstances.

With Brian as my tour guide, we had a look around Jakarta and enjoyed a hot and spicy Indonesian lunch. Our 6pm soundcheck was attended by about 20 local musicians, including members of local jazz clubs. The bad speakers had been removed, and the dead room allowed me the opportunity to really get everything up in the mix. I took advantage of this to make a tape for Perla and the local USIA library. The concert was well attended, and Curtis again amazed all of us with some inspired playing.

Monday necessitated an early wake-up call: we were scheduled to take the 9:40am train to Bandung, a university town about 150 miles southeast of Jakarta. The equipment left much earlier; it was going by truck, and would be delivered to our venue at the Institut Teknologi Bandung by noon.

Travelling by train gave us another view of Indonesia, and not always a pleasant one: many poor families struggled to carve out a home in shantytowns that lined the tracks. During our ride, Perla, Arlene and I discussed the latest news from Burma. The government there had devalued Burma's currency, the kyat, declaring

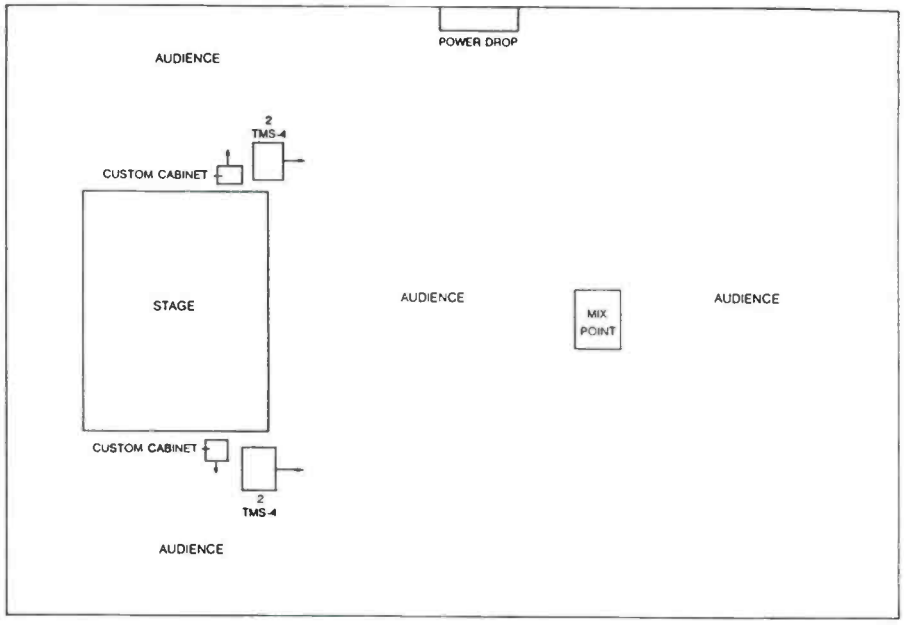


Figure 6. The Aula Barat stage setup and PA placement.

several specific denominations as worthless.

Protests and other civil disobedience were rocking Rangoon and other large cities as the population reacted to the financial distress.

USIA-Burma was now forced to modify our program, in response to safety factors and political pressures from the Burmese government. Rather than cancel the program outright, it was decided that we would only perform 2 concerts, both on U.S. diplomatic soil. The audiences would be invitation-only; there would be no "public" performances that might provide the opportunity for a large public gathering.

We expected a mix of Americans, other members of the diplomatic community, and high-ranking Burmese officials and business contacts. While we were deprived of a concert for the people, we took solace in the fact that we were going at all, considering the circumstances.

TO THE INSTITUTE

The train ride took around 3 hours; while Arlene and the group went to the hotel, Perla and I left for the Institute to check out the venue and PA system. The Aula Barat, ITB, was a large, rectangular multi-purpose room with a tile floor. Reverb time was just over 1-1/2 seconds, and seemed harsh in the 2 kHz area.

The sound system had already arrived; the crew was waiting for my placement instructions, as covering the room involved 2 separate systems (*Figure 6*). The stage was placed in the center of the room, with the rear of the stage about 10 feet from a wall. The audience was positioned on three sides of the stage. The sound company, Aru Renaldi Sound, used 4 Turbosound TMS-4 cabinets to cover the straight-away audience area. Two smaller custom cabinets covered each "sidestage" audience area.

I elected to use my wedges, amp, mics, and stands for stage use while using the local front-of-house equipment. I had a 24-input Soundcraft 400B console, with Yamaha graphics for house EQ. AC power was available from 2-prong European-style receptacles located around the room. These provided 220-volt power, but were wired in a dual 110-volt fashion. I found a power board on the side wall about 25 feet from the mix point, where I tied into one of the 110-volt hots. No grounds were available anywhere, so I used Brian's copper pipe and made my own, driving the pipe into the ground outside the hall and fishing the wire through a window next to the power board. I measured a whopping 35 volts on the neutral, so I tied my neutral to ground via a separate wire to clean it up.

At 2pm, a speech was to be given in this hall, so Perla and I left to rejoin the group. I returned to the hall at 5pm to complete our setup and prepare for the 6:30pm sound check.

My biggest problem proved to be making the PA quiet. Buzz and hum

I was dreading another early morning at the airport when Perla informed me that the U.S. Embassy expediter would handle the equipment clearance; I could sleep in and leave with the band for a change.

were everywhere, even in my monitors, which were run off my amp. I did notice that when I unplugged the monitor feed, the buzz would go away. When changing the cable didn't work, I started to check power again, and found that the local sound guys were using the wall outlets with no ground! We tied all their AC into the power board, using my ground rod. My monitors cleared up, and the house PA was suddenly "the most quiet we've ever heard it," according to Aru. My insistence on good grounding made a noticeable difference.

My problems weren't over: as we started our sound check, Curtis was having trouble with his mic beltpack. Changing batteries did not help; there was next to no level on the trombone. I set up an E-V DS-35 mic on a straight mic stand for him, which worked perfectly, so we knew the problem was in the beltpack circuitry somewhere.

However, after playing on the new mic Curtis decided to ditch on the beltpack permanently; he was very pleased with the warmth and presence of the stand mic. Perla and Brian estimated our audience that night at around 800, mostly students and faculty. During stage announcements, you could see groups of students huddle around English speakers as they translated Benny and Curtis' comments for their friends. The audience was most generous with their applause, with Ray's pop-song quotations in "I'm Confessing That I Love You" and Curtis' trombone special effects eliciting delighted laughter from the student audience. After a lengthy post-concert autograph and photo session, we returned to our hotel for a late meal and some relaxation. I hooked up with Sonny Soeng, manager of the Indra Lesmana Trio, the group we'd played with in Singapore. He gave me a short tour of popular local clubs and student "hot spots" before I called it a night.

Tuesday began with a luncheon in our honor, sponsored by the local Jazz Club. We all enjoyed the opportunity to chat with Bandung's biggest jazz fans and musicians, all of whom had attended our concert last night. The club's own jazz combo played for our pleasure, and everyone was pleasantly surprised when Billy jumped onto the drums to jam with them.

Around 2:30pm, we were driven to the train station to catch our afternoon train back to Jakarta, where we arrived at 6pm. Our gear had already arrived (it was returned to Jakarta via truck), and would be delivered to the airport early Wednesday for customs clearance prior to our 7:30am departure. I was dreading another early morning at the airport when Perla informed me that the U.S. Embassy expediter would handle the equipment clearance; I could sleep in and leave with the band for a change. Hallelujah!

Figure 7. Dodging the rain during setup at the U.S. Ambassador's residence in Rangoon, Burma.

TROUBLE IN BURMA

Wednesday, September 30, found us traveling to Burma via Singapore. Perla did her usual fine job: Indonesian customs clearance, which can be sticky, was a snap, and we were soon in the air, winging toward Singapore. Our layover in Singapore was supposed to be 2-1/2 hours; this became 5 hours due to mechanical problems with the plane. These were finally sorted out, and we finally left Singapore for Rangoon around 4pm.

Flying Burma Air was a real experience: the planes are older, and have whole sections of seats removed on the inside to handle extra cargo. The rear of our aircraft was littered with all sorts of Western consumer goods that were rare in Burma. We'd noticed that the flight crew and stewardesses were laden down like Sherpas with bags and boxes from Singapore shopping: they took full advantage of the opportunity to stock up on hard-to-find items also.

Burma from the air was miles of verdant green rice paddies as we banked in to land in Rangoon. The tense monetary situation was immediately apparent in customs entry: we were required to register all our foreign currency, jewelry, or any other valuables with customs, so they could insure that they left with us. Money was tightly controlled: we were warned not to change money or buy local goods anywhere except government sanctioned outlets.

USIS PAO John Fredenburg helped us through the paperwork maze and escorted us to the Inya Lake Hotel, our home for the next five days. After settling in, we attended a dinner at John's home, where we had a chance to rest up from our long travel day and get the current news on our program. Our program had been reduced to two concerts: a reception/concert at the U.S. Ambassador's residence, and a concert on John's tennis court. He invited me out back to have a look. I selected a location for the stage on a low hill overlooking the tennis court, so the audience could sit on the court and have an unobstructed view of the group. John informed me that the stage and tennis court would be covered by a temporary thatched roof structure built especially for our concert.

In the event of rain, likely due to the rainy season, we could still give our performance. I asked that the stage cover be constructed with tarps that would offer more watertight integrity than thatch; John agreed to this modification.

Thursday was basically a day off for everyone, but I did want to advance the other performance site and see to related details. With Mickey Tucker in tow, we went over to Ambassador Burton Levin's home to check up on their grand piano, slated to be Mickey's instrument for the next two concerts. Mrs. Lily Levin and I got together on stage location, and made contingency plans to set up inside the house should we be rained out. Mickey loved the piano, and entertained Mrs. Levin and assorted guests with an impromptu version of Billy Strayhorn's "Lush Life."

I spoke to the embassy electrician about power; he agreed to tie my tails directly to drops by the Ambassador's pool and John's tennis court lights. He confirmed that grounds were available at each location, and I could expect 230 volt power with occasional 5-15 volt drops. My house PA system would consist of 2 Yamaha column speakers and a Yamaha PC 1002 power amp that could put out 100 watts/channel. Both concerts were outdoors, so a 100 watt amp was not going to get it. I elected to use my Carver to power the mains and the Yamaha to power our monitors.

It was very hot and humid; I was soaked with sweat in no time.

TOWEL DRY

Friday morning was spent shopping for Burmese jade and touring the Shwedagon Pagoda and its gold-covered spire, visible for miles. I began set-up at the Ambassador's around 2pm; it became a contest of dodging rain. I would work for an hour, then hurriedly cover everything with plastic as rains came. After an hour's shower, it would clear and I'd dive in again (*Figure 7*). This went on all afternoon and into the evening, when it finally cleared up enough to get the concert in. We almost moved the concert indoors due to the wet stage, but many Burmese

waiters with towels went to work and got things dry enough to be safe. I never could get in a sound check, so it was again mix-on-the-fly, with the first song as my check. Fortunately, everything went off without a hitch. The weather held off, and we were treated to a beautiful evening for a concert. The audience was comprised almost exclusively of members of the diplomatic corps, and Burmese army security outside the residence was extremely tight. The group was aware of all this, and never really seemed to relax during the 1-1/4 hour set.

Saturday was our last concert day on the USIS portion of the tour. Our jade shoppers scored big in the morning, and we all enjoyed a luncheon in our honor hosted by Ambassador and Mrs. Levin, featuring traditional Burmese fare that was right up my alley: hot and spicy! I began my set up at the tennis court around 3pm; the covers over stage and roof were complete, so naturally it didn't rain. It was very hot and humid; I was soaked with sweat in no time. The group joined me for soundcheck around 6pm. Out of curiosity, Benny decided to try a stand mic instead of his clip-on Sony; I gave him an E-V ND-757, which he loved. It offered a warmth that the clip-on couldn't touch. Benny was like a kid with a new toy; during the show he freely experimented with different mic effects, waving his horn over the mic for tremelo or varying his distance for low-end boost. Our audience was much larger than the previous evening, and comprised a cross-section of the Burmese and expatriate music community as well as the usual sprinkling of U.S. personnel and local dignitaries. The band was inspired by the musically-hip crowd; both Benny and Curtis played brilliantly on "Stablemates," and there were good-natured horn ad-libs during Ray Drummond's feature "Come Rain Or Come Shine." Curtis had asked me to get up on stage and play something during the last song, but I had a better idea. During another beautiful Fuller reading of "Lover Man," I used my SPX-90 to sample Curtis' trombone. As Curtis improvised during the last song, I played back the sample through the PA and monitors in tune and in tempo. I tried hard to be deadpan as the entire band, shocked, looked toward Curtis, wondering how he could play two parts at once! After the show, Curtis congratulated me on my chicanery, gave me a high five, and told me I could play with him anytime.

I had plenty of help from some of the audience during tear-down, and quickly joined the group for a post-concert dinner party at the home of APAO Frank Huffman, just a short walk from the tennis court. I had a chance to meet some leading Burmese musicians, who were brimming with questions about modern sound reinforcement. An impromptu jam session was soon in progress, with Mickey and Curtis the main instigators. Our last night in Rangoon became a memorable one through the brotherhood of music.

ON TO BANGKOK

Sunday, October 4, meant dealing with Burmese customs prior to our flight to Bangkok, Thailand. The inspection was very serious: all of our personal bags were searched, and our money was checked against our declared amounts. All purchases of jade or other souvenirs had to be corroborated with receipts from officially-sanctioned outlets, or the goods would be confiscated. While all this was going on, I dealt with the band and sound gear. Surprisingly, all the inspector wanted to do was look inside the bass case and check my mixer and signal processing gear. We were glad that John had suggested leaving extra early for the airport, as the customs inspection ate up most of our cushion. We left Burma at 3:30pm, arriving in Bangkok about an hour later.

At this point, our group split up. Mickey and Benny were driven into town to begin their Thailand commitment, while the rest of us grabbed our bags and went to the airport hotel to spend the night.

My sound gear was off-loaded and handed over to USIS-Thailand expediters, who would arrange for the equipment to be sent air-freight from Bangkok to Detroit. This procedure insured the safe return of the gear: it is almost impossible to air-freight anything out of Burma. Many shipments had never been seen again, and those that did make it were months late!

We elected to take our stuff out as accompanied baggage so we could keep an eye on it, then leave it in capable Thai hands. Once we settled in, several of us took off to enjoy Bangkok, a fun city in anyone's book. I enjoyed some gem shopping, a great Thai feast, and some nightlife before I turned in.

We got to enjoy Monday twice: by flying from Bangkok to San Francisco via Tokyo, we crossed the Date Line, gaining a day. With a heartfelt farewell to my good friends Curtis Fuller, Ray Drummond, and Billy Hart, we went our separate ways. After a two-hour layover, I continued on to Detroit, where I arrived just before 11pm Monday evening, after 20 hours of travel. The sound equipment returned about 10 days later. At that point, I could begin preparations for my next USIA tour with the Don Cherry Quartet. db

ROBYN GATELY

The Sound Contracting Engineer

CHURCH REINFORCEMENT

Music is normally defined by the concert-going public as an aural experience with definable melodies and meter (beat). Although this description covers a wide range of formats ranging from classical to jazz to heavy metal, the business of sound reinforcement sometimes exposes one to something that goes beyond the boundaries of what one normally defines as "music." A good example of this is a recent show with David Hykes & the Harmonic Choir.

The concept of acappella-type singing usually involves each member singing one note at a time, usually with a lyric. David Hykes' concept of music is for one person to sing a long, slow fundamental note and then, add up to three other harmonic notes on top of it: *by himself.* The addition of several other vocalists doing the same thing creates a sound not unlike Gregorian chants.

Of course, one should expect no less a unique concept when a sound system becomes involved. Most of David's concerts take place in churches because of the natural reverberance of the rooms (never mind the visual and psychological effects on the audience). At the Church of the Covenant in Boston, Massachusetts, promoter John Aaron brought in Modular Sound Reinforcement because of David's unique technical requirements.

Throughout the church were spread 15 speakers on a total of 6 mixes. The purpose of all these speakers, and extra mixes was not volume, but to create a *highly*, reverberant environment. These are not notes being sung, but sounds totally enveloping the audience. The lowest note is about 60 Hz, with the highest being "sung" at 6-8 Hz.

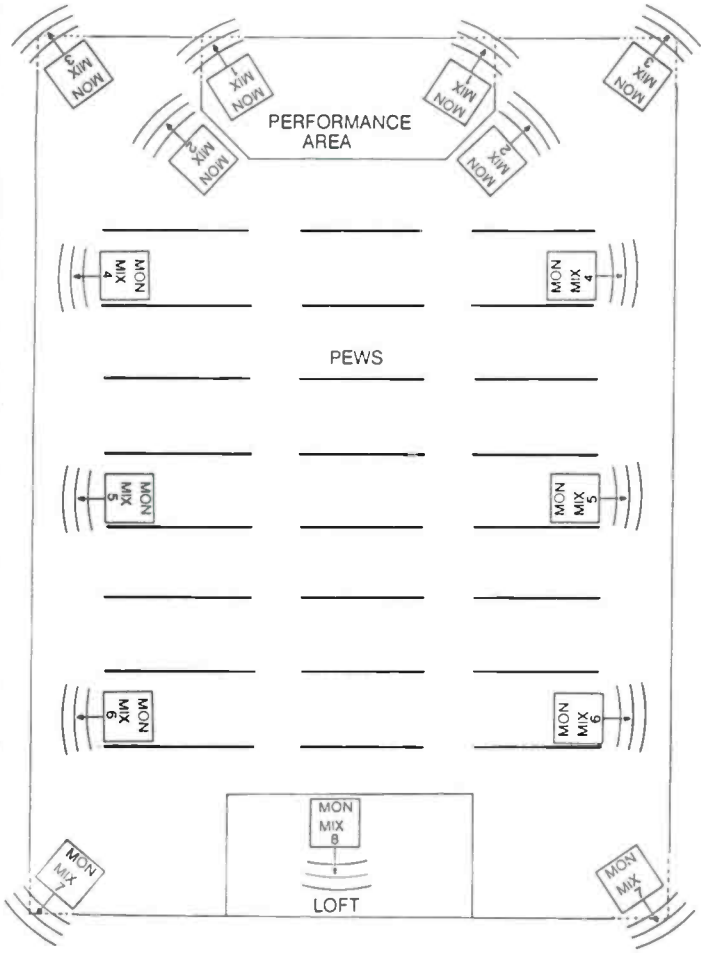
The use of a small but extremely clear P.A. is essential to David. He carries a pair of Schoeps mics for his own personal use, the first time I've ever seen Schoeps used for vocals "on the road." Additional mics for the other seven vocalists were all Schoeps and AKG 451 supplied by Modular.

The mixing console had to be able to supply multiple mixes to accomplish the effect desired, so the small but effective Yamaha 2408M was used. This allowed us to achieve the multiple sends desired without taking up too many prime seats. The console allowed for the six necessary mixes as well as four effect sends. Additional effects at the mixing console included Lexicon 224, Yamaha REV-7, and dbx limiters.

The number and the placement of the speakers to achieve the "highly reverberant" effect necessitated using mostly monitors spread throughout the church. Some monitors were placed in the pews and pointed at the walls and ceiling. Others were placed in the corners of the venue, while still others were reflected off the altar and the loft in the rear (*Figure 1*).

The point of all these speakers being pointed away from the audience is to eliminate, as much as possible, the ability of the ear to pinpoint the source of the sound. The results desired are one of making "music" appear to be everywhere at once, not coming from on-stage. Many of the mixes were set up so that the reverb return was actually much louder than the source material.

Figure 1. Block diagram of the church layout.



At one point, systems engineer Chris Gately put on CDs of jazz and rock music, just to confirm his suspicions that "normal" music would be unlistenable in this set-up. To say the least, all other forms of music were quickly reduced to unintelligible "mush."

The system set-up did indeed perform to expectations with the intended source material. The individual voices seemed to come from everywhere, without the listener being able to distinguish the actual source by ear alone. The final result was an ethereal, religious "sound" that provided the audience with the proper angelic experience. Truly a case of a sound system enhancing the performance without getting in the way of it. db

LEN FELDMAN

Lab Report

Rocktron HUSH IICX Noise-Reduction Unit

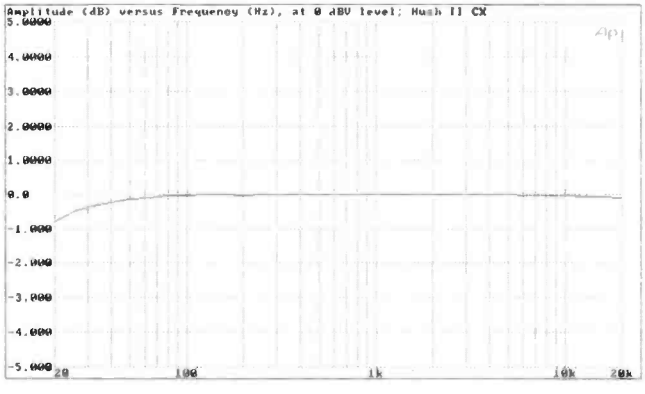
GENERAL INFORMATION

The Rocktron HUSH IICX is a two-channel rack-mountable single-ended noise-reduction unit. By single ended, we mean that signals need not be in any way pre-processed or encoded prior to their passing through the device in order for it to eliminate unwanted noise. There are any number of applications to which this unit can be applied, including recording applications, studio monitoring application, PA applications, live monitor applications and even home audio applications.

In the studio, this noise-reduction device has many applications including multi-channel mix-down, two channel mastering and reducing the noise of individually recorded racks. It can be used with good results when copying previously recorded tapes and can also be used to reduce noise generated by outboard signal processing equipment such as digital delay lines, reverb units and drum machines. In PA applications, it might prove useful if applied to the output feed to quiet ambient stage noises and to reduce noise levels of mixing consoles and any other signal processing devices. In live applications it can be used to quiet the monitor feed from a mixing console and thereby quiet the stage mix and reduce the possibility of feedback from vocal microphones.

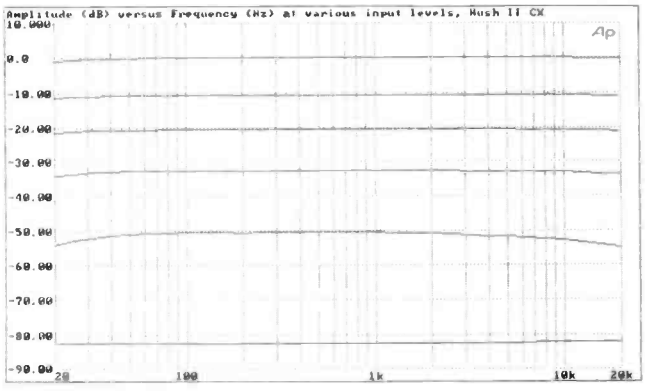
The HUSH system employs two well-known principles in order to achieve its objectives, each of which is controllable by the user. These principles are low-level expansion and dynamic filtering. A dynamically controlled low pass filter is designed to open and close the bandwidth, depending upon the amount of mid and high frequency information that is present in the audio program signal. The filter, in effect, opens up to pass any high frequency program content while reducing high frequency noise above the highest input signal frequency. For example, if the highest program frequency content at a given instant is 8 kHz, the filter will open up to pass 8 kHz, while noise above that frequency (from 8 kHz to 20 kHz) will be reduced by the filter action. The filter cut-off point is adjustable by means of a front panel control over the range from 400 Hz to 4 kHz.

Figure 1. Frequency response.



Frequency response, Rocktron Hush II CX Noise Reduction Unit

Figure 2. Curves illustrate the effect of downward expansion, with control set to begin downward expansion at –20 dB setting. Note that the degree of downward expansion increases at lower levels.



Curves illustrate the effect of downward expansion, with control set to begin downward expansion at -20 dB setting. Note that degree of downward expansion increases at lower levels.

The second part of the noise-reduction process is called downward expansion. Low level downward expansion takes place when the signal level drops below a threshold point that is also adjusted by the user. Once the signal level is below threshold, the amount of expansion increases as the signal level decreases.

CONTROL LAYOUT

The HUSH IICX has two identical channels each of which has identical front panel controls. A "Stereo/Master" switch near the center of the panel ties the expander and filter detection circuits of Channel 1 and Channel 2 together for stereo applications. When this switch is depressed, Channel 1's controls govern operation of the unit and Channel 2 controls are inoperative. A Power On/Off LED is at the extreme; left end of the panel. Power is applied as soon as the line cord is plugged in, as there is no on/off switch. Individual controls and indicators for each channel include an expander gain-reduction meter (4 LEDs that indicate when –30, –20, –10 or –3 dB of gain reduction is taking place.) Nearby is the expander threshold control which sets the threshold point (between 0 dB and –50 dB) at which low-level downward expansion is to take place.

Alongside is the filter cut-off control that sets the –3 dB point of the dynamic filter at any frequency between 400 Hz and 4 kHz. A bandwidth meter consisting of four LEDs indicates the overall bandwidth of the system. A release switch allows the user to select fast or slow release or time constants. A switch labeled "Line/Instrument" adjusts the sensitivity of the unit, optimizing the unit for either –20 dB (instrument level) or –10 to +5 dB (line level) operation. A channel in/out switch permits bypassing the noise-reduction circuitry. An LED illuminates when the channel in/out switch is in the "in" position (noise-reduction circuitry active in the signal path). Inputs and outputs for each channel are connected via standard 1/4-inch phone jacks found on the rear panel of the instrument.

LAB MEASUREMENTS

Based upon the principle of operation of the dynamic filter contained in this noise-reduction unit you can readily understand that it would be difficult if not impossible to measure the action of the filter using test signals. By its very nature, if we were to sweep a test signal over the audio frequency range, what we should see at the output is flat frequency response, since the filter will "open up" in the presence of frequencies higher than the cut-off frequency to which it had been set. That's exactly what happened, regardless of the cut-off setting, as can be seen in *Figure 1*. Even with the cut-off set to the minimum frequency (400 Hz), frequency response shown in *Figure 1* remained virtually flat from 20 Hz to 20 kHz. At 30 Hz, response was down by a mere 0.35 dB while at 20 Hz response was down less than 1.0 dB. The action of the dynamic filter, therefore, could only be judged when listening to actual musical program material and we'll have more to say about that presently.

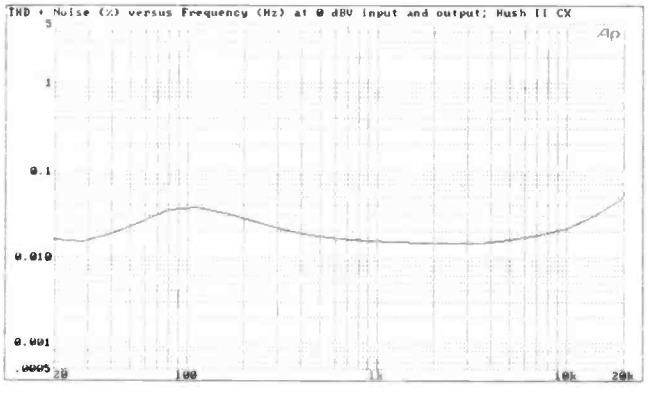
As for the second noise-reducing action that takes place within the HUSH IICX, that could be easily demonstrated, even on the test bench, using test signals swept over the audio bandwidth. For the plots shown in *Figure 2*, the downward expansion threshold was set to –20 dB. A succession of sweeps was then made, beginning with a 0 dBV level. Each successive sweep was made after reducing the level by 10 dB compared with the previous sweep. Notice that for the 0 dB, –10 dB and –20 dB plots, output levels were equal to input levels. When input levels were reduced to –30 dB, however, output levels decreased to around –32.5 dB, indicating that some downward expansion was already taking place. The –40 dBV input level sweep resulted in an output level of just over –50 dB, while the final sweep, made with an input of –50 dB, resulted in an output level of around –83 dB, indicating a high degree of downward expansion.

We were also able to measure a couple of static performance measurements in order to confirm some of the published specifications for the HUSH IICX. For example, in *Figure 3* we plotted harmonic distortion plus noise (in percent) as a function of signal frequency, with an input level of 0 dBV. At 1 kHz, THD plus noise was only 0.016 percent and even at 20 kHz, THD plus noise remained a low 0.05 percent, or marginally better than the 0.06 percent claimed by Rocktron for a 1 kHz signal at that level.

Figure 4 consists of two separate plots of distortion plus noise versus output level (in dBV). With the Instrument/Line switch set to "Instrument," high levels of distortion occurred at output levels of just under 6 dBV. With the switch set to "Line," output levels approached 18 dBv before distortion reached unacceptably high levels.

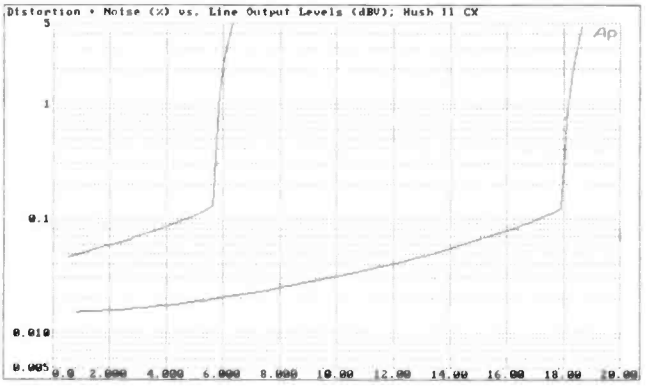
Signal-to-noise measurements were made for various settings of the threshold and filter controls. At minimum settings of these controls (least filtering, least downward expansion) A-weighted S/N measured –93.71 dB for one channel and –93.85 for the other channel. These and other

Figure 3. Harmonic distortion plus noise versus frequency, at 0 dBV input and output.



Harmonic distortion plus noise versus frequency, at 0 dBv input and output.

Figure 4. Harmonic distortion plus noise versus output level. Lower maximum level is for "instrument" setting; higher maximum level is for "line" setting.



Harmonic Distortion plus Noise versus Output Level. Lower maximum level is for "Instrument" setting; higher maximum level is for "Line" setting.

S/N measurements were all referred to 0 dBv. With the downward expansion threshold control set at the opposite extreme (maximum downward expansion), A-weighted S/N increased to –100.14 dB on one channel and –100.27 dB for the opposite channel. With the noise-reduction circuitry bypassed, (but with the HUSH IICX still in the signal path), A-weighted S/N increased to –118.05 dB for one channel and –115.88 dB for the opposite channel. Rocktron quotes the dynamic range as being 110 dB. Even for our worst-case S/N readings, if you add the headroom (+18 dBV) to 93.71 dB, you come up with 111.71 dB, or a bit better than the published claim.

COMMENTS

As we indicated earlier, a real test of the noise-reduction capabilities of this unit can only be made by actually listening to noisy program material and setting the two major controls at various points to determine the effectiveness of the product. We did just that, listening to a wide variety of program material ranging from noisy old tapes made with less than state-of-the-art cassette recorders to weak-signal stereo FM broadcasts from distant stations outside our normal reception range. The key thing about this or any other single-ended noise-reduction unit is adjusting its controls so that the amount of noise reduction is no more than is required to make the program acceptable. If that is done properly, the HUSH IICX is amazingly effective. We found, too, that some types of program material responded better to the unit when the release time was set to the "Slow" setting while other kinds of program material did better when the switch was set for "Fast" release. All in all, some experimentation is required to get the most effective noise-reduction action from the HUSH IICX, but when optimum settings are attained, the product performs extremely well. db

VITAL STATISTICS

SPECIFICATION	MFR'S CLAIM	db MEASURED
Input Impedance	470K ohm	Confirmed
Max. Input Level	+20 dBv	+18 dBv
Frequency Response (+0.5 dB)	30 Hz to 20 kHz	28 Hz to 20kHz
THD @ 0 dB, (1 kHz)	0.06%	0.016%
Dynamic Range	110 dB	111.7 dB
Effective Noise Reduction	50 dB	See text
Maximum Line Out Level	+20 dBv	+18 dBv
Maximum Instrument Out Level	+8 dBv	+6 dBv
Output Impedance	Less than 100 ohms	Confirmed
Power Requirements	110/120VAC 50/60 Hz	Confirmed
Dimensions	19"x6"x1-3/4"	Confirmed
Price:	$409.00.	

JOHN BARILLA

THE ELECTRONIC COTTAGE

PRODUCTION TIPS FROM THE ELECTRONIC COTTAGE

• In recent issues of **db**, we have explored the technical aspects of installing an EC. Now it's time to share some notes on common production problems and offer you some trustworthy solutions. The problems we deal with will be those of concern to any engineer or producer, whether they be working in a world-class studio, or a modest home facility. No matter where you produce your music, the bottom-line question is still the same: how does it sound?

It's not too difficult to get a professional sounding product when you have every piece of gear known at your disposal. Such studios command (and deserve) big bucks. The electronic cottage concept, however, is essentially different. While some ECs may verge on the opulent, the median level EC is a built on a limited budget for the express purpose of keeping the workspace close to the home. Hence the term electronic cottage.

If you are going to turn out competitive product from an EC, you must learn to be a savvy operator. For example, since you probably don't have compression and gating for every channel on your recording console, the decision to use such gear cannot always be deferred until mixdown. To get multiple usage from any of the signal processors in your rack, much of your processing must be done while you lay down tracks, rather than later on. Doing this effectively requires a great deal of foresight, aesthetic judgement, and good organizational skills.

TRACK MANAGEMENT

No matter what the configuration of your studio is, you will eventually come to the point where you need more tracks than those available to you. It takes some solid planning to avoid boxing yourself into a corner. One way to defer decision making in this area is to keep everything in the domain of MIDI information for as long as possible—perhaps even until the final mix. In other words, with a sufficiently sophisticated MIDI sequencer, all performance information can be stored as *virtual tracks*.

Virtual tracks are aptly named because they exist only as data. They are not, so to speak, "laid in stone" the way audio tracks are. Instead they represent performance information that can be changed and manipulated in many wonderful ways. But this approach has some significant restrictions. The number of tracks one can hear *simultaneously* is limited by two factors: a) the voice allocation of your sound generators, and b) the number of channels on your mixing console. In other words, if you have 32 tracks worth of data in your sequencer and an insufficient number of independently assignable synthesizer voices, you will not be able to audition the entire production simultaneously.

Furthermore, unless you have a large selection of signal processors, you will have to forego any serious sound manipulation on a track-by-track basis. For many projects, "out-of-the-box" synthesizer sounds will be quite sufficient. But in other cases, you will not be able to develop subtle ambiences and dynamics control from the synthesizer itself. You will need the help of traditional studio gear.

While there are many ways to work around the limitations of your system, there is no single way that is right for everybody. For example, an EC that was built to record New Age music could do quite nicely with a simple assortment of synthesizers, a sequencer, a couple of ambience devices, a mixer, and a digital two-track. This is because New Age music relies more on the pristine quality of the sound than sophisticated signal processing. On the other hand, an EC geared towards Pop music would most certainly require the addition of a multi-track recorder and a good selection of signal processors. In each case, a technique for track management would have to be developed in order to maximize the available equipment. Unfortunately, there is no shortcut for developing it. It comes only by experiment.

ONE MAN'S METHOD

As an example, I will offer you a synopsis of my own scheme of track management. My studio was designed with the expressed intent of turning out Pop music. Hence, I have felt it necessary to include *at least two channels* of every kind of signal processor: expander/gate, compressor/limiter, delay, exciter, dynamic filtering, and ambience devices. The number "two" is significant, because it takes two channels to process anything in stereo.

I usually start a production on strictly MIDI gear. I sequence the basic tracks: bass, drums, and one "fat" keyboard track. Then I immediately start dumping over to my multi-track recorder (an AKAI 12-12), one track at a time. Why so soon? Surely, I could have gone on to finish the production in the sequencer, but I opted to go to tape for several reasons. One is that I favor very complex timbres. Generally, it will take several of my sound modules to generate one complex sound. Also (and this is particularly true of drums), I often tie up several of my signal processors on each channel. A snare drum will often be compressed, gated, excited, treated with subtle amounts of delay, early reflections, and/or gated reverb while being recorded, freeing these devices for general use during mixdown.

This MIDI composite takes up five *tracks* on my multi-track, but actually represents 16 or more *channels* of

audio. While the bass is recorded on a single track, both drums and keyboards are recorded in pairs to retain stereo dimensionality. With 7 tracks left over, I then record a "scratch" vocal, and perhaps a guitar track. With 5 tracks left I start to record background vocals. Since I favor thickly textured backgrounds (triple-tracked), I will record three tracks and bounce them to one, three more identical parts and bounce them also down to one track, resulting in a stereo pair. During the bounce a lot of processing will go on: compression, gating, harmonizing and chorusing contributing to a huge, and very smooth sound.

There are only three tracks left now, but with stereo background vocals in place, I erase the "scratch" vocal, putting the number of tracks back up to four. (Remember that in order to make hassle-free bounces, tracks must be strategically placed so that one never bounces to an adjacent track.) There are three stereo pairs now—drums, keyboards, and background vocals—plus mono bass and guitar. At this point the production process varies a bit. I will usually want to add one or two "sweetener" tracks (such as strings, horns or analogous electronic textures), one track for a lead instrument, and a track to re-cut the finished lead vocal. If the sweetener tracks require a mechanically precise articulation, I will compose them on the sequencer and sync up to the existing tracks. In most cases though, I find it easier to just fly them in manually, which also gives them a nice "human" feel.

Notice that the guitars, sweeteners, lead instruments and lead vocals are taken in mono. This is mostly by necessity rather than by choice. But lead vocals and lead instruments usually occupy center channel in the mix, so mono is quite sufficient. As to the sweeteners and guitars, during mixdown these tracks can be "reconstituted" in artificial stereo by panning the track to one side of the mix and a time delayed image to the opposite side.

By using MIDI sequencing in conjunction with more traditional studio modalities, I have gotten a lot of extra mileage from the equipment in my EC. Developing an efficient system of track management was a very important step in the process.

PROPHYLACTIC MEASURES

It's an axiom of audio that the overall mix cannot be quieter than the sum of its individual tracks. Therefore, a clean, crisp, professional product demands that each track be kept as free from noise as possible. Noise just sort of sneaks up on you. On the first few tracks it can get by unnoticed, but as your production progresses, you may start to notice that quiet passages are no longer quiet.

There are a few ways to deal with this problem. If you have a MIDI-based console automation package, you can deal with most of it upon mixdown by simply muting the offending channels when they are not active. Without automation, some degree of muting can be achieved by manual switching. (It helps if you have a well-trained octopus for an assistant!) Still, it is my opinion that the old adage is true: "An ounce of prevention is worth a pound of cure." So it is my policy to take measures against noise *while* tracks are being recorded. Since most noise emanates from the source rather than the tape, this is really the best time to do it. Precisely what measures I take depends on the nature of the noise I seek to alleviate. In many cases, a simple noise gate will suffice. The on/off switching effect of the gate will not interfere with steeply ramped transients—like those from drum sounds or mallet instruments. But sounds with more subtle transients—like wafting electronic keyboards or strings—will sound a bit clipped. This type of sound responds better by using an expander. (Usually it's just a matter of choosing gate or expand as a function on the same unit.) The expander will do essentially the same thing, but will track the envelope of the sound much more sensitively. Whereas the noise gate offers you two distinct states: off and on (black and white), the expander offers you more shades of gray. They both have most appropriate application. To find out, you will have to experiment.

In the above cases, we were treating a sort of "idling noise"—something that becomes noticeable only when the instrument is not playing. There are cases, however, when the offensive noise is actually part of the sound itself. In this case gating or expanding will not be effective. A prime example of this phenomena is the trashiness of certain digital synthesizer sounds. You might think that digital is synonymous with cleanliness, but unfortunately, this is not always the case. Certain sounds are just rife with a certain indescribable annoyance known as quantization noise. To your ear, it will seem like the "graininess" of photographs in a tabloid newspaper. Certain bass sounds in FM synthesizers are prime examples of this. Since the annoying sound is in the upper frequency range, you may be able to notch it out to oblivion with some good parametric EQ, but sometimes this will render the sound a little too dull. Enter single-ended noise reduction systems like Dynafex or Rocktron Hush II. Utilizing the concept of *dynamic filtering*, these systems vary the effectiveness of a filter in accordance with the level of the signal. With certain synthesized sounds, it seems to be able to slice away enough of the graininess to fool your ears into not caring about the noise at all! While dynamic filtering is not a universal panacea, it is a valuable weapon in the war against noise.

PROCESSING ON THE WAY DOWN

Other types of signal processing can also be beneficial when recording tracks. I am speaking now about discretionary purposes: not merely preventing noise, but aesthetically enhancing the sound. Many avenues are possible here, and the direction you take is truly a personal one. Nevertheless, I will try to point out a few useful applications.

Before I do though, I would like to offer an observation about the difference between signal processors that cost hundreds of dollars (commonly found in electronic cottages) and those that cost thousands of dollars (commonly found in large professional studios). While it is obvious there is a difference in sonic purity between low-end and high-end audio processors, this is not the most significant factor to the listener. What does set the high-end processors apart is really a wonderful complexity of sound achievable only through a sophisticated algorithm (the mathematical model by which the processor effects changes in the input signal). This allows for more control over individual parameters of the sound and for a pleasing diversity in the soundspaces that are drawn. But it takes a lot of computing power to do this, and you have to pay for it.

Can you get more complex sounds from the processors you currently have? You certainly can, if you use them more than once when processing a sound. Each instrument can be recorded with a tight ambience which sort of describes the imaginary local

space the instrument occupies. Early reflections programs are excellent for this, and so are short delays, choruses, gated or reverse reverbs with short decay times. Added to the track in subtle amounts while being recorded, these type of effects will add depth and dimension to an otherwise quite sterile electronic sound. It will give a little more animation to the sound without altering it in some irretrievable way. Later on, during mixdown, when you add the overall reverb, you will notice a new smoothness and density to the sound. Once again though, you will need to experiment to find what ambience factors work best for you.

There are other aspects of signal processing which can also profitably be done while you record your tracks. In order to figure out what is a "safe" option—something you will not later regret—you must ask yourself the question, "how will this help me place the track in the final mix?" Unless you are naturally clairvoyant, this is a perspective that you will gain only by getting to know your own production style. To cite an example: I favor thickly-textured, smooth-sounding background vocals. They need to sound big, but at the same time cut through the mix without overpowering it. To achieve this end, I triple track the vocals and bounce them into stereo pairs, one trio left, one right. While doing the initial recording, I have found it beneficial to moderately compress the vocals and add some early reflections. (I have tweaked an early reflections program on my Yamaha REV 7 so that the room size and hardness parameters are virtually zero, but the first reflection is maxxed out to about 90 percent. This gives a subtle warmth to the sound and helps increase the intelligibility of the lyrics.) Later on when I bounce three of the tracks together, I may add some slight pitch shifting, chorusing or a tight echo, and I *re-compress* the entire bus—three tracks with added effects. The idea of re-compression may seem strange, but it really isn't. Two passes at moderate compression settings are more effective and natural sounding than one pass at a radical setting. What I am doing here is mimicking the effect of a more expensive compressor or leveling amplifier which achieves control of dynamics by processing the signal in two stages, commonly a compressor followed by a limiter.

One more piece of gear that I have found to be an important tool is the exciter. Exciters are still not universally loved by all engineers, but I have put mine to good use. There is one caveat that you should know: Don't use an exciter on every track or your mix will start sounding too edgy. The idea is to use it sparingly—like salt. My prime usage is adding life to drum sounds and bass and guitars as well. On snare drum, it is particularly noteworthy, because the upper harmonics that it accentuates enable me to keep the snare quite audible, even when I need to pull the level of the drums down in the mix. If you use it in these rather mundane capacities while recording, the exciter will remain available for special service during your mix.

SEND IT IN

I would very interested in finding out what kind of obstacles *you* might be encountering in getting the best possible sound from your EC. If you have any questions, comments or even a great idea you would like to share with fellow electronic cottageers, feel free to write me at: P.O. Box 585, Wheatley Heights, NY 11798. db

AES Show Round-Up

October's AES Convention held at the Los Angeles Convention Center was a busy place indeed. As exhibitors ourselves there was perhaps not as much time allowed to see everything that we should have seen, but we did see a lot.

Digital Recording is certainly a highlight that was paramount at the convention what with new machines from no less than Sony and Mitsubishi and a new open reel digital multi-track from Tascam as well.

It wasn't all digital though; one strong message from Sony was a new analog multi-track mastering machine and a firm commitment from them that analog remains alive and well and will be fully supported by advancing R & D for upcoming new products.

One of the most eagerly-awaited new product introductions was by a company called Finial Technology who showed a working pre-production LP turntable that uses a laser to scan and extract information from the grooves. No actual contact with the groove is made. With radio stations and others still owning vast amounts of LP records, here is a system for superb playing that does not in any way cause wear or damage to the record.

Speaking of records, Denon was there with a new anechoic recording of specialized music on a CD that should prove quite a useful tool for sound contracting and recording setups.

At a special press conference, Les Tyler impressively demonstrated a new dbx D/A chip that convinced all who came that much improvement in sonic quality is possible with digital audio recorders. dbx should be contacted for probable OEM availability of the 20 bit chip.

There was much more, of course. New England Digital, Fairlight, DAR, AMS/Calrec, and Waveframe all had dramatic and very well-attended demonstrations of their respective audio editing computer systems.

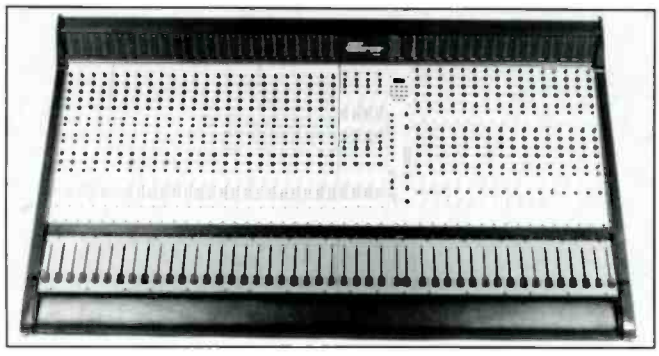
A special highlight of the Convention was a large room set aside for the Jack Mullin historical collection. One room is only a part of Jack's extensive collection, but he and Peter Hammer (who designed the exhibit), held court to large crowds of admirers.

On the pages that follow: highlights of the AES Convention.

What Was Seen

• **Peavey Audio Media Research** introduced the Production Series 1600 which is a totally modular console, due not only to the number of channels, but also because channels may be added or removed separately. Each channel stands alone from the input to the assignment matrix. Removing the channel also removes the entire array of input jacks and all patch points for that particular channel. From a service standpoint, the channel may be easily checked out on the bench or in some way outboard from the main mixer housing, since the input patch panel is part of the channel module.

The input stage of the mixers has approached the theoretical limit of signal-to-noise with a less than 1 dB noise figure for 150 ohm sources while maintaining 60 dB of input gain. The input design is discrete and utilizes the lowest noise transistors currently available. All bus signals are differential to eliminate crosstalk and grounding problems. A monocoque chassis construction was selected for maximum rigidity and resistance to flexing of the chassis mainframe.



The design minimizes electronic problems caused by mechanical bending of the mixer chassis during transportation and set-up. The highest degree of signal integrity is maintained through all signal interconnects. Gold-plated contacts are utilized throughout at critical connections for lowest noise and maximum reliability. The rugged external power supply is rack mountable and occupies three standard vertical rack spaces. Critical voltages are double regulated, pre-regulated at the external power supply and regulated again at each module.

The channel options are unlimited for special applications, and for fixed installations. The series is available in 8, 16, and 24 output bus versions. An electronically balanced input circuit offers 100 dB of common mode rejection, allowing the mixer to operate in studio environments without undesirable interference. The premium faders are mounted on a separate panel below modular strips. This type packaging facilitates upgrading moving fader or other available industry-standard, fader automation packages. Basic specifications are rack-mounted power supply, new electronically balanced input circuitry, 8, 16, or 24 submasters, mic preamp, 1 dB NF at 150 ohms, +24 dBu on bus outputs, 4-band sweepable EQ on each input, VU meter option available, and the console will accept after-market fader automation.

For more information, circle 90 on the reader service card.

• **Sony Professional Audio** unveiled the 48-channel PCM-3348 digital audio recorder. The 3348 has the ability to play any existing 24-channel DASH tape. The recorder has been designed with dedicated LSI circuitry to achieve a new level of sonic quality, practical size, low power consumption, and reliability. Most of the LSI chips are dedicated to the encoder/decoder and digital filter sections of the recorder. Utilizing two times oversampled digital A/D and D/A converters and an all new filtering system, the recorder offers a unique hi-fi design.

Additional built-in features are SMPTE/EBU time code reader/generator, variable speed and video clock function, all provided to ensure an elegant interface into the recording studio or video post-production environment. The optional features include DMU-3048 remote 48-channel meter

bridge with multi-function channel status indicators and DABK-3348 channel remote interface.

The drive train of the PCM-3348 consists of a newly developed servo motor system that employs such functions as a clutch that disengages the capstan during fast wind modes, allowing for unprecedented speed. Price- $240,000.00

For more information, circle 91 on the reader service card.

• **Yamaha's Professional Audio Division** announced the DMP7D All Digital digital mixing processor. The unit is an expansion of the DMP7D introduced two years ago. It is a mixing processor with digital audio input/output. It supports all popular digital recorders, including formats such as AES/EBU, Sony SDIF-2 and S/PDIF (CD/R-DAT). The unit also accepts analog signals using AD808 Analog-to-Digital and DA202 Digital-to-Analog converters from Yamaha. The mixing processor is 8-input, 2-output, and all digital. More inputs may be accommodated by cascading DMP Series units together.

With a dynamic range of 92 dB and THD of less than 0.01 percent, the unit is ideally suited for the requirements of digital audio tape recorders, CDs and R-DAT technology. The DMP7D employs a 16-bit linear system sampling at 44.1 kHz or 48 kHz. Each input features a digital pad (from 0 dB to 42 dB attenuation), phase select, 3-stage digital equalization, mute select, 3 sends with, pre/post fader select, and stereo panner. It has a comprehensive digital input/output panel. The sample frequency may be internally set, or set by an external master clock. The Emphasis On/Off select may be used when emphasis information is not detected. It also has analog output for Monitor Out and Headphones. The processor includes multi-function motorized faders, and 3 built-in digital signal processors.

The DMP7D has all of the DMP7's total recall capabilities, all of the parameters can be stored as "scenes" in any of the 30 internal RAM memory locations, or in 67 off-loadable memory locations on the removable RAM4 cartridge. Also retained are the real time automation capabilities. Each parameter can be individually addressed in real time with external MIDI controllers, and easily automated with MIDI sequencing system, or locked to SMPTE Time Code sources.

For more information, circle 92 on the reader service card.

• **Tascam** introduced the DA 800/24 digital multi-track recorder. The DASH recorder has incorporated Teac's propriety ZD circuits in the opto isolated analog-to-digital, digital-to-analog converters along with two-time oversampling in both record and playback.

In addition, there is very low power consumption. There is also a special pinch-roller drive system for tape-handling precision and stability. The unit was designed for reliability and adaptability to endure heavy usage, and adapt easily to any studio's existing system. It supports interchangeability with any DASH 24-track, as well as future 48-track DASH recorders.

All transport tape movement is logged by the recorder. With two digital IOs for S DIF-2 PCM equipment and standard AES/EBU systems, the DASH allows direct digital transfers to various other digital devices. Other features include the recorder's ability to facilitate manual block and razor tape editing, and a remote control which offers front or rear plug-in operable with EXT up to 30 meters away. The meter bridge also accommodates remote installation; a second meter bridge may be added for remote use. Dimensions are 38x25x32, and weighs 385 lbs. Price- $99,000.00.

For more information, circle 93 on the reader service card.

• **Mitsubishi** announced the addition of the X-880 32-channel digital audio recorder. It utilizes the ProDigi (PD) format. While maintaining complete tape compatibility with X-850 machines, the X-880 offers improved sound, more convenient utilization, and higher reliability. Extensive use of LSI has reduced the size and weight of the recorder.

The unit features an optional plug-in chase synchronizer (model CS-1) for convenient synchronization to popular VCRs, VTRs, and ATRs. Resolution within +/- 20 microseconds facilitates phase coherent 64-channel recording or inter-machine editing using two X-880 recorders. Highlights of the circuitry design include newly developed proprietary modem LSI, latest monolithic A/D and D/A converters, and linear phase active analog filters. The recorder includes an enhanced and redesigned auto-locator with integral and remotable meter bridge, a convenient multi-function pull down front panel, and comprehensive dual status displays.

For more information, circle 94 on the reader service card.

• The Warm Interface from **Summit Audio** can be used to warm up and enrich hard-edged or metallic digital signals, tape machine output or signal processing equipment. Used

as an interface between CD players, R-DAT recorder/players and any analog audio equipment, it provides tube sound and level matching. The unit is based on Summit's hybrid technology: using vacuum tubes for sound quality and solid state for reliability.

It controls even order harmonics to soften the typically hard or metallic quality of digital recordings. It has the following technical features: two channels, input/output electronically balanced, maximum output +25 dBm, input designed to work with –10 dB or +4 dB systems, screwdriver trim gain adjustment from front panel, maximum gain of 20 dB, maximum input +24 dBm, dynamic range of 110 dB, harmonic distortion less than 0.1 percent, and frequency response 3 Hz to 90 kHz.

For more information, circle 96 on the reader service card.

• **Studer/Revox** introduced two new members of the A807

series of professional recorders—a high-speed version for applications requiring 30 in./sec., and a new 4-track 1/2-inch version for multi-channel applications requiring a full-featured yet economical machine. The A807 VUK HS (high speed) 2-track recorder features 3 speeds (7.5, 15, and 30 in./sec.) and is intended for use in recording studios and for general high performance applications. This recorder is available in 1/4-inch half-track and 1/4-inch quarter-track configurations and is specifically meant for console mounting with overbridge metering.

The A807 1/2-inch 4-track recorder for recording studio and broadcast production applications is available only in the high speed version with overbridge metering. These new models feature 3 speeds, servo controlled DC capstan motor, servo controlled spooling motors, and are designed for quick response under synchronizer control. Standard features include MDAC controlled audio electronics, Dolby HX Pro recording process, tape shuttle controller and a variety of control ports including an RS 232 serial port. In addition, all units share such construction features as a rugged die-cast chassis and massive headblock assembly.

For more information, circle 97 on the reader service card.

• **Sennheiser** showed the wireless microphone systems that were chosen by NBC for use in the Summer Olympics in Seoul, Korea. Forty-one UHF systems, based upon the SK 2012-TVH transmitter and EM 2003-TVH diversity receiver, were designed to optimize the number of simultaneous channels usable in each of the 12 sports venues, in two mobile trucks, and by 14 ENG/EFP crews. An added constraint proved to be the small frequency spectrum which the Korean counterpart of our FCC had allocated to NBC—a mere 8.5 MHz.

In all instances, the design allowed for a minimum of 10 channels of operation: three at a given venue, three in one of the mobile trucks, and at least four ENG/EFP crews. Additionally, NBC's specifications called for diversity reception for the ENG/EFP crews. The response was a shoulder bag for its EM 2003-TVH which holds both the receiver as well

as the 12-volt battery which powers the unit on DC. Antennas are wired into the shoulder harness, allowing for suitable antenna spacing, and a battery test LED is incorporated into the receiver's face plate.

For more information, circle 98 on the reader service card.

• An optical turntable that employs a laser beam to play LP vinyl records was shown by **Finial Technology**. The LT-1 Laser Turntable will be available by early spring 1989. The turntable audibly improves the sound quality of vinyl (12-inch LP 33-1/3 RPM and 12-inch EP 45 RPM) records, with no record wear, because nothing but light touches the record

grooves. The inertial drag of tonearm and cartridge is eliminated, along with rumble.

It will provide state-of-the-art performance while preserving irreplaceable and valuable record collections for audiophiles, radio stations, record libraries and archives. Forward or backward scanning, cueing to cuts, and complete programming are accomplished by soft-touch controls. The unit shown sells for $3,786.00.

For more information, circle 99 on the reader service card.

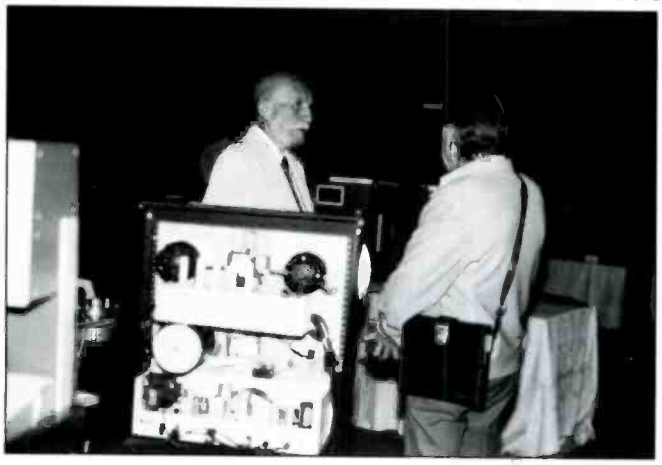
• **Kenwood** presented a DAT testing system, including the DA-5730 Encoder, DR-5750A Decoder, and the DB-5740 Jitter Analyzer.

The DA-5730 R-DAT Encoder generates signals to evaluate and test demodulators, in DAT hardware and ICs, of formatted standard signals. Sampling at 32 kHz, 44.1 kHz and 48 kHz are featured.

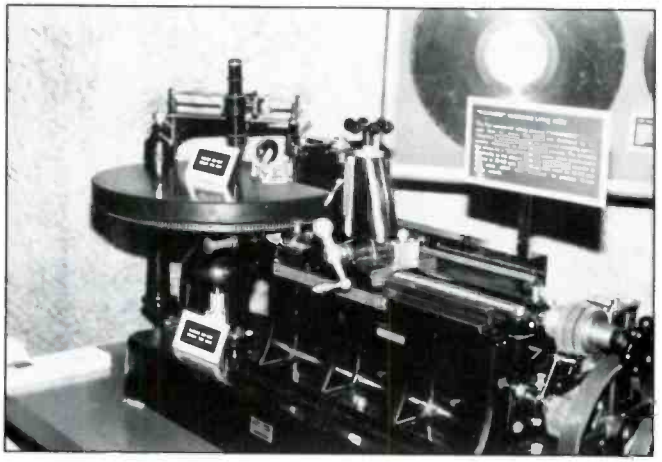
The DR-5750A R-DAT Decoder decodes formatted standard signals, and displays errors and ID codes. Playback signals from the DAT deck heads and tape are all measured and evaluated. The DB-5740 R-DAT Jitter Analyzer provides nearly real-time measurement and display of the data bit-length reversal distance jitter for each head. It also features an azimuth adjacent-track protection system (used in video recorders) instead of a guard band.

For more information, circle 95 on the reader service card.

A Bit of the Jack Mullin Collection



Jack Mullin in the museum room.



The Vitaphone film recording lathe, 1928.

An Ampex 200, the first American recorder.

In 1947 you recorded on wire with this machine.

New Products

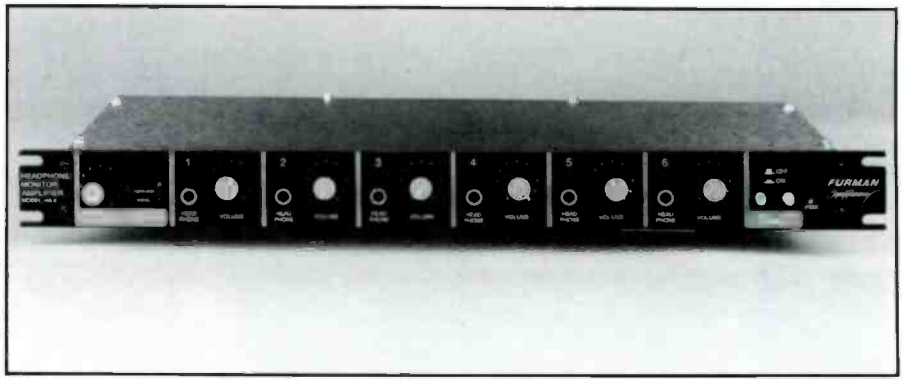
HEADPHONE AMPLIFIER

• Furman Sound has announced the Model HA-6 headphone/monitor amplifier, which is a versatile 20 watt per channel stereo power amp for overdubbing, rehearsal sessions, equipment demonstrations, etc. In its headphone mode, it powers up to six pairs of headphones with more than adequate loudness (both with older low-impedance headphones, or newer high-impedance models requiring higher voltage swing). Each headphone output has its own volume control. Switched into its monitor amp mode, it can power either or both of two sets of small monitor speakers.

Mfr.- Furman Sound

Price- $399.00

Circle 60 on Reader Service Card



2-TRACK RECORDER

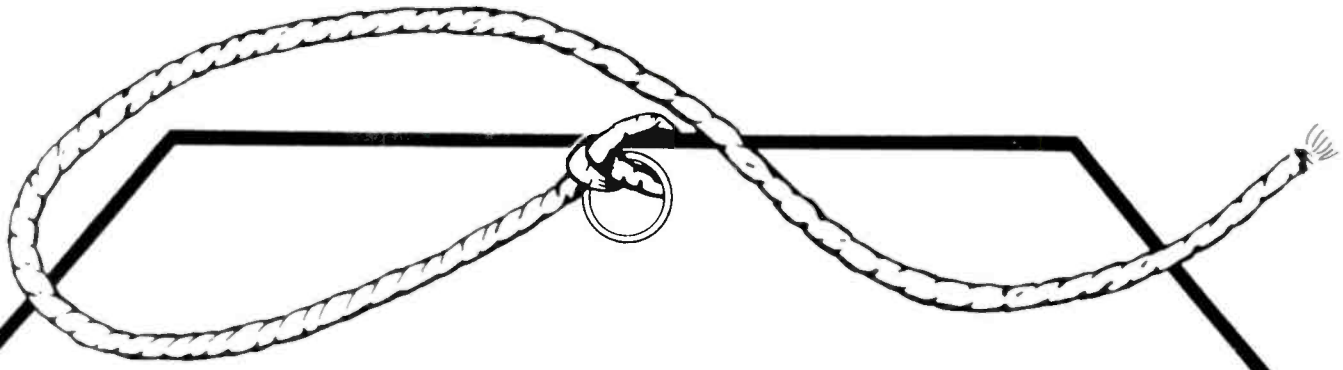
• Otari has introduced the MX-50 2-track recorder. It is available in both a 15/7.5 in./sec. and a 7.5/3.75 in./sec. version, and includes features such as a built-in tape timer display with search-to-cue and search-to-zero, a front panel +/-7 percent vari-speed, 10.5-inch reel size capacity, headphone amplifier, electronic lifter control, and dump edit function. An optional Voice Editing Module (VEM) is available which provides 2X playback without pitch shift for fast editing.

Mfr.- Otari Corporation

Price- $2,495.00

Circle 61 on Reader Service Card

(Continued on page 77)



THE SOUND ENGINEERING MAGAZINE

serving: recording, broadcast and sound contracting fields

Buyer's Guide—Speaker Systems, Performance and Monitor

On the pages that follow you will find a Guide to speakers, both studio monitors and performance types, in chart form that is immediately followed by manufacturer's addresses, concluding the Guides.

As usual, be aware that we attempt to contact every manufacturer, but not all are cooperative or prompt enough for our necessary deadlines.

MONITOR SPEAKERS

MODEL	DIMENSIONS, HWD	OUTSIDE FINISH	GRILL SCREEN FINISH	IMPEDANCE, OHMS	FREQUENCY RESPONSE dB	BASS DRIVER DIMENSIONS	BASS DRIVER TYPE	MID DRIVER DIMENSIONS	MID DRIVER TYPE	HIGH FREQUENCY DRIVER DIMENSIONS	HIGH FREQUENCY TYPE	CROSSOVER(S)	WEIGHT, LBS	PRICE	FEATURES
ALTEC LANSING CORPORATION															
9842-8A	30 34 18	gray lacq	black nylon	8	35-20k	12	cone				horn	1.5k	60	$1,056.00	Vented 2-way studio or broadcast monitor system.
9842-8D	30 34 18	oak venr	black nylon	8	35-20k	12	cone				horn	1.5k	60	$1,290.00	2-way vented studio or broadcast monitor
9844-8B	30 40 20	gray lacq	black nylon	8	35-20k	12	cone				sect horn	800	80	$1,650.00	2-way vented monitor system.
APOGEE SOUND															
AE-1	16 10.25 8	black text paint	gray foam	8	63-19k 4	8	cone			1	horn	4k	18	$420.00	Exceptionally clear reproduction of voice and music in foreground music applications.
ELECTRO-VOICE															
Sentry 100A	17.25 12 11.13	black vinyl	gray cloth	6	45-18k 3	8	cone			1	dome	2k	28	$286.35	High power handling in a small cabinet. Dome is rated at 25 watts of input power.
Sentry 100EL	17.25 12 11.13	black vinyl	gray cloth		45-18k 3	8	cone			1	dome	2k	33	$589.15	Internal 50 watt MOSFET power amplifier. Balanced and unbalanced line inputs with front-panel level control.
Sentry 500	23.75 27 13	black vinyl	gray cloth	8	40-18k 3	12	cone			1	dome	1.5k	70	$562.00	Features extended low-frequency response and high power handling.
FOSTEX CORPORATION OF AMERICA —See our ad on page 9															
RM765	15 9 8.7	matte		6.5	70-20k 3	6.5	coax cone			2	prnt ribn	5k	14	$250.00	Coaxial design for time and phase coherency and excellent imaging.
RM780	17 10 10.7	matte		6.5	58-20k 3	8	coax cone			2	prnt ribn	5k	19	$330.00	Near-field monitors that handle high power.
RM865	24 13 13	matte		6	50-20k 3	10	cone	6.5	coax cone	2	prnt ribn	250 5k	45	$399.00	
LS2	29 26 20	black		8	45-20 3	12	cone		wood horn		horn	1.2k 7k		$1,649.00	Studio monitors.
LS3	36 31 29.5	black		8	38-20k 3	15	cone		wood horn		horn	1.2k 7k		$1,999.00	Has high efficiency, low distortion and wide dispersion.
RM900	17 10.4 10.63	black wood	dark blue	8	55-20k 3	8	cone		horn		flat ribn	6k	19	$399.00	As above, both have wider dispersion for a larger listening field. Phase and time coherent characteristics.
JBL PROFESSIONAL															
Control 1	9.25 6.25 5.63	charc gray paint	black metal	4	120-20 3	5.3	cone			.75	dome	6k	4	$200.00	Shielded magnet structure, optional mounting hardware. Miniature system, Control Series family.
Control 5	15.25 9.88 9	charc gray paint	black metal	4	75-20k 3	6.5	cone			1	dome	3k	10	$335.00	
4425	16 25 12.25	oiled walnut	cloth	8	40-16k 3	12	cone			.88	bi-rad horn	1.2k	57	$950.00	Smooth, accurate response, flat power response, 200 watts cont. program capacity.
4435	35.75 38 17.13	oiled walnut	cloth	8	30-16k 3	15 (2)	cone			1	bi-rad horn	1k	250	$2,095.00	Stable stereo imaging that remains fixed over a wide range of horizontal positions.

MODEL	DIMENSIONS, HWD	OUTSIDE FINISH	GRILL SCREEN FINISH	IMPEDANCE, OHMS	FREQUENCY RESPONSE, dB	BASS DRIVER	BASS DRIVER DIMENSIONS	BASS DRIVER TYPE	MID DRIVER	MID DRIVER DIMENSIONS	MID DRIVER TYPE	HIGH FREQUENCY DRIVER	HIGH FREQUENCY DRIVER DIMENSIONS	HIGH FREQUENCY TYPE	CROSSOVER(S)	WEIGHT, LBS	PRICE	FEATURES
4406	15.38 9.38 8.5	oiled walnut	cloth	8	55-20k 2	6	cone				1	Ti dome	3k		17	$225.00	Ideal for console or close-in listening. Deep, powerful bass.
4408	17.25 12 11.63	oiled walnut	cloth	8	50-20k 2	8	cone				1	Ti dome	2.5k		26	$275.00	Ideal for broadcast and general monitoring applications.
4410	23.5 14.25 11.25	oiled walnut	cloth	8	45-20k 2	10	cone	5	cone				800 4.5		43	$425.00	Vertical line array that gives maximum special detail at greater listening distances.
4412	14.25 23.5 11.25	oiled walnut	cloth	8	45-20k 2	12	cone	5	cone				800 4.5		47	$650.00	Tight cluster arrangement and superior power efficiency.
KLARK-TEKNIK																	
Jade One MKII	21.5 15.5 10	black text epoxy	no grille	20k 10k	55-17k 3	8	cone neoflex				1.25 dome	soft	2.5k		48.5	$2,295.00	Optimum phase linearity, creating an accurate stable soundfield for mixing, mastering, etc.
KLEIN & HUMMEL (GOTHAM AUDIO CORPORATION)																	
098	15 10 7.25	gray	black cloth	4.7	50-16k 2.5	8	cone	1.5	dome	.75	dome	dome	800 6k		26.4	$985.00	Active, tri-amplified, 2 electronic X-overs with location dependent equalizer. (amps:1-100W, 2-50W).
096	20.7 12.4 11.4	gray	black cloth	4.7	50-20k 2.5	10	cone	2	dome	.75	dome	dome	600 4k		48.4	$1,695.00	Active, tri-amplified (3-60W), 2 electronic X-overs with location dependent equalizer.
092	31.5 17.3 11.8	gray	black cloth	4.7	50-17k 2.5	10 (2)	cone metal	3.5	cone	1	dome 3k	500			66	$2,995.00	Active, tri-amplified (1-120W, 2-60 W), 2 electronic X-overs with location dependent equalizer.
MEYER SOUND LABORATORIES INC. —See our ad on page 11																	
833	32 20 19.75	satin black lamin	foam	8	35-18k 4	15	cone					rad horn			115	$6,300.00	Studio reference monitor system includes electronic control unit.
834	38.5 24.13 20.13	satin black lamin	foam	8	30-100	18	cone								127	$1,600.00	130 dB SPL. Used as a subwoofer with the 833 monitors.
PANASONIC RAMSA																	
WS-A10	8 12.5 8	black resin	black metal	8	80-16k	6	full-range cone								6	$120.00	Compact full-range, near-field monitor. Magnetically shielded. Accessories opt.
PEAVEY AUDIO MEDIA RESEARCH																	
PRM 312A	25 15.88 13	black	black fabric	8	42-18k 3	12	cone	6.5	cone	1	soft dome	300 3k			58	$439.50	3-way system with rear level control for both the high and midrange drivers. Power handling is 200 watts program.
PRM 310S	21 14 11.25	black	black fabric	8	44-18k 3	10	cone	5	cone	1	soft dome	300 3k			40	$399.50	3-way system with a power handling capacity of 150 watts program.
PRM 308S	17.5 12.25 11.5	black	black fabric	8	45-18k 3	8	cone	5	cone	1	soft dome	300 3k			26	$299.50	3-way system with response mode switch, power handling capacity of 180 watts program.
PRM 205A	8.25 11.5 6.75	black	black fabric	8	79-18k 3	5	cone			1	soft dome	2.5k			7	$99.50	2-way system with drivers that are mounted on the same vertical axis. Power handling capacity is 50 watts program.
PRM 208S	9.75 15 8.25	black	black fabric	8	68-18k 3	8	cone			1	soft dome				6	$199.99	2-way system with drivers mounted on the same vertical axis. Power handling capacity is 60 watts program.
PROFESSIONAL AUDIO SYSTEMS																	
SM-1	25 19.5 18.5	oak black	black cloth	8	37-20k 3	15	cone			1	horn	1.2k			90	$4,600.00	Studio monitor with time offset correction.
SM-2	36 36 24.5	black		4.8	25-20k 3	15	cone	15	cone	2	horn				190	$10,500	3-way studio monitor with time offset correction.

MODEL	DIMENSIONS, HWD	OUTSIDE FINISH	GRILL SCREEN FINISH	IMPEDANCE, OHMS	FREQUENCY RESPONSE, dB	BASS DRIVER DIMENSIONS	BASS DRIVER TYPE	MID DRIVER DIMENSIONS	MID DRIVER TYPE	HIGH FREQUENCY DRIVER DIMENSIONS	HIGH FREQUENCY TYPE	CROSSOVER(S)	WEIGHT, LBS	PRICE	FEATURES
STUDER REVOX AMERICA INC.															
2706	12 15.1 13.5	dark gray nextel	black anod alum	4	42-20k 3	12	cone	2	dome	1	dome	720 5k	48	$825.00	Compact, can be installed on floor stands or suspension brackets. High power dome transducers.
TANNOY NORTH AMERICA INC.															
PBM 6.5	11.9 8 8.5	pewter gray vinyl	black material	8	57-20k	6.5	cone			.75	dome	2.6k	10	$298.00	At home in a wide variety of applications coupling high power handling/sensitivity with ex. resp.
PBM 8	15 10.13 10.63	pewter gray vinyl	black material	8	47-20k	8	cone			1	dome	2.4k	18.5	$248.00	Extended low freq. response and fluid-cooled H.F. dome.
TP-1	15 8.25 8.5	black ash vinyl	black material	8	55-20k	6.5	cone			1	dome	3k	10	$548.00	Ultra hi-tech shielded monitor for broadcast and audio-visual suites.
NFM	18 11.75 8	text black paint	black cloth	8	55-25k	8	dual conc drivs			.75	comp	1.8k	25	$998.00	Features metal dome H.F.
LGM	23 16 11	walnut venr	black cloth	8	55-20k	12	dual conc drivrs			2	comp	1.4k	46	$1,998.00	Ideal for pop rock. A time reference monitor.
SGM 15B	26.5 19.75 18	text black paint	black cloth	8	40-20k	15	dual conc drivrs			2	comp	1k	80	$3,298.00	Compact high-power with hard-wired X-over and gold-plated high current switches.
SGM-1000	40 25.5 18.5	walnut venr	black cloth	8	46-20k	15	dual conc drivrs			2	comp	1k	139	$3,898.00	Hard-wired X-overs with gold-plated high current switches. Point source phase aligned. For rock and pop rock.
FSM	41.25 28.25 21	walnut venr	black cloth	8/ 4	40-20k	15 (2)	dual conc drivrs			2	comp	500 1k	198	$5,498.00	Large twin 15 high SPL studio monitor featuring adjustable low freq. window allowing 8 or 4 ohm operation.
TASCAM (TEAC CORPORATION OF AMERICA)							—See our ad on Cover II								
S1010 M		black metal	black metal	25k	100-18	4	cone						5	$300.00	Reference monitor system with built-in amplifier.
CM-4	9.2 5.8 5.6	black metal	black metal	8	80-20k	4	cone			1	dome	2.5k	5	$125.00	2-way reference monitor speaker system.
TRANSDUCER DEVELOPMENTS LIMITED															
Ref Stnd TLS	20 22 48	black wood walnut	black brown cloth	8	16-35k 6.5	9.5	cone	4.5 (2)	cone	1	dome	200 3.5 13k	154	$6,995.00	Transmission line design. Low freq. separately terminated.
Monitor TLS	18 12 47	black wood walnut	black brown cloth	8	18-35k 6.5	9.5	cone	4.5	cone	1	dome	300 13k	103	$4,595.00	Transmission line design. Low freq. separately terminated.
Studio TLS	16 12 39	black wood walnut	black brown cloth	8	20-20k	8 (2)	cone			1	dome fluid	3k	59	$1,995.00	Transmission line design, featuring magnesium alloy suspended dome with separate chamber.
Studio TLS	15 11 35	black wood walnut	black brown cloth	8	24-20k	8	cone			1	dome	3k	48	$1,595.00	Same design and high frequency component as the Studio-3.
Super Compact	14 11 20	black wood walnut	black brown cloth	8	28-20k	8	cone			1	dome	3k	26.5	$1,095.00	Reflex design.
Compact	12 9 18	black wood walnut	black brown cloth	8	30-20k	6	cone			1	dome	3k	22	$935.00	Reflex design.
UREI															
809	23 16.5 13.5	flat black paint	opt. grille	8	50-17k 3	12	cone			.88	comp driv		60	$750.00	Time aligned, flat power response maintaining freq. bal. at low distortion over wide range output levels.
811C	20.75 26.5 19	flat black paint	opt. grille	8	70-17k 3	15	cone			1	comp driv		110	$1,590.00	Minimizes listening fatigue, accurate stereo imaging.

PERFORMANCE SPEAKERS

MODEL	DIMENSIONS, HWD	OUTSIDE FINISH	GRILL SCREEN FINISH	IMPEDANCE, OHMS	FREQUENCY RESPONSE, dB	BASS DRIVER DIMENSIONS	BASS DRIVER TYPE	MID DRIVER DIMENSIONS	MID DRIVER TYPE	HIGH FREQUENCY DRIVER DIMENSIONS	HIGH FREQUENCY TYPE	CROSSOVER(S)	WEIGHT, LBS	PRICE	FEATURES
ALTEC LANSING CORPORATION															
937	30 23 20.7	black text	black nylon	8	70-15k	12	cone			18x9	horn const dlrec	3k	45	$886.00	Multi-purpose, vented, two-way monitor loudspeaker system.
9872 8A	30 23 14	unfin birch	neut brown	8	80-20k	12	cone			18x9	horn const direc	2k	42	$716.00	Two-way, vented, full-range.
9872 8F	30 23 14	tan text	neut brown	8	20-20k	12	cone			18x9	horn const dlrec	2k	42	$1,700.00	Two-way, vented, full-range.
9812 8A	34 23 22	gray text	black nylon	5?	60-13k	15	cone			30x 17	horn const direc	500	80.1		Two-way, vented, full-range.
APOGEE SOUND															
3X3	45 29 30	black text paint	gray foam	8L 8M 16H	53-19k 4	15	cone	2	horn	28	horn	1k 7.6k	250	$4,400.00	Extremely high power, wide range, fully horn-loaded, trapezoid design will array for concert reinforcement.
AE-2	10.5 32 10	black text paint	gray foam	16	63-19k	8	cone			3x5	horn	4k	30	$1,095.00	165 degree horizontal dispersion enables underbalcony applications- or in facilities with low ceilings.
AE-3	16 12.5	black text paint	gray foam	8	70-18k 3	10	cone			3x5	horn	4k	40	$750.00	Tremendous power/size ratio in vocal range. Works well with subs for club and disco installations.
AE-5	23 14 16	black text paint	gray foam	8	53-17k 4	12	cone			5x 13.5	horn	1k	78	$2,150.00	Exceptionally clean, natural high frequency response. Trapezoid design enables multiple coupling.
AE-6	14 23 15.5	black text paint	gray foam	8	53-17k	12	cone			5x 13.5	horn	1k	78	$2,170.00	High power stage monitor. Multiple angle design, polar response for optimum stage coverage.
AE-10	22.5 32 24	black text paint	gray foam	8	36-120	15 (2)	cone					100	138	$1,785.00	Powerful bass reproduction from compact enclosure for small club applications.
AE-12	30 44.8 22.5	black text paint	gray foam	8	35-120 4	18 (2)	cone					100	60	$2,110.00	Powerful bass response for large clubs and concert venues. Built-in rigging points.
CARVIN CORPORATION —See our ad on Cover III															
973	30.5 22 15.25	charc Ozite	black metal	8	50-19k 3	15	cone	6.5	cone	1	horn	400 4k	85	$368.00	Has a 6.5-inch cone and precision crossover network.
993	47 25 19.25	charc Ozite	black metal	4	45-19k 3	15 (2)	cone	6.5	cone	1 (2)	horn	400 4k	146	$629.00	An ultimate three-way system.
ELECTRO-VOICE															
MT-4	36 36 30	black Ozite or paint	black steel	4, 8	40-20k 3	18 (4)	cone	10, 2	cone /comp driver	1	horn 1.6 6k	160	415H 311L	$4,675.00 $2,650.00	Manifold Technology (MT-4) utilizes low and high enclosures, phase aligned.
DML- 1122	23 14.6 14	black text paint	black steel w/foam	8	70-20k 3	12	cone			2	horn	1.3k	68	$1,550.00	High output electronically controlled system featuring high excursion componets.
DML- 1152	29.88 18 16.28	black text paint	black steel w/foam	8	50-20k 3	15	cone			2	horn	1.3k	96	$1,820.00	High power wide range 2-way electronically controlled system prevents over-heating/over excursion.
DML- 2181	36 22.5 29.88	black text paint	black steel w/foam	8, 8	36-100 3	18	cone					100	164	$1,94.00	Electronically controlled subwoofer utilizing Manifold technology, high excursion drivers.
FORMULA AUDIO INC.															
DR-	24	gray	black	16H	60-18k	12	cone			1	horn	1.5k	70	$1,300.00	Flying hardware standard, trape-

MODEL	DIMENSIONS, HWD	OUTSIDE FINISH	GRILL SCREEN FINISH	IMPEDANCE, OHMS	FREQUENCY RESPONSE, dB	BASS DRIVER DIMENSIONS	BASS DRIVER TYPE	MID DRIVER DIMENSIONS	MID DRIVER TYPE	HIGH FREQUENCY DRIVER DIMENSIONS	HIGH FREQUENCY TYPE	CROSSOVER(S)	WEIGHT, LBS	PRICE	FEATURES
4401	14.5 13	carpet	metal	8L	3						comp driver				zoidal, 310 watts RMS.
DR-4402	36 19.5 22	gray carpet	black metal	8H 8L	43-20k 3	15	cone	2	horn		slot twt	800 7k	105	$2,100.00	Flying hardware standard, trapezoidal, 370 watts RMS.
DR-4403	36 36 22	gray carpet	black metal	4H 4L	43-20k 3	15	cone	2	horn (2)		slot (2)	800 7k	215	$3,500.00	Flying hardware standard, trapezoidal, 740 watts RMS.
DR-4418	36 36 22	gray carpet	black metal	8L	30-250 3	18	cone					80	132	$1,600.00	Flying hardware standard, trapezoidal, 500 watts RMS.
DR-4428	45 30 22	gray carpet	black metal	8	30-250	18 (2)	cone					80	170	$1,800.00	130 dB continuous, 133 peak, 1000 watts RMS.
P-6000	60 22 24	gray carpet	black metal	8H 4M 8L	26-20k 3	18	cone	10 (2)	cone	2	horn slot	250 1.5k 7k	245	$4,900.00	1350 watts RMS, connector panel with ground lift and breaker.
CAD2	36 24 22	gray carpet	black metal	16H 8L	80-16k 3			12	cone	2	horn	1k-6k	165	$2,600.00	Flying hardware standard, 400 watts RMS, trapezoidal, SPL 132 continuous/136 peak.
FOSTEX CORPORATION OF AMERICA —See our ad on page 9															
SP11	7 14 8.4	black plas	black metal	8	60-18k 3	4 (2)	cone						12	$270.00	Built-in power amplifier.
SPA11	7 14 8.4	black plas	black metal	8	60-18k 3	4	cone						17	$399.99	
JBL PROFESSIONAL															
4612B	18.5 21.5 10.25	multi lamin hdwood	cloth	8	60-21k	8 (2)	cone			3	ring bi-	3k rad.	45	$665.00	Wide, tightly controlled dispersion, extended freq. res.,high power, high efficiency.
G-734	26.25 20.25 12.75	gray tolex	black metal	8	50-17k 10	15	cone			.88	horn comp driv	1.5K	53	$555.00	2-way portable system designed to deliver wide bandwidth and high SPL
G-791	5 15.25 9.75			8	1.5-17 10							1.5k	10	$260.00	Contains horn, driver and X-over to custom load components in own cabinets.
G-730	21.75 18.25 11.75	tolex	black metal	8	70-17k 10	12	cone			.88	horn comp driv	2k	45	$495.00	Compact, 2-way system ,high yield acoustic output from small/portable package.
G-731	16 18.25 21.75	tolex	black metal	8	70-17k 10	12	cone			.88	horn comp driv	2k	47	$525.00	Lightweight, 2-way floor monitor designed for high acoustic output from small/portable package.
G-732	33.25 24.75 17.75	tolex	black metal	8	45-17k 10	15	cone			.88	horn comp driv	1.5K	77	$660.00	High efficiency system utilizing a G-135A-8 low freq. driver mounted in a horn enclosure.
G-733	20.25 26.25 12.25	tolex	black metal	8	50-17k 10	10	cone	8	cone			3k	52	$595.00	3-way keyboard system.
4628B	30.19 20.13 18.8	multi lamin hdwood	cloth	8	35-21k	15	cone	8	cone	3	ring rad	800 3k	108	$950.00	Specially designed for synth, piano and organ with superb bottom end for clean pedal tones.
JOE'S SOUND & SALAMI CO. —See our ad on page 40															
15AA	24 18 17	black spakle	black metal		50-2k	15	cone						55	$401.00	Available In three formats: PRO, CBB, and ULTRA-LIGHT. PRO line is constructed of rigid wood/chemical.
18UPS	24 21 16	black spakle	black metal		50-500	18	cone						40	$407.72	Ultra-light cabinets, manageable and inexpensive.

MODEL	DIMENSIONS, HWD	OUTSIDE FINISH	GRILL SCREEN FINISH	IMPEDANCE, OHMS	FREQUENCY RESPONSE, dB	BASS DRIVER DIMENSIONS	BASS DRIVER TYPE	MID DRIVER DIMENSIONS	MID DRIVER TYPE	HIGH FREQUENCY DRIVER DIMENSIONS	HIGH FREQUENCY TYPE	CROSSOVER(S)	WEIGHT, LBS	PRICE	FEATURES
18UL	31 25 22	black spakle	black metal		40-500	18	cone						50	$501.33	7 cubic foot enclosure for thundering bass and subwoofer applications
15UL	24 19 18	black spakle	black metal		40-2k	15	cone						40	$370.67	Honeycomb/birch construction, delivers clean, tight bass, high SPL.
12BE	18 15 14	black spakle	black metal		70-2k	12	cone						35	$329.50	Compact, professional, comes in CBB and ULTRA-LIGHT formats.
10SX	13 20 12	black spakle	black metal		75-8k	10	cone						29	$282.93	Extremely versitile, works well with bi-amped rigs, doubles as musical instrument cabinet.
18AB	24 21 18	black spakle	black metal		35-1k	18	cone						75	$529.90	Compact subwoofer, available in CBB and ULTRA-LIGHT formats.
18MW	48 21 18	black spakle	black metal		35-1k	18 (2)	cone						102	$849.90	Lightweight, compact, excellent truck-pack.
KLIPSCH & ASSOCIATES															
KSM-1	18 20 25	black text paint	black cloth	8	50-15k 5	15	cone	1.5	horn comp driver			1.1k	59	$530.00	Can be positioned for shallow or deep stage monitoring. Highly efficient. Metal grill insert.
KP-301A	32.6 20.9 16.9	black text paint	black cloth	8	45-20k 4	15	cone	1.5	horn comp driver	1 driver	horn comp	650 7k	82	$760.00	High output in a compact enclosure. Trim and corner protection.
MEYER SOUND LABORATORIES INC. —See our ad on page 11															
UPM-1	6.75 18.5 7.5	black text	exp metal	16	60-20k 4	5	cone	5	cone	2x5	horn		17	$893.00	Ultra-compact and light weight, efficient high power.
UM-1A 14	14 22.5	black text	metal w/gray foam	8, 8	60-16k 4	12	cone			CD	horn		66	$2,390.00	Efficient high power, ultra-low distortion, flat response, requires M-1A control electronics.
UPA-1A	14.5 22.63 14.5	black text	metal w/gray foam	8, 8	60-16k 4	12	cone			rad	horn		66	$2,490.00	Efficient high power, ultra-low distortion, compact and versatile.
MSL-3	31.25 56.75 30	black text	metal w/gray foam	8, 4	75-20k 4	12 (2)	cone			rad	horn		265	$4,820.00	High power, high clarity and coherence, arrayable, requires electronic control unit (M-3T).
USW-1		black text	metal w/gray foam	4	40-100 4	15 (2)	cone						115	$1,549.00	Sub-woofer, high power, low distortion.
650-R2	45 30 22.5	black text	metal w/gray foam	4	30-100 4	18 (2)	cone						180	$2,615.00	Sub-woofer, high power, low distortion.
500 Series System		black text		8 4	30-16k	15	cone			mod radial	horn		110	$5,660.00	System includes two full-range speakers and amplifier, 3 sub-woofer options.
PANASONIC RAMSA															
WS-A70	13 21 12	black or wht paint	black or wht cloth	8	50-18k	8	cone			120x 120	horn	2k	13	$240.00	Power capacity is 80 watts. Magnetically shielded, variety of mounting options.
WS-A80	14 21.5 12	black or wht resin	black or wht metal	8	65-18k	8	cone			60x 40	horn	2.5k	15	$280.00	High SPL, compact, stackable, variety of mounting options.
WS-A200	28 20 16	black or wht resin	black or wht metal	8	70-20k	12	cone			60x 40	horn	2.5k	32	$560.00	125 watt power handling, compact, high SPL, stackable, variety of mounting options.
WS-A240	28 20 16	black resin	black grille	8	35- X-over	12	cone					50 80, 120		$450.00	400 watts power capacity, high output, stackable.

MODEL	DIMENSIONS, HWD	OUTSIDE FINISH	GRILL SCREEN FINISH	IMPEDANCE, OHMS	FREQUENCY RESPONSE, dB	BASS DRIVER DIMENSIONS	BASS DRIVER TYPE	MID DRIVER DIMENSIONS	MID DRIVER TYPE	HIGH FREQUENCY DRIVER DIMENSIONS	HIGH FREQUENCY TYPE	CROSSOVER(S)	WEIGHT, LBS	PRICE	FEATURES
PEAVEY ELECTRONICS CORPORATION															
HDH2	30 27 27	carpet	black mesh	8	40-17k 3	15	cone			2	comp driver	1.2k	100	$649.00	High-level, 2-way, biamp only. SPL is 103 dB (1W, 1M).
3020 HT	38 36.5 18	carpet	black perf steel	4	45-20k 3	15 (2)	cone	10 (2)	cone	2 1	driv twt	1.2k	161	$899.00	High-level, full-range or triamped enclosure. Internal 4-way passive X-over. SPL is 99.5 dB.
HDH4	30 27 27	carpet	woven mesh	8, 8	300-17 3	12			cone	2 (4)	comp driver	1.2k	173	$1,199.99	High-level, 2-way enclosure. Biamp-able for mids and highs. SPL is 108 dB (high), 109 dB (mid).
HDH1	57 27 27	carpet	woven mesh	4L 8M 8H	40-18k 3	15 (2)	cone	12	cone	2 (4)	comp driv	300 1.2k	256	$1,699.99	High-level, 3-way enclosure. Flying hardware equipped.
415 Sub	41 36 21	carpet	black perf steel	8	45-1k 3	14 (4)	cone					500	162	$699.99	High-level sub enclosure. Designed to work as sub for 3020HT enclosure.
1245M	17 24 17	carpet	black perf steel	8	100-14 3	12	cone			2	comp driv	800 1.2k	53	$399.99	2-way, blampable stage monitor. Built-in passive X-over. SPL is 102 dB.
1545M	20 20 23	carpet	black perf steel	8	80-14k 3	15	cone			2	comp driv	800 1.2k	59	$429.99	2-way, blampable stage monitor. Built-in passive X-over for full-range operation. SPL is 103 dB.
HDHM	22 27 27	carpet	mesh	8	55-17k 3	15	cone			2 (4)	comp driv	1.2k	95	$599.99	Blampable, high-level, 2-way stage monitor with internal passive X-over for full range operation.
PROFESSIONAL AUDIO SYSTEMS															
MRS-2	51 32 23	gray carpet	black metal	8	40-15k 3	15	cone			2	horn	1k	185	$1.490.00	Modular, full-range with time off-set correction.
CX 15-3	25 19 10	gray carpet	black metal	8	60-15k 4	15	cone			1	coax horn	1.2k	70	$684.00	Compact, full-range, high output stage monitor with time offset cor-rection.
SHURE BROTHERS INC. —See our ad on Cover IV															
3200	25 17 13	black vinyl	black metal	8	60-13k 5	12	cone			12x 8	CD horn	2k	38	$470.00	120 watts, protective corners, handle, stand mounting bracket, time-sync crossover.
3100	24 16 12	beige paint	brown fabric		60-13k 5	12	cone			12x 8	CD horn	2k	52	$416.00	120 watts, paintable finish, T-nut hanging hardware, time-sync cross-over.
SUNN															
1212	21 17 12	gray carpet	black metal	8	60-17k	12	cone			comp driver	horn	2.5k		$259.00	Full-range system with 100W power-handling, 95 dB SPL.
1215	25 20 13	gray carpet,	black metal	8	60-17k	15	cone			comp driver	horn	2.5k		$319.00	Full-range system with 100W power-handling, 95 dB SPL.
SPL 1225	28 25 19	gray carpet	black metal	8	50-20k 3	15	cone			comp driver	horn	1.3k	74	$449.00	Trapezoid plywood cabinets, 200W power handling, 100 dB SPL.
SPL 1226	46 25 19	gray carpet	black metal	4	38-20k 3	15 (2)	cone			comp driver	horn	1.2k	116	$649.00	Trapezoid plywood cabinet, 400W power handling, 100 dB SPL.
1272	15 22 18	gray carpet	black metal	16	60-20k	12	cone			piez	horn		32	$199.00	100W power-handling, 95 dB SPL.
1275	17 25 19	gray carpet	black metal	16	60-20k 3	15	cone			piez	horn		38	$229.00	150W power-handling, 100 dB SPL.
1282	17 25 19	gray carpet	black metal	8	60-15k 3	12	cone			comp driver	horn	1.2	52	$399.00	150W power-handling, 100 dB SPL.

MODEL	DIMENSIONS, HWD	OUTSIDE FINISH	GRILL SCREEN FINISH	IMPEDANCE, OHMS	FREQUENCY RESPONSE, dB	CROSSOVER(S)	BASS DRIVER DIMENSIONS	BASS DRIVER TYPE	MID DRIVER DIMENSIONS	MID DRIVER TYPE	HIGH FREQUENCY DRIVER DIMENSIONS	HIGH FREQUENCY TYPE	WEIGHT, LBS	PRICE	FEATURES
1282	17 25 19	gray carpet	black metal	8	50-15k 3	15	cone			comp driver	horn	1.2k	56	$429.99	200W power-handling, 100 dB SPL.
TURBOSOUND (EDGE DISTRIBUTION)															
TXD-250	16.75 11.88 10.25	blue paint	black metal	8	100-18	10	cone				soft dome	4k	26	$665.00	Compact near-field for delay systems, surround sound, etc.
TXD-530	10.75 23.5 13.75	blue paint	black metal	8	150-18	10 (2)	cone				slot twt	4k	33	$1,064.00	Extra-wide dispersion under balcony, surround system enclosure.
TXD-580	45.75 22 17.38	blue paint	black metal	8H 8L	45-18k 4	18	cone	10 (2)	cone	1	horn	4k	150	$2,244.00	Full-range high power wide dispersion enclosure for bands, club, cinema, DJs, mobile systems.
TFM-2	22.63 14.88 33	black blue paint	black foam	8, 8	60-18k 4	15	cone	15	cone	2	horn	170 4k	123	$2,693.00	Horn-loaded super high power floor monitor for high SPL applications such as drum monitors.
TMW-215	18 20 34	black paint	black foam	8	90-17k 3	15 (2)	cone			2	horn	1.6k	105	$1,647.00	Wedge monitor is a low profile switchable active/passive.
TMW-212	12 16 27	black paint	black foam	8	110-17 3	12 (2)	cone			1	horn	4k	66	$999.00	Low profile, 2-way passive monitor for vocal, keyboards, percussion.
TMW-210	10.75 23 13.75	black paint	black foam	8	150-18 3	10 (2)	cone				twt	4k	33	$895.00	Extra low profile vocal wedge for acoustic and jazz applications.
YAMAHA CORPORATION OF AMERICA															
S4115 HIIA	32.3 25.8 18.2	ply w/blk	black metal	8	50-16k	15	carb fiber			1.7	horn	1.6k	97	$695.00	2-way stage monitor, high power and wide response, recessed handles and interlocking corners.
SW118 A	29.6 25.1 18.2	ply w/blk	black metal	8	30-2k	18	cone					120	90	$595.00	High-power, sub-woofer system. Rugged cabinet with recessed handle and interlocking handles.
S300	28.8 22.5 15.3	ply w/blk	black metal	8	50-20k	15	cone	8	cone	90x 120	horn	800 4k	65	$645.00	High powered, 3-way, full-range system for small to medium sized venues.
S2115 HII	22.3 26.6 26.2	ply w/blk	black metal	8	50-16k	15	carb fiber			1.7	horn	1.6k	77	$645.00	High power-handling and excellent low frequency response.
S115 MT	22 28.6 13.9	ply w/blk	black metal	8	40-20k	15	cone	6.5	cone	3.2	bull	1.2 5k		$445.00	All-cone 3-way system for close-field reinforcement applications. Available in oak finish.
S115H	20.3 28.6 13.9	ply w/blk	black metal	8	40-16k	15	cone			rad	horn	1.6k		$395.00	2-way system for medium-throw sound reinforcement. Ideal full-range sidefill. Available in oak finish.
S112H	18 24.3 11.8	ply w/blk	black metal	8	60-16k	12	cone			rad	horn	1.6k		$345.00	Compact, 2-way system for medium-throw applications. Ideal for tight stage situations. Opt. oak finish.
S110H	15.3 18 9	ply w/blk	black metal	8	70-16k	10	cone			rad	horn	2k		$295.00	Very compact full-range reinforcement system with high power-handling.
SM15H	20.5 25.75 15.5	ply w/blk	black metal	8	30-16k	15	cone			rad	horn	1.6k		$395.00	2-way slant-front stage monitor with wide high frequency dispersion.
SM10H	14.75 18.75 14	ply w/blk	black metal	8	60-16k	10	cone			rad	horn	2k		$295.00	Ultra-compact stage monitor with high power. Ideal for applications requiring "invisible" speaker.
YORKVILLE SOUND															
MX-1000	40 27 19	black ozite	black metal	4	55-16k 3	15 (2)	cone			16x5	horn	2.3k	143	$1,150.00	Sensitivity is 105. SPL is 134 dB (1W/1M). Protection circuitry.

MODEL	DIMENSIONS, HWD	OUTSIDE FINISH	GRILL SCREEN FINISH	IMPEDANCE, OHMS	FREQUENCY RESPONSE, dB	BASS DRIVER DIMENSIONS	BASS DRIVER TYPE	MID DRIVER DIMENSIONS	MID DRIVER TYPE	HIGH FREQUENCY DRIVER DIMENSIONS	HIGH FREQUENCY TYPE	CROSSOVER(S)	WEIGHT, LBS	PRICE	FEATURES
SW-600	28 23 22	black ozite	black metal	8	50-300 3	18	cone						95	$645.00	Sensitivity is 100. SPL is 124 dB (1W/1M). Protection circuitry (sub-woofer).
SW-1000	43 28.5 24.5	black ozite	black metal	4	45-300 3	18 (2)	cone						185	$1,250.00	Sensitivity is 103. SPL is 132 dB (1W/1M). Protection circuitry (sub-woofer).
M-160	18 14.5 13.5	black ozite	black metal	8	65-19k 3	10	cone		9x5	horn	4k	33	$420.00	Sensitivity is 99. SPL is 118 dB. Protection circuitry.
M-400	23.5 20.5 14	black ozite	black metal	4	50-16k 3	10 (2)	cone		5x5	horn	4k	62	$675.00	Sensitivity is 97. SPL is 120 dB. Protection circuitry.
M-600	19.5 23 13.5	black ozite	black metal	4	50-16k 3	10 (2)	cone		9x5	horn	1.8k	77	$850.00	Sensitivity is 97. SPL is 120 dB. Protection circuitry.
MX-401		black ozite	black metal	4		15	cone		12x5	horn			$795.00	Sensitivity is 103. SPL is 130 dB. Protection circuitry.

ADDRESSES

Altec Lansing Corporation
10500 W. Reno
Oklahoma City, OK 73128

Apogee Sound Inc.
1150 Industrial Ave, Suite C
Petaluma, CA 94952

Carvin Corporation
1155 Industrial Ave.
Escondido, CA 92025

Electro-Voice
600 Cecil St.
Buchanan, MI 49107

Sunn (Fender Musical Instruments)
1130 Columbia St.
Brea, CA 92621

Formula Audio
Route 5, Box 4403, Hwy 39
Zebulon, NC 27597

Fostex Corp. of America
15431 Blackburn Ave.
Norwalk, CA 90650

JBL Professional (and UREI)
8500 Balboa Blvd.
Northridge, CA 91329

Joe's Sound and Salami Co.
303 Clymer Ave.
Morrisville, PA 19067

Klark-Teknik
30 B Banfi Plaza
Farmingdale, NY 11735

Klein and Hummel (Gotham)
1790 Broadway
New York, NY 10019-1412

Klipsch & Associates
Box 688
Hope, AR 71801

Meyer Sound Labs
2832 San Pablo Ave.
Berkeley, CA 94702

Peavey Electronics/Peavey Audio Media Research
711 A St.
Meridian, MS 39301

The Phelps Group (Ramsa)
11999 San Vicente Blvd,
Suite 301
Los Angeles, CA 90049

Professional Audio Systems
1224 West 252nd St.
Harbor City, CA 90710

Shure Brothers
222 Hartrey
Evanston, IL 60204

Studer Revox America, Inc.
1425 Elm Hill Pike
Nashville, TN 37210

Tannoy North America, Inc.
300 Gage Ave, Unit 1
Kitchener, Ontario
Canada N2M 2C8

Tascam (Teac Corporation of America)
7733 Telegraph Rd.
Montebello. CA 90640

Transducer Developments Ltd.
(Connectronics)
652 Glenbrook Rd.
Stamford, CT 06906

Turbosound (Edge Distribution)
RR-2, 144C Milewood Rd.
Millbrook, NY 12545

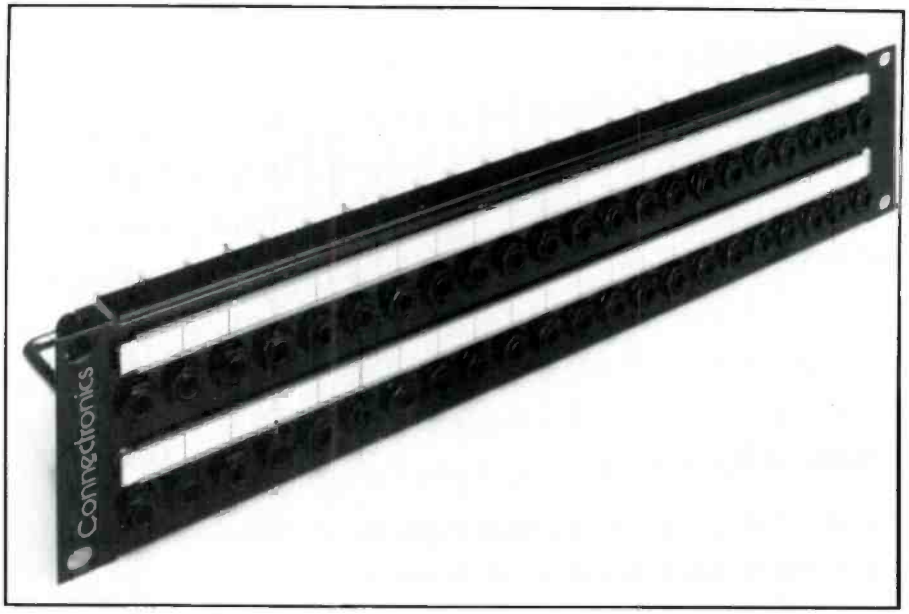
Yamaha Corporation of America
PO Box 6600
Buena Park, CA 90622

Yorkville Sound Inc.
56 Harvester Ave.
Batavia, NY 14020

(Continued from page 64)

PATCH BAY SYSTEMS

• Connectronics Corporation announced a new patch bay system which provides for complete flexibility of connectors. The "J" Bay is a circuit card based system comprised of two rows of 22 (44 in all) 1/4-inch jack sockets. Each patch bay can be balanced (tip, ring, sleeve) or unbalanced (tip, sleeve), and terminates on the rear panel with a 1/4-inch jack on phono (RCA) or hardwire option. Each pair of connectors can be arranged in a normaled, half-normaled, snif (listen), or direct configuration. Also available in the "J" Bay range is a 1U high panel with 16 points. A feature of the system is the Insert Card option, this enables any of the pairs of connectors to be charged to allow for full sound and return insert capability to be provided on any mixing console with a 1/4-inch T.R.S. insert point connector. A simple balanced patch cord between the console and the patch bay connects the two.



Mfr.- Connectronics Corporation
Price- range from $106.90

Circle 62 on Reader Service Card

CD TEST DISC

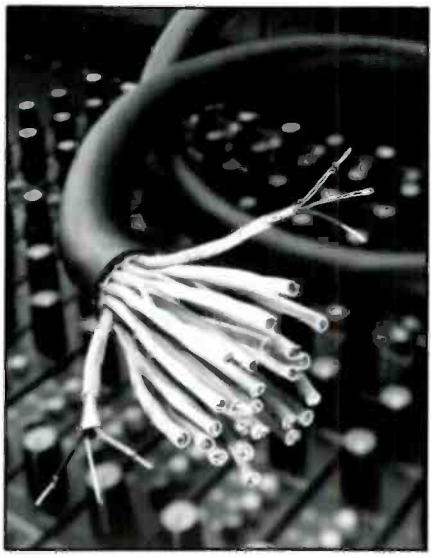
• Denon has released the first anechoic recording on CD. It contains performances from every era of European art music, for chamber ensembles and full orchestra. Anechoic recordings deliberately eliminate the echo, reverberation, and hall resonance that aurally define the space in which the recording was made. The disc should help research in architectural acoustics by making possible tests that would otherwise require the presence of a live orchestra. The recording can also be used to test audio systems and listening rooms. The CD was recorded on the stage of a concert hall, the Large Hall of the Minoo Civic Hall in Osaka. To control echo, Denon covered the stage with sound absorbent material and erected a temporary anechoic box, inside which the orchestra performed. Inverse square characteristic deviation measurements demonstrated that the temporary room satisfies the recommended values for semi-anechoic rooms contained in ISO 3745.

Mfr.- Denon America, Inc.
Price- $49.95

Circle 63 on Reader Service Card

PAIR CABLES

• Belden Wire and Cable has introduced a new line of multi-pair audio "Snake" cable featuring individually jacketed and shielded pairs for optimum protection against signal loss. The series has eight different pair construction ranging from 4- to 32-conductor pairs. Each pair is individually shielded with Beldfoil (R) for 100 percent coverage against interference. Jacketed with PVC and insulated with polypropylene, the cable has 22 AWG (7x30) stranded tinned copper conductors. The loose tube construction enables high flexibility while the outer jacket features an overall non-reflecting black matte finish. Inner jacketed pairs are numbered for ease of identification. Available from stock in 100, 250, 500, and 1000-foot put-ups.



Mfr.- Belden Wire and Cable
Price- $640.00 (1000 ft. of 4-pair cable)

Circle 64 on Reader Service Card

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People, Places... & Happenings

• **Helge H. Wehmeier** has been appointed President and CEO of **Agfa Corporation**, Ridgefield, NJ, effective January 1, 1989. He will remain on the Board of Management of the Agfa-Gevaert Group of Europe. Agfa Corporation will officially be formed on January 1 through the integration of Agfa-Gevaert, Inc., Compugraphic Corporation, and Matrix Corporation. Previously, Mr. Wehmeier was Director of Agfa-Gevaert AG, Leverkusen, in charge of the Industrial Division.

• **Ansel Kleiman**, chairman of the board for **Telex Communications, Inc.**, has announced that **Jeffrey S. Wetherall** has been named president and chief operating officer. Wetherall transferred from another Telex subsidiary to join Telex Communications, Inc. He succeeds John Howe who retired earlier in the year. Also announced was that **Philip A. Phelon** was named executive vice president. Reporting directly to Phelon will be all manufacturing plant managers, the director of quality assurance and the director of management information systems.

• **Andrew Mougis** has been named vice president, sales, Professional Tape Division, **Sony Magnetic Products Company**, responsible for Sony's complete line of professional audio and video tape products. The announcement was made by **John Bermingham**, senior vice president of the company. Also announced was the appointment of **Kenneth F. Wiedeman** to director of marketing. He will be responsible for developing marketing programs, including those for professional audio and video tapes.

• **Marvin Caesar**, president of **Aphex Systems, Ltd.**, has named **Michael Stewart** as manager of the company's newly formed Systems Design Group. Stewart will be responsible for developing a variety of unique MIDI-oriented control devices for musicians.

• **ATM Audio** has changed their address: 17104 S. Figueroa Street, Gardena, CA 90248, (213) 538-2004

ATM Audio services the professional user with sound reinforcement services, sound system rentals, sound contracting, audio consulting, professional equipment sales, and custom audio system design, development, and manufacturing.

• **David Harrison**, chairman of the board of **Harrison Systems, Inc.**, announced that the company has acquired new executive offices to house its administrative, sales and engineering department. The announcement explains that this new space not only allows expansion of production capabilities at the existing facilities, but also allows better coordination of services.

• **Denise Ewing**, vice president of operations, announced the formation of a new company, **H&E Micro-Trak Corporation**. H&E has purchased certain assets of Micro-Trak Corporation and will continue to supply products previously manufactured by Micro-Trak. H&E will locate in Chicopee, Massachusetts. **Roger Hamel** is president of the new company. **William E. Stacy** will be vice-president sales and marketing.

• New officers and board of directors of **The Society of Professional Audio Recording Services (SPARS)** were elected at a general membership meeting during the AES Convention. Those elected are:

President: Bruce Merley (Clinton Recording, New York City), First Vice President: David Porter (Music Annex, San Francisco), Regional Vice President/Treasurer: Dick Trump (Triad Productions, Des Moines), Regional Vice President/Secretary: Dwight Cook (Cook Sound and Picture Works, Houston), Regional Vice President: John Rosen (Fanta Professional Services, Nashville), Regional Vice President: Charles Benanty (Sound Works, New York City), Regional Vice President: Howard Schwartz (Howard Schwartz Recording, New York City), Regional Vice President: Charles Comelli (Capitol Records, Inc., Los Angeles), Regional Vice President: Pete Caldwell (Doppler Recording, Atlanta), Regional Vice President: Tom Kobayashi (Sprocket Systems Division of Lucasfilms, San Rafael, CA), Regional Vice President: John Fry (Ardent Recording, Memphis), Chairman of the Board: Guy Costa (Operations Vice President, The Gordy Company, Los Angeles)

• **Trident Audio Developments, Ltd.** of London, England, have entered into an agreement with **Digital Creations** of Plainview, New York in which Trident will use Digital Creations' moving fader automation system in all of their consoles requiring fader automation. All newly ordered Trident automated consoles will feature the moving fader automation, or it may be retrofitted to any existing Trident console.

WHAT YOU DO WITH THE M-600 MIXER IS YOUR BUSINESS.

That's why we've designed it to meet or exceed your most demanding requirements. And made it the easiest, most flexible professional mixing console you'll ever work with.

The M-600 is modular. Which means you can custom configure the console to *your* audio or video production needs. The M-600 lets you choose up to 32 input channels, or you can start with 16 or 24 input channels and expand the board as your needs change. Optional stereo modules can also be added to provide even more line inputs for MIDI instruments and video production convenience.

Installation and wiring is exceptionally easy. The M-600 is the only modular mixer that's available with all the necessary finished cables and installation hardware. And that can eliminate a lot of installation hassles and expense. At the same time, no other mixer at its price gives you multi-pin, computer-type connectors for quieter, more secure connections.

But the real pleasures of the M-600 will only be evident after it's in your studio. Up to 64 stereo or 128 mono inputs can be accessed directly from the top panel. A patch bay can be added for fast, flexible routing. That's convenience.

The M-600 has all the features you'd expect in a professional mixing console. Like balanced insert patch points on all inputs, PFM busses as well as the stereo master buss for increased signal processing capability. Plus sweep-type parametric EQ, balanced inputs and outputs, phantom power, talkback/slate channel and all the audio performance you'll ever need. Without the exorbitant price you don't need.

So check out the M-600 modular mixing console. It's ready for fame when you are.

TASCAM

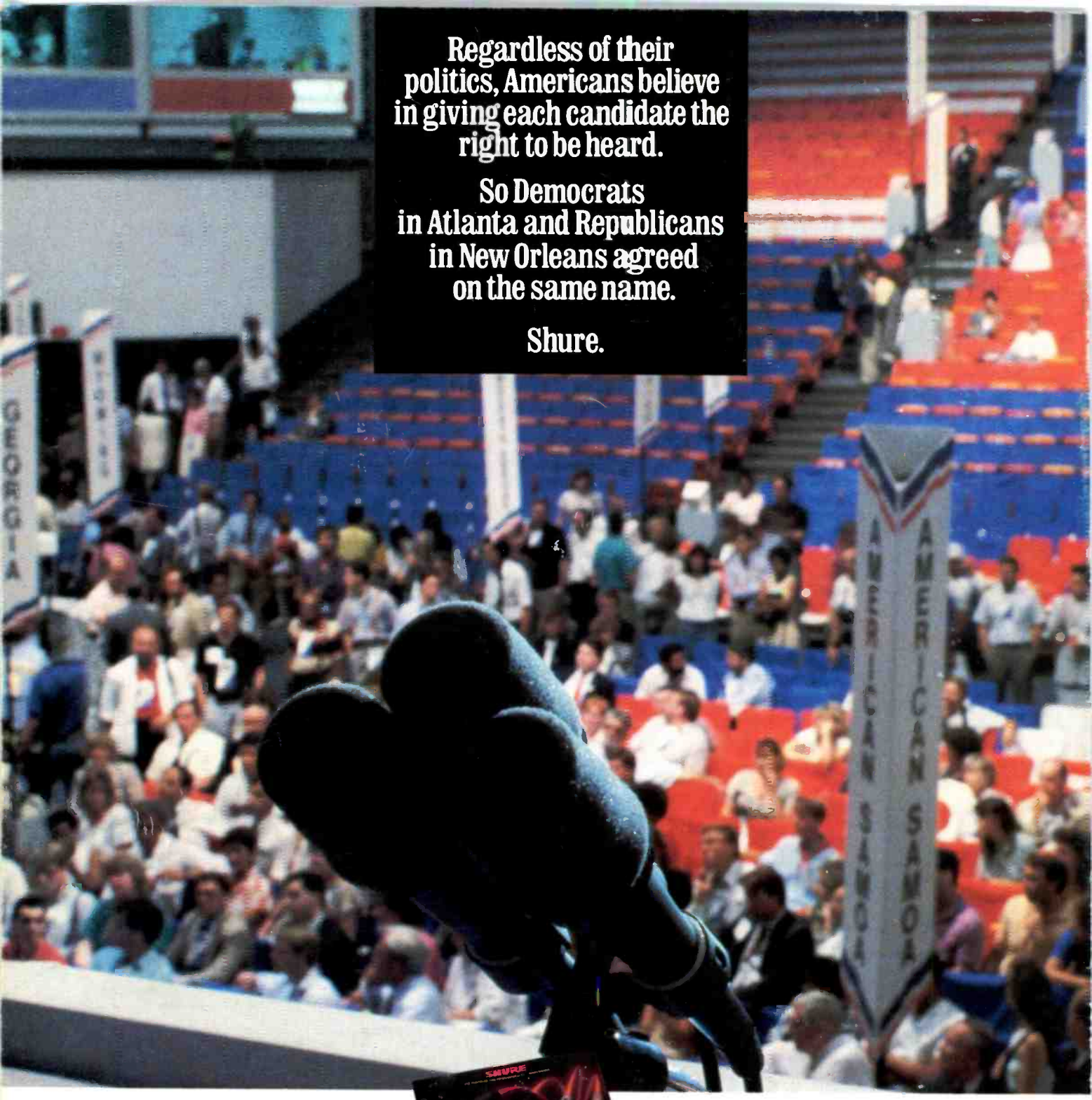

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Photo: SM57 Microphones at 1988 Democratic Convention.

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