RECORDING ENGINEER/PRODUCER

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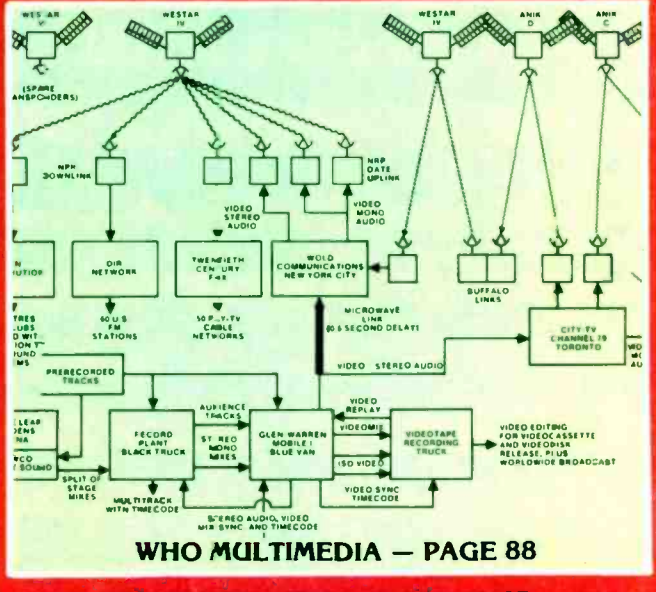
STUDIO DESIGN AND CONSTRUCTION IN A PROBLEM ENVIRONMENT — PAGE 74

STYX ON TOUR — PAGE 30



WHO MULTIMEDIA — PAGE 88

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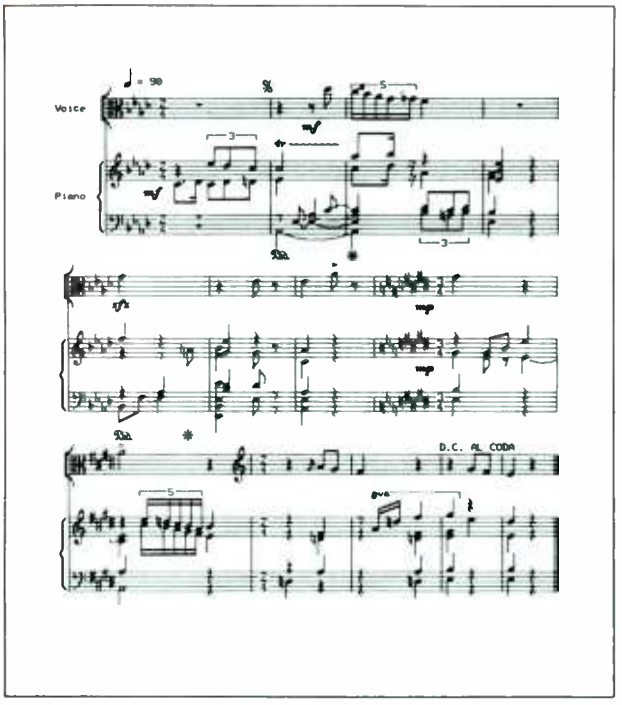

Actual Music Printing Sample, Reduced

For additional information circle #2

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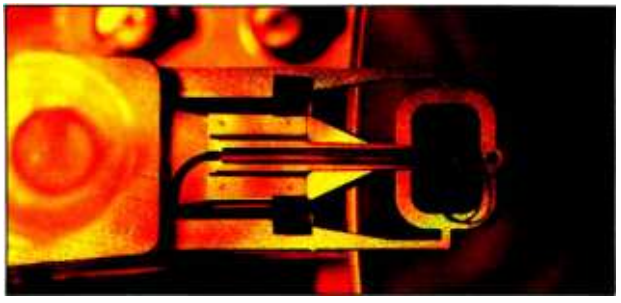

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— the magazine produced to relate recording **ART** . . . to recording **SCIENCE** . . . to recording **EQUIPMENT.**

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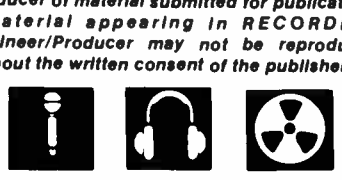

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June 1983
Volume 14 — Number 3

— Contents —

Production Viewpoint —
Three decades in the recording industry . . . sessions with Barbra Streisand, Neil Young, Steely Dan, Bill Evans, Claus Ogerman — **AL SCHMITT** . . . winner of a 1983 Grammy Award for co-production and engineering on *Toto IV* album
by Robert Carr *page 26*

Studio Practice —
A SYSTEMATIC APPROACH TO THE DESIGN AND OUTFITTING OF A STUDIO MAINTENANCE SHOP
by Roman Olearczuk *page 40*

Concert Sound —
AUDIO ANALYSTS' CONCERT SOUND FOR THE STYX "KILROY WAS HERE" TOUR Including Turbosound Speaker Cabinets and Soundcraft Series Four Consoles
by David Scheirman *page 50*

Creativity in the Studio —
AN ENGINEER'S GUIDE TO MUSIC Understanding the Basic Syntax of a Session by Following Music Scores and Charts
by Jimmy Stewart *page 64*

Studio Design and Construction —
BABY 'O RECORDERS — A Second-Floor Studio Complex with its Own Particular Sound Isolation Problems
by Larry Blake *page 74*

Audio/Video Marriage —
THE WHO'S NORTH AMERICAN FAREWELL CONCERT, TORONTO — A Multimedia Extravaganza Combining High-Quality Audio and Video Distribution for FM Broadcast, Theatrical Presentation, and Cable Television
by Paul D. Lehrman *page 88*

Technology Perspective —
THE GRATEFUL DEAD — A Continuous Development of Concert Sound Design for Twenty Years
by David Gans *page 98*

Live-Performance Sound —
NOTRE DAME COLLEGIATE JAZZ FESTIVAL Overcoming Unfavorable Acoustics to Provide Complex Sound Mixing and Monitoring Facilities
page 104

— Departments —

☐ **Letters** — *page 12* ☐ **News** — *page 12* ☐ **Exposing Audio Mythology:** Laying to Rest Some of the Pro-Audio Industry's More Obvious "Old Wives Tales," *by John Roberts — page 14* ☐ **Industry Inventiveness in The Eighties:** Diversification and Specialization — A Profile of Synthesizer Player and Studio Owner, Bruce Lowe, *by James Riordan — page 21* ☐ **Studio Update** — *page 82* ☐ **On The Studio Trail** — At The Plant, Sausalito. *by Mel Lambert — page 86* ☐ **New Products** — *page 112* ☐ **Classified** — *page 127* ☐ **Advertiser's Index** — *page 130*

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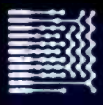

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For additional information circle #4

views letters news

AUDIO MYTHOLOGY

from: **Don Hobson,**
engineering manager
KJQY-FM
San Diego, CA

I enjoyed John Roberts' article in the April issue of *R-e/p* ["Exposing Audio Mythology," page 21], and look forward to future discussions.

On the subject of absolute polarity: I have had mixed results with the experiments I have conducted. I would agree that when care is taken throughout all the recording and reproduction steps, that the effect is audible. However, one area where absolute polarity is important, and which should be of interest, is when an announcer (or vocalist) is hearing his or her own voice on headphones at the same time it is being broadcast or recorded.

If the headphone polarity is reversed in relationship to the microphone, the voice sounds like you are talking in a barrel with a very "phasey" sound quality. This effect is noticed only in real time. Play back the same voice through the headphones, and it is difficult to tell a difference one way or another.

Certain radio stations which have "all-pass" polarity scrambling networks in their audio processing have had to resort to some sort of direct microphone audio to the headphones, in order for the announcer to understand himself. All other material can be monitored off the air as normal.

John Roberts replies:

Thank you for your input; I was not aware of the phenomenon. I suspect that the problem is related to the parallel signal paths (conduction through the head, and microphone/headphones), since delay and phase shifts in parallel paths can cause the described symptoms. I would like to hear of others' experiences in this situation.

M79 REPAIR UPDATE

from: **Rich Houston**
Rohnert Park, CA

I recently re-read the December 1980 *R-e/p* article on modifying the 3M M79 recorder prior to performing a "transformer-ectomy" on a local studio's 24-track machine. One problem appeared that readers may be interested to note. By including the suggested 5 kohm resistor in series with the input [to "mimic" the 10 dB voltage gain loss caused by the input transformers, and also increase the input impedance to 7.5 kohm], an apparent RC effect was created in our particular case. High-frequency response began to roll off around 3 kHz, and was down 4 dB at 10 kHz. After removing the resistor, HF response was restored. It should also be noted that the jumpers that replace the input transformer should be installed in a criss-cross fashion on the PC board.

One final comment: if you modify all channels on the machine first and *then* test the result, you'll find your spare parts inventory increasing dramatically.

news

NEW STUDIO ASSOCIATION FORMED IN TEXAS

In reflecting the continued growth of the audio production industry in the region, a new alliance, known as the Professional Audio Recording Association of Dallas/Ft. Worth (PARA), has organized some 90% of the area's major recording studios, and many related facilities.

The purpose of PARA is to foster mutual understanding and support among members through the exchange of ideas, experiences, and knowledge; to present the organization as one that represents standards of excellence to both its clients and industry peers; and to present the organization to the business community and the public at large as a creditable member of the communications industry.

Newly elected officers include:

- President: Paul A. Christensen, president of Omega Audio & Productions, Inc., Dallas.
- Vice-President: Jim Hodges, president, Buffalo Sound, Ft. Worth.
- Secretary: Norma Swafford, co-owner, Edenwood Recording Studios, Dallas.
- Treasurer: Les Studdard, general manager, January Sound Studios, Dallas.

Recently PARA participated in a teleconference with the Society of Professional Audio Recording Studios. The New York, Atlanta, and Miami chapters of SPARS were linked with the Dallas chapter of PARA to discuss the subject of Audio for Video.

PARA plans to sponsor four seminars during the year, featuring prominant speakers on revelant industry subjects. In addition, the Association is cooperating with other area associations, including the Dallas Communication Council (DCC), The Texas Association of Film and Tape Professionals (FAFTP) and The Texas Music Association (TMA), the Dallas Producers Association (DPA), and the Audio Engineering Society.

For membership information contact PARA, Les Studdard, membership chairman, 3341 Towerwood, Dallas, TX 75234. (214) 243-3735.

. . . NEWS continues on page 122 —


FIRST, AGAIN.
The pioneers of 24 track recording make the best even better.
Less than ten years ago, MCI introduced a radical new concept that made other multi-track recorders obsolete. The design was based on a totally servo controlled transport, all new and all D.C. And it made the pioneers of 24 track recording the most imitated designers of professional tape recorders in the industry.
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EXPOSING AUDIO MYTHOLOGY

Laying to Rest . . . or at least exposing the false premises upon which they are based . . . some of the Pro-Audio Industry's more obvious "Old Wives Tales"

by John Roberts

In the first part of this issue's column on digital audio, I would like to look at some of the design parameters for digital technology, and try to explain how they are decided. While there will not be a single set of correct solutions to the digital dilemma, there will be different optimum compromises for different applications. In part two, I'll be considering the "new" RIAA replay EQ curve; more on that later.

THE DIGITAL TRADEOFFS

If there's a myth to puncture about Digital Audio, it would be that digital often is considered to be a "no compromise system." Since an analog waveform is quantitized along the amplitude axis, and sampled along the time axis, the *only* time the digital output will *exactly* equal the analog input is for a very large number of bits, and an infinite sampling rate. What we actually get when reconstructing an analog waveform from digital data is a smoothed stair step approximation of the original; the fineness of those stair steps determines how close the digital reproduction comes to the real thing.

Compromise #1: The number of bits. It could be argued that analog signals are not really continuous, but rather the combined effect of a very large number of discrete electrons flowing through a circuit. If, from basic physics theory, a one-ampere current flow equals 6.24×10^{18} electrons per second, then 1 milliamp for 20 microseconds (equivalent to a 50 kHz sampling rate) will represent the flow of 1.25×10^{11} electrons. To describe that with single-electron resolution would require a digital word 37 bits long! If instead we choose the dynamic range of human hearing to define the absolute, we end up with a somewhat saner word length of 20 bits (which represents 120 dB, since each additional bit increases the available dynamic range by 6 dB).

While there is not much debate that 20 bits is more than enough (2^{20} quantums; 1.048 million discrete levels), there is little agreement as to the acceptable *minimum* number of bits. I'm sure every designer would love to spec in a 20-bit parameter for digital systems; however, he'd soon be looking for another job! First of all, the state-of-the-art in audio speed analog-to-digital converters isn't anywhere near 20 bits; and if it could be done it would probably cost an arm and *two* legs.

So what we end up with is a price/performance tradeoff. How many bits can we afford? And will anybody buy it at that price? For that reason "consumer" manufacturers have been pushing for 14-bit standards (84 dB dynamic range), while the professionals have settled on 16-bit (96 dB theoretical) as the present SOTA. Note: There is a lot of less than 16-bit "pro" equipment out there, most with some form of companion noise reduction. (The problems encountered of which has noise reduction will be the subject of another column). The bit levels we have to work with are dictated by cost considerations. If XYZ, Inc., were to come out with a $2.25 18-bit analog-to-digital converter there would be a stampede. But for now we must make do with 14-and 16-bit systems.

Compromise #2: Sampling Frequency. To a lesser degree, sampling

frequency also is driven by cost considerations, although not quite as hard. Once again there is no debate that sampling at 100 kHz would be wonderful. However, it would take twice as much memory (or tape, or whatever) to store the same signal as a system using a 50 kHz sampling rate. Although the price of memory has come down quite a bit during recent times (thanks to the blossoming market for personal computers), it is still a factor in low-cost digital products. After all, how would you like your "long-playing" digital wacker to only play for five minutes? There are other factors influencing the choice of a sampling frequency standard, including A/D conversion speed, and compatability with existing high-bandwidth storage mediums, such as videocassette.

Thanks to information theory we can define an absolute lower limit for the sampling frequency: "You must take at least two samples per cycle to recover a given frequency component." As will be well-known to *R-e/p* readers, this relationship is known as the Nyquist Theorem, and simply predicts a sampling frequency of two times the highest frequency of interest. The sampling frequency question is further complicated, however, by a phenomenon known as "aliasing." Signals that happen to be more than one half the sampling frequency don't just disappear; instead they beat against the sampling frequency, and pop up as some new frequency. (For example, a 20 kHz signal in a system sampled at 32 kHz would reappear as a 12 kHz "phantom" signal.) While this may be interesting perhaps for some special effects, it's not too musical.

And this leads into our third compromise, which is so closely linked to the second that we should call it *Compromise #2½: Anti-aliasing filters.* To avoid contaminating the signal with those nasty "aliases," we must filter the incoming signal sharply above the bandwidth of interest. Since real-world filters don't roll-off like the proverbial brick wall, we must allow a guard band between the passband and Nyquist limit (half the sampling frequency). To achieve the maximum bandwidth for a given sampling rate, or to get the minimum sampling rate for a given bandwidth, the anti-aliasing filters must be *very* steep, and usually are realized by cascading multiple-pole filter sections.

Because it is impossible to "stop band" filter a signal without causing phase shift and other effects in the passband, these anti-alias filters can have a significant effect on the final result. I suspect the major audible difference between today's better digital systems is related to the design of these filters. (See reference #2 for further comment on the audibility of anti-aliasing filters.) It should also be noted that the signal must pass through another lowpass filter after the D/A, to smooth out the stair steps into a continuous waveform. Phase and amplitude errors produced by this filter will add to those of the anti-alias filters.

Higher sampling rates enable simpler anti-aliasing filters for two reasons. Firstly, the significant audio bandwidth stops somewhere around 20 kHz, allowing a wider guard band between passband and Nyquist limit (as sampling rates are pushed above 40 kHz). In other words, the wider the guard band, the milder the roll-off needed for a given attenuation. Secondly, the higher the Nyquist limit the less natural energy there is to filter out. If the sampling frequency was high enough, there wouldn't even need to be anti-alias filters (except perhaps to keep out high-frequency garbage like bias or multiplex noise).

Well, I hope I have adequately defined the questions faced by today's digital designer: how many bits, how many samples, and how much filtering? Now I would like to hear your comments as to how well digital is working, or not working, for you in the practical reality of a recording or production studio.

There is another interesting method for digitizing signals, called Delta Modulation. Instead of quanitizing an

amplitude sample to 12 or 16 bits 45 thousand times a second — as with traditional PCM techniques — Delta Modulation digitizes the difference between the input signal and an internally generated approximation to one bit (that's right, *one* bit), at sampling rates on the order of 800 kHz. [For a full description of the various forms of Delta Modulation, see Richard De Freitas' guest editorial, "Delta Modulation —Fact from Fiction," published in the February 1983 issue — *Ed.*]

While it is a little difficult to try and compare Delta Modulation with PCM techniques, it is interesting to note that because of its high sampling rates, the former does not suffer from the typical Nyquist-related problems. As usual you don't get something for nothing, however. In certain designs, because of sampling-rate limitations, Delta Modulation can suffer from a poor high-frequency headroom characteristic (slope overload), and an undesirable quantization spectrum. (dbx has made some interesting improvements to the state of Delta Modulation; see reference #3).

While it is possible to process and operate on a Delta Modulated signal in the digital domain, it becomes much more complicated because of the analog processing placed around the Delta Modulator circuit to make the resultant audio suitable for professional applications (such as companding noise reduction). This lack of easy manipulation in the digital domain possibly makes Delta Modulator designs less powerful than PCM for the studio of the future. However, it does offer great potential for today's self-contained equipment (analog-in/ analog-out).

Reading for Extra Credit

1. "The Digital Recording Science," by Daniel Gravereaux; *R-e/p* December 1980, page 44.
2. "Time Correction of Anti-Aliasing Filters Used in Digital Audio Systems," by John Meyer; AES Preprint #1911 (E-7).
3. "The dbx Model 700 Digital Audio Processor; Design Parameters and Systems Implementation," by Robert W. Adams; *R-e/p* October 1982, page 150.

* * *

THE "NEW" RIAA PLAYBACK EQUALIZATION CURVE

I have noticed from manufacturers' advertising (mostly relating to broadcast phono pre-amps) that there seems to be a serious misunderstanding about the actual RIAA playback equalization standard. While the RIAA specs the playback EQ as three time constants (75, 318, and 3,180 microseconds) from 20 Hz to 20 kHz, several manufacturers have added a fourth time constant of 7.95 milliseconds (-3 dB at 20 Hz). A broadcast consultant's newsletter even went as far as to publish this new "supposedly" RIAA spec with values to 0.1 dB all the way down to 2 Hz!

This was indeed news to the RIAA, since it hasn't changed the specification in years. What these manufacturers and that unlucky newsletter have latched on to is an IEC (International Electro technical Commission) bulletin issued in late '77 or '78, proposing a 7.95 millisecond, playback-only rolloff. For whatever reason, the RIAA declined this proposed change and restated its original three time constants over a 20 Hz to 20 kHz range (as specified in Bulletin E-1, dated November 1978). Prior to 1978 the RIAA curve was only specified from 30 Hz to 15 kHz.

Since the RIAA doesn't spec (or care about) the response below 20 Hz, the only conflict between the two curves is at 20 Hz and the octave or two above.

Why the Fuss?

From my experience with phono preamplifier design, I can readily appreciate the logic of the IEC proposal. After the oil price shocks of the early Seventies, the decline in record-pressing quality seemed to accelerate, with truly flat records becoming the exception to the rule. Add to this the availability of higher compliance phono cartridges, wide-range speaker systems, and DC-coupled power amps (for all that DC music), and you've got potential prob-

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For additional information circle #12

lems down in the infrasonic end of the frequency range.

On a properly set up turntable, the tonearm/cartridge mechanical resonance will fall within the 8 to 10 Hz range, with warp energy peaking in the 2 to 5 Hz region. Since most single-stage preamps rely upon a blocking capacitor to reduce DC offset errors (Figure 1), this is an ideal place to roll off the gain. There is a problem with doing that, however, since it is virtually impossible to ensure a flat response at 20 Hz, and have any usable attenuation down at the 5 Hz region where warp energy becomes problematic. To incorporate the IEC pole the RC network in Figure 1 must be tuned for 7.95 milliseconds (-3 dB at 20 Hz) and, presto, you've got 12 dB of attenuation at 5 Hz (but at the cost of being down 1 dB at 40 Hz; -3 dB at 20 Hz).

How Does It Sound?

Since I am able to switch between RIAA and IEC replay EQ on my reference pre-amp (there being an additional -12 dB per octave roll-off filter below 10 Hz) I have been able to monitor and compare many commercial pressings with both equalizations.

On most records the IEC position sounds better. On the few classical and even fewer pop rock that have any extreme low-bass information the IEC

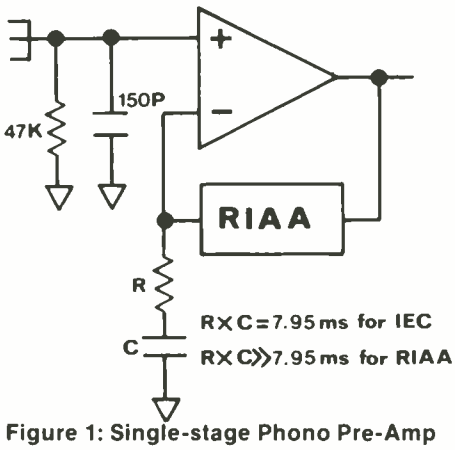

Figure 1: Single-stage Phono Pre-Amp

position sounds "tighter," however slightly diminished.

Since I have made such a stink in the past about using vague words to describe sound quality (see my column in the April issue on Audio Terminology), let me try to define what I mean by "tighter" bass. Tight bass, and it's opposite terms "flabby" or "sloppy," is a function of the attack and decay of low-frequency sounds. For example, a tight bass sound would have a quick attack and a quick decay, while the sloppy bass may overshoot or lag on attack, and tend to overhang or decay too slowly.

While a simple one-pole roll-off filter shouldn't affect the dynamics of a signal, my listening room is a classic case of having too much power in too small of a room. With the turntable only three feet from one of the speakers, I expect the IEC pole was supressing some low-level acoustic feedback. Which tells me two things: first, the IEC pole can be useful in some real-world applications; and, secondly, I should put my listening room in order.

While it would be wonderful for the RIAA to adopt the 7.95 millisecond time constant as a record/playback characteristic, it is not likely to happen. The errors introduced by using the 7.95 millisecond constant as a single-ended roll off (as proposed by the IEC) appear to be acceptable, and are probably preferable in mid-fi and some professional applications (like discotheques, where high SPL and acoustic feedback could be problematical). As elegant as the 7.95 millisecond rolloff may be for the mass market, it just doesn't cut it for reference pre-amps. After all, you can't be RIAA ±0.1 dB, and -3 dB at 20 Hz at the same time!

As usual I invite other opinions on this matter; write me care of the *R-e/p* office.

Incidentally, you can determine which equalization curve your pre-amp is designed for by using an oscillator and a wideband AC voltmeter. Apply a very low-level 1 kHz signal to the pre-amp input. (The signal will be on the order of a few millivolts, so use a -40 dB pad if you have one.) Adjust the input level until you read -10 dB (ref: 0.7746

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For additional information circle #14

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For additional information circle #15

volts) at the pre-amp output (245 millivolts AC). Now change the oscillator frequency from 1 kHz to 20 Hz without changing the oscillator level. You will now read a much larger voltage at the pre-amp output. A level of +9.3 dB, or 2.25 VAC, will indicate true RIAA response, while an output of +6.3 dB, or 1.6 VAC will indicate IEC response. (The accompanying table provides comparisons for frequencies between 2 Hz and 20 kHz.)

COMPARISON OF IEC AND RIAA REPLAY EQ CURVES

Frequency	IEC	RIAA
20 kHz	-19.6	-19.60
16 kHz	-17.7	-17.70
8 kHz	-11.9	-11.91
4 kHz	-6.6	6.64
2 kHz	-2.6	-2.61
1 kHz	0.00	0.00
400 Hz	+3.8	+3.81
200 Hz	+8.2	+8.22
100 Hz	+12.9	+13.11
50 Hz	+16.3	+16.96
30 Hz	—	+18.61
31.5 Hz	+17.0	—
20 Hz	+16.3	+19.30
10 Hz	+12.8	*
5 Hz	+7.6	*
2 Hz	-0.2	*

***Note: the RIAA curve is not defined below 20 Hz.**

If you measure something higher or lower than these two figures, it's probably a good idea to check some of the other frequencies to the RIAA EQ table. If your pre-amp is more than a small fraction of a dB from the specification between, say, 200 Hz to 10 kHz, you should tweak it up, or ship it out.

A word of caution: Many meters are not sufficiently accurate to a small fraction of a dB, especially when switching between ranges. If enough *R-e/p* readers are interested, I'll offer a circuit for an inverse RIAA network that will simplify such measurements. (The circuit attenuates and pre-amphasizes the signal from the oscillator to look like it was coming from a record.)

INDUSTRY INVENTIVENESS IN THE EIGHTIES

— A Profile of Synthesizer Player and Studio Owner, BRUCE LOWE

by James Riordan

All of us are aware of the many changes currently happening within the record industry. Without becoming too immersed with the myriad of different views regarding the causes and solutions to the contemporary slump in record sales, I think most of us can agree on at least two major points. The first is that as an industry, we grew too fast; and the second is that the current market conditions are forcing new, and more substantial, practices within our business. In short, the recording industry is growing up. The industry, of course, will survive and grow both in sales and good business sense, but what of the individuals caught by this sudden burst of adolescent awkwardness? How are they surviving the transition?

Necessity, it is often said, is the mother of invention, and the key to survival in today's record industry is inventiveness. The purpose of this new column is to examine the background of individuals who have rolled with the changes and continued to prosper, in the hope that a lot can be learnt from their experiences. However, this column is not going to focus on the recognized leaders of the industry because, in most cases, they are too well shielded to feel the necessity that produces the invention. Instead, I intend to throw a spotlight on several career professionals who, *R-e/p* feels, have applied a new approach, or discovered a more precise direction to use their talents. I would like to encourage those of you who feel you have something unique to share through this column to write me, care of the magazine, with a brief description of your experiences and ideas.

Many of these short articles will dis-

INDUSTRY INVENTIVENESS

cuss two of the best known methods for coping with economic upheaval: Diversification, and Specialization. Put simply, diversification can be explained in terms of concentrating on new and additional directions for one's talent to produce earning power, while specialization often is referred to in terms of concentrating on a specific talent, or area of career interest. The former generally increases income by providing more opportunities to work, and the latter by increasing one's fee for the same type of work because of your additional expertise. Specialization in the recording industry also can mean additional work opportunities by cutting down on one's competition; i.e., becoming an expert in a particular area, so that you are only competing for jobs with a very few others. A good example of diversificaiton would be the case of a recording studio that gears up to do commercials and film sound post-production, to make up for less album recording revenue. An example of specialization would be the recording studio that purchases some advanced SMPTE timecode equipment, in order to handle some of the more difficult audio/video synchronization work that the majority of studios currently are unable to attempt.

While diversification and specialization seem to be at opposite ends of the spectrum, in regards to a method of approaching one's career occasionally they can work together. The subject of this first column, electronic music specialist and multi-keyboardist Bruce Lowe, illustrates the application of both methods with a respectable degree of success. Most of these profiles will be with individuals who are either a master of diversification, or a master of specialization. From all appearences, Lowe seems to be a master of both.

Bruce Lowe started out playing keyboards and guitar in his native Ohio, and eventually concentrated on piano at Ohio State University. Working his way through college at a music store he became exposed to synthesizers for the first time, an instrument that would later result in his working with Stevie Wonder, Andre Crouch, The Commodores, Michael Jackson, and many others.

"The synthesizer opened up a whole new range of possibilities in the way that I approached my career," he recalls. "It gave me new freedoms in that I soon learned that I could duplicate other instrument sounds with my synthesizer. I no longer had to put up with the difficulty of getting players together, because I had an orchestra at my fingertips."

Diversification

Seizing upon this freedom as a method of developing faster, Lowe threw himself into two areas simultaneously: synthesizers, and home studios. Building up the quality of his home recording equipment, and improving his technique in procedures such as track bouncing, allowed him to lay down enough synthesizer tracks to duplicate an entire musical ensemble. This required that he learn synthesizer programming in depth, and here we come to his first area of specialization.

BRUCE LOWE

"I had gone from taking electronic music classes to teaching them, but there was so much to learn about programming, and very few places to learn it at the time," he concedes. "A real break for me in this area came when I became one of only six people chosen to

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work with Alan R. Pearlman, the founder of ARP Electronics Corp. They offered an intensive training course in Boston, where everyone shared programming ideas and patches. We learned how to interface various keyboards and new devices for an entire month, and they paid for everything."

Becoming an expert in synthesizer programming paid off handsomely for Lowe. After graduating from Ohio State, he relocated to the Los Angeles area, and before long wound up working with Stevie Wonder. "He was looking for someone to program his synthesizers, do special effects, and computer programming for his album, *The Secret Life of Plants*. Usually we worked together six days a week. He wanted certain sounds, and I would try to program them."

By concentrating on his craft Lowe had become a recognized expert in a relatively short time. His specialization produced results, but when the music industry began tightening its belt, Lowe learned to diversify his talents into other areas.

"As a programmer I can do sounds for video games, pinball games, and a whole variety of film sound effects," he offers. "Most of the 'laser shots,' trains, planes, helicopters, and gunfire effects that you hear in films are done with synthesizers. You can also do sounds like leaves rustling, or footsteps in a tunnel. You can also digitally record a natural sound, and store it into a computer memory to play back through your synthesizer. If I was going to do something like a bumble bee, I would store the sound and then play it back on the keyboard, resulting in the bumble bee actually singing in time and in pitch!"

Synthesizer programmers who also play the instrument are even paid double scale for studio work: one scale as a player, and the other as a programmer. Performing live opens up more opportunities and as an accomplished keyboardist Lowe performs regularly with artists such as Andre Crouch. "We had three keyboard players with Andre. One was an acoustic piano player, and one played a Rhodes and a Hammond Organ. I played all the synthesizers. My job was to learn all the synthesizer and orchestral arrangements from Andre's albums so that I could reproduce them live."

Currently, Lowe has in his collection of synthesizers an Oberheim OB-8 4-and 8-voice Modular System, a pair of ARP 2600s, Oberheim Digital Sequencer and DMX Drum Machine, ARP Axxe, Mellotron, and ARP Pro-Soloist. An Apple II+ computer can be used to link the various keyboards and sequencers.

Demo Sessions

Lowe's considerable attention to home-recording techniques also has led to substantial income as a producer and studio owner. "I've been producing demos for about seven years. I kept upgrading my recording equipment with good outboard gear and better mixing consoles. It makes a lot of sense, especially in these times, to demo a project on four or eight tracks, even if you have to stack them so that you can get a real sense of direction when recording the master. I've done a lot of demos in my studio for songwriters and groups to get them ready for a master, besides a lot of work that is strictly geared as a demo to shop for a recording deal.

"Of course, you can't make as much money producing a demo as you can a master, but it makes for a great way to fill in those down times with a good income. Producing demos is also a good way to discover new talent that you might want to later record in a master situation."

His home studio also allows Lowe to experiment with a lot of tape effects, and record his own songs while playing most of the instruments. He uses the studio often to develop material for his band, Himalaya, which currently is recording an album project.

Control-room equipment at Lowe's demo studio includes a four-track rig (Tascam Model 5 mixer and Model 44 multitrack), and a separate eight-track system (custom 24/8 console and Otari MX-5050 MkIII). Monitoring is handled by JBL and Yamaha NS-100 speakers driven by SAE and BGW amplifiers.

. . . concluded on page 130 -

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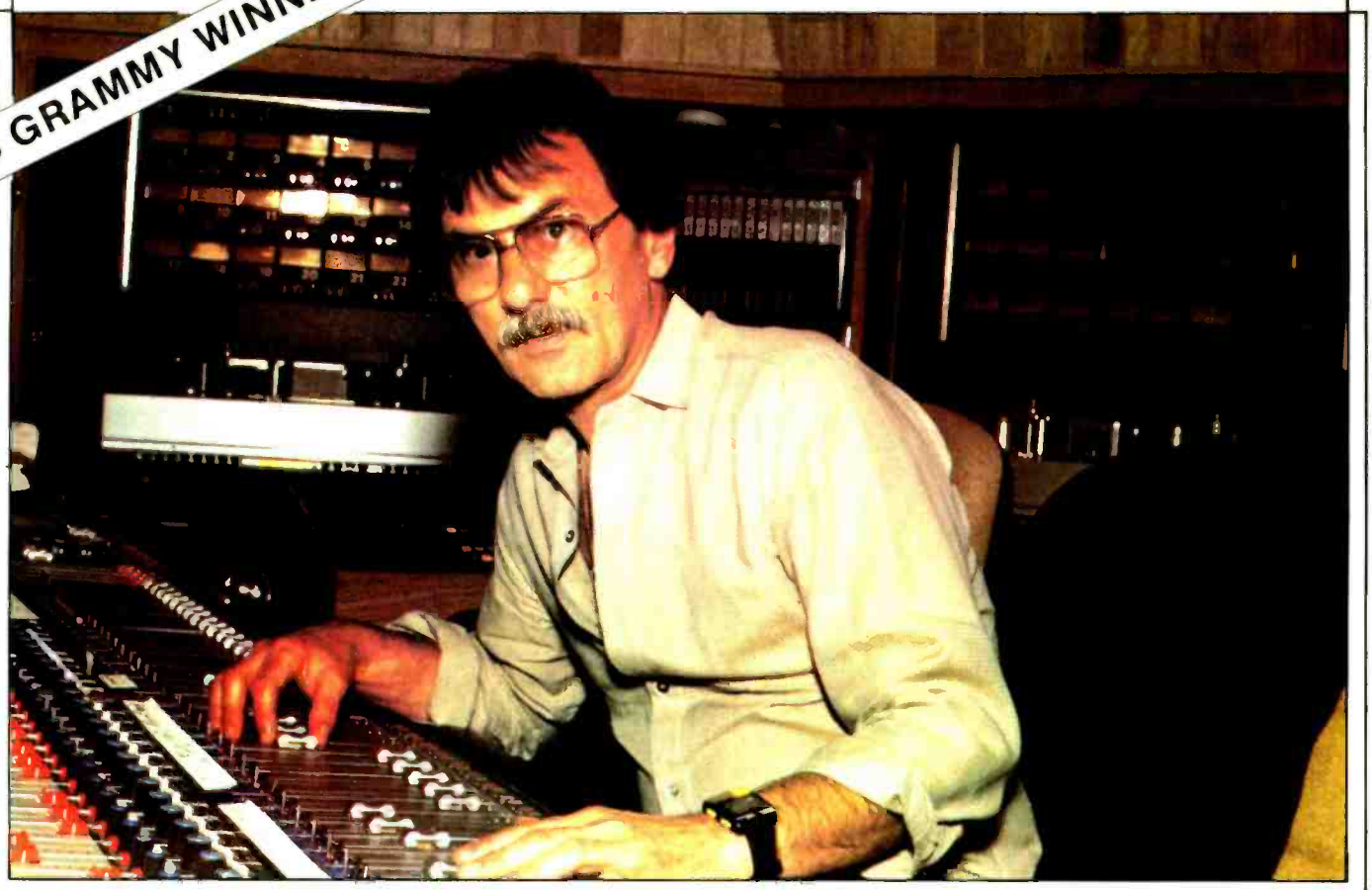

Photography by Kathy Cotter

AL SCHMITT

Interviewed by Robert Carr

In 1950, Al Schmitt started work at Apex Recording in New York City, alongside chief engineer Tom Dowd. The studio thrived on sessions for many of the top R&B groups of the Fifties — The Drifters, Clyde McPhatter, and The Clovers. But by 1958, after stints at several smaller studios in the Big Apple, Schmitt relocated to the West Coast. His first job at Radio Recorders lasted only about a year and a half (long enough to record Elvis' first post-army album *G.I. Blues*), at which time he made the jump to the new RCA Studios on Sunset and Vine in Hollywood. Schmitt won his first Grammy there for engineering duties on Henry Mancini's *Hatari* album.

Around 1964, the yen to become a producer was so strong that he took a cut in pay to work in RCA's A&R department. For five years Schmitt didn't touch a recording console, but his separation from engineering eventually came to an end. Since 1968, he's been independent, and during that time has worked with artists such as Barbra Streisand (*The Way We Were*), Neil Young (*On the Beach*), Steeley Dan (*Aja*), Bill Evans, Randy Crawford, and Al Jarreau, and has earned two additional Grammy Awards for George Benson's *Breezing* and, most recently, *Toto IV*, which he shared with co-engineers Greg Ladanyi, Tom Knox, and David Leonard. Reflecting on his colorful 33-year career seemed like the perfect place to start the interview.

R-e/p (Robert Carr): Throughout your career you've produced, engineered sessions, and worked in A&R. Are you just engineering now, or still doing projects in other capacities?

Al Schmitt: Basically I'm just engineering, but I'll do some production if it's a project I'm really into. I usually like to produce something that's different and unique, like the Jefferson Airplane, Al Jarreau, and Jackson Brown sessions. But I don't do production as much anymore.

I've found that it's awfully difficult to engineer and produce at the same time, at least for me. I tried that with Al Jarreau's fourth album [*Fly Home*], but there were just too many things to concentrate on. I'd be trying to focus on getting a sound right, and I'd miss something else. So I ended up hiring Hank Cicalo to engineer for me.

Doing both simultaneously could work, but it depends on the artist. If it's a group, and you have somebody from the group sitting in the control room with you who can be aware of the feel, or whatever, it helps a great deal. But doing both by myself is too difficult for me anymore.

R-e/p (Robert Carr): Going to the other extreme, what's it like working with Toto, where everyone in the group is the producer?

Al Schmitt: Toto is great to work with. Whoever writes the tune seems to be the one that's mostly in charge of what's going on. David Paich wrote most of the

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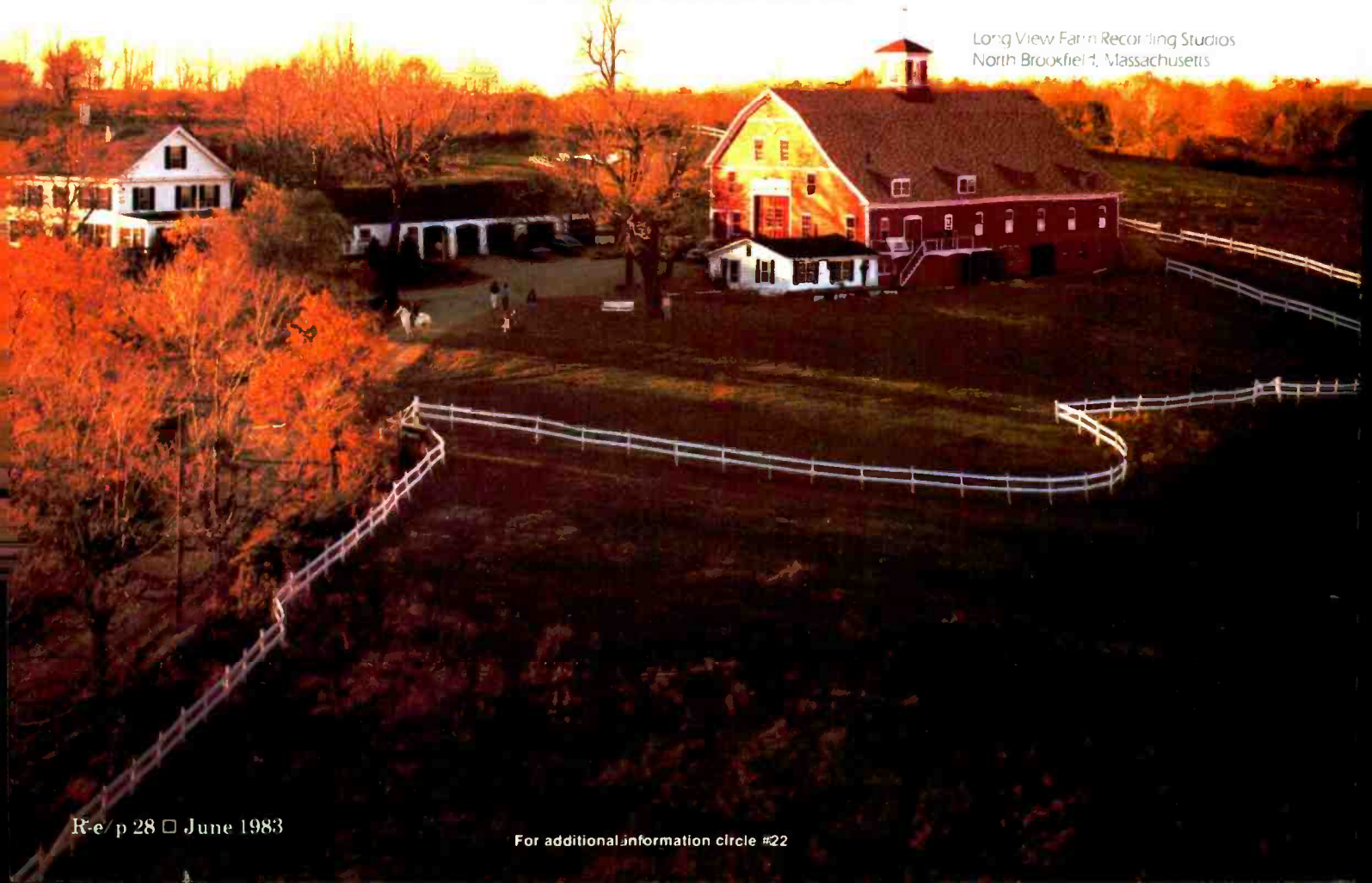

Long View Farm Recording Studios
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material on *Toto IV*, so he basically did most of the producing, along with Jeff [Porcaro]. But [guitarist Steve] Lukather had a tremendous amount of input on his own ballads. For the individual performances, like guitar solos or piano solos, it was pretty much left up to the individual player.

R-e/p (Robert Carr): Everybody monitors themselves?
Al Schmitt: Pretty much so, with input from everybody else. They're such great pros. That's another aspect to consider. Engineers who are just starting out usually work with musicians who also are just starting out. So it's tough for a young engineer to get a good drum sound on a drummer who doesn't have a good-sounding set of drums, or doesn't have them tuned right. If you can't get a good sound on Jeff Porcaro, you're in *trouble*. The same with Steve Gadd or John Robinson; any of the big session players. Once an engineer becomes established, and begins working with the better musicians, the job becomes a lot easier.

These guys play in the studio everyday — they know what their instruments *should* sound like. The first time the group runs down a tune, I'll stay in the studio, and listen so I know exactly what they sound like live. Then when I go into the control room I have a reference to work with, and it's just a matter of trying to get in the control room what I heard in the studio.

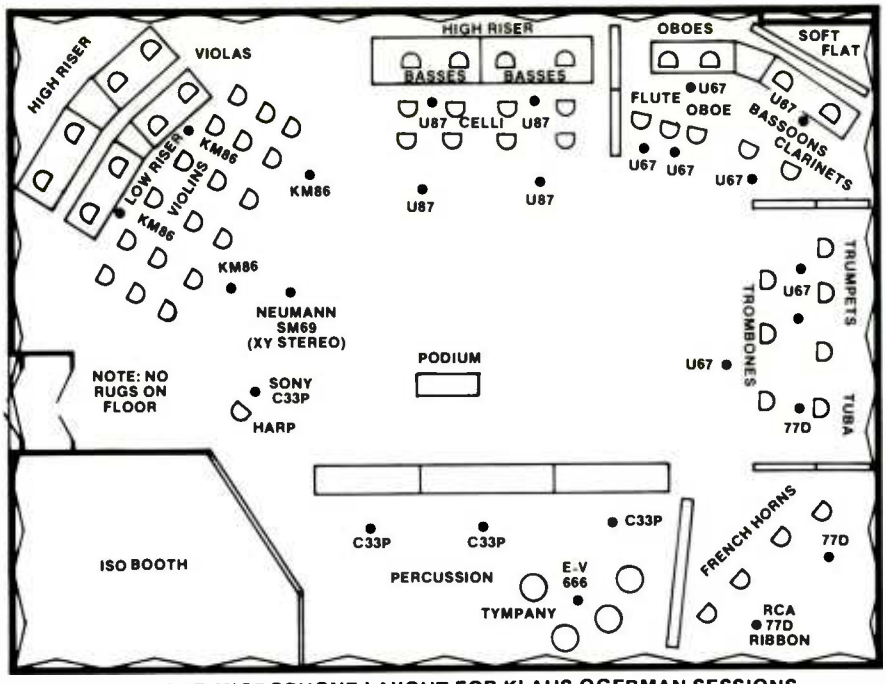
A lot of engineers have their own drum sound that goes from record to record, no matter *who* the drummer is. I don't have an "Al Schmitt drum sound." I try to capture the sound of the drummer in the studio.

Another thing: some engineers screw around for three hours trying to get a sound on something. I don't know of *any* album that's ever sold because of a drum sound. I think if the "feel" is there, *that's* what is important.

R-e/p: Do you have a technique for getting the bass guitar and kick drum sounds to blend, and still stay separate?
AS: If it sounds like they're muddying together, I'll try moving mikes on the kick, and maybe changing the EQ just a touch to get the parts to fall right. But, again, if you're working with *good* players, you usually don't have that problem. They can adjust immediately to what's happening in the earphones.

The players are your greatest allies. If you have a good rapport with the guys, they'll do almost anything you ask, especially if they know you're trying to give them a good record. But nine times out of ten, you don't have to ask; they're always looking to see if everything is alright.

Once [the musicians] trust you, and they know they don't have to worry about what's happening in the control room, there's a whole diffferent relationship between the engineer and players. The musicians can concentrate on their parts. If the drummer is worrying about the sound of his drums, it *has* to take away from the performance.



ROOM AND MICROPHONE LAYOUT FOR KLAUS OGERMAN SESSIONS AT CAPITOL STUDIOS, HOLLYWOOD. ENGINEER: AL SCHMITT

Over the years, you build up a reputation as an engineer. The musicians who have worked with me know they don't have to deal with the sound. And I always ask them if everything is alright, and whether there is something I can do to make them more comfortable. I value their opinion.

Some engineers get their sound, and don't give a damn what the musician thinks. You tend to get a little friction there. The *last* thing you want is for the musicians not to like you when you're trying to record; you've *got* to have them on your side. You are all there for the same reason — to get this record to sound good, and to get the "feeling." The musician is the guy who's going to do it for you, so you need him on your side.

R-e/p: Doesn't that tension in the studio often show up on the record?
AS: I've seen it happen; situations where the drums or bass sounds bad, and the musician, after a while, doesn't give a damn. At first, he's trying to get a good sound, but the engineer maybe can't do anything to help him, or doesn't know how to help him. Then, all of a sudden, the player doesn't care any more. He can't fight four or five hours straight trying to get the sound. If the engineer can't do it by then, he's in trouble.

I've got to tell you, as fast as you can put something down on tape and play it back for the guys — even if you *know* it's not right — they'll hear it and adjust themselves so the second take clicks into place.

R-e/p: That makes your job a lot easier, too.
AS: It sure does. I don't care who they are, nobody wants to fool around in the studio spending an hour, two hours . . . I've heard of guys spending four or five hours trying to get a drum sound. By then, it's time to go home and come back the next day. Everybody's burned out.

I try to get my sounds and balances while the band is running through the tune the first time. Then we're ready to put one on tape so they can come in and listen right away. It shouldn't take more than 20 minutes.

R-e/p: Have you done a lot of jingle work during your career? It sounds like that was a big part of your background.
AS: Yes. That was years ago, back in New York, but I haven't done jingle work in ages. When I first started making records, everything was monaural, and all the parts were done at one time. So you had to get your sounds quick. We used to complete three or four tunes in three hours. One album with Ray Charles and Betty Carter took 6½ hours. And that was with an orchestra. We'd go direct-to-mono and direct-to-two-track. At the end of the day, the producer would give me the sequence, we'd arrange the tunes in order, and the album would be finished. It was great.

The first studio I worked at didn't have a tape machine. We'd record on 16-inch transcription disks with two or three cuts on a side at 33-1/3 RPM. I had to be *extremely* careful of my levels, or during playback the needle would skip all over the place. It was great schooling, because it really helped me keep my balances and levels together. I had to blend everything at one time, so I learned quickly how to put a horn section together, or how to balance violins, violas, and celli.

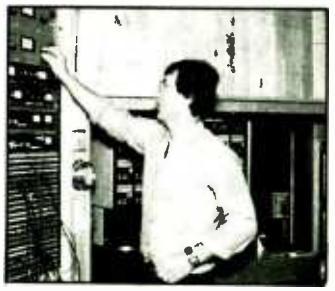
R-e/p: What is your technique for miking strings?
AS: When I do a large string section, I

RECOLLECTIONS OF JAPANESE SESSIONS

Over the last few years, trade with Japan has escalated to phenomenal proportions. While much of the flow is from East to West, in the form of cars, cameras, state-of-the-art audio and video technology, musical instruments, and a myriad of electronic gadgets and gizmos, the demand for American music in Japan remains practically insatiable.

Al Schmitt has had the opportunity to work in Japan, as well as engineer some sessions in the U.S. for distribution in that island country. The point of departure for the following conversation centered on a comparison of the two recording worlds.

"Many Japanese producers come to the United States," he offers, "primarily because they want to use the musicians and the engineers that are here. It's kind of a selling point, too. For some reason, engineers are a lot more famous in Japan than here in the States. When I was over there, I would get people coming up to me asking for my autograph, or too sign albums. One guy pushed an album toward me, and I asked him, 'Where the heck did you get this?' It was some obscure album that I'd almost forgotten about. I think they sold about 20 copies, but it was one of his favorite albums!



"I think the biggest problem in Japan at this point is experience, in terms of how to record. I just did a project for distribution in Japan, and one guy paid his own way over here just to watch me mix. What a great compliment.

"From what I understand, the Japanese spend most of their time mixing. Studio time is a *lot* more expensive for recording than it is for mixing down, so they try to get the recording done quickly. That translates into recording instruments really tight and then, in the mix, trying to get the open sound that I get from recording techniques. When I recorded there, I worked in two studios. One was really tiny, and the monitoring system was a bit strange. Luckily I had brought a reference tape with me. I knew what it was *supposed* to sound like, and was able to adjust the monitors accordingly.

"The second studio had everything — great equipment, great microphones, large rooms, and a good monitoring system. I could make some great records there. But, again, the biggest problem for the Japanese engineers is how to mike things. I'd be doing a session, and when I'd get up from the board to take a break, there must have been 20 guys there with cameras snapping pictures of the board to get the EQ settings, and everything else. They shoot the mike set-ups, measure the heights of the overhead microphones from the cymbals, and so on. They'd write all the numbers down as if that was the answer. 'Al has the mike eight feet from here, so if we put it eight feet away it's going to sound the same.' Well, the next time it could be 7½ feet, or 8½ feet — it depends on your ear. I'm sure when one of those guys did a session, he had the mikes exactly where I did, and if it didn't sound the same he probably couldn't figure out why it wouldn't work.

"I think the Japanese should send more of their engineers over here to learn our techniques. Or, better yet, hire some of the American engineers to go over there and give classes on mike techniques and mixing. That's really all they lack.

"Also the players are not as mature, which is understandable in a young industry. A drummer over there may play like [session percussionist] Steve Gadd, or be influenced by him, but probably wouldn't have his drums sounding like Gadd's. That will give the engineer trouble, too, when he's trying to get the tracks to sound right. If the tom is boomy in the studio, it's going to be boomy on the tape. Then when the drummer hears it back, he goes into the studio and spends 10 minutes hitting the drum trying to get it to sound right. I can't stand that . . . it drives me crazy. And I won't go out and help a drummer tune his drums. You can *really* dig yourself into a hole there.

"I don't want you to think it was a bad experience. I had a good time. I'm looking forward to going back again."

Turning to sessions recorded in the States for release in Japan, Schmitt recalls a recent tracking date at Sunset Sound Recorders, Hollywood, with a band called Charizma. "We had two drummers, Carlos Vega and Jeff Procaro," he remembers. "Lenny Castro on percussion, David Paich on acoustic piano, David Garfield played Rhodes, Neil Larson on organ, Dean Parks and Steve Lukather on guitars. Dean Cortez played bass, and Ernie Watts and Tom Scott saxes. One more guy played a Steinerphone, an electronic woodwind, sort of like a Lyricon. We did it all live — no overdubs; live solos. Everybody went for it. We did it in 10 minutes. The sound was *there*; it was just a matter of doing the take. We video-taped it, too. You don't get too many opportunities to do that anymore.

"Miking was conventional, with close mikes on the drums and a couple of room mikes. I had the two saxes in a booth. They were isolated, but they could see out. The Leslie for the [Hammond] B-3 was isolated in a room. Everything else was out in the main studio: acoustic piano, two drummers. Both of them used a full set, and Jeff also had Simmons [electric] toms that went direct. Rhodes and bass direct, too. Guitar amps were goboed off. Once we locked it in, it was great. When you get that caliber of musicians together, each guy stimulates the next. Everybody plays up to their full potential. And I got off on the energy, too.

open up the mikes all the way around, and get all the room [ambience] I can. I go for the leakage among the sections, so the violins aren't coming from one direction, the violas from another, and the celli from another. I want eveything to blend. Omnidirectional mikes give me that.

R-e/p: You're talking about all *the microphones being omnis, not just the room mikes?*

AS: Right. For example: Capitol [Studios, Hollywood] has about 15 [Neumann] U-67s. I put them all up for composer/conductor Claus Ogerman's recordings [for example, *Cityscape* and *Gate of Dreams — Ed.*]. Every microphone was open all the way around [omnidirectional], and up about 15 feet above the strings.

Claus has so much control over the orchestra. He'll listen to the first playback, and if he wants a little more of the violas in one section, and a little more celli in another, he won't ask me to dig for those things. He'll tell the viola section: "Listen, on this bar I want you to come out a little more." I leave everything set the same way, and that makes a *big* difference.

R-e/p: I assume that you'd record a string section the same way regardless of whether it's for an orchestral piece, or as background for a rock group?

AS: Pretty much. Unless somebody's got a certain sound they're looking for. If there's six violins and they want a really "present" sound, of course I'll bring the microphones in. That's a matter of the arranger's interpretation. Or the producer may want a certain effect. But, in general, you try to keep it the same.

R-e/p: Would you still use omnidirectional mikes if you were coming in close to the string instruments?

AS: I always do. I did a session at Sound Labs [Hollywood] with 12 violins. The ceiling is not very high, but I had two microphones about a foot below the ceiling, and open all the way around. I was amazed at how great they sounded —the concert master, and everybody else who came in the control room, had their mouth open. It's a wooden room, and we got the slap off the ceiling into the backside of the mike. I was amazed.

R-e/p: Having recorded such a diverse collection of musical styles and combinations of instruments, do you approach each session a bit differently?

AS: It's a different approach as far as the set-ups are concerned. If it's a full 40-piece orchestra, you don't want a really tight, small rhythm-section sound. You want the rhythm section to be open and airy, too. A lot of times I'll use a stereo mike on the overhead drums for a little room ambience. And depending on how I want that to blend with the rest of the orchestra . . . In other words, if I'm overdubbing a 40-piece orchestra to

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a rock, rhythm track — or any rhythm track for that matter — I want the two recordings to sound like they were done at the same time — like the drums were leaking into the strings. I don't want the strings to sound like they're coming from all over the place, and the drums to be concentrated to a particular spot. I'll keep the ambience recording on a separate track, and blend in however much I need to make the drums and strings match.

R-e/p: Going to the other extreme, let's consider the Bill Evans Trio, and the album You Must Believe in Spring, *produced by Helen Keane and Tommy LiPuma. That session didn't have a condensed sound to it, either; it was very open.*

AS: Right. I had a stereo mike on the drums about 10 or 12 feet over the kit, and one mike each on the kick and snare — just four mikes on the drums. I had three microphones about five feet from the piano, and a stereo mike about 15 feet away.

R-e/p: Were the players isolated, or spread out from each other?

AS: The players were real close. We tried to get that "trio" sound. We didn't worry about the bass or drums leaking into the piano, or piano into the drum mikes, and so on. We tried to achieve that [leakage]. Once we locked in the sounds, we recorded one tune and brought the group into the control room. After they knew what it sounded like, it was simple. I could have sat back, put my feet up on the console, and just taped it. They produced their own dynamics. The album took about four days.

Somebody like Bill [Evans] is amazing. The grand piano sounded so great when we started to record, but there were just a few of the notes that were a little louder than the others. After playing for a while, he learned which notes rang out, and would play those softer. All of a sudden the piano sounded even and balanced, where before certain notes were sticking out. Instead of trying to equalize a little more bottom from the piano, he'd play the bottom a little harder to even it out.

Those are things that most musicians don't think about doing. But when you're working with these kinds of pros, it makes the job a lot easier.

R-e/p: Didn't you have to worry about the phasing effect of all the piano microphones being so close together?

AS: You'll get some phasing, but that's natural. The leakage is what makes the record sound good. Instead of living this big, open piano sound, and a tight, little drum sound, it sounded like a *trio*. They were sitting right next to each other. The drummer could have reached out and touched Bill; that's how close they were. It *works*.

R-e/p: Eddie Gomez' bass sound on the song "Sometime Ago" from You Must Believe in Spring *was very distinctive. It was an upright bass, but the sound was so punchy, almost like an electric bass.*

AS: Gomez has a great bass sound. We had it wired with a pickup, and took it direct as well as through his amp with a mike in front of his instrument.

R-e/p: So you actually had three lines coming into the board from the upright bass?

AS: Right. I used a Neumann 47 tube on the bass itself, aimed towards the middle of the f-hole, and about a foot in front (primarily for arco passages); a direct box for the direct signal; and a Neumann U-67 about a foot away from the front of the amp. It was a small amp with not very much bass [output], so we got a lot of top-end from there.

"The players are your best allies. If you have a good rapport with the guys, they'll do anything you ask, especially if you're trying to give them a good record."

R-e/p: On several of your recordings, the bass sound just jumps out of the record. Not that it was unbalanced, but it has such a "life" to it. Like on the Claus Ogerman piece, "Time Passed Autumn," from the Gate of Dreams. *In fact, the whole album had such a smooth, natural ambience to it.*

AS: You're talking about what we did in Studio A at Capitol Records [Hollywood]. That room has such a marvelous sound, especially for strings. The room has a very even decay, and one of the greatest live echo chambers. I just love it, because it's so natural sounding. It's great on vocals, too.

R-e/p: You touched up the strings with the live echo chamber?

AS: A little. And also at Capitol, in particular, where the ceiling is so high, we put a stereo mike about 35 feet up in the air, so it would catch the ambient sound as it bounced off the ceiling.

When I have an opportunity to work in a room like that, I try to take advantage of the acoustics as much as I can.

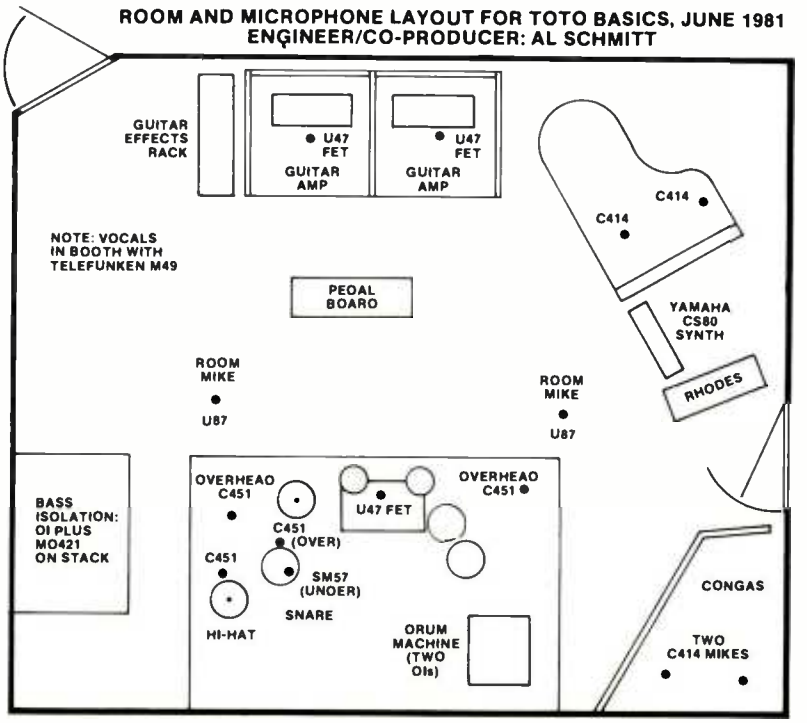
R-e/p: Well, the bass on "Time Passed Autumn" certainly has a smooth ambience sound to it.

AS: It's partly the echo chamber, and partly leakage from the other instruments. We did most of those tracks live. The player was Chuck Domanico.

R-e/p: Just one bass player? It sounded like a section.

AS: He's another guy with a big, fat sound, yet it has a punch to it that doesn't take up all the space, like a bass sometimes can. He knows what his

ROOM AND MICROPHONE LAYOUT FOR TOTO BASICS, JUNE 1981
ENGINEER/CO-PRODUCER: AL SCHMITT



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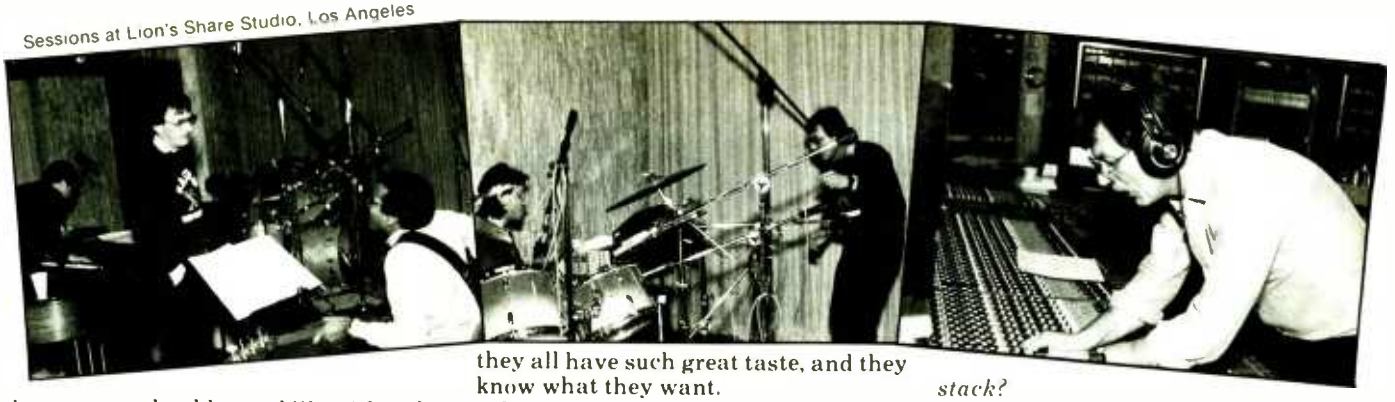


instrument should sound like. After the first playback, he automatically adjusts his playing technique. Sometimes it's just a matter of how hard he's playing, or the articulation.

R-e/p: We talked earlier about handling a big orchestra, and a small jazz trio. When you work with a group like Toto, I assume those sessions involve a lot of overdub work?

AS: Actually, we did that album [*Toto IV*] at Sunset Sound Studios [Hollywood]. All the tracks were live. We recorded drums, percussion, acoustic piano, bass, and guitar all at one time. "Rosanna" was a "second take." We did it in about an hour and 20 minutes. While they were running it down, I was getting the sounds. The band came in after the first playback, did another take, and that was it. In fact, I think we did nine tracks in seven days, although we didn't use all those nine tunes. The whole project just locked in.

R-e/p: How do you feel about the adverse publicity that talks about the Toto IV *album being so "slick?"*

AS: It doesn't bother me, because that's the sound that was there. The band was well-rehearsed. They had played together for quite a while, and *that's* the way it came out. We didn't spend time trying to get it to sound "slick." Everything just came together.

There were really no overdubs. [Bassist David] Hungate might have punched in a note or two. The leads, or some parts where [guitarist Steve] Lukather wanted to play harmony with himself, were overdubbed of course. But, basically the rhythm guitar and piano were all done live with bass, drums, and percussion.

R-e/p: How were the electric guitar tracks recorded?

AS: Lukather uses two amps in stereo. He just tweaks one amp, and then the other, until he gets exactly what he's looking for. I don't have to do much to it. Lukather and the rest of the players come in the control room and listen to their own instruments on the first playback, to make sure they're sounding right. Lukather will tell me, "Maybe a little echo here," or "Brighten it a little here." Just so we're both on the same wavelength. Very rarely do you ever get into battles with guys like this, because they all have such great taste, and they know what they want.

Sometimes I'll get players who want all bass. They tell me to turn it up, and [as a result] the rest of the tracks start to wash out. So I have to draw the line sometimes. But the members of Toto are such good studio players, I never worry about that.

We'll put most of the effects on during the mix, when there's time to play with them . . . maybe just a little echo on the track during the session, so everybody knows it's going to be there in the mix. But they all realize that it's not necessarily the same echo that's going to be on the final [mix]; it's just a guide.

R-e/p: How do you achieve so much sustain on the guitar. Is that done live in the studio, or through some outboard effects?

AS: It's pretty much live, except for a little echo we add during the solos. He basically gets that sound, and I record it. If I add 2 dB at 10 kHz, that's about it.

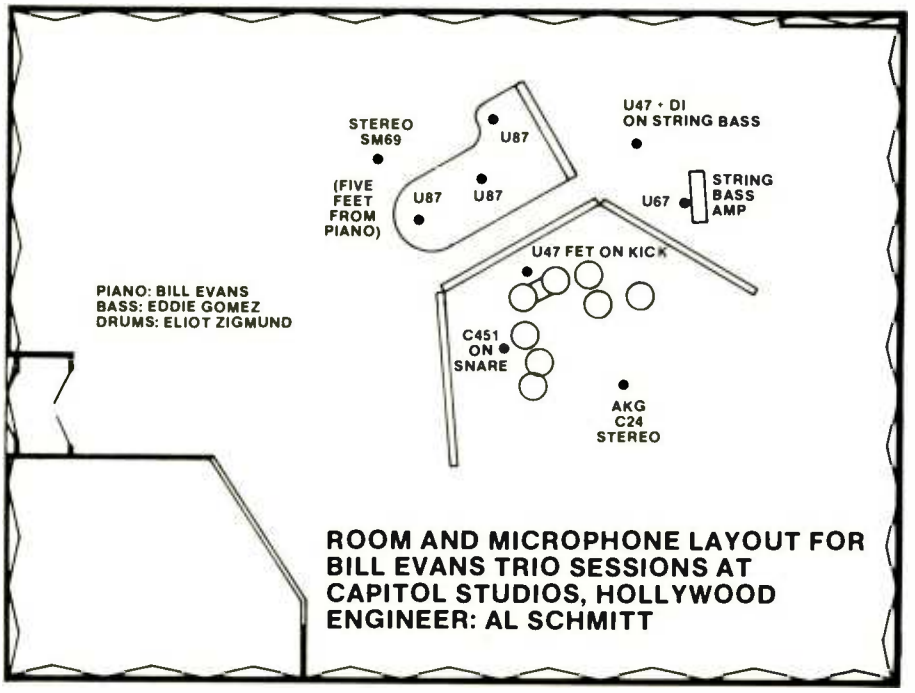
All the sound is taken right from the amps, although sometimes we'll record direct for a certain kind of sound. But that's rare. The amps vary from tune to tune, depending on what sound he wants. They may be small, or they might be Marshalls stacked up in the room.

R-e/p: How do you record the amp stack?

AS: I may put a mike [dynamic model, such as a Shure SM-57] about five feet in front of the amp, and then a second one [omnidirectional patterned Neumann U-87, AKG C451 or C452] about 30 feet back to pick up the room. When he cranks it up, I get a blend from both microphones. I don't go any closer than five feet, because there's too much power there, and the mike may fold up. I'll open the farthest mike first, and then gradually bring in the closer mike until I get the right amount of presence. The farthest microphone gives me the *big* room sound, and the closer mike adds the "punch" and definition.

When I'm doing an overdub, and am not worried about leakage coming in the back of the microphone, I like to have the distant mike open all the way around, even though the sound is only coming from the amp. That pattern tends to provide more of the slapback from the room coming in the backside of the mike, and seems to make the instruments sound bigger.

It's like the PZM concept, except better. When I was working at the Power Station in New York a few years ago, the [Crown] PZMs had just come out. We tried them on *everything*. We'd put one up everytime we'd record an instrument, in every place we could think of. We didn't waste time doing it; we'd just put



ROOM AND MICROPHONE LAYOUT FOR BILL EVANS TRIO SESSIONS AT CAPITOL STUDIOS, HOLLYWOOD ENGINEER: AL SCHMITT

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up the PZM as a spare with the regular mike, and A/B'd them while the band ran down the song.

R-e/p: Did you put them on a larger surface or backing plate, the way the manufacturer recommends?
AS: We tried everything, but they never worked for me. Some guys [mount] them on the wall behind the drummer, and they get a good sound. It just never worked for me.

I'm really a microphone freak. Anytime there's something new coming out, I love to put it up and try it. I'd like to try those new [Isomax] mikes by Countryman.

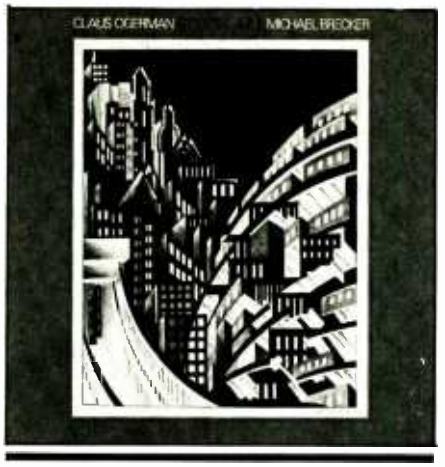
R-e/p: Before we get too far off track, what kind of mikes would you use on small guitar amps?
AS: I think I used [AKG] C451s. I try to use good, clean condensers as much as I can. Sometimes we'll use one mike on one amp, and another mike on the other. Those are run to separate tracks in stereo, of course, and placed left and right in the mix.

Which brings up an interesting point about placement in the mix. Sometimes, when you bring up the guitar, for instance, on the left side, it may not sound [correct]. But if you move it to the other side, without changing anything else, all of a sudden there's a certain clarity. Maybe something on the left was getting in the way at that point. Or taking away a certain frequency when you move it to the right gives it that clarity.

R-e/p: Is the guitar a mono source, or stereo?
AS: Could be either one. If it's stereo, you're just flipping it back and forth. If it's a mono guitar track, you're moving the guitar from one side [of the mix] to the other, or maybe just bringing the stereo in a little closer together.

R-e/p: Was the bass on those Toto sessions recorded in the same way as the guitar?
AS: The bass was recorded both through an amp, and direct. We had a Sennheiser 421 at least a foot away from the bass amp. [David] Hungate is such a marvelous player that all I had to do was bring the faders up. When we mix, I use basically the direct sound, and add a little of the amp sound just to get a bit of the room.

R-e/p: There were a lot of pops and thumbing on the bass part to "Rosanna." Did you need much limiting or compressing to combat the transients, and control the levels?
AS: No, I rarely ever use limiting on the bass. But if the guy has the levels all over the place, then sometimes I might have to add like 2 dB of compression or something, just to help it along. A lot of guys use filters on the direct bass: they'll cut off the low-end, or whatever. I rarely do. Maybe just a little equalization, like



"I try to get my sounds and balances while the band is running through the tune the first time . . . it shouldn't take more than 20 minutes."

a 2 dB boost at 3 kHz, and another 2 dB at 10 kHz.

I do the same with the kick drum: 2 dB at 10 kHz. It gives the sound a little "edge." And maybe 2 dB at 15 kHz for the vocal. You don't particularly hear it, in the sense that it changes the voice, but it seems to give the voice a little edge on top . . . some air.

R-e/p: Do you usually gobo the bass from the rest of the band?
AS: The bass was isolated, and so were the rhythm-guitar amps. The amps were in the same room as the rest of the band, but we set flats between them, and sometimes even between the stereo guitar amps, which might be only two feet apart. We'd run a gobo down the center to stop some of the leakage between them, so we'd get a little more clarity. We might put delay on one guitar amp and not the other.

The members of self-contained groups usually know what they want ahead of time. By talking to them up front, you know how to set them up. It's important, I've found, to keep the musicians *close* to each other in the studio. The music sounds better, because the musicians can hear beter, and adjust to the room.

Some engineers tend to separate the players in order to get more separation on the tracks. But guys tend to play differently, even if they have headphones on. It may be psychological, but they play louder when they are further away from each othr. By moving them closer together, they play a little softer, and you get a tighter, punchier sound.

We did the percussion live on the Toto dates, with the conga player [Lennie Castro] almost in Jeff's lap. They were right next to each other and there were no flats in between. Jeff was up on a riser about a foot-and-a-half high. When they were fooling around together without headphones, they could hear each other really well during the run-down. When they put the headphones on, they played the same. That subtlety shows up in the music. The music *breathes* better; the dynamics are better.

R-e/p: What were your choice of mikes for the piano?
AS: The microphone choices vary. I may use an [AKG] C414 on the low-end, and a C451 on top, or two 414s or two 251s; maybe something like a U-67 on the low-end, and another mike on top. It depends on the player, the piano, the style of the music. Sometimes during playback I'll go out in the studio and switch mikes quickly, because it's just not right for me. The present sound may be acceptable to the players and producer, but I'll know the sound is *still* just a bit off, and I'll go with another microphone, or move the mike just an inch one way or the other. Those minor adjustments can make all the difference in the world.

It's just a matter of experience — knowing the mikes, the players, etc. I've used a certain microphone [Sony C-500] on Jeff Porcaro's snare. He told me he wouldn't let anyone put one there, because he doesn't like them. But he never questions it when I do, because I can get a good sound with it.

R-e/p: The vocals on "Rosanna" sound really tight and clean. Did you use any outboard effects on the vocals, maybe double- or triple-track the background?
AS: As far as effects, there might have been some delay, echo, maybe DDL or Harmonizer here or there. But only enough to "perk" up the track. It's not a totally natural sound — just a little touch added to it to give it some quality, but not overwhelming.

There was some doubling. In a few cases, we'd get one chorus down, transfer it to another tape machines, and then fly it back a smidge out of sync with the first one. It gave the overall track a unique sound. Sometimes we'd fly the whole vocal section in to different parts of the song, so we wouldn't have to do the chorus over again!

R-e/p: Did you use SMPTE timecode, or some kind of sync tone?
AS: Just trial and error. We transferred the background parts to two tracks of a four-track machine, and punched it in at the right time. Actually, with a lot of help from David Leonard and David Paich, it went pretty fast.

R-e/p: How do you perceive your mix visually or aurally?
AS: It's a little bit of both. When I record drums, I set them up as though I was playing the kit, so the high-hat is always on the left, and the snare is centered a little to the left. It always bothered me to turn them around, as though I was in front of the kit. That's just the way I learned.

Mixing is like a puzzle — trying to put all the parts together in the right place so it sounds natural. Again I use very

little limiting, because I like to keep the dynamics natural. I'll use a limiter if somebody wants an effect to squash something. But, in general, I don't try to level it all out so that everything is even all the way across.

Horns are a good example. If the horns are playing loud, they should be loud, and soft parts should be soft. Too many guys make the mistake of trying to keep it even *all* the time. You lose the dynamics and the feel.

R-e/p: What mikes do you prefer for horns?

AS: I use stereo mikes. For the Toto sessions, I started with a stereo mike about 10 or 12 feet back — that's the mike I opened first to get my big room sound. Then I added the mikes on the individual sections, gradually getting my presence. There was one U-47 on the two trumpets, maybe five feet in front, and one U-47 about three or four feet in front of the one trombone. I used three U-87s on the three saxes, open all the way around so I could get some leakage back and forth. The individual sax miking gives me the definition.

R-e/p: That's interesting. Most engineers close-mike saxes with a cardioid pattern rather than omnidirectional.

AS: Right. I try to back them off a little bit. If there's two or three saxes, the alto can leak into the tenor, and vise versa. The ambience seems to open up the sound more.

Next time you're overdubbing a guitar, or something, try putting up a mike in the cardioid position. Then flip it to omnidirectional, and the difference is *amazing* — the sound just opens up. The cardioid pattern has the back blocked off. Opening up the back of the mike seems to let the sound follow *through* the mike.

Sometimes the weirdest things work for me. I learned a long time ago that the first place I go is to the exact opposite of what I normally think would work, and that's the answer.

R-e/p: On a few of your projects, you've come in half way through to do overdubs, or maybe just mix. Is there ever the chance of getting fouled up, because you have no control over what's been done before you stepped in?

AS: You can, but if you're following an exceptionally good engineer, like Lee Herschberg, who did the basics for the Yellowjackets album, or Bill Schnee, or Hank Cicalo, I know the tracks are going to sound good. Sometimes engineers work a little bit harder if they know someone else is going to be using the tracks. The sounds may be a little bit different than what you would have done taste-wise, but in those cases just a touch of equalization will put it where you want it. Usually you don't need any EQ.

R-e/p: So the track sheets you get have only the track assignments on them and no EQ settings?

AS: Right. That's pretty much left up to the next engineer. Or the producer, like Tommy LiPuma, knows what he wants. He'll tell me to bring the kick up a little; make something a little brighter, more punch, or whatever. Besides, a different room or board would change the EQ settings anyway. You really have to depend on your ears.

R-e/p: Is there a procedure you may go through to check out the tapes, or prepare for the session with a partially completed project?

AS: I always try to get to the studio early, and find out what tune they're going to work on. If someone else did the basic tracks, I put that tape up and listen to each track individually. Then I try to put together an earphone mix that will be suitable for what they're overdubbing. Plus, I get a mix for myself so I can add echo, or take things off, and get a chance to fool around with it even while they're overdubbing. It's basically learning the tracks.

Then when it comes time to do the final mix, I'll know exactly what I want to do. I make mental notes of what to pull out, what to boost when, and so on. If you're working with a dynamite producer, and it sounds good when they walk in, that's all that counts. Unless there's something they particularly want changed, they'll leave you alone. They rely on you, so you've got to be prepared. ■■■

A SYSTEMATIC APPROACH TO THE DESIGN AND PLANNING OF A STUDIO MAINTENANCE SHOP

by Roman Olearczuk

For a recording or production studio, maintenance is a lot like insurance —you hope you'll never need it, but when you do, it's good to know that you're covered! But, just like insurance, your maintenance "coverage" is only as good as the policy you adopt. With that analogy in mind, this article will present the following general considerations for planning and implementing a well-organized maintenance shop:

- Maintenance site selection
- Shop layout
- Selection of shop furniture
- Test equipment choices
- Information gathering
- Parts inventory systems
- Daily maintenance routines

These topics, to be discussed at length later in the article, will provide technical personnel and also studio management with a practical guide that can be used to improve any existing maintenance organization.

Selecting a Suitable Location

From this writer's experience at least, maintenance shop locations always seem to be an afterthought. The shop usually winds up in the last available space in the building, often crammed in with a tape library, supply depot, or along the way to some other unattractive office utility. The location and "look" of the technical workspace should reflect the attitude of the studio to today's demanding and aware clients. A top recording engineer simply will not buy the studio manager's sales pitch about "no studio down-time" if he sees a disorganized, disheveled, and poorly-equipped hole-in-the-wall shop. In addition, there is a good chance that a qualified technical engineer will make a fast exit out the back door as soon as another job offer promises him better surroundings and more money. The prudent studio owner, therefore, would be sure to reap the benefits from both satisfied clients and happy employees, once a maintenance site has been professionally chosen and pleasantly appointed.

The following suggestions are a checklist of desireable features to incorporate into a technical workspace site:

- A central shop location, preferably on the same floor level as the studios. Such a site aids in fast response and ease of equipment serviced remotely from the control room.
- Access to the shop should be through wide doorways with easy approaches to studio control rooms. Doorway thresholds should be flat, and there should be no stips between all service areas.
- A Minimum "comfortable" shop area, for one or two people, should be approximately 144 square feet (possibly a 12-by 12-foot room shell without any furniture). By the time a bench, desk, cabinets, and other equipment are added, this room size is on the *verge* of giving a technician claustrophobia. Add an additional minimum space of 100 square feet for each additional employee (over two) working in the room at the same time.
- The room also should be well lit and well ventilated. The walls ahd floor should be light colored, which can be extremely helpful when small parts are lost. Also, a flat floor covering helps when heavy tape machines have to be moved about.
- The maintenance site should *not* be an accessway to tape libraries, restrooms, and other parts of the building. Constant interruption by wandering clients and office personnel will only hamper repair time during any critical down-time situations. If the room has to be shared, consider partitioning the undesirable area away from the shop space.
- If needed to protect shop equipment inventory, consider controlling the shop entrance with a self-closing door and combination lock (electronic or mechanical). Such security still provides a fast access, yet is quite useful during those hectic sessions where there is a lot of studio traffic present.

Shop Layout and Furniture

Once a location has been chosen, a preliminary layout of the shop can be done to explore alternate furniture placements. A simple overhead scale drawing of the floor plan showing the wall boundaries and entrances of the room can be drawn on grid paper, and placed underneath a plastic sheet. Next, scale pieces of the proposed furniture (i.e., desk, bench, shelves, etc.) can be drawn on an adhesive-backed paper, such as Scotch Post-It note pads, and then cut and placed on to the plastic sheet. In this way a variety of room plans can be tried until the ideal furniture setting is found. This exercise, for example, can lead to the conclusion that maybe a bigger room is needed, or perhaps custom shelving may be a requirement in order to maximize existing wall space. In any event, a little time spent with these paper renditions of shop furniture will provide you with the best solution for your own individual shop requirements, with the least amount of time and money spent.

The main focal point of the maintenance shop is undoubtedly the lab bench. Depending on budget, a bench can vary from an inexpensive garage workshop type, similar to the ones stocked at Sears, for example, to custom, heavy-duty professional units generally produced for the aerospace industry. (Table 1 provides a reference listing of some of the better-know manufacturers of lab benches.)

The following features should be considered when a bench is initially specified:

- Typical dimensions for a one- to two-man basic bench are: 8 foot long, by 3 feet deep, by 3 feet high (counter top to floor). These dimensions provide the bench with wide versatility. For example, a 36-inch height is especially convenient whenever quick repairs are done while standing.
- An overhead test instrument shelf is a highly-desirable feature for any main-

TABLE 1: A SAMPLING OF LAB BENCH MANUFACTURERS

Advance Engineering
18255 S. Hoover Street
Gardena, CA 90248
(213) 321-3100

Formica Metal Products
Dept. 405
225 Corporation Way
Medford, MA 02155
(617) 395-5656

Line-Master Products
14507 S. Hawthorne Blvd.
Lawndale, CA 90260
(213) 772-5255

Production Industries
12880 Pierce Street
Pacoima, CA 91331
(213) 896-0555

Sturdilite Scientific Furniture
100 Acorn Street
Plainwell, MI 49080
(616) 685-6400

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You can produce eleven C-60 cassette tapes in less than two minutes!

EASY AUTOMATED OPERATION

The 6120 practically runs itself. The system features automatic end-of-tape stop and auto recue on the reel master, and a choice of manual or auto rewind on the cassette master, providing virtually uninterrupted operation. Changes in equalization are made automatically when you change speeds on the reel master, thereby reducing setup time and avoiding errors.

EXPANDABLE

The modular, building block concept lets you buy just what you need today and expand the system to meet your growing needs tomorrow. Modules simply plug together. There's no need to add people or space as the system grows, because the 6120 is so compact that even a full system can be operated by one person.

QUALITY TRADITION

For over 20 years now, Telex has been the choice of those who are fussy about the quality of their duplicate tapes. The brand new 6120 is made in the U.S.A. in the Telex tradition of quality, so parts and service are always available. To learn more about the 6120, write today for complete specifications and production capabilities. While you're at it, make an appointment to see our special 6120 video tape presentation entitled "Beating Real Time".

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Boston, MA 02118

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Title

Company/Organization

Address

City State Zip

Best time to contact

Phone No.

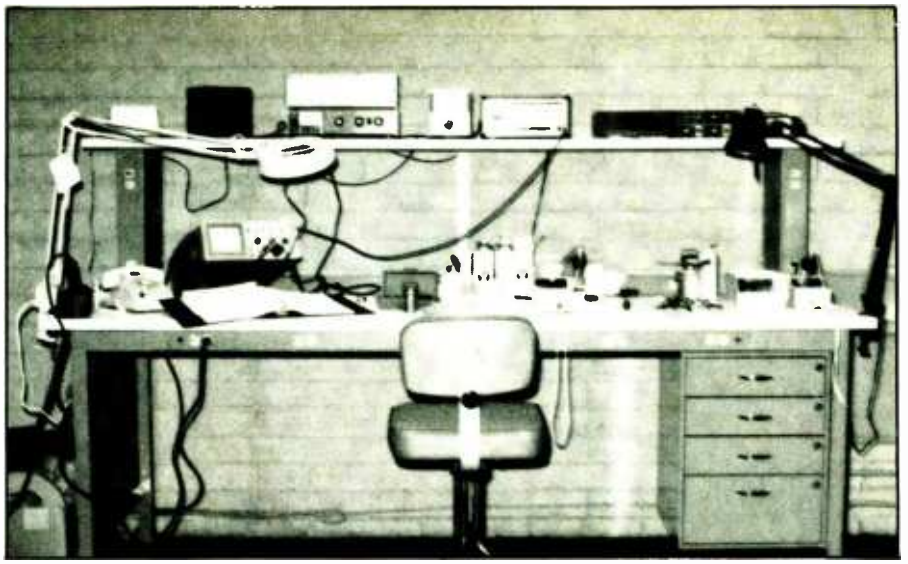
tenance shop. The extra shelf aids in keeping test equipment out of the way of units under repair, yet provides easy reach for the user. Usually the shelf is 14 to 20 inches above the counter top, and 14 to 18 inches deep. The added depth also will accommodate a larger range of test gear.

• The counter top should be made of a one-piece, smooth and mark-resistant material, also in a light color; Formica, as an example, is seamless, and popular for this application. Some bench manufacturers even provide counter tops in a static-free configuration. This extra feature is quite useful in protecting sensitve MOS circuitry when printed-circuit boards are being repaired.

• Provide plenty of AC outlets! Benches can be specified with a variety of power strips that are even controlled by a convenient single on/off switch. Circuits usually come in 15A configurations, but heavy-duty 20A currents also are available. Even though these ideas seem extravagant, once all the pieces of test equipment and electronic tools are plugged in, you always wish that there were just a few more outlets.

• Provide comfortable and adjustable bench stools that can be altered for height and back support. These stools usually get a work-out in such a busy environment, and only industrial-quality chairs should be considered.

Next on the shopping list is shelving. Some thought should be given to the extent of all possible present and future storage requirements in this newly-organized shop. In addition to storage of used equipment, outboard gear, and miscellaneous hardware, reserve space for "Repaired," "Needs Repair," "Needs Parts," and "Projects" shelves. The "Needs Repair" shelf would be a temporary storage area for reported malfunctioning equipment in order of individual repair priority. The "Needs Parts" shelf aids in storage of disassembled gear that is diagnosed, but not completed due to a part shortage. The "Projects" shelf will keep long-term updates and additions to studio equipment better organized during periods of incompletion.



Photography by DAVE MARQUETTE

Workshop bench and overhead test-equipment shelf at Soundcastle Studios, Hollywood, showing neat and uncluttered layout, with room for possible expansion to handle increased work load.

Generally, there is quite a variety of shelving available throughout the country, so no special mention will be made here of any specific manufacturers. However, there are a few features that are *musts*. Purchase shelving that is built strong, deep, and fully adjustable. The last requirement especially gives you the flexibility to facilitate all your changing storage needs of the future.

Another useful shop organizer is a supply of parts bins; Table 2 lists a sample of some of the better-known manufacturers. Usually these bins are made of either paper or plastic. As an extra feature, some of the plastic bins come with divider slots for use in partitioning. A simple location system, once all the parts have been divided among the boxes, is to label the bins alphabetically and numerically in a grid-like fashion. XLR connectors would be noted, for example, by the label D5. By counting down alphabetically to "D" and numerically across to "5" on the bin shelves, you can find the desired box quickly.

An alphabetized directory of organized parts with their labels can be typed, enclosed in a protective sheet of plastic, and hung near the parts bins for easy reference. This method works well for large bins that are stored on metal shelves. For small parts bins, since they are usually enclosed in individual carrying cases, the most common method is a sequential numerical label with a master list as a directory. These cases then can be added as small parts inventory increases, and new higher numbers assigned for each new drawer addition.

To keep screws, nuts and all other types of metal fittings arranged, consider using inexpensive, capped wide-mouthed plastic bottles, available from local pharmaceutical supply houses, to contain all the individual hardware. Labels can be easily fastened to the bottles, including the original packaging label part numbers. This technique will aid personnel in quickly restocking popular items. These bottles, of course, can then be kept neatly in the newly-organized parts bins.

To organize cables and test leads, the well-equipped shop should have plenty of cable holders. Even though commercial units are available, perhaps a local carpenter can be commissioned to construct a row of custom cable hangers. Wooden dowels, a half-inch in diameter, positioned two inches apart at a slight

TABLE 2: A SAMPLING OF PARTS BIN MANUFACTURERS

Akro-Mils
1293 S. Main Street
Akron, OH 44301
(216) 253-5593

International Instrumentation
31131-602 Via Colinas
Westlake Village, CA 91362
(213) 991-9614

Lyon Metal Products
47 Railroad Avenue
Aurora, IL 60507
(312) 892-8941

Techni-Tool, Inc.
5 Apollo Road
Plymouth Meeting, PA 19462
(215) 825-4990

Zero Corporation
777 Front Street
Burbank, CA 91503
(213) 846-4191

TABLE 3: A SAMPLING OF TEST EQUIPMENT MANUFACTURERS

B&K Precision Group
6460 W. Cortland Avenue
Chicago, IL 60638
(312) 889-8870

John Fluke Manufacturing Co.
Box C9090
Everett, WA 98206
(206) 356-5400

Hewlett-Packard
3000 Hanover Street
Palo Alto, CA 94394
(415) 857-4101

Leader Instruments Corp.
380 Oser Avenue
Hauppaguge, NY 11788
(516) 822-9300

Sound Technology
1400 Dell Avenue
Campbell, CA 95008
(408) 378-6540

Tektronix, Inc.
Box 1700
Beaverton, OR 97075
(800) 547-1512

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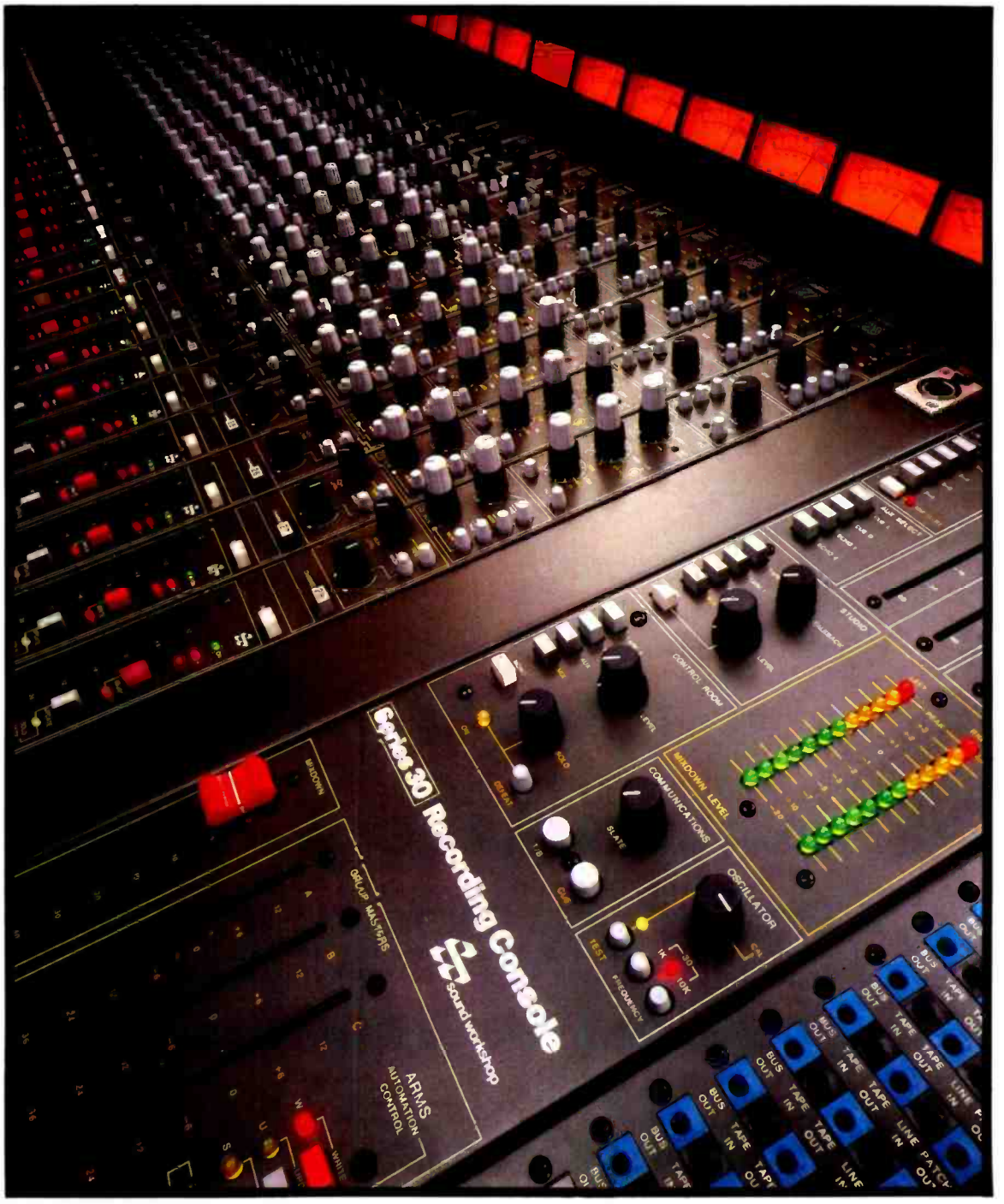
should be judged on the basis of performance, not price. Sophisticated and functional design and proven reliability at realistic prices are the basic factors that distinguish Sound Workshop consoles.



Sound Workshop Professional Audio Products, Inc.
1324 Motor Parkway, Hauppauge, New York 11788 (516) 582-6210 Telex 649230

sound workshop

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Our warmest congratulations to Al Jarreau, Dawnbreaker, Garden Rake, and to all of the other fine recording professionals who've earned the Golden Reel Award.

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Storage shelves for equipment currently under fault diagnosis and repair, or awaiting replacement parts.

A useful collection of parts storage bins.

angle on a two- by four-inch length of wood provide excellent results. As can be seen from Figure 1, space has been left above each dowel for identification by adhesive labels. Larger dowels can be used, as expected, for larger cables. Each two- by four-inch piece can be conveniently mounted and removed from any blank wall spaces. Large bundles of cables can be kept tied with versatile Velcro straps (available from: Velcro, USA, Inc., 521 Fifth Avenue, New York, NY 10175. (212) 953-0900.). This company manufactures two unique new products: the Nylon Back Strap Fastener (great for cable ties), and the Nylon Velstrap Fastener. The minimum OEM order, from regional offices, is 100 pieces, and the product comes in a wide variety of lengths, widths, and colors.

Test Equipment

As the complexity of studio equipment increases, so does the need for service through the use of sophisticated test equipment. The days of repair with only VOM in hand are long gone. No maintenance shop should be without the following basic test gear:

- **Oscilloscope:** preferably dual-trace with no less than a 15 MHz bandwidth; 35 MHz or higher is preferred.
- **Frequency Counter:** should cover at least the audio range (20 Hz to 20 kHz).
- **Digital Multimeter:** should measure DC, AC and resistance; new units have frequency counters, continuity checks, and decibel scales.
- **Small VOM:** still comes in handy!
- **Audio Oscillator:** low distortion over the audio range; a high output is preferred.
- **Simple Logic Probe:** for troubleshooting TTL and CMOS circuits [see October 1982 issue of *R-e/p* for a full rundown on the use of logic probes —*Ed.*].

TABLE 4: TEST EQUIPMENT RENTAL COMPANIES

Continental Resources
175 Middlesex Turnpike
Bedford, MA 01730
(617) 275-0850

Electro-Rents
4131 Vanowen Place
Burbank, CA91505
(213) 849-5791

Gen Star Rental Electronics
6307 De Soto Avenue
Woodland Hills, CA 91367
(213) 887-4000

U.S. Instrument Rentals
2988 Campus Drive
San Mateo, CA 94403
(415) 572-6600

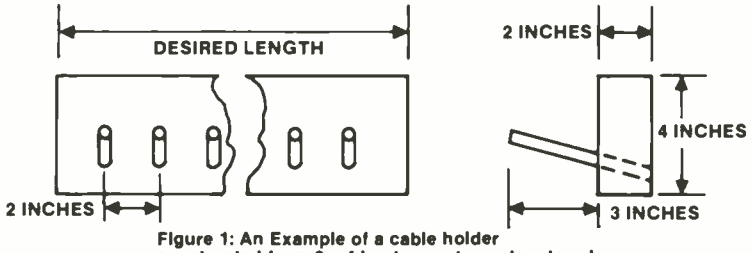


Figure 1: An Example of a cable holder constructed from 2 × 4 lumber and wooden dowels.

Beyond these basic units, the sophisticated shop can be equipped, depending on your needs, with a great variety of test equipment, ranging from pulse generators to tape test systems. It can become as state-of-the-art as you may want to get! However, the next few points should be kept in mind when determining what to purchase for the shop. Buy equipment from reputable and well-recognized manufacturers. There is plenty of variety, within everyone's budget, provided for by even the best of brands. As an alternative cost savings, consider purchasing used test equipment that was demonstration or reconditioned models from the manufacturers, or former rental units from test equipment rental firms. (Tables 3 and 4 provide a listing of the better-known companies). In either case, you'll get a better choice in a well-maintained, less expensive unit with a solid company reputation behind it, rather than a lower cost, unknown brand that may be dropped once the company realizes the product doesn't sell well.

Access to Information

One of the important concepts behind an efficient maintenance organization is availability of instant information. In order for information retrieval to be instant, it must be gathered and then organized for fingertip access. There are a number of periodicals (listed in Table 5) that deal specifically with the electronics world. All the major periodicals produce annual product guides that cross-reference a huge amount of part manufacturers (from company representatives to local distributors). Forms are available from the publishers for complimentary subscriptions to qualified readers. All these magazines have reader service cards for product information retrieval, which will help build a technical library quickly.

The EEM annual catalogs also offer a feature that is a *must* for file organization, since the company prints a master file system with a complete product index that is numerically cross-referenced. Files can be cataloged by using the supplied pressure-sensitive labels on your own third-cut file folders. This product index saves numerous hours normally needed to catalog information.

Semiconductor data catalogs, which

TABLE 5: A SAMPLE OF ELECTRONICS INDUSTRY PUBLICATIONS

EDN
270 St. Paul Street
Denver, CO 80206
(303) 388-4511

Electronic Design
50 Essex Street
Rochelle Park, NJ 07662
(201) 843-0550
(Annual Product Guide: *Gold Book*)

Electronic Products
Hearst Business Communications, Inc.
645 Stewart Avenue
Garden City, NY 11530
(516) 222-2500
(Annual Product Guide: *EEM — Electronic Engineers Master*)

Electronics
McGraw-Hill, Inc.
1221 Avenue of the Americas
New York, NY 10020
(212) 997-3469
(Annual Product Guide: *Electronic Buyer's Guide*)

Now **you control** how much better you'll sound!

Wait until you hear how good you sound with a new Audio-Technica AT831 picking up your guitar, mandolin, violin, or other acoustic instrument. And, if you think all ultra-miniature mikes are about alike, read on.

The AT831 is a *cardioid* (directional pickup) microphone. Which means it picks up more of *you* and less of the stage noise around you. It also means better feedback control, even when you're playing *ppp*. It's a more intimate sound, well balanced and smooth with just enough presence to clarify without harshness. And the sound stays constant no matter how or where you move.

There's a major bonus only with the AT831. Want a "fatter," fuller sound? Just slide it closer to the strings on its adjustable mount. Want a "leaner" sound? Simply slide the AT831 further away. The felt-covered slip-on mount holds with gentle pressure, so there's nothing to mar the finish of your instrument.

Or you can use the traditional "tie clasp" mount to put the AT831 almost anywhere you can imagine (even on a *tie*, if you're into that)! And with eight feet of super-flexible cable between microphone and battery module, your freedom to move is assured.

Better sound and more convenience. . .just what you've come to expect from Audio-Technica. Find out more at your nearest dealer or write for our latest catalog. Your audience will love you for it!

New AT831 *Directional* ultra-miniature electret microphone with adjustable slip-on mount. Under $120.

audio-technica.

AUDIO-TECHNICA U.S., INC., 1221 Commerce Dr., Stow, OH 44224 216/686-2600

For additional information circle #3

used to be available free for the asking, can be obtained from local semiconductor representatives at a nominal printing cost. If you have some salemanship in you, perhaps a studio tour to an interested field sales engineer can even get you a free set of data catalogs! Data catalogs are a great help, since they provide internal circuit details, and cross-reference information to other semiconductor brands. With this information on hand, part inventory systems can be implemented much more easily.

Parts Inventory

In order to provide 100% coverage, the maintenance shop should stock every spare printed-circuit card and part that is used in each of the major pieces of studio equipment. This action, although costly, does provide the ultimate in preparedness for the eventual down-time situations. Usually a compromise is in order, however. A good approach is to analyze the critical pieces of equipment, and the consequences of a failure on separate PCBs. Also, consider the situation of what would happen if the studio does not own a spare replacement for the failed card: how long the actual repair will take (assuming the studio has stocked the part, and a technician is on duty); and how much time will be credited as down-time (including the sticky issue of idle union scale musicians' costs).

When viewed in this light, some critical one-of-a-kind circuit boards actually will pay for themselves in down-time savings after a few maintenance incidents. A discusion with your local technical equipment representative will pinpoint the problem areas for which additional circuit cards would be a wise idea.

If the manufacturer does not supply a spare component kit with the equipment purchase — or if it is available at an additional cost — let's consider a logical method of analyzing individual component coverage. Table 6 presents parameters used by the military when making statistical averages of failure rate versus hours of use for equipment in service. As an exercise, take a circuit board and count all the individual ICs, transistors, capacitors, resistors, diodes, solder joints, and other listed components, and multiply each quantity by the related failure rates. The total will give you a mean time between failure (MTBF) percentage for 1,000 hours of use. How many hours before a failure occurs? Simple divide 1,000 hours by the MTBF (in percent). Now, if you have 24 of these particular cards, divide the total by 24, which will give you an estimate as to the number of hours before a failure rate occurs on any one card.

TABLE 6: FAILURE RATES FOR MILITARY APPLICATIONS

Component	Failure Rate (% Per 1,000 hours)
1. Capacitor	0.02
2. Connector contact	0.005
3. Diode	0.013
4. Integrated circuits, SSI, MSI, and LSI	0.015
5. Quartz crystal	0.05
6. Resistor	0.002
7. Soldered joint	0.0002
8. Transformer	0.5
9. Transistor	0.04
10. Variable resistor	0.01
11. Wire-wrapped joint	0.00002

A word of caution: this exercise only deals with reliability in *military* applications. Industrial circuitry, as a rule, is not designed with the same kind of stress limits, so these failure rate numbers would be greater than indicated on the chart. Also, the MTBF rates do not take into account the quality of circuit design. Obviously, poorly etched circuit traces, on environmentally warm circuit boards, will lead to greater failure occurrences, especially after defective parts have been replaced and resoldered. In addition, components exhibit different failure rates over time.

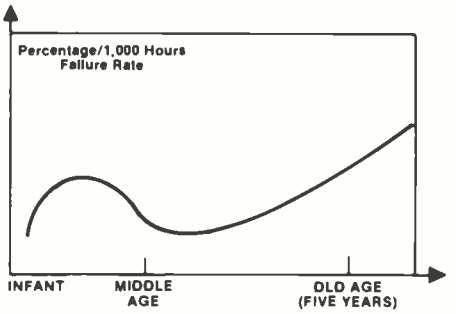
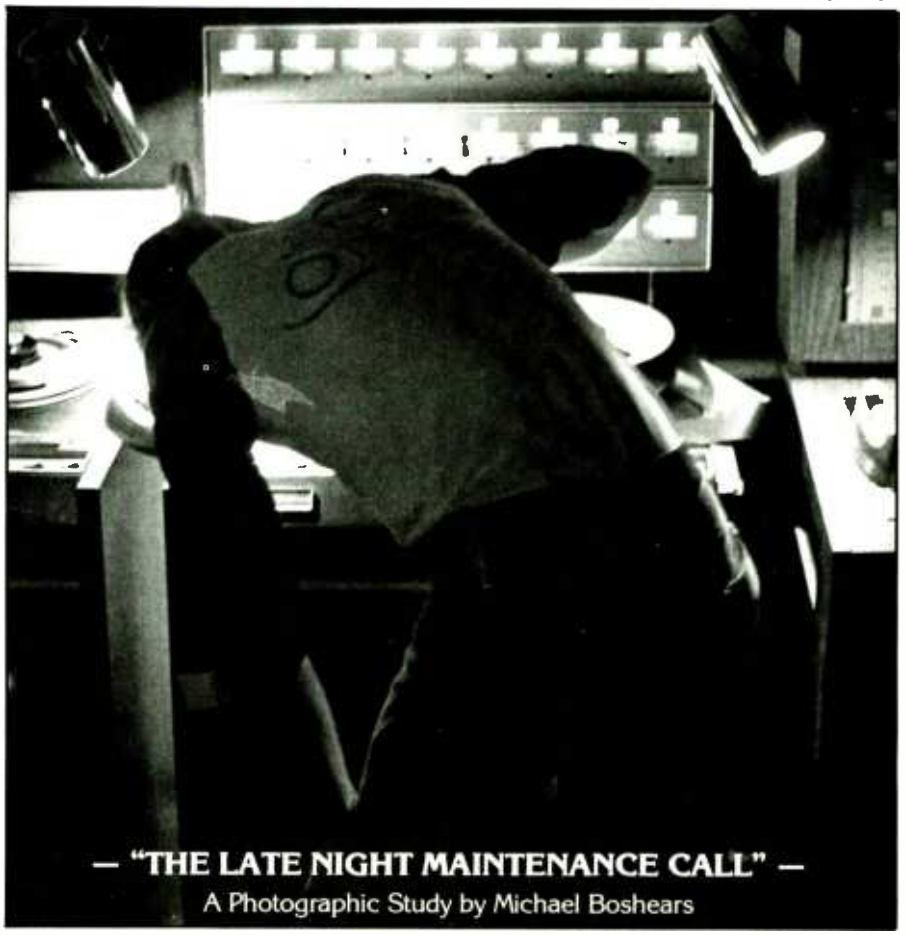


Figure 2: Failure Rate versus Component Age.

Figure 2 shows a gross average representation of failure rate versus component life. As shown, components usually fail at a higher rate when they are either new or old. If your good-quality equipment is new, and has been burned in by the manufacturer (which is not always the case), it should perform well in a hospitable environment for a number of years before things start acting up. If your equipment is more than five years old, you can count on component failures occurring much more frequently than has been previously noticed. The best maintenance policy,



then, is preparedness for this eventual component failure.

An analysis of component use can be made by keeping a running total of actual parts found in a circuit, and their re-occurrence in other circuits. A spare component count of one can be assigned for each increment of five re-occurring components. For example, a quantity of one to five of 7474 TTL dual-D flip-flops would be assigned a one spare IC, while a quantity of 20 to 25 4116-16K RAMS would be assigned five spare ICs. This is just a starting point. Actual frequency of spare component use will dictate future spare component purchases. In this way, all critical circuits can be checked and a small parts inventory will have been properly established.

Maintenance Routines

Once all these steps have been completed, daily maintenance routines can now be efficiently introduced. The main concept here is *communication.* The engineers, studio manager, and maintenance personnel have to work closely together to satisfy the client's needs. For example, the maintenance department should know the technical requirements of incoming sessions, as well as their correct starting and, if possible, ending times. In turn, the studio manager should know the status of all equipment out of service. This type of dialog aids greatly in minimizing embarrassing down-time incidents.

As an aid to equipment repair, all malfunctioning equipment is reported on a form generally known as a trouble report. Figure 3 shows an example of a well-designed trouble report that is currently in use at Sound Castle Studios in Los Angeles. For larger, multiroom studios, additional spaces for equipment location, machine number, and work order number might also be useful additions to this form. The large 8½- by 11-inch format is preferred over the popular 3-by 5-inch card, since this form lends itself to easy filing reference in a three-ring binder. A convenient equipment repair history can be compiled in this way. Multipart NCR paper forms can be specified for large-scale bookkeeping routing.

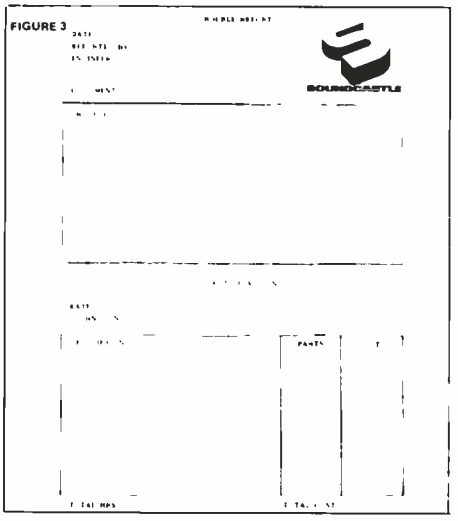


FIGURE 3

To operate efficiently, the maintenance department should consider these additional organizational aids:

- Monthly planning schedule
- Bulletin board
- Line cards of local part distributors
- Part order lists
- File cabinet using EEM system (mentioned earlier)
- Purchase order system
- Multicopy memo letter forms for handwritten correspondence

This list can go on forever. The ideas included in this article only form a basis for a streamlined operation; they are not intended to be all-inclusive. The maintenance shop can be only organized to the extent that personnel are willing to organize it.

* * *

In this brief discussion, a method has been demonstrated to show the logical process needed to systematically pull together a recording or production studio maintenance shop. Even though many topics have been covered, other subjects (such as tool selection, etc.) were simply beyond the scope of this article. Hopefully, the reader's imagination will be sparked by these few ideas, and will go on to provide better work surroundings for themselves within an efficient operating structure.

Color Photography by JEFFREY MAYER

AUDIO ANALYSTS' SOUND SYSTEM FOR STYX' "KILROY WAS HERE" TOUR

by David Scheirman

To promote their latest album, *Kilroy Was Here*, the rock group Styx is spending much of 1983 performing in theaters and arenas across North America. The chart-topping band has been consistently filling the largest available venues for the past several years. The current tour, however, offers several interesting twists: an initial "small-hall" tour of classic theaters; a new stage show in tune with the *Kilroy* theme, complete with motion-picture projection and robot costumes; and a new sound-reinforcement company for the first time in nearly a decade — Audio Analysts, a concert sound specialty company with offices in Plattsburgh, New York, and Montreal, Quebec.

The 1983 American tour started in early March with a series of shows held in smaller, older theaters (Styx has shown an interest in promoting this type of venue since its *Rockin' The Paradise* album told the story of a vintage Chicago-area theater due to be torn down by developers). The first stop on this leg of the March tour was at downtown San Diego's Fox Theater, an aging, high-ceilinged room with well-preserved and ornate plaster proscenium mouldings. The characteristics which make theaters such as this one so picturesque often can contribute to poor acoustics. The high ceiling and thrust balconies create three (or more) separate acoustical zones, each presenting the sound man with its own problem to be solved.

The high balconies typically get little direct sound, due to the physical problems involved with accurately focusing temporary loudspeakers at extreme angles (Figure 1). Seating areas underneath the thrust balcony often suffer from a lack of low-frequency response, and the high-frequency program material can become very irritating at the back wall due to the beaminess of horn-loaded systems. Forward seating areas either get "blown away" by excessive sound pressure levels, or else hear only a jumbled bunch of reverberated sound from the other two problem areas.

House System Loudspeakers

Perhaps the Styx tour's greatest challenge faced by a sound company was that the same loudspeaker system to be used for the small-hall portion of the tour also had to serve the arenas. The show's house mix engineer, Rob Kingsland, settled on the patented TMS-3 speaker enclosures from Turbosound, of London, England. "I knew that whatever speaker system I picked, I had to live with for six months," explains Kingsland, who has been involved with Styx's sound for the better

ROB KINGSLAND

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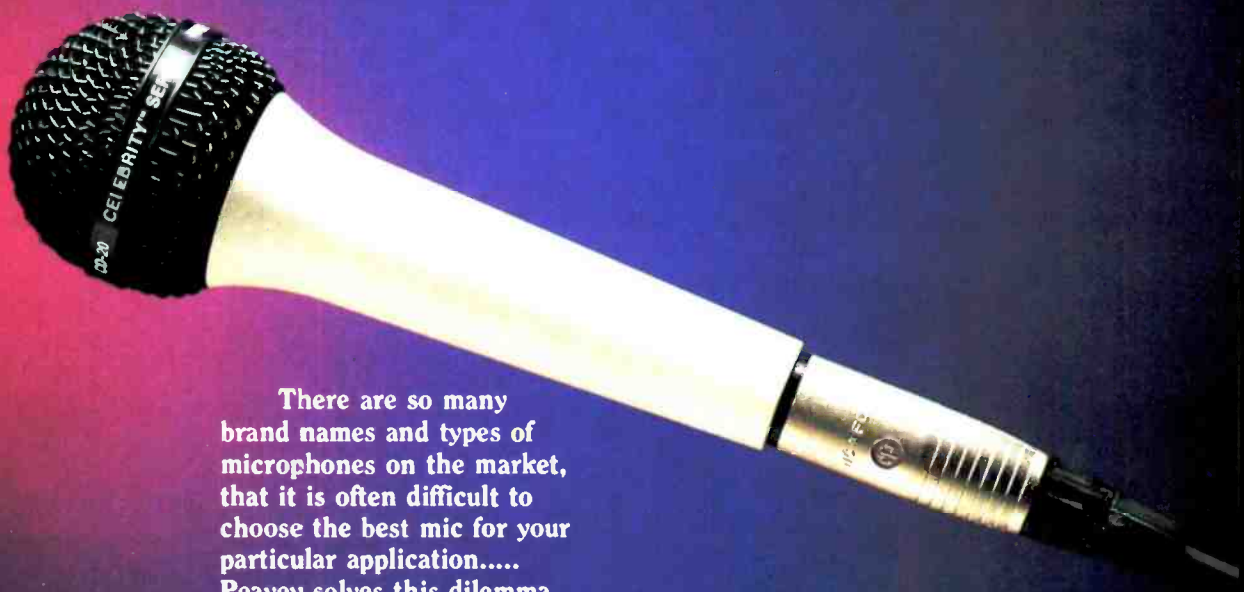

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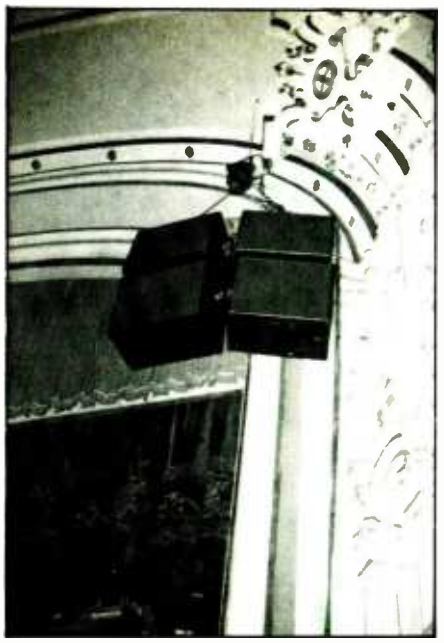


All photography by DAVID SCHEIRMAN

Figure 1: Four Turbosound TMS-3 cabinets are flown by chain host per side, to cover high thrust balcony area with direct sound.

part of the last decade, both in the recording studio and on the road. "The TMS-3 system offers very high efficiency in a relatively small package, has excellent fidelity, and is versatile enough to handle both the small theaters and the large arenas. Of course, I am not bringing all of the system into the small halls; as you can see here [at San Diego] I have a total of 22 cabinets including the subwoofers. I'll start the arena tour with 48 cabinets."

As provided by Audio Analysts, the house loudspeaker system consists of two basic types of cabinets: the TMS-3 box, a three-way composite loudspeaker package, and the TSW-124, a Turbo-SubWoofer with single 24-inch speakers (Figure 2). The TMS-3 measures only 33 by 40 by 23 inches, and weighs 298 pounds when fully loaded with two LF 15-inch drivers, two MF 10-inch drivers, and a HF driver mounted on a Northwest Sound 340F 90- by 40-degree constant directivity foam flare. Turbosound claims an *unequalized* response for this cabinet of 55 Hz to 20 kHz, ±3 dB. It is designed for both stacking and flying. Typically, the cabinets are supplied in equal amounts of "left" and "right" boxes. When stacked, the mirror-image cabinets are designed to allow for vertical and horizontal acoustical coupling of the low-frequency chambers, and vertical coupling of the mids and highs.

Low-frequency speakers are horn-loaded in the TMS-3 box, one above the other. This low-frequency section of the cabinet, utilizing the TurboBassDevice, is a separately patented unit developed by Turbosound (Figure 3). Also patented is the TurboMidDevice that gave the cabinet, and the sound company, its name: each 10-inch speaker is loaded to a specially moulded horn and phasing plug assembly. The plug resembles nothing so much as the front end of a turbo-jet engine — hence the name. The cone drivers provided with the TMS-3 are designed by Turbosound engineers, and assembled by a subcontracted acoustical transducer manufacturing facility. Turbosound supplies the cabinet with a TAD 4001 compression driver for the high-end.

For the Styx tour, Audio Analysts' chief sound engineer Albert Leccese had some ideas of his own for modifying the TMS-3 cabinets. The boxes were shipped from England with only the 10-inch drivers pre-loaded. Then the box underwent acoustical testing in an anechoic chamber at the Canadian government's National Research Council. Basing his decision partially on this data, Leccese decided to install 15-inch JBL 2225 units in the low-frequency compartment, and JBL 2445 drivers on the high-frequency horns. Audio Analysts also is experimenting with additional super-high-frequency units to be used with the TMS-3 cabinets, a new JBL prototype tweeter.

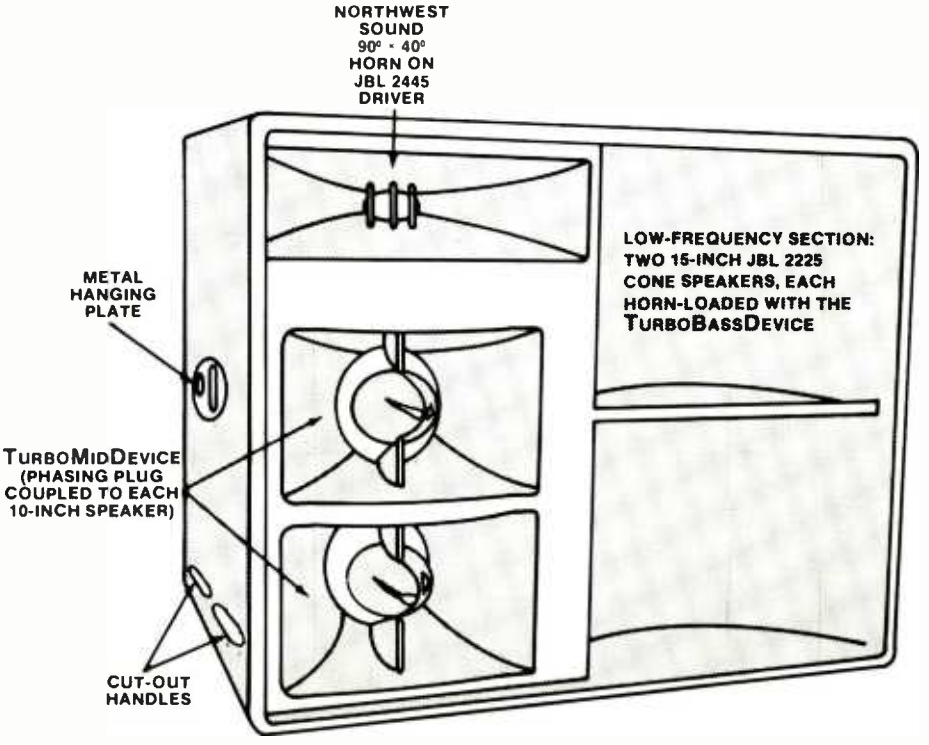
The already sturdy speaker boxes (constructed of 17-ply Finnish birch, butt-jointed, and sealed with marine glue) were then covered over with a super-tough epoxy-bonding paint. "We discovered this black paint almost by accident," comments Leccese. "A Canadian chemical manufacturer was throwing this stuff out; it was a by-product of their regular products. It has turned out to be so good, scuff-resistant and scratch-proof, that we now use it on everything."

When asked why Audio Analysts had chosen to purchase the Turbosound TMS-3 cabinets for the Styx sound system, Leccese provided a perfect advertising-brochure answer: "It is a very high-Q device . . . a very high directivity factor. The painstaking care that has gone into the research and development really shows. The cabinet acts as a very coherent sound source." Audio Analysts placed an initial order with Turbosound for 48 TMS-3s, and took delivery of the first 18 for the theater portion of the Styx tour.

Figure 2: TSW-124s and TMS-3 cabinets stacked & splayed for improved coverage.

Styx engineer Rob Kingsland echoes Leccese's sentiments about the TMS-3 system: "Wherever you point these things, that's where the sound goes," he emphasizes. "I also was particularly

FIGURE 3



Albert just bought eighty-eight of our best amps and thought he got a deal.

Albert Leccese is the Chief Sound Engineer and partner with the Paré brothers at Audio Analysts, Inc. The company is a prominent supplier of sound reinforcement systems to major national and international touring groups.

Albert has no room for error or failure. He doesn't put his stamp of approval on any piece of audio support equipment unless it meets a rigid set of standards.

QSC Series Three amplifiers exceeded all of Albert's tough requirements. In fact, he spent the better part of a week trying to default one of the units in a test of reliability under stress.

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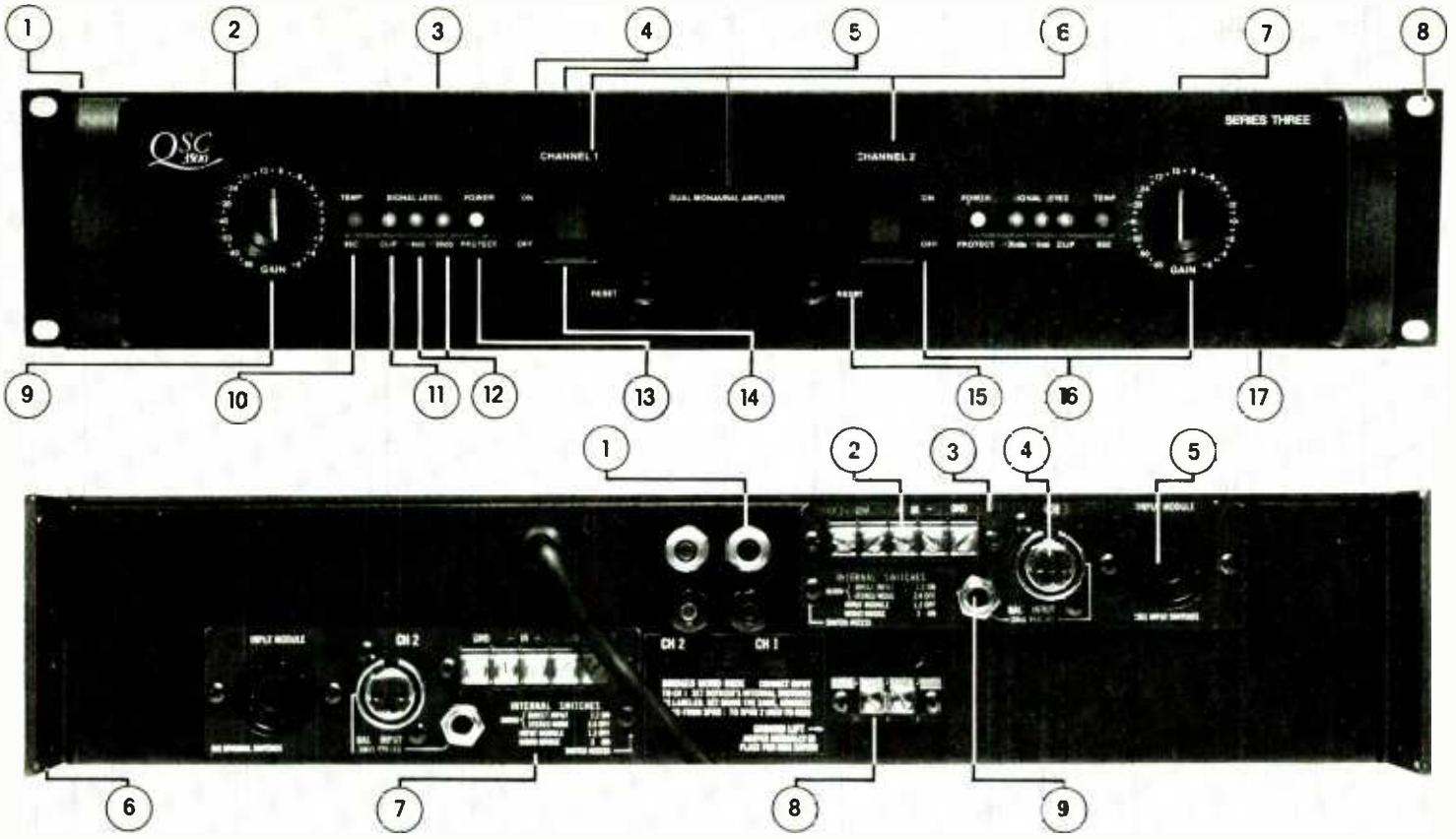
Just ask Albert.

*We'll be happy to supply the actual test conditions upon request. Albert Leccese, the Paré brothers and Audio Analysts, Inc., did not receive any compensation for this endorsement.



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5. CENTRAL WELDED STEEL AC AND TRANSFORMER BAY
For maximum strength and shielding.

6. TRUE DUAL MONO CONFIGURATION
Two completely separate amps sharing common AC cord for maximum reliability and flexibility. All protection separate for each channel.

7. HIGH DYNAMIC HEADROOM AND MULTIPLE PARALLEL, LOW ESR FILTER CAPACITORS
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17. MASSIVE OUTPUT SEMI-CONDUCTOR SECTION
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drawn to this speaker design due to the very *real* mid-range reproduction. Right in the vocal range, the most critical area for me, this box is unbelievably smooth." Kingsland also commented that the Styx system packs more "sound-per-pound," and thus saves on labor costs, truck space, and set-up time. (Of course, the same could be said for most composite speaker systems.)

TurboSubWoofer Cabinet

Although the TMS-3 speaker system was designed as a self-contained, full-range system, some customers, including Albert Leccese of Audio Analysts, had asked for the development of a subwoofer system to complement the three-way box in the lower register. A foot or so deeper than the TMS-3, and not quite so tall, the subwoofer cabinet houses a single 24-inch cone driver that loaded into an identical and larger version of the Turbo-based device. A year of R&D by Turbosound engineers Tony Andrews and John Newsham went into the design of the 24-inch speaker. The first run of speakers was hand-made by Andrews and Newsham. "This speaker has a 4-inch voice coil, and we rate its power-handling capacity at *700 watts*," Newsham says. "It took us months to find just the right paper to use for the cone. We tried everything, and finally settled on a heavy craft paper. We hand-formed the cones, and bonded them initially with quick-set adhesive. We get the baskets cast from one supplier, and the magnets from another." Newsham is currently on the road with the Styx tour, overseeing the system, and working as Kingsland's assistant house mix engineer. According to Alan Wick, president of Turbosound, Inc., "The 24-inch speakers are still being made by hand at our plant in England. We can only put out 8 or 10 a month, as it is a very labor-intensive process." Wick also comments that demand for the TSW-124 with its 24-inch cone has been high.

JOHN NEWSHAM

House System Stacking

For the theater portion of the Styx tour, a stack of two subwoofers and five TMS-3s is positioned on each side of the stage, with the boxes in vertical columns of three and four. Additionally, overhead groups of four TMS-3s are flown from a single hanging point per side with a chain motor hoist.

"Ideally, we would have the overhead speakers positioned in a single center cluster, but it was not possible here because of the plaster sculptures above the proscenium," Leccese points out. "The single point source would have been better, but this is certainly an acceptable compromise."

The flying clusters were positioned at approximately the mid-point of the thrust balcony. The lower stacked columns were splayed out from each other slightly, with the back center of the theater being on-axis with the two inside columns (detailed in Figure 2).

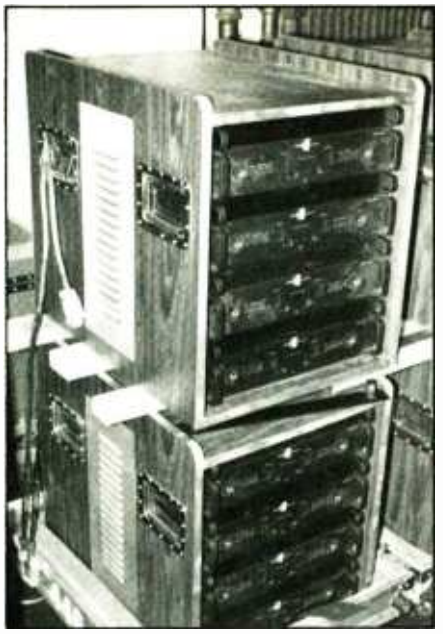


Figure 4: Audio Analysts' amplifier rack housing four QSC Series Three amps per rack for both main and monitor systems.

Audio Analysts' crew chief Everett Lybolt comments that all 22 cabinets —18 TMS-3 and four TSW-124 subwoofers — could be stacked, hung, and wired within less than one hour . . . a definite plus, he offers.

Power Amplifiers

Prior to the Styx tour, Audio Analysts took possession of 88 of QSC's new Series Three amplifiers. This new-generation unit is capable of developing approximately 550 watts into an 4-ohm load. "QSC really underrates the output capabilities of their product," Leccese says. "These amps really dish it out, and are practically bullet-proof." (Leccese claims to have left QSC's prototype Series Three operating on the test bench with an overloaded input into a dead short for several days with no ill effects, failure, or overheating.)

The Series Three boasts a true dual-mono design configuration, with front-panel access modules, and a very comprehensive input-output interface. As well as utilizing passive cooling (no internal fan noise), the amplifiers feature a floating internal connector system to prevent contact damage due to road vibration.

"These amps really do run cool," Leccese says, referring to a bank of QSC amplifiers loaded four to a rack (Figure 4). "They cut our cooling requirements down to half of what was required for my old [amplifiers]." Each rack develops in excess of 4,400 watts RMS.

One complete rack was assigned to the four subwoofer cabinets, left and right channels of each amplifier in that rack being bridged to mono, and the resultant 1,100 watts traveled down a doubled pair of 14-gauge speaker cables to a single 24-inch driver, with the purpose of providing over twice the normal amount of headroom. The nine TMS-3 cabinets per side were powered by the remaining three racks.

Power Distribution

AC power for the Audio Analysts' sound system and the band's stage gear was supplied by a distribution panel of the company's own design and manufacture. A fairly typical road AC system, it supplies up to 200 amps per leg, three-phase. A digital voltmeter on each leg is constantly reading voltage, and can be switched over to register current draw in amps. Distribution lines running out to various demand areas are joined to the panel with Hubbellock

Figure 5: Soundcraft Series Four 40-in/16-out monitor mix consoles.

connectors.

Monitor System

The stage monitor system utilized for the Styx tour was perhaps as complex as any currently in use. Two brand spanking new Soundcraft Series Four mixing consoles were overseen by Mike Cooper, the band's personal monitor mix engineer for the past five years (Figure 5).

MIKE COOPER

"What I have here is a 40-channel board and an auxiliary 26-channel board, giving me 66 inputs," Cooper explains. "These really are the first Series Four consoles in use . . . I have serial numbers #0002 and #0003. The primary board takes the vocal mikes and solo instruments; I've loaded extra percussion, auxiliary keyboards, and tape returns from the house on to the 26-input board."

The two monitor consoles are tied together via bus transfer, and were set up by Soundcraft to be a linked pair; a circuitry modification was incorporated into the units by the factory at Audio Analysts' request. As of this writing, 11 of the available 16 mix outputs were in use on the tour, as detailed in the accompanying table. (Cooper did feel that he might add another mix or two as the tour got underway, however.) Five mixes covered the downstage areas; two were used for overhead mixes left and right; and three covered the upstage performance areas. The remaining mix was a feed to one of the EXR Exciter sides, primarily vocals and percussion, which was then brought back into selected primary mixes.

Monitor Signal Processing

Four monitor electronics racks were used to house a host of processing devices: graphic and parametric equalizers, compressor-limiters, EXR Exciters, noise gates, and a real-time analyzer (Figure 6). "Much of my processing is done with individual channel inserts," Cooper comments. "I am using a noise gate on every single drum; six individual [Valley People] Kepex IIs. Additionally, I have a side of dbx 160 compression for each of two kick drums, the bass guitar, and the bass pedals. I also use a frequency-triggered noisegate [OmniCraft GT-4] on the top snare drum mike, which really lets me get a crisp snare sound with tons of gain, but very little bleed through of the stage instrument noise."

Monitor Mix Output Assignments for Styx Tour

Mix #1: Stage Right, Downstage.
Mix #2: Downstage Center; two cabinets.
Mix #3: Stage Left, Downstage.
Mix #4: Stage Right Overhead Sidefill.
Mix #5: Stage Left Overhead Sidefill.
Mix #6: Stage Left Sidefill, floor.
Mix #7: Stage Right Sidefill, floor.
Mix #8: Keyboards.
Mix #9: Bass guitar.
Mix #10: Drums.
Mix #11: EXR Exciter.

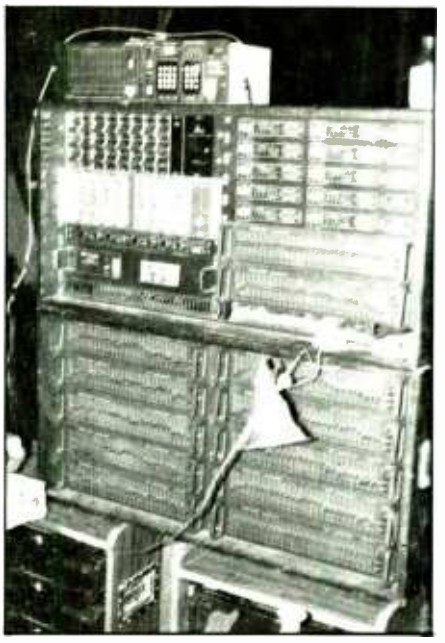


Figure 6: Stage monitor electronics includes Phase Linear graphics, dbx three-band parametric EQ, EXR Exciters, and Valley People Kepex II gates.

Nine sides of EXR Exciter were used as individual channel inserts on each vocal mike, the hi-hat, and overhead cymbals. A tenth side received its own mix, which was then available to be brought up in any monitor mix that needed more definition. "The Exciters give the listeners — in this case the performers themselves — a subjective impression of greater intelligibility," Cooper explains. "The words are easier to understand, and they are worth using for that reason alone."

Each monitor mix followed an interesting signal path from the console to its respective amplifier channels, as detailed in Figure 7. At the Soundcraft console, insertions were made into the mix output summing amp. The signal first hit a dbx three-band parametric equalizer, and then a Phase Linear third-octave graphic, before returning to the console. "This lets me visually shape a curve, and still have filters left over which I can sweep the program material with to locate feedback rings," Cooper says. "I don't have to use a lot of heavy EQ, but it's sure there when I need it."

From the mix output on the console, the signal is fed into a John Meyer crossover and signal processor, and finally into QSC amplifier channels that power the low- and high-end components in the monitor cabinets. When this writer remarked that Cooper's graphics were depicting an unusually smooth system response, he attributed this to the Meyer Sound Laboratories' electronics and speaker cabinets. "The Meyer system

offers a speaker system which is very flat to begin with," he explains, "and their crossover is not *just* a crossover; it has amplitude and phase-coherency correction, as well as three limiters. There are two broad-band limiters and a peak limiter; the high-frequency limiter is a sort of sliding-type which narrows or widens its effect to take out *only* the peaks which are altering the system's correct frequency response. And, it is a very *fast* circuit, so it works well for pulling out feedback transients."

Meyer Monitor Speakers

All stage monitor speakers on the Styx tour are John Meyer products, and are owned by the band. Meyer advises that the amplifier used to drive one cabinet should produce at least 250 watts driven into 8 ohms. As in the house system, Audio Analysts uses QSC Series Three amps to drive all of the monitor lines in a bi-amplified mode. Three different Meyer speaker cabinets were in use for the Styx tour: the UM-1, the UPA-1, and the USW.

The UM-1 Ultra-Monitor is the smallest Meyer speaker cabinet available. Intended to be used as a "spot" monitor, the cabinet contains a single 12-inch speaker in a ported chamber (Figure 8), and is used by Cooper as spot reinforcement at each vocal mike. A high-frequency driver is mounted on a conical horn with a narrowly controlled pattern. Six cabinets were placed along the edge of the downstage line, with a pair angled up at each of three vocal stands; cabinets also covered the bass guitar and keyboard positions.

With the same single 12-inch speaker and HF driver, the Meyer UPA-1 differs from the UM-1 only in choice of horn, and contains a radial to provide wider coverage. The box has slightly different

Figure 8: Meyer UM-1 stage monitor slant houses a single 12-inch bass driver, and a conical horn mid-range.

exterior dimensions than the UM-1 to maintain a constant internal cubic-inch displacement. Four UPA-1s were used for wide-area coverage, and were placed offstage.

The drummer's monitor mix was heard through five stacked cabinets: two UPA-1s, and three USWs. The latter is a dual-fifteen cabinet with an internal cubic displacement of five feet. These three subwoofers were stacked a mere two feet behind the drummer's stool, and inadvertantly projected the amplified kick drum well out into the audience seating area. The effect of this interference would not have been noticeable in an arena setting, but was evident in the smaller theater.

Setting up the Monitor System

At load-in, Audio Analysts' engineer Sean Webb placed the monitor speaker cabinets on stage, and cabled them up. First to go in were the flying side-fills, which were hung from the downstage lighting truss, and required immediate attention. For this application, a pair of Meyer UPA-1 boxes were strapped together and hung from each end of the truss with nylon webbing and metal hooks. The cabinets were secured at an extreme downward angle with ratchet-straps, as shown in Figure 9. These small cabinets developed an amazingly high sound-pressure level from such a high over-head distance — strong enough that Rob Kingsland out at the house console was moved to comment that he noticed a slight interference with the house sound during the show's louder passages.

After the Meyer speakers were positioned and wired, monitor engineer Mike Cooper used a White Model 200 real-time analyzer with pink-noise to perform an initial level check of the various monitor zones. "We'll use the analyzer, to a large degree, to give us an idea what we are

FIGURE 7

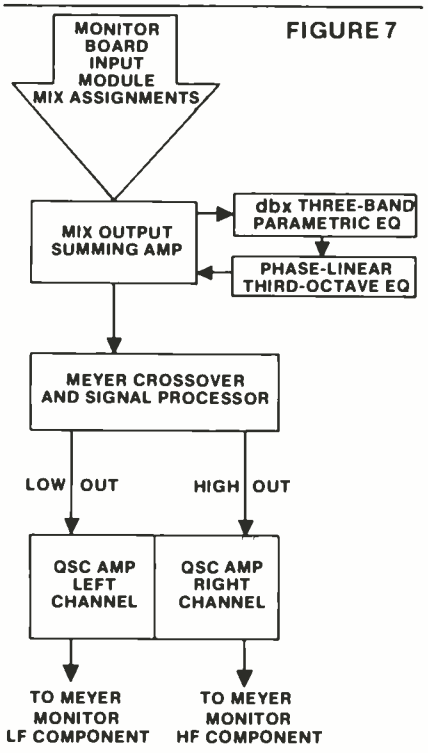
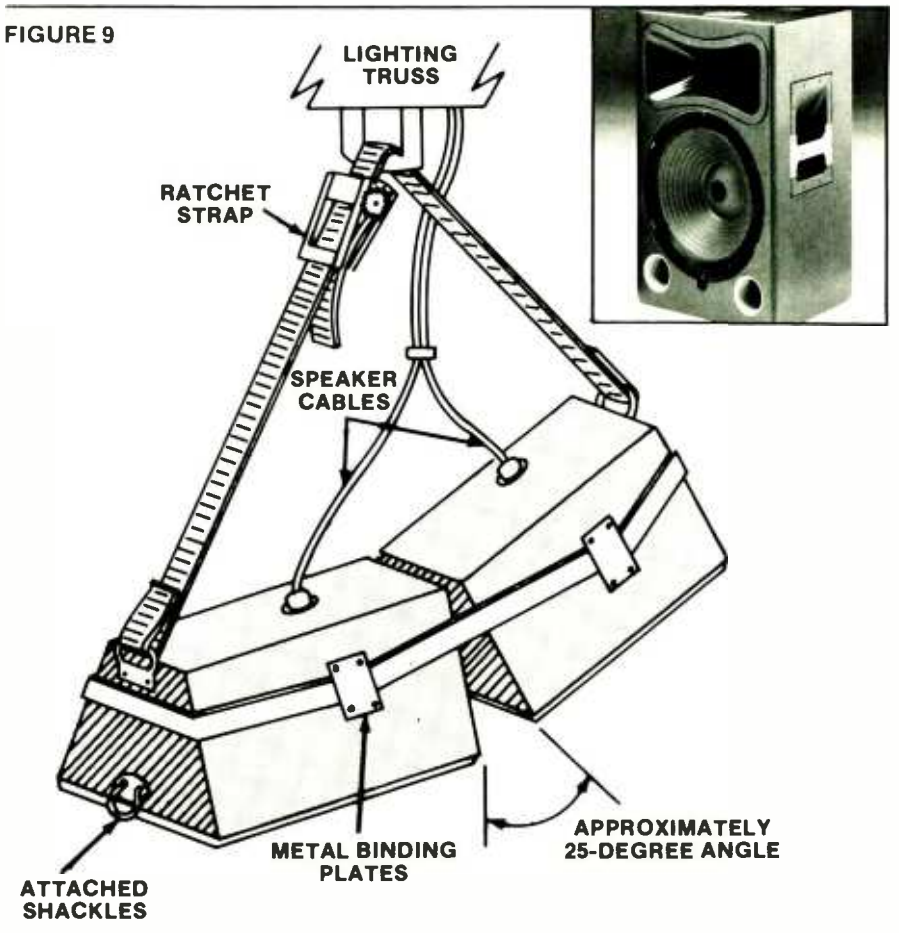


FIGURE 9



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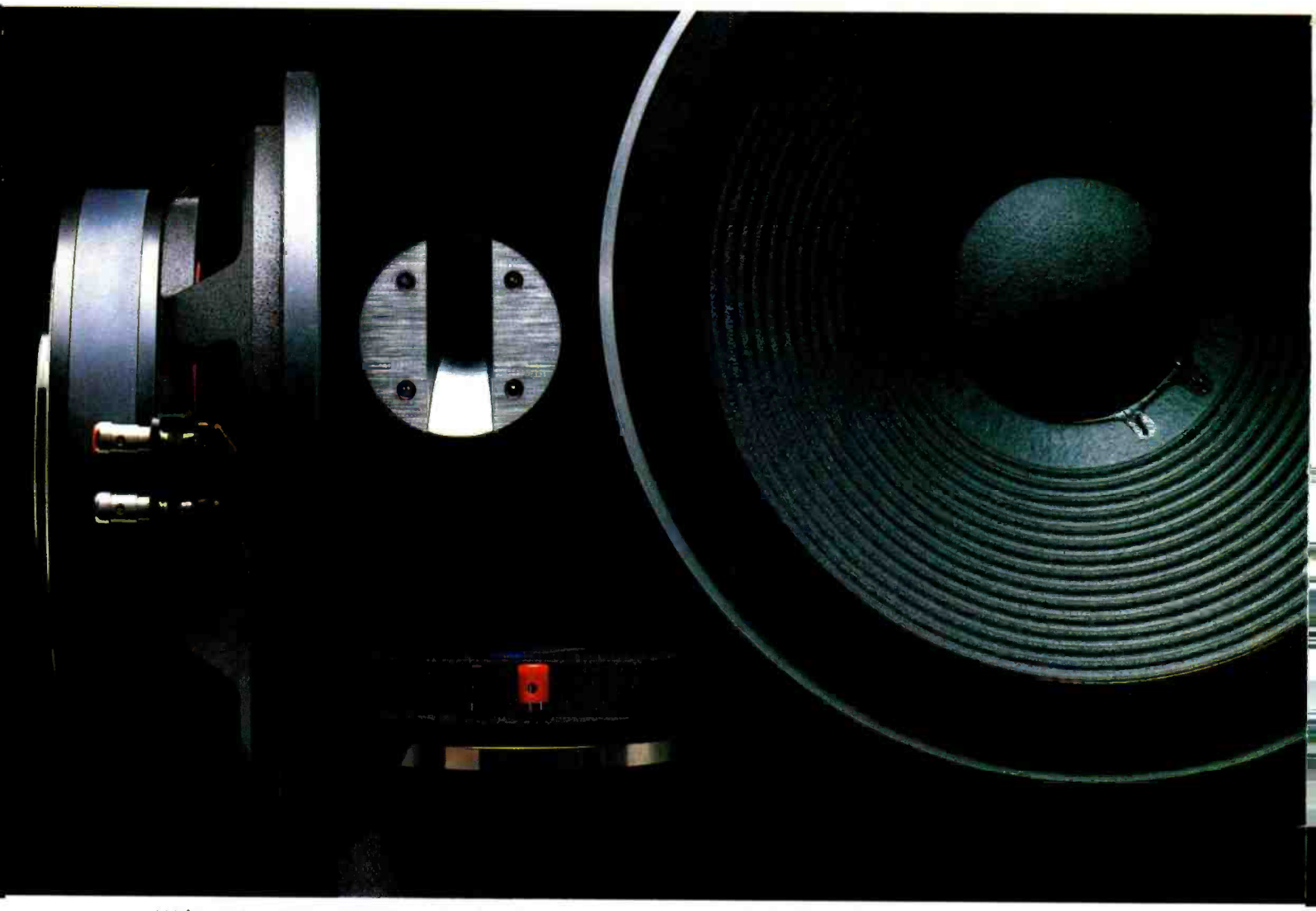

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experiencing as far as acoustical problems go on a given stage," he explains. "But, we *don't* live by the analyzer . . . after I see what needs to be seen on it, I then look for problems. Often things like poor mike placement show up. The ears though, are the real thing. If the display doesn't correspond with the ears, go with the ears."

Cooper explains that, for this act, vocals and drums are most important. "I really have to spread the snare and hi-hat over the stage," he says. "And, the EXR Exciters go a long way towards giving me a really bright, present sound on the vocal mix anywhere on stage. My downstage mixes are important, but the sidefills actually carry the show, since these boys move around a lot." In addition to the overhead sidefill pairs, a Meyer USW and UPA-1 are placed at stage level on either side of the front vocal line, and fed separate left and right mixes.

Feedback, with all those monitors? "Not really," Cooper claims. "I *never* have all of my 64 inputs open at the same time. Drums and vocals are a constant, but the many keyboards and guitars come and go. I probably average about 22 open channels at any given time during the show, and half of those are likely to be direct inputs, so acoustical feedback problems are not really that common. It really depends on two things: how loud the band plays; and how well we tuned them beforehand. But, the Meyer speakers give me just as much level — and it's cleaner — as any huge triamplified stack I ever used for sidefills."

According to Cooper, unlike some tours that basically are done in a spontaneous, "seat-of-the-pants" method, the Styx show places a great demand on him for proper monitor cues. As he explains, "What happens is this: we have a lot of cues . . . some instruments may be used on only one tune during the entire show, maybe only for a few bars. But it has to be there on time. I also have four tracks of tape return from the house console, and a film audio track to bring in and out. And there are three different [Audio-Technica] wireless lavalier mike channels, each one used twice during the evening."

Stage Miking

With three multi-instrumentalists in the band, Styx featured many different guitars and keyboards — and that eats up a lot of channels. There were three separate keyboard positions individually mounted on a rolling cart or riser (Figure 10). Keyboard instruments included two Roland Jupiter synthesizers, a Fender Rhodes electric piano, Korg electric organs, among others. All keyboard inputs were taken direct, including the acoustic grand piano pickup. A Leslie cabinet was miked with an AKG D12E on the low-end, and a Sony ECM-22P on top.

Electric and acoustic guitars were all

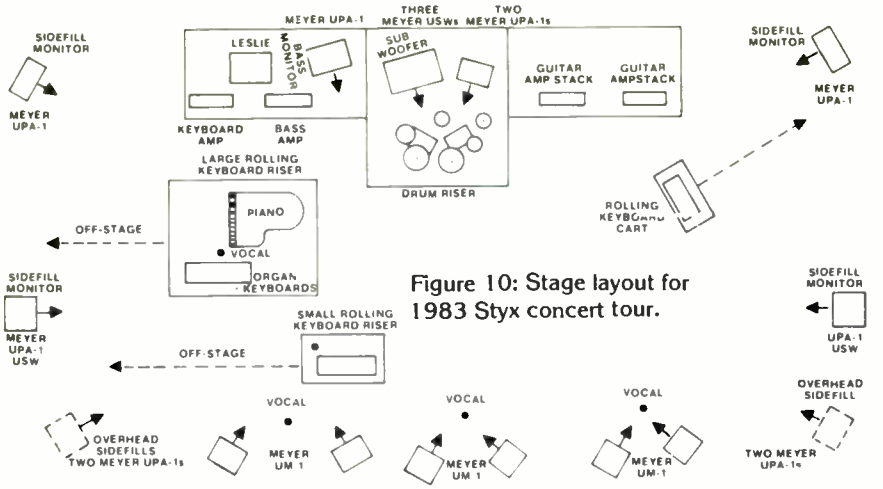

Figure 10: Stage layout for 1983 Styx concert tour.

equipped with Nady wireless devices. One of the band's stage technicians spent the entire show overseeing a bank of 20 wireless receivers. Guitar amp stacks received mikes, while the bass guitar and the Moog Taurus bass pedals were taken direct. Hard-wired vocal microphones were Beyer M600 models.

The drum kit took up 15 input channels with its double kick drums (Electro-Voice RE-20 mikes), the four rack toms (Sennheiser 421s), and the top and bottom snare mikes. A third mike was placed on the snare drum for use exclusively in the monitors. Hi-hat and overhead cymbals were covered by AKG C451E condensers, as were the various percussion "toys." A large pair of concert tympany completed the set.

Console Interface

Stage lines were picked up by satellite boxes situated in various parts of the performing area. These 11-pair boxes utilize Amp g-2 connectors to feed signal into two identical 40-pair splitter boxes, providing lines from stage to the console areas. The junction boxes have three discrete outputs for house, monitor, and recording. "These three outputs are completely isolated from each other," Albert Leccese explains. "I won't say whether or not we use transformers in there to split the signal, but we do use a very simple idea . . . I am surprised it is not more commonly known. Of course,

the splitter box is stuffed with PCs, and a lot of wires — we have had great success with it." Two input snakes run from the splitter box to the house mix position, and two identical (though shorter) snakes feed the two monitor consoles.

House Mix Position

Two identical Gamble HC40-24 consoles provided 80 inputs at the house mix position. House engineer Rob Kingsland handled the primary board, while John Newsham assisted on the secondary board. In addition to the myriad lines coming from the stage, Kingsland returned a host of effects lines into the Gamble boards, along with a four-track music tape feed — tunes from the current album into which was mixed live vocals from the wireless lavaliers — and a film soundtrack, used as the opening sequence of the show.

Newsham found the Gamble consoles to be versatile when it came to having enough "ins-and-outs," but had encountered a couple of problems with the pair in use on the Styx tour. "I get bleed-through from the cue circuit into the main outputs if the headphone amp input is overloaded," he recalls. "Audio Analysts plans to modify this particular console and replace the graphic section with an auxiliary effects return panel," Newsham added. The tour was due to receive, by the end of May, a second pair of Soundcraft Series Four desks with 40 inputs routing to 16 discrete mix outputs for front of house. Shane Morris, technical manager for Soundcraft, says that the Series Four house console is equipped with eight stereo subgroups and eight mono effects returns, and has a full patch-panel, with easy access to the auxiliary and program group busses.

Audio Analysts engineer Ray Dilfield was the third man in the house mix area. As tape operator, it was his job to handle the Otari MX-5050 which fed four tracks of music into the system. Dilfield also had a TEAC 3300X reel-to-reel standing by as two-track backup, in case of primary tape transport failure. Both machines were started in sync and ran simultaneously, thus providing him with instant access to the two-track should problems arise with the Otari.

House Processing Equipment

A formidable array of processing devices lined the wall behind the house consoles. Four separate equipment racks were packed with enough gear to stock a major recording studio or two (Figure 11). Rack #1 contained 10 Valley People Kepex II compressor-limiter-gates, which were applied to each individual drum, including the snare. Omni-Craft G-4 noise gates were used on the effects returns. Four dbx 160 limiters were patched into channels assigned to handle bass guitar, bass pedals, and two kick drums. Four sides of EXR Exciter were used on the left and right overhead drum mikes, and on the toms. A spare crossover and a Dietz parametric equalizer completed the rack.

Rack #2 housed a Crown RTA-2 real-time analyzer, connected to an AKG C414-B mike for ambient frequency response readings. Two Technics M-85 stereo cassette decks were included for recording and playback. Also contained within this rack were the main sound system processing gear. Console outputs first were put through a pair of Klark-Teknik stereo third-octave graphic equalizers, and then through a custom Brooke-Siren crossover. These English-made units are built specially for Turbosound with additional phase-correction circuitry, adjustable at the front panel, and are specifically recommended for use with the TMS-3 system. A four-way stereo crossover drives the stacked speakers, with crossover points at 60 Hz, 280 Hz, and 3.7 kHz. The flying clusters had a separate three-way crossover that allowed the TMS-3 cabinets in the air to start receiving signal at 30 Hz.

The third house electronics rack contains most of the show's special effects devices. A Lexicon Super Prime Time II (with 40 programmable memories), a standard Lexicon Prime Time, and two Eventide H949 Harmonizers were available for vocal processing. Also included was an URSA MAJOR Space Station for reverb effects on the drums, a DeltaLab DL-1 for vocal special effects, and a new Lexicon 224X digital reverb unit that served as the primary drum and vocal reverberation system for the show. "It's interesting, this 224X," says Kingsland. "It offers very long reverberation times [up to 70 seconds — *Ed.*] with a good, *natural* sound."

Rack #4 primarily houses the channel-insert gear, including eight dbx Over-Easy compressors that were placed on vocal mike channels. Two de-essers were included for dialog and sound effects, along with six dbx Model 905 parametrics for vocal channel inserts. Omni-Craft GT-4 noise-gates and Bi-Amp Quad-limiters were put in-line with the synthesizers as a safety factor for the main sound system. Other processing devices included a flanger for the drums, two more parametrics and compressor channels used as inserts on the lavalier mikes, and two sides of dbx noise reduction for the Otari tape deck (two tracks being run with dbx, and two without). An Eventide H910 Harmonizer was included in the rack for the Fender Rhodes; six more

SOUNDCRAFT SERIES 4 FRONT-OF-HOUSE AND MONITOR CONSOLES

As with all other modular Soundcraft consoles, the Series 4 mainframe design is based on custom aluminum extrusions between aluminum plate profiles, which is said to result in a strong yet reasonably lightweight structure. Internal wiring is based around insulation displacement techniques that eliminate the need for a fixed mother board system with fragile, unreliable edge connectors.

The Series 4 front-of-house console, available with a maximum mainframe configuration of 40 inputs routing to eight stereo subgroups, is divided into an upper and lower section, with two modules per input. The upper module contains an LED bar-graph meter, input gain and equalizer controls, while the lower module contains routing, auxiliary sends, fader, and the programmable grouping controls. The sub-groups are contained in the lower modules to the right-hand end of the console; the modules above the sub-group modules contain the 8×8 matrix controls and effects return channels. Between the input and sub-group sections is the master and intercom module, above which is found the auxiliary master modules. At the right-hand end of the console is the patchbay sunken beneath a plexiglass cover that can be retained in place whilst patch cords are inserted in the jacks.

The Series 4 monitor console is similar in format, and uses the same upper input module with a dedicated lower module containing 16 rotary pots with an overall master fader. To the right-hand end of the console are 16 group output modules, eight in the lower section, and eight above. In addition, the monitor board can be built with a customer-specified stage distribution system as an integral part of the console. Facilities for outboard record splits can also be provided. A mike patch bay can be provided to allow the monitor operator to assign the mike inputs differently to the house, or so that a monitor console with less inputs than the house board can be used. ■■

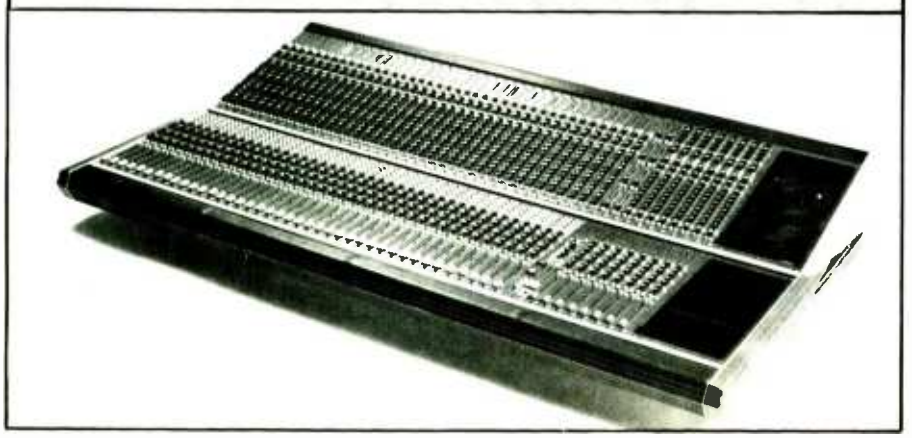

Figure 11: Two of four house electronics racks used on the Styx tour.

EXR Exciter sides were inserted on the vocals. A few more spare Dietz limiters completed the rack.

Speed of System Construction

Perhaps the most astonishing thing about the sound system put together for Styx is the fact that it was built in the month prior to the tour going out. Audio Analysts did not receive final confirmation of the tour until December 17, 1982. (Styx has been known for last-minute decisions in the past. Rob Kingsland sent mild shock waves through the concert sound business in 1979 by mailing out a bound set of specifications for essentially this same system, bids being sought for a tour hardly eight weeks away!)

According to Albert Leccese of Audio Analysts, "The recession actually helped us to prepare for this tour. Warehouses were full, and many of our suppliers were able to ship items right from stock." Leccesse offers that the company's biggest worry was the monitor consoles. "I flew straight to England and laid out the specs," he recalls. "Graham Blythe and Phil Dutteridge at Soundcraft were very helpful; those guys got these consoles out in less than 30 days." Betty Bennett, general manager of Soundcraft, Inc., confirmed that the console manufacturer had only three week's notice. "We were just getting ready for the holiday season, and Audio Analysts ordered two of our new monitor consoles. We had not even seen them here yet in the States. And Albert wanted delivery in three weeks."

According to Alan Wick of Turbosound, the purchase order for the TMS-3 cabinets was received on December 16, 1982. By January 21 the boxes had been loaded, painted, and tested in Audio Analysts' Plattsburgh facility. Consoles, speakers, cabling and electronics were all hastily . . . and expertly . . . put together as the parts arrived. Personally, this writer would not have known that the system had only been bits and pieces 30 days prior to the tour, had he not been told. The system seemed to be a well-built and finely-tuned package, right down to the last road case.

Show Sound

As stated earlier, the smaller, high-ceilinged San Diego Fox Theater can offer great challenges to a sound engineer and his system. During the course of the first night's performance, I spent a great deal of time trying to locate spots in the room which had poor sound. I found none. Words were clearly heard even in the back row of the high balcony, though the low-frequency response was, expectedly, somewhat attenuated up there. The TMS-3 system, to my ears, was able to clearly reproduce the music program material in such a manner that I was not even aware that I'd been listening to 115 dB peaks until I stepped out into the lobby to find my ears ringing. Inside, the system was very easy to sit and listen to. Odd frequency peaks and harmonic distortion were practically non-existent. The lack of distortion in the system definitely helped to make listening to it a pleasure. The PA looked good, and sounded better. A wide range of audio effects actually attracted the audience's attention to the high-fidelity sound system. And, for a system assembled in 30 days, heard on the first night of a complex tour, that says a lot. ■■■

An Engineer's Guide To Music

Understanding the Basic Syntax of a Session by Following Various Musical Scores and Charts

by Jimmy Stewart

A creative engineer is one that is sympathetic to the musical goals of the producer, artist and musician, and who can utilize his or her knowledge to ensure that the recording technology is being used to bring life to the musical performance. Without doubt the "catalyst" for any session is the musical score. Even if an engineer is unable to read music (which is not to say that it can be a great advantage for them to follow a score sheet), the ability to gain a grasp of the musical "punctuation" and "syntax" of the piece to be recorded can be extremely useful, to say the least.

This article will consider the various ways in which an engineer can gain some insight into the myriad details contained within the written music, ranging from a simple appreciation of a song's structure, through the markings on a rhythm chart, to understanding the important landmarks to be found on a full orchestration score.

On pop records, the song is the most important element we are dealing with," Quincy Jones told *R-e p* in the October 1982 issue. "The engineer has to understand and be able to relate to its musical structure."

Pop songs can be made up from basically six types of Blueprints, or internal structures, as shown in Table 1. The individual sections within a song are labeled on most lead sheets in the form of (A) for verse, and (B) for the chorus; sometimes a song may have a tag, labeled (C). These sections may be repeated again in the song, in the form of (A2) — (B2) — (B3), and so on. Such a lettering system is used by music-reading musicians, and will appear on their music sheets. It's useful for an engineer to be able to relate the two sets of terms: the letters that relate to the musician's chart; and the verse and chorus indications on the lyric sheet. song sections most generally are eight bars in length, although you may come across variations.

The strongest lyric line and/or melodic line in a song is the "hook," and is the part that, as the name suggests, is easiest to remember. Also, song arrangements use an introduction, which can vary in length from two to eight bars, or more. Other parts in the song arrangement could be a link or setup. A bridge or release could be added as a diversion from the song, keeping the listener entertained before the payoff (hook) in a song. An "outro" is a groove section or vamp used before the last chorus (hook) is stated. The turn-around in the song arrangement is a repeat of the chorus (hook), and appears at the end of the song.

CHRIS MINTO

"Although you are watching the VU meters and getting balances, start to learn the song form as soon as possible," says engineer Chris Minto, whose most notable recordings have been with Pat Benatar, Rick Springfield, and Carlos Santana, produced by Keith Olsen. "I'm not a trained musician, although I played guitar by ear for several years, and also experimented with drums and some vocals. I learned by listening; I trust my ears. I had to learn to communicate with musicians at a musical level, and understanding song form is one way we can communicate."

In Table 1, Minto's six basic blueprints for a pop song, the various letters relate to the musical structure. For example: section A melody, same as section A2; B section change in melody, same as section B2; section C, new melody. It should be noted that the C section is a bridge, as shown in Blueprint III, and usually is a surprise in the song; it's always memorable, and stands on its own. It could be called a tag. Some songs, for example Blueprint IV, eliminate the chorus by building the cumulative emotion on the sections already introduced. The words change, but the musical sections are identical.

"When I'm recording a song, I learn quickly the Blueprint," Minto continues. "And once we get a version on tape we like, I'll write out on paper the Blueprint and arrangement." The accompanying chart is Minto's script for production of the Tane Kain song, "My Time to Fly."

TABLE 1: THE SIX BASIC BLUEPRINTS FOR A POP SONG

Blueprint I: A1 1st Verse	A2 2nd Verse	B Chorus	A3 3rd Verse	B2 Chorus repeated	—	—
Blueprint II: A1 1st Verse	B1 Chorus	A2 2nd Verse	B2 Chorus	A3 3rd Verse	B3 Chorus	—
Blueprint III: A1 1st Verse	B1 Chorus	A2 Verse	B2 Chorus	C Bridge	B3 Chorus	—
Blueprint IV: A1 1st Verse	A2 2nd Verse	A3 3rd Verse	A4 4th Verse	—	—	—
Blueprint V: A1 1st Verse	A2 2nd Verse	B1 3rd Verse	A4 Chorus	A5 4th Verse	B2 Chorus	B3 Chorus
Blueprint VI: A1 1st Verse	A2 2nd Verse	B Chorus	A3 3rd Verse	A4 4th Verse	B2 Chorus	C Tag

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"When we are working on vocals, I'll use a lyric sheet with verses and chorus labeled, and reel time numbers from the tape recorder. My way of getting into a song is tapping my foot lightly, and this is done after I determine the meter of the song.

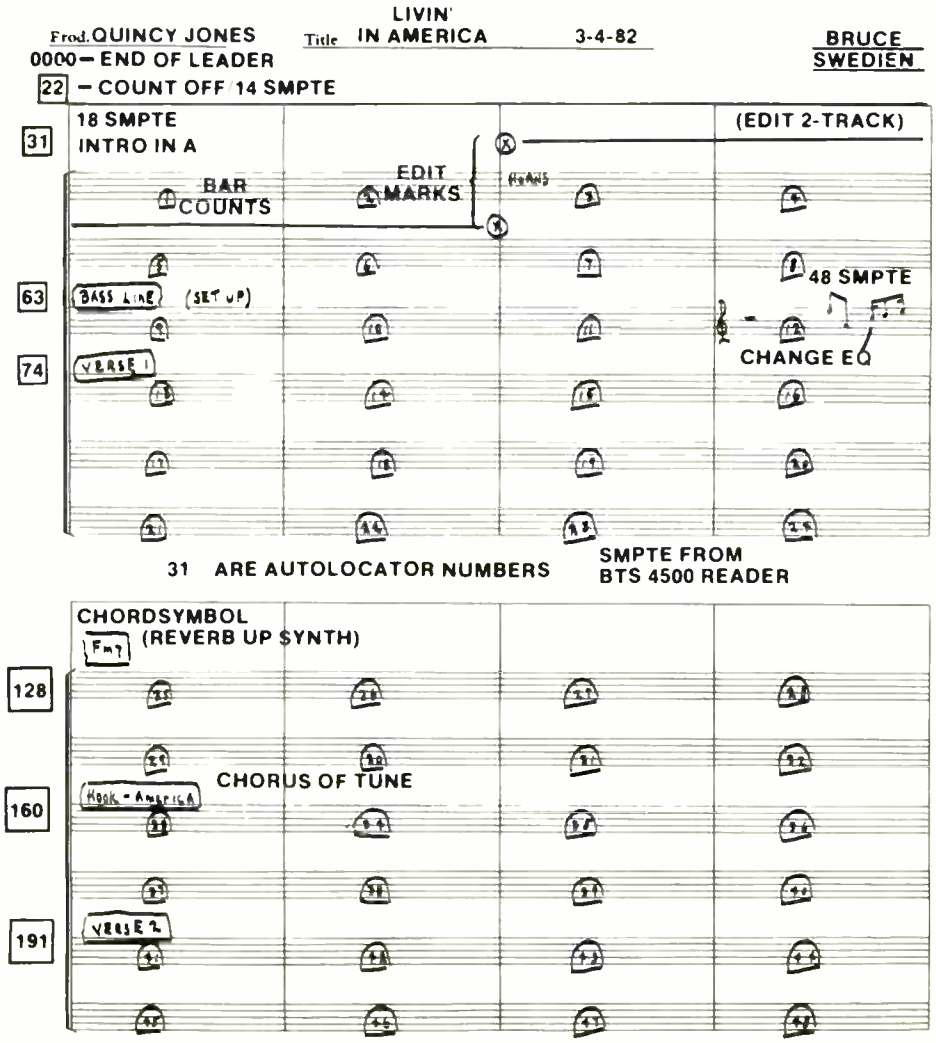
"In working on punches, I like to play the section through to find out where the punch-in and -out will be, counting with the song meter: 1234, 2234, 3234, 4234, etc. With some tape machines you have to anticipate the punch, because the erase head is far away from the record head, and you also have to worry about getting *out* of the punch. I'll subdivide the beats within the bar — *one*, and, *two* and, *three* and, *four* . . . and so on. And for a *very* tight punch, I'd count one *e* and *ah*, two *e* and *ah*, three *e* and *ah*, four *e* and *ah* . . . to give a subdivision on each count."

A good sense of rhythm is very important for an engineer, especially in multitrack work, Minto offers. "I know the punching times for different recorders. Take the MCI, for instance: it might take a 1/30th of a second before the machine takes hold, and longer when dropping out. Depending on the style of music and tempo, I will have to anticipate by a 16th note, or whatever. Being able to subdivide notes really helps me getting in *and* out of punches cleanly."

When you're working on a line from a section in a song, Minto advises, always give the artist the line just before it, and catch the breath before the word at the punch-in. Getting out is just as difficult; you want to make sure you don't erase the breath for the next line, just in case it's a keeper.

SONG STRUCTURE OF TANE KAIN SONG, "MY TIME TO FLY," ANNOTATED BY SESSION ENGINEER CHRIS MINTO

Song Form	Reel Time (From multitrack tape position counter)	SMPTE Labels (From Neve NECAM console automation system)
[Tape Starts]	0.00	1
Introduction	0.09	2
Verse #1	0.22	3
Intro #2	0.46	4
	[0.50 . . . Band Entrance . . . 5]	
Verse #2	0.51	
Chorus #1	1.17	6
Intro #3	1.40	7
Verse #3	1.48	8
Chorus #2	2.13	9
Bridge	2.36	10
Verse #3	3.02	11
Outro	3.26	12
Turnaround #2	3.33	13
Turnaround #3	3.50	14
Turnaround #4	3.59	15
End	4.16	16



"Sometimes a singer may not be right on pitch," Minto continues. "If they hear too much track in the earphone they go flat, if they have too little track in the earphone they'll go sharp. I always wear earphones [in the control room] so I know what they are hearing." An engineer will always look better, and gain respect and confidence if you can count rhythm and recognize song Blueprints, Minto concludes.

Writing Your Own Chart

A music script tells an engineer what the song Blueprint will be, and outlines the song arrangement. This can be elaborated on by writing the script on music paper. Bruce Swedien, considered by many to be the dean of recording engineers, has received many awards for his engineered records dating from the late Fifties. In recent years, Swedien and Quincy Jones have become one of the most successful producer engineer teams. He's also an able pianist.


BRUCE SWEDIEN

"I like to write out my own chart," Swedien says, "because it helps me understand the song, and is my way of seeing the production as a script. The way I work on pop records nowadays, with many rolls of multitrack tape, I'm able to keep a record of the song as it develops. I'll refer to my music sheet during all the stages of production."

Swedien starts his script by blueprinting the song on music paper, and writing out the bars and bar numbers. As the rhythm track is recorded, autolocater numbers are added, along with the SMPTE timecode references. This musical script will be his instant, fast, and concise reference to the music being recorded. As the production develops, Swedien notates elements that he feels will be important for the final mix; for example, edit marks, the key or keys

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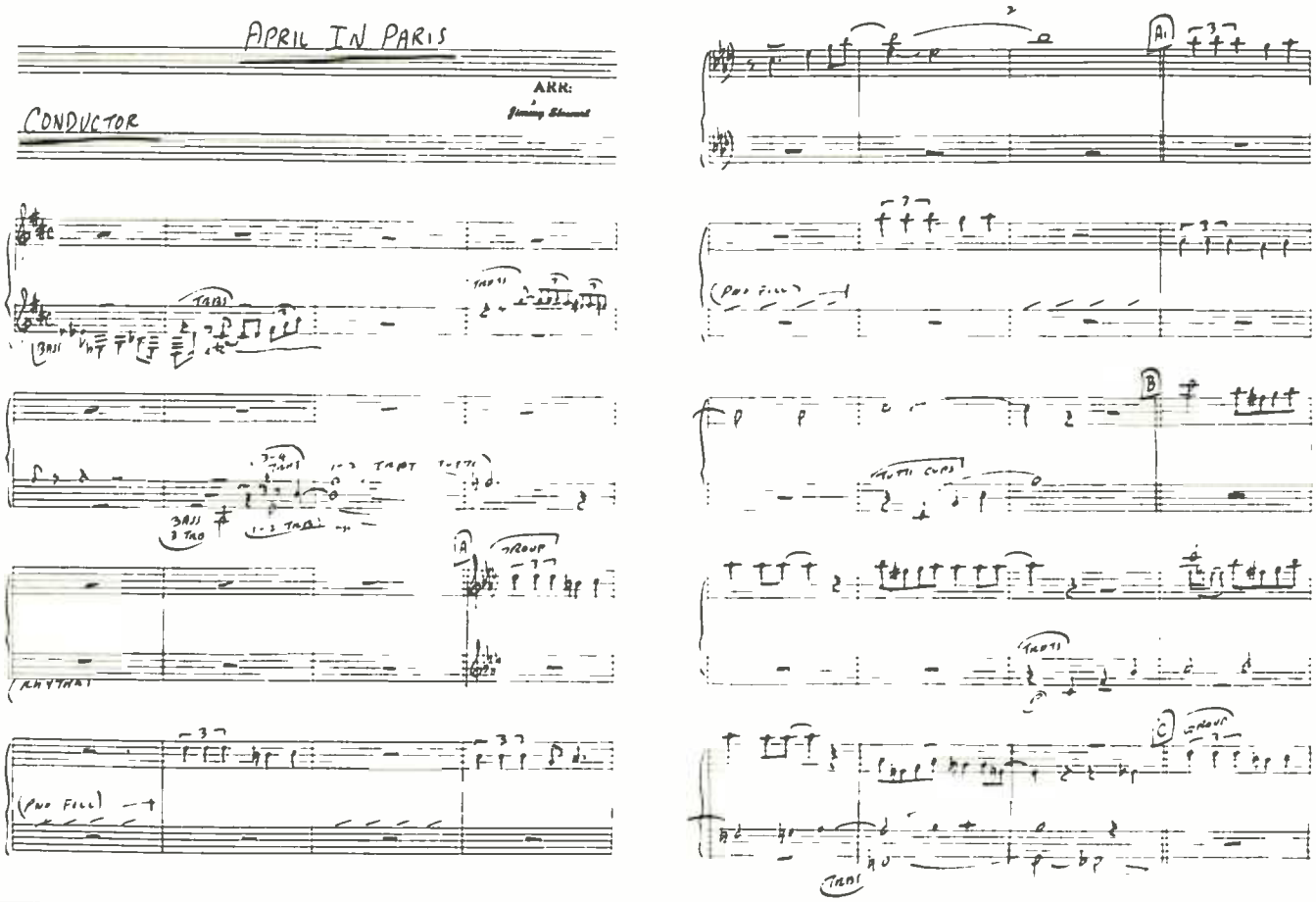

The Physics of Music

The varying and contrasting degrees of intensity or loudness in musical tones are refered to as dynamics. Increases or decreases in volume are indicated by the following terms: *pianissimo* (PP), very soft; *piano* (P), soft; *messo piano* (MP), moderately soft; *mezzo forte* (MF), moderately loud; *forte* (F) loud; *fortissimo* (FF), very loud; *forte piano* (FP), loud and immediately soft; *sforzato* and *sforzando* (SF, SFZ), heavily accented; *cresendo* (CRES, or <), getting louder; decrescendo and diminuendo (DECRESC and DIM, or >), getting softer.

Rhythm

Rhythm has several dimensions that need to be coordinated by the mind and ear: meter, tempo, and duration. Meter is the structure of regularly occurring *accents*

NOTE EQUIVALENTS AND THEIR CORRESPONDING RESTS

NAME	DURATION (WHEN QUARTER NOTE GETS ONE BEAT)	EQUIVALENT REST
WHOLE NOTE	4 BEATS	
HALF NOTE	2 BEATS	
QUARTER NOTE	1 BEAT	
EIGHTH NOTE	1/2 BEAT	
SIXTEENTH NOTE	1/4 BEAT	
HALF NOTE TRIPLET	4 BEATS	
QUARTER NOTE TRIPLET	2 BEATS	
EIGHTH NOTE TRIPLET	1 BEAT	
SIXTEENTH NOTE TRIPLET	1/2 BEAT	
DOTTED HALF NOTE	3 BEATS	
DOTTED QUARTER NOTE	1-1/2 BEATS	

being played as the song progresses, bass-line elements, set-ups, breakdowns, links, special equalized notes, sections or instruments that need reverb attention, plus the song form (see accompanying chart for "Livin' in America").

Using a Conductor's Score

Jim Mooney is a trumpet-player/engineer, and the owner of Sage and Sound Studios in Hollywood. He specializes in recording small groups and stage bands.


JIM MOONEY

"A two-line conductor part can make a nice production sheet for me," Mooney says. "It's especially convenient to see all the musical lines in the treble clef. This form of conductor's part tells me what instruments enter, and blueprints the arrangement for me. Once I get my levels set on the first run through, I'll look at the chart for instrument blends that I might work on with mike placement, and circle them on my score. For example, during the intro to 'April In Paris,' second bar, the trombone line and trumpet line answer in bar #4 will need some touching up [see accompanying chart]. I can tell by the trumpet register [high pitch] that there will be loud 'shout.' I also like to mark modulations [changes of key], which helps me understand what the form is, and build in the arrangement.

— continued . . .

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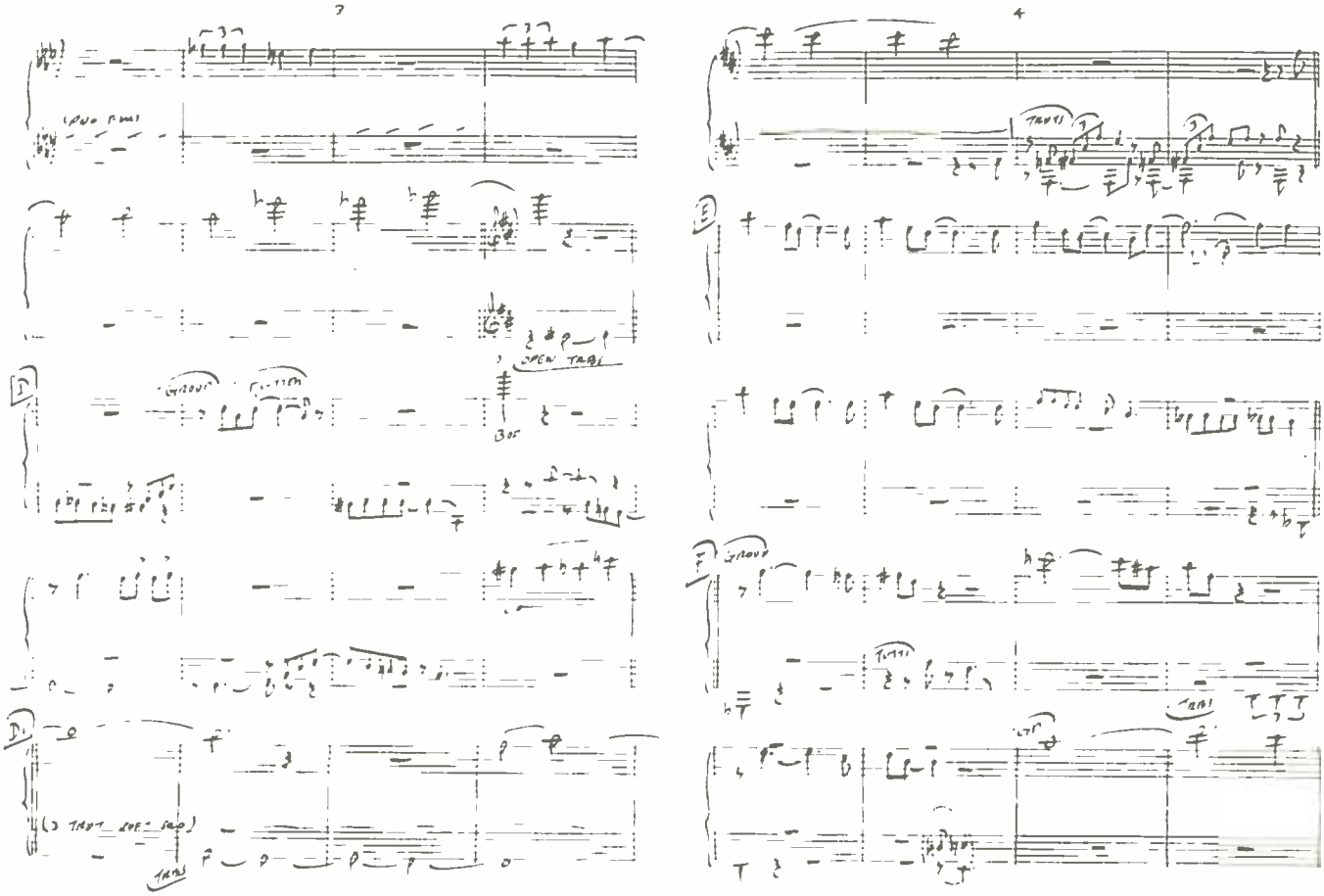
APRIL IN PARIS ... *continued* —



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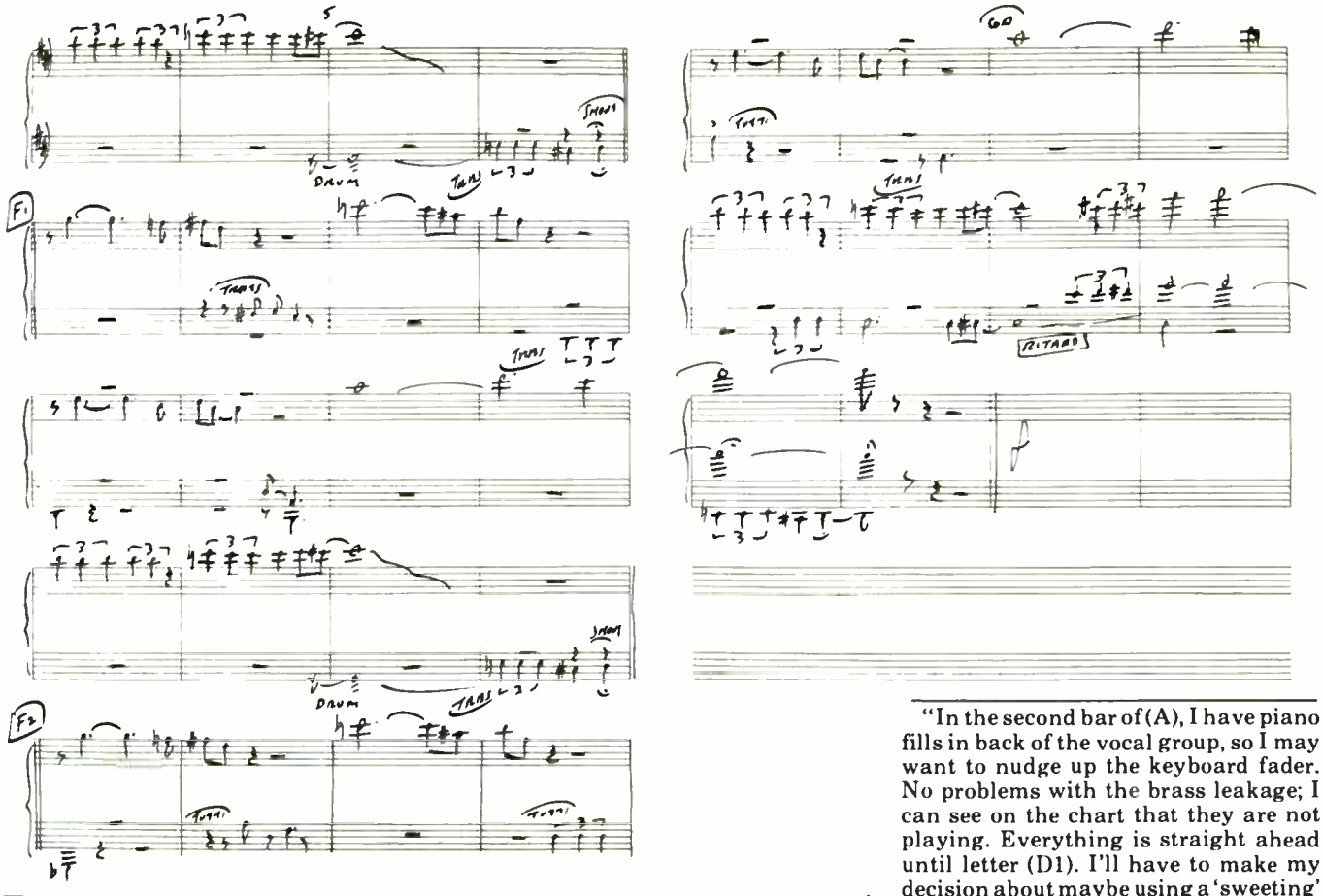


The Physics of Music ... *continued* —

or *pulses*, which underlines the particular rhythm of a melody or harmonic progression. The rhythmic pulses (which also may be called counts) lead us to divide sequences of notes into groups called *measures*. This division makes the grouping of the time relationship between segment of the melody easier for the eye and mind to grasp. The different measures are separated by bars, or straight lines drawn vertically across the staff, which is a series of horizontal lines upon which tones and their durations are represented. The notes are of different durations, but a pattern of accented and unaccented notes or rests usually repeat themselves throughout the piece.

A whole note, represented as an unfilled oval, is the standard by which all other notes are measured. It is divided by fractions of two into half-notes, quarter-notes, eighth-notes, and so forth, as shown in the accompanying table of note equivalents and their corresponding rests. The series of rests represent silences of equivalent duration to the corresponding notes.

Since writing out each set of equivalents can be a tedious process, shorthand symbols have been developed for common combinations. The dot and the tie are two of these. A dot after a note indicates that the note is to be increased by half its normal duration. That is a dotted quarter note is equivalent to a quarter-note/eighth-note combination. Dots also work with rests in the same way.

Meter refers to the patterns and spacings of beats within the bar, while tempo refers to the speed of the beats within it. The song tempo ordinarily is indicated at the beginning of a piece by a word or phrase of instructions, fast, medium or slow.

Tempo indications can be coupled to the Time Signature (also called the Metric Signature) to establish the performance rhythm of a piece. The Time Signature is also found at the beginning of a piece, and resembles a fraction. The numerator (top number) refers to the number of beats in a measure, while the denominator (bottom number) indicates which length note gets one full beat. The basic pulse is always counted as an integer. Try tapping as you count out the patterns below:

ONE BAR OF 4/4 TIME

QUARTER NOTE	ONE —	TWO —	THREE —	FOUR —
EIGHTH NOTE	ONE — AND	TWO — AND	THREE — AND	FOUR — AND
SIXTEENTH NOTE	ONE · E · AND · A	TWO · E · AND · A	THREE · E · AND · A	FOUR · E · AND · A
EIGHTH NOTE TRIPLET	ONE TRIP-LET	TWO TRIP-LET	THREE TRIP-LET	FOUR TRIP-LET

"In the second bar of (A), I have piano fills in back of the vocal group, so I may want to nudge up the keyboard fader. No problems with the brass leakage; I can see on the chart that they are not playing. Everything is straight ahead until letter (D1). I'll have to make my decision about maybe using a 'sweeting' mike for the *soft* trumpet solo that enters at that bar, if he will be playing with a mute on the horn.

"My next spot to watch will be two bars before letter (E): trombones and trumpets shouting after the soft trumpet solo, so I need to watch my levels. The sixth bar of letter (F) has the trumpets starting the lick, and are joined by the trombones. I need to think about the blend, and balance. When I'm recording direct to two-track, I'll have to ride the faders because I'll be pulling up solos. I'm not saying that I go crazy on the faders; you'd be amazed how much 2 or 3 dB pull can help you in a soft spot, and pulling down the same amount in a loud spot. As long as it's *subtle*, the listener won't really hear it.

"When I'm recording a big band, I'll study the score looking for solos, ensembles, and the basic orchestra for my mike setup. I try and hear the parts, and visualize presence and dynamics as if I'm hearing it on the monitors. I have learned from experience in recording stage bands that I can spot most problem areas. With top professional players, the horn sections are always in balance, but with college bands there is always a problem. For example, on a four-way sax solo the lead players sound may be 'brittle'; this calls for a different mike. Some sax players may change a reed on me, which alters their sound. All of these things relate to the music. If I didn't read [charts] I might think that something is going wrong at a technical level."

A conductor's score tells you what

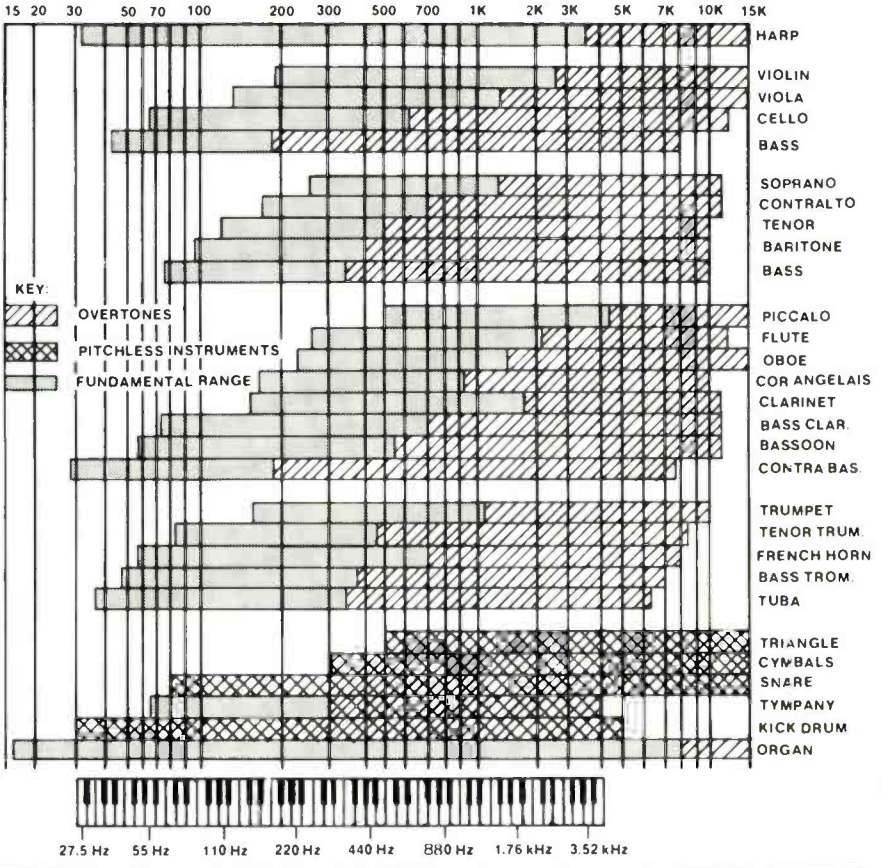
instruments will be playing, and how they relate to the production of a recording. In many ways, it's like driving along the freeway; the score is your road map. It's telling you what to expect, where the curves are going to be, where the turn-off is, and a lot more. It can even tell you "weather conditions," as in the case of dynamics — raining is akin to heavy fortes, and clear weather the case where everything is smooth, and you can sit back and enjoy the performance.

"Some musicians and producers have a tendency to put down engineers if they can't follow orchestrated music," Mooney offers. "I was once recording a classical pianist, and we had to make a difficult punch. I asked if he would give me the music. I was able to follow the passage, and he did a complete turnaround. Everyone was very happy with the session after that."

* * *

In part two of this article, to be published in the August issue, Jimmy Stewart will move on to consider more complex musical charts. Engineer Larry Brown will explain what sort of production information he can glean from a Master Rhythm Chart, while Rick Riccio, who engineers sessions for TV and film music soundtracks, will consider the increased detail found on a full score sheet. — ***Editor.***

FREQUENCY RANGES OF STUDIO INSTRUMENTS



BABY 'O RECORDERS

A Second-Floor Studio Complex With its Own Particular Sound Isolation Problems

by Larry Blake

In today's buyer's market, a smart shopper for session time can find 24-track studios available in most larger cities for $50 an hour. Conditions like this are driving many facilities out of business, and demand that studio owners think long and hard about any new purchases, much less building a new studio.

By the same token, no smart businessperson hesitates to seize the opportunity to expand with success. For the recording world, in this era of specialization, expansion often means increasing a facility's flexibility. Just such an expansion took place in April 1983, with the opening of Baby 'O Recorders' Studio B in the Berwin Entertainment Complex in Hollywood. With the facility's Studio A booked solid by Kenny Rankin, Ambrosia, and Lakeside, among others, since its opening in April 1982, the owners of Baby 'O consulted with Chris Huston, designer of Studio A, regarding the possibility of adding a second, smaller studio. In addition to handling overflow from Studio A, "B" was designed from the start as a mix-down/production room.

The idea for Baby 'O Recorders initially came from Rafael Villafane, co-owner of the popular — they often have lines around the block at 8 *AM* — discotheque in Acapulco. (Incidentally, the name "Baby 'O" comes from the title of an old Dean Martin song.) Villafane also is a musician, and has spent many session dollars with L.A. studios while recording a number of albums. One of the studios that he patronized frequently was Golden Sound, a Los Angeles facility in which Rick Perrotta had a partnership. Realizing that the amount he was spending out of pocket every year at other people's studios was more than a down payment on a state-of-the-art facility, Villafane, Perrotta, and Enrique Senker, one of his partners at the Acapulco disco, decided to build a studio from the ground up. (Well, not exactly, as we shall see later.)

Berwin Complex

"Rafael [Villafane] and I were driving around," Perrotta recalls, "feeling out prospective areas that were centrally located. We happened to drive by this building [in Hollywood] and we said, at the same time, 'Look at that beautiful building.' When Gary Berwin showed us around, it was an automatic decision — parking lot, large rooms that were once handball courts — and the building had *vibes*."

Built in 1926 as the Hollywood Athletic Club, the complex counts almost any star (male, that is) that you care to name as a former customer. (Film buffs will remember Mike Hammer finding The Bomb there in "Kiss Me Deadly.") Gary Berwin had bought the complex in 1979, the building having housed The University of Judaism for 24 years prior to his acquisition.

Along with the "vibes" came a few problems, primary among them being that the conveniently high-ceilinged handball courts were not only located on the second floor, but in the rear of the building, making the first-floor entrance on Sunset Boulevard inconvenient, at best. A bridge entrance leading out to the rear parking lot was constructed at a cost of $12,000. In addition, an enclosed forklift was necessary, as Perrotta notes: "The [necessary] legal requirements to allow handicapped people to enter your building makes the cost of whatever you're doing much higher. We were going to put in an elevator, instead of a forklift, which would not have cost that much money. Actually, the elevator would have cost about the same as the forklift — about $5,000 — but to make it suitable for handicapped people would have driven the cost up to about $9,000. So it was cheaper to buy a forklift, which was not subject to any of those regulations." [Useful advice to studio owners, provided they fully understand their *legal* obligation to provide access to handicapped engineers, producers, and musicians. — *Ed.*]

"You can make a studio sound good," he continues, "whether you're on the second floor or the fiftieth. *But*, being on a non-ground floor means spending a lot more bucks!"

Just as the bridge has proved to be a great convenience, another costly problem proved to be a blessing in disguise. "When we moved into the building," Perrotta remembers, "we assumed, because everybody else in here was able to turn lights on and have typewriters going, that there was a source of power for us. We though that the building had a power vault.

"But when we applied for a permit to hook up our electricity, the electric company told us that the present vault was completely over-taxed, and we couldn't take any more power.

"At that point we had no choice but to build — to some very, very rigid specifications — a completely new vault. And even though we knew that this would cost a lot of money — $20,000, or the cost of two Studer two-tracks — we didn't mind doing it because we knew that we would be doing further development in the building, and we would have first rights, legally, to access the vault. So we built the new vault under Hudson Street, and ran our power in from there via three big distribution transformers.

"A further benefit to us is that it's all new equipment, and is overrated beyond our present needs. The power, including the lighting, is again isolated at each studio via isolation transformers. So, if someone comes in wanting to do a video shoot, not only is the audio power going to be clean, but if they need to hook up lights, the lighting power will be pure, too. We don't ever anticipate having a problem from outboard sources coming in and hooking up to our power. We have

— *continued overleaf . . .*

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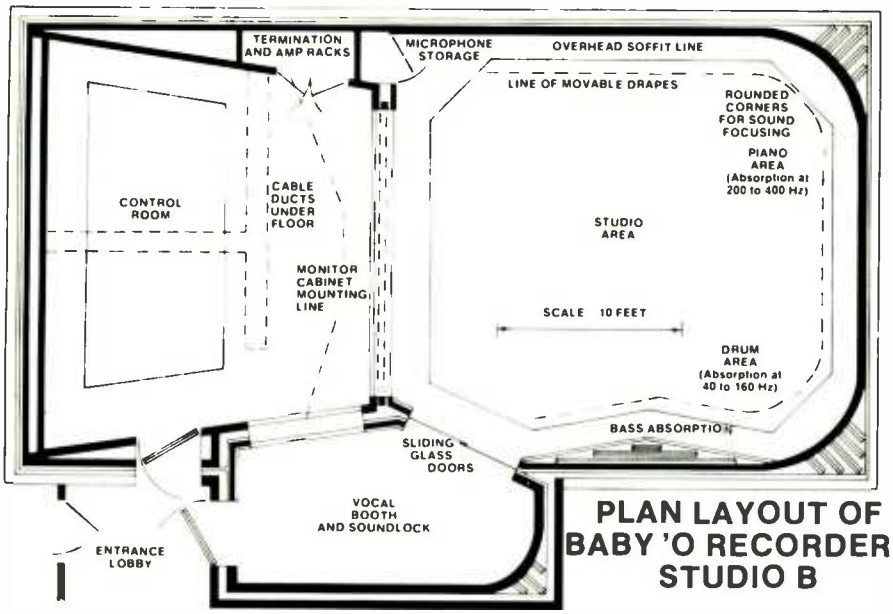
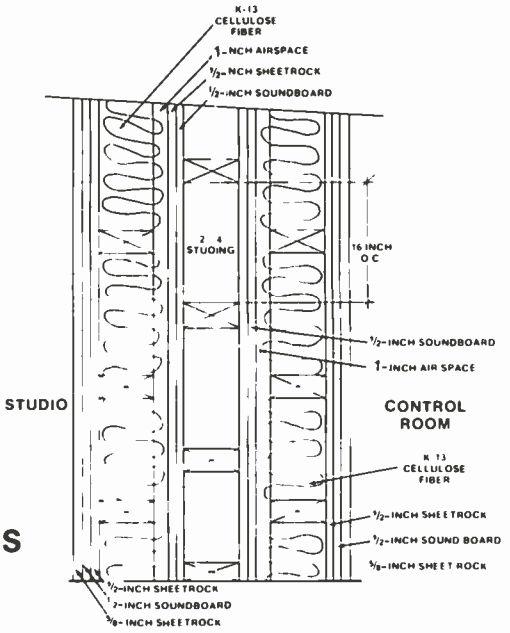


PLAN LAYOUT OF BABY 'O RECORDERS STUDIO B



CROSS SECTION OF WALL BETWEEN CONTROL ROOM AND STUDIO AREA

such overkill that it's ridiculous!"

Design of Studio B

A constant bookings schedule for Studio A — despite being financially satisfying — became somewhat frustrating for Perrotta, "because I would have to turn a whole album over to a friend [at another studio]. Whenever I did this, it was like giving away $30,000!"

The decision to build Studio B was made in the summer of 1982, with construction beginning that November. The new control room and studio area was designed by Chris Huston as a self-contained facility; the amenities necessary during a lock-out session have been provided, including its own kitchenette, bathroom and lounge attached to the studio.

"I've always found that when musicians take a 20-minute break, it is always an *hour* and 20-minute break," Huston offers. "That's downtime to a studio owner — you can't rent the time. You can't give it away, and you can't charge for that time. With this in mind, Baby 'O Studio B provides an area where people never have to leave the studio. We provide drinks, fresh fruits, and vegetable — and even bagels — to make it easier to stay within the environment and create... where the music is the most important thing."

Notable among the creature comforts that form part of Studio B is a Jacuzzi. "I know that the idea was worn out in the Seventies," laughs Huston, "when they were used as a communal hot tub. We had a totally different idea in putting it in Studio B, though. Even if the clients don't use it, we will. There are many times during a mix when you can't go any further, creatively. What's the problem with taking 15 minutes to relax and get your mind off the music?"

Chris Huston has incorporated into the design of both studios numerous ideas that have evolved over 20 years of working as a musician, engineer, producer and, latterly, studio designer. Although Huston's initial passion, while growing up in Liverpool, England, during the late Fifties, was art — he was well on his way to becoming a commercial artist at the age of 15 — he found that there was more money to be made playing guitar in his band, The Undertakers.

Later, having relocated to New York, Huston found himself on the other side of the glass, producing and engineering at Talentmaster Recording Studios. In the period from 1965 thru '68, he engineered for many Atlantic Records artists, including the Young Rascals ("How Can I Be Sure?," "Groovin'," plus two albums for the band), Sam and Dave, Solomon Burke, and Wilson Pickett. In addition, Huston recorded the Who's "Sell Out" album, "96 Tears" for ? and the Mysterians, Mitch Ryder, and two albums for the hardest-working man in show business, James Brown.

Huston remembers that creative era of three- and four-track recording during the Sixties. "In the old days," he says, "musicians would play with each other; they were in tune with each other, and had visual contact. There was something happening in the room that you *had* to get down. I can remember recording string sessions with tears in my eyes — the emotion of that many people playing as *one*."

Against this background, in 1968 Huston was able to merge his musical and artistic skills when he was placed in charge of redesigning Talentmasters Studios after the facility had been purchased by Atlantic Records. Later studio design assignments included Mystic Studios in Hollywood, a remote truck for Far Out Productions, and the design of George Benson's Lahaina Recorders, based in Hawaii.

During the Seventies Huston grew up with multitrack along with the rest of the industry, engineering and producing such acts as War, Blood, Sweat and Tears, and Jimmy Witherspoon. Both studios at Baby 'O reflect his opinion of the effect that 16- and 24-track recording technology has had not only on the *modus operandi* of rock music sessions, but also on studio acoustic design. "In the Seventies," he offers, "with the advant of 24-track recording everybody wanted everything to be totally isolated, and the acoustics in recording studios were correspondingly treated to be very dead. It got to the point where the bass [in those studios] tended to get sucked

STUDIO B CONTROL ROOM EQUIPMENT LIST

Console: 56-input Trident Series 80, linked to Melkuist GT-800 disk-based automation system (shared with Studio A); 46-track operation and video sweetening with Audio Kinetics Q.Lock 3.10 SMPTE synchronizer.
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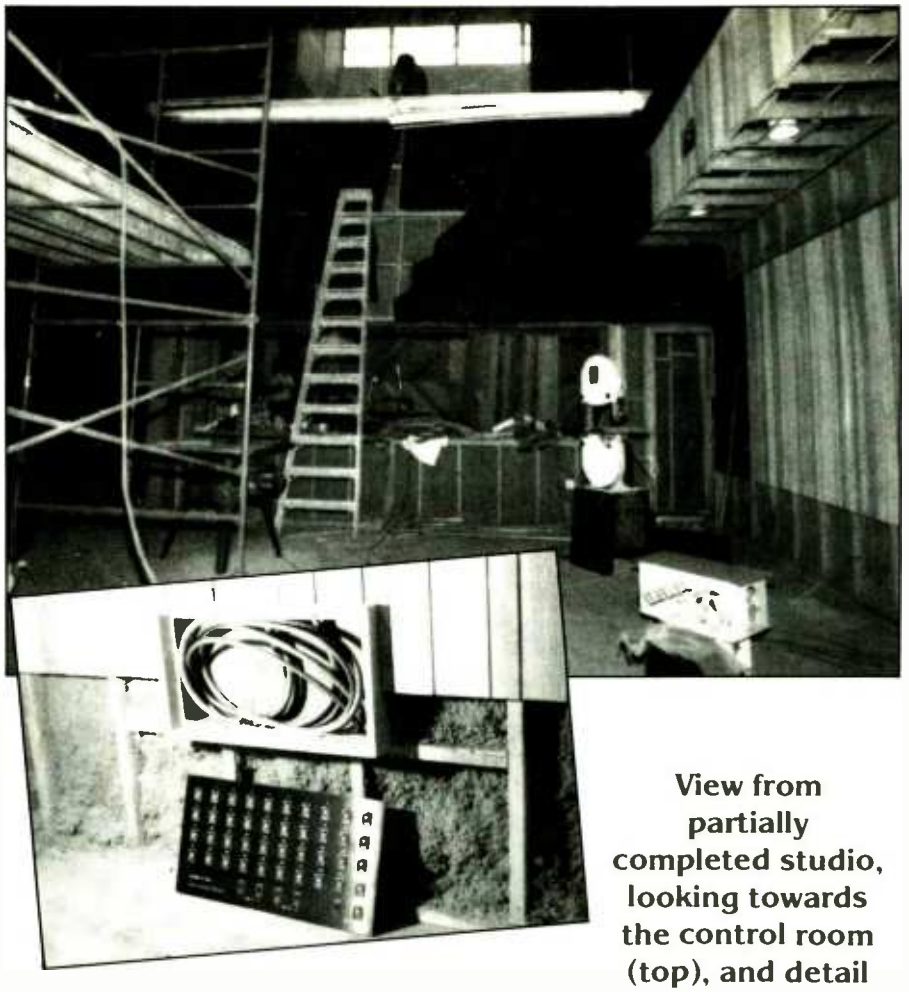
All Photography by KATHY COTTER

into the walls immediately, and the highs would tend to continue travelling in a straight line. Maybe this is because today we create a performance, whereas 15 to 20 years ago we were documenting a performance. If you listen to a lot of records from the Seventies, you will notice that they have a lot of highs, a lot of lows, and a shallow mid-range, strange as it sounds. The lows after reaching their physical limits turn back into the room, thereby 'modulating' the other acoustic information. In broad terms, this can be stated as excitement, or musical energy.

"My idea at Baby 'O was to build a *live* studio, where the music comes back at you, to put it bluntly. A musician should be able to feel the air *move*, and feel the effect of the studio. In the broadest sense, I'm trying to put more 'liveness' back in the rooms. I feel that a musician is much more comfortable if the creative surroundings are pleasing to him, and he doesn't feel oppressed by them. He has to feel that the room is going to work *for* him, and is not bigger than he is.

"One of the funny things about mixing in the Seventies that I noticed — and it took a long time to realize — was that you'd do a track, and spend a couple of weeks overdubbing. But, when you came to mix it, you could never recapture the original *magic* — the reason you chose the track to begin with. The pianist had overdubbed his part, and the guitar player had done his part again. In fact, the drums might be the only instrument you have left from the basic tracks.

"Recording 24-track gave you *so* many options that it took the intrinsic value of the music away. You came to mix it, and all the overdubs seemed to be going parallel. In order to find the mix you'd have to go back to when the musicians played against each other — played *with* each other. If you're listening on headphones while doing overdubs, it's easy to play at a continuous volume level, with a continuous sort of feel. What he's playing will not reflect the dynamics of the track."



View from partially completed studio, looking towards the control room (top), and detail of wall mounted microphone and foldback connector box.

Studio Acoustic Design

The main room at Baby 'O, Studio A, measures 50 by 30 by 25 feet (length/width/height), and occupies the area of one of the converted handball courts. The control room, two iso rooms (one live, with reflective wall surfaces, and the other dead) plus bathrooms fill a second court, and office and workshop a third. By comparison, the whole complex of the recently opened Studio B occupies the space of a single court, with its main recording area half the size of Studio A's.

"Pretty early on I realized that I would have to tune the part of the room that would be used for drums," Huston continues, "and also the part for the acoustic piano. So, in designing the room I made the baffling around the drum area [on the right rear looking from the control room] consistent with taking away the very, very lows around 40 to 160 Hz that you are liable to get from kick drums. The baffling around the piano area soak up the frequencies around 200 to 400 Hz, so that the second and third harmonics from the drums would not affect the piano.

"In doing the room tuning I used rough cedar planking, which has a very good absorption coefficient, and is very 'natural' sounding. The specific [absorbed] frequencies are arrived at by the use of Helmholtz resonators. These calculations "play" the depth of cavity behind the wood slats with the width of the wood itself and, most importantly, the width of the space between the slats. The principle of the Helmholtz system allows for the wood slats to vibrate sympathetically, thus absorbing troublesome modes of sound energy."

Both Studios A and B feature movable, sound-absorbent drapes of velour on the side walls, and which can be brought in to further deaden selected parts of the room. The rear corners of each room are rounded, one being fully covered with wood, and the other a 50% version intermixed with felt over masonite, so that the latter is not quite so reflective as the other corner. "The roundness focuses the sound to the radius, and adds a coloration to it which is controllable because of the drapes," Huston says.

"Concert halls traditionally are not acoustically perfect," he continues, referring to the general acoustics policy adopted at Baby 'O. "Part of the glory and bigness of an orchestra comes from the acoustic enhancement of all those random modes. When building a live studio, you would be leaving something out if you didn't build in some of those random reflections and absorptions that they have in concert halls. For example, we have the ability to create a flutter echo, if you need it."

Baby 'O Recorders' second-floor location poses not only potential sound isolation problems for the studio, but also sticky legal problems should the nuisance clause in other tenants' leases be violated. Unable to float the preferred three- or four-inch concrete slab in Studio B, because of the large unsupported area, the builders instead "poured to flat." This resulted in a concrete slab no more than 1.5 inches deep at the thickest part, with some areas, due to the unevenness of the original floor, consisting of only a scraping. Perrotta says that, so far, the studio has experienced no problems with regard to sound either leaking into the studio or, possibly more importantly, given the facility's close

— *continued overleaf . . .*

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With the Dyna-Mic, we modified our revolutionary Trans-Amp™ technology to provide transformerless brilliance to all input sources... mics, instruments, semi-pro outputs, and line levels. Mixing controls and front panel switches allow complete routing freedom... either or both inputs may be passed through the EQ section. Here, the three EQ frequencies are tailored to musical centers (44Hz, 880Hz, 3520Hz), with ± 14 dB EQ available in each band. Even the outputs are special. Optimum level interfacing is provided not only for feeding line level gear, but also for driving musical instrument amplifiers or audio sections of video equipment and semi-pro gear.

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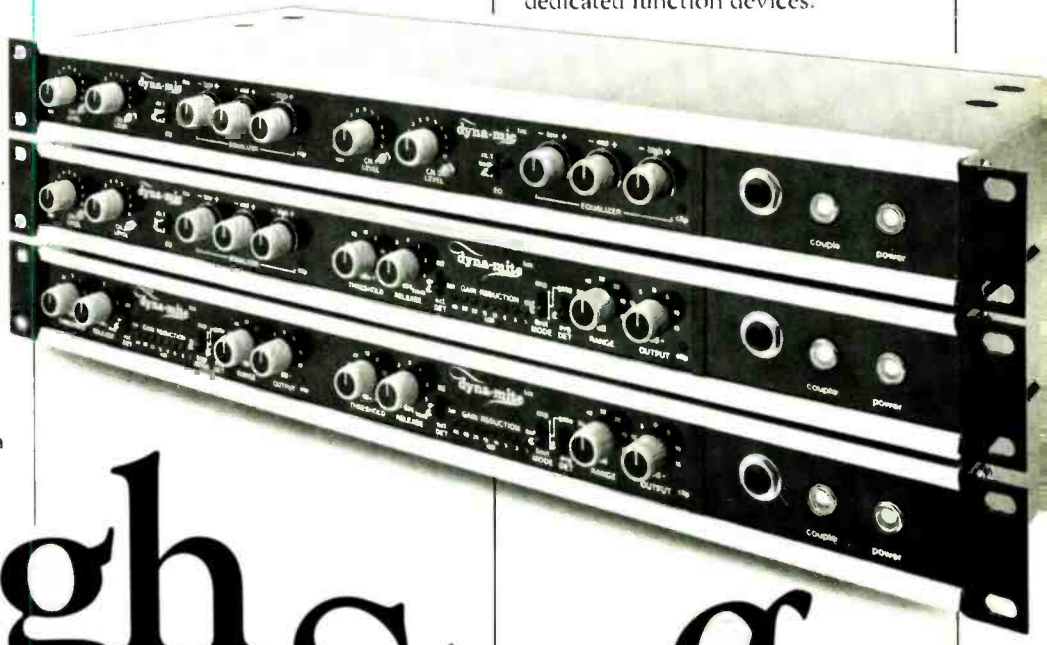

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The Model 431* – A combination of one Dyna-Mite channel and one Dyna-Mic channel. This unit will accept a variety of input impedances and levels and optimize them for routing through the 3-band EQ section and/or the Dyna-Mite.

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*Each model is shown with the optional, front panel jack, which allows the user ready access to inputs, external inputs, outputs, patch points and control/meter functions by use of a patch cord at the rear panel. This accessory is especially useful for level alignment checks, control room or production room overdubs, remote metering applications and direct musical instrument inputs at the front panel.

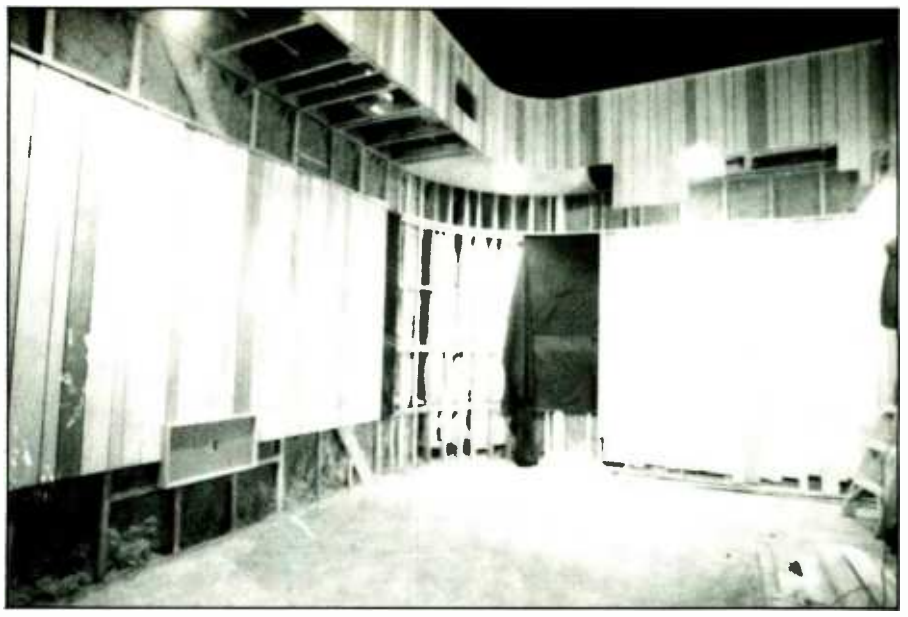
neighbors, passing to the outside world.

Control Room Design

Since a major use of Studio B is expected to be for mixdown, Huston tailored the control room acoustics with this application in mind. As he explains, "When we came to do Studio B, we had the option of putting in a 14-foot ceiling, as in Studio A's control room, or a 12-foot ceiling. I opted for a 12-foot ceiling in order to load the sound a little tighter bass-wise. As a result, some of the things we have to do electronically to compensate for the volume of the room [as in Studio A], we didn't have to do in B. You really can't notice it, but by having the ceiling two feet lower there are actually a couple of hundred cubic feet that the bass can't go to."

The main monitors in the control room are three-way systems custom made at Baby 'O, and utilize a pair of JBL 2235H 15-inch woofers, JBL 2221H 10-inch mid-range drivers, and TAD TD-4001 high-frequency drivers working to Gauss 8263 horns. The system is tri-amplified with BGW 750 power amps, at crossover points of 400 Hz and 1.2 kHz. Why go to the trouble of designing and building your own system, we asked, when there are so many studio monitoring systems available off-the-shelf? Rick Perrotta explains: "First of all, we felt that since we were in a position to build a studio from scratch, why *not* build our own monitors? Everybody has his or her own concept of monitors, and there doesn't seem to be any *real* standards, other than the UREI [Time-Aligned] system, or [Altec] 604s.

"Second, we wanted a large system that would be relatively maintenance-free, with a lot of 'overkill.' We proved this with a group that blew out four pairs of JBL 4311s, two pairs of [NS-10M Yamahas and, in our big system, only two of the mid-range drivers. Had we not had overkill in the big system, we would have been tearing up the speakers every other day, which would have meant down time for the studio, maintenance expenses, etc. etc. We felt that building a system of this nature would make the studio more trouble-free."



Recording area interior of Studio B, showing rounded corners for focusing sound and to provide individual character acoustics for recording drums and keyboards.

Less exotic and more familiar monitoring is available in the form of UREI 813s, and JBL 4311s. "Real-world" monitoring is provided by Auratones and Yamaha NS-10Ms, which can either be powered by the studio amps, or a consumer receiver rated at 35 watts per channel.

Equipment Selection

Baby 'O Recorders makes use of a Trident Series 80/Studer A800 combination in both of its control rooms. "I like the simplicity of the Trident board," offers Huston. "Trident made their name on the transparency of the signal. They didn't choose to cut down the signal bandwidth to help improve the signal-to-noise ratio."

"We were in a position, financially, to buy any board that we wanted," notes Perrotta. "We considered all of them. The more complex the board is, the more problems a studio has in aiding an engineer in the operation and maintenance of that board. So, we opted for a very *simple* board with no frills, and no extra BS. I feel I can sleep at night with the Series 80; if something putzes out, it's real easy to get it going."

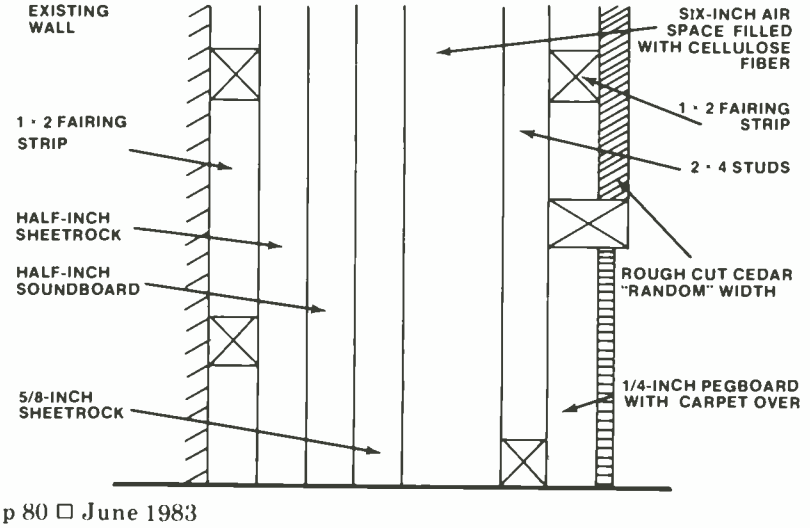
Some of you may be wondering why, since price was no object while outfitting the studio, Baby 'O didn't purchase a "top-of-the-line" Trident TSM console? Rick Perrotta explains: "Although the TSM was a nicer console, the noise factor and crosstalk were higher. [An unavoidable fact of life, Trident USA's VP Ken Bray concedes, because of the additional circuit complexity and larger mainframe size of TSM consoles — *Ed.*]

"What led us more to purchase the Series 80 — and it wasn't dollars — was that the Trident name, with the success of the old 'A Range' consoles, put us in a good position. When people ask us what kind of console we have, the minute we say 'Trident' it's automatically accepted."

While the Series 80 boards in both rooms have 24 output busses, the new console for Studio B is equipped with 56 inputs, compared to 40 in Studio A, thus enabling SMPTE-locked, dual 24-track mixdown. The Trident Series 80 design is of a split rather than in-line format, and is made available with separate monitor modules, which in the layout adopted for Studio A. A separate monitor section was not purchased for Studio B, however. Instead multitrack returns are dedicated to console inputs 1 thru 24. In this manner, full equalization is made available during tracking *and* playback and overdubbing. Monitoring during both modes of operation is handled via the Series 80's dedicated stereo remix bus.

Huston offers his own thoughts on this somewhat unusual console layout: "I prefer to monitor *exactly* what is coming off the tape, but I find that a lot of clients rely on equalization of the play-

CROSS SECTION OF STUDIO WALL ACOUSTIC TREATMENT



back during overdubbing. They have a very logical way of explaining it — they want to be able to equalize what they have on tape as they go along, so when they get near the final mix it's that much easier.

"I also have a pet peeve [with in-line consoles], in that the monitor sections always have rotary pots, or a mini-fader. They are like after thoughts, all packed together, in almost every console I've ever seen."

Perrotta feels that on most in-line designs, "the monitor section sounds different. In addition, I think you get a more realistic picture, sound-wise, by just using a standard input module. There are less amplifiers, noise and stuff in the chain, and it sounds *better*. Also, using input modules [to provide monitoring] allows the producer to fool with his levels and equalization, and not affect what the engineer is doing."

In regard to the choice of A800 multitracks, Perrotta says that "we bought Studers because they will probably run longer over a period of time with less maintenance costs overall than any other machine. We bought [the A800] for the ruggedness of construction, which is, I think, the only thing that the more expensive machines have over the others. *All* 24-track tape recorders sound pretty good; there's not a bad one on the market.

"But I definitely feel that for the amount of money a Studer costs, its audio performance isn't a justification of the price. To my mind, the old 3M Model 79 — which I've had a lot of experience with — with all of its 14- and 15-year-old technology and op-amps, still has better 'transparency' than a brand-new Studer A800. And I think a Stephens machine sound better than *all* of them.

"In fact, I think the American machines have been able to achieve better audio performance, electronically, in terms of noise and headroom, than European machines. The Europeans seem to want to so completely control the parameters of an amplifier that they tend to put in self-limiting factors, such as many points of feedback. They actually over-design [their circuits], and the amplifiers are *too* stable; they like to make things so tight that they only like to run within a certain set of parameters. But I'll have to give the European manufacturers this: they have the mechanics worked out to *perfection*."

Perrottta also keeps a 16-track head block on hand for the Studer multitracks. "That was part of Chris' design: to go for a 'liver' recording environment, with less overdubs," he recalls.

An Audio Kinetics 3.10 Q.Lock SMPTE synchronizer and a Melkuist GT-800 disk-based automation system are shared by both rooms. Mixdown is to a collection of Studer A-80 ½-inch and Ampex ATR-102 ¼-inch two-tracks, plus ATR-104 ½-inch four-track decks.

Future Expansion Plans

Having run out of deceased handball courts, so to speak, there's no further space at the Berwin Entertainment Complex to construct a Studio C. However, there is plenty of room at a 350-year-old castle owned by Villafane, and situated on a 1,000-acre ranch 40 miles outside of Mexico City. Containing eight living quarters, the castle will have plenty of room for a proposed Studio C within it two-foot-thick walls. Construction is scheduled to begin this summer.

Closer to home, plans are in the "lease negotiation" stage to develop a nightclub, a video shooting stage, and a video post-production room, all of which are planned for the first floor of the Berwin complex. The proposed video stage will be located directly beneath Studio A, where at present there is an Olympic-size swimming pool dating from the Hollywood Athletic Club days. The video post-production room will be used not only for on-line editing, but also as a control room when taping acts either on the video stage, or in the nightclub scheduled for the complex. "The nightclub will be a showcase for bands where we can do 24-track recording *and* video recording, tied together with SMPTE timecode, in a live-mix situation," Perrotta adds. "This way a band can walk out the door after a performance with a 1-inch master *and* a multitrack audio tape." ■■■

STUDIO FACILITIES EQUIPMENT PEOPLE UPDATE

Northeast:

☐ **EDITEL-NEW YORK** (New York City) has opened the Editel Sound Mix Room for audio-video post-production sweetening. The new room features an automated Solid State Logic 6000 series console with 32 inputs and 6 mix busses (three stereo pairs for effects, dialog, and music), and equipped with SSL's Events Controller used to roll cart players, cue non-synchronous tape machines, fire cue lights or switch digital processors. Tape machines include Studer A800 24/16- and 8/4-tracks, and A80 2-track; all are equipped with Dolby noise reduction. The system includes 35/16mm mag playback, as well as stereo audio cart machines used primarily for sound effects and sweetening. The mix room can interface to any of the facility's 27 one-inch VTRs or 2-inch quad machines. In-session video is serviced by a Sony BVU 800 with high speed search. An Audio Kinetics Q.Lock synchronizer utilizes a serial interface to expand its capabilities to control five tape machines at a time from a single keyboard. Outboard equipment includes AMS 1580, Lexicon Super Prime Time, Audio + Design Scamp modules, Pultec equalizers, UREI limiters and notch filters, EMT 140, Lexicon 224X, and AKG BX10. The new post-production sound mixing room was designed by audio consultant **Vin Gizzi**, acoustical consultant **Carl Yanchar** of Lakeside Associates, and Editel staff designer **Ralph Potente**. *222 East 44th Street, New York, NY. (212) 876-4600.*

☐ **FISHTRAKS RECORDING STUDIO** (Portsmouth, New Hampshire) has recently acquired a Marshall Time Modulator, Loft Delay, a Fender Rhodes, and a Hammond organ with a Leslie. *62 Congress Street, Portsmouth, NH 03801. (603) 431-5492.*

☐ **AIR CRAFT COMMUNICATIONS** (Pittsburgh, Pennsylvania)has recently upgraded its facility from 8- to 16-tracks. The new equipment includes an Ampex MM-1200, and an Allen & Heath/Brenell Syncon Series B 26/24 console. An Otari MX-5050 MKIII 8-track will remain in service. The studio's outboard gear includes Orban and Ecoplate reverb units, DeltaLab digital delay, UREI, Symetrix and Orban effects equipment. The monitor system consists of JBL 4430s and 4311s, and Auratone speakers powered by Crown, SAE, and Nikko power amplifiers. Staff engineers are **Barney Lee, Gary Hohman, Henry Yoder,** and **Cy Anderson**. The studio also offers a full-service repair shop, graphic arts services, and an equipment sales department. *Dormont Square, Pittsburgh, PA 15216. (412) 343-5222.*

FEDCO AUDIO

☐ **QUADRASONIC RECORDING STUDIO** (New York City) has recently installed a new completely automated Harrison 3232C console, and **Ron Johnson** has been added to the engineering staff. *723 Seventh Avenue, New York, NY*

☐ **FEDCO AUDIO LABS** (Providence, Rhode Island) has installed a Trident Series 80 32×24 console in its mobile unit. With the addition of the Trident console, the 48-track remote recording unit now carries 56 inputs, each with full equalization. *Providence, RI.*

RIK TINORY

☐ **RIK TINORY PRODUCTIONS** (Cohasset, Massachusetts) has opened a new 16-track audio production studio featuring a Soundcraft Model 1600 console. Tape machines include a Tascam 85-16 16-track with dbx noise reduction, Ampex AG-440 2-track/¼-inch and 4-track/½-inch, and Ampex AG-500 2-track and mono ¼-inch. The monitor system is by JBL, Auratone, and Altec Lansing powered by Crown DC300 II Amps. Microphones available include Neumann, AKG, Electro Voice, Shure and RCA models. Full audio/video production and duplication services continue to be available. Living accommodations, helicopter and limosine services are available on special request. *180 Pond Street, Box 311, Cohasset, MA 02025. (617) 383-9494.*

☐ **GREENE STREET RECORDING** (New York City) has recently installed an Aphex II Studio Aural Exciter. A newly added AMS Model RMX-16 digital reverberation system features a full 18 kHz bandwidth and 90 dB dynamic range, and can also store 90 user programmed settings, according to studio manager **Michael Rubinstein**. *112 Greene Street, New York, NY 10012. (212) 226-4278.*

☐ **SHEFFIELD RECORDING** (Phoenix, Maryland) has updated its equipment list by adding a Lexicon 224X digital reverb, Studer A80 ½-inch/2-track recorder, and a Real-Time Cassette Duplication System. The studio also now has 48-track capability with the addition of a 3M M-79 24-track recorder interlocked with a BTX Shadow Synchronizer. *13816 Sunny Brook Road, Phoenix, MA 21131. (301) 628-7260.*

Southeast:

☐ **DOPPLER STUDIOS** (Atlanta, Georgia) has recently added two new Otari MTR-90 II 24-track tape machines, four new Otari MTR-10 stereo mastering machines, and an Ampex ATR-102 for ½-inch stereo mastering. Also, **Curt Bush** has joined the engineering staff. *1922 Piedmont Circle NE, Atlanta, GA 30324. (404) 873-6941.*

Southcentral:

☐ **TOMLYN RECORDING STUDIO** (Flint, Texas) has recently upgraded to 16-track with the addition of an MCI JH-114 24/16 recorder with Autolocator III; also installed was an MCI JH-110B-14 mastering machine. Outboard additions include a dbx 165A and two 160X compressor/limiters, and a Lexicon 224X digital reverberation unit. Microphones by AKG, Sony and Sennheiser were added to the studio's equipment list, as was a new Sony PCM F-1 digital processor. The equipment package was put together by Milam Audio, and the new studio was designed by **Russ Berger** of Joiner, Pelton, and Rose in Dallas. *Rt. 1 Box 696, Flint, TX 75762. (214) 894-7713.*

☐ **DALLAS SOUND LAB** (Irving, Texas) is scheduled to open Studio A in June. The new room is a 24/48 track recording studio with video/film interlock capable of 50-piece orchestra scoring, video sweetening, and album-jingle production. Audio tie lines to the three sound stages at Las Colinas will be provided for live television and concert recording. Equipment includes Otari MTR 90-II 24-track, MTR 10-4 4-track, and MTR 10-2 tape machines, and MCI JH-114 24/16-track, JH-110 4-track, and JH-110B 2-track recorders. The control room features an MCI JH-536 automated console. Monitor speakers are by UREI, Eastlake, JBL, Electro-Voice and Auratone. A full complement of microphones by Neumann, AKG, Electro-Voice, Sennheiser, Beyer, Crown, Sony, Shure, and RCA are supplied. The studio is also equipped with Lexicon 224 digital reverb and PCM 41 digital delay, Eventide H910 and H949 Harmonizers, in addition to plate reverb and live chambers. Recently purchased video/film equipment includes an Audio Kinetics Q.Lock 310 synchronizer, MTM 16/35mm high speed projector, MTM dubbers and recorders, JVC CR-8250-U and CR-8200-U ¾-inch video recorders, Sony CVM-2560 video monitor, and a Nagra 4.2L for location recording. Available instruments include a Steinway 9-foot concert grand piano, Yamaha CS-50 synthesizer, Sequential Circuts Prophet-5 ploy phonic synthesizer, Prophet-1005 poly sequencer, Mini-moog Model D synthesizer, Hammond B-3 with Leslie, Hohner Clavinet, Linn Drum Machine, and Roland Bass Line and Drumatix. **John P. Marshall** is the studio manager for the new facility. *Four Dallas Communications Complex, Suite 119, 6305 N. O'Connor Boulevard, Irving, TX 75039. (214) 869-1122.*

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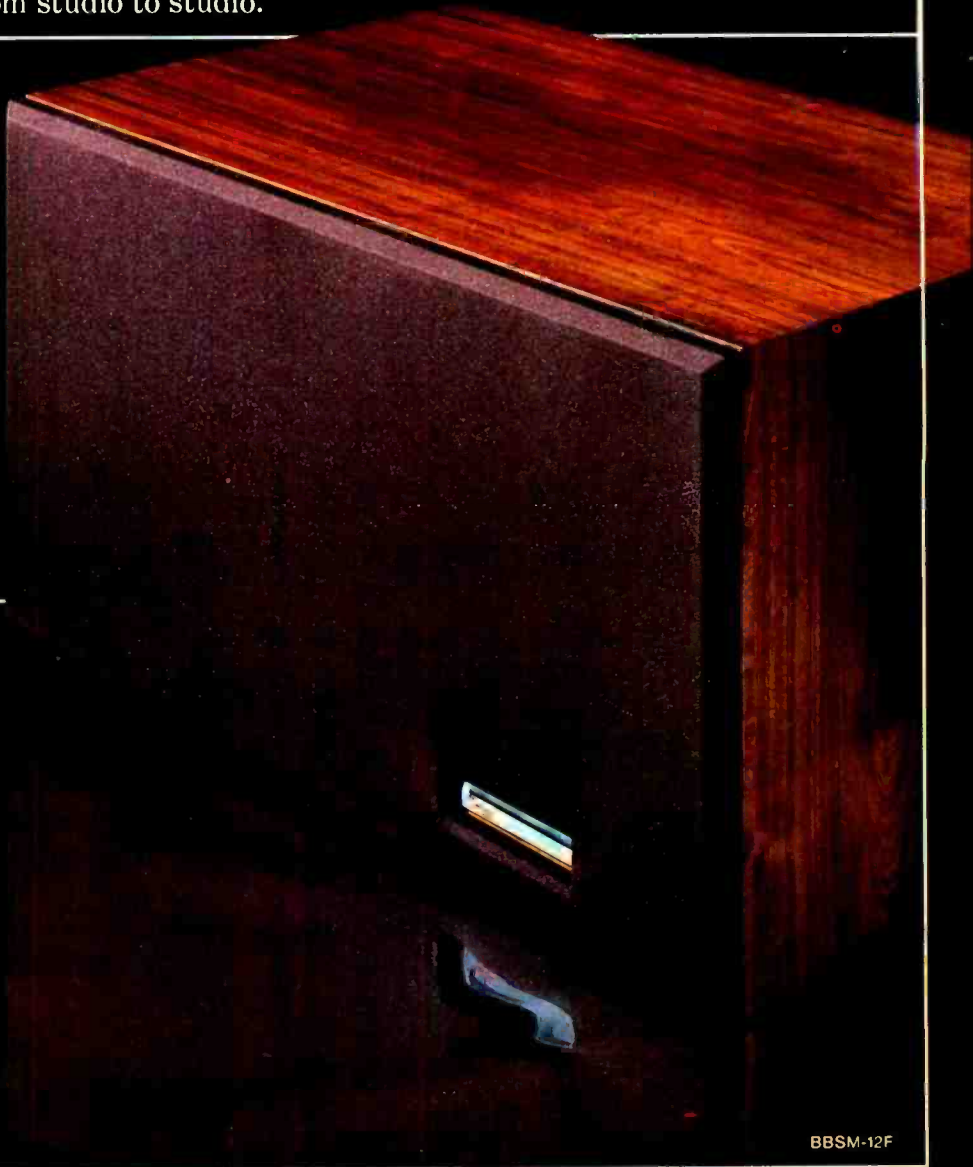

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STUDIO FACILITIES EQUIPMENT PEOPLE UPDATE

Midwest:

☐ **RAINBOW RECORDING** (Omaha, Nebraska), has installed a new Interface 30×16 mixing console to complement Otari MX-5050 2-, 4-, and 8-track machines, according to owner **Nils Erickson** and studio manager **Rick Schwartz**. A new Baldwin 7-foot concert grand has also been added to Studio A. *2322 South 64th Avenue, Omaha, NB 68106. (402) 554-0123.*

☐ **TALDEK SOUND** (Newton Falls, Ohio) has upgraded its facility with a new control room and 24-track capability. New equipment includes MCI JH-24 and Otari MX-5050-B tape machines, and a rebuilt Tangent 3216 console. Also added was an URSA MAJOR 8X32 digital reverb unit and UREI 813-B Time-Aligned monitors. *530 Arlington Road, Newton Falls, OH 44444. (216) 872-5719.*

☐ **UNIVERSAL RECORDING** (Chicago, Illinois) has added **Bob Miller** to its engineering staff. *46 E. Walton Street, Chicago, IL 60611. (312) 642-6465.*

☐ **STUDIO A** (Dearborn Heights, Michigan) has added a New England Digital Synclavier II synthesizer. The 16-voice 40K system has a built-in 16-track recorder, control over all sound parameters, and synchronizing capability. This latter feature allows the instrument to be driven from tape, drum machine or almost any analog rhythm device. A Linn Drum Machine was also recently purchased. *5629 N. Beech Daly, Dearborn Heights, MI 48127. (313) 561-7489.*

Southern California:

☐ **W.E.D. ENTERPRISES** (Glendale) recently acquired a DMX 16E Digital Preview Editor System for use with its 3M 32-track digital recorders. The new DMX unit contains a total of 21 seconds of audio delay memory and allows capture of pre- and post-edit material from the two recorders, plus SMPTE timecode from each. *1401 Flower Street, Glendale, CA 91201. (213) 956-6500.*

☐ **CONWAY RECORDING STUDIO** (Hollywood) has just completed a major upgrade of its facilities. New equipment includes a Neve 48-channel 8108 console, and a Studer A-800 tape machine with Q-lock system. The control room was remodeled with consultation from Waterland Design and **George Aushburger**. *655 N. St. Andrews Place, Holywood, CA 90004. (213) 463-2175.*

GROUND CONTROL

☐ **GROUND CONTROL** (Santa Monica) is a new facility equipped with a 36-input AMEK M3000 automated console, a Lyrec 24-track, Ampex ATR-102 and AG-440B with VSO for mixdown and tape delays, etc., plus a full array of signal processing gear, including an Eventide H949 Harmonizer, MXR Delay IIs, Phasor and Flangers, Marshall Time Modulator, Publison Fullmost processor, EMT 140 plate, Ecoplate, AKG BX-20E, a live room chamber, and AMS RMX16 digital reverb. Outboards include UREI LA-2A, LA-3A, LN1176, dbx Model 165, Spectra Sonics 610, Valley People Gain Brain compressor-limiters, and Valley People Kepex II gates. A custom-designed, tri-amped monitoring system uses H&H and Bryston MOSFET amps; Westlake BSM-6s, Yamaha NS-10s and Auratones also are available. The main recording area measures 40 by 30 feet, with 16-foot ceilings, and two large isolation booths. The studio is owned by producer/engineer **Paul Ratajczak**, and studio manager is **Lisa Roy**. *1602 Montana Avenue, Santa Monica, CA 90403. (213) 453-1255.*

Northern California:

☐ **BEGGAR'S BANQUET** (Santa Rosa) has moved to a new facility featuring a "live-end/dead-end" control room designed by Tom Kraus. Tape machines include Tascam 4- and 16-track, and Otari and Technics 2-track recorders, all interfacing with a Sound Workshop 24×16×16 console. Other new equipment additions include a Studio Technologies Ecoplate reverb unit, Eventide H949 Harmonizer, DeltaLab digital delay, Valley People limiter/compressor, and an Ashly parametric equalizer. Monitoring is supplied by JBL and Auratone units. **Warren Dennis** is owner/engineer, and **TheresaStoops** the studio manager. *540 B East Todd Road, Santa Rosa, CA 95401. (707) 585-1325.*

☐ **HARBOUR SOUND** (Sausalito) has added Lexicon 224X digital reverb, and an Eventide Harmonizer to the equipment list of its automated 24-track facility. *301 Harbor Drive, Sausalito, CA 94965. (415) 332-0983.*

☐ **PHIL EDWARDS RECORDING** (San Francisco) has added a new Adams-Smith 605B 3-machine SMPTE synchronizer to facilitate audio post-production for video. PER has also recently upgraded its remote truck with the addition of two 3M M79 24-track tape machines, UREI 811B Time-Aligned monitor speakers, and an API console expansion to 40-in/32-out. *1338 Mission Street, San Francisco, CA 94103. (415) 861-4439.*

Canadian Activity:

☐ **ZAZA SOUND PRODUCTIONS** (Toronto) has opened a new 24-track facility which, according to owner **Paul Zaza**, is "truly designed to meet the needs of the musicians." The new control room centers around an MCI JH-600LM console with full automation, and MCI JH-24 and JH-110 tape machines, linked with a JH-45 synchronizer. Additional recorders from Scully and Ampex are in service. Monitor speakers are Altec Super Reds and Big Reds, plus Auratones. Outboard equipment includes an Eventide Harmonizer, UREI 964 digital metronome, Audio + Design F760X-R Compex limiter/compressor and gate, Orban Parasound parametric equalizer, Aphex Aural Exciter, and a Lexicon PCM41. An EMT 240 Gold Foil reverberation unit and Eventide digital delay are also in-house, and other outboard equipment is available on request. The studio is also equipped with ¾-inch video, 6-foot monitor, audio/video lockup facilities with EBU, Drop Frame and SMPTE timecodes. *322 Dufferin Street, Toronto, Ontario, M6K 1Z6.*

Great Britian:

☐ **BRITISH BROADCASTING CORPORATION** (London, England) has recently purchased four Otari MTR-90 Series II 24-track recorders. *London, England.*

☐ **ULTRA VOX** (Chiswick, West London) member Midge Ure recently purchased a Harrison MR3 36-input console for his new studio as part of a system supplied and installed by F.W.O. Bauch. Also included in the package were Studer A80/VU 24-track, A80-RC and B67 tape machines, and various effects processors from UREI, Valley People and EMT. *Chiswick, West London, England.*

☐ **ECO** (Cardiff, Wales) recently purchased Soundcraft Series 2400 consoles for each of two dubbing suites in its new post-production center. The console supplied for the video dubbing suite is equipped for 16-tracks in/out, and is interfaced with Studer 16-track and B67 tape machines. The film dubbing suite console is also a Series 2400 24/16 which has been set-up for 12-in/6-out. *Exchange Building, Stuart Square, Cardiff, Wales.*

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South America.

☐ **TV MANCHETE** (Brazil) has installed six Soundcraft Series 2400 28/24 consoles with bargraph meter displays. Seven additional Series 800B 24/8 consoles are to be installed in studios in five major cities, including the main production center in Rio de Janeiro. The purchase was handled through Soundcraft agents, Peerless Imperial of Sao Paulo, Brazil, and was probably the largest single order for studio sound equipment ever placed by a Brazilian buyer, where foreign exchange restrictions strictly limit imports of professional audio equipment. TV Manchete is a completely new television network owned by magazine publishers Block Editores, and is being built with the assistance of consultant **Sam Tolbert** of SST Enterprises Ltd, Oklahoma. *Rua de Russel, Rio de Janiero, Brazil.*

South Pacific.

☐ **TIARE TAHITI RECORDS STUDIO** (Tahiti) recently acquired a Soundcraft Series 2400 28/24, custom equipped for 28/8, along with 2-inch 16-track and 1-inch 8-track tape machines. The equipment was purchased through Tahitian professional audio dealer, Oceanic Garage. *Tahiti, French Polynesia.*

☐ **PAPUA NEW GUINEA PARLIAMENT** (Papua) recently installed two Otari MTR-10-2, four MTR 10-4 and two MX-5050-B-II tape machines, plus an Otari DP4050-C2 cassette copier. The equipment will be used to record the proceedings of parliament for future reference and publication. The system was supplied through joint effort by Klarion Enterprises, of Australia, and Andrew Sweeney Electronics. *Papua, New Guinea*

☐ **JANDS** (St. Peters, Australia) has taken delivery of an Otari MTR-90 Series II 24-track tape machine to be used in its new mobile recording van. The mobile also features a modified Jands JM-7 console, Otari MX-5050 MKIII-8 tape machine, Tannoy Super Red monitors, Jands amplifiers, and a dbx 900 Series rack with compressors and noise gates. The new 24-track was supplied by Klarion Enterprises, of Australia. *St. Peters, Australia.*

ON THE STUDIO TRAIL

Mel Lambert . . . At The Plant, Sausalito

THE PLANT Studio C

"We like to look upon the change of name as being more a case of 'Old wine in new bottles,' " offers Paul Broucek, general manager of The Plant studios, Sausalito, Northern California. As the more astute *R-e/p* reader may already be aware, in 1980 Record Plant supremo Chris Stone sold his Sausalito facility to Laurie Necochea, with an agreement that the new owner could make use of the existing name for a period of three years. May of this year marks the end of the three-year period since the studio changed hands, and so it's time for The Plant to make itself known under a slightly different guise.

In preparation for the May deadline, and the effective "relaunch" of the facility — "making," as he says, "The Plant visible again with its own identity as a world-class studio" — Broucek has been busy over the last several months refurbishing, retooling, and upgrading the studio's two existing control rooms, as well as installing a completely new studio area. Studios A and B — both of which feature Tom Hidley-designed acoustics and control-room monitoring — now boast mirror-image 40-input/24-out/32-monitor Trident TSM consoles equipped with Melkuist VCA faders and a GT800 disk-based automation package (the latter currently shared between both rooms). Mastering duties are handled by Ampex ATR-100 two-tracks, and Studer A80 Mark II 24-tracks.

Of particular interest to nostalgia freaks is the fact that probably the most famous of The Plant's recording areas, "The Pit," designed by original studio co-owner Gary Kellgren in cooperation with Sly Stone (no relation), has undergone some interesting changes during the recent renovations. In its original guise, The Pit lived up to its name: a sunken area in the middle of the studio floor into which had been squeezed a console and outboard equipment. The Pit hasn't seen much recording activity in recent years, the sunken mixing area having been boarded over a few years ago, and the room serving mainly as a rehearsal area.

Like a proverbial Phoenix risen from the ashes, The Plant's new Studio C has at least as interesting a genesis as Kellgren and Stone's "Pit." According to Broucek, ex-Doobie Brothers Keith Knudsen and John McFee were on the look out for a permanent home for their personal-use 28-input Neotek Model III console, which for want of a better location had been languishing in Knudsen's Marin County house. As soon as friend Tim Goodman entered the picture with his 3M M79 24-track, the germ of an idea came upon the trio. Instead of having the bother of maintaining their collective "studio," and also putting up with all the fuss of booking the facility between personal recording projects, why not contribute the equipment to The Plant, have the staff install it in the former Pit, and then let the studio rent the space as a normal recording facility?

To cut a long story short, late April saw the official opening of Studio C, which comprises the original Pit now serving as a more conventional recording area, working with a brand-new control room designed by Terry Delsing and Randy Rand, in conjunction with contractor Craig Sams. New monitor cabinets include a Meyer phase-aligned ADM system, JBL 4315s, and Auratone 5C Sound Cubes; a full selection of outboards also is offered, ranging from a Valley People Kepex II rack and dbx Model 165 Over-Easy compressor-limiters, to a Lexicon Model 93 Prime Time. After a couple of check-out sessions, Broucek reports that the room is working out well, and proving popular for tracking dates.

But Broucek is quick to stress that the recent hardware upgrades are only part of the changes being made at The Plant. "It's the equipment and people that attract interesting projects to a facility, and who enjoy working in good studio with a good staff," he offers. To this end Broucek has assembled a formidable collection of technical talent to look after day-today running of the studio. The maintenance crew is comprised of Mick Higgins (an expatriot Brit from Trident, with a wide range of experience in TSM consoles), Bob Knox (ex-Sigma Sound), and Jim Weyeneth. Engineering duties are covered by Jim Gaines ("the closest thing we have to a chief engineer, and who serves as our engineer-in-residence," Broucek says), and Ron Nevison, who recently relocated from the L.A. Record Plant, and now is using Studio A as his home base.

All in all, the combination of recording hardware and technical talent should stand The Plant in good stead during the transition period.

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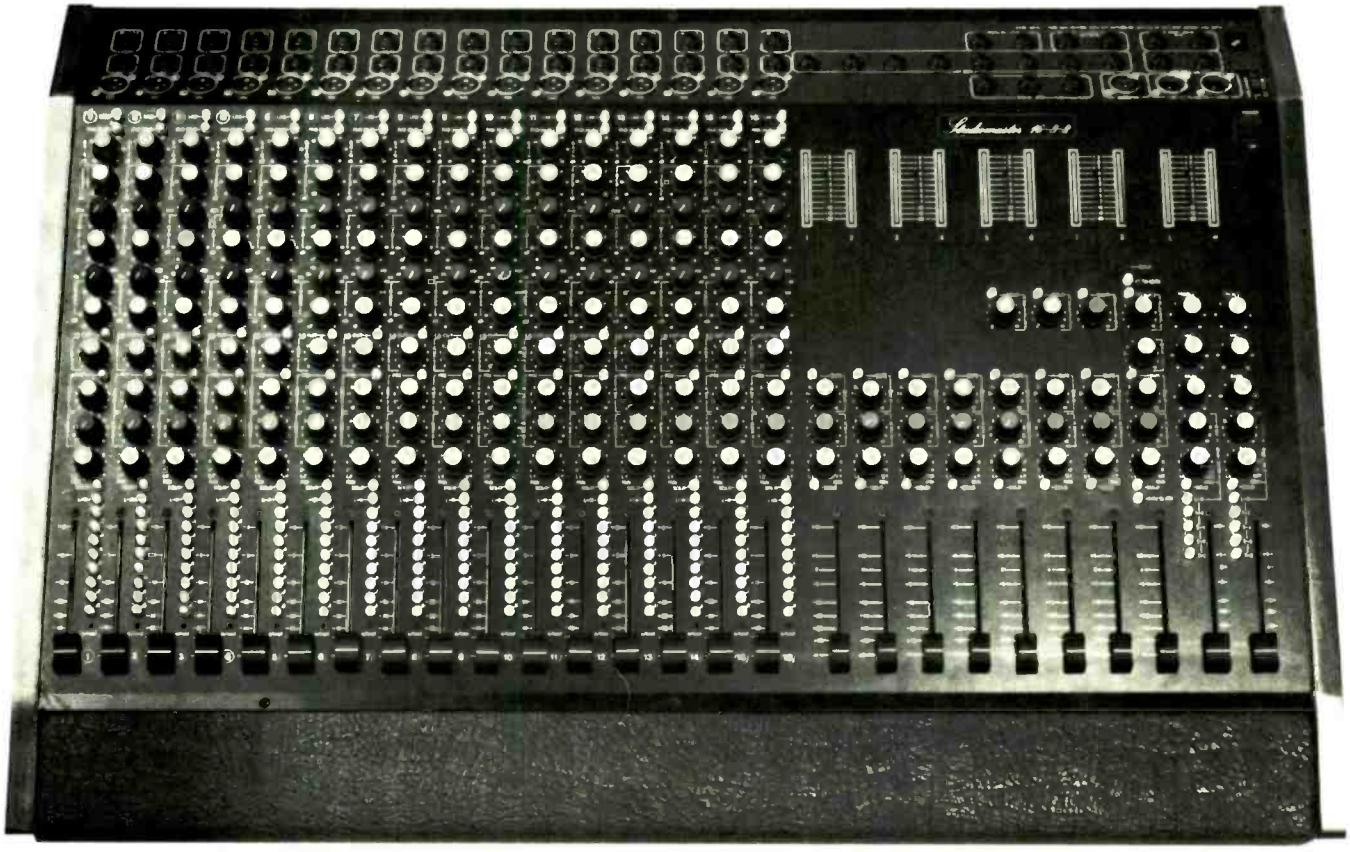

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THE WHO'S NORTH AMERICAN FAREWELL CONCERT

A Multimedia Extravaganza Combining High-Quality Audio and Video Distribution for FM Broadcast, Theatrical Presentation, and Cable Television

by Paul D. Lehrman

The Who's North American farewell concert of December 17, 1982 from Toronto's Maple Leaf Gardens (which soon will be experienced by an even greater audience, thanks to delayed broadcast, and home videotape and disk equipment) brought together the latest equipment and techniques from a number of diverse disciplines: sound reinforcement; recording and broadcast mixing; live multiple-camera video switching; post-production (in what usually are considered incompatible video formats); landline and satellite distribution; wide-screen TV projection; and pay-per-view cable television.

While hundreds of technicians in dozens of cities around the country contributed to the effort, a few companies were central to the success of the event, including Showco and the Record Plant (New York) Mobile for audio production, and Glen-Warren Productions of Toronto for video facilities. For distribution, five different systems were used to get the live show out to the Canadian and American audience. City-TV in Toronto set up an ad hoc network for 16 Canadian free-TV stations, and a second network fed a couple of dozen Canadian FM stations for simulcast. In the US, Campus Entertainment Network (CEN) delivered video and high-quality audio to 40 theaters and clubs around the country, where audiences payed $8 or more per head to see the event on huge projection-TV screens, and hear it over multikilowatt sound systems. Twentieth Century Fox Cable signed up 50 cable-TV systems in every state except Alaska for pay-per-view delivery to subscribers' home screens. DIR Broadcasting, producers and syndicators of numerous radio shows, including *King Biscuit Flower Hour* [see October 1981 issue of *R-e/p — Ed.*], delivered a stereo audio signal to 60 FM stations in the US.

All of these companies were aided, abetted, organized, and/or contracted by World Showvision, AT&T, Telesat, Videonet, Canadian Bell, National Public Radio, Greene, Crowe and Co., CLOS Video Associates, Schlitz Brewing, several hundred local promoters, cable systems, and radio stations and, of course, the dozens of individuals who make up the entity known as the Who.

Producing the Audio

Glyn Johns, longtime engineer/producer for the Who, was brought in well before the tour began to supervise all aspects of the required audio feeds. He rehearsed with the band in England, setting up mike plots for both concert-sound and recording. Through most of the subsequent tour, it was Johns and Showco president Jack Maxson who mixed the front-of-house sound.

On the very first date, at the Capitol Center in Washington, DC, Johns and Maxson were joined by David Hewitt and the Record Plant "Black Truck." Hewitt and his crew recorded a rehearsal, some of which was used on a commercial for Schlitz, sponsors of the tour, and some of which ended up on the Warner-Amex MTV channel. "We used the occasion to prove ourselves to Glyn," Hewitt recalls.

All told, the Plant mobile recorded about 20 of the concerts, with Johns

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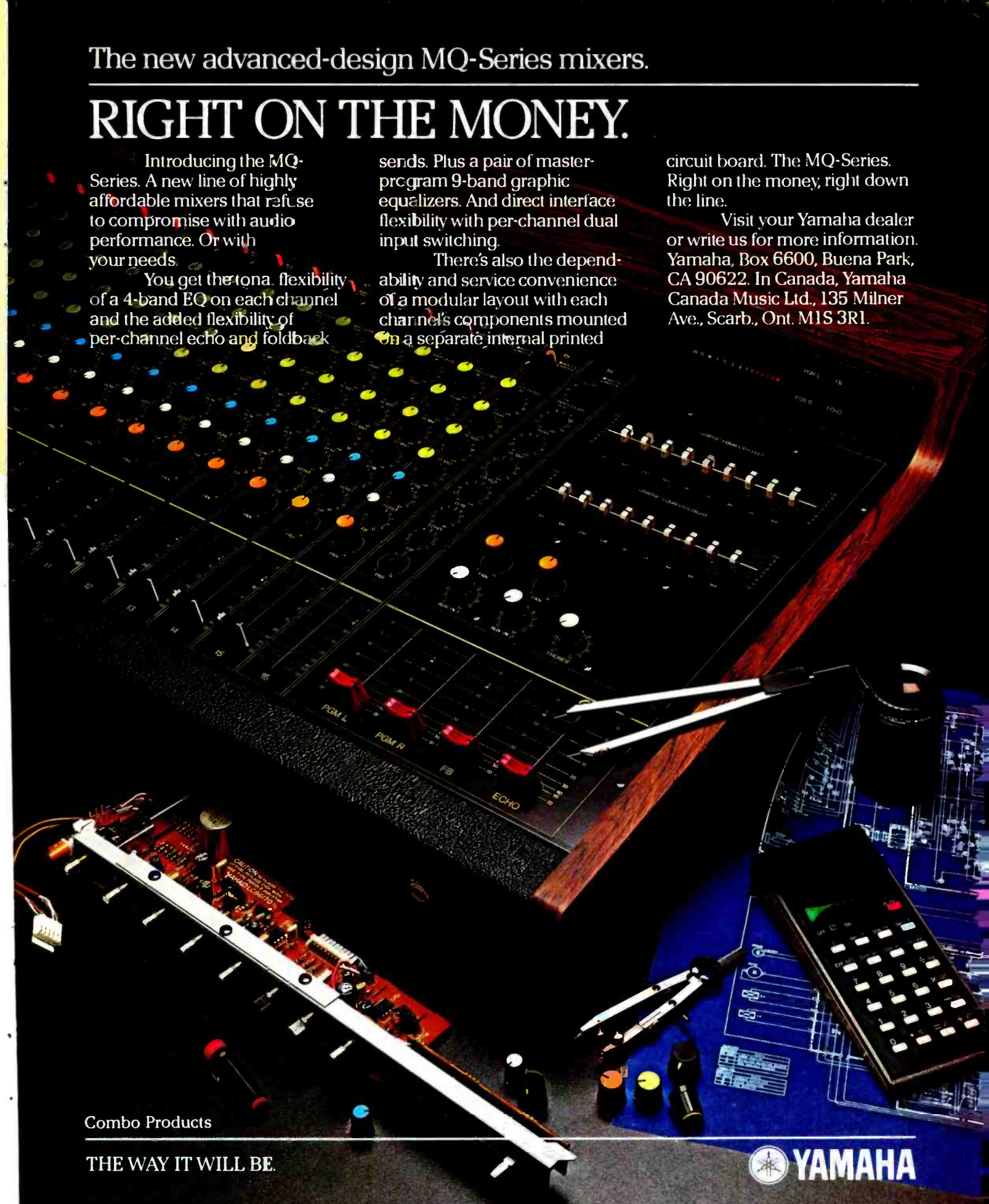

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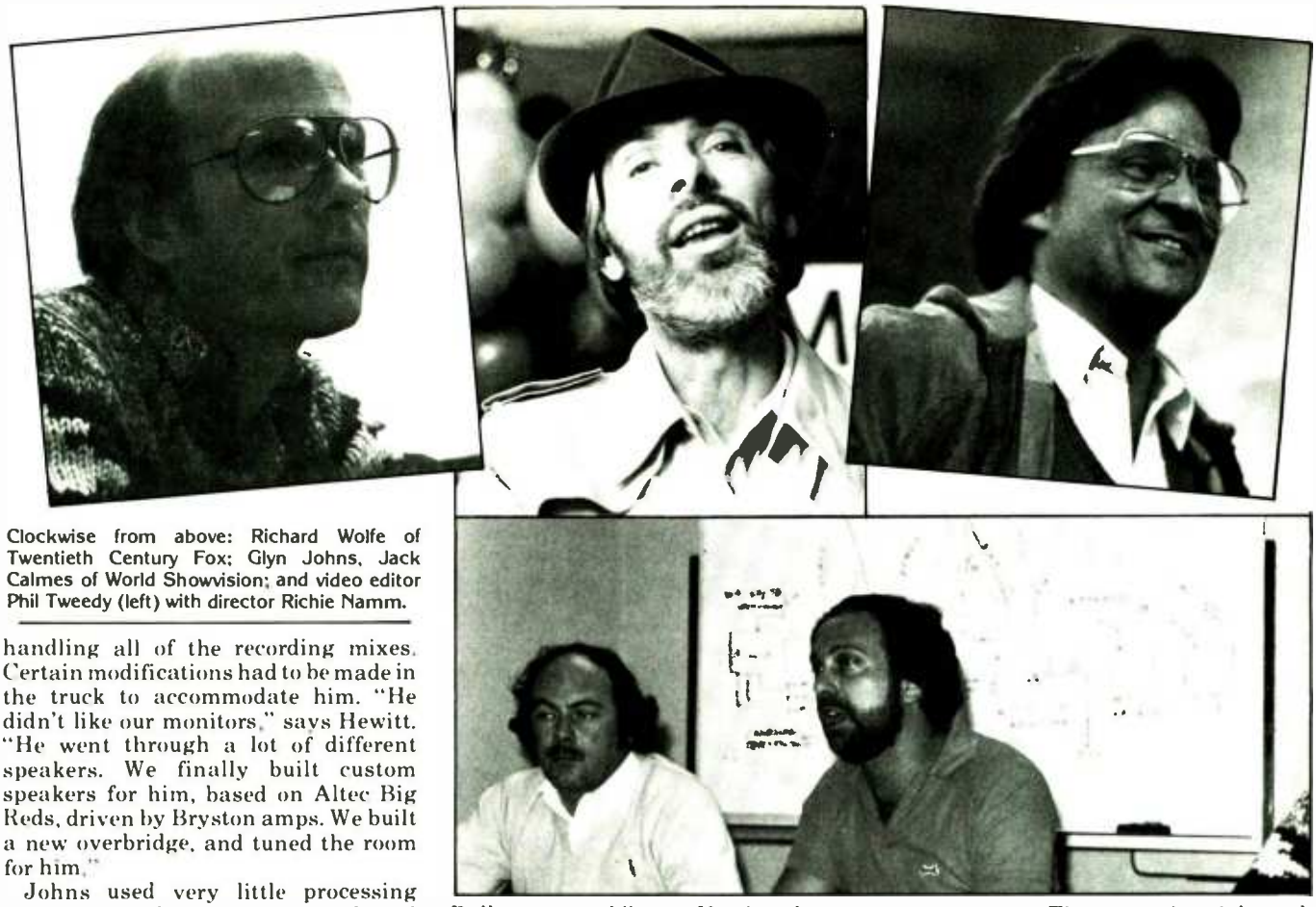

Clockwise from above: Richard Wolfe of Twentieth Century Fox; Glyn Johns, Jack Calmes of World Showvision; and video editor Phil Tweedy (left) with director Richie Namm.

handling all of the recording mixes. Certain modifications had to be made in the truck to accommodate him. "He didn't like our monitors," says Hewitt. "He went through a lot of different speakers. We finally built custom speakers for him, based on Altec Big Reds, driven by Bryston amps. We built a new overbridge, and tuned the room for him."

Johns used very little processing equipment in his mix; to quote David Hewitt, "It was all in the miking." The kick drum mike was sealed and suspended inside the drum (which had both heads on). There was a snare mike and, at the beginning, the only other drum mikes were a stereo pair of Neumann U87s placed between and a couple of feet in front of the toms and cymbals. Later on, Johns added a snare-bottom mike and a cymbal mike. Bass and guitar also were miked simply, from a distance. There were no limiters used at all Hewitt recalls, the only piece of outboard gear called in being an AMS stereo digital delay line, used to process some vocals and guitar solos.

At New York's Shea Stadium the truck recorded a concert, and from there followed the band through the Western and Southern legs of its tour. "On some of the shows, they were also shooting video," Hewitt explains. "We recorded everything on 24-track with timecode, and when they were shooting we would also put the monitor mix on four-track tape with code. We kept everything, but most of the dates served as rehearsals for the crews for the live concert."

Audio for Video

When the Record Plant truck was on hand to tape a show, all of the signals from the stage went to its Jensen splitter boxes. The truck got a direct feed, while the PA system took its signals off the transformers. There were 32 stage inputs, plus six audience mikes. "We were going to mix the live concert in Dolby-surround," says Hewitt, "but we ruled it out as being too complicated, and also nobody [in the home audience] could pick it up."

"Glyn had never mixed in quad," says Jack Calmes of World Showvision, Dallas, Texas, producer of the broadcast, "and he was real nervous about it. It also would have meant doing even more mods on the Record Plant truck. Fox was pushing hard for it — they had about 1,000 Dolby-surround decoders out in the field — but I think it was mainly because they were having a party during the concert with 1,000 people on their lot. They ended up listening to it in stereo, with a rear-channel simulator."

Inside Glen-Warren's 45-foot Mobile I audio/video center (known as "The Blue Van") was a custom 26-input, six subgroup Ward Beck stereo console, equipped with four pre-mixes and four auxiliary send busses on each channel. The Record Plant fed Glen-Warren with two sets of left, right, and mono audio. David Brown of the Record Plant set up a mult line to feed signal back from the Glen-Warren truck, on which was to be found stereo audio, switched video for monitoring, timecode, and video vertical sync drive.

On stage during the concert was a Scully four-track containing prerecorded synthesizer tracks for five of the band's songs, along with a click or "thump" track feeding Kenny Jones' headphones — so that the drummer could keep the band in sync with the taped tracks. The tape signal looped through the Record Plant truck, and also to Glen-Warren's Mobile I, so that video director Richie Namm could cue the start of a videotape containing visual effects used on the air during a synthesizer solo for "Won't Get Fooled Again."

In addition to the sound mix from the Record Plant mobile, Glen-Warren took pre-fader feeds from the audience mikes. "A TV broadcast needs more audience than a recording," comments Michael Jones, who handled engineering duties. (Vision sound was mixed by Doug Drew.)

Another function of the video company's audio equipment was to boost program levels coming from the Record Plant's console and the various distribution systems from studio-standard +4 dBm, to broadcast-standard +8 dBm. (This was to make sure that Telco lines carrying the signal away from the video truck were operating at maximum efficiency, and to maximise signal-to-noise ratios.)

Also coming from Glen-Warren were a pair of Interrupted Foldback lines: mono monitor feeds routed to two on-site announcers who were stationed at the back of the hall for a three-minute preshow warmup, and backstage after the concert. Both monitor feeds could be overridden by director Namm's intercom. An RTS intercom system was brought in (and continually cranked up) to ensure that signal levels at the announcers' headphones were

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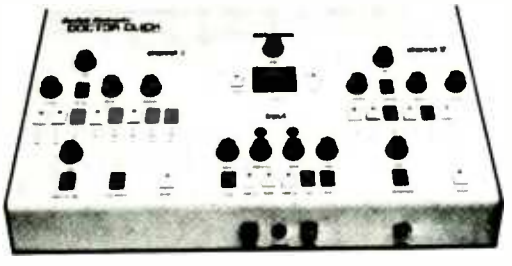

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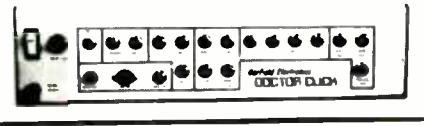

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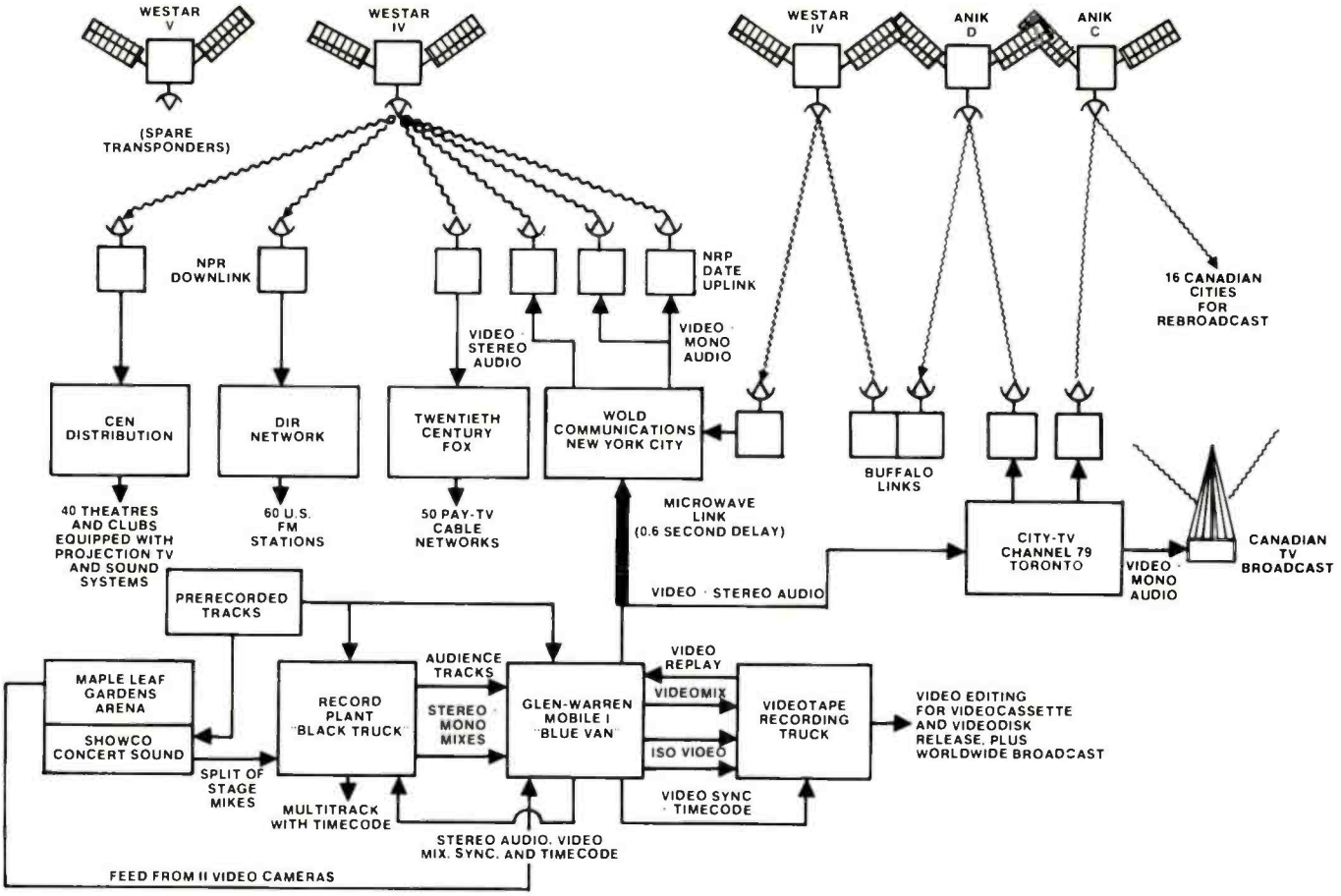


AUDIO AND VIDEO SIGNAL DISTRIBUTION

high enough to compete with the Showco concert-sound system.

Other audio signals came from a VTR containing a half-hour pre-concert show seen in Canada, and by fans at the CEN venues. Audio for the pre-show was Dolby-encoded. "The playback machine had its channel A and B audio boards removed," Jones explains, "and replaced with Dolby-A boards. Channel C, which is usually the timecode track, had the mono audio signal, and we used an external Dolby decoder on that."

Except for the pre-show segments, no noise reduction was used anywhere in the signal path, and no processing took place after the audio left the Record Plant truck, save for a little soft limiting to prevent overload of the microwave landlines for which the signal was headed, and also to discourage local FM stations from over-limiting the signal themselves.

Producing the Video

Director Richie Namm came aboard the Who's travelling road show at the end of October, in preparation for the December concert at the Maple Leaf Gardens. "Usually I get a week's notice for this kind of gig," he recalls. "This time they gave me over a month." Namm's previous experience with live visual music included REO Speedwagon, the Charlie Daniels Band, and Frank Sinatra. "On those shows I made some mistakes," he laughs, "This was my opportunity to learn from them."

Namm and the video crew, in an effort to familiarize themselves as much as possible with the Who's stage show, shot several concerts on the road using five cameras, and constantly reviewed the tapes on wide-screen projection televisions. Frank O'Connell of CLOS Video Associates, based in New Jersey, and who was hired by World Showvision to coordinate technical efforts with Fox, explains that some lighting modifications had to be made along the way to accommodate the TV cameras. "It was important that we didn't disturb the theatrical aspects of the lighting," he says.

Glen-Warren gathered all its equipment at Toronto's Maple Leaf Gardens arena on the Monday prior to the Friday night broadcast. For three days, cameras were checked, and lines, lights, and the stage put in. A major obstacle to the set-up was that a hockey game was scheduled for Wednesday evening, just two days before the Who's concert. "We had to raise the lights to the roof and take down the stage and the ramps," says Namm. "We color-coded and marked everything."

In addition to The Blue Van, Glen-Warren had two other trucks at its disposal. According to Jack Calmes, a lot of equipment (including one of the trucks) had to be rented for the event. The Blue

Engineer David Hewitt aboard the Record Plant "Black Truck" remote vehicle.

Video mixing and monitoring area in Glen-Warren's Mobile I "Blue Truck."

Van contained audio and video control, audio distribution, and room for Calmes, Namm, and an assistant director. Also available was a two-channel Quantel DPE-5000+ digital effects generator, a Telemation character generator for end-of-show credits, and a still-store. Two timecode generators were located on-board, running in sync with one another. "There was *no* room for failure," Namm concedes. "We had a dual-trace 'scope on which we could compare the code with the video, and make sure that the sync word was *always* in the right place. If for some reason one of the generators unlocked, we could instantly switch in the other one."

The second truck housed eight Sony BVH-1100A one-inch video recorders, all being fed with stereo audio, timecode, and vertical sync drive. Two of the machines (main and backup) recorded the switched video feed going out over the air; one handled the signal from a separate iso switcher; and another received a dedicated single-camera iso (to provide cutaways during the subsequent video editing processes). Since the show was to run longer than 90 minutes, for overlap each video line had a second VTR assigned to it. There also were several ¾-inch videocassette decks, plus audio and video distribution equipment feeding the various machines and monitors.

In the third truck were located two Sony playback VTRs, which provided the pre- and post-concert shows, titles, graphics, and the animation for "Won't Get Fooled Again."

Inside the Maple Leaf Gardens arena there were 11 Ikegami HL-79 cameras to cover the concert. Most were HL-79As which, according to video engineer Keith Winikoff, of Greene, Crowe, and Co., have less tendency to "burn in" than the later Model HL-79Ds, a necessary attribute for cameras that were going to be shooting much of the time directly into stage lights. Two cameras were mounted on cranes, one stationary camera located at the back of the house, another mounted on stage, two on a platform in the center of the audience, two hand-helds used on stage, and another at the base of the stage, plus a Steadicam-mounted unit whose operator wandered through the house. "We wanted to put the Steadicam on an RF link," says Winikoff, "but it proved unreliable, so we wired it with co-ax instead." Another camera, installed for the first time on Wednesday night after the hockey game, hung from the scoreboard above the stage, and was wired with remote-control pan and tilt.

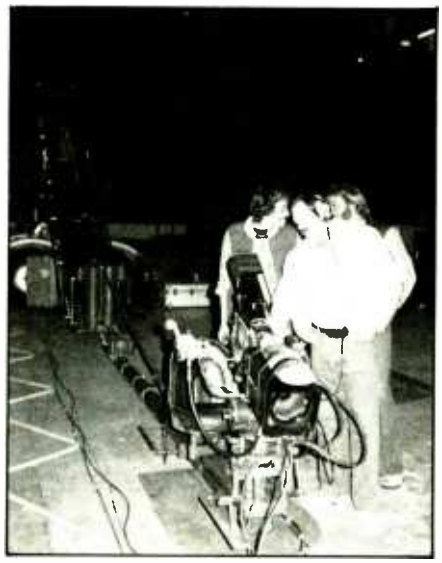
The entire put-in took from 11PM Wednesday to 8PM Thursday. The band's Thursday night concert also was taped, as a "dress rehearsal" for the crews. "It was incredibly neat and tidy," says Glenn-Warren's Michael Jones, "considering we didn't even have time to eat an apple!" At 10AM on Friday, the previous night's tapes were screened, and suggestions made for finishing touches for the live broadcast that night. "Actually, the Thursday show was better," recalls video engineer Winikoff, "in terms of the performance, lighting, and direction. We wanted to see how we could improve it for the second night, but somehow it didn't gel as well."

Audio and Video Distribution

The completed video and audio mixes exited Maple Leaf Gardens via several paths. A link with stereo audio and video went to City-TV, Channel 79 in Toronto, where the audio was summed into mono for broadcast, and commercials inserted. From there, the signal went up to the Canadian communications satellite Anik C, via an uplink in suburban Toronto's Allen Park, and then down to stations in 16 cities. Some stations carried the concert live, while others in Western time zones recorded it

for delayed broadcast. All of the Canadian TV broadcasts were over conventional ("free") stations, which created a rather sticky problem during the planning stage. Most of the major affiliate stations of CBC and CTV (Canada's government and commercial television networks, respectively) broadcast on VHF, and have a powerful signal with a long reach that often extends over the US border. The signal from CFTO, Channel 9 in Toronto, for example, a CTV station originally designated to carry the broadcast, spills over into upstate New York. Since Fox was charging *all* US home audiences for the show, and HBO planned to rebroadcast the concert over its pay-cable system during June of this year, this signal spillage could have led to a serious conflict. Eventually, the Canadian stations signed to carry the concert were carefully chosen so that none of their signals reached a significant audience in the US.

For distibution on the Southern side of the border, the linking setup was a bit more complicated. A full signal package (video, plus left, right, and mono audio) went up to Anik D satellite via a portable uplink provided by Telesat and the Canadian Teleconference Network, and set up in the parking lot of Maple Leaf Gardens. The signal was picked off the satellite by a commercial downlink in Buffalo, New York, and then sent up again to AT&T's Westar IV. (It was also used by FM stations in Canada.) The Westar IV signal was received at Wold Communications in New York City, where it then was relayed to the three US distribution systems. Another portable dish at the site, this time a downlink, allowed the engineers to monitor what was happening on all the satellites.



One of a pair of crane-mounted Ikegami HL-79 video cameras covering the Maple Leaf Gardens concert. Nine other stationary and hand-held cameras were sited at various locations around the arena.

At the same time, a microwave/cable landline carried the signal package from Toronto, over the Peace Bridge in Niagara Falls, to Wold Communications in New York City. The landline was supposed to be a backup — in fact, it ended up as the primary link. Richard Wolfe of Fox explains: "The quality on the landlne was better. Part of that was due to the satellite signal having to double-hop, but most of it was because of Canadian regulations [governing] portable uplinks. Since they operate at a relatively low power, and don't saturate the transponders on the satellite, the signal-to-noise ratio suffers a bit. For political reasons we couldn't bring in an American, higher-power uplink, or else we would have used the satellite signal exclusively."

International treaties prohibit ground stations in the US from receiving signals from Canadian satellites, and vice versa, so special authorizations had to be granted to allow the Buffalo downlink to tune into Anik and the portable dish in the Toronto parking lot to monitor the US satellites.

Because of the double hop, the satellite signal to New York arrived 0.6 seconds behind the landline signal. Had Wold decided, because of some equipment failure, to use video from one source and audio from the other, they would not have been able to do so, because the video and audio would have been out of sync with one another. Fortunately, this problem did not arise. However, as Wolfe says, "We didn't know which circuit we were going to use up until air time." Needless to say, engineers at the concert site and Wold personnel in New York maintained continuous telephone contact with each other.

The half-hour pre-concert show with hosts Pringle and Nightingale, which had been prerecorded at the studios of City-TV, was carried over the Toronto/New York satellite link for eventual distribution to CEN's clubs and theaters. During the same time period, the landline carried prerecorded music, and test and timing signals.

From New York, the program went out over four uplinks. Most American local cable head-ends are equipped with two satellite dishes: one is tuned to Satcom IIIR, which carries HBO and most of the other popular pay-cable services; and the other is tuned to either Westar IV, or Westar V. To cover all eventualities, Fox put video and mono audio on transponders on both Westars IV and V. Another transponder on Westar IV carried video and both stereo and mono audio for CEN's portable downlinks. The CEN receiving dishes were supplied by Videonet of Woodland Hills, California, which located and arranged to rent privately-owned portable dishes in the appropriate cities, and supplied operating personnel at each site.

Yet another Westar IV transponder ("It was busy that night," says Richard Wolfe), leased for the occasion from National Public Radio's DATE service,

and accessed by an uplink at New York City's public station, WNYC, carried stereo audio for the 60 FM stations signed on by DIR Broadcasting. In those cities where NPR downlinks were not available, DIR arranged for portble dishes or AT&T landlines to provide the signal. About half of the CEN venues took their audio from the local FM station, while the rest used the stereo signal on the transponder carrying their video feed. Pay-cable systems told their viewers, where possible, to turn down the sound on their TV sets (the vast majority of local cable systems do not have the capability of broadcasting stereo audio on video channels — and few viewers have the equipment to receive it), and turn on their FM radios.

To simplify the setting up of the various satellite networks, all of the landline and transponder orders were arranged through Fox. "The only way it was going to work was if all of them came out of one office," says Frank O'Connell of CLOS Video. "It helped that Wold's Los Angeles office is right down the street. We were still making changes up to a week before the show."

Worldwide Distribution Plans

As well as the idea of broadcasting in quad, several other great notions fell by the wayside as the December 17 concert grew closer. One was to beam the concert overseas via Armed Forces Radio and a few foreign pay-per-view networks. "It would have been 4AM in Europe and 10AM in Australia," says O'Connell, "and it just wouldn't have been worth the expense. We were also thinking of bringing signals *back* from venues overseas to put on the air here. It would have been interesting . . . switching satellites like that."

In order to prevent pirating of the satellite signal, scrambling it at its origin was considered. The idea was rejected, according to Jack Calmes of World Showvision, because "there just aren't enough decoder boxes out there to service all the different outlets we had." An alternative was formulated: the credits at the end of the broadcast announced a prize (unspecified) to viewers who wrote in, telling Fox where they saw the show. "The purpose was to catch folks who paid someone to watch the show illegally," says Calmes, like private satellite-dish owners who charged admission for access to their living rooms. The results have not been made public yet, but apparently some viewers of pirated signals were indeed dumb enough to write in.

A Multimedia Success

On the night of the Who broadcast, the months of preparation paid off — it went so smoothly that, as Record Plant's David Hewitt offers "it was boring." "Everybody worked together," enthuses Michael Jones. "They were all terrific," Peter Kauff of DIR says, "The Who told us that if they could buy the problems off, they would. This isn't a solution for everyone, though." To put it mildly.

One truck housed 8 Sony BVH-1100A 1-inch VTRs, for video, stereo audio, timecode and sync from main video mix, plus 2 iso feeds.

There were a few rough spots, however. An hour prior to showtime, it was discovered that the mono feed on the Toronto/New York landline was distorting. The source of the signal distortion was tracked down (it was in the line from the concert site to Toronto's toll-network switcher), and the signal switched on to a spare Telco circuit 10 minutes before air time. At the beginning of the concert, some Canadian audiences experienced a two-minute signal loss, because a routing switcher inadvertently had been turned off. One of the engineers monitoring back-feeds discovered it, and rectified the problem. (Peter Kauff reports that a car crashed into the transmitter tower of an FM station carrying the concert in Florida, putting it off the air. So it goes.)

In sum, to quote Jack Calmes, "It was the most complex and successful distribution of a music event ever."

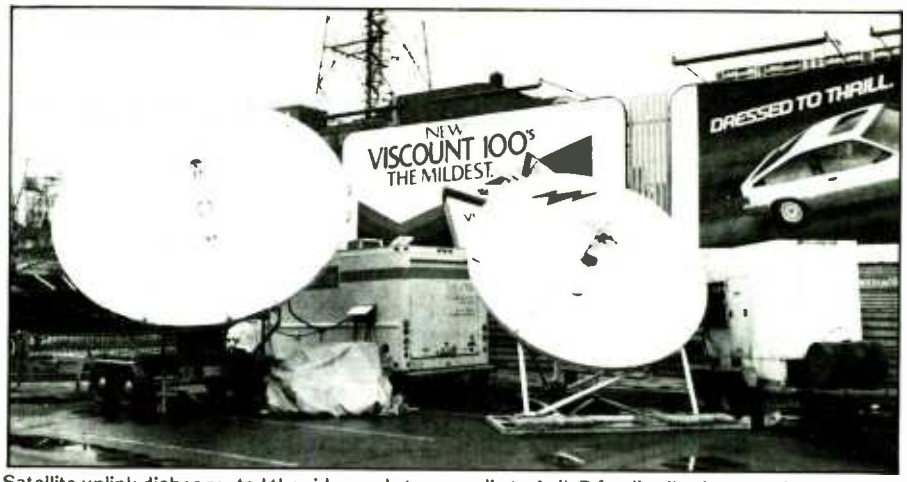
Audio/Video Post-Production Stages

Although they had been heavily promoted, Fox did not make money on the home-cable broadcasts. Relatively few US cable systems have the equipment to individually address subscribers' decoders (in a few cases, local systems provided viewers with individual, disposable "traps" for unscrambling the signal, but the procedure for distributing these, even within a small system, is cumbersome), and so the paid home audience was no more than 200,000. (By contrast, the free-TV Canadian broadcasts reached an audience estimated to be

between four and six million.) Richard Wolfe says of the live broadcast, "It was more successful technically and artistically than financially."

To recoup its considerable investment, Fox licensed the show for later release in several forms: a two-hour version (the live show ran about two hours and 20 minutes) which, as you read this, should be in release on both Pioneer LaserVision and RCA SelectaVision CED videodisks, as well as VHS and Beta videocassette, all with matrixed Dolby-surround sound, and all on the CBS Fox label; a 90-minute version simulcast for the first time on June 7 via Home Box Office cable; and a 60-minute version for future domestic and foreign broadcast syndication.

Besides the obvious editing that must be done, an effort is being made in post-production, to quote Richard Wolfe, "to make the home video and later broadcast product have more diverse cutting." Director Richie Namm was faced with the unenviable task of making the live show look good on both large and small TV screens, which is somewhat more difficult than making an audio mix sound right on, for example, UREI 813s and Auratones. This reporter watched the show on a 25-inch television set, and there were times I thought things could have been done differently. I am told, however, that the video mix looked extremely effective in CEN's theaters.



Satellite uplink dishes routed the video and stereo audio to Anik D for distribution to various parts of the country. A separate downlink enabled on-site engineers to monitor traffic on U.S. satellites.

Editing a show like this would seem to be a rather conventional, albeit long, process for an up-to-date post-production house, but there was a fly in the ointment. While the show was recorded using the North American NTSC video standard, and both audio and video tapes were striped with SMPTE timecode, all of the editing decisions and audio mixing were to be done in England.

As this article is being written, the various post-production processes are still in progress on two continents, so it is difficult to pin down exactly who is doing what. According to Richard Wolfe, of Twentieth Century Fox, the scenario goes something like this:

From Toronto, the video tapes were taken to Audio Plus Video in New York, where they were dubbed on to ¾-inch videocassettes, using Sony's high-band PAL format, and the cassettes striped with new EBU (25 frames-per-second) timecode. The cassettes then went to CETA Video in London, where post-production director Phil Tweedy bumped them up to one-inch PAL and, under the supervision of the band, edited them into the 60-, 90-, and 120-minute programs. Tweedy also drew up detailed edit lests from the EBU time-code numbers, and struck ¾-inch work prints from his edited one-inch tapes.

In February of this year, Tweedy brought the work cassettes and his edit lists to Complete Post in Los Angeles. There, the edit lists were recalculated for the SMPTE timecode striped on the original tapes. This operation was done by hand — due to the differences in frame rates between 29.97/30 FPS SMPTE and 25 FPS EBU, there is no way of automatically achieving frame-accurate conversion from one code to the other. Using the new numbers, a second set of off-line edits was prepared. The English and American edits were compared, and final edit numbers decided upon. During the final assembly from the original one-inch tapes, special effects were added.

Meanwhile, Glyn Johns took the multitrack audio tapes to his studio in London for mixing. Although Who bassist John Entwistle was acting as musical director for the editing and post-production stages, Johns completed his work before Entwistle had the opportunity to hear the final mixes.

Johns set up his control room for the Dolby-surround format (the matrixed two-track format on Dolby stereo optical cinema releases), which as well as deriving left, right and (phantom) center, provides surround information for rear channels. He had access to SMPTE equipment, so no restriping of timecode on the audio tapes was necessary — which was fortunate, since there was no room on the tapes for another code

track.

The tapes were recorded and monitored through a Dolby DS-4 surround encoder, which provides a two-channel, stereo-compatible signal that can be decoded for four-channel replay systems. The finished master, which consisted of two audio channels and SMPTE timecode on half-inch tape, was laid back on to the completed video at Compact Video in Los Angeles.

According to Richard Wolfe, "95% of the finished product is from the second show. Occasionally we filled in shots or tracks from the first night. But even though some of the songs had click tracks, we didn't do any audio crossfading — it just wouldn't have worked."

Will History Repeat Itself?

Everyone involved in broadcasting and taping the Who concert now knows that such a colossal undertaking is possible. The question is, will it be done again? The answer is: yes and no. For one thing, pay-per-view cable television is still in its infancy. The relative lack of technical sophistication of local cable systems makes the potential audience — and therefore the resultant revenues — for such an event rather small in light of the huge expense and complicated logistics involved in handling such an event. This situation will not change quickly. The Who concert was only Fox's second attempt at pay-per-view (the first being a boxing match), and while movies like *The Pirates of Penzance* and other special events have been and will continue to be distributed this way, there appears to be little motivation to do more live music. "It was a memorable event," Wolfe says. "The kind you don't get to do very often."

On the other hand, Jack Calmes sees his company, World Showvision, and Campus Entertainment Network, in which he holds a minority interest, thriving on rock concerts. "We may stay away from small screens entirely," he offers. Besides the comparatively lower profits, he feels that home viewing is "not that good for rock." Instead, he sees "superstars" like Pink Floyd and Supertramp, who travel with huge entourages and mammoth stage and sound setups, taking advantage of the ability to perform, via satellite, for large audiences in many locations at once. "They could do 10 nights in one place," he considers, "and we could have 10 or 20 mobile units, with portable satellite dishes, large-screen projectors, and 20,000-watt sound systems, moving to theaters in different cities every night. That way they could play to a couple of hundred audiences without ever taking their equipment down."

The mechanism for accomplishing this, he feels, would not be at all difficult to put together. "We only did 40 cities for the Who concert," he says. "There was no reason why we couldn't have done 100."

Calmes is convinced that presenting rock concerts this way is the wave of the future. And he isn't exactly resting on the laurels he won for the Who concert. He won't say which artists or backers are involved, but he reports that six more such shows already are in the works.

For better or worse, Calmes' is probably a prophetic vision. As audiences demand more elaborate and expensive shows from their favorite rock acts, and as ticket prices skyrocket while record companies continue to tighten their tour-supporting belts, live video, with the assistance of high-quality audio and the best possible distribution and presentation systems (as well as a hefty dose of sponsorship from well-heeled corporations like Schlitz), will surely become the next best thing to being there. ■■■

Author's Note: In the course of researching such a complex story as this, it always is possible for some inaccuracies to slip in. Since most of the research was done after the fact, I was slightly hampered by the inevitable incomplete recollections of some of the participants, and by occasional contradictory information from two or more sources. I am sure, however, that the vast majority of this article reflects the events as they actually occurred.

I would like to thank my sources (including, but not limited to, Jack Calmes, David Hewitt, Michael Jones, Peter Kauff, Richie Namm, Frank O'Connell, Ann Weldon, Keith Winikoff, and Richard Wolfe) for their assistance and patience.

THE GRATEFUL DEAD

A CONTINUAL DEVELOPMENT OF CONCERT SOUND SYSTEM DESIGN FOR TWENTY YEARS

by David Gans

The Grateful Dead have been playing their unique brand of improvisational, eclectic music going on 18 years now. Though their records are modest sellers, and more or less ignored by radio and the "establishment" press, the Dead are consistently among the highest-grossing concert acts in the country. What they do musically is improvisational, existential, and not always satisfactory; but since the beginning the Dead have been attended and experimented upon by forward-looking sound specialists, always seeking to improve the quality of their live sound.

Dan Healy has been mixing the Dead's concerts since the band first took to the San Francisco clubs and ballrooms, and he says he's never been bored. To Healy, the Dead is "a vehicle that enables an aggregate of people to experiment with musical and technical ideas. It's a workshop and a breadboard, as well as a dream and a treat. There's no place in the world that I know of that would give me this much space to experiment and try new things — and also to hear good music."

The Dead's own people have developed equipment and techniques to improve the state of the sound-reinforcement art, and they have invited others to use Grateful Dead gigs as live testing grounds. "We live on the scary side of technology, probably more than we ought to," guitarist Bob Weir concedes. But you don't learn much from maintaining the status quo, and the Dead have always encouraged experimentation and sought new knowledge in many areas.

The Early Days

The first PA system Healy operated, at the Fillmore Auditorium in San Francisco, consisted of a 70-watt amp, two Altec 604s, and a two-input microphone mixer. "And that was far out compared to what was there the week before," he recalls.

When Healy and his fellow soundmen started trying to put better systems together, they found that the hardware available was not very advanced. "The first thing we did was go get tons of it, only to find that that was only a stopgap measure," Healy remembers. "It was obvious that there was nothing you could get off the shelf that you could use. Furthermore, there were no answers to our questions in journals or texts; where the equipment ended, so did the literature and research. What we needed was past the point where R&D had taken sound equipment."

So they set out to find the answers for themselves. Healy and the Grateful Dead became willing guinea pigs for John Meyer, then of McCune Sound; Ron Wickersham of Alembic; and others on the scene who were looking for ways to deliver music painlessly and efficiently at the often ridiculously high SPLs of the San Francisco sound and rock music in general.

"Those guys were long in the design and prototype area," Healy explains, "and we were long in the criteria. We built a system and scrapped it, built another one and scrapped it. We never had a finished system, because by the time we'd get one near completion it was obsolete in our minds, and we already had a new one on the drawing boards."

The concept of speaker synergy — and phase coherency in particular — was understood by the early Seventies, and several designers had come up with ways of implementing it. John Meyer and McCune Sound developed a three-way, tri-amped single-cabinet system with crossovers that reduced phase shift considerably. It was a significant improvement, but there was plenty of work yet to do. While Meyer was in Switzerland studying every aspect of speaker design, acoustics and the electronics of sound, Healy and Alembic and the rest took off in other directions.

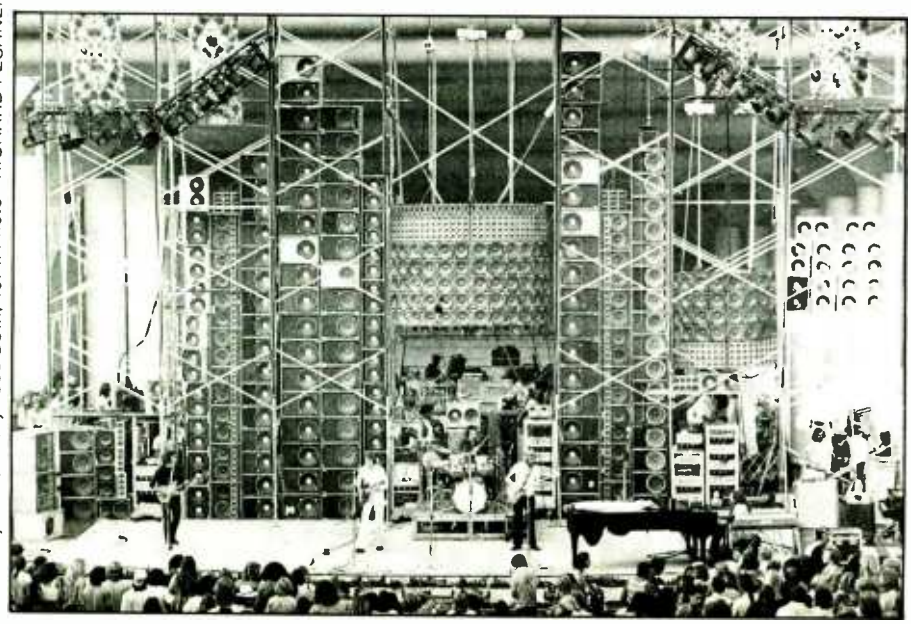
The Dead debuted a new system at San Francisco's Cow Palace on March 23, 1974, in a concert dubbed "The Sound Test." Bassist Phil Lesh calls it the "rocket gantry" and maintains that it was the *best* PA the Dead ever had. "It was the ultimate derivation of IM cleanliness," Healy explains. "No two things went through any one speaker. There was a separate system for the vocals and separate systems for each guitar, the piano, and the drums. You could get it amazingly loud, and it was staggeringly clean — cleaner than anything today. It still holds the record for harmonic and — most especially — intermodulation distortion."

Healy calls this system's theory of operation the "as above, so below theory. If you stack a bunch of speakers vertically and stand close to one, you hear the volume of that one speaker. If you move a little farther away, you hear two speakers; move away some more and you hear three. If you have a lot of them stacked up high, you can move quite a ways away and the volume stays the same."

There was no mixing board in the house. Each musician controlled his own instrumental volume, because his speaker stack was its own PA system. Guitarists Bob Weir and Jerry Garcia each had about 40 12-inch speakers in vertical columns, and bassist Lesh had a quadrophonic system.

Vocals also were delivered to the band and the audience by the same speakers. Each singer had a pair of mikes, wired out of phase so that background sound arriving equally at both was canceled, while what was sung into one mike was passed on to the amplifier.

Healy recalls one unfortunate inci-



Sound System at Hollywood Bowl, 1974. Photo © RICHARD PESHNER

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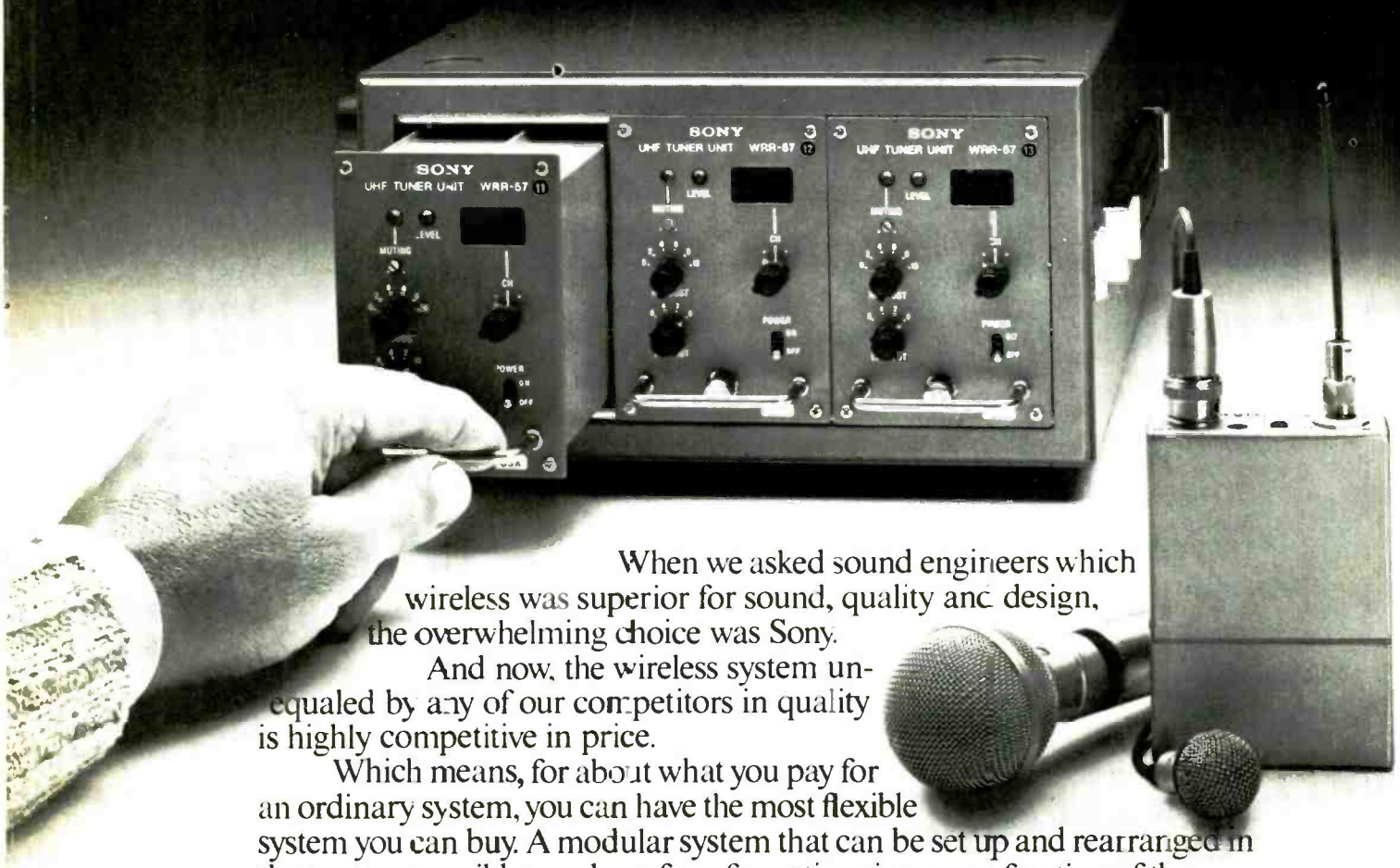

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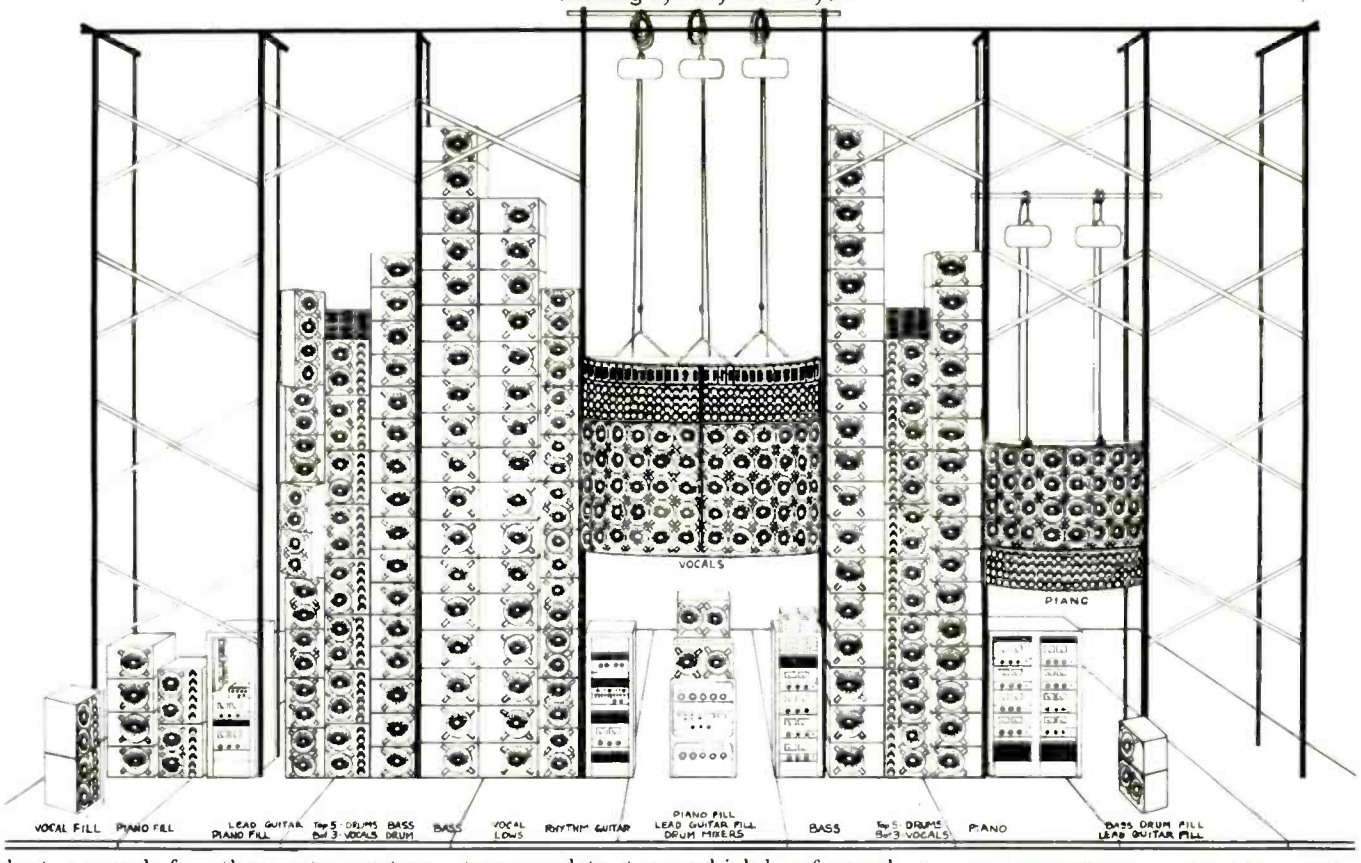
GRATEFUL DEAD CONCERT SOUND SYSTEM, circa 1974.

Drawing by Mary Ann Mayer.

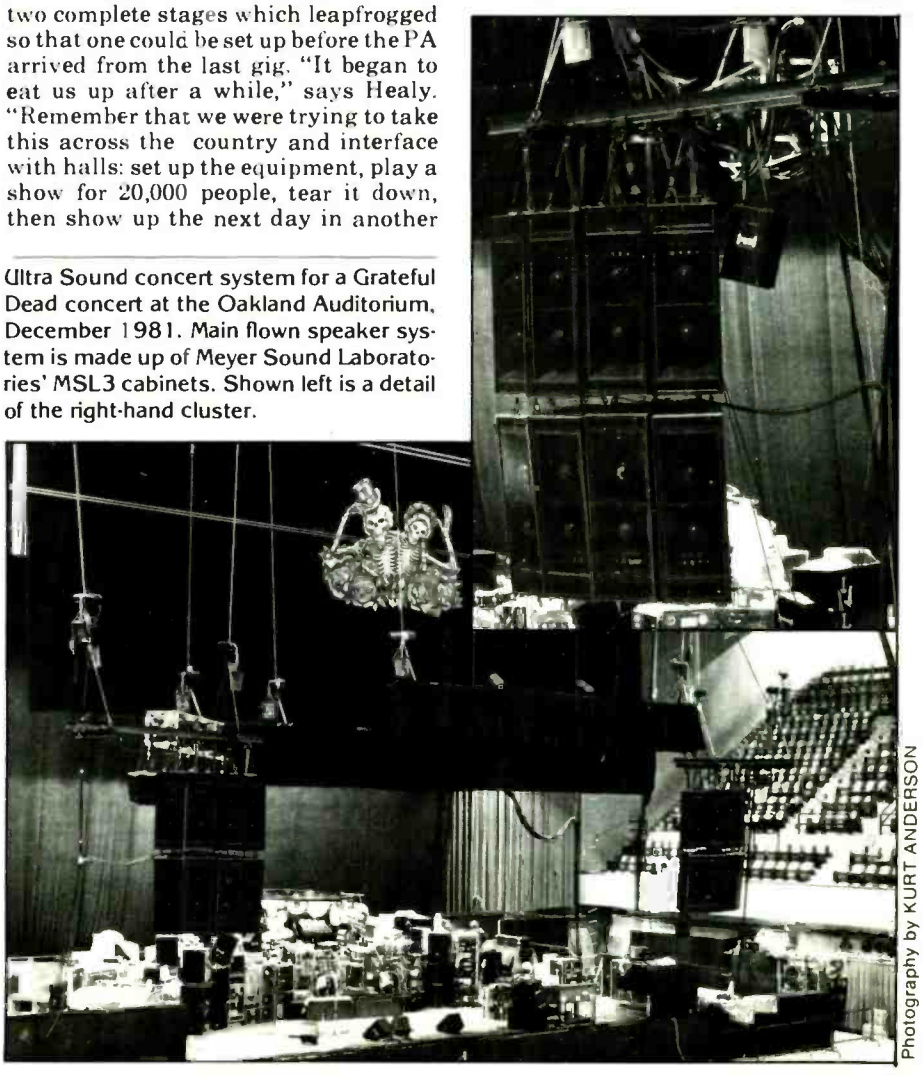


dent a year before the gantry system was officially unveilded, when some of these principles were tested at a concert in Stanford University's basketball areana. "We spent maybe $20,000 on amplifiers, crossovers, and stuff," he recalls, "and we rebuilt a lot of Electro-Voice tweeters. We pink-noised the room from the booth and got it exactly flat. If you flatten a system from a hundred feet away, it'll sound like a buzzsaw — and it did.

"We started the show, and in the first two seconds every single one of those brand-new tweeters was smoked. We went through all those changes to put protection devices in, and they never worked — they blew long after the speakers were gone." There was no hope of replacing the 80 or more tweeters they'd blown, so Healy says they "opened up the tops of the crossovers, equalized a little bit and faked it." Healy points out philosophically that recovery from such catastrophes is "another thing that you learn after enough years. Recovery is your backup buddy." He also notes that the years of experience make it much easier to estimate what will work and what won't, so it's easier to avoid disaster.

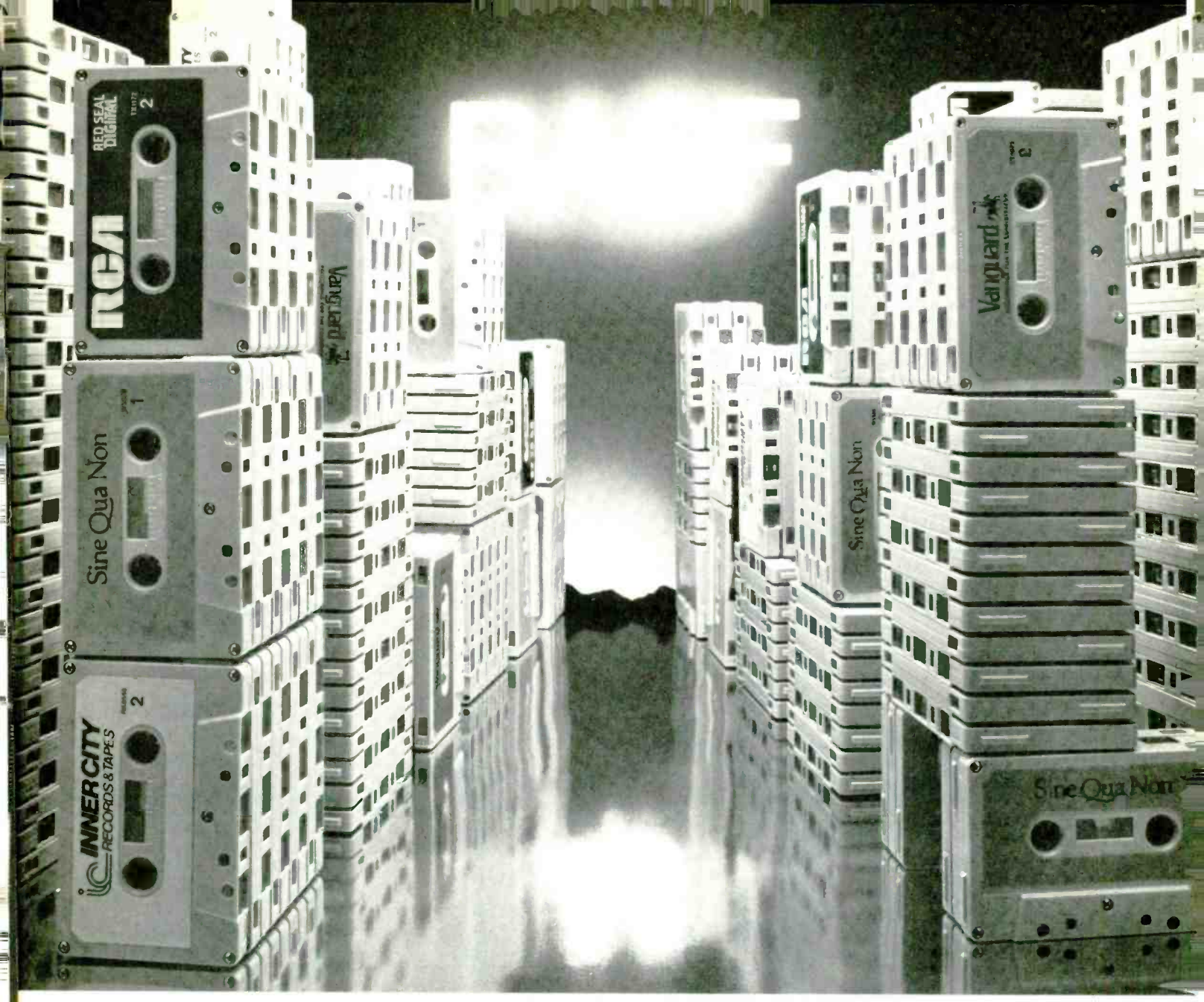
[This writer happened to have been in attendance at that Stanford concert. Although there were some rather long pauses while the equipment was worked on, the show itself was a good one, and a high time was had by all.]

It was economics that caused the "Sound Test" system to be dismantled. The gasoline crisis of the mid-Seventies made it unfeasible to truck tons of speakers, amplifiers and spares — plus two complete stages which leapfrogged so that one could be set up before the PA arrived from the last gig. "It began to eat us up after a while," says Healy. "Remember that we were trying to take this across the country and interface with halls: set up the equipment, play a show for 20,000 people, tear it down, then show up the next day in another



Ultra Sound concert system for a Grateful Dead concert at the Oakland Auditorium, December 1981. Main flown speaker system is made up of Meyer Sound Laboratories' MSL3 cabinets. Shown left is a detail of the right-hand cluster.

Photography by KURT ANDERSON



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city and do it again — for three weeks in a row, or a month, or six months."

"We were damn lucky," Healy adds. "We got a tremendous amount of knowledge out of that system before it became such a burden that it started to distract from the music."

Smaller can be Beautiful

When the Dead resumed touring in 1976, after a 20-month hiatus, PA technology had advanced sufficiently that it was no longer necessary to isolate each instrument and run it through a separate speaker system — not to mention the fact that it was economically impossible to truck those mountains of gear around. "Efficiency comes down to the number of boxes that you have to carry, of weight in a semitruck going down the highway," Healy observes. Not only was it impractical, but it was no longer necessary. In the intervening years, what Healy and the Dead wanted — a system that performed as well as the "wall of sound," but which was "one fourth the size and four times as efficient" — came into existence. "The system we have now is *better* than the '74 system, overall, even though the '74 system may have been better in certain ways."

The Dead currently tour with a PA owned by Ultra Sound, using speaker systems and associated electronics by Meyer Sound Labs. [Meyer's principle of single point source, phase coherent speaker arrays is explained in the article, "Time Alignment of Sound Reinforcement Equipment," to be found in the December '80 issue of *R-e/p.*] "Meyer has been able to extend the low and high frequencies without hopelessly distorting the rest of the sound," Healy notes. "That's actually the main significance." And by arranging the speaker cabinets to work together in a very precise way across the whole frequency spectrum, it takes fewer drivers to cover the desired area, and intelligibility is uniformly good nearly everywhere.

With the quality of the PA hardware firmly in hand, Healy says that the Dead's concert setup these days goes through subtler changes and refinements. One interesting development came to Healy almost by accident, and resulted in a very useful device to make his job easier. "The vocal mike is the loudest one in the mix," he explains, "and if it's open on the stage it's picking up drums or guitars from 15 feet away, and adding them in 15 milliseconds later —which is that many degrees of phase cancellation — and the net result is a washing-out of the mix. You can't use audio amplitude to gate those mikes, because the guitars are frequently louder at the mike than the voice that's standing right in front of it. So a certain amount of me always had to be on the watch for the singers so I could turn their mikes on. That was annoying, and it kept me from being able to listen on a more general level.

"The Paramount Theater in Portland, Oregon, has a balcony that's right on top of the stage. I was looking down at the guitar players, and it all connected for me. I'm a musician myself, and I know that one of the most embarrassing things that happens when you're playing rock 'n' roll is running into the mike and banging yourself on the lip —or being a mile away from it when it's time to sing.

"That night in Portland I realized that every musician has a kind of home base where he puts his foot in relation to the stand so he knows he'll be right at the mike. It was duck soup: I got the kind of mats they use to open doors at the grocery store, then designed and built the electronics that gated the VCAs [to control the mike-preamp gain], and lo and behold, it worked!"

For keyboardist Brent Mydland, the situation wasn't so simple. John Cutler, who works with the Dead in R&D as well as other capacities, designed a system around the sonar rangefinders used in Polaroid cameras. Using discrete logic rather than a full-blown microprocessor, Cutler came up with an automatic gate that opened the mike when Mydland's head came within singing distance of either of his two mikes. "It's just one of those things that came about as a means to an end," says Healy. "I built the floormat [device] just so I could be freed from switching on microphones."

GRATEFUL DEAD SOUND SYSTEM
AT THE OAKLAND AUDITORIUM, DECEMBER 1982

According to Howard Danchik of Ultra Sound, "The Dead's system, as always, was run in stereo. The main speakers were flown, and comprised 12 MSL3s at each side of stage, plus a center cluster of eight (four left and four right channel), also above band.

"Suspended from the side clusters are three [Meyer Sound Laboratories] UPA cabinets, angled downward to fill in for those at the front of the audience. There are also four UPAs below the lip of the stage at the center (two left and two right) for the spectators at the very front-center, plus one UPA at the rear of each main cluster, pointed up and back for spectators in the balcony directly to the sides of the stage.

"Each MSL3 is driven by 650 watts RMS of amplification — 225 to each 12-inch speaker (two per cabinet), and 200 to the four piezo tweeters. One MSL processor is used to drive all the MSL3s on each side; two (one per channel) to drive the center cluster; and two (one per channel) for the front and sidefill UPAs.

"The Subwoofers were made up from eight MSL 652-R2 subwoofer road cabinets (two 18-inch drivers, front-mounted) on each side, stacked on their sides, four wide and two high. Each *speaker* is driven by 225 watts of Crest amplification. The processor takes a full bandwidth signal from the house mix, and extracts 80 Hz and below for the subwoofers.

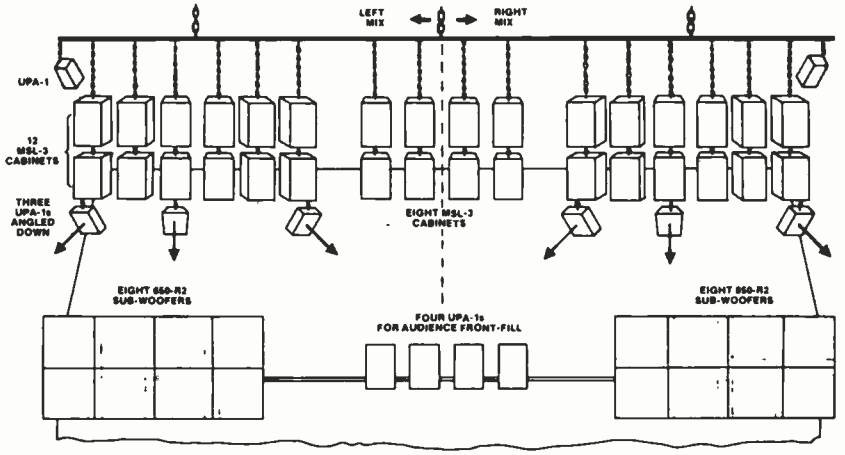
"Additional speaker systems included: for the lobby four UPAs (stereo, via Meyer processors); for the bars one UPA in each bar (mono, one processor each); the kitchen one UPA (mono, one processor); and the kids' room a pair of Hard Truckers five-inch cubes (mono, no processor).

"All power was provided by Crest amps, 225 WRMS per channel into 8 ohms.

"House mixer was a Jim Gamble custom board, 40-in/8 stereo submasters, with automatic built-in mono output. The monitor mixer was a Gamble custom 40/16 console.

"House Effects included a Lexicon 224X digital reverb and Super Prime Time; dbx Boom Box subharmonic synthesizer; a collection of vocal gates; and an autopanner, homemade by Dan Healy & company.

"Microphones included Shure SM-78s for vocals, plus a new Neumann mike for Jerry Garcia, and Sennheiser 421s, AKG C451s and C414s."



DAVID GANS

Side stack of Ultra Sound system at Ventura County Fairground, July 1982.

Rather than get involved in marketing a device like this, which Healy says is "not my business," he just has a few extra circuit boards made. "If somebody comes by and wants to try it, we give them the cards and a parts list."

Because every Grateful Dead gig is different — no songlist, plenty of room for instrumental improvisation, no prearranged sound cues to speak of — mixing for the band has never settled into a routine for Healy. "Some nights they start out screaming and get softer, and some nights they start in one place and stay there. There isn't really any good or bad in it — it's just a different night in a different way. From the start to the end of the show, it's a continuous progression, figuring out how to spend the watts of audio power that you have in such a way that it's pleasant and human."

It's been years since Healy went into a hall and pink-noised the sound system. "I leave my filter set flat, and I dial it in during the first couple of songs. After enough years of correlating what I see and hear, I know what frequencies, how much, and what to do with it." Test equipment is on hand for reference, but Healy prefers to rely on his ears. "You have a speedometer in your car, but you don't *have* to use it — or even necessarily have it. You don't need it to know how fast you're going, but it's there for reference. That's how I use the SPL meter and the real-time analyzer."

In the "hockey-hall-type spaces" the Dead play in these days, Healy likes to set up about 85 feet from the stage. "In my opinion — and my opinion only, for that matter — the ideal combination of near-field and far-field is 85 feet. I don't like to be far enough into the far field that it's a distraction, but for me it's important to hear what the audience hears.

Healy considers himself the audience's representative to the band, comparing notes with the musicians after shows, and telling them things they might not want to hear "if I feel I have to." He also encourages — within reason — those members of the Dead's following who bring their recording gear to concerts. "I'm sympathetic with the tapesters, because that's what I used to be," he says. "I remember buying my first stereo tape machine and my first two condenser microphones, sweating to make the payments, and going around to clubs and recording jazz. So I've sided with the tapesters, helped them and given them advice and turned them on to equipment.

"I learn a lot from hearing those tapes," he continues. "The axiom that 'microphones don't lie' is a true one. If you put a microphone up in the audience and pull a tape and it doesn't sound good, you can't say, 'It was the microphone,' or 'It was the audience.' You've got to accept the fact that it didn't sound good.

"When you stick a mike up in the audience and the tape sounds cool, it's probably because the sound *was* cool. So it's significant to pay attention to the tapes."

Even after 18 years of working with the Dead, Healy says he still enjoys going to work every day. "I've been doing it so long that I don't even look at it as a job," he explains. "It doesn't get stale for me on any continuous basis — I react more to 'Tonight was a good night,' or 'It wasn't so good.' I can have a bad night and go home discouraged and kicking the dog, grumble-grumble, but I'm always ready to start again tomorrow." ■■■

THE NOTRE DAME COLLEGIATE JAZZ FESTIVAL

Overcoming Unfavorable Acoustics to Provide Complex Sound Mixing and Monitoring Facilities

Sound contractors on occasion face far from ideal acoustic environments. And if you need to provide high-quality sound for a two-day band competition where no sound checks could ever be made; for which three discrete mixes change throughout the job; and where a floating feather can create problems in a venue alive with sound reflections . . . a sound engineer is in for a complicated time.

The Notre Dame Collegiate Jazz Festival (CJF) is just such a demanding event. The Jazz Fest, held annually at the university's Stepan Center in South Bend, Indiana, and this year celebrating its Silver Anniversary, offers collegiate bands from all over the United States an arena for displaying their talent before a judges' panel of well-known jazz performers that has included Quincy Jones, Billy Taylor, "Cannonball" Adderly, and others. The CJF performers, many of whom later attain greater fame in the world of professional jazz, play to a house of over 2,000 jazz enthusiasts that swing in and out of the performance sessions over a two-day period.

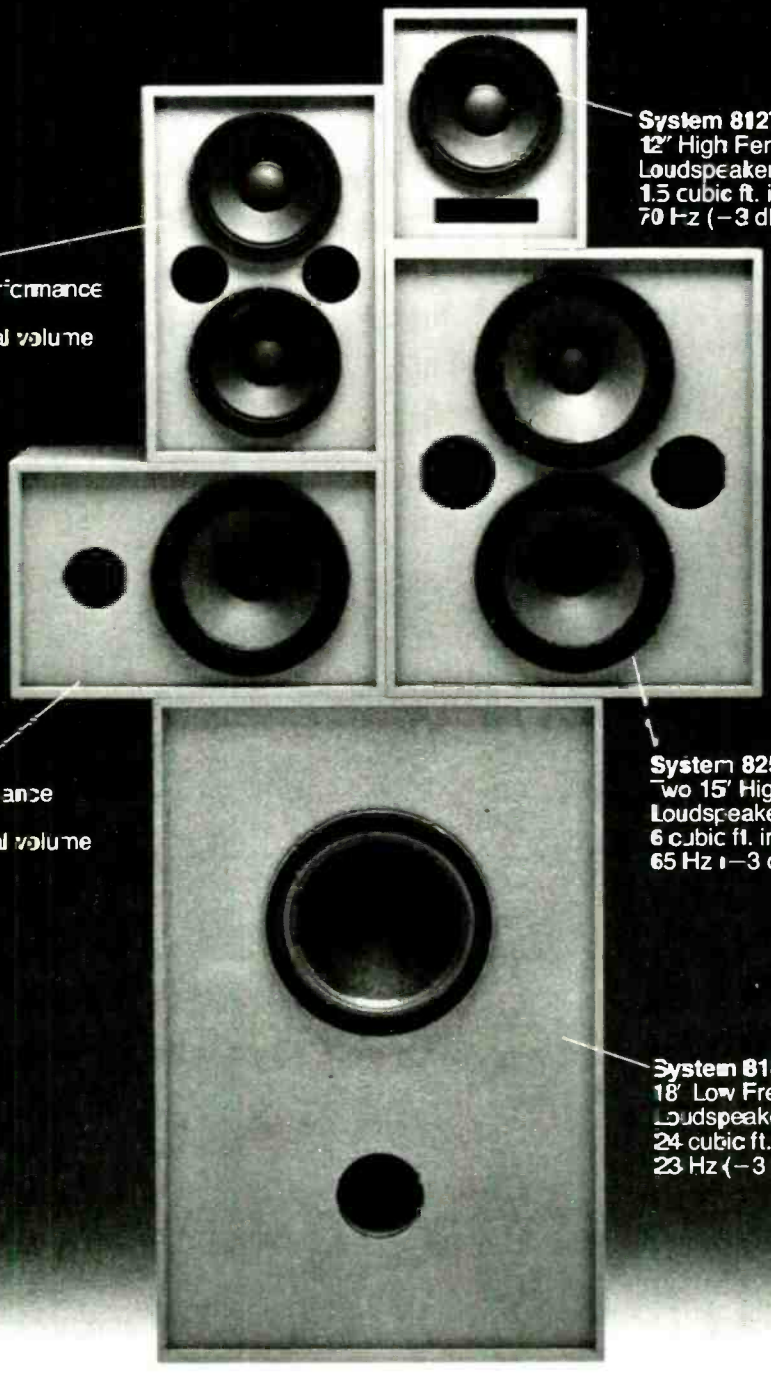
The Jazz Fest's two-day agenda, last April 15 thru 16, included performances by 15 or more collegiate bands, a High School Festival conducted in conjunction with CJF featuring high school talent, and a "judges jam" during which the judging panel takes to the stage.

HSA-Heather Sound, a local sound contracting firm, secured the CJF sound and lighting contract knowing that the event posed some unusual mixing and acoustic requirements. As Rick Johnson, owner of HSA-Heather sound, recalls, "We actually set up three mixes: one for the house; one for the performers; and one for the judges. And the venue is quite interesting. Through past experience on jobs at Stepan Center we had identified many of the acoustical effects that require some form of treatment. For CJF we've tried to accommodate those needs with our pre-event planning, sound set-up, and mixing. At the festival, each band's performance must be presented in an unbiased manner for judging, and this year the event was video-taped for broadcast over local cablevision TV."

To provide a fair showing for all the bands, HSA solicits pre-planning information, such as stage layouts and requirements, musical arrangements and cue sheets, from each participating band a few weeks prior to the event. At the time of performance, HSA's stage manager moves the bands into place on stage, while making last-minute mike adjustments and handling special requests from each performing group's director. It's a system that keeps the CJF on schedule, but there are

TECRON® and TEF® are registered trade marks of Crown International, Inc. Our thanks to Don Eger, TECRON division manager, Richard Johnson, owner of HSA-Heather Sound, the 1983 Notre Dame Collegiate jazz Festival Committee, and the University of Notre Dame for their valuable assistance in the preparation of this article — *Editor.*

ALL LOUDSPEAKER/BOX SYSTEMS ARE NOT CREATED EQUAL.



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System 8227
Two 12" High Performance
Loudspeakers
3 cubic ft. internal volume
70 Hz (−3 dB)

System 8156
15" High Performance
Loudspeaker
3 cubic ft. internal volume
65 Hz (−3 dB)

System 8256
Two 15" High Performance
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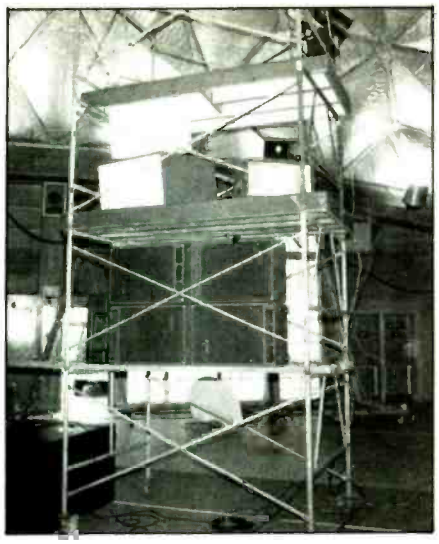


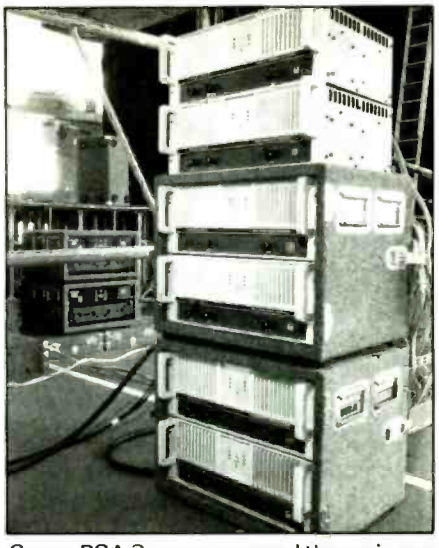
HSA sound system on either side of stage included Electro-Voice and Renkus Heinz components on scaffold supports.

unknowns that require on-the-spot expertise.

"Once the CJF starts swinging," Johnson says, "there are 15 or more bands of different sizes that we have never heard before, playing compositions that we may have never heard before. We get about 10 minutes between bands to plot a final diagram, make mike selections and channel assignments for the main and monitor mixes. Of course, the time constraint, and nature of the competition, does not allow us to make any sound checks, although a few minutes before the first performance on opening night we were able to make a half-hour sound check with the host band."

A Difficult Venue

Complicating the house and performer monitor mixes is Stepan Center's open 40-foot wide by four-foot high stage, and the 52-foot ceiling. "The stage is located in the northern section of the building," Johnson continues. "During performances, the delay paths are unreal! There are narrow focal points on stage right that retain information from stage left, at what we estimate to be 0.25 seconds later. There is a slap from the rear wall that can *kill*."



Crown PSA-2 amps powered the main system, while Ashly FET200 and QSC Series III amps served as backup units.

To accommodate this condition, for performers HSA provides two stage monitor speakers, each with its own discrete mix. But the stage position and mix change for every group. The challenge is to adjust position, levels, and mix for the groups while preserving as much of an un-monitored feel as possible. "And we try to convey a bigger, more open sound for the large bands, and simulate a close, intimate sound for the combos," he offers.

The judges' table, located eight feet in front of the stage, has its own monitor mix that is subject to dramatic changes during the first few group performances

HSA SOUND SYSTEM EQUIPMENT FOR COLLEGIATE JAZZ FESTIVAL

Main Console:	RAMSA 8716 16-in/4-subgroup board.
Monitor Console:	Allen & Heath Brennell Series 8 Model 168 16-into-8 mixer.
Record/Video Console:	RAMSA 8118 18-input/4-subgroup desk.
Processing:	Two Ashly SC66 EQs on Main Mix; Klark Teknik DN27 graphics on Judges' Monitors; Klark Teknik DN30/30 on Stage-Left and -Right Monitors; Ashly SC80 crossover on House System; and Brooke Siren System crossover as back-up.
Amplification:	Six Crown PSA-2s for House Speaker system; two QSC Series III 3500s for monitors/mix monitor/stage left, stage right; two Ashly FET 200s for Judges' Monitors.
Loudspeakers:	Four Intersonics bass enclosures, eight HSA 1501 15-inch enclosures, four E-V HR40 horns on DH1012 drivers, and two Renkus Heinz 820 horns on 3301 drivers for the House System (two E-V HR60 horns on DH1012 drivers as spares); three EV100S speakers for side and rear fills/monitor mix; two E-V Sentry 500 for Judges' Monitors; and two HSA 12T stage monitors for left and right monitors.
Microphones:	Shure SM81s on piano; E-V CH15E with hyper head as drum overhead; E-V RE20s for kick drum, and stand-up solo mike; E-V RE18s and 16s on horns/woodwinds; E-V CS15Ps on percussion; Beyer M88s on upright bass, and vocal; and E-V PL80 for vocals.

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TECRON TEF SYSTEM 10 SPECTRUM ANALYZER

Technical Description and Operation Abstracted from Manufacturer's Literature

The TECRON TEF System 10 utilizes the principles of Time Delay Spectrometry (TDS) developed by Richard C. Heyser, a senior staff member at the Jet Propulsion Laboratories, Pasadena, California. (Crown International has been licensed by the California Institute of Technology to manufacture the new unit.) The system, which comes in a 22- by 18- by 7½-inch metal case, can perform a complete spectral analysis (DC to 31 kHz) of a concert hall, for instance, in much less than half a day, TECRON claims.

The major physical components of the TEF system include a 92-character keyboard on a hinged cover, a 7-inch green-phosphor CRT, 5½-inch mini-floppy disk drive (dual disk optional), a rear panel with all input/output connections, three Z80 microprocessors plus 96K of random-access memory, and sealed lead/acid batteries to provide emergency power in the event of a main-power failure while operating in the field.

Principle of Operation

When in use, the TEF output sweep signal if fed to a system under investigation (which can be a room, component, structure, and so on). A transducer (for example, a microphone) picks up the signal coming out of that system, and feeds it to the TEF tracking filter whose sweep exactly matches that of the test signal. The System 10 provides for an adjustable delay to be programmed into the filter operation, so that any desired time portion of the received signal can be processed through the TEF spectrum analyzer. This TDS type of analysis is said to eliminate any ambient effect on the received signal, so that the filtered signal is a *true* anechoic response, whose characteristics are only those of the system under investigation.

Since the investigation of late arrivals (whether reflections or indirect transmission paths) forms an important part of audio-range signal analysis, an Energy-Time Curve (ETC) is available as a separate program in the TEF machine, and is the one normally first used in spectral analysis. In addition, operator selection of setup parameters is automatically saved on disk, so the conditions of the test can be recalled at any time.

The TEF System 10 also is said to make comparison checks very much easier to accomplish. In a quick difference mode, the unit will automatically display the difference

as the judges decided what they need to hear. According to Johnson, "They are very specific about the sound they expect to be reproduced in order to fulfill their responsibility as judges of the good, and the exceptional. And they like to know we can handle whatever they can produce during the 'judges jam' performance."

Considering the wide variety of jazz presented ("Everything from straight swing to something a director called 'Zen Jazz'," Johnson considers), HSA designed the triple-mix sound system for CJF to a high-performance standard.

"We set a split stack array of equipment on scaffoldings on either side of the 40-foot stage," Johnson explains. "We used six Crown PSA-2 amplifiers to drive the system, two ElectroVoice HR40 [40- by 20-degree] constant directivity horns with EV-DH1012 drivers on each side for overall coverage, with the inside EV-HR40 on each scaffolding positioned to create a 'deadened' zone straight down the wide center aisle of the seating area. A single Renkus Heinz 830 horn and 3301 driver combination on each side provided fill-in for the front rows, and fed a sampling of the house mix to the judges. We used eight of our custom-designed single 15-inch, vented enclosures loaded with EVM 15Bs to handle the upper bass and low mids [four per side].

"CJF '83 gave us an opportunity to try out an innovative new enclosure from

TECRON TEF SYSTEM 10 ANALYZER

. . . *continued* —

between two successive tests on the CRT immediately following the second test. Differencing also can be done as part of the post-test analysis, during which data from different jobs can be compared.

All received data is available for analysis through Hilbert or Fast Fourier transforms. Time Delay Spectrometry sweeps can be analyzed by the TEF system in various domains:

- Time versus Energy (decay curves);
- Energy versus Frequency (frequency response);
- Phase versus Frequency; or
- Phase versus Energy (Nyquist).

In addition, a complete Time-Energy-Frequency (TEF) analysis can be performed, in which the machine automatically makes 31 separate TDS sweeps over a selected time window, and displays the final result as a three-dimensional display of amplitude versus time at various frequencies, which is characterized as a "waterfall" display.

All operations of the TEF System 10 are software controlled, including the selection of sweep rates, bandwidth, time window, and delay. A cursor mode enables the cursor position to be keyboard controlled, with automatic computation and display of the point values of the cursor. Distance of reflections or transmission paths can be read easily on the display from this data. ■■■

Intersonics, Inc. These devices are a product of aerospace servo technology, and use a rotary power-to-force converter. They measure approximately 22½ inches wide by 30 high, and 45½ inches deep, and do not use dynamic or conventional drivers. The design, which is without a voice coil, thereby eliminating magnetic-gap position problems, produces unprecendented diaphragm excursion, low harmonic distortion, very high efficiency, and is highly resistant to burnout. We tested the enclosures at 136 dB SPL with 300 watts in at one meter at 39 Hz!"

Mixing Consoles and Outboards

The triple-mix system included a 16-input RAMSA 8716 mixer, two Ashly parametric equalizers, and an Ashly four-way crossover for the main house mix. The right house master was fed to a single EV100S enclosure on each main stack, to give coverage behind and to the sides of the stage. For the judges' mix, and the stage left/stage right monitors, HSA used an Allen & Heath Brenell System 8 16-in/8-out board.

"The Allen & Heath monitor section gave us the flexibility to punch any of the mixes/channels into a monitor speaker six foot in front of, and pointing at, our monitor mix engineer," Johnson says. "That's really important in a situation where sound checks cannot be taken." HSA also used Klark Teknik third-octave equalizrs to process sends to EV Sentry 500 reference monitors (for the judges), and HSA-designed enclosures with EV conponents for the two stage mixes. The monitors were powered by a combination of the new QSC Series III 3500 and Ashly FET 200 amplifiers.

Split from the AHB System 8 board was a RAMSA 8118 console used to provide a separate stereo mix for the video production group, Gemini Video Productions, Inc. According to Thomas

— *continued* . . .

Smith, president of Gemini Productions, "Videotaping the CJF event was much like doing live TV —[there was] no opportunity for retakes. Most importantly, we regarded our function as secondary to the audio function. We know good audio reproduction is a key factor for high-fidelity, high-definition audio/video. For CJF we knew the success of our final product depended upon the quality of the soundtrack that would actually give 'life' to the performances. HSA provided us a discrete signal — a balanced stereo feed — that enables us to offer the CJF taping for stereo simulcast, as well as for a regular format.

"We used JVC CY2700 cameras to do the CJF in a three-camera production with Panasonic recording and special effects equipment on ¾-inch videocassettes. The result is a fine audio/video production of a swinging event!"

Acoustic Measurements

While the overall sound system results have been satisfactory, Johnson concedes that HSA came into this year's CJF event realizing that there were still unknowns. "We suspected acoustic treatment of the venue itself may be needed," he concedes.

Many of HSA's suspicions were confirmed two days before CJF opening night with the use of a new acoustical measuring device, the TEF System 10. Manufactured by TECRON, the industrial division of Crown International, the System 10 is a microprocessor-based, two-port test instrument designed for quick and easy audio spectral analysis (see accompaning sidebars). For HSA, the 40-pound suitcase-size machine provided critically important information about the unique acoustic behavior of the Stepan Center.

Using the TEF machine, Don Eger, TECRON division manager, completed the analysis in less than an hour. In that time Eger was able to determine where each echo originated, its spectral response, and level relative to the source.

"With the TEF machine we uncovered an interesting phenomenon at Stepan Center that is becoming more widely understood as we identify it in concert halls around the world," Eger explains. "TEF analysis shows that what often are perceived by the ear as reverberations are actually hot echoes. The TEF analysis of Stepan Center shows a cluster of several hot echoes that pierce the RT60 curve. Combined, these hot echoes nearly equalled the original sound source. For CJF, the phenomenon mainly affects the performers who experience a myriad of delayed 200-millisecond echo returns."

Eger and Johnson agree that an effective acoustic treatment to overcome this echo-related phenomenon is primarily diffusion, combined with absorption. "For Stepan Center we know that acoustic treatment will require absorption to suppress the high-end, mechanical movement for low-end reflection, and a way of diffusing very lively echoes," Johnson offers. The combination of absorption and diffusion would break up the cluster of hot echoes, reflect them in multiple directions, and cause the reflections to fall into the reverberation range, is Eger and Johnson's diagnosis.

With highly detailed Energy-Time Curve (ETC) measurements provided by the TEF analysis, specific reflective wall areas can be identified and isolated at Stepan Center. To achieve the desired

TEF ANALYSIS OF NOTRE DAME UNIVERSITY'S STEPAN CENTER

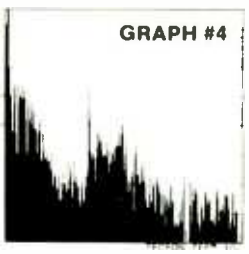
The accompanying graphs represent Energy-Time Curves made at the Stepan Center by TECRON division manager, Don Eger. While it had been determined that the hall, which comprised a pair of handball courts with reflective walls, floor, and ceiling, was producing a pronounced 0.25-second echo from the stage to the listening area, the source of this echo — and hence how to reduce it to manageable proportions for the jazz contest —still had to be discovered.

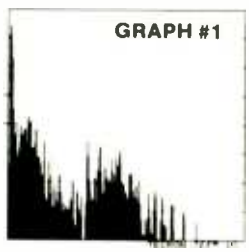
Graph #1, produced with the excitation speaker at stage center and half to the right, and the measuring microphone downstage and to the right, clearly shows a cluster of reflections centered approximately 200 milliseconds after the direct sound arrival. Although the perceived echo appeared to consist of a single "slap," from the TEF display it is clear that a group of sound reflections are responsible for the echo phenomenon. By re-orientating the loudspeaker/mike array, and taking into account the velocity of sound, Eger says, it is possible to pinpoint the surfaces responsible for producing the echoes.

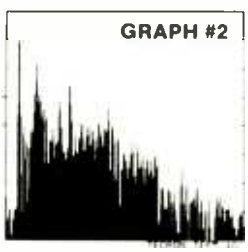
Graph #2, produced with the speaker at the front center of the stage, and the mike centered between the courts, shows a couple of "hot" reflections projecting above the reverberation-time decay envelope.

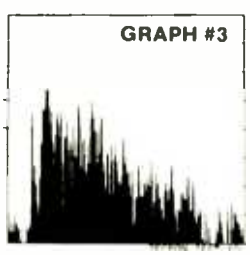
Graph #3, taken with the speaker located center stage front, and the mike on the east edge of the east court, shows that in this orientation the direct sound is much lower in level than the reflected sound. Also, there are a series of closely-spaced reflections spread out along the RT60 decay envelope. All of which, Eger says, leads to the conclusion that the acoustic difficulties in the Stepan Center are being caused by extreme reflection problems, and not reverberation time anomalies.

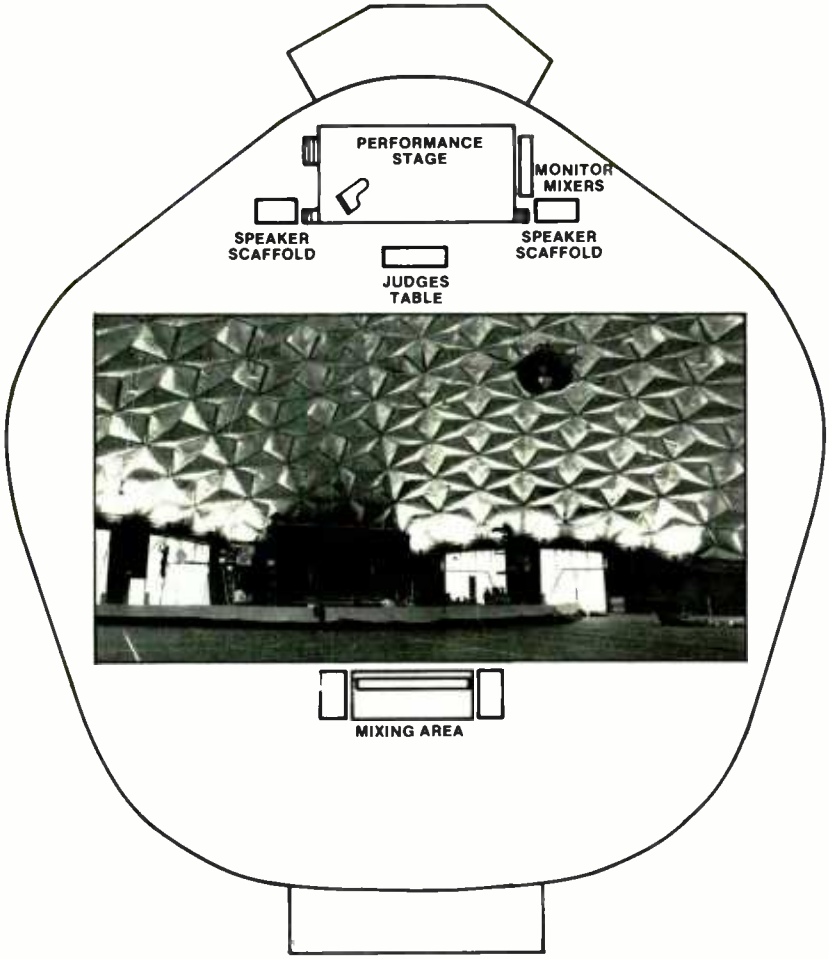
Graph #4, taken with the loudspeaker at stage front and slightly to the left, and the mike stage front slightly right, corresponds to an on-stage monitoring situation — the idea being, Eger recalls, to try and come up with a "sweet spot" for the performers. As can be seen, even on the front of the stage there are multiple reflections being produced, a situation that was to be found throughout the performing stage area.











diffusion, Eger and Johnson suggest that convex panels could be attached to walls that have been shown to be highly reflective.

There are other acoustic treatments that could be considered, such as polycylindricals, and/or geometric shapes suspended from the ceiling; the construction of a "live" band shell, or positioning the portable stage on a perpendicular point to a wall surface that is less conducive to hot echo returns, Johnson and Eger suggest.

"Combined with proper wall acoustics, the band shell especially would enhance each band's ability to hear itself as a cohesive unit, and the structure would simplify monitoring," Johnson says. He also noted that even simple treatments greatly affect hot echoes at Stepan Center. "We noticed a lower bass echo this year than we remembered from last year's CJF. After investigation we realized that portable concession trailers at the southeast and southwest areas of the building, not used last year, were providing bass-end diffusion and bass trapping during performances this year."

"The important result of the TEF testing at Stepan Center," Eger concludes, "is that the venue *can* be acoustically treated effectively and economically. And such treatment would simply enhance the good sound reproduction that is already possible for events such as the CJF." ■■■

New Products

LEXICON MODEL 1300 AUDIO DELAY FOR VIDEO SYNCHRONIZATION

The new Model 1300 audio-delay synchronizer allows production facilities and broadcasters to effectively solve "lip-sync" problems that result from the increasing use of digital video processors and synchronizers. The system decodes the hysteresis and frame offset information from any video synchronizer, to provide frame-accurate audio synchronization.

Three standard decoding options are supplied: pulse-width decoding; "wild-feed"/genlock decoding; or serial data decoding, each with its own interface panel and software. The removable Delay Configuration Control Module can be set up to conform to any delay/sync decoding scheme presently in use, and provides software/hardware flexibility for future configurations.

The Model 1300's digital audio delay section offers up to two seconds of delay, a quoted 20 Hz to 20 kHz bandwidth, distortion less than 0.025%, dynamic range greater than 90 dB, and channel separation greater than 70 dB.

LEXICON, INC.
60 TURNER STREET
WALTHAM, MA 02154
(617) 891-6790

For additional information circle #146

MXR INTRODUCES NEW DRUM COMPUTER

The new Model 185 Drum Computer features 12 drum sounds that have been digitally transferred to the unit's programmable read-only memory chips (PROMs). Each of the 12 voices has its own output level control, and separate output jack. Recording capacity of the unit is 100 patterns, with up to 99 click track beats each, and 100 songs.

Seven accuracy levels — from 1/8 notes to 1/32 triplets — are available, and built-in error correction places the programmed drum sound on the nearest note according to the accuracy level selected. Any time signature can be programmed in merely by setting the pattern length and accuracy level, MXR says. Tempo is adjustable from approximately 40 to 250 beats per minute.

To operate, the pattern length and accuracy levels are set as required, the tempo adjusted using the built-in click track, and the appropriate drum voice key depressed. The click track automatically emphasizes the first beat of the selected pattern length, so multiple drum tracks can be laid down. Pattern lengths can be extended or shortened with the push of a few buttons.

On playback, both Tempo and Pitch can be adjusted, and a human "feel" can be induced by using any of the four levels of Shift (sometimes called "swing" or "shuffle"), a feature which offsets the drum voices slightly, positioning them either just before or just after the selected primary rhythm beat.

The Model 185 Drum Computer has a suggested retail price of $1,250.

MXR INNOVATIONS, INC.
740 DRIVING PARK AVENUE
ROCHESTER, NY 14613
(716) 254-2910

For additional information circle #147

UREI UNVEILS MODEL 1620 COMPACT MIXER

The Model 1620 is a multi-input stereo mixer optimized for the heavy use in production, sound reinforcement, broadcast and any other professional applications.

The new unit features two stereo phono inputs (each with its own level control), one transformer-isolated mike input, plus five stereo line-level inputs. The mike, line, and up to three additional optional phono and/or mike inputs are assigned by a flexible switching matrix to four auxiliary level controls. Each input control has its own balance control for precise adjustment.

Separate outputs are provided for on-

air (house) and monitor (booth) amplifiers, each with its own level control. A separate headphone circuit allows the operator to select any of the six inputs or the program output. An isolated mono output is provided on the rear panel. Two separate tape outputs also are provided for recordings, and a processor loop allows connection of equalizers or signal processors.

UREI
8460 SAN FERNANDO ROAD
SUN VALLEY, CA 91352
(213) 767-1000

For additional information circle #102

FURMAN SOUND LC-3 LIMITER/COMPRESSOR

In addition to continously adjustable attack, release, and compression ratio controls, the LC-3 also features "side-chain" and "de-ess" modes of operation, an LED-style meter displaying gain reduction, and separate input and output level controls.

The input control automatically adjusts the gain of the input stage, maximizing the signal-to-noise ratio. This feature, in addition to carefully tailored bias currents through the VCA, results in extremely low noise and low distortion at all levels and with all amounts of gain reduction, Furman says.

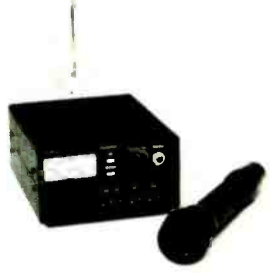
Suggested list price of the new Model LC-3 compressor-limiter is $335.

FURMAN SOUND, INC.
30 RICH STREET
GREENBRAE, CA 94904
(415) 927-1225

For additional information circle #103

MINIATURE SYSTEM 85 WIRELESS MICROPHONE FROM HME

The all-new hand-held wireless mike combines a Shure SM85 cardioid condenser element with the smallest 9-volt powered transmitter available, HME claims. A 9-volt alkaline battery will provide eight hours of continuous life at 50 milliwatts of radiated power.



The 11-ounce System 85 transmitter/element combination is less than nine inches in length; shorter than a standard SM85 plus cable connector. Dynamic range is quoted at over 115 dBA — greater than that of the element itself — and a totally silent mike mute switch enables the talent to turn off the audio without breaking the RF link. An advanced squelch circuit prevents audible RF dropouts, as well as unwanted pops when the transmitter is turned off.

The System 85 is available for $2,535, including a fitted flight case.

HM ELECTRONICS, INC.
6151 FAIRMOUNT AVENUE
SAN DIEGO, CA 92120
(714) 280-6050

For additional information circle #104

ALLEN AND HEATH MODEL 168 SYSTEM 8 MIXING CONSOLE

Designed as a 16-input recording or sound reinforcement console, the Model 168 features electronically balanced microphone inputs with phantom-power option, and line-level inputs with separate insert points for connection of effects devices. PFL is offered on each channel, plus an input pad giving 20 dB attenuation on mike signals.

Three-band EQ is available with LF and HF offering selectable shelving at 60/120 Hz and 8/12 kHz. Three auxiliary sends, one pre-fader, one post-fader and one switchable pre/post, are fea-

New Products

tured, plus direct routing to the main stereo mix.

System 8 provides instant monitoring of all signals without disturbing the recording in process. A one-shot PFL function with PFL-Active LED indicator overrides monitor mix, outputs, and metering. The control room monitoring system, with independent level control of headphones and loudspeakers, may be driven by the main stereo mix, stereo master recorder, or cue system. Cue mixes can be set up from the channels, track monitors (or a combination of the two), or the stereo mix.

Two or more mixers can be cascaded without sacrificing any inputs or outputs, since rear-panel sockets allow direct access to and from the monitor and remix groups, auxiliary sends, PFL system, and the main output groups. This same facility enables the add-on 8-input expander module (EX8) to be used for increased input capacity.

ALLEN AND HEATH BRENELL USA, LTD.
FIVE CONNAIR ROAD
ORANGE, CT 06477
(203) 795-3594

For additional information circle #148

OTARI MODEL CB-116 AUTOLOCATOR FOR MARK III SERIES MACHINES

Designed for use with Mark III two-, four-, and eight-track machines, the new CB-116 autolocator also will function with all new Otari recorders (5050 Mark III Series), and most existing machines in the field.

The new unit features six one-button-storage cue location memories; one-button search to any cue location; repeat mode for continuous rehearsal between any two cue locations; Play and Park, which plays to any selected cue location, and then stops; Head and Tail Guard Points, which stops tape from winding past selected points at head and tail of selection; and Automatic Cue Offset that recalculates all cue locations when local time display is reset.

In addition, time settings may be entered into Cue or Guard point memories, and there is provision for foot switch punch-in.

Price of the new Model CB-116 autolocator is $695.

OTARI CORPORATION
2 DAVIS DRIVE
BELMONT, CA 94002
(415) 592-8311

For additional information circle #149

BANNER REAL-TIME ANALYZER DISTRIBUTED BY MXR

The new RTA 1232 third-octave real-time analyzer/SPL meter from Banner Electronics is said to provide very high selectivity without the loss of interband frequencies. This high-Q performance is the result of an entirely new electronic filter-shaping circuit that exhibits the steep skirts and somewhat flat-top shape of conventional double-tuned, four-pole filters, but does so with about half of the electronic parts of single-tuned (two-pole) designs.

The RTA 1232 provides 31 ISO bands from 20 Hz to 20 kHz, with frequency distribution displayed on a 12-by-32 LED matrix. Features include the ability to accurately measure broadband SPL with an optional calibrated microphone; two phantom-powered mike inputs, and two line-level inputs. Meter reference range is 65 to 120 dB, with selection of 1, 2 or 3 dB per step. Digital pink and white noise generation is built-in.

Suggested retail price of the Banner RTA 1232 is $1,250.

MXR INNOVATIONS, INC.
740 DRIVING PARK AVENUE
ROCHESTER, NY 14613
(716) 254-2910

For additional information circle #150

YAMAHA MODEL RM804 RECORDING MIXER

The RM804 has eight input channels, each with an electronically balanced XLR mike/line input, and an unbalanced RCA jack tape input, routing to four main program mixing busses. Separate two-track tape inputs and outputs are provided for mixdown and monitoring.

The XLR inputs have continuously variable gain trim controls for levels from -60 to -20 dB. A three-band equalizer and channel insert point also are featured, along with direct output jacks.

In addition to the main program mixing busses, there is an echo send bus and a stereo bus. The stereo bus derives its signal from one of two points — after the channel fader, or from the tape input jack — and these sources can be assigned to the stereo bus for control room and performer headphone cue monitoring. The echo send bus may be fed by the channel's post-fader signal or the tape input, allowing a choice of wet or dry monitoring and recording. Two echo returns are provided.

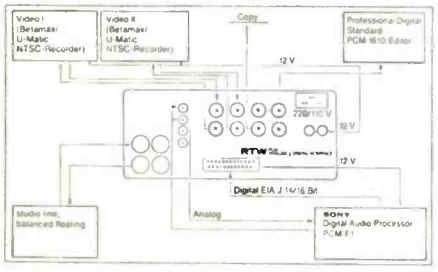
The RM804 has a suggeted retail price of $1,195.

YAMAHA COMBO PRODUCTS
P.O. BOX 6600
BUENA PARK, CA 90622
(714) 522-9134

For additional information circle #151

RTW DIGITAL STUDIO PROCESSOR FOR SONY PCM-F1

Now available in the U.S. from Auditronics, the RTW Studio Processor Set utilizes a modified Sony PCM-F1 digital audio processor, and a specifically designed interface unit to enable digital recording on any commercially available EIAJ standard videocassette recorder.



Operation is improved over the standard PCM-F1 by the inclusion of balanced line-level inputs and outputs, headroom optimization, more extensive status and error correction displays, and data translation to the Sony PCM-1610 standard, thereby enabling direct digital copying and editing capability.

Representing the first unit to interface between the PCM-F1 (14/16-bit) and PCM-1610 (16-bit) standards, the RTW Studio Processor has many applications in studio mastering, and audio/video production.

AUDITRONICS, INC.
3750 OLD GETWELL ROAD
P.O. BOX 18838
MEMPHIS, TN 38118
(901) 362-1350

For additional information circle #152

APHEX ANNOUNCES NEW COMPELLOR COMPRESSOR/LIMITER

The new unit, a combined compressor/leveler/peak limiter, is said to provide complete dynamics control, smooth inaudible compression, increased loudness, with freedom from constant gain riding. High audio quality results from use of the Aphex 1537A VCA chip, which is controlled by two partly interdependent side chains.

The Leveler section maintains long-term audio output level within 1 dB for a 20 dB input level change, while the Compressor operates over a 30 dB range of input levels, varying the ratio from about 1.1:1 to 20:1. The resulting "soft knee" prevents the usual "choked" sound associated with deep compression. Attack and release times are dependent on program material. The Peak Limiter holds an absolute ceiling 12 dB above the average level.

Another feature is the Silence Gate, which prevents gain reduction release when the input drops below a predetermined level. This prevents gain and noise build-up when program material stops, or between pieces of material.

Also made possible by the Compellor's intercependent side chains is Ste-

For additional information circle #76

New Products

reo Enhance. When activated, the dual channel's compressor can be triggered by certain audio information that causes widening of the stereo image that is fully mono compatible.

Retail price of the Compellor is $995, and the unit will be available mid-1983.

APHEX SYSTEMS, LTD.
7801 MELROSE AVENUE
LOS ANGELES, CA 90046
(213) 655-1411

For additional information circle #153

AKG ACOUSTICS LAUNCH C-460B CONDENSER MICROPHONE SYSTEM

The C-460B modular mike system is an addition to, and is compatible with, all existing C-450 components (except for the CK-9 and VR-2 capsules). Standout features include: wide dynamic range (sound pressure levels of 138 dB SPL over the full frequency range; 148 dB SPL with pad); low self-noise (measured at 15 dB SPL to IEC 179-A); minimum current consumption when connected to any powering voltage from 12 to 52 volts; and built-in 50, 70 and 150 Hz roll-off, and 0 or 20 dB attenuation.

An electrically conductive rubber adapter ring is supplied with the C-460B as a means of using existing capsules, such as the CK-1, CK-22, CK-8, etc. Its mechanical construction is said to ensure lower sensitivity to handling noise, and maintains a consistent low impedance connection between the housing of the capsule and the microphone pre-amplifier.

THD at 1 kHz is a quoted 0.01% at maximum SPL; equivalent noise level 15 dB SPL; dynamic range of 123 dB and maximum SPL of 138 dB at 0.5% THD over the full frequency range.

AKG ACOUSTICS, INC.
77 SELLECK STREET
STAMFORD, CT 06902
(203) 348-2121

For additional information circle #154

REMOTE CONTROLLER FOR LEXICON 224X REVERB SYSTEM

The Lexicon Alphanumeric Remote Controller (LARC) is an option on new 224X systems, and easily retrofitted to existing installations. A 48-character alphanumeric display guides and prompts users in applying the full range of capabilities of the 224X, and speeds mastery of the system by even inexperienced operators, Lexicon claims.

Registers for user-created programs in the 224X will store up to 36 setups, which can be off-loaded to a cassette by the LARC, and reloaded in less than one minute. This feature allows relocatable setups and program to be transported to any location with a LARC-equipped 224X.

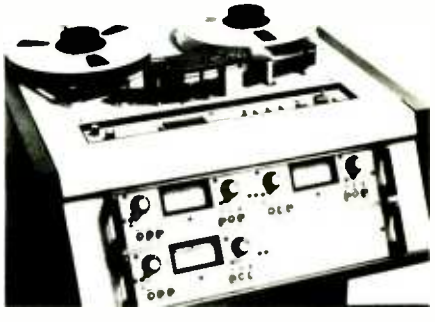
The LARC measure 6 by 10 by 3 inches, and may be operated up to 1,000 feet away from the mother chassis.

LEXICON, INC.
60 TURNER STREET
WALTHAM, MA 02154
(617) 891-6790

For additional information circle #155

MCI/SONY AUDIO LAYBACK TAPE MACHINE FOR ONE-INCH VIDEOTAPE

The Audio Layback Recorder/Reproducer, based on the MCI JH-110B transport, is a post-production recorder for layback or transfer of audio to one-inch, Type-C videotape. By employing specialized heads and electronics design, the new unit optimizes signal-to-noise ratio, and wow and flutter of the final edited videotape's audio tracks.



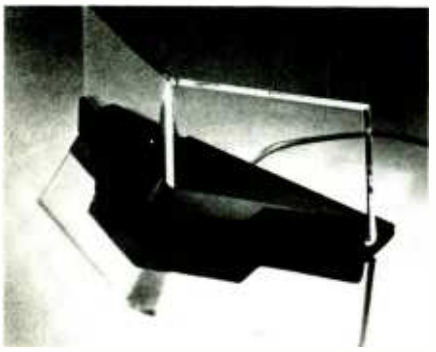
The new machine will record two audio tracks for stereo sound, and a SMPTE timecode control track. Signal-to-noise ratio is quoted at greater than 60 dB, frequency response from 30 Hz to 20 kHz, and wow and flutter less than 0.025%. The system is available for NAB A or B, one-inch tape reel sizes.

SONY COMMUNICATIONS PRODUCTS COMPANY
SONY DRIVE
PARK RIDGE, NJ 0765
(201) 930-6432

For additional information circle #156

CROWN INTRODUCES PZM 2.5 FOR DIRECTIONAL PICKUP

The PZM 2.5 low-profile, minimum visibility microphone combines a precision-calibrated pressure capsule with nearly invisible corner boundary to achieve improved directionality. According to Crown, the new mike effectively captures and emphasizes sounds approaching from its front, while rejecting sounds from behind, thereby effectively eliminating audience noise pickup during theatrical productions, conferences, and public meetings.



In operation, the microphone can be placed on a surface such as a floor, table or lectern and aimed at the desired sound source. The corner boundary design increases the microphone's sensitivity, and is said to actually improve speech articulation through its specially tailored frequency response.

The PZM 2.5 microphone plugs directly into a 12- to 48-volt phantom power supply, includes a transformer balanced, low-impedance output, and a permanently attached 15-foot cable.

CROWN INTERNATIONAL
1718 W. MISHAWAKA ROAD
ELKHART, IN 46517
(219) 294-5571

For additional information circle #157

MM12 MONITOR CONSOLE FROM RANE

The MM 12 compact 12-input/6-output mixer features three-way input EQ, mike output patching, two-stage parametric output EQ, stacking inputs, send/receive loops, and submixing.

Of special interest, Rane says, is an "output-oriented" layout design for improved ease of operation. The MM 12 measures 21 by 19 inches, by 2¼ inches deep in an all-steel chassis.

Suggeted list price for the MM 12 monitor mixer is $1,299.

RANE CORPORATION
6510 216TH SW
MOUNTLAKE TERRACE
WA 98043
(206) 774-7309

For additional information circle #158

NEUMANN KMR 81i SHOTGUN MIKE

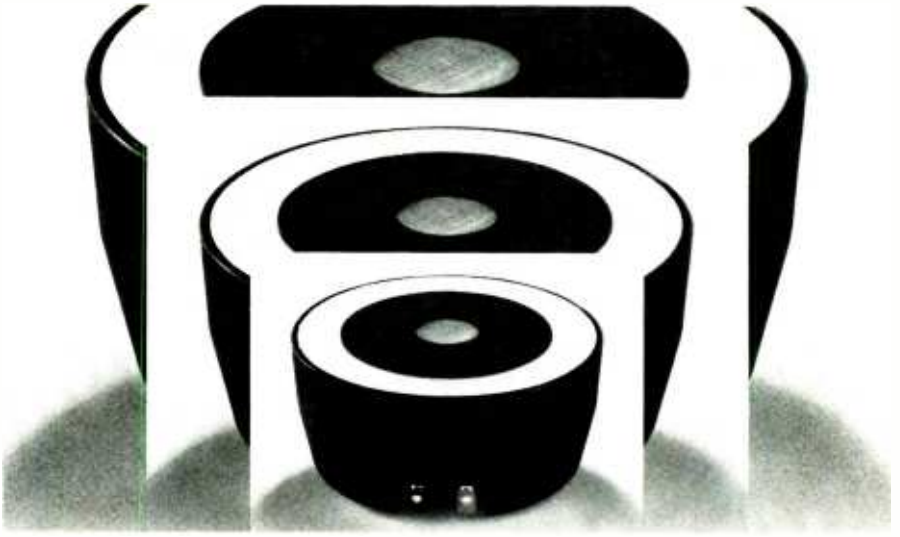
In miking situation where "reach" is required, the 9-inch KMR 81i is said to form a perfect complement to Neumann's 15½-inch shotgun, the KMR 82i. Both microphones use an especially developed capsule and amplifier located inside an interference tube, which is acoustically open but results in a high diaphragm driving force at a low capsule pressure gradiant.

According to Neumann, the new KMR 81i combines a high degree of sound rejection at its sides with an excellent front-to-back ratio. The microphone is largely insensitive to wind and popping, and has an internal elastic suspension to suppress handling noise.

Suggested user price is $695.

GOTHAM AUDIO CORPORATION
741 WASHINGTON STREET
NEW YORK, NY 10014
(212) 741-7411

For additional information circle #159



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EASTERN ACOUSTIC WORKS

P.O. Box 111
Framingham, Mass. 01701
(617) 620-1478

For additional information circle #77

New Products

AUDIOARTS ANNOUNCE 8X SERIES MIXING CONSOLES

Intended for 8- to 24-track recording/production studios and video editing rooms, the 8X features three-band sweepable EQ, HPF, stereo monitoring, four mixdown effects sends, phase reversal switches, phantom powering, and assignable direct outputs.

A Super Solo section includes solo switching for pre- and post-fader, tape return and bus outputs. In addition, all mike, line and return inputs are electronically balanced, as well as all bus and direct outputs, stereo masters, effect send, control room, and studio outputs.

Standard features include the M104 conductive plastic fader, a 20 Hz to 20 kHz oscillator, full control room and studio listening function, headphone jack, and talkback/slate switching.

The 8X Series is available in 12- to 40-input configurations, with or without built-in patchbay, and is available with 8-, 16- or 24-track VU or LED metering systems.

AUDIOARTS ENGINEERING
5 COLLINS ROAD
BETHANY, CT 06525
(203) 393-0887

For additional information circle #160

YAMAHA COMPACT STAGE MONITOR SPEAKER SYSTEM

The new S2112H slant-type, two-way monitor speaker features a compact Thiele-aligned enclosure housing a JA3105 12-inch woofer. A built-in crossover network protects the JA3201 compression driver and flush-mounted horn from frequencies below 2.5 kHz.

The S2112H delivers 97 dB SPL at 1 meter with 1 watt input, and can handle up to 100 watts continuous program power (8 ohms). Frequency range is quoted at 60 Hz to 16 kHz, ±6 dB.

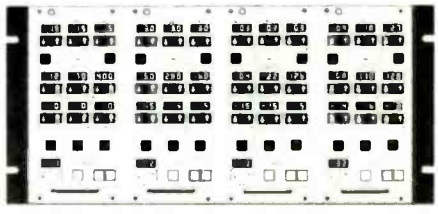
The S2112H has a suggested retail price of $365.

YAMAHA COMBO PRODUCTS
P.O. BOX 6600
BUENA PARK, CA 90622
(714) 522-9134

For additional information circle #161

AUDITRONICS PROGRAMMABLE PARAMETRIC EQUALIZER

The PPEQ-1 Programmable Parametric EQ System is designed for production use in audio-for-video, disk mastering, or film. The unit includes up to four mono- or stereo-tracking, three-band parametric equalizer units, each with variable Q, variable frequency, and variable boost/cut. High and low bands also include peak/shelf capability, and each band features an independent in/out switch.



Each equalizer unit has 32 on-board, non-volatile memories, and an interface

available to accept serial or parallel data for external sequencing or programming from an external editor or computer. All parameters are software controlled, and displays are provided for each parameter to enable all settings to be viewed at a glance.

AUDITRONICS, INC.
3750 OLD GETWELL ROAD
P.O. BOX 18838
MEMPHIS, TN 38118
(901) 362-1350

For additional information circle #162

TEF SYSTEM 10 SPECTRUM ANALYZER FROM TECRON

Investigation into audio and other vibration phenomena is said to be greatly simplified with the TECRON TEF System 10, a microprocessor-based, two port-test instrument for spectral analysis in the DC to 31 kHz range. Manufactured by the TECRON division of Crown International, Inc., under license from Jet Propulsion Laboratories, California Institute of Technology, Pasadena, California, the TEF machine utilizes the principles of Time Delay Spectrometry (TDS) developed by Richard C. Heyser, a JPL senior staff member.

In use, an output sweep signal is fed to a system under investigation, a transducer (a microphone, for example) picks up the signal coming out of that system, and feeds it to the TEF tracking filter whose sweep exactly matches that of the test signal. An adjustable delay can be programmed into the filter operation so that any desired time portion of the received signal can be processed through the TEF spectrum analyzer. This TDS type of analysis is said to eliminate any ambient effect on the received signal, so that the filtered signal is a true anechoic response. [A feature article published elsewhere in this issue provides full application details—*Ed.*]

The TEF System 10 is offered with standard equipment and software at $14,500.

TECRON DIVISION OF
CROWN INTERNATIONAL, INC.
1718 W. MISHAWAKA ROAD
ELKHART, IN 46517
(219) 522-1274

For additional information circle #163

BASF INTRODUCES FERRO SUPER LH OPEN-REEL TAPE

BASF Ferro Super LH is a 1-mil-thick, back-coated quarter-inch tape available in 1800-foot (7-inch reels), and 3600-foot (10½-inch reel) lengths. Designed for studio mastering use, the tape's special oxide formulation is said to deliver high output, very low distortion, and reduced noise.

According to BASF's marketing director Mark Dellafera, "Ferro Super LH has a special back-coating which virtually eliminates static and dust debris, and it guarantees the superb winding properties that have always distinguished BASF mastering tapes, even during high-speed shuttling. This means remarkably smooth, even winds, and no crushed edges which cause signal losses."

BASF SYSTEMS CORPORATION
CROSBY DRIVE
BEDFORD, MA 01730
(617) 271-4000

For additional information circle #164

LONGER LENGTH MASTERING TAPE FROM AGFA-GEVAERT

Agfa PEM 428 is a 1-mil version of the company's PEM 468 two-inch studio mastering tape. Available as 4,800 feet on a 12½-inch reel, a full-hour recording can be made at 15 IPS.

A high-output/low-noise tape offering improved dynamic range and print-through, PEM 428's polyester base is

New Products

tensilized and, according to Agfa, consequently much stronger than other tapes that use a thicker but weaker conventional base.

Quality slitting assures consistent edge tracks, even transport across the head, and accurate phase relationship from edge to edge. Batch number and webb position on the back coating assure permanent tape-type identification.

AGFA-GEVAERT
TAPE DIVISION
275 NORTH STREET
TETERBORO, NJ 07608
(201) 288-4100

For additional information circle #165

ECOS MODEL 1023 POW-R-MATE AC POWER TESTER

Designed specifically for testing AC power systems and equipment rated through 600V, the Model 1023 Pow-R-Mate is said to incorporate several unique features, including:

- Complete analysis of grounded and ungrounded single- and three-phase circuits and equipment rated through 600VAC.
- Phase rotation, open phase, and phase-to-ground reversal testing.
- Phase-to-phase and phase-to-ground voltage measurement at the touch of a switch.
- Leakage-current testing of portable and cord-connected equipment to determine safety.

By combining all these testing features in a single lightweight instrument, the Model 1023 eliminates the need to carry several different testers, and provides maximum safety and accuracy.

ECOS ELECTRONICS CORP.
205 WEST HARRISON STREET
OAK PARK, IL 60304
(312) 383-2505

For additional information circle #166

TRIDENT LAUNCHES SERIES 70 MULTITRACK CONSOLE

The new Series 70 is a 28-input, 16-track routing and 24-monitor recording board with more than enough flexibility to be used as a PA console, Trident says.

The input section is based on the successful Trimix Series, and features include four echo returns; full VU or PPM metering; 16 output group faders with 24-track monitoring capability; and a 306-point patchfield integrated in the frame.

Typical price for a 24-into-16 Series 70 is $19,500 list.

TRIDENT (USA), INC.
652 GLENBROOK ROAD
STAMFORD, CT 06906
(203) 357-8337

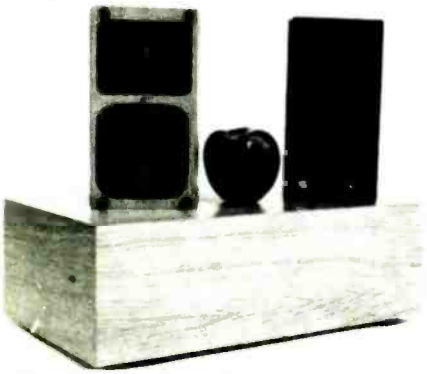
For additional information circle #167

DLS-1 ULTRA-MINIATURE MONITOR FROM DL SYSTEMS

The new loudspeaker system's small size, coupled with true high-fidelty performance, is said to make the DLS-1

ideal for use as a monitor in the studio, on remotes in vans, as portable monitors, and other professional applications.

The system can deliver 100 dB SPL at one meter with peaks in excess of 113 dB. To achieve this dynamic range, DL Systems employ Transform Matched component speakers and Compression Compensated crossovers.



Consisting of a pair of two-way desktop speakers and one subwoofer containing two low-frequency drivers, the entire three-way stereo system displaces only 0.54 cubic feet, and weighs 27½ pounds.

Prices range from $525 for ash and oak, to $1,600 for the complete system in solid rosewood enclosure.

DL SYSTEMS
P.O. BOX 398
SIMI VALLEY, CA 93062
(805) 526-2230

For additional information circle #168

OTARI UNIVERSAL RESOLVER FOR AUDIO/VIDEO AND FILM INTERFACE

The new Universal Resolver was designed as a multi-purpose speed controller for all audio tape machines in film and video interface applications, and also will be made available as a plug-in accessory for Otari MTR-Series machines.

The UR will lock an audio transport's speed control track over a ±30% speed range to an external or internal crystal reference source, for quoted playback speed accuracy of better than 0.001%. Internal crystal-controlled references are provided, or the unit may be referenced to the AC line, composite video, SMPTE/EBU timecode, or an external source.

The tape track may be either Mono pilot (mono audio with a superimposed bi-phase pilot tone, and compatible with Neo Pilot) or FM pilot (stereo audio with an FM modulated pilot tone in the center guard band of the NAB stereo format, and compatible with Nagra Sync). Additionally, the UR can record the Mono or FM pilot tones for field-compatible playback. The selected timebase frequency also is available as a sine wave for recording as a pilot track.

Delivery of the new Universal Resolver is slated for late 1983 in the US. Prices will range from less than $2,500 for a stand-alone unit, or around $1,000 as a plug-in accessory for MTR-Series transports.

OTARI CORPORATION
2 DAVIS DRIVE
BELMONT, CA 94002
(415) 592-8311

For additional information circle #169

STEREO CHORUS UNIT FROM DYNO MY PIANO

The new Tri Stereo Chorus 618 (mono-in/stereo-out) incorporates three distinct waveforms, or chorusing effect. A Chorus Mode automatically varies the phase relationships of left and right outputs for stereo applications, and is switchable to mono for single-channel use.

An LFO Mode offers two modes of operation: a Preset configuration of Tri Chorus; and/or the Manual controls of Rate, Intensities I, II, and III. This latter feature is said to allow up to six waveforms and two speeds of chorusing to occur simultaneously.

New Products

The Rate control's delayed response allows a gradual increase or decrease of chorus speed after an engineer's fingers leave the dial, and also is controllable with a footswitch. The output level indicator LED bar graphs are in three colors for improved monitoring.

Recommended retail price is $1,195.

DYNO MY PIANO
P.O. BOX 1007
BURBANK, CA 91507
(213) 845-7864

For additional information circle #170

AUDIO + DESIGN D60 STEREO DELAY OPTION FOR F601 LIMITER

Intended for use with the recently introduced F601 Super-Dynamic Limiter, the D60 Dual Mono/Stereo Feed Forward Limiter Delay Line option consists of the delay path, and a master control VCA providing control voltage for the limiter.

The F601 with its greater than 100 dB dynamic range has been designed to meet the challenge of the digital era. 16-bit PCM systems can provide a dynamic range in excess of 90 dB, but when headroom and what some call "low-level granular distortion" are considered, this 90 dB Range can shrink to that of better analog systems, ADR says.

The D60/F601 Superdynamic feed forward delay line limiter package obviates the need for a clipper, and eliminates all problems associated with clipping, it is claimed.

Prices of each unit are: F601-R mono $990; F601-RS dual-mono/stereo $1,490; and D60 Delay-Line Option $560.

AUDIO + DESIGN RECORDING
P.O. BOX 786
BREMERTON, WA 98310
(206) 275-5009

For additional information circle #171

news

. . . continued from page 12 —

SOUNDCRAFT STEALS LOPEZ FROM *R-E/P*

In a surprise tactical move, Soundcraft Electronics stole Erika Lopez from the staff of *R-e/p*. Since no ransom has been asked, it is widely believed that they intend to keep her in their advertising department in Santa Monica.

Brave *R-e/p* publisher, Martin Gallay, was heard to mutter, "Our loss is Soundcraft's gain."

— News Notes —

Simon Systems has changed its address to 14201 Foothill Boulevard, Suite #29, Sylmar, CA 91342. Telephone: (213) 362-4000 . . . **Fairlight Instruments, USA**, has opened a New York office at 575 Madison Avenue, New York, NY 10022 — telephone (212) 605-0296 — to be headed up by Jim Roberts and Clive Smith . . . **DeltaLab Research, Inc.** has relocated to a larger facility, whose new address is: 19 Alpha Road, Chelmsford, MA 10824. The company's telephone number remains unchanged: (617) 256-9034.

JBL TO MARKET UREI PRODUCTS IN U.S.

Ron Means, VP of marketing and sales for JBL's Professional Products Division, has announced that the company will begin marketing UREI brand name products in the United States, effective July 1. The URC Corporation, of which UREI is a division, recently was acquired by JBL parent, Harman International.

According to Means, JBL and UREI will share a combined sales organization, including common representatives, regional managers and national sales manager. No major changes are anticipated in the UREI dealer distribution.

SOUND WORKSHOP APPOINTS EVERYTHING AUDIO AS SO CALIFORNIA DEALER

Everything Audio will act as exclusive Southern California dealer for Sound Workshop Series 20, 30, and 40 mixing consoles, ARMS Automation, and the DISKMIX Automation Storage/Editing System.

According to Emil Handke, Sound Workshop's sales manager, "This new agreement was a natural because of Everything Audio's broad market base, and their thorough knowledge of mixing consoles and console automation [for] recording studios and video post-production facilities. We look forward to Everything Audio becoming deeply involved with retro-fitting existing consoles [of all manufacturers] with both ARMS Automation and DISKMIX Automation Storage."

MCI/SONY APPOINTS THREE NEW PRO-AUDIO DEALERS

The three recently appointed MCI/Sony Professional Audio dealers are: **Recording Studio Equipment**, North Miami Beach, Florida, **Leo's Professional Audio**, Oakland, California, and **Westlake Audio**, Los Angeles, California. Sales, demonstrations, and service for all MCI consoles, tape machines, and accessories, and Sony Professional Audio products, will be available at all three locations.

Existing MCI/Sony dealers are: Audio Industries, Hollywood, CA; Audiotechniques, Stamford, CT; Milam Audio, Pekin, IL; Studio Supply, Nashville, TN; Pro Audio Systems, Seattle, WA; Southwest Pro Audio, Austin, TX; and Studioworks, Charlotte, NC.

BARRY ROCHE APPOINTED PRESIDENT OF NEVE

On the occasion of his recent appointment, Neve president Barry Roche had some interesting words to say about the state of the audio industry: "While some companies may look like they're moving ahead by adding lots of 'bells and whistles' to their latest consoles, they're probably moving away from the real-world *human* requirements. For example, our newest analog console, the 8128 Series, certainly has lots of features, but first and foremost it sounds *good*. I feel that nothing sounds as good as a Neve, yet at the same time is so easy to use.

"In the 8128 we combined ergonomics with the famous Neve sound. We simplified track assignment chores by literally eliminating over 1,500 separate buttons! Now instead of track assignments being a cumbersome chore, and sometimes a trap for the unwary engineer, they are easy and fast. You can even store your favorite assignments into memory, so that typical resetting chores for the next day are greatly reduced.

"The audio console of the future will have fewer buttons," Roche concluded "yet be even more versatile and easier to use than its predecessors."

news

DIGITAL ENTERTAINMENT CORPORATION FORMED BY TORE NORDAHL

The new company was set up by Nordahl to develop, assemble, and market interactive digital audio storage and processing systems for professional applications within recording and broadcast.

In making the announcement, Nordahl also stated: "Currently available digital audio and computer technologies make it possible to drastically reduce the cost of a complete digital audio studio facility, compared with the total cost of purchasing separate storage and processing systems from different manufacturers in today's market. Digital Entertainment Corporation's purpose is to bring the various technologies together in a comprehensive system at half of today's price. I believe we can accomplish this by mid-1984. To that end, we are presently discussing joint venture opportunities with several prominent companies."

Nordahl recently resigned as president and deputy chairman of Neve, a company with heavy involvement in digital audio processing areas. He has more than 17 years of experience from the entertainment industries, primarily professional audio, broadcasting and cable television.

The new address for DEC, of which Nordahl serves as chairman and president, is P.O. Box 95, U.S. Route 7, Brookfield, CT 06804. Telephone (203) 775-4465.

HARRISON SM-5 MONITOR CONSOLES FOR SHOWCO AND CLAIR BROS.

In late April, the company delivered the first of its new SM-5 stage monitor mixing consoles to Showco, for use on an upcoming summer tour with David Bowie. Showco has ordered 10 boards, and Clair Brothers six.

The SM-5 console, which is the result of a joint design effort between Harrison, Showco, and Clair Brothers, is capable of generating 32 separate mixes. Of particular significance is the fact that two of the world's largest sound-reinforcement companies, despite being competitors, pooled their experience and design expertise with a major equipment manufacturer.

Other features of the new SM-5 include 16 main mixing busses, 16 group re-assign busses, four-band fully parametric EQ, a group muting matrix, and VCA grouping. The main frame is fabricated from welded box steel, and can hold up to 32 inputs.

Clair Brothers will take delivery of its first SM-5 for use on an upcoming tour

continued on page 130 . . .

Classified

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For additional information circle #90

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The Model 3000 provides a powerful and comprehensive operating system with mixing flexibility and features never before available. It is modular and adaptable to an extraordinary degree, and the quality and versatility have been proven over years of use. When every signal counts, can you afford to settle for less?

Make the Model 3000 your choice. Call us and let's discuss your requirements - we'll build a Model 3000 especially for you.

Photo: Sound Design Recording Studios
Burlington, MA

AUDIO PROCESSING SYSTEMS, INC.
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EMPLOYMENT

VIDEO/AUDIO TECHNICAL/ENGINEER
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Hollywood, CA 90078

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For additional information circle #106

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For additional information circle #107

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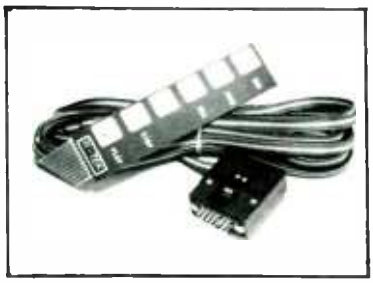
For additional information circle #94

NEW RS-1 REMOTE CONTROL STRIP

for Tascam, Otari & Fostex Machines



20 foot ribbon cable interface connector allows record, play, fast forward, rewind, stop, and pause functions *without* the need for a bulky remote box.

The RS-1 Remote Control Strip, which measures 5½ by 1¼ inches, has an adhesive backing for mounting on any flat surface, such as a blank mixer module.

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Auditronics 111
AXE 119
BASF 101
Beyer Dynamic 20
Bruel & Kjaer 39
Brystonvermont 116
Carvin Manufacturing Co. 67
Countryman Associates 57
Cramer 71
Crown International 36,122
dhx, Inc. 69
DeltaLab Research 3,52
Digital Services 33
Eastern Acoustic Works 117
Ecos Electronics Corp 46
Electro-Voice, Inc 23
EXR Corporation 59
Fairlight Instruments, USA 65
Flanner's Pro Audio 73,126
Full Compass Systems 61
Garfield Electronics 91
Goldline 128
Gotham Audio Corp 96
Hardy Co. 12
Harrison Systems 17
JBL 85
Jensen Transformers 93
JRF Co 119
Lexicon, Inc. 28
Magnetic Reference Labs 106
MCI/Sony 13
Meyer Sound Labs 97
MICMIX Audio 113
Microphonics 49
Neutrik 93
Rupert Neve, Inc 7
New England Digital 4,5
Omnicraft 122
Orban Associates 18
Otari Corporation 25
PAIA Electronics 126
Peavey Electronics 51
Polyline Corp 128
Professional Audio Services 22
Pro Audio Systems 109
Professional Recording & Sound 24
PRS Rentals 129
Pulsar Labs, Inc 121
QSC Audio Products 54,55
Renkus Heinz 94
Research Associates 127
Restoration 129
R-TEK 129
Saki Magnetics 49
Shure Brothers 132
Simon Systems 95
Sony Pro Audio 99
Soundcraft 27
Sound Workshop 43
Stage Sound Inc 103
Standard Tape Labs 112
Studer Revox/America 75,131
Studiomaster/IMC 87
Studio Technologies 118
Summit Audio 38
Suntronics 81
TAD/Pioneer 60
Tascam Div./TEAC Corp. 35,107
Telex Communications 41,120
Tentel 45
TOA Electronics 14,15
Turbosound, Inc 63
URSA MAJOR 11
Valley Audio 70
Valley People 79
Westlake Audio 83
White Instruments 108
Yamaha 89

news

. . . continued from page 126 —

with Rod Stewart. The remainder of the orders were scheduled to be delivered by the end of June; at that point Harrison will begin offering the console to the rest of the sound-reinforcement market. After July, a limited number of SM-5s will be offered on a short term rental basis.

PEOPLE ON THE MOVE . . .

• **Michael Bernard** has been appointed to the new position of manager, Special Products Division at Otari. In a parallel development, **John Carey** has been promoted to the position of national sales manager, from his former position as MTR sales manager.

• **Larry Schara**, formerly of AVC Systems in Chicago, has been appointed field sales manager at Soundcraft Electronics USA. His responsibilities include administrating Soundcraft's national rep network and dealer sales training. Also, **Erika Lopez** will handle all advertising and public relations for the company, while **Mary Gutierrez**, will serve as sales administrator, and **Gary Lynn**, formerly of Westlake Audio, as service manager.

• **Rick Olsen**, formerly of Ampex and United Western Studios, has been appointed chief of maintenance at Restoration, which now also is offering a complete reconditioning and head refurbishment service for Ampex Series 350, AG350, and AG440 tape machines.

• **Melanie Rogers** has been appointed to the position of president of EXR Corporation. Ms. Rogers was formerly general manager and administrative assistant, reporting to **Jim Cassily**, EXR's chief executive officer.

• **Steve Williamson** has been appointed to the position of northeast regional sales manager for Nortronics, responsible for coordinating the sales efforts of seven of the company's representative organizations in that region.

• **John P. "Jack" Jenkins**, general manager of International Tapetronics Corporation, Inc. (ITC), a subsidiary of 3M, has resigned that post to pursue other personal interests. Jenkins, who says that he is making the change because the transition of ITC into the 3M organization had been completed smoothly, was one of the founders of ITC in 1969, and was its president when 3M purchased the company in late 1981. **Jack B. Hanks** has been named his replacement as general manager of the 3M subsidiary.

• **R. Dale Scott**, formerly general sales manager of HM Electronics, Inc., has joined Bowen and Associates, a San Diego-based advertising agency that provides advertising and public relations services as well as sales and marketing support for several high-technology electronics firms in the Southern California market.

• **Philip J. DeSantis** has been named Lexicon's new director of marketing. Prior to assuming his new position, DeSantis was field sales manager for Lexicon's broadcast product line. Also, **Virginia Casale** has been named to the newly created position of manager, marketing services at Lexicon.

• **George F. Currie** has been named vice president and general manager for Sony Professional Audio Products. Currie, who began his career with Sony Corporation of America in 1973, most recently was central regional zone manager for the Communications Products Company. ■■■

INDUSTRY INVENTIVENESS

by James Riordan

. . . continued from page 24 —

Since Lowe is active as a player, programmer, producer, and studio operator, conscientious scheduling is an important part of his career. "I have control over most of the work — except when a master session will suddenly pop up — so I try to keep things flexible with the artists I'm producing demos for. That way I can still do master sessions as a player or programmer. I usually work with one or two demo sessions in the studio each week; I allow one day a week for film work; a couple of days for master sessions and other programming work. I also schedule in a little office time to make it all flow smoothly."

Bruce Lowe sees a bright future for synthesizer players and programmers: "I think the public has become much more acquainted with the synthesizer sound. They can identify it, and accept it much easier today than in the early Seventies, when many people were saying all we did was duplicate other instruments. Today the same people see the viability of having so much capability within one instrument, *plus* the exceptional originality it has to offer. I believe that the analog, digital, and computer synthesizers are the first of the instruments of the future."

That belief not-withstanding, Lowe is wise enough, and resourceful enough, not to stake his entire future on the public's love of synthesized music. He has specialized and diversified to ensure that whatever future directions fo the recording industry will take, he at least will be a part of it.

"I think we are seeing today what it *really* takes to succeed in the music business, and the industry is toning down its overhead to keep a profit margin," he concludes. "Today is a good time to re-evaluate what you've been doing, and to see how you can become more efficient. It's a great time to look at the amount of free time that you have, and see what else you could be doing to produce income."

In the next column, we'll look at the "Careers of Tomorrow." ■■■

Like father, like son.

For roughly $10,000, you can own the ultimate analog mastering deck—the Studer A80RC half-inch two-track recorder.

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The PR99's bloodlines are evident in every detail... in the precision-machined headblock, the rugged die-cast chassis, the servo-controlled capstan motor, and the Studer-made heads. Professional design features include a flat faceplate for easy head access; edit switch to defeat tape lifters and fast wind latching; tape dump button; balanced XLR inputs and outputs switchable for calibrated or uncalibrated mode; and two-way self-sync with auto input switching. The PR99 may be ordered with 3¾-7½ or 7½-15 ips tape speeds. Vari-speed, full remote control, and monitor panel available as options.

The PR99 now comes in console, rack mount and transportation case versions. Check it out. Call or write today for the location of your nearest dealer.

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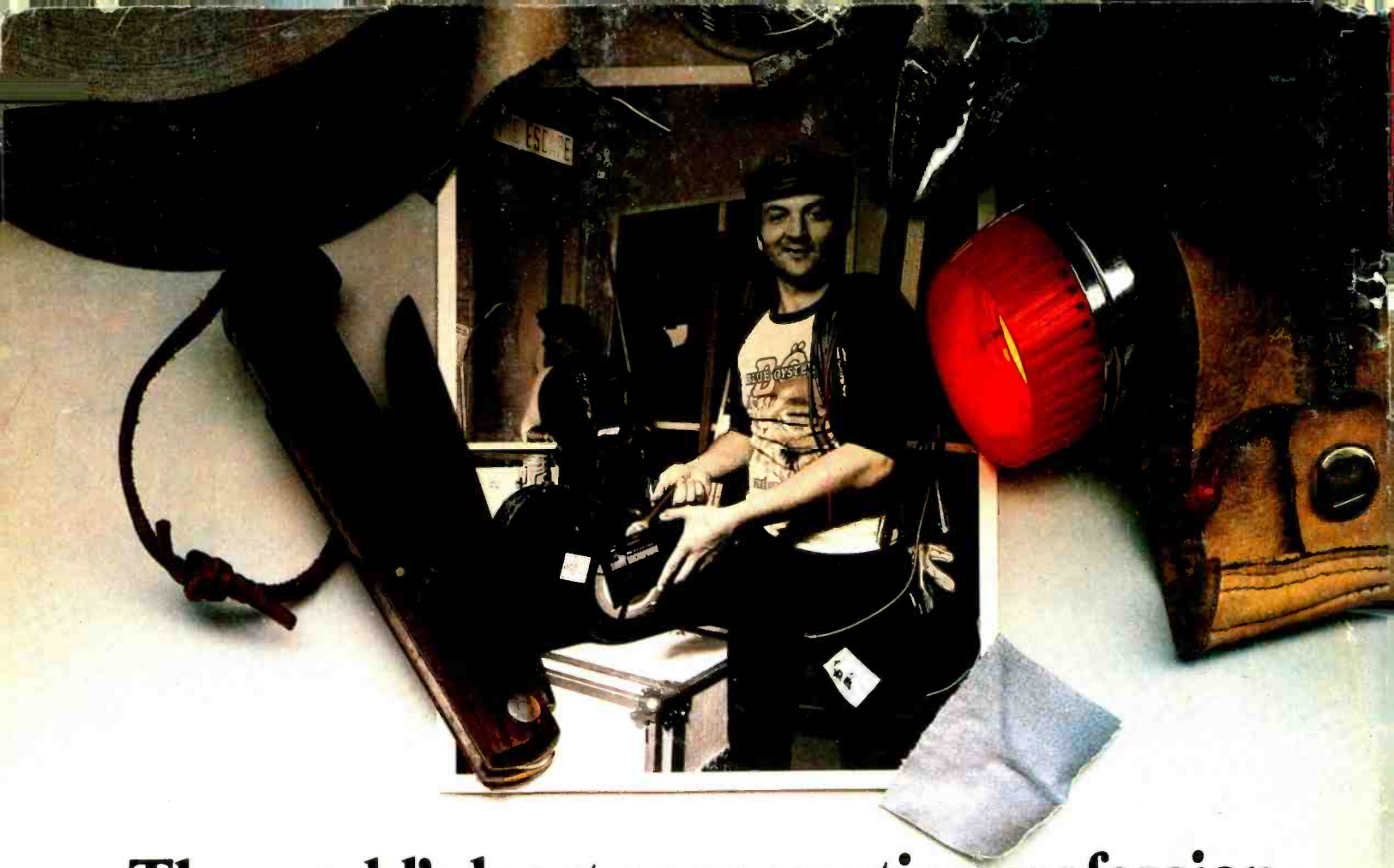
For additional information circle #100



The world's least conservative profession has maintained one rigid tradition. The SM58.

In an industry that discards electronic products like ice cream wrappers, the SM58 and its close cousin, the SM57, have remained the overwhelming choice of rock, pop, R & B, gospel and jazz vocalists for the last 16 years.

Why?

Simply because there is no sound quite like the SM58 sound. Its punch in live vocal situations, coupled with a distinctive upper mid-range presence peak and fixed low-frequency rolloff, give it the trademark quality no other manufacturer can imitate, although others have tried.

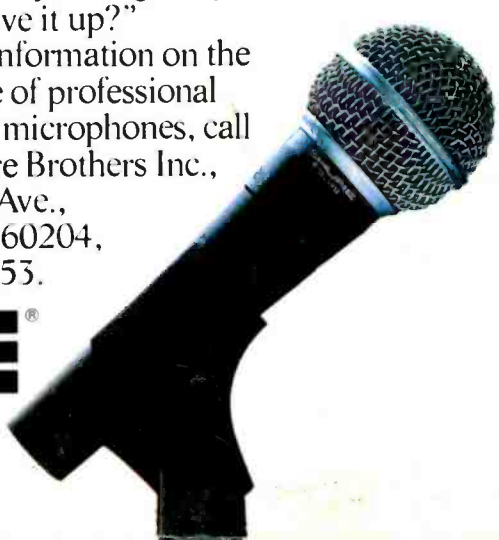
And to protect that sonic perfection, the SM58 is extraordinarily tough. Even six-foot drops on hardwood floors won't faze it. Ask any roadie who has used–and abused–one.

Performers the world over favor the weight and balance of the SM58, especially in hand-held situations. Even the finish is totally professional–a non-glare grey that looks as great on stage as it does on camera.

The crispness of the closely related SM57 enhances musical instruments the way the SM58 handles vocals. Beautifully.

Musicians are tough to please, but with the world-standard SM58 and SM57, they'll tell you, "when you've got a good thing going, why give it up?"

For more information on the complete line of professional performance microphones, call or write Shure Brothers Inc., 222 Hartrey Ave., Evanston, IL 60204, (312) 866-2553.



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