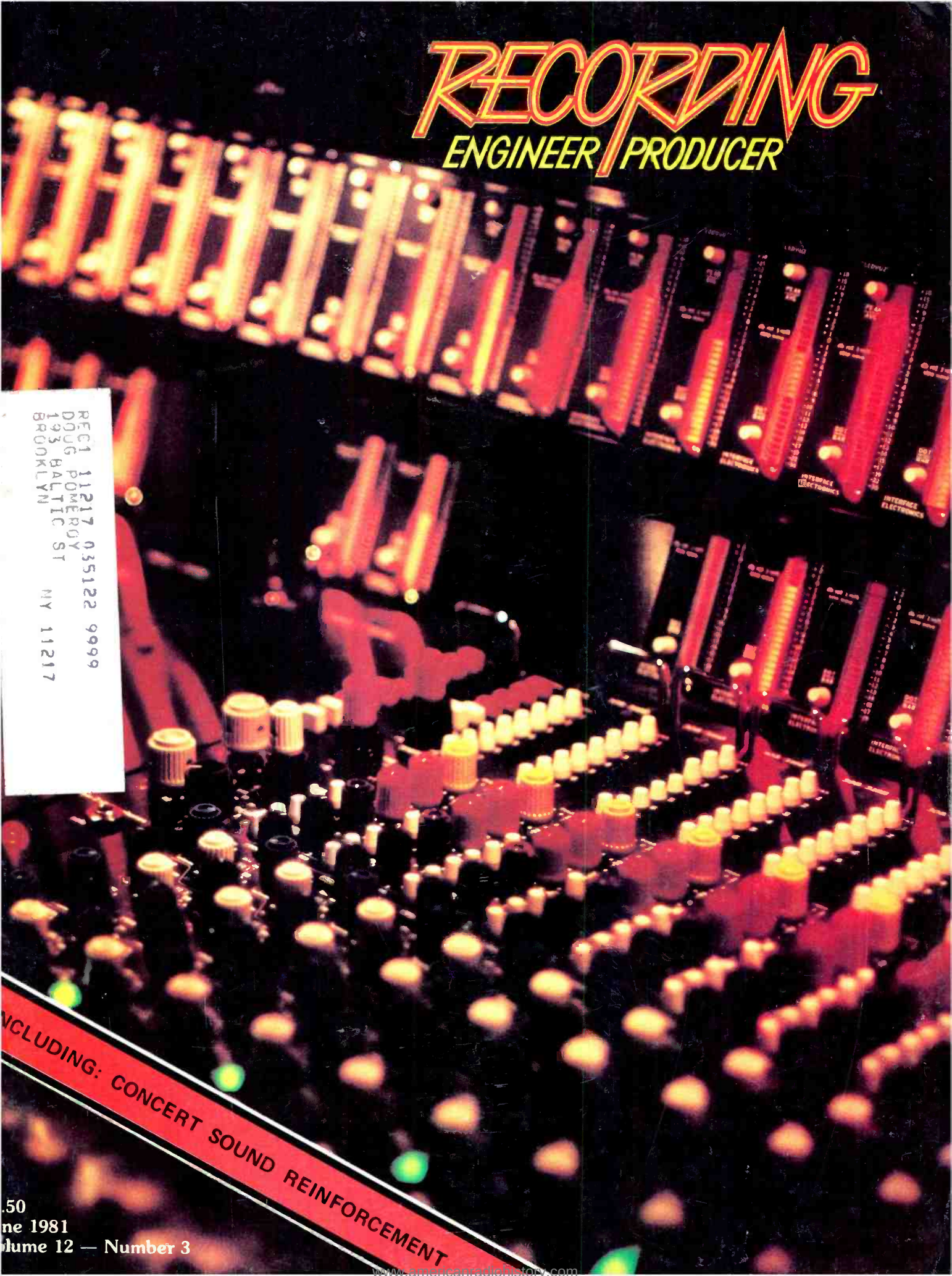

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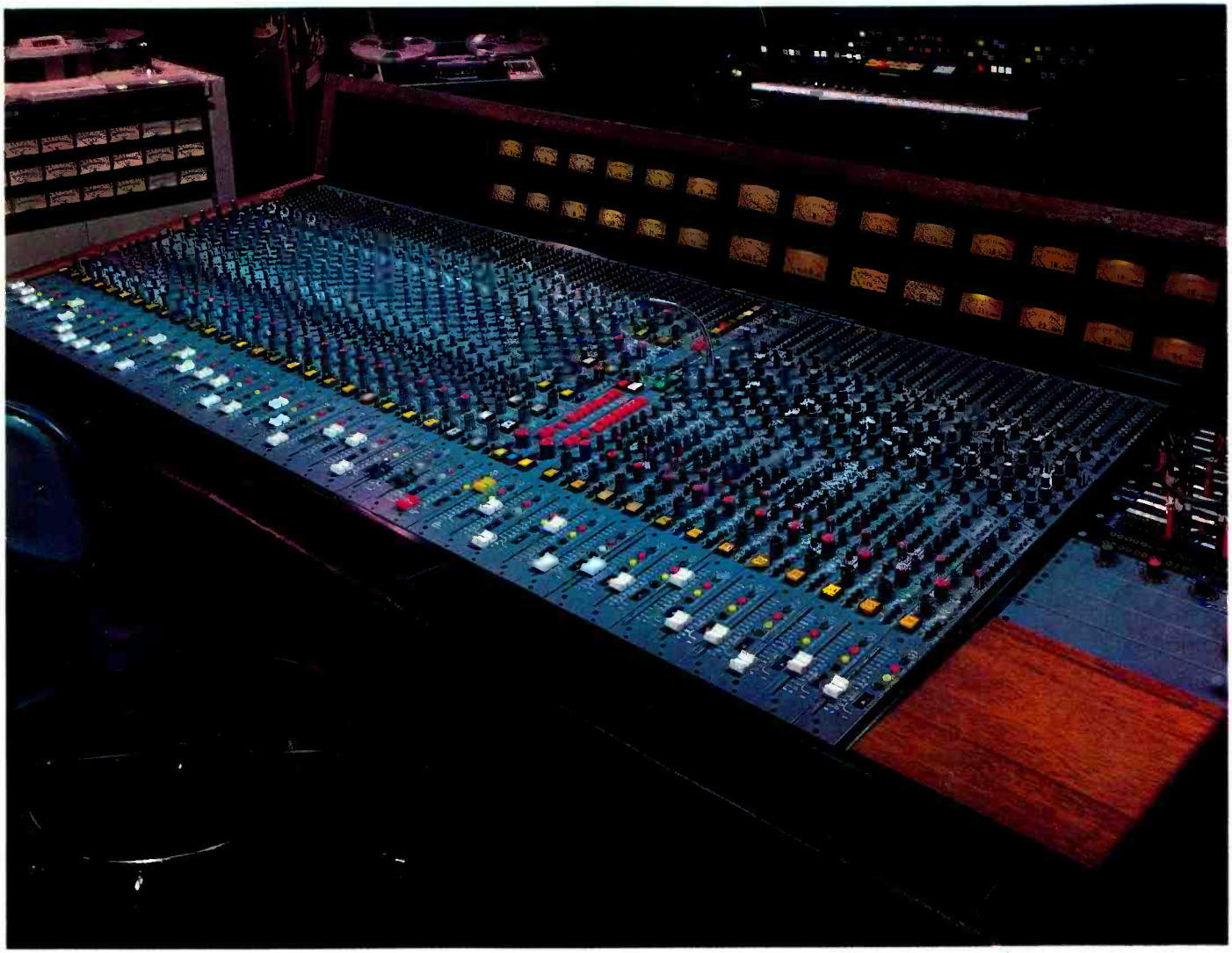

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September 23, 1980

Quite frankly, studios that succeed in the 80's will have to be sensitive, more than in the past, to the desires and requirements of clients. Nothing new about this, of course, but as producers, engineers and artists become more aware of what can or can't be done with certain mixing consoles, the line of selectivity becomes vividly drawn.

As a studio manager, facing the decision of whether or not to update and purchase a new mixing desk presented me with a number of challenging questions.

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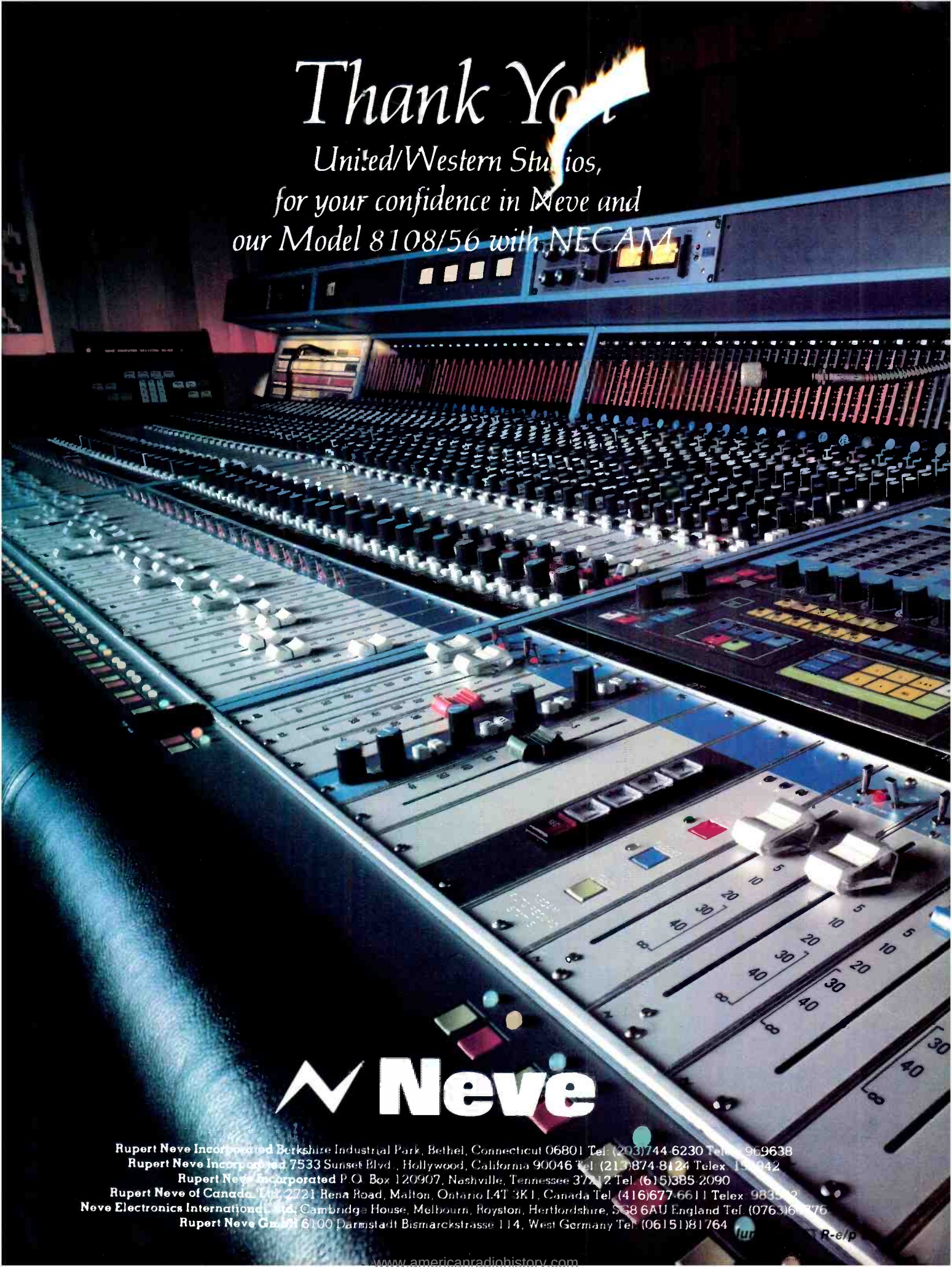
Jerry Barnes
Vice-Pres. Recording
United Recording Corp.
Hollywood, California



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June 1981
Volume 12 — Number 3

— Contents —

— The Cover —
A "night" photograph of an **Interface Electronics** Version 891 Rock Concert house mixer, delivered recently to **Calbro Sound,** of Little Rock, Arkansas, to replace their older Interface mixer which was lost in a fiery crash on the highway.

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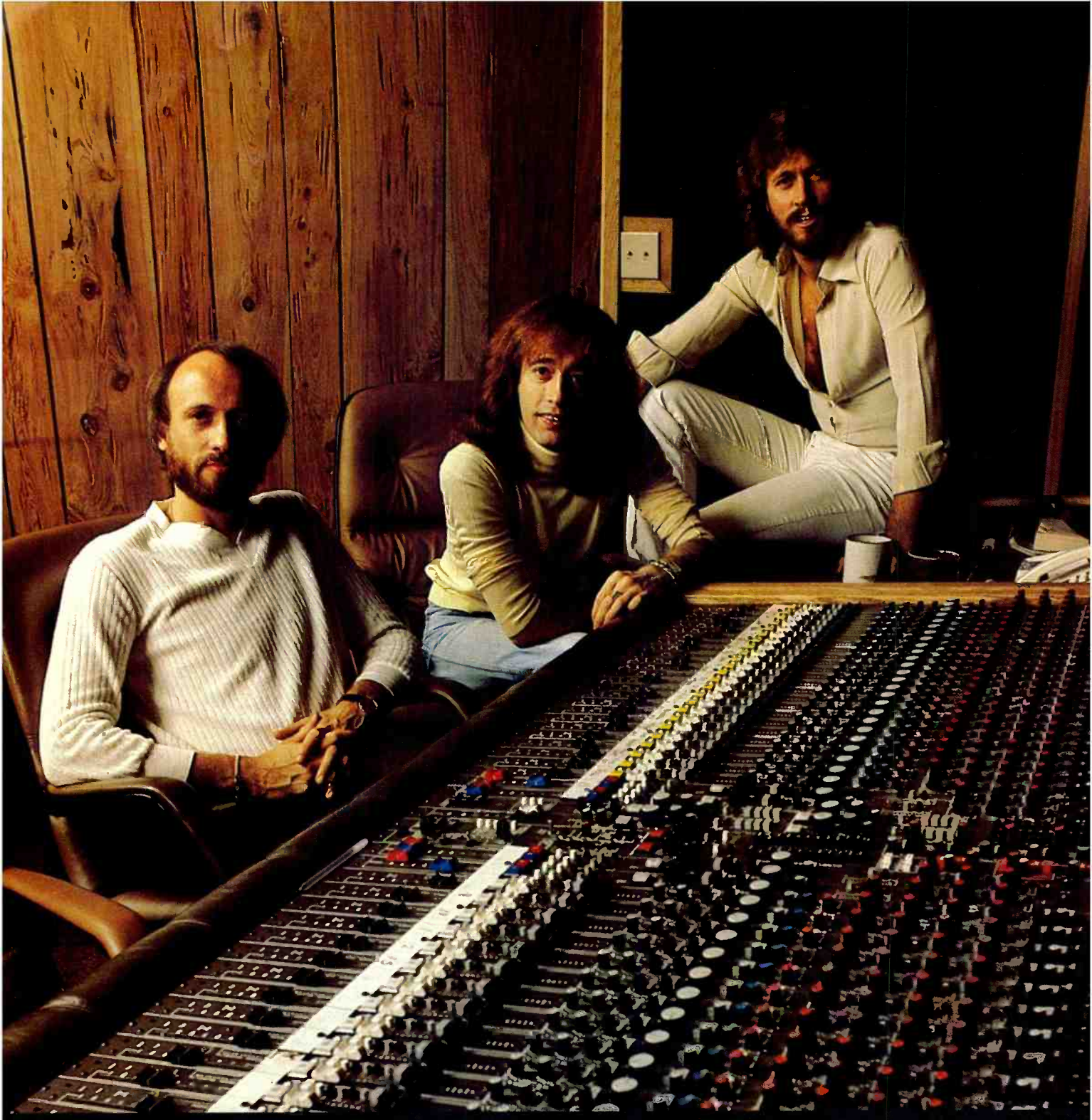

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views letters news

— *PPM Additions & Corrections* —

from: **Ethan Winer**
The Recording Center
East Norwalk, CT

I originally began this letter simply to call attention to the obvious (I hope) errors that appeared on the schematics in my article on peak reading meters (*R-e/p April 1981 issue, page 114*), but it seems appropriate to add a few additional thoughts which I'll get to in a moment.

Regarding the schematics, the capacitors marked 2 picoFarad for 7½ IPS pre-emphasis should have been labeled 2 *nano*Farad or 0.002 uF. Likewise, the caps for stability in the log converter are 0.001 uF instead of the 1 pF indicated. Also on the log schematic, the "full scale adjust" trimmer should have been labeled 20 k, and in the text regarding alignment, the word *volts* was omitted. The sentence should have read: apply a 1 kHz signal at a level that you want to be full scale — and adjust the full scale trimmer for an output of -10 volts.

Normally, this would be a small matter, but in audio, -10, when said by itself, usually refers to dBm. (I love the way these things are always refered to as a "printer's error.")

While I can't take credit for any of these errors, I will readily confess to the following oversights: first and undoubtedly least, I should have made it clearer that the entire discussion regarding resistor matching, tolerance, and noise was for general interest only, and is mostly irrelevant in a meter driver circuit. You would be wise to save the 1% metal films for your next low-noise preamp project. Equally unimportant, it occurred to me that everyone may not know that the initials "CW" on a schematic of a potentiometer means clockwise, and is used to ensure that the volume knobs on your console don't work backwards. While decidedly less important for a trimmer that will be adjusted once or twice, it would be wrong to do it any other way.

Going beyond the trivia, John Roberts from Phoenix Audio Lab called me and pointed out that the 0.1 uF capacitors in the balanced input buffer are not only unnecessary, but could degrade common mode rejection at low frequencies (like 60 Hz) if they weren't 1% tolerance like the resistors. Again, in a meter driver it's mostly academic but, technically, John is correct in that these caps should either be eliminated or increased substantially in value if the circuit is to be used in an actual audio channel. I also have to agree with his observation that a 4.7 kohm attack resistor will prove closer to the BBC standard than the 2.2 kohm shown. It should be noted that, at low levels, the attack time will decrease due to the inclusion of the attack resistor in the feedback loop of the detector. This should pose no problem in actual use however.

One final point: readers may notice the adoptation of the European notation for resistors. That is, 2K2 for 2.2 kohm or 3M3 for 3.3 M. While it may seem a little strange at first, this minimizes errors caused by omitted decimal points, and makes it less likely to misread a schematic. (This is assuming of course that there are no "printer's errors.") The nanoFarad — one thousandth of a microFarad — is also fairly recent and can similarly clarify by eliminating a row of zeros before the number.

I hope this helps at least a little.

— *Signal Purity* —

from: **Alan Fierstein, President**
Acoustilog, Inc.
New York, NY

I would like to comment on the subject of signal purity. Too often, we A-B the sound of a device with a straight wire, usually with no audible difference. Such is the case with even the most complex console module. However, a console module is placed in the signal path several times during the recording and mixing process, as are innumerable other equalizers, transformers, and amplifiers. The *Cumulative* effect of these individually "perfect" devices is far from perfect. Just how far depends upon the number of devices, and the quality of each device.

It has been stated that "speakers distort several percent anyway so *Why Bother* [to attempt to clean up the signal chain] ?" It should be kept in mind that:

a) Speakers usually have several percent distortion only at very high playback levels.

b) Distortion comes in various flavors, and one type seldom masks another.

c) A distortion component at one frequency does little to mask other frequencies. (This ties in with b.)

d) And what about noise? Distortion won't mask tape hiss!

Now this brings up a pet peeve of mine. We have repeatedly read notable industry figures claiming that low noise figures are likely to be masked by the typical 40 dB ambient noise of most listening rooms. They have used this as an excuse for recommending that car stereo owners not bother with quality cassettes, or that audiophiles supposedly can't appreciate wide-dynamic-range recordings. In a prestigious AES paper, it has even been stated that dynamic range expanders are useless in discotheques, because the acoustical signal to noise ratio is only 20 dB!

Suggestion: these acoustical experts should read the instruction manuals that came with their Sound Level Meters. The fact is that the typical ambient noise of most listening environments is 40 dB, *only* when you use a flat, or unweighted, SLM. When A-weighting is used, and the low-frequency rumble that we usually can't hear is tuned out, we find most home environments to be very quiet: of the order of NC 15 to NC 25. Of course, many studios and control rooms are

even quieter. Even here in New York City, it is possible to enjoy a wide-dynamic-range recording. Listening to a selection at 95 dB average, with clean, unrestricted peaks to upwards of 110 dB, a 15 dBA ambient calls for material with nearly 100 dB range.

Personally, I can easily get used to a constant hiss on a recording, but we should all strive for perfection. I believe that the recording industry will continue to improve its technical quality, over and above the objections of those who shout, "Why Bother?". I just hope that a sane economic sense accompanies this progress.

— *"Megasound" for Movies* —

from: **Bradley Arrington**
Odeon Theatres Ltd.
Long Beach, California

I have just read the article entitled *Mixing Dolby Stereo Film Sound*, by Larry Blake (*February 1981 R-e/p*, page 68), and found it fascinating. For our little theatre company we have been trying to track down many older films which were released in stereo. Some we have found, and others we haven't. I'm still trying to track down *War of the Worlds*, *House of Wax* and *Journey to the Center of the Earth*.I hope that one day we are successful because, as I'm sure you're aware, the only studio which keeps halfway decent prints of their films is Disney. The others couldn't care less.

I am anxious to obtain a copy of Larry Blake's book on film sound. Could you tell me when it will be available, and where? One final question to which nobody seems to have an answer. Could you tell me what *Megasound* is? I'll hazard a guess and say that it is the brand name for a bass-booster or amplifier, but I'm just not sure and nobody seems to be able to tell me. In any event, the article was tremendously interesting and informative, and I certainly hope to see Larry Blake's book out soon.

Larry Blake replies:

Megasound, first used on *Altered States*, augments the low-frequency capabilities of the Dolby 70 mm system by adding subwoofers and extra power amplifiers to channels two and four, which carry information below 200 Hz. This is especially helpful below 100 Hz, as the standard Altec-Lansing A-4 speakers roli off sharply at that point.

Megasound can also be used in conjunction with Dolby's recently introduced optical bass-extension card, which extracts certain low-frequency information — such as music and sound effects — from Dolby Stereo optical prints.

My book is currently in its final stage of preparation but, as yet, I haven't found a suitable publisher for it.

CORRECTION
— *Bruce Springsteen's Guitar Modification* —

An error in one of the drawings that accompanied the article *Clair Brothers on the road at LA's Sports Arena with Bruce Springsteen* (*R-e/p* February 1981 issue, page 50) may have caused a mild amount of confusion. On Figure 6, the modifications made to Springsteen's guitar electronics, the pair of 68 mFd capacitors should be connected to the midpoint of the two 100 kilohm resistors. Also, the unmarked resistor passing to the positive input of the TL061 op-amp should have read 1 megohm.

views

The Powerhouse audio/video facility, Kansas City

AUDIO/VIDEO RECORDING

—*A Countrywide Sampler*—

by Robert Carr

I can remember when it was all so easy: you'd bring in the whole group at one time; set up two or three microphones; run them all through a Hammond reverb for that Carlsbad Caverns sound; and then lay it on the two-track. That was it!

Nowadays you have to own a full complement of vintage mikes, a Starship Enterprise console, go overboard with outboard gear, be computerized, digitized, and supplied with any number of "goodies" just to play "Let's Make a Deal" with your regular clients.

A considerable number of studios today are considering branching out into the allied visual field to attract a wider range of projects, but are not quite sure which direction to take? Buy the equipment? ... Rent it when it's needed? ... Affiliate with a house that has everything already? ... Stay out of it completely and just refer?

Aside from the advertising and industrial work, "all I've been hearing is *Videodisk, Videodisk, Videodisk,*" exclaims Roy Segal of the total state-of-the-art Fantasy Studios complex in the San Francisco area. "All America feels that all you have to do is buy some video equipment, and you'll be flooded with business. That's not so!"

But what "is so"? How well is video doing around the U.S., and what is it being used for? To get some portion of the truth concerning this survival-in-the-future topic *R-e/p* made phone calls to several involved

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studios and institutions around the country to put you in touch with your colleagues in other portions of Music-land.

It should be borne in mind, however, that this article is by no means an attempt at a scientific survey; rather it should be regarded as a random sampling to provide some indication of the relative demands for audio/video facilities throughout the United States.

The businesses chosen to talk with were those audio studios with some sort of complementary visual-media capability. This decision was made on the assumption that such facilities would have the best reasons for wanting to know the who, what, when, and why of their respective areas. The main points of interest to be determined pertained to the type of client or project that provided most of the income; to what extent the studios were equipped with video gear; the formats used; and the attendant creative capacity offered with the technology.

The results obtained were not in any way clearly defined as a trend. Every studio that was contacted was a little different from the rest, since each tried to fulfill the specific needs of their surrounding area. Consequently, the responses were not always predictable from one locality to the next. None the less, certain patterns did start to emerge as the data accumulated.

. . . continued on page 21

AUDIO/VIDEO PERSPECTIVES

by Martin Polon

One of the current dilemmas facing the audio recording industry is how to segue into the high-technology Eighties with the same number of prodigious record buyers that the record business had in the Seventies. This problem has affected all levels of disk sales and production for the last two years, leaving huge gaps in record sales, empty time in recording studios, and unused pressing capacity in record plants.

From the perspective of the professional audio equipment manufacturers and studio users, the problem has developed several painful dimensions. The first involves purchasing decisions directed towards the constant and competitive improvement of individual studio acoustics, sound monitoring techniques and new mixing tools; while the second requires potentially adventurous initial steps into the new technologies of digital audio, video, or both. Most studio buyers are reluctant to commit to new audio equipment or technology until a trend appears; there is a strong desire to stay current, but not to buy into an unclear future.

This rather natural reluctance on the professional audio level is not mirrored at the professional video level. State-of-the-Art in video is rapidly approaching digital, with a high level of analog improvement in very small cameras, edit-ready video tape recorders, and actual digital devices such as still-frame stores, switchers, effects generators, video art and graphic systems. The competition for video release channels has grown with network and independent television stations competing with cable operators, on-air pay-TV, video cassette and videodisk as entry systems to the home. The videocaster has to be technically competitive to retain viewers, and produce acceptable software.

The future of recordable and reproducible audio entertainment should exist as a synergy of audio and video formats. Unfortunately, until one of the newtechnology disk formats shakes out, it's unlikely that the home consumer will buy heavily and thus create a new audio standard. The existing analog audio disk has been made suspect in the minds of record buyers. But the presence of four disk players in the home — one for conventional audio, one for digital audio, one for video, and one for computer software — seems an unlikely burden for the home buyer to bear; it is especially unlikely with numerous incompatible systems fighting for dominance in the various categories. Until one multi-function player emerges out there as a standard, the audio consumer seems likely to stay in place. No movement at the consumer level translates into lack of sessions, poor record sales, and so on.

A positive direction for the audio recording studio might well include video as part of a total electronic service. The method is to move in several directions: first to provide audio facilities and sound enhancements for video production; and, secondly, to offer video services compatible with the traditional role of the recording studio. The successful audio-video studio should not compete outside of its capability range. There have been real advances in low-cost video production equipment, but studio or theatrical video quality is still determined by cameras, switchers and video-tape recorders that sell in $100,000 modules. A fully-equipped theatrical video production studio can easily cost in excess of $10 million, and it would be difficult to assemble a new theatrical-quality video studio for less than $2 million. Complicating the situation, local independent stations, network affiliates, and network television stations in every major market in America have most, if not all, of the equipment in place for full-scale video production. With so much of today's satellite-delivered programming coming from major West Coast and East Coast production facilities, local TV studios offer tough competition for theatrical video production.

A recording studio can enter the world of video by taking advantage of the "now" revolution that is sweeping television news. ENG, or Electronic News Gathering has produced a whole series of moderately-priced, high-quality and light-weight production cameras, 3/4-inch U-Matic video recorders and editing consoles. This kind of equipment enhances the audio recording studio in three ways:

Firstly, the video production capability provided by such equipment will allow a studio to do video and audio showcase productions. For musical groups, for local cable video-music, and

. . . continued on page 21

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DHM 89 B2 stereo

Memory capacity :
210.000 bits.
Bandwidth :
switchable 10 or 20 KHz. True dynamic range : 95 dB.
Dual digital delay :
continuous setting up to 1,2 s. on option up to 5 s.
Dual echo :
(up to 5 s. of repeat).

Dual pitch shifting :
From – 2 to + 1 octave.
Sophisticated Micro Computer operates phase coincidence of joining points and eliminates «glitches». The serial delay in pitch shifting mode is adjustable.
Dual automatic arpeggio :
is a pitch, increasing or decreasing echo.

Dual reversed sound :
Electronic equivalent of a magnetic tape running reversed. Reversed sound itself can be pitch-shifted.

Dual memory latch mode :
Memorized sound can repeat indefinitely. The two borders of repeating sound are continuously selectable, as well as reading sense and pitch ratio.

put any sort of sound in memory and tame it

KB 2000

KB 2000 is an external programming unit for the DHM 89 B2, and transforms it into a musical instrument it allows :
Three voice chorus :
(Including original sound).
Reverse synchronisation :
Which gives to reversed sound the same tempo as original.
Biphonic memory synthesizer :
Any existing sound, supplied by a tape recorder or by a microphone, is memorised in DHM by simply depressing the «memory latch» button. Then the KB 2000 synchronises memory reading with attacks of the notes. «Attack point» sets the part of the sound which is heard at beginning of the note, «End point» and «Return point» choose the sustained sound. The speed of reading is adjustable.
Two envelope generators :
Drive two VCA to control the envelope of the notes.
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Three basic parameters : frequency, sharpness and depth are modulated function to time by a form generator initialised by attacks of the notes.
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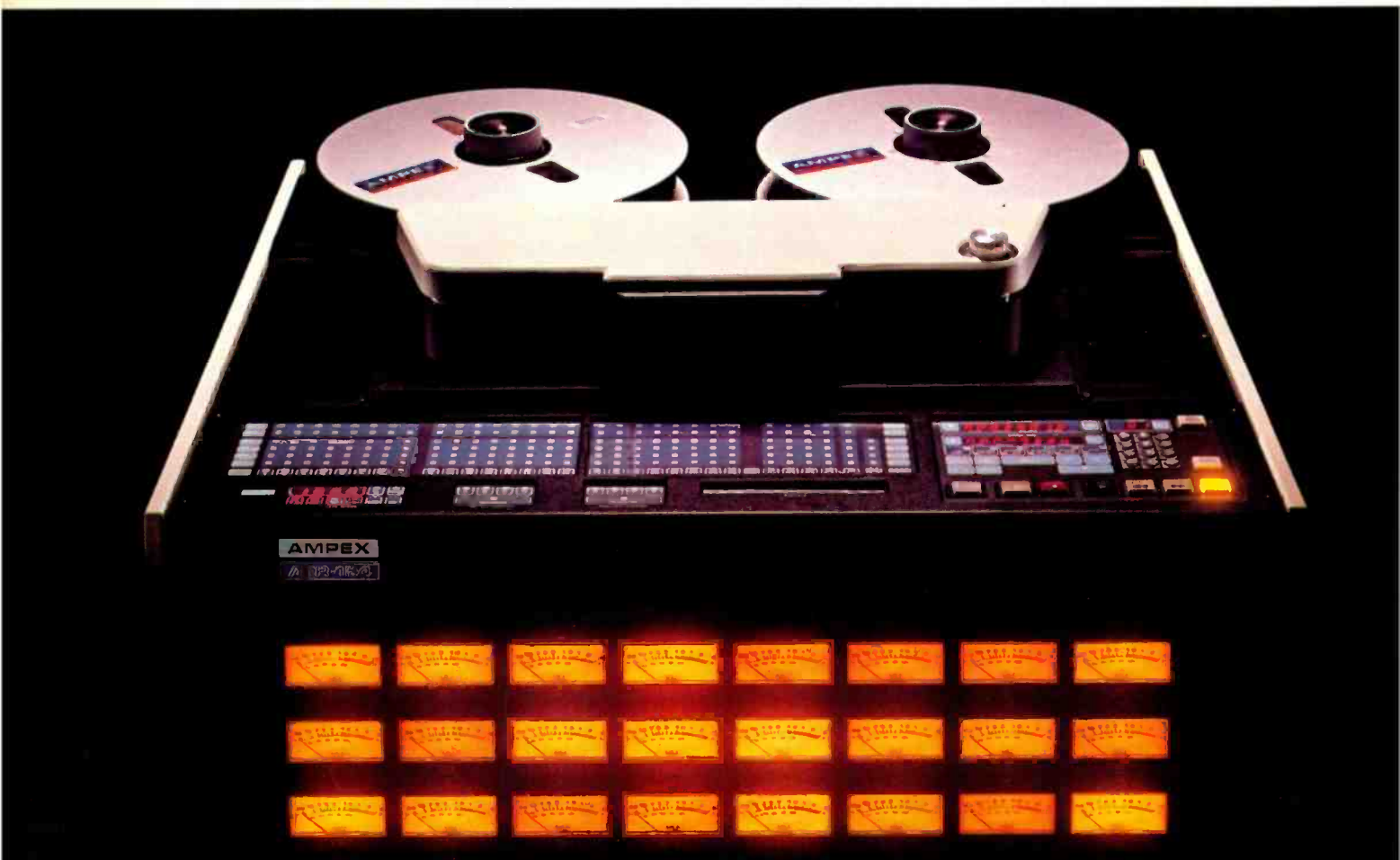
ATR-124 gives you the unheard of: Time on your hands.
Which means you can use that time to give clients more of what they're paying for—your creative skills. With the ATR-124 microprocessor-based control system, you can pre-program what you want to do ahead of time so you won't waste studio time setting things up. When their time starts, you're ready to record by touching a single recall button.

ATR-124 also lets you duplicate a technique you may have used earlier in the session without having to rethink what you did. Just touch the memory button and it'll all come back to you. ATR-124 lets you rehearse what you've got in mind, without recording it, to make sure what you've got in mind is right. Tape can be manipulated faster which means you'll get the sound you want sooner. And the chance to try something "a little different." All because of the speed and accuracy that ATR-124 puts at your fingertips.

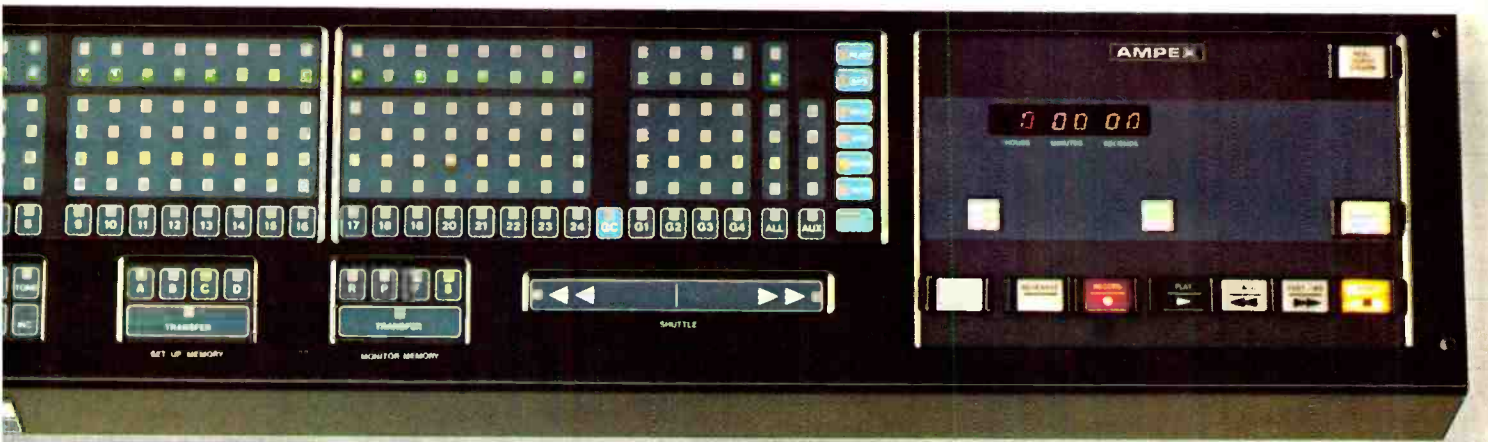
ATR-124 doesn't take away your creativity, it adds to it.
The less time spent setting up, correcting, and redoing, the more time spent creating. And when you add features that help you create to the ones that help you save time, you've got one very potent piece of audio machinery. Take the control panel for instance. It's like nothing you've ever seen. Pushpads linked to a microprocessor give you a new level of creative flexibility. Program a setup, then change it. Then change it back, all with a single fingertip.

A repeatable, variable speed oscillator for pitch correction and special effects is built in. In addition



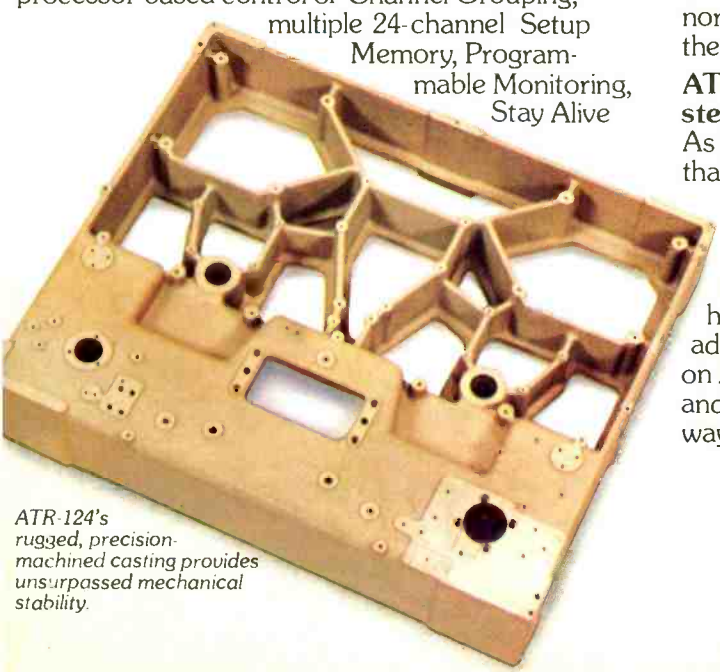
rom the future: ATR-124.

to the standard output, there is an optional auxiliary output with each channel that enhances flexibility. So don't think that ATR-124 is going to replace anything that you do. On the contrary, it's going to improve the skills you have, if not help you develop some new ones.



ATR-124's Control Panel. Speed and accuracy at your fingertips.

ATR-124 picks up where ATR-100 leaves off.
It's only natural that the people who brought you the ATR-100 should be the ones to bring you something better. ATR-124 offers you 24 channels instead of 4. You also get many new and exclusive features. The kind that have set Ampex apart from the crowd for the last 30 years. Features like balanced, transformerless inputs and outputs; a patented flux gate record head; 16" reel capability; input and output signal bus for setup alignment; membrane switch setup panel; fingertip-operated shuttle speed control; and microprocessor-based synthesized Varispeed -50% to +200% in .1% steps or in ¼ tone steps. ATR-124 also features microprocessor-based control of Channel Grouping, multiple 24-channel Setup Memory, Programmable Monitoring, Stay Alive Memory, and Record Mode diagnostics. The point is this: If you like the ATR-100, you're going to love working with the ATR-124.



ATR-124's rugged, precision-machined casting provides unsurpassed mechanical stability.

ATR-124 options.
As impressive as the ATR-124 itself.
With the addition of a built-in Multi-Point Search-To-Cue (MPSTC), you can rehearse edits and control five tape-time actuated events and be compatible with SMPTE time code. Separately controlled auxiliary output amplifiers with each channel provide simultaneous monitoring of normal and sync playback as well as all other monitoring modes. A roll-around remote control unit can also be added to the ATR-124 which contains all control features normally found on the main unit.

ATR-124's Multi-Point Search-To-Cue (MPSTC). Provides 100 cue locations.

ATR-124. Your next step is to experience it firsthand.
As you scan the points we've covered, remember that you're scanning just a small portion of ATR-124's story. We haven't even begun to discuss the accessibility of key components for easy servicing and minimal downtime, or the features we've built in to give you greatly improved tape handling. To find out more, write to us at the address shown below. We'll send you a brochure on ATR-124, our latest audio effort. Better yet, call us and we'll set up a demonstration. It's really the only way to listen to the future.

ATR-124. Pure 24-Channel Gold From Ampex.

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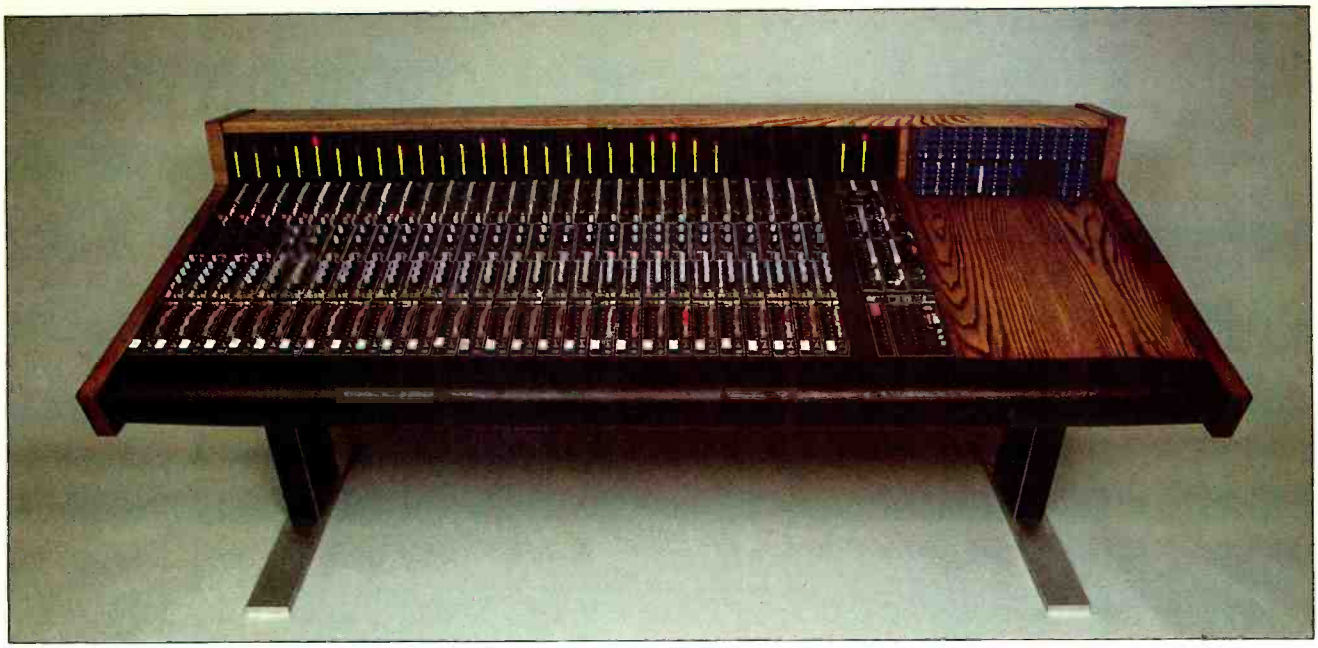
For additional information circle # 9



UPDATE

Series 40: The Sound Workshop theory of evolution.

The Series 40 is the latest link in the evolution of progressive recording consoles from Sound Workshop. Having incorporated the most recent audio advances into the highly acclaimed format of Sound Workshop's Series 1600, the new Series 40 offers today's recording engineers the ultimate in sonic excellence and flexibility while maintaining Sound Workshop's reputation for highly cost-effective recording gear.

The overall intelligence of design enables the Series 40 to offer a wide range of advanced features as standard—

- Eight send busses configured as two stereo and four mono cue/effects sends.
- 22-segment, graphically enhanced LED metering with peak indicators.
- Transformerless balanced outputs.
- Transformerless microphone preamp featuring the **TRANS-AMP$_{TM}$LZ***
- Updated summing configurations and lossless panning which yield superior noise and crosstalk performance.
- Unique Mixx switching which enables each input module to accept a line-level return in addition to its primary signal source, thus doubling the number of line level inputs. Essential when employing a multitude of effects. Also permits mixdown of two synched-together multitrack machines.
- Handcrafted, solid oak cabinetry.

In addition, the Sound Workshop Series 40 offers a variety of options—

- VCA input subgrouping package which utilizes EGC-101 electronic gain cells for state-of-the-art VCA performance.
- Arms Automation—Sound Workshop's proven, computerized mixdown system featuring independent writing of levels and mutes, essential for automated mixing. Fully compatible with MCI JH-50 automation. Arms Automation includes SuperGroup—Sound Workshop's unique VCA grouping feature which allows computer control of all VCA grouping functions. SuperGroup includes "Solo Dim" and negative grouping which enact grouping functions and level changes unavailable on competitive systems.
- High resolution, multicolor VU bar graph displays featuring average, peak, and peak hold modes for both level monitoring and spectrum analysis.
- Choice of three EQ formats—switchable, sweepable, parametric—for console customization.

Sound Workshop is sensitive to the immediate fiscal demands that face the growing studio operation. All of the options above, therefore, may be retrofitted to the Series 40 or any existing Series 1600 console.

The new Series 40 from Sound Workshop. Flexible. Sonically excellent. Up-to-date.

The evolution continues.

*TRANS-AMP$_{TM}$LZ is a registered trademark and is manufactured by Sound Workshop under exclusive license from Valley People, Inc., Nashville, Tennessee.

SuperGroup shows console group status at a glance, eliminating the need to scan each module.

sound workshop

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(516) 582-6210 Telex 649230

. . . continued from page 16 —

—AUDIO/VIDEO—
RECORDING

A NATIONWIDE SAMPLER

For example: studios located in large cities known to have broad music interests were not automatically assured of adaquate client volume and, in many cases, they have been hit hard by the inflationary economy. On the other hand, cities situated in predominantly rural, and vastly underpopulated regions are proving their ability to support huge audio/video complexes utilizing the latest advancements in technology.

The purchase price for shooting equipment is relatively reasonable, but the attendant costs of expansion for a separate soundstage, post-production facilities, maintenance staff, shooting crew, air-conditioning, lighting, and electrical power — not to mention the creative forces beyond the technical expertise — turns any anticipatory look at the possibility of visual production into a blinding blizzard of dollars.

For a company such as International Automated Media, which is located in Orange County, south of Los Angeles, this kind of an investment makes a lot of sense. IAM is a complete audio-video house located in an area that supplies the work and allows for expansion. According to IAM's owner, Skip Konte: "Since the beginning of the year [until May 1] we've done two 1-hour specials for TV; one re-edit on old footage to make a movie; one film; a mini-series, comprising four, ½-hour shows; and a cooking show, just to name a few. Even with the music business not being what it used to be, we're still turning out about one or two record albums every six weeks.

"We can do just about anything in-house, from developing an original idea to finishing a piece that's all scripted and ready to shoot, audio sweetening for pre-existing visuals, and sometimes even securing the financing. We'll shoot three or four projects at a time, and then go into post production; we average about one project a week."

IAM has had two video trucks in the last five years, but now they've decided that it's more cost effective to lease them when they're needed, in addition to renting broadcast video equipment that isn't always in demand.

Los Angeles and New York are the primary markets for video and film production. There will always be room for the experienced audio houses like Regent Sound Recorders in New York, which has been doing sound for video exclusively since 1973, as well as for the newer entrants into the field, such as the Village Recorders and the Record Plant in Los Angeles. These are the sort of studio that have gained good reputations, and are able to draw the best jobs with the healthy budgets. But what about the smaller rooms in these markets, who are caught up in the fiercely competitive price wars, and are dropping profit margins dangerously close to

. . . continued from page 16 —

AUDIO/VIDEO PERSPECTIVES

by Martin Polon

for live production of group promotional tapes, a video capability enhances the studio's service range. The spectacular growth of rock video night clubs with giant screens in New York, and now in Los Angeles, will effect the market for videomusic entertainment, as the trend continues around the country. The production of video-music spotlighting The Who, Elvis Costello, Blondie, Adam and the Ants, Talking Heads, Clash, Squeeze, and The Pretenders are just the beginning of video-music showcases for nightclubs, local cable-TV, etc. ENG equipment and techniques would produce good in-concert tapes for audio-video usage; such video equipment is portable and, if loaded into a van, would allow many other kinds of video productions to be performed in a metropolitan area. Many studios handle audio remotes at music festivals, and the addition of video would enhance the production of a *total* record of a program. Other possibilities would include renting out video equipment and crew for overflow TV news production, etc.

Secondly, in addition to providing basic stand-alone ENG video recording, the 3/4inch equipment will serve to provide audio sweetening of video productions. The use of U-Matic equipment with SMPTE time code will allow audio track clean up and enhancement. Such 3/4-inch equipment using time code is becoming an editing standard for off-line video post-production, and the expertise of audio recording studios can assist as the demand for improvement in the general level of audio quality rises for video program production.

And thirdly, 3/4-inch U-Matic equipment will provide, with an add-on PCM adapter and digital editing console, full digital audio recording capability. To be able to offer audio clients digital audio recording will be a major drawing card in the recording studio business.

So it would seem that an immediate way to join audio and video at the recording studio level would be to purchase one or two cameras, several 3/4-inch U-Matic video recorders, a video editing console, some kind of time-code equipment, a PCM adapter, and a digital audio editing console. This level of purchase is far more affordable, and would produce much more work for the studio, than stand-alone theatrical video equipment. The only possible negative involves the uncertain future, but the 3/4-inch standard seems well entrenched for ENG news and editing of video, and the equipment would be paid off long before it needs replacement. Such a scenario will not work for every studio, and local patterns of media production and competition will have a significant impact. Nevertheless, it is a real way to get video, now! There is a lot of air between the studio and the blue sky of the audio-video future, and the recording audio industry does not have to sit and wait for an electronic "Godot". □□□

A NATIONWIDE SAMPLER

the break-even point?

Moogy Klingman, ex-keyboardist for Todd Rundgren's Utopia, owns two multi-track audio studios in New York City. As the prices that he was able to charge for his time decreased, an alliance with the video marketplace started to look better and better.

"The clients aren't there any more to have a profitable audio situation," says Klingman. "If you rent your 24-track time out for $50 an hour, you may survive — but you won't make any money. I think you have to get into video in order to make some bucks."

Klingman has rebuilt the Bell Sound Recording Studio into a budget, rock, audio/video facility containing a large soundstage and video editing room; he can do most of his projects — record company promos, cable shows, and unsigned-artist demos — in-house. "It's not that feasible to rent the equipment unless you're dealing in real big-budget productions, which I'm not," he continues. "I'm dealing in marginally budgeted productions. If someone wants to do something for low cost, they come to me."

Hi-Five is comprised of two studios: a 1,000 square foot main room with a mobile control room and 16-track capability; and a smaller, 8-track setup for both audio and video recording. Video shooting equipment consists of a color camera, complete lighting system, ¾-inch Sony VCRs, switchers, and post-production gear. Dealing with just the rock market, Klingman does about four shoots per week.

L.A.'s answer to the same problem is personified in a similar facility called Music Labs, owned by Chaba Mehes. Mehe's customers are as diversified as one could imagine — bands, symphonies, commercials, voice-overs, spoken word — but the common denominator is still *budget*. Although Music Labs does none of its own video production, it offers its clients in-house post facilities with SMPTE, and both ½- and ¾-inch time-base corrected, broadcast-quality tape formats. By transforming his audio room into a temporary sound stage, the business is able to log four to five shoots per week. But it doesn't stop there. Music Labs has also started an audio/video and sound reinforcement school by drawing from the pool of talented engineers, producers, technicians, and video people in the surrounding Los Angeles area, and scheduling classes during what is normally down time.

"There's just not enough work in Los Angeles to sustain an audio-only studio," Mehes conceeds. "I would have been out of business a long time ago without the added video capacity. Now the school is doing fine, too; we have students from all over the world. Everything we make goes back into buying more equipment. We're still growing, and it's because all the businesses work so well together."

Unfortunately, the chances for these kinds of novel solutions to succeed diminish as one travels outside the dominant music centers, and farther into the real world. For cities not too far from Los Angeles or New York, the location can be both a blessing and a blemish. You may be able to catch some of the extra work available in the big city, but the lure of "bigger-is-better" could steal your clients away.

"Philadelphia is in the shadow of New York 90 miles away," says Joe Tarsia, owner of Sigma Sound. "Audio sweetening is in a relatively unsophisticated state here, and doesn't warrant complicated 24- and 48-track mixing facilities for video. But I also believe that sometimes having the facility creates its own market, and we're going to ease into it further. We have SMPTE time code and video monitors, and have done the peripheral work so that we are capable. Having sister studios in New York lets us accommodate our Philadelphia clients wherever they want. Certainly, we have our share of the New York market — in New York we're going into audio for video sweetening, but not any kind of video shooting per se."

Although 400 miles from Los Angeles, **San Francisco** is experiencing similar repercussions from the production giant to the south. Occasionally, major projects make their way up the coast. The Automatt did the soundtrack recording for *Apocalypse, Now*. "The rushes were all on video," recalls chief maintenance engineer Mike Fusaro. "We put time code on, did the sound, and then transferred back to film. All we needed was a VTR and a monitor. There really aren't that many clients who require a full-blown orchestra and studio with video capabilities. If there is, it's usually for background, and doesn't need to be locked in." (For a fuller discussion of the audio requirement for a video shoot, see Kim Dempster's article, *Creative Visual Music; R-e/p, April 1981 Issue, page 78 — Ed.*)

As a result of their successful entrance into the film business as producers of *One Flew over the Cuckoo's Nest*, Fantasy Studio, Berkeley, California, has expanded into a multi-media, post-production facility doing film-audio post-production, and editing, records, jingles, advertising and video sweetening. Fantasy's general manager Roy Segal doesn't get many requests for video work either, and finds that "you can do commercial production in almost every city in the country and, as a result, you can do a certain amount of audio. But the real demanding work — the sit-coms, game shows, and so on — is not happening through America, except for one or two local stations. The most important production shot in San Francisco was *The Streets of San Francisco*, and all of the posting was done in Los Angeles. At the time, it would have been a smart move on somebody's part to have gotten the work up here, but there weren't any good post facilities then. We have enormous capability at Fantasy now, but the demand doesn't even come close to what we can do. As more shows are produced in the Bay area, there will be more demand for audio wedded to video and, hopefully, it will develop; I'm looking forward to it."

A short flight from California into the

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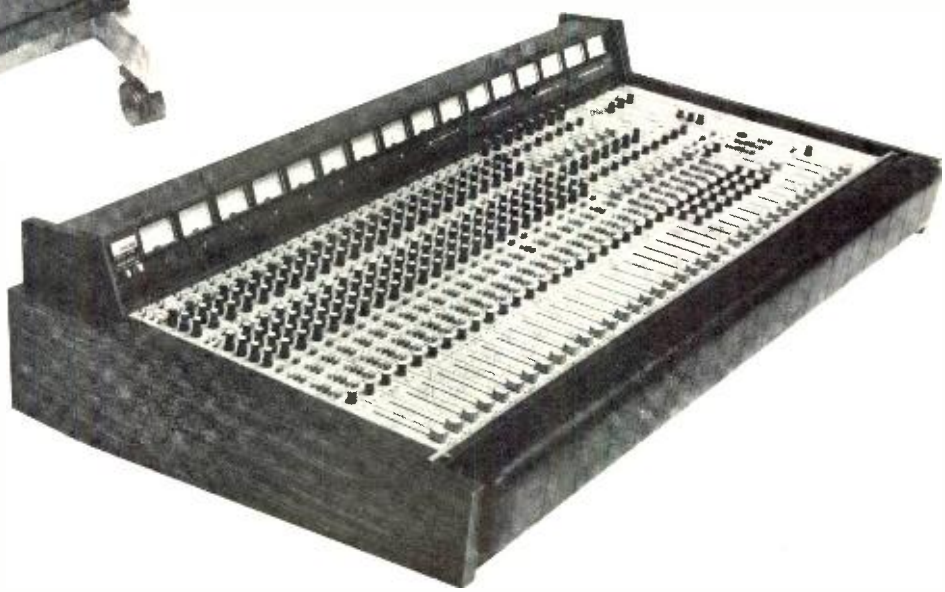

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—AUDIO/VIDEO— RECORDING

A NATIONWIDE SAMPLER

desert is **Las Vegas,** the live entertainment capital of the continent. "The Strip" serves up a smorgasbord of made-to-order audio/video extravaganzas and a fair percentage of special sporting events.

Las Vegas' CSS Recording has been doing video for about six months, and is a full-service operation in terms of writing, production shooting, posting, and multi-track audio recording.

"We have a remote truck outfitted with 1-inch VTR format that my technical director can take anywhere," Jon Parks, owner of CSS emphasizes. "Our proximity to Los Angeles has definitely benefitted us, because of the great scenery around here for location shoots. The music market couldn't be healthier. We do a lot of the concert-type pieces at the hotels. On top of that, we've been supplying our services to Home Box Office and CBS — primarily for sports coverage — so business for us couldn't be better."

To most people, **Austin (Texas)** is the city that has a syndicated TV show named after it —*Austin City Limits* — but few realize just how extensive the music business is in that town.

"On any given night; we have over 35 to 40 clubs with live entertainment. There's lots of rock 'n' roll, blues and, certainly, country," says Music Vision's Steve Weiner. "The opportunity to do live concert shooting is overwhelming." Music Vision's parent company, Third Coast Video, is a video production house utilizing the 1-inch broadcast format. Music Vision which was formed specifically to interface the visual aspects with Third Coast Audio is comprised of a 24-track audio studio located in the same

. . . *continued on page 110* —

Sound Recorder's Powerhouse — Twinned Facilities For Film & Video

Sound Recorders has two facilities, the smaller of which is located in Omaha, Nebraska, and the larger in Kansas City, Missouri. Clete Baker estimates that "70 to 80% of our business is commercial. We're involved enough in video so we can tie audio to ¾-inch. The studio recently purchased a Sony PCM digital machine, and that gave us reason to have a ¾-inch video editing machine as well. We do a lot of post-production work, but it's primarily as a service for our clients only. We don't own a video camera, but we can do 16 mm film and can transfer film to video cassettes. The video editing facilities have been installed for only three or four months, so that's a small (5-10%) part of what we do. The Kansas City branch has a professional quality video production company co-existing in the same building. They rely on each other heavily."

Sound Recorders Kansas City, is indeed full-service. Designated as Sub-Station K, the structure was built in 1911 by the K.C. Electric Company to supply electrical power first to the State Line Street Car, and more recently to the Power and Light Co.

"Generally I believe in non-specialization," VP Jim Wheeler says matter-of-factly about the building they affectionately call the Powerhouse: an affiliation of Sound Recorders on the ground floor, and Video Production Associates on the second. The two facilities are interlocked with SMPTE time code via transport logic ties that run between the floors.

"In our audio room, we can make the 1- or 2-inch VTR a slave or master to their editing system upstairs. In terms of services, we can offer videodisc/cablevision recording and production; scoring to picture with original music, library music, sound effects, or voice elements; interlock video while computer mixing audio tracks for TV commercials, industrials, etc; ¾-inch color video/stereo audio demos for music groups; location recording with 24-track audio SMPTE time code to 1-inch or 2-inch quad format; or simulcast production from our 2,000 square foot sound stage.

"There are an amazing number of quality bands in the area; four or five are putting budgets together now. We recommend a 3-, 4- or 5-tune audio demo to show the material, and then one tune to do as a video. That way they save money and get good value. We'd hire a local ¾-inch video production house to bring in their truck for that kind of project — unless there was a bigger budget, in which case we'd tie together the whole facility. We also do record work independently of the video firm, and have our own audiophile label, 'Fresh Aire,' with American Grammaphone."

Besides Sound Recorder's MCI JH-50 Automation System and Sony PCM digital audio recording and editing capability featured in their studios, Powerhouse can undertake digital or analog disk mastering, and film mixing with a 16 mm Magnasync chain interlocked to ¾-inch video. The rest of the facility's video equipment includes the following:

Two editing suites
40'x 40' sound stage with hard CYC
13' x 10' insert stage
CEI 310 broadcast color camera
RCA TR600 Quad video recorders
RCA TH200 1-inch videotape recorder
RCA TH50 1-inch portable recorder
Ampex HS 100C Slo-Mo video disk recorder
Quantel DPE 5000 digital effects
Grass Valley switching console
RCA AE600 editing system
Mole Richardson lighting
Dolphin Arm

If you think that the Omaha site feels overshadowed by the size of her sister company, don't worry. A satellite uplink/down-link is scheduled for installation during the latter part of 1981, which will tie the facilities together for simultaneous recording projects. □□□

The New UREI Power Amplifiers

The UREI power amplifiers are designed to extend UREI quality from our low level signal processing all the way through to our exclusive Time Align™* studio monitors.

Careful evaluation of competitive power amplifiers indicates that while in some cases adequate reliability has been achieved, audible performance is often marginal.

The UREI 6000 Series amplifiers offer the knowledgeable professional the reliability he demands *and* the sound quality he deserves.

Exceptionally large power supplies and exceedingly high speed, high current circuitry combine to produce low-end punch and high-end sparkle which is unexcelled in professional power amps. Moderate use of negative feedback results in fast recovery from transient overloads and avoids excessive high order harmonic distortion when the amplifier is driven into clipping.

The Model 6500 Listening Amplifier

Two totally independent plug-in channels, removable from the front panel, each with its own power supply and continuously variable cooling fan. Exclusive Conducto-Compensation™ corrects for wire loss and transducer related load anomalies resulting in absolutely accurate waveforms at the speaker terminals. 275 Watts per channel into 8 ohms, 600 Watts per channel into 2 ohms. Standard rack mount, 7" high.

The Model 6300 Dual Channel Power Amplifier

225 Watts per channel into 8 ohms, 380 Watts per channel into 4 ohms. 5¼" rack space!

The Model 6250 Dual Channel Power Amplifier

150 Watts per channel into 8 ohms, 200 Watts per channel into 4 ohms. 3½" rack space!

The Model 6150 Dual Channel Power Amplifier

80 Watts per channel into 8 ohms, 80 Watts per channel into 4 ohms. 1¾" rack space!!

Audition the UREI Power Amplifiers at your professional sound dealer and discover how good a reliable amplifier can sound.

From One Pro to Another—trust all your toughest signal processing needs to UREI.

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See your professional audio products dealer for full technical information.

photo: Jeffrey Mayer

engineer
studio owner
producer

KEITH OLSEN

by
Jimmy
Stewart

Keith Olsen represents a fine example of the newer breed of engineer/producer who, having worked for many years in commercial studios, now enjoys the greater creative freedom of recording in his own, tailor-designed facility, Goodnight L.A. Over the last dozen or so years, Keith Olsen has participated in recording projects with Grateful Dead, Fleetwood Mac, Santana, and Foreigner. His greatest success, however, has been with Pat Benatar; the following interview was conducted during the final mixdown stages for Benatar's soon to be released album, *Precious Time*, **co-produced with Neil Geraldo.**

R-e/p (Jimmy Stewart): What comes first during a production — the sound or the performance?

Keith Olsen: It's the artist that performs; it's always the *performance* that comes first. We could have the most sophisticated technical set-up, but if it doesn't start with the song, it's not there. When the song is right I don't care if you're using a $5 mike or a $2,500 microphone, it's going to be the same; it's going to be a great song! I demand excellence in equipment because I don't want the technical aspect to hinder the performance of musicians or an artist. I want to turn on a mike to do a vocal, not knowing if Pat Benatar, for instance, is going to do it on Take 1 or Take 20.

R-e/p (Jimmy Stewart): Every time the artist performs on the floor it's a take.

Keith Olsen: Sure, that's it, because you never know, and you can't predict what may happen.

R-e/p (Jimmy Stewart): That's rather like the older concept of recording: first, the run-through was taped; then the second was the real take; and the third was the cover. So it's important to record in a studio where you will know that everything works properly?

Keith Olsen: Yeah, in a way that facilitates my mode of operation. The tape machine, input switching, mode functions and the speed of punch-in on the multi-track have to be the way I like them to work. I like simple cue monitoring which makes the artist more comfortable, enabling them to concentrate on performance. This helps them to expose their musical soul *"Take me, I'm yours."* That's what I'm looking for!

R-e/p (Jimmy Stewart): It's the feel up front for you?

Keith Olsen: Yes. Well, it's the song too, and the feel. Feel is so important. Tell me a hit record that doesn't feel good? I can't name one.

R-e/p: Why did you decide to build your own studio, Goodnight L.A.?

— continued overleaf . . .

". . .the most common fear amongst artists, producers, and engineers? 'Oh my God, I (we) finally did (got) the perfect performance, and we (they) didn't get it on tape!' "

— The Author —

Jimmy Stewart has appeared as a guitarist and arranger on more than a thousand recordings made in Los Angeles studios. He has served as Musical Director for various artists, including Lainie Kazan, Chita Rivera, and Andy Williams. His widely read column in *Guitar Player* magazine is now in its tenth year, and he has also published 14 books on music. Currently, Jimmy is involved in a 16/24-track studio developing songs and recording artists. He has musically coached Juice Newton, Tommy Chong and Linda Ronstadt, and is presently finishing up his third solo album.

Bruce Swedien was given a disc recorder for his tenth birthday. From that moment on, he knew he wanted to be a recording engineer. By the time he was fourteen, he was working in a studio. And by 1955, he had graduated college with an electrical engineering degree and a music minor. He started a studio in Minneapolis, then went to Chicago, where he was just in time for the last great days of big band jazz and the first great days of rock 'n roll. He recorded "The Duke of Earl," among others. In fact, he recorded just about everyone who was anyone in every category of music, not to mention spoken word. For the last 23 years, he's worked with Quincy Jones. He and Quincy did the soundtrack for "The Wiz," as well as Michael Jackson's "Off the Wall" album, a monster success, both critically and commercially.

ON STAMINA

"I have been able to discipline myself to hang in there longer than a lot of people can. The work that we do requires an awful lot of self discipline. Working in Chicago in the early days of the record business, I learned an awful lot from the musicians about conserving energy and being able to just stay in the studio at peak performance for a long period of time. I don't see that very much today. I wear out second engineers in here that are half my age—all the time. Quincy and I can hang better than anybody."

ON HINDSIGHT

"I did the second Beatles album. It was done four-track and they had recorded virtually everything in England. Then they brought the tapes over and we finished vocals and did a quick mix and they pressed the record. And that's about all there was to it. Nobody thought it was going to be anything. Just another bunch of kids from England. They sold their contract for $25,000. And the rest is history."

ON GOING INDEPENDENT

"I must have been one of the first. A real rebel It was fun, though. I really stuck my neck out. I didn't sleep much in October, that year."

ON SELLING OUT

"You have to have something to sell before you can sell out."

ON BAD EXPERIENCES

"I did an album with organ, trombone and banjo. Awful. Organ, trombone and banjo. The longest project I ever did. It took about a day and felt like a month."

ON PREPARATION

"It isn't true that you can just sit down at one of these things and push a couple of knobs and get exceptional sound. You can get *acceptable* sound. But there is a big difference. Study. Learn. Go out and listen. Listen to the recordings, but listen first to real music. Acoustical music. That is number one with a bullet."

ON TAPE

"I grew up with Scotch 111. That was the first tape I put on a machine. I was recording for quite some time on 206. In Chicago, they used 206 almost exclusively until about 1975-76 at Universal. I started using 3M 250 and don't contemplate a change in the immediate future. Does that say anything? I like the sound of it very much. If I didn't, I wouldn't be using it, and I guess the best verification for the reason that I use 250 is the fact that I haven't felt any need to change to another type of tape. And they have all been after me."

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We Design the Future

For additional information circle # 17

Keith Olsen

Olsen: I wanted a facility that was going to be comfortable; you live in a studio. People are building their own studios because they want an environment that's going to be comfortable for them. It's not for money, believe me: this thing is a White Elephant as far as money goes! There are only a few people in this industry that can make money at it because it's *not* a profitable business.

I [built the studio because I] was tired of being cramped in small control rooms; of listening to highly equalized speaker systems because the depth of the control room wouldn't facilitate a 42 Hz waveform. It always hurts when you start paying other studios $125,000 in session time, and you're sitting there, fixing their studio, demanding certain things out of their facility — playing quality-control manager for them! Then virtually by the end of the album you've made their studio totally operational for another nine months. I just wanted a clean, comfortable atmosphere to work in for long periods of time, without getting highly tired and upset.

R-e/p: Then the studio reflects your personality — the mood and the type of music that you're into?

Olsen: No, you create your own vibe and environment . . . the mood of a session . . . as soon as you walk into any studio; that goes without saying. You've got to say: "We're here to have a good time, make good music, and have fun." That's what I do. We make our own coffee; we have our own mugs; we fill our own refrigerator. We use our own mikes, cables and headphones, because I know it's all going to work *every* time. So the artist never has any question that when he or she does that perfect performance it's going to get on the tape. That's the fear of every artist: "Oh my God, I finally did it and they didn't get it on tape." I guess you could call it a common fear among artists, producers and engineers that a perfect performance will get on the tape that's not technically perfect.

R-e/p: Let's talk a little about the studio's equipment. What do you like about the NECAM-equipped Neve 8108 board you have?

Olsen: I like the lights; that's why you'd buy anything with pretty lights. When you turn it on they flash, everything is basically a light show! [Laughs] No, Neve has established a certain level of excellence in signal processing. A lot of consoles and a lot of pieces of gear have too much coloration. I like the way a Neve console sounds. I have a 32-input 8108, and it's got everything I need to do a record. I don't record things 48-track; I record 24-track, and usually don't fill up all the tracks. Although there are a few times that I'll spread things out.

I use a fairly basic collection of microphones: a couple of Neumanns; a couple of AKGs; a couple of Shures; a couple of Sennheisers — very standard types of microphone. I selectively choose a microphone for the particular sound source that I'm putting it in front of, and for the level of that sound source. If it's a screaming electric guitar, just by knowing microphones you can predict which one is going to self-limit; what microphone's internal amplifier is going to click when you put it in front of a guitar at 135 dB sound-pressure level.

R-e/p: What monitor loudspeaker system do you use?

Olsen: This particular monitoring system is a George Augspurger designed monitor speaker system that has a couple of JBL bass drivers, a JBL mid-range, and JBL tweeter. It's bi-amped with a couple of Yamaha P2200 power amps, and voiced with a White Instruments third-octave EQ. I like the system because you can listen to it for long periods of time without getting horrendous amounts of ear fatigue. A lot of monitor systems sound really good, and a lot of them sound a little strange! In most of the speaker systems that sound strange it isn't really the monitoring, but rather the room it's sitting in. You're trying to pump that low-end energy into a room, and a lot of studios do a tremendous amount of trapping so that the speaker system can reproduce a 40-Hz waveform.

R-e/p: Do you like to listen to your monitors at a loud or a reasonable level?

Olsen: The level you're monitoring at is dependent on the level at which the musicians are performing. Say, for instance, you're cutting basic tracks: the drummer's sitting there pounding on his drums, and every time he hits a snare drum, his ears are hearing 120 dB sound pressure level for that instant. Then if you play it back at a soft level, they're going to instantly get turned off just because of the contrast. They have to hear it back the first time at the same level they were playing it out there. So, yeah, during tracks, you play back pretty damn loud. During overdubs, you're talking about reasonable levels. During mixing, I'm going from loud level, to soft level to medium level . . . from big speaker to small speaker . . . just to keep my reference points totally confused! [Laughter] I don't know, really . . . it just depends on the feel at that time.

R-e/p: What do you think about digital equipment?

Olsen: Going digital? That's a real tough one. I think you should talk to some people who actually use the hardware — "whales", as they refer to them. No doubt they're gettin' there; it's going to be really great soon. It's going to be wonderful, especially when one of the best creative tools in a studio is still

"Secret of my sound?
. . . making sure the drummer has his drums tuned to the point that they sound great . . . there in the room.
If the drums sound good, you'll be surprised how good the microphones sound . . ."

Keith Olsen

a razor blade. As soon as you can edit *easily* on digital, then it will be a highly useable tool. But the manufacturers seem to forget that sound quality isn't the only thing. Converting analog to digital, then recording the digital, then bringing it back to analog and just having that wonderful tonal spectrum of sound . . . that's just amazing. I'm thrilled with that; I love it! *But you can't physically edit it.* As soon as you can walk over to that machine and say: "Okay, downbeat of the bridge from Take 12; through the second bar of the out chorus; the rest of it from Take 14" — Bam — do it. And *not* have to send the tape back to the factory to have it done; *that*'s when it's ready. Right now it isn't ready. Also, how many studios have the two machines that it takes to do electronic multi-track editing? I mean, a $200,000 investment to be able to edit; give us a break!

Anyhow, most of the time the average consumer isn't going to be able to hear the difference on his home system. As soon as they get the quality of the pressings up to where digital really makes a difference in the home, then it *will* matter to the record-buying public.

R-e/p: Do you like console automation?
Olsen: Yeah, if it's done properly, and you don't have to look at a TV screen going up and down. If the automation is controlling a fader, should you have to relate in your mind to a bar in front of you, or a line on a TV screen, or LEDs at a meter on a fader to represent a position? No. You should be able to say: "Okay, *I'm* under control."

R-e/p: I know that you do most of your own engineering, but occasionally you have someone working with you?
Olsen: Engineer Chris Minto works with me all the time, because it's real hard to wear two hats. In fact, you can't. When we're setting up, yeah, I'm twisting every knob in the book. When it comes to the take, when we start rolling tape, I'm listening to the performance, not for little problems or idiosyncrasies. Chris keeps an eye on the levels for me. If I want to run out there to be with the musicians, he slips right behind the console; there's a totally silent slippage. Our working relationship is just like glass, and he's the fastest puncher this side of the Mississippi. [Laughter] He can get in and get out of anything!

R-e/p: When did you first feel that you wanted a career in the music business?
Olsen: When I decided I *didn't* want to be a school teacher. I was a Music Ed. Major and an Electronics minor in the University of Minnesota years ago. I dropped out because I felt that it looked pretty dead end to me. (Sorry out there, all you school teachers!) It was looking like you could take yourself just so far. That's when I decided, hey, let's try something else.

R-e/p: Your principle instrument in school was . . .
Olsen: . . . classical bass — upright bass.

R-e/p: Were you primarily an ensemble player or did you get into some of the solo works?
Olsen: No, I tried out for a leading symphony orchestra, got accepted, rehearsed a few times, quit, and then went on the road.

R-e/p: Who did you go on the road with, because I know you've played some non-orchestral material on bass?
Olsen: The first person was Jimmy Rogers, for a while. The road trip, which I think started in Missouri, was called the Upper Mid-West Hootenanny Tour. Basically, I was playing folk bass behind Jimmy. We'd play maybe three songs before he'd come on, it was like a little jazz ensemble. Bad word jazz: [Laughs] The Jazz Police. Put down your instruments, up against the wall, the Jazz Police are here!

R-e/p: An electronics minor must have been a great combination for becoming a producer. How did it work out for you?
Olsen: Believe it or not, today they have music-industry classes and engineering courses that include musical theory and appreciation. That's about how far they get into music; the rest of it is electronics. They forget such wonderful things as psychology and logic. Dealing with people, which is the part of the music education major, is very important, as are psychology and logic courses. I look back at them thinking what a joke they were, but they really helped.

It's not that musicians or artists are hard to work with, because if a successful artist is confident in himself, he's really quite easy to work with. It's the people who have made it, although possibly shouldn't have made it, who are the hardest ones to work with; the ones that really don't know why they're so popular. When I'm picking projects, I try to make sure that I work with someone who is so talented and confident in his own creativity, that we can get things done.

R-e/p: Do you feel that it's important that a producer has a background as a recording engineer?
Olsen: You should have an understanding of what's going on under all those knobs, and what they all do. You've got to be able to make a definitive request to an engineer, in his language, so that you can be that vehicle to get the artist through you on to tape, and out to the market place.

I also think it's pretty important that a producer should have an acute understanding of music. He's going to be guiding musicians, and has got to know if he hears something that's wrong musically. A producer has to understand what is being recorded; what's being played. Yes, it definitely helps to be a musician, to have music theory in your back pocket. For anyone out there who is thinking of becoming an engineer or a producer, how can you think: "I'm going to become a producer?" without an understanding of music!

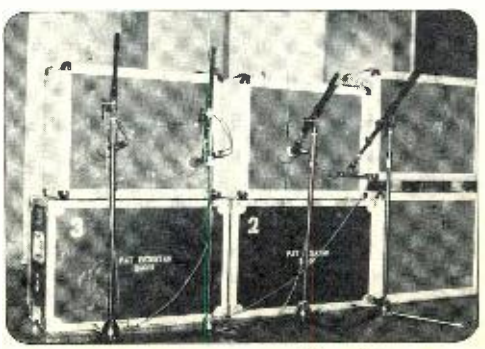
Its' been one of those natural transitions in my life from the study of music to engineering and producing. The first thing you've got to do is learn music; understand exactly what is going on; take all those classes; learn that music theory. It all helps! Composition, counter-point, all that. Rock and Roll is a dangerous business — you can't take any prisoners! [Laughter] So if you want to succeed you have to learn all the way through. If a guitarist is playing a guitar solo, and there's this one note that's driving you crazy, you've got to know the tonality of the scales. A lot of time, guitar players don't have that kind of knowledge. They're playing from gut reaction, from the heart, so there's got to be somebody there who isn't going to technically sterilize them, but who's going to say: "Try a B flat instead of B."

R-e/p: Do you use anything unusual to get a guitar sound with Pat Benatar's guitarist, Neil Geraldo?
Olsen: I place a mike in front of the amplifier! In fact I use four microphones; Neil has two amplifiers, and each one has two speakers in it. I put a condenser mike on one speaker, and a dynamic on the other. I do the same on the second amp. I bring it into the console, adjust the level, use no EQ and it goes on tape. I do elevate the amp off the floor and get the mike so close that I don't have any phase cancellation by destructive interference.

R-e/p: I thought perhaps that you might have experimented with putting the amplifier on its back, or at an angle.
Olsen: Well, it depends on the instrument. For instance, if you use a Marshall cabinet — a standard Marshall with four Celestion speakers — I've found that if it sits on the floor pointing straight ahead, because of triangulation of direct versus reflected sound, you get a great sound out of the room, and then the guitarist comes in and it sounds lousy! With a front-loaded, four-speaker cabinet like that, where the sound is all going one way, I tip the amp back about 35 to 40 degrees, and it just eliminates that possibility of destructive interference.

In California, the softest part of any studio is the ceiling. It's not quite the same in New York, since your ceiling is usually another man's concrete floor, and you have another

Keith Olsen with engineer Chris Minto.
Photo: Kathy Cotter



Photographic detail of amplifier miking.
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Keith Olsen

hard surface above you that's going to bounce back the sound. There again, if you aim it up, you do have all that area for it to bounce around. By the time it gets back to the microphone, the sound is so far down just by going through the air, that it really doesn't matter. I don't care if you're in a room of 200 or 1,000 square feet; it doesn't really matter.

R-e/p: Why do you use the combination of a dynamic and a condenser mike — to get the highs?
Olsen: No. I put those four mikes on Neil's amps one — on each speaker — because we go for different guitar tones on each song, and while cutting tracks we just go for a sound that's fitting this particular song. It's not preconceived until the moment we start running down a sound for that particular song.

A dynamic mike has a lovely little self-limiter in it. It's really just a piece of Mylar and a coil of wire sitting in front of a horrendously loud sound source. That poor little piece of Mylar can only move back and forward so far, because it's restricted by its suspension.

The way it works is that the waveform comes into it and goes out, so you don't get that last octave of sub-harmonics. The first attack of the pick hitting the string is that motion of air; it's not a tone, but rather an impact *before* the sound. You don't really pick up the last octave that well with a dynamic mike because of the self-limiting function.

I use AKG C451s as the condenser mike on Neil's amps. I don't use C452s even though AKG says they're exactly the same. I've listened side by side comparing them, and the 451 sounds like it has at least an extra half an octave on the bottom end.

R-e/p: Are you trying to cut the bottom on some of that?
Olsen: No, you want the mike to be able to reproduce it; you want it to be there. Okay, let's get technical: if you have a system with a bandwidth of 20 Hz to 20 kHz, it sounds normal because your average is about 1 kHz. (Maybe these figures will be slightly incorrect but the analogy will be right.) If you have a 50 Hz to 20 kHz overall bandwidth, everything's going to sound toppy. If the bandwidth is 20 Hz to 15 kHz cycles, it's going to sound bassy. The human ear does not respond to ultra-low and high frequencies. The range of sound that an ear hears best is between 300 Hz and 3 kHz.

R-e/p: Do you record the guitar on two tracks?
Olsen: Neil uses an effects rack on one amp, so he has one output that's dry and normal. The other one goes through his rack to the auxiliary amp. So there's one amp that's affected, and one that's dry. I record them on two different tracks. We record guitar solos with two amps set for power, or *"Kill."*, and then lay it on just one track.

R-e/p: What about your drum sound?
Olsen: This is the big secret of my sound, and I don't know if I should go into it. I'm kidding, really!

The big secret of my sound is going out there and making sure that the drummer has his drums tuned to a point where they sound great — *there* in the room. Then it's just mike placement, so that the microphone hears what you hear. It matters a little bit what mikes you choose, but that just goes by personal preference. If the drums sound good, you'll be surprised how good those microphones sound. If the drums sound bad in the room, regardless of what mike you have, and regardless of how good the drummer is, it's still going to sound bad on tape.

It gets right back to those same old things: Performance, and Expertise. It's just like having a guitar out of tune: a guitar that's out of tune is going to sound awful, regardless of how good the setup on the mikes and amps, or how much power you have. It all depends on simple, basic facts. You forget them much too often, and those simple facts are that if it sounds good there in the room, and you've just carefully placed your microphones, then it's going to sound good inside the control room.

R-e/p: Any tips on drum tuning?
Olsen: Remember that any time you're adjusting a hollow tube with a diaphragm over each end, then you're screwing with a tuned tube. The laws of physics are so complex regarding why that tuned tube is going to sound one way or another when you hit it with a baseball bat — and that's basically how these drummers are hitting them now! They're taking these baseball bats and pounding the crap out of them. As far as how to tune the drum, you have to tune to its resonant point; if you take the drum above or below its normal resonant point, it's not going to ring or sound real.

R-e/p: Do you prefer to mike a piano in stereo, with two mikes sitting in the middle to pick up the highs and lows?
Olsen: It depends on the part that the pianist is playing, and also on the sound of the piano. Certain pianos sound great miked near the hammers. With some of them, however, you have to mike farther down on the lower end of the sounding board. Some pianos sound like a little tiny toy piano.

R-e/p: What about the vocal? I know that you use a grading system from 1 to 10, and you start at 7.
Olsen: I'm very simple and straightforward on vocals. Sometimes I use a C451, sometimes a U87, or U47 — it depends on the singer. It depends on how hard the consonant sounds are, the "frck-a-ts," what value to those definitions of annunciation — how much of that I have to bring out.

R-e/p: Do you like to record your vocals in an open room, or a purpose-built booth?
Olsen: I don't particularly like to use a booth, because a singer can load up a small booth, and all of a sudden it's sounding boxy. I like using a room the size I have here at Goodnight L.A. I'll put a couple of tall baffles around the back of them so they don't have the feeling that they're out there all alone, and that the spotlight is on *them*; naked . . . exposed. That's quite an intimidating feeling for a singer to walk out into a giant room with one microphone sitting there. I don't see how they can do it.

R-e/p: For your lead vocals do you slate using your grading system? For instance, when you have a good feel on a track, but might have a problem with one word, do you use a mixture of tracks?
Olsen: Yes, I'll pop in another track for that word, but try to keep that going because of that linear thing that happens within an artist as they're singing a song from the beginning to the end. If you have to stop, say, at the bridge, all of a sudden you get this emotional let-down, and it's hard. But, there again, with some singers you can wind back two words, come back in, and they're right at the same point emotionally; *exactly* the same.

R-e/p: Do you record everything in stereo?
Olsen: Sometimes in stereo; sometimes in mono — it depends on the instrument. There's no reason to record a bass that way, since our ears don't hear bass in stereo. They hear it monophonically. Again, there's no reason to record a bass or snare drum in stereo. As far as the rest of the kit is concerned, I record it in stereo the way you look at it as if you are the listener, because that's how the end product is going to be. I don't record the stereo spectrum of a drummer as if it's a case of: *You* are the drummer. I mean, how many people listening are drummers?

R-e/p: How about acoustic piano?
Olsen: If I'm using a piano on a tracking date, I like having an isolation box over it — quite a tall one. As soon as you have a grand piano on a date you stick a couple of mikes in it, tilt

"The level you're monitoring at depends on the level at which the musicians are performing! Monitoring during tracks, pretty loud . . . overdubs, reasonable levels."

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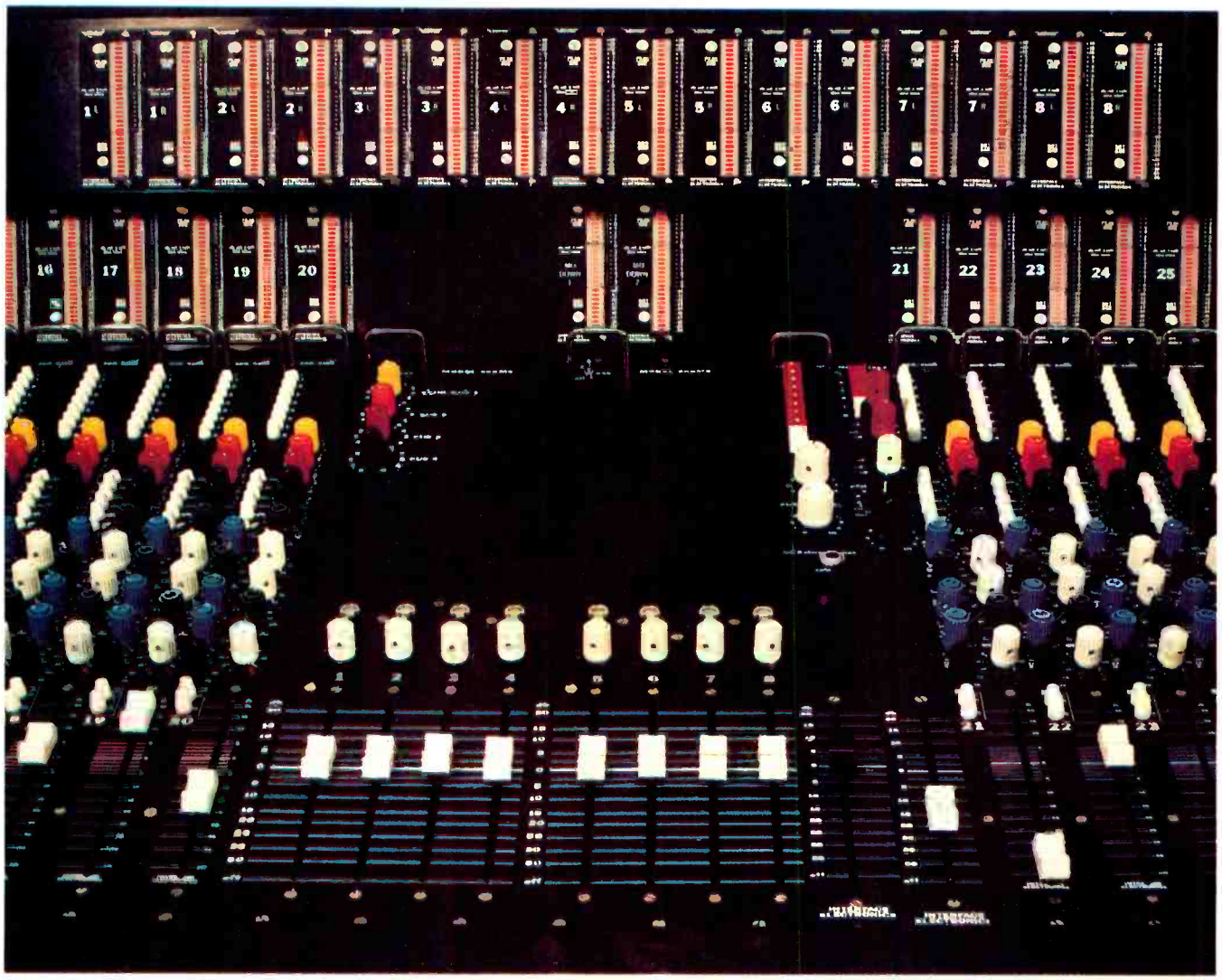

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the top down as low as it goes, then you put blankets over it. But all of a sudden you have created so many reflections inside that piano, that you get this real tinkly, small-sounding piano. So when I need isolation, I like having a tall box over the piano, and which is heavily insulated with glass fiber to absorb everything. Essentially it's synthesizing a wide, open room, where the microphones can be close to the piano, and the sound that's generated inside the box is absorbed. As long as it doesn't come back, you're listening and hearing the resonance of the sound board and the sound of the strings. *Not* the sound of the resonance bouncing off an ebony top, coming back immediately at a very sharp angle, and cancelling out all your lower and upper mid-range.

R-e/p: What kind of cue monitoring system do you use for musicians?
Olsen: I have a very good headphone system at Goodnight L.A.; it's a full-frequency, high-powered system. The headphones themselves are AKG 141s, which are comfortable to wear. Everybody likes the sound and the volume you can get out of them. They are prone to blowing out at high levels, however, but that's the price you pay. You can have either a headphone system that's protected by putting transient limiters on them, or have a low-powered amplifier, or limit the frequency response on the bottom end. There's a lot of things you can do, and a lot of studios do it. I prefer to have it as powerful as can be. I bought the 141s because I can buy replacement drivers for like $15. Of the seven I use I will blow out one headphone every tracking date.

I just don't like all these headphone systems that are limited and frequency-compensated; they just sound *unreal*. This way you can get into it, as if you're standing on stage with this whole band behind you. I'm driving the headphone system with Yamaha P2100 power amps. In fact, I'm using Yamaha power amps for everything in the studio — I have had not trouble with them at all.

R-e/p: What's it like to record Pat Benatar's vocals?
Olsen: With Patty Benatar, she has so many voices inside that throat of hers - so many tone colors and timbres — that she'll sing it the first time, and it will be absolutely fantastic. But then she'll want to color it just a little bit, and because she has so many different voices, she'll have to sing it five or seven times to find the placement. That's her expertise: she's an expert at finding all of those different colors in her voice. That's why in all of her songs, there's a different voice color. And it's *not* EQ, and it's *not* different mikes — it's definitely her! You can't achieve that with mikes and EQ. It's different head tone versus chest tone, and she does it all right there in her throat.

It's amazing. She'll work on it until she finds that placement. It just takes hearing the difference — you know, singing and placing — and all of a sudden Patty will hit on it, and it'll be the right color and texture for that song. Then we'll go for those performances with that tone color. After three times through, all of a sudden the tone color may shift a little bit, and then she'll say, "Better play me a verse of the first take. I forgot what it's supposed to sound like."

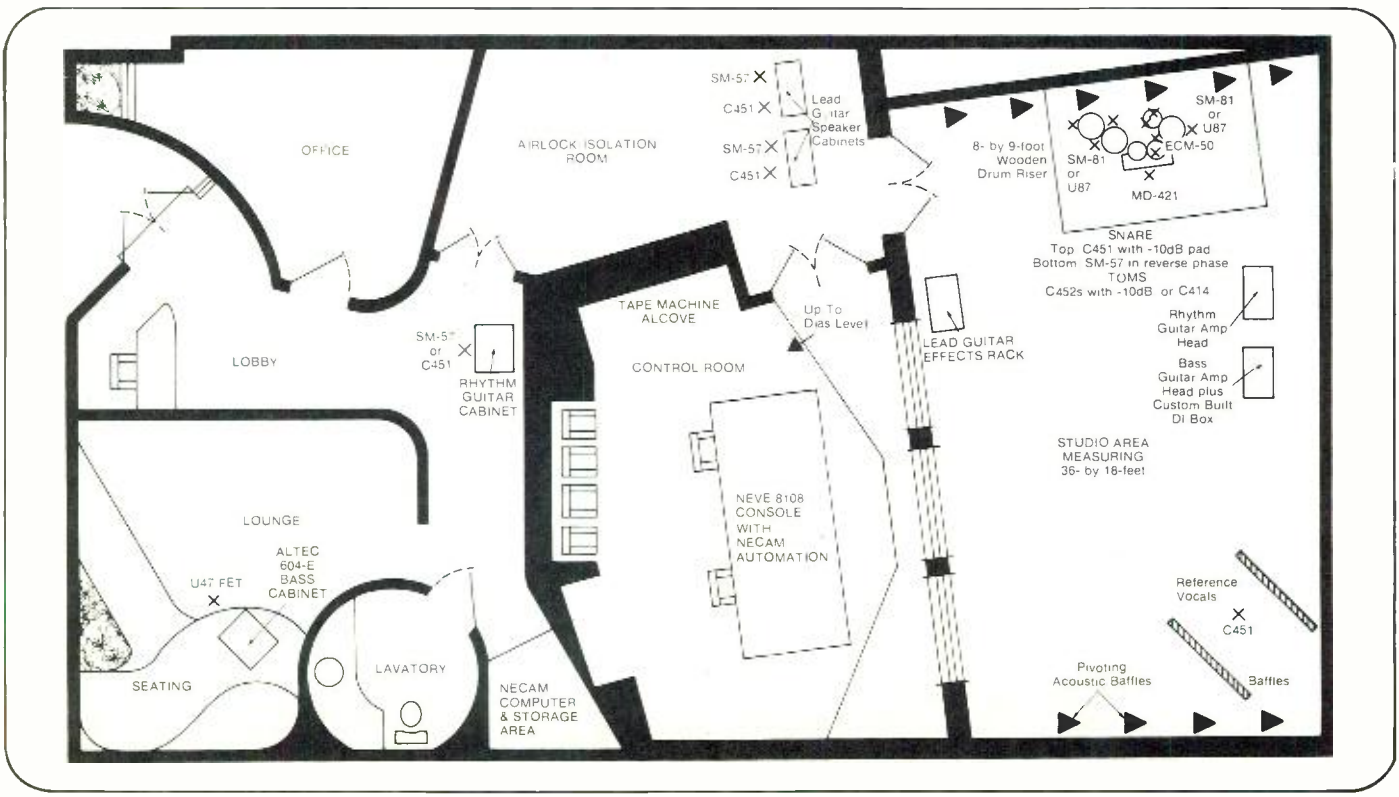
R-e/p: Do these colorations help in over-dramatizing the song?
Olsen: Yeah, it's definite. Instead of just singing the song, it's a *performance*.

R-e/p: Do you like to use outboard gear?
Olsen: I'm not Electric Larry, no. Electric Larry is the guy who . . . oh, we've got a snare drum track! Mmmmm . . . Just have a phaser on the snare drum. Oh, a kick drum . . . Let's put a parametric on . . . with a limiter. Then

Basic Room/Microphone Set-up For A Typical Keith Olsen Tracking Date. Engineer — Chris Minto/Goodnight L.A. Studio, Los Angeles

Shown below is the basic microphone layout used to record basic tracks for Pat Benatar's forthcoming album, *Precious Time*, produced by Keith Olsen at his personal studio, Goodnight L.A. Generally, for increased isolation all acoustic instruments are arranged in a loose circle around the recording area, electric and bass guitar speakers being located in other rooms at the studio. All microphone and cue monitoring cables are laid carefully around the perimeter of the room, to provide greater uncluttered space for the musicians to move around as they may wish — and, in this way, create a 'live-date' feel to the tracking session.

The control room houses a Neve 8108 console equipped with NECAM servocontrolled automation, and is coupled to a Studer A800 multitrack plus A80 and B67 mastering machines. Effects and outboard equipment includes a Publison DHM89B2 digital delay and pitch-shifter; Lexicon Model 102 DDL; Eventide H949 Harmonizer®; and Pultec Programme Equalizer. Monitoring is via custom-designed enclosures housing JBL components.



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we have overheads . . . Run those through a sweep filter. Then we have tom-tom tracks . . . Let's compress those, and get a separate echo sound off of those, and dump it into a compressed echo chamber on this end. Oh, we have a guitar track . . . Let's put a slap-back echo on that. Here's a vocal track . . . Let's see, we need a delayed echo on that with a Harmonizer® on the left, and a varying delay in time on the right, so it gives a slight tremelo effect on the right side. Oh, here's the background tracks . . . what we need to have is those ADT'd, and then bring it back twice at different delays at different times on different sides. Here's a guitar solo . . . put *everything* on it.

Pretty soon everything sounds synthetic; the original performance is so altered. It has been screwed with : phased and buzzed, and this and that. What's left of the original performance? All of a sudden electronics has come in to alter the feel of the performance so much, that it might not be the same thing. Which is one of the other things that kind of went overboard in the late Seventies but which has gone away today. [Holds up a sign that sits on the console: 'IF WE DON'T HAVE IT — YOU DON'T NEED IT!']

R-e/p: Do you use one echo system or more?
Olsen: I like having a couple of chambers. I love EMT 140s; they're something that I've been using for years, and I feel comfortable with them. I didn't want to get into building a live chamber, because I'd probably be disappointed with it. There's so few of them that feel good. Everyone's tried to build them, and most of them don't work. Most of them sound weird, but there's a couple in this city that sound great. And you say: "God, I wish I had *that* chamber." So you measure that particular chamber, hoping you'll get the same thing. But you never do.

R-e/p: Why do you remain an independent producer? What are the advantages . . . or are there any disadvantages?
Olsen: Well, I would not want to be signed to any one record company, because that means that you're locking yourself into the performance of that particular company.

R-e/p: Of all the numerous albums you've produced, which ones are you the most proud of?
Olsen: I'm proud of a lot of albums I've done. I like the *Fleetwood Mac* album; Foreigner; Pat Benatar; Santana. I like the Buckingham/Nicks record; it was kind of a trend setter for being as early as it was.

Chrysalis, Pat Benatar's label, is a great record company to do business with, because they're small and they're family. The artists — and that's where it's really at — say that Chrysalis is where they want to be. That could be my home.

R-e/p: How do you begin to work on a song?
Olsen: When you start working on a song, it's best to have a firm grasp of the end product in your mind before you start. If you don't have that you're sort of hoping that somebody does . . . it's like a crap shoot, you're rolling the dice and hoping to come up a winner. You've got this idea of what the whole thing is going to sound like, and usually when you hear a song — a voice and guitar demo — you *hear* it. If it's a really good song, you can hear the whole thing in your head: how the band's going to sound; which artist is going to sing it; what parts go where. It's amazing how fast it happens.

And that's the concept you first have in your head when you go into the rehearsal studio, and then into the recording studio — you lay it down! Now, things alter a little bit because there's this spark or something that happens when you're actually in the studio, which might alter that vision or pre-conceived idea.

R-e/p: Do you spend much time rehearsing a tune?
Olsen: Sometimes a long time; sometimes just an hour. It all depends on the song. If a song is very involved, and there's a lot of sections to it, you have to segue all these sections together musically, to the point where it makes sense and is accessible to the listener. He's going to hear it the first time through, and has to be able to understand it;

you've got to make it sound comfortable.

There are other times, like on the song "Tough Life", from Pat Benatar's new album, where we rehearsed it in the studio because it hadn't been written in the rehearsal room. While we were rehearsing, I was rolling 24 track — I've still got that tape! That's why it sparks! Oooh, is it real fresh! And that's wonderful, *if* you can do that. I wouldn't want to do that with an entire album, because, first off, the main problem that you come across in a rehearsal studio is finding the right key.

R-e/p: What do you look for in a lyric — for example, Pat Benatar's lyrics?
Olsen: Hers are not visual lyrics. With a band like Journey, or something like that, everything is a poem of five verses describing a leaf. I mean, give me a *break*. Who cares? I don't and probably 99% of the people out there in Radioland don't care either. They want to be able to grab on to something simple and straightforward. You can write about anything as long as you do it in a clever way, and it's accessible to the listener on the first pass.

The kids want to hear something that happened to them. That's why real punk music never happened here, because all the lyrics were about a social revolution that was going on in England, not in the U.S.A. You can't relate to it. Here you're driving around in the car that your Dad gave ya; smokin' your cigarettes; rollin' your joints; havin' a great time on Van Nuys Boulevard. How can social revolution — young versus establishment like they wanted in England — happen here? It can't. No way.

Too bad that the record companies didn't think like that. To have asked: "What is this music all about that's selling so well over there?" *Before* they invested millions in all these bands, and tried to push it down the throats of everybody in this country who rejected it. That's stupid. You *have* to put the listener in the song within the first line, because if you don't he's going to either push the button, get side-tracked or whatever. You're going to lose their attention span unless you catch their ear in the first verse. Then your repetitive chorus is your next hook, and they get nailed again. It's like writing a hit novel.

R-e/p: What would help a songwriter get his material in shape for you?
Olsen: A good song shows off with a voice and guitar. That's all you need — or a voice and piano. You can't sell a song to a listener by arrangements, but rather by the song's performance. It gets down to three things: Song, Performance, and Sound. By performance I'm talking about feel, groove and consistency of tempo.

The day and age has come and gone — definitely underline the word *gone* — where every track has to have some kind of effect on it. There is no such thing as fixing a song in the mix. Okay, you can fix certain things in the mix, such as clipping out a bad note or something like that, but as far as using an effect on this, and an effect on that — to confuse the listener into drawing his attention to a feel change, or not drawing his attention to it — is a *mistake*. I've heard too much of that. That's the sound of the Seventies. We're talking about 1981/82 — whatever's happening in the future.

It is a simplistic form of music which has basic elements — drums that sound like drums, a bass that sounds like bass, a guitar that sounds like a guitar, and a human voice that is singing some semblance of the English language that we can understand. Basic elements to music; you make them sound real because they *are* real.

R-e/p: Who's making the decisions at the record companies?
Olsen: A lot of it is done by committee, instead of a record company giving each A&R guy one shot. They take it into the A&R committee, which includes the record

"A good song shows off with a voice and a guitar — or a voice and a piano . . . You can't sell a song . . . by arrangements . . . it gets down to three things: Song, Performance and Sound!"

Keith Olsen

company president, and the heads of A&R and promotion, to see if it is accessible to the market.

A producer must look for a band that sounds unique. Sounding like themselves, and not like every other band, is very, very important. Look back at the Seventies; lots of bands sound alike. There were three catagories of what bands sounded like; if you didn't sound like one of those bands you had no chance of being signed. Everybody thought at first that Eighties rock was a big regression back to where it was in the late Sixties. It's not at all — it's simplification by eliminating the overdub syndrome. I think the public got tired of being bombarded with 18 gillion sounds to their ear. How much can a listener take before it all starts becoming highly confusing?

R-e/p: Do you like working with an artist that has a self-contained group?
Olsen: Absolutely! When you have a solo artist and have to hire the musicians, I try to put together the weirdest concoction of musicians known to mankind. I'll hire a good session drummer, because they have good time; they give a good attitude; and they learn their part quickly. I'll use Mike Baird, or someone like that. For bass, I'll use one of my own session bass players, because bass and drums have to lock together. I'll use some of the most unknown guitar players; I refuse to use the everyday guitarists. There's only one session guitarist who doesn't play like an everyday session player, and his name is Watty Wattell. Every time he plays he puts his heart and soul into it. I'm always looking for new players, new ideas. I don't care if they're inexperienced in the studio, because they'll get their confidence. I'll use Bill Champlin on a tracking date; he's a wonderful singer. The attitude and vibe that he gives to a session is invaluable.

R-e/p: Do you help the musicians on the floor with their licks? Do you make choices for them?
Olsen: Sure. You say: "Hey, you're onto something there, it was sounding great." Or, maybe, "You're doing it wrong . . ." You always keep this attitude — this little bit of sarcasm . . . little shots firing away — to keep their attitudes pumped up so they think they are great. Because the end product, what you're going to put out on them, is hopefully going to be great; the best that they can possibly do.

". . . starting to work on a song . . . it's best to have a firm grasp of the end product . . . or it's like a crap shoot, you're rolling the dice and hoping to come up a winner! If it's a really good song you can hear the whole thing in your head: how the band's going to sound; which artist is going to sing it; what parts go where."

R-e/p: How do you start to mix a song?
Olsen: I start working on the rhythm section, and make that sound just right as far as bass and drums. I put in the chordal rhythmic instruments second. So I have the chordal flow of the song, then the rhythmic emphasis, and then I adjust those two elements together. Then I bring in the vocals to where it is totally intelligible through it all, where every word is heard. I'm listening at a level where the big speakers actually do fill the room, just like the smaller speakers that you have in your home fill up your smaller room, and where your ear is equally affected by each frequency. I will take ear breaks, which is a good way of saying I want to play a game of pinball or pingpong, or throw some baskets; anything to get your blood circulating, and to divorce yourself from the concentration that it takes to mix a song.

R-e/p: How long does the mixing process take?
Olsen: I would say that I go from six to eight hours on a song — sometimes a lot longer — of which two or three hours are spent on programming, cuts, layering and stuff like that. Then it's the time for decision making. I like the artist to be there. In fact, I won't ever mix without the artist being there, because they may have something in their head they wanted to hear that much more of, and they're not going to like the end result. If they're there and they say, "I hear enought of that," then they're taking it totally at its value as a song, not listening for one little part that they played. "You know that little line on Bar 3 of the second verse? I did that little bit — I want to hear that just a little more: 1 dB more . . . 5 dB more."

If the artist wasn't there you might not do that, and he may not like the whole mix because of it. The artist being there also gives you someone to bounce ideas off.

R-e/p: How do you sequence an album?
Olsen: There's no formula. Sequencing an album simply makes it move from song to song in a logical way. You've got to be careful not to put too many songs in identical or relative keys right next to each other. Because all of a sudden you start gettting the same timbre, and it starts sounding alike — even though the song has different melody structure; different parts; and the lead vocalist singing in the same key.

R-e/p: Do you do a reference acetate in the cutting room?
Olsen: Oh yeah, I'll cut probably two or three different references before actually cutting the parts.

R-e/p: And listen to them on different systems, just to double check?
Olsen: To double check, yes. I also cut references at more than one mastering lab because they're all different. There's a number of real good ones here in Los Angeles that I've used. I'm not real particular, like: "I have to have this guy do my records or it's no good." Hopefully, it's on the tape. All I want to do is get it in the grooves in a way that is powerful enough and strong enough to overcome the crap plastic.

Now that I have all this high-quality sound equipment at my disposal, it does strike me as being about time that something was done about the "indifferent" quality of software available from the record companies!

R-e/p: Can you summarize your role as producer on a recording session?
Olsen: I demand and get excellence from my team and equipment: we never settle for second best. A great record starts with a song, then capturing on tape the best possible performance of the song by the artist. Being able to make decisions and having good common sense all helps. I've been through my equipment trip, and come full circle. For me, I'm back to the basics: the Song, the Artist, and the Performance. I know when I've got that perfect take, because it all feels wonderful!

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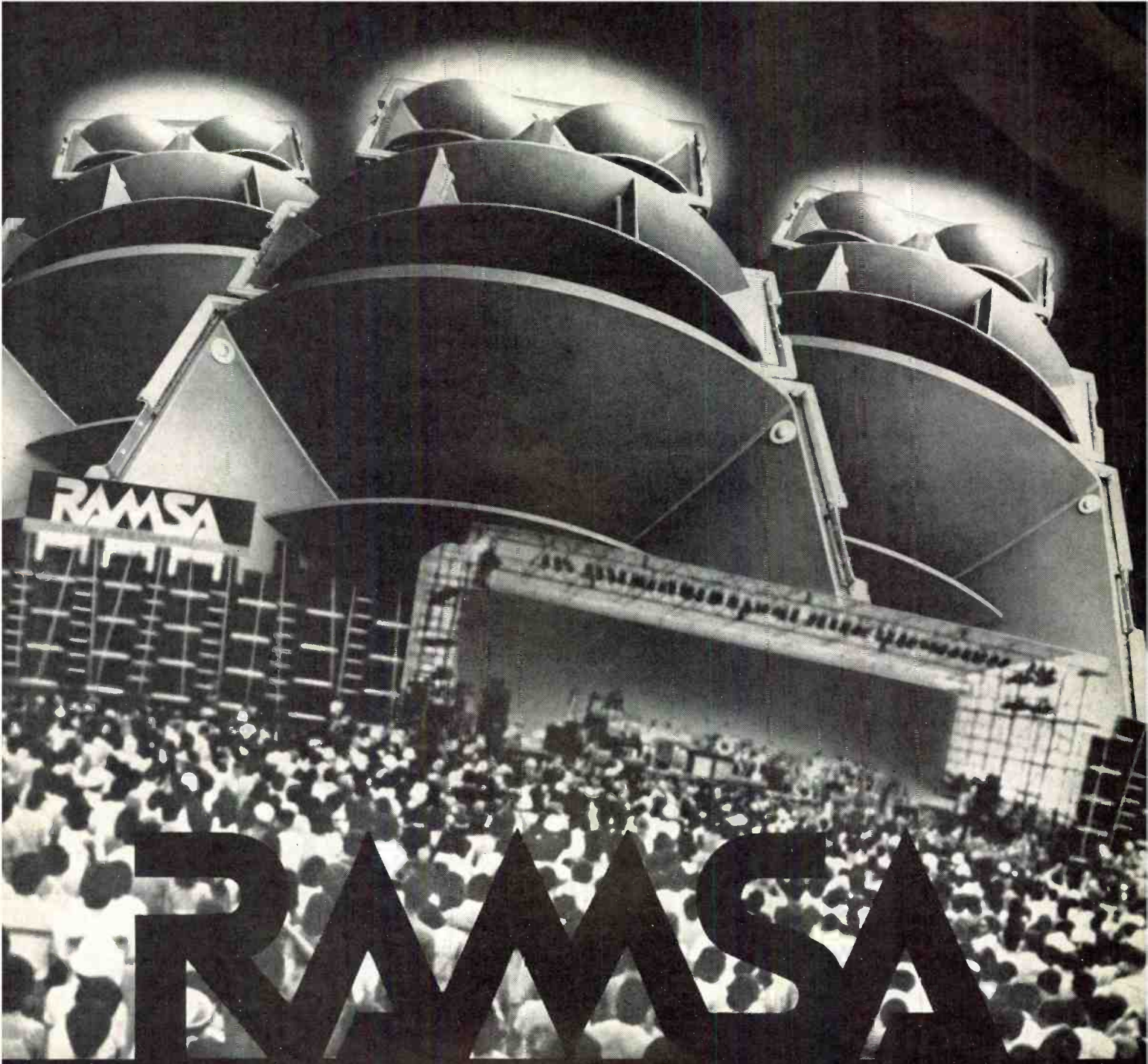

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For Less Than Technical Studio Personnel

by Ethan Winer
The Recording Center Inc.
East Norwalk, Connecticut

As the title clearly states, the main emphasis of this article — the first in the series — will be the practical application of electronics as it relates to music recording. I will gladly spare the reader from yet another long winded treatise on electron theory, calculus, and how essential it is for a sound mixer who wants to be *really* good to understand these important, basic principles. In my opinion, that is pure baloney. An understanding of circuit design *per se* has little to do with making a good-sounding record, and I can think of several instances where some pretty interesting effects were created by someone who innocently hooked up some outboard gear incorrectly.

Nonetheless, some electronic knowledge will be useful to the studio owner or operator, especially if he or she can't afford to pay for a service call every time something breaks down. Those hardest hit are usually the smaller studios where, because of a limited budget, much of the equipment is older, and was bought used. In other words, the folks with the least amount of spare cash are generally the ones who are faced with frequent breakdowns.

But, even aside from the practical considerations of repairing or modifying your own equipment, electronics can be fun — even if you're not the technical type. I know a lot of musicians who are pretty interested in the workings of their equipment, but are discouraged by all of the mathematics and physics they believe must be learned before an appreciation of these circuits is possible. After all, electronics *is* a bit more abstract than, say, mechanical engineering, where one can readily observe the action of gears, pulleys and levers. Likewise, it is not difficult to understand the flow of water through a pipe, or the action of a faucet where you can see, feel, and hear the mechanisms at work.

Well, I want to assure you that electricity and electronic components adhere to the same laws of physics as their mechanical counterparts. For example, just as it is harder to move a lot of water through a small pipe, the flow of electricity is similarly impeded by a thinner gauge of wire. And, to carry this example further, voltage could be likened to the amount of water pressure; while current would be the actual number of gallons flowing through every minute. When you turn off a bathroom faucet, the pressure is still there in the pipes. And likewise, when you unplug a lamp from the outlet on your wall, the voltage is still present in the outlet, even if it's not being consumed.

Following a discussion of basic electronic parts, I will move on to some typical troubleshooting techniques. Also to be covered in future installments will be test equipment that is commonly used for checking audio circuits. If you have a working knowledge of signal flow through a console, and can correctly patch the output of an equalizer into a limiter, you're more than half-way there. Audio travels through a circuit in exactly the same way via resistors and capacitors on its journey from transistor to transistor.

Besides the usual tools that are required for stripping wires and soldering, a studio should equip itself with a reasonably good multimeter. This should be a high-impedance type — at least 50 kohm per volt — and maybe I'm just old fashioned, but I prefer a conventional analog meter. For our applications, a digital readout with an accuracy to three or more decimals is unnecessary; in fact, it may be a handicap with fluctuating inputs. High input impedance is important on a meter to avoid its affecting the circuit being tested, which could result in misleading indications. In fact, I once saw a low-cost meter actually cause a working circuit to oscillate, just by being connected to it. In addition to a test meter, an oscilloscope can be a big

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help, although it certainly isn't essential.

Components

To begin at the very beginning, all electrical circuits require two wires to operate. Unlike water that simply flows from here to there, an electrical circuit requires a return path back to its source; this is why a battery has two terminals, and a guitar cord two conductors. Interrupting either path will halt the flow of electrons and is, of course, the basis for a switch, probably the simplest of all electronic components. But where a switch can only be completely on or completely off, a resistor offers a choice between these two extremes, and can be used to allow some reduced amount of current to flow.

Resistors

The value of a resistor is expressed in Ohms, while the power rating — another important specification — is stated in Watts or, more typically, fractions of a Watt. Now, when a resistor is inserted in the path of a circuit, less voltage comes out than went in; after all, this *is* the whole idea. Furthermore, the higher the resistance, the greater the amount of voltage that is lost, or dropped, in the process. But when considering power, all the resistor cares about is the *difference* in voltage between its terminals, as well as the current, in Amps, passing through it. For a given power rating you can have lots of volts but few amps, or vice versa, but not both.

Most resistors used for audio employ some type of carbon compound or film element, though, as mentioned earlier, other types actually use a length of this wire wound on a ceramic core; it should surprise no one to learn that these are called wire-wound resistors. Well, pretty easy so far, eh? Then let's move ahead and take a look at capacitors and inductors.

Capacitors

One way that you can think of a capacitor is to consider it to be a sort of frequency-dependant resistor; as the applied frequency is raised, the capacitor's apparent resistance goes down. Or, to look at it another way, when a capacitor is inserted in the path of an audio circuit, lower frequencies are attenuated by the ever increasing resistance. Actually, "impedance" is the correct term to use when referring to capacitors or inductors, while this frequency-dependant characteristic is called *reactance*.

Internally, a capacitor consists of pieces of metal held in close proximity, but not touching. If you can picture a piece of Saran Wrap sandwiched between two strips of aluminum foil, you're getting the general idea. Wires are then attached to the foil, and the whole assembly is rolled up and dunked into goo that hardens. Other types, such as a disc capacitor, contain many separate leaves of metal with the alternate elements connected together. If you haven't done this already, I recommend that you buy an assortment of resistors, capacitors, and other goodies, just to bust 'em open and see what's inside. This will be not only educational, but a lot of fun as well.

The lack of any actual connection between the leads of a capacitor makes this device ideal for blocking the flow of direct-current (DC) through a circuit, while still allowing alternating-current (AC) to pass. Other important uses for the capacitor are based on it's energy-storing capabilities. Since a capacitor is capable of accepting an electrical charge, almost like a battery, it can be used to remember the last note played on a synthesizer, or to filter hum from a power supply.

The unit of capacitance is the Farad, although probably you will never see one that large. Typical values range from several thousand microFarads (millionths of a Farad), down to a few picoFarads (millionths of a *micro*-Farad). While power dissipation is not usually as big a consideration as it is with resistors, the voltage applied across a capacitor should never be allowed to exceed its specified rating. Also, capacitors larger than 1 microFarad or so are generally made with an electrolytic material, which enables more capacitance to be squeezed into a smaller package size. Unfortunately, this creates a side effect known as polarization, which requires that the plus terminal never be more negative than the minus. If this is allowed to occur, the capacitor will not operate properly, or may even be damaged.

In direct contrast to the behavior of a capacitor is the inductor, which simply consists of a coil of wire, often wound on an iron core. DC has no trouble passing through the coil since it is, after all, a conductor. In contrast, alternating currents have an increasingly difficult time passing through inductors; as the input frequency is raised, less and less will appear at the other end. In practice, almost no one uses inductors for audio anymore, since they can add distortion to a circuit, as well as pick up hum from nearby power transformers. A good example of the latter is the buzzing that you can pickup from an electric guitar when the guitarist stands too close to his amplifier. Also, the size and weight of the larger value inductors make them impractical to use in today's miniatur-

— continued on page 47 . . .

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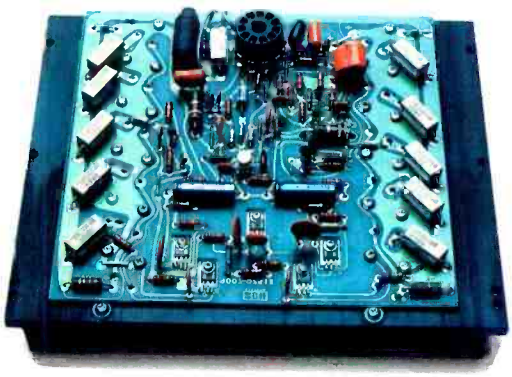

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This unique thermostatic cooling system, combined with 24 large-geometry output devices, give BGW the largest SOA, or Safe Operating Area, in the industry today.

Two handles and one piece of steel. Instead of aluminum or plastic, the chassis of all BGW amps are constructed of welded steel for maximum strength, rigidity and RFI immunity.

Two, large, convenient front panel mounted handles make moving easy. (By the way, because of our unusually strict standards, we are forced to make most of our metal parts ourselves. And that's fine with us.)

Circuitry: Sophistication at the heart of the system. We use large-geometry, full-complementary circuitry. Full. Not "quasi" like a lot of our competitors still use. Full costs a little more. But the result is much better high frequency response with much less distortion.

It's a tradeoff we'll gladly make.

Thanks, Billboard. Thanks, America. According to the Billboard magazine U.S. Equipment Brand Usage Survey, between 1977 and 1980, of the top three amplifier manufacturers, only BGW showed an increase in market share. Specifically, a 25% gain in studio usage, making BGW the fastest growing power amplifier source in the United States today.

That's what happens when you make it right.

Look at the Numbers:

TANNOY

MODEL	DRIVE UNIT	MAXIMUM OUTPUT LEVEL (PEAK)	SENSITIVITY 1 WATT 1 METER ANECHORC 4TT STERADIANS	FREQUENCY (1) RESPONSE	DISPERSION INCLUDED ANGLE @ −6dB POINT @ 10 KHZ	RECOMMENDED AMPLIFIER POWER @ 8 OHMS	CROSSOVER FREQUENCY	ENCLOSURE DIMENSIONS H X W X D	ENCLOSURE INTERNAL VOLUME
SRM 10B	10" Dual Concentric	109dB SPL (115dB)	90dB	55Hz-20kHz	90 degrees conical	50 Watts	1 2 kHz	20.6 X 13.8 X 10.4"	35 Liters. 1 2 Cubic Feet
SRM 12B	12" Dual Concentric	112dB SPL (117dB)	92dB	55Hz-20kHz	90 degrees conical	100 Watts	1 2kHz	23 X 15 7 X 10 8"	46 5 Liters. 1 6 Cubic Feet
M 1000	15" High Sensitivity Dual Concentric	114dB	94dB	50Hz-20kHz	90 degrees conical	200 Watts	1 0kHz	40 5 X 28 4 X 17"	230 Liters. 8 Cubic Feet
M 3000	15" Wide Bandwidth Dual Concentric	112dB SPL (119dB)	92dB	40Hz-20kHz	90 degrees conical	150-200 Watts	1kHz	40 5 X 28 4 X 17"	230 Liters. 8 Cubic Feet
DREAD-NOUGHT	1-15" Special Dual Concentric 2 15" Woofers	121dB SPL (126)	96dB	30Hz-20kHz ±3dB	90 degrees conical	750 Watts Low Frequency 500 Watts Mid Frequency 250 Watts High Frequency	250Hz 2 0kHz	35 X 52.4 X 23.2. 14.2 15° Baffle Slope	400 Liters (15 Cubic Feet) 40 Liters (1 5 Cubic Feet) Sealed Cavity

(1) Frequency Response measured in 1/3 octave bands at any power up to Rated Continuous Power with response within ± 4dB

BGW

MODEL	DESCRIPTION	TOTAL POWER* OUTPUT	8Ω POWER OUTPUT EACH CHANNEL	FEATURES MODULAR CONSTRUCTION	MAGNETIC CIRCUIT BREAKER	FULL COMPLEMENTARY CIRCUITRY	DC ARC INTERRUPTOR SPEAKER PROTECTION	FAN COOLED	CALIBRATED PRECISION STEPPED ATTENUATOR	LOSS OF FEEDBACK CLIP INDICATOR	TRI COLORED LED VU METER WITH CLIP LIGHT
75	Professional Power Amplifier	75	25 Watts	Yes	No	Yes	No	No	No	No	No
150	Professional Power Amplifier	150	50 Watts	Yes	Yes	Yes	No	No	Yes	Yes	5% & 50% LED's
250D/E	Professional Power Amplifier	400	100 Watts	Yes	Yes	Yes	Yes	No	Yes	Yes (250D)	Yes (250E)
600	Professional Power Amplifier	800	175 Watts	Yes	No	Yes	No	No	No	Yes	No
750B/C	Professional Power Amplifier	900	225 Watts	Yes	Yes	Yes	Yes	Yes	Yes	Yes (750C)	Yes (750B)
1250	Professional Power Amplifier	1200	400 Watts	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
320B	Commercial Power Amplifier	100 Watts/Ch @ 70 volts		Yes	Yes	Yes	No	No	Yes	Yes	No
620	Commercial Power Amplifier	200 Watts/Ch @ 70 volts		Yes	Yes	Yes	No	No	Yes	Yes	No

*TOTAL POWER OUTPUT
The total power output is the actual power output as measured during our final test at the factory
Test conditions mono operation 8 ohm load 1kHz @ 0 1% Total Harmonic Distortion Line voltage maintained at 120 volts RMS 60Hz This power is equivalent to the sum of both channels when driving 4 ohm loads in the stereo mode

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ized equipment — to say nothing of their high cost. Instead, clever designers have come up with a circuit called a gyrator, which can synthesize the action of an inductor by "inverting" the reactance of a capacitor. Though the details are not important here, this is the approach taken in the design of many of the equalizers currently being manufactured.

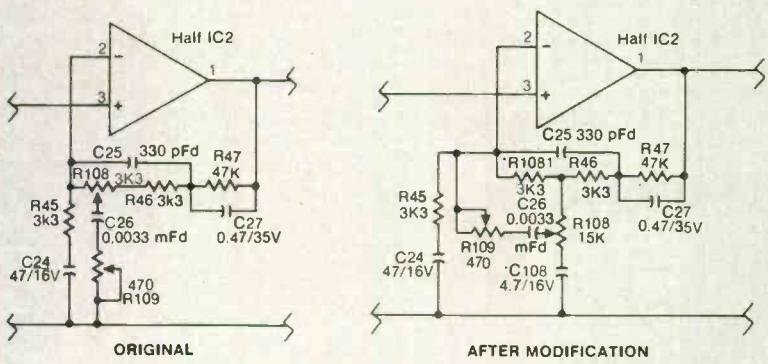
The value of an inductor is measured in Henries, and while a typical unit is insulated to withstand several hundred volts, the current passing *through* the device is a much more important factor. If the inductor's rating is exceeded, it may heat up and cause the insulation to melt or, in an extreme case, the wire could go open-circuit, like a fuse.

One of the problems facing an inexperienced experimenter is trying to decipher the various codes used to identify the value of resistors and capacitors. Larger pieces are generally stamped on the side with the appropriate numbers — such as: 220uF/16V, or 100/10W — but for smaller components, a three-digit code has been devised. A small capacitor with the number "153" on it can be interpreted as 15,000 picoFarad or, more commonly, 0.015 microFarad. The key here is that the last digit, called the multiplier, tells you how many zeroes to add after the first two numbers: 621 would be 620 pF, and 150 would be 15 pF.

The color bands on a resistor also refer to this code though, additionally, a fourth band is used to indicate the component's tolerance. Most resistors being made today are guaranteed to be within 5% of the specified value, and this is indicated with a gold band. Silver is used for 10%, and occasionally you may encounter brown or red, which are 1% and 2% respectively. Many books are available on electronic experimenting that detail the color code and other marking systems currently being used, so I won't elaborate here. Additionally, for readers that are interested in electronics at this level, but would like a bit more of a challenge, I suggest purchasing the latest copy of *The Radio Amateur's Handbook,* published by the American Radio Relay League, 225 Main Street, Newington, Connecticut 06111. At the beginning of this virtual encyclopedia, an entire course in basic electronics is presented in clear and easy to understand language. Furthermore, while the main emphasis is unquestionably on amateur radio, many intersting and useful circuits are described showing detailed plans for construction. If you can't find it at your local electronics store, you should write to the ARRL directly.

Record EQ Modification for TEAC Tascam 80-8 Eight-track
by Greg Hanks

The 80-8's high-frequency record EQ control has no or very little effect upon record response, other than changing the noise level. Upon looking at the schematic circuit, it appeared that the design provided for boost of high-frequency, the trimmer simply determining the manner in which this was accomplished. My client was using dbx noise-reduction, which amplifies frequency response errors by two, so that this EQ error of +2.5 dB is equal to +5.0 dB when played back.



The solution to this problem is pretty simple. The new circuit is obtained as follows:

Changes

1) Remove RI08, bend the lead of the pot that goes to R45 straight towards front, taking care not to break the pot, which is very delicate. Use two pair of longnose pliars: one to hold lead near body of pot; the other to bend the lead.

2) Remove RI09, and bend the lead that goes to ground in the same manner as RI08.

3) Attach one end of a 4.7 microFarad capacitor to the bent lead of RI08; this capacitor becomes CI08.

4) Attach a 2-inch insulated wire to the *bent* lead of RI09.

5) Re-insert the pots on to the PC board, being sure not to short the bent leads to any old location.

6) Attach the other end of capacitor CI08 from RI08's lead, to the hole from RI09.

7) Attach the wire from RI09's lead to the hole from RI08.

8) Attach a 3K3 resistor (RI08I) from the R46 RI08 junction, to R45 IC2 pin-2 junction.

New Circuit

When adjusting the 80-8, use RI09 to affect the 16 to 20 kHz EQ range, and RI08 for 10 kHz. For optimum noise and headroom, RI08 should be changed to approximately 15 kohm.

Diodes

The last component to be considered in this installment is the diode. This is the most basic of the semiconductor devices and, among other features, it can be used to allow current to flow in only one direction. Some possible applications include protecting portable radios, etc. from damage caused by installing the batteries backwards, or converting an AC voltage into DC, as in a power supply or an envelope follower. Diodes are identified by part numbers and are not assigned a value as such, though there are maximum voltage and current ratings that must not be exceeded. The only exception to this would be the zener diode, which is specified by it's fixed voltage drop as well as maximum power; but more about that later.

A side effect of this one-way behavior is a threshold, or step, when voltage is applied in the normal direction. For diodes made of silicon (most of them are), this threshold amounts to a bit more than half a volt, although the actual amount may vary slightly. This is completely unlike the behaviour of a resistor, where the amount of voltage dropped can be varied, depending on how it is used in the circuit. So, because of this offset, if you put less than 0.6 V into the diode, nothing will come out; if you start with, say, 5 V, you will have 4.4 V at the other end. For circuits requiring a threshold lower than 0.6 V, germanium diodes are available with a typical forward drop of around 0.2 V. If a voltage is applied in a reverse direction, however, the threshold voltage obtained will be quite a bit

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higher and, in fact, is the basis for the maximum voltage rating of the device.

Zener diodes, on the other hand, are intended to be used this way and are available in voltages ranging from under 3 to 100 V, or more. Probably the most common use of the zener's fixed voltage differential is to provide regulation for a power supply. By adding a single resistor, a voltage that is varying between 20 and 25 V could be reduced to a steady 15 V, for example.

The elements of a diode are called the cathode and the anode, with the anode being more positive when used in the forward direction. If nothing else is marked on it's body, there will always be at least a band showing which end is the cathode. Light-emitting diodes, since they generally come in a different shape from the others, will have a flat spot on their otherwise round body to show which lead is the cathode. You'll also need to apply about 2 or 3 V before an LED will light, due to it's higher than usual threshold.

Troubleshooting

Probably the best presentation of troubleshooting methods would be to use an actual case history as an example. In this instance, the perfect choice would be a particular MCI JH-16 tape machine, with which I am on intimate terms. (This wouldn't be *my* tape recorder, of course. It belongs to a friend. Yes, that's it.) When purchased, the JH-16 was about three-years old, tired but well cared for, and the internal elapsed timer — showing hours of use — was pinned at 5,000 hours. Although the heads were well broken in, the wear was evenly distributed, and a check with the test tape showed the response to be within quite acceptable limits. Unacceptable, however, were the frequent dropouts that occured when playing back in sync mode and, in fact, several channels would not playback at all in sync. The obvious thing to do was to pull out the schematic showing the replay circuits, and try to see what was different between the two playback modes.

Since sync playback temporarily involves the record head, a relay is used to do the switching automatically; this was the first item that was checked. Since we didn't have any extra relays, the only possible solution was to borrow one from a working channel, and see if the problem disappeared. Well, the good relay did indeed restore sync playback on most of the tracks it was tried on, but some still refused to cooperate. So again, back to the schematics, where it was discovered that there was yet another relay in the playback path, although this one was used only to select between the two level controls used for replay.

During normal playback, one trimmer is utilized for play level and, when in sync, a different trimmer allows the two levels to be matched. Since the level really didn't differ very much between the two heads, and several relays were still giving a problem, a decision was made to simply bypass these relays entirely, and live with the half dB or so difference in level. (To be perfectly honest, I'm not a big fan of relays anyway, especially when they are used for switching low-level audio.) Eliminating these relays improved things considerably, but there were still some problems with playback level drift, which were aggravated by wiggling the level trimmers.

In its former life, apparently this particular machine had seen many frequent alignments, since most of the trimpots were badly worn. The best thing to do in this case was to just replace them all with a more rugged type, which we did. This may come as a surprise to some folks, but many trimmers are only rated for a useful life of 1,000 or so adjustments, since it is assumed by the trimmer manufacturers that internal adjustments are made relatively infrequently. This is *not* the situation with professional audio products, of course, where constant alignment is a way of life. So, after installing trimmers that were capable of withstanding this frequent exercise, the playback was finally together. But there were some other problems still to be addressed.

One of the more important audio innovations of the Seventies was the application of the servo motor to professional master recorders. With these circuits, engineers could design a motor to have a high degree of speed regulation, or to provide constant holdback and take-up tension, regardless of the amount of tape on the reel. But along with this increase in sophistication comes the inevitable: increased complication. Never before have there been so many darn things that could go wrong inside a recorder.

Instead of powering a motor by simply applying 115 V, now we have a circuit comprising some 15 op-amps and other ICs, along with all the other associated components that are required. A power amplifier is used to drive the motor; a tachometer then senses the speed; while another circuit analyzes the signal from the tachometer. This tachometer circuit in turn then closes the loop by telling the amplifier how hard to push the motor. Add to this 13 trimmers — any one of which could go out of whack — and you will begin to see what I'm getting at.

Regarding our particular MCI JH-16

machine, the capstan motor has always been rock solid, even in the varispeed mode. The take-up and holdback tensions were not nearly so stable, however, varying considerably even during the course of one session. When a complete transport alignment failed to bring things under control, we tried alternately crying and praying but, alas, this approach didn't work very well either. So, continuing on with standard professional practice, there was only one thing left to try — kicking it. This worked beautifully, and the tensions stayed constant for several weeks. Eventually, the drift did reappear, but we knew we were getting close.

Since more than one motor circuit was experiencing this drift problem, it seemed unlikely that an IC or, for that matter, any other single part was to blame. Also, because physically banging the side of the recorder definitely affected the drift, interface troubles seemed the next likely suspect. Similar to the bad contacts that can develop with relays, push-on connectors are notorious for going flaky over an extended period of time, and this deck is loaded with such connectors. The slightest bit of corrosion or dust on the mating surfaces can cause the connection to fail. Furthermore, previous experience with these particular Molex connectors had shown them to be inadequate for use with millivolt signal levels. Unlike XLR connectors, for example, where the entire male pin is encompassed by a cylindrical receptacle, a thin spring clip is used in the Molex design, touching the pin along only one edge.

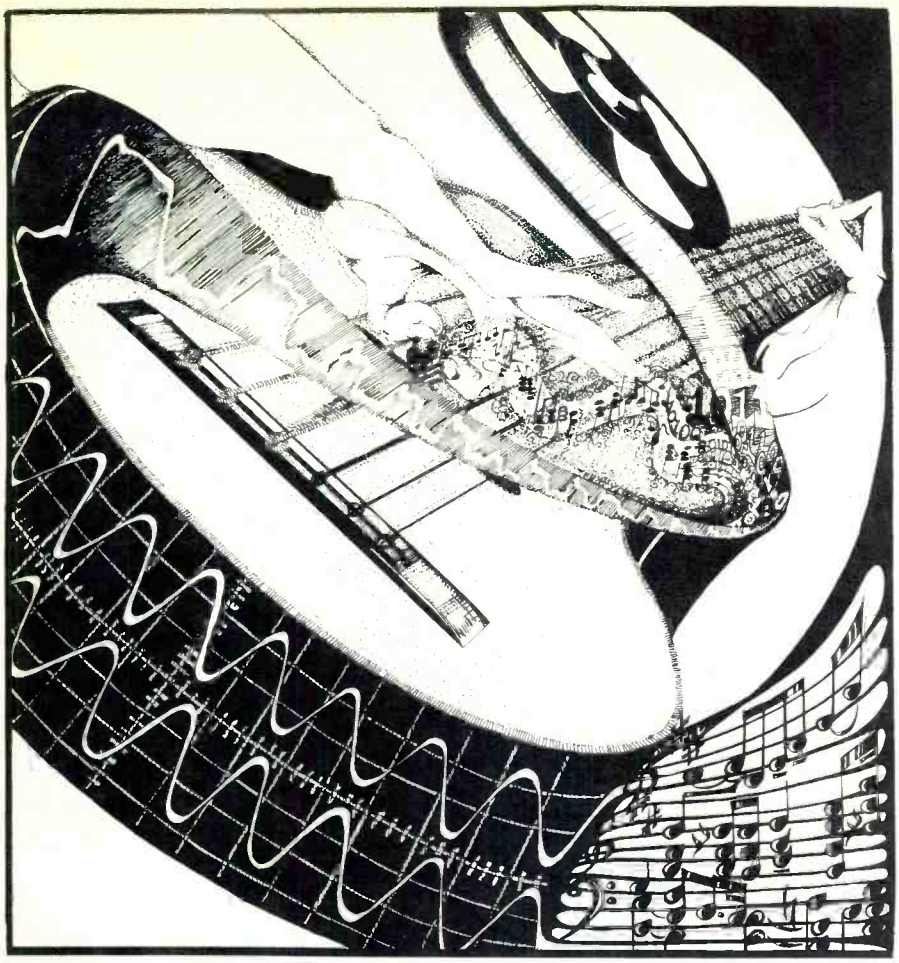
Outfitting the whole deck with new connectors was obviously out of the question — there being literally hundreds of them in the JH-16 — and most of them were not giving a problem anyway. So, all of the circuit boards involved with controlling tension were unplugged, and the pins and spring clips carefully cleaned with alcohol. It was also necessary to give the recorder a thorough vacuuming since, due to the use of internal ventilation fans, the entire inside of the thing was caked with dust; it was on the switches, the circuit boards, and every single trimpot. No wonder the connections had become contaminated.

With the cleaning completed, circuit boards were re-installed, and I can say with relief that the transport problem was finally cured. Well, almost; one small problem did still remain, and that was with the tape counter.

If you were to reset the counter to zero at the beginning of a reel, shuttle up and back a few times,and then return to the beginning, the counter would be off by as much as two minutes. While the electronics involved seemed to be behaving themselves, it certainly didn't seem unlikely to have connector problems here as well. The suspect boards were pulled, and all of those contacts cleaned. The only problem was that this time, it didn't fix it.

I am indebted to audio consultant Greg Hanks for diagnosing the problem as mechanical, since what was happening was due to tape slippage. A roller on the take-up side is connected to the counting mechanism, and its surface had become polished with use. All that was necessary to return things to normal was to lightly clean the roller with steel wool (far away from the recorder, of course!) and thus provide the tape with something to grab on to. After the roller had been thoroughly cleaned by rubbing vertically with wool, it was placed back on the machine. All was finally well — for the time being at least.

It is hoped that this account has provided insight into some of the difficulties that can develop in a tape recorder. This is not to imply that all equipment failures can be traced to loose wires or bad connections, but certainly many of them can. As we progress in future installments with a greater understanding of electronic components, tougher problems will be presented, along with methods for finding their cure. After all, it is everyone's ultimate goal to have achieved a technically perfect studio, where nothing can ever go wrong...go wrong...go wrong... □□□



Original illustration by: **Trici Venola**

Miking And Recording Electric Guitar And Bass

by Robert Carr

"I tell my classes of engineering students that the best mike is the one that sounds the best to the artist, engineer, producer, or whoever is knowledgeable, regardless of how it looks or what it costs. It's as simple and as complex as that."
— Carson Taylor, Audio Video Rents
San Francisco, California

Moods, emotions, personal interaction, daily diets, and whether the moon is full or the sky is falling — all these factors can determine what the best guitar sound is for any given recording date. Unfortunately, when it comes to an industry that's governed by so many intangibles, there's no way to lay down any hard and fast rules concerning even the most elementary situations.

Scientists call them random parameters; artists label it creativity, but the paramount aspect to keep in mind is that music in the Twentieth Century is a delicate balance between electric technology and eclectic inspiration. The two cannot be divorced. A desire to understand one side of the recording process implies that at least an introduction to the alternate point of view is necessary — initially, if only for better communication, and, ultimately, for a mutually admired consummate creation.

All of us involved in the recording process must work together in order to achieve optimum results. If anyone in the production chain becomes too compartmentalized, in the sense of losing sight of the entire recording process and the eventual goal, they end up being the proverbial weak link — neutralizing the best efforts of even triple-scale players, or award-winning engineers.

No discussion on miking techniques would be complete if it were not approached — for want of a better word — holistically. It's for this reason that *R-e/p* enlisted the aid of such a diverse group as guitar design engineers Fred Tavares and John Page; recording engineers Paul Grupp, Jim Isaacson, and Chris Desmond; guitarists Lee Ritenour and Jeff Baxter; and bassists Abraham Laboriel and Max Bennett.

The First Step

The most logical place to start is with the guitar's design and idiosyncrasies. By understanding the animal, accurately capturing its sounds on tape or disk becomes more matter-of-fact. Such an air of confidence shouldn't be underestimated, because the humble self-assuredness of each participant is an important, intangible ingredient that gets transferred to the tracks — along with the boost at 10 kHz, or the phased sustain panned soft left and right.

The electric guitar is basically one, two, or three hunks of wood (sometimes plastic or aluminum) glued or bolted together; a variable number of strings stretched across one side; and a couple of inductance coils to pick up string vibrations. The quality of workmanship in choosing, assembling, and calibrating these components, determines the dependability and degree of subtlety that the instrument will possess. In terms of the sound it will produce, these factors are pertinent, but not necessarily relevant. A $10.00 guitar may manifest the perfect emotion, while a $1,500.00 hand-made may be as appealing as old fish. The final judge is a well-trained ear; the product of bookings, not books.

"The ideal electric guitar would be two 10-ton vises with the strings stretched between them," says Freddie Tavares, design consultant at Fender Guitars in Fullerton, California. "That way all the string energy goes into making the sound, and keeping the string oscillating. If the string is supported by anything that vibrates, the string's energy gets absorbed and the sound dies quicker. The sound of a balsa wood guitar would die almost immediately."

The body mass must be capable of achieving a force oscillation resonance, which requires a certain amount of rigidity in the body material. Lacking rigidity, the string energy is consumed by intrastructural friction. The balsa wood guitar, or one made of heavy rubber, would not resonate; hence, the quickly dying note. Bassist Max Bennett has noticed that "with some inexpensive basses you can't feel anything through the instrument at all. My Fender P-bass and Kramer bass resonate so I can feel the notes in my hand and arm as I play them."

Woods chosen for use as solid body electric guitars — ash, alder, maple, and mahogany being the most common — are able to vibrate at rates other than their natural frequency, provided that the driving force is strong enough. Unlike an acoustic guitar, the electric does not stimulate air to produce sound. The energy that would be dissipated in the movement of air is retained by the strings. The more the mass with rigidity, the greater the retention of energy, and the greater the sustain.

Generally speaking, denser wood accentuates the sustain while reducing the overall loudness of the acoustical sound. More specifically, fluctuations in density can cause a guitar body the size of a Fender to vary as much as four pounds from one guitar to the next.

"Fender usually makes their guitars out of ash," says Freddie Tavares. "Theoretically, a one-piece body and neck construction will sustain more, but if the four screws on the Fender are tight a remarkable amount of sustain can come out of that."

As the stiffness of the wood increases, the center of the frequency range it will support rises. The sound boards of hollow-body electrics, like the Gibson 335, are constructed of three or four layers of hard plywood covered with a beautiful veneer. Since plywood is very stiff — owing to its alternating grain construction — and higher frequency waves have a shorter wavelength than low-frequency ones, higher notes are emphasized to the detriment of the lows. The best plywood instruments will have a strong, clear treble and a weak, but clear acoustic bass quality — but this is also true of solid-body electrics. Such characteristics are

— continued overleaf . . .

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probably desirable to eliminate an over-emphasized bassy or muddy sound with the addition of an amplifier.

It should be noted at this point that feedback and sustain are two separate phenomena, although one may enhance the other. Soundwaves coming out of a loudspeaker will try to vibrate whatever they come in contact with. If what they come in contact with is easy to set in motion — such as a guitar soundboard or an open string — that object will resonate sympathetically. The pickup will sense the oscillations, send them back to the amp, and a feedback loop is set up. Packing a hollow body electric with damping material, covering the sound holes, or muting the open string with the flesh of the hand will reduce the feedback potential.

Just covering the F-holes on a Gibson 335 or similar style guitar won't keep the soundboard from resonating. Soundwaves can still enter the body, which makes the top move, so packing the guitar may be the only solution. If covering the holes is sufficient, the tone at low and medium volumes probably won't be affected. At high levels — a la Ted Nugent — the tonal change will most likely be very noticeable. Of course, packing the guitar will have more drastic results on tone production at all levels.

FREDDIE TAVARES is a design consultant with Fender Musical Instruments, and has been with the company since March 1953 when he helped Leo Fender develop the original Stratocaster. He's worked extensively in recording studios around Los Angeles from the Thirties until the Sixties playing steel guitar (the opening glissando of the Bugs Bunny "Looney Tune" theme is Freddie), and ukelele ("Blue Hawaii" with Elvis Presley).

JOHN PAGE owns Page Guitar Works, a custom guitar shop located in Fullerton, California, which he founded in 1974, and is a member of the American Guild of Luthiers. He joined Fender in 1978, and presently holds the position of Project Engineer Guitar Design.

Guitar Hardware

Metal, with its higher natural resonance than wood, has a beneficial effect on the higher frequencies when added to a guitar in the form of a bridge, saddle, or nut. Two guitar nuts the same size — one being metal and the other ivory — will provide more sustain. If hardware material is porous, the mass is greatly reduced.

Brass has been the keyword for replacement parts for quite some time. "Brass was so popular when it came out," John Page recalls, "because nine out of ten manufacturers made replacement parts that were so massive: thicker, bigger, and machined. The mass was so great that, of course, the sustain *had* to be better. You could have the same bridge done in steel with brass plating, gold plating, chrome plating, or powder-coated, and the sustain is going to be increased by the same factor."

Guitarist Jeff Baxter warns that "pickups that suck the strings down, incorrectly filed bridge pieces, tail pieces that are adjusted too high or too low, and even the pitch of the neck at the nut can drain string energy faster than what's desirable. Even after putting a brass nut on a Fender Precision bass, the F and F# on the G-string may still be damped as a result of resonance of the neck."

Restricting or cutting down the amount of string in a "speaking" position — that is a string that's open and free to vibrate — will help increase the sustain. The lengths of string behind the bridge and outside of the nut both respond sympathetically to upper harmonics that they "hear." For example, the length of a guitar's G-string from the nut to the third machine is about 2.5 to 3 inches on a Fender Stratocaster. Baxter suggests mounting a string retainer to cut down the length, and dampen the sympathetic vibrations.

Selecting Guitar Strings

There are currently three kinds of string available for electric instruments: round wound, flat wound and half round.

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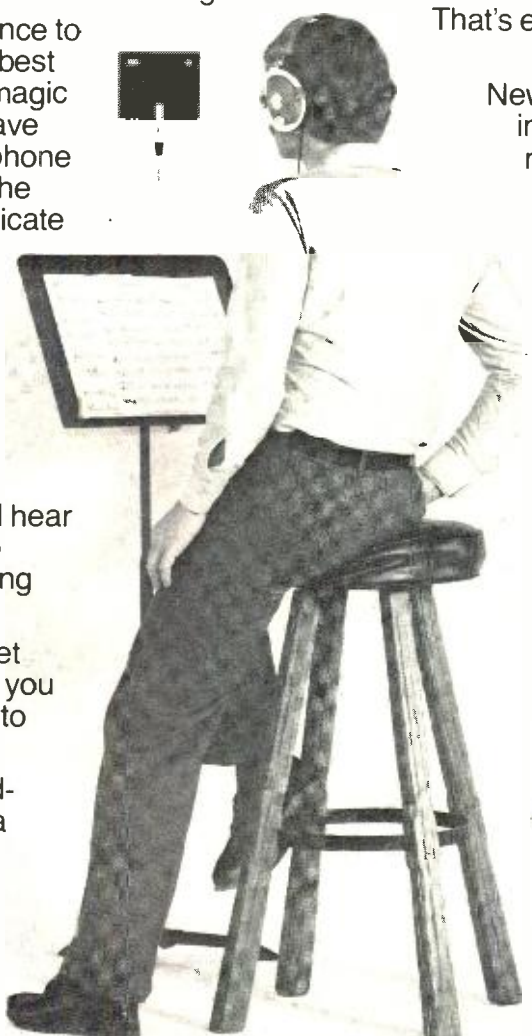

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MIKING & RECORDING ELECTRIC GUITAR AND BASS

by Robert Carr

Bassist Abraham Laboriel feels that "the most exciting sounding strings are the round wounds. But I don't use them, because they take away from the personality of the person who is playing. They tend to make everyone sound alike, and they hurt the frets a lot. Most bass players who use exclusively round wounds have to change the frets sometimes two or three times a year. I use GHS Bright flats, which is a combination of flat and round strings."

Microscopically, the center core of a guitar string is very uneven, as shown in Figure 1. If a round winding is used for the outer layer, the roundness allows for a "knife edge" contact with the core, and consequently a tighter mechanical assembly with more upper harmonics. The rough outer surface is the primary cause of finger noise, but can be reduced substantially, according to engineer Paul Grupp, by powdering the player's fingers or oiling the strings. "It'll change the sound a little, but not as much as flat wounds," Grupp finds.

A flat ribbon winding doesn't set evenly over the bumpy core. The winding is looser than that on a round wound, which results in a loss of harmonic content, along with reduced finger noise.

A logical compromise involves the use of a half round wind on the inside for tight winding and brightness, and flat on the outside for smooth, clean motion. Bass players like Abe Laboriel, Stanley Clarke, and Jaco Pastorius play licks that are faster than many guitar players. They especially need the harmonics in order to be heard, and to get the definition at such a low pitch.

The ear is sensitive to upper and middle partials, but relatively insensitive to bass frequencies. In a noisy, ambient situation like a music group, your ears have the most trouble hearing the bass, unless there are some highs in the tone. If all the highs are turned off the bass amp, a great deal more power is needed to hear it.

ABRAHAM LABORIEL is another first-call session musician who is always in demand to add his bass sound to increase the chances of an artist achieving a hit record. Besides being a member of the band Friendship, he contributed to Herb Alpert's Grammy-winning *Rise* album, as well as musical accomplishments that rival Baxter and Ritenour: Henry Mancini, George Benson, Larry Carlton, Crusaders, and Quincy Jones.

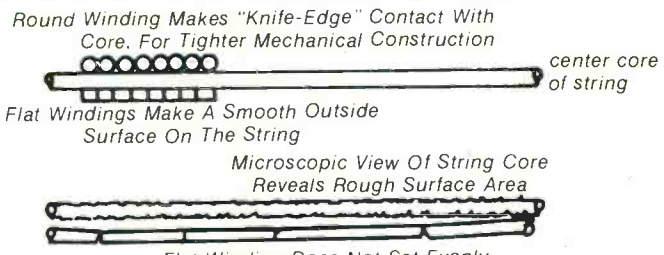

Figure 1

"A steam locomotive that puts out thousands of watts of power in the low register is a good example," offers Tavares. "Stand about 50 feet away and place a quartet of singers four feet from you, but between you and the train. The quartet that's putting out about half a watt of power will drown out the engine. You'll feel the train but you'll hear the singers."

The guitar, too, is a very low-pitched instrument, Middle-C on the guitar (128 Hz) is an octave below concert Middle-C (256 Hz); thus almost half of the notes on a guitar are, in fact, below concert Middle-C. The pitch of a string is determined by length and tension, and a change in either one will alter the pitch. A string at rest is covering the shortest distance. As soon as the string is plucked, the length and tension are both increased which, in turn, raises the pitch. With the aid of a strobe, John Page has found that "when you strike down real hard on a string, it could be off by as much as 10 cents. A guitar string will restore quickly, because the strings are shorter and have less mass, but bass-guitar strings react more noticeably. They can be displaced as much as ⅜-inch or more."

"I play hard when the music is percussive," says Laboriel. "The actual duration of the notes is short enough so that it's not crucial to the effect the producer, arranger, or composer wants. It doesn't show up as sharp, because I'm not holding the note; I'm not allowing the ear to hear it go up and come down."

Reducing the playing pressure can minimize this pitch fluctuation somewhat. Practically speaking though, it's an inevitable effect and one that's not really noticeable.

Pickup Design

A pickup, in theory, is very simple: just a magnet, two pieces of plastic or cardboard, and some coiled windings. Increasing the number of turns of wire around the magnet increases the voltage that the pickup will put out. Unfortunately, because of inductance effects, it also decreases the amount of high end. The trick is finding the optimum balance between power and clarity.

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MIKING & RECORDING ELECTRIC GUITAR AND BASS

condenser, dynamic, and piezo contact devices; and electromagnetic pickups which can be single-, double- or triple-coil. The topic of pickup design and construction is complex enough to fill several magazines this size, and may be of little interest to the majority of recording engineers. For those who would like to read an in-depth (and I mean *in-depth*) study, Donald Brosnac's *Guitar Electronics* is invaluable and irreplaceable. This present article, however, is primarily concerned with general characteristics of electromagnetic devices as they apply to the recording studio.

The single-coil pickup is an inductance coil. The more winds it has, the "hotter" or more sensitive it is, not only to picking up string vibrations, but also to stray electrical waves such as the hum of flourescent lights, 60 Hz hum, radio stations, and even automotive spark plug systems.

"I've tried wrapping the guitar player in metal, or tying wires to him, and attaching the other end to the guitar shield of the cable or the guitar itself," recalls engineer Jim Isaacson. He has found, however, that "the only thing that really eliminates the bulk of the noise is to find the null spot in the room. Most guys are so sensitive about the sound of their guitar that they're willing to work with me to find the right spot."

In cases where there is a lot of gain coming up on the board, you run into tape saturation, or are using a lot of limiting either from the amp or at the console, a noise gate might offer some relief. "The gate will take out some of the noise," adds Paul Grupp, "but when the guy is playing, he'll be so loud you won't hear the buzz anyway. After using a noise gate and finding the quietest spot in the room, you reach a point of diminishing returns. You put so much effort into cancelling the noise that it's not worth what little more you'll get rid of."

Single-coil bass pickups don't seem to suffer from such misfortune. AC line hum has a repetition rate that's definitely at 60 Hz. The square waves or pulse noise coming out of the power lines, however, have an actual frequency of sometimes 10 kHz, and can run all the way out past the upper limit of the audible spectrum. Even though a bass can pick up such interference, its spectrum is generally far enough above the bass notes so that filtering it out presents few problems.

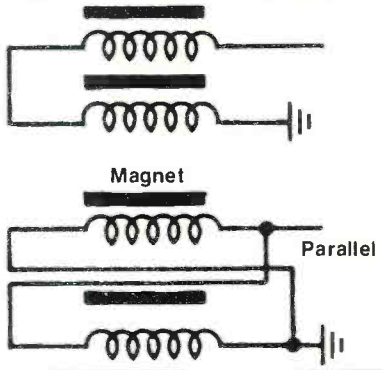
A humbucking pickup is simply two coils wired together in series or parallel. Their method of operation is best explained in the following excerpt from *Guitar Electronics*, by Donald Brosnac:

"There is an opposite magnetic polarity field in each coil, and nearby and inside the coils are magnetic conductors. This means that the top of one coil is magnetically north, and the top of the other coil is magnetically south. If you look at the series and parallel diagrams(Figure 2), you can see that the positive connects to the negative. You would expect that this would cancel the signal, but your expectations are only half right. Half of the pickup's signal is cancelled — the hum half. The coils of the humbucking pickup are wired out-of-phase so that any signal received by them is cancelled, but the opposite magnetic polarity of the coils puts any signal magnetically sensed back into an in-phase signal.

"In summary: A humbucking pickup acts in the following manner — any signal (i.e. hum) 'seen' by the coils is cancelled, and any signal (i.e. string vibration) seen by the magnetic poles is accepted.

"Series and parallel each have their own distinctive sound. The series sound is characterized by high volume with a good

Figure 2: Schematic of Parallel-linked (bottom), and Series-linked (top) humbucking guitar pickups.

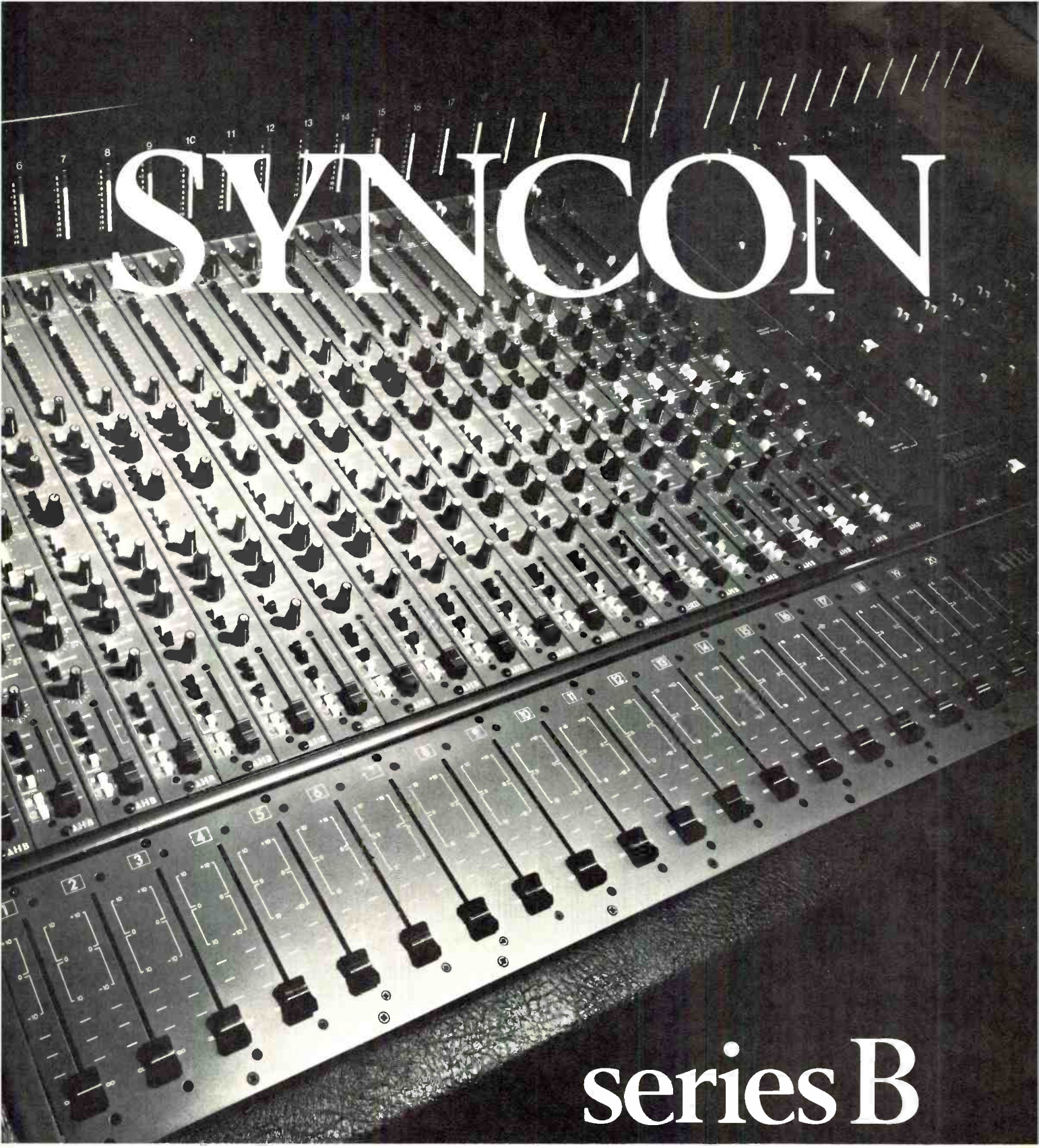


OUTPUT LEVELS OF SOME POPULAR PICKUPS[1]

Courtesy of William Bartolini

Bartolini Acoustic Pickup / Lawrence L220	0.5 of a Fender Stratocaster
Fender Telecaster Rhythm	0.75 of a Fender Stratocaster
Fender Stratocaster	0.57 of a Gibson "Original"
Gibson "Original" Humbucker	70 millivolts (third string hit by a medium pick)
Schecter F500* / DiMarzio Fat Strat	1.25 x Gibson "Original"
Bartolini Beastie II / Gibson 6L6	1.5 x Gibson "Original"
DiMarzio Super II / Bartolini Beast	2.0 x Gibson "Original"
DiMarzio Super Distortion	3.0 x Gibson "Original"
DiMarzio X2N	4.0 x Gibson "Original"
Bartolini ES1**	12.0 x Gibson "Original"

*Schecter tapped F500 has two output levels: one is about the same as a regular Fender Stratocaster pickup; and the other is about equal to a Gibson "Original."
**This pickup is battery-powered.
From:[1] *Guitar Electronics*, by Donald Brosnac, pages 23 and 24; used by permission.



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degree of bass and favorable signal-to-noise ratio."

This fact holds true if both series and parallel are fed to a high-impedance piece of equipment, such as a guitar amplifier. Parallel wiring is approximately 0.25 times the impedance of the same two coils wired in series. Higher impedance translates into higher voltage output from the pickup, while lower impedance means less voltage output. If parallel wired pickups are run into a *lower* (not low) impedance input, the signal-tonoise will be comparable to that of series wiring into a high-impedance amplifier.

If either type of pickup is placed near the bridge, the sound will be very bright and thin. This is called the "lead pickup." As the pickup is moved toward the neck, a more bassy, fundamental tone or "rhythm pickup" sound is secured. Likewise, picking near the bridge produces a fuller complement of higher-order harmonics, and therefore a more treble tone. String output is stronger at the rhythm pickup, for the simple reason that the string is displaced a greater distance near its midpoint than at its ends.

In The Studio

"If I can get the cue system to sound like the control room sound, then we're all hearing the same thing and we can breathe together, so to speak. It complicates things in the sense that it limits the way I can react on Evergreen's Harrison console, but the musicians will end up playing better."*

Engineer Chris Desmond
Evergreen Studios
Burbank, California

*There are many points in the electronic circuitry of this desk from which to feed the cue system. The players are monitoring the mix directly off the faders — in effect, hearing the control-room monitor mix in their cans.

PAUL GRUPP built his own recording studio with his strong electronics background, plus the money he made doing repairs in a music store. Capitol Records offered him a job as engineer, and during his two years in their employ he met John Boylan, an executive producer at Epic Records. He's free-lanced, primarily at the Record Plant and Westlake in Los Angeles, with Boylan ever since. Together their album projects include Charlie Daniels Band, Johnny Lee, R.E.O. Speedwagon, Pure Prairie League, and many more.

JEFF BAXTER, guitarist with Steely Dan for two years and the Doobie Brothers for four years, is now producing (Nazareth, Livingston Taylor, and Billy & The Beaters) and engineering, as well as keeping a full schedule of session work with artists such as Barbra Streisand, Donna Summer, Dolly Parton, and Harry Nilsson.

The most popular approach to recording guitar tracks is the overdubbing technique, although many people still prefer to record as much as possible at one time, and reduce overdubbing to a minimum. Both methods offer their own unique advantages and disadvantages.

Paul Grupp and producer John Boylan focus initially on getting a tight bass/bass drum marriage: "We rarely plan on keeping a guitar when we record the basic," Grupp emphasizes. "We may get lucky and find a sound is so good that it would take us a long time to duplicate it, but 90% of the time we plan on everything else over the bass and drum foundation."

Since the bass and drums are usually the first instruments recorded, there's no way of knowing how their tones will blend with the rest of the subsequent parts; flexibility is the keyword here. Grupp will always record the bass on two tracks — one being a miked signal from the amp, and the other a direct signal taken from a DI box placed between the bass and the amp. (Directs can also be taken from the back of the preamp, or right off the speaker leads as long, so it's padded down. Both of these alternate methods add coloration that may or may not be desirable.)

When the recording is completed, the choices available range from all direct to all live sound, or any combination of the two that seems appropriate.

"The bass is one of the few things I don't like to make a decision about while I'm recording," Grupp continues, "because the bass and drums are the two things that will never be redone. We'll almost always recut the song before we redub either one. When all the tracks are finished, the tune may be completely different from the original conception, whether it's the first time I've worked with the group or the fiftieth.

"The direct sound that we thought was going to be great may not be as good as the amp sound. A bass sound that works with the track may sound terrible when it's soloed. That's true of guitars, too. It's not necessarily more true for bass than guitar; it's simply that the bass is the foundation. If it's not right, you can't build up on it."

Jim Isaacson prefers a different approach that allows him to make more decisions up front: "What you hear on the Doobie Brothers' *One Step Closer* album is basically eight pieces live — bass, two sets of drums, congas, two guitars, organ, and keyboards all recorded at the same time. I go for the ensemble setup, and then layer on top of that. I think of the bass and guitars as being part of the basic rhythm section, and record their sounds in context with the rest of the group. Any other parts that I add later I make conform to that foundation."

More often than not Isaacson goes back to recording the bass direct. If he also mikes the amp, he'll decide on the right sound before recording, and mix both signals on to one track.

The sounds available, of course, depend on the bass, amp, direct box, and microphone. The DI technique will tend to capture more lows, because it's directly connected to the pickup, and can reproduce anything that comes out of the bass. Some amplifier electronics and speakers, on the other hand, are not able to faithfully reproduce the lowest frequencies. The results will be attenuated with the addition of more mid-bass. But, there again, an amplifier can produce a growling sound that is impossible to achieve with a DI.

Microphone Selection and EQ

Popular choices for bass miking are the Neumann U-67 and U-87, and the Sennheiser MD-421. The U-67 is a tube version of the later U-87, and will produce a slightly warmer sound than its solid-state counterpart, even though they are supposed to be similar. The MD-421 is a dynamic mike that's a bit "middy" sounding, but which can also be an advantage. Basses that sound great by themselves can disappear once they are added to a track; a 421 gives the bass definition by accentuating the mid-range. Cutting the EQ around 200 to 400 Hz — depending on the key of the song, and where the musician is playing on the neck — can be an effective way to enhance the bass sound; it has the effect of adding super lows and mid-highs for cut. Above all experiment with the possibilities. Occasionally, the highs have a tendency to get lost in the snap of a kick

JIM ISAACSON also owned his own studio, located in Omaha, Nebraska, where he did jingles and industrial shows. After moving to Los Angeles in 1972, he worked his way to Head of Maintenance at Clover Recording, transferred to the same position at Sunset Sound, and then made the switch to engineering a short time later. Three years ago he went independent, and has engineered albums for Nicolette Larson, the Doobie Brothers, Lauren Wood, and Rita Coolidge, among others.

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MIKING & RECORDING ELECTRIC GUITAR AND BASS

drum. If this alteration is done at the instrument's amplifier, the signal will require less power; if done at the console, however, the volume will have to be boosted to compensate for the part of the signal that was taken away. The fundamental is where the amp has to push to get the note out.

Everyone has tried at one time or another to record or work with a bass player whose live-sound philosophy is to push a lot of bottom on stage with very little top end — a style that is not conducive to recording well in the studio. To compound the situation, the bassist may have a habit of popping or hitting the pickups with the fingers of his right hand. Any attempt to brighten the signal in order to obtain a smooth sound makes the clicks virtually jump out of the track, and can easily saturate the tape. Using a compressor-limiter, however, would remove some of the tone from the bass sound. Engineer Chris Desmond has found that "the only solution short of demanding that the player change his technique, is to roll-off all the top end, and get a tight sound down around 100 Hz. By not pushing the top end or the low bottom, a livable sound that sets properly with the bass drum is possible. It won't be snappy or punchy; it'll just be there."

An important point to bear in mind when using both a live and direct signal is the phase relationship between the two. Some amplifiers have an inherent phase shift which will vary from model to model. The primary source of concern, however, is the distance from the speaker cone to the microphone. This phenomenon is present regardless of the sound source (it can happen with the bass, guitar, electric keyboards, etc.), and may be used to advantage by eliminating the need for additional equalization.

CHRIS DESMOND graduated from the University of Southern California at San Diego with a degree in Music Composition. He taught at Palomar College in that city, but his loyalty to engineering and rock 'n' roll lead him to Los Angeles in 1977. He has since co-produced the just-released *Shot in the Dark* album for RSO Records, co-produced and engineered Al Stewart's *Twenty-Four Karats*, and the upcoming *Al Stewart Live* album. R-e/p sat in on his recording date for Japanese producer Haru Maruya with Abraham Laboriel (bass), Jai Winding (keyboards), Mike Baird (drums) and Dean Parks (guitar).

"I'll try various mike distances until I get a phase cancellation or addition that I like," explains Paul Grupp. "Or I'll find one that I don't like, and reverse the phase 180 degrees. That will give me the reciprocal of what I didn't like. With the bass, it's beneficial to have the two as close to being in phase as possible. With the mike a couple of inches away from the speaker, the delay will probably be only a few milliseconds, in which case I'll put a delay line on the direct sound in order to match the phases. I'll check it with an oscilloscope, or by ear. If the amp and direct sound are very close, the bass will actually disappear once I put the two signals 180 degrees out-of-phase. If one had all the highs and the other all the lows, the bass wouldn't disappear, but there'd be some pretty interesting effects."

Recording Techniques

Dynamic range is another subject that can cause headaches for engineers. An electric bassist seldom keeps a VU meter between -5 and zero, or even close to it. Actually, it may not be practical; he has to play with some dynamics.

"I have a tendency to play in relation to the music — to be sensitive to the highs and lows in volume and mood," says bassist Max Bennett. "I find myself lightening up for easy things, and digging in for hard things. I think that stems from the fact that I started on string bass, where you have to *play* louder to *be* louder."

It's the engineer's job to retain as much of those dynamics as possible — to keep them audible, but never overload the tape — while keeping the bottom of the music solid. Jim Isaacson usually uses a compressor or limiter with a delayed attack time, a fairly quick release, and sufficient compression to hold the signal to within about a 6 dB range.

"A reasonably long attack time can create a certain amount of punch," he offers. Within the first few hundred microseconds after the string is plucked, the signal passes through the compressor untouched. When the unit does kick in, the result is a dynamic edge on the front of the note. A relatively quick release time is needed so the compression doesn't leak into the next note. If the release time is too fast in the extreme, the unit starts following the waveform and creates a little distortion; too slow a release time and the first note sets the level for the rest of the song."

Larry Graham's popping, snapping and thumbing added a new dimension to bass playing, as well as a new source of distortion to recording. The percussive nature of his style produces sharp transients similar to those visited upon engineers by snare drums. The peaks happen so fast that a conventional VU meter will not react fast enough to pick up the peak. Provision must be made, therefore, to allow for adequate headroom, or else channel distortion and tape saturation will visit, too. As Paul Grupp explains: "Through the speaker it will show up as distortion, or loss of punch or attack. You'll hear the transient up to the level of where it was clipped off, but you'll only get half of it during playback — just like a limiter." In fact Grupp will use a limiter to get that effect when it's needed.

Peculiarities of the Electric Guitar

Electric guitars and basses are similar in terms of design, methods of mechanical and electrical sound production, and recording approaches. Much of what has been said already about the bass can be applied directly to the guitar. However, sufficient differences and preferences exist that guitar and bass should be considered as being two totally distinct instruments, just as the piano differs from drums, or the violin from the trumpet. What works well for electric guitar may not be the best for bass, and vice versa. A blanket assumption made about both could be more a function of a situation than of an empirical truth.

The electric guitar is tuned an octave above a bass, but that range is still pretty low: there are really no fundamentals above 1 kHz. A thousand Hz — at least for test purposes — is the center of the audio spectrum, or about the middle of what the ear can hear. Quite a number of harmonics are present above that though, especially if there is anything in the chain causing distortion, which will add a number of overtones and harmonics.

Recording the guitar direct, as with bass, will provide a much cleaner result. Since the signal is coming right off the pickups, obviously there is no amplifier distortion. (Technically speaking, an amp can only *add* distortion to the guitar sound because, in its simplest terms, it is only electronics and a paper cone flapping back and forth.) The sound is richer in mid frequencies, and doesn't have nearly as much treble or top end that would come from a backline amp. Guitar amplifiers generally have brightening circuits (Thanks, Leo Fender) built into them that users aren't usually aware of; even with the front panel controls set flat, the boost is still present.

Certain styles, such as the Steve Cropper, single-coil R&B sound that made Stax/Volt unique, dictate that the guitar has to go direct, and can be made to sound warm with the use of a limiter. Paul Grupp warns that more than once he's taken the guitar through a DI placed between the amp and instrument, and a change from one amp to another changed the direct sound. "It's a result of the varying ways in which the amplifiers load down the line." he concludes.

Bass players and guitarists prefer to play

— *continued overleaf . . .*

Bassist **MAX BENNETT** is familiar to music lovers as the co-founder of the L.A. Express, for his work with jazz greats Stan Kenton, Stan Getz, Jazz Crusaders, and Ella Fitzgerald, and as conductor for Peggy Lee. He is currently devoting himself to demanding session work for TV and movie soundtracks , plus a few, select record dates.

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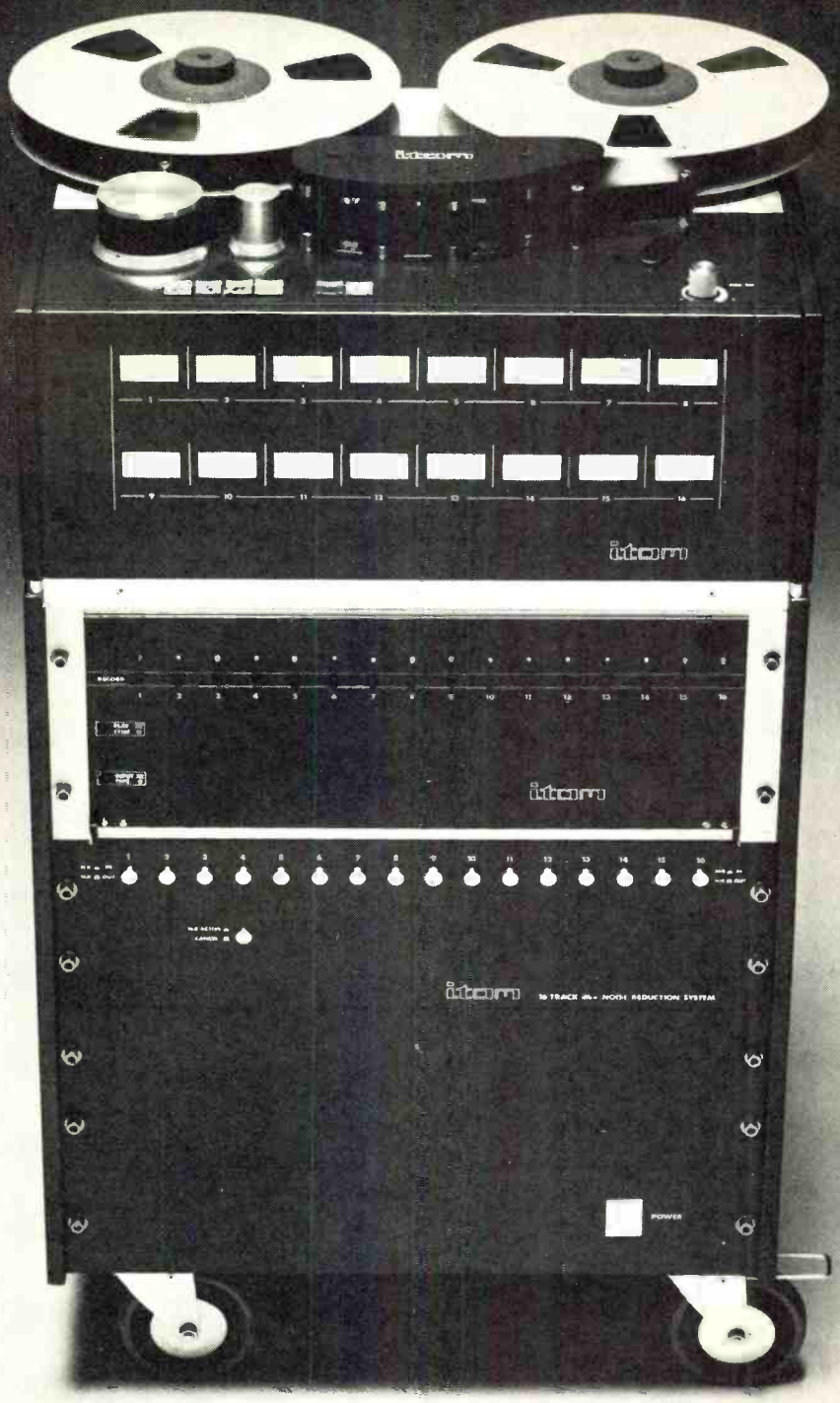

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through their amp whether they record live or not. After all, music is a physical expression of emotions.

"Hearing myself well is important," says Max Bennett, "and through a set of headphones is not always the best way. It's best as far as isolation is concerned, but it's important to feel the pulsation of the bass just as I would if I were playing string bass, where my body is very close to the instrument. I always use an amp unless the producer or engineer specifically do not want it."

Guitar/Amplifier Interface

Many people tend to think of the instrument and the amplifier as two separate entities, but often it can be a distinct advantage to consider both components as being equal and essential extensions of each other. According to Freddie Tavares, "Fender's popularity in the early days stems from the fact that we realized the guitar amp is a special part of the instrument." He also notes that "the hi-fi type of controls on the amps in those days were set around 800 Hz to 1.1 kHz. The amps we made set the control range around 200 Hz, and gave the guitar more bite."

It's true that those design problems don't exist today, but the philosophy is still valid nonetheless. Abe Laboriel claims that his style of sound "comes from the bass *and* the amp. I have a tendency to like a bass that has more high end or, if it's going to be deep, I like it to be smooth. It's those qualities that allow people to recognize what's going on. I prefer to hear the tone of the notes very clearly, so I can tell if it's in tune or not."

At this particular session, Laboriel was using a Fender Precision bass with two low-impedance Alembic pickups wired in stereo, in addition to a high-impedance Precision pickup modified by Valley Arts Guitar Center. (12162 Ventura Boulevard, Studio City, California.) According to engineer Chris Desmond, both lines from the "stereo out" were recorded direct *without* a direct-injection box — a situation made possible by the absence of transformers in the input pre-amplifier of the studio's Harrison console. One input was recorded flat, and the other with a 2 dB cut at 300 Hz, plus a 1 dB boost at 2 kHz. The Precision pickup was run through a custom amplifier made by Bill Wyatt at Professional Audio Labs — a single JBL K-Series 15-inch speaker, and miked out-of-phase with a Sennheiser MD-421. All lines were mixed and recorded on one track as Laboriel played; the two directs were at equal volumes, and the out-of-phase at a somewhat lower volume.

Musicians' Choices

How Lee Ritenour does a date depends on whether he's the artist or the sideman, the style of music, and sometimes the studio. If he's playing strictly rhythm guitar in a small studio, where the potential for leakage is inevitable, he doesn't mind going direct: "Most of the time — this is 80% of the time — I much prefer to record through my amp. I've spent years cultivating what is just the right sound for me, so I bring several different kinds of amplifiers to a session. My roadies set up three amps, and there are three more in my trunk ready to be pulled out in case I need to change the sound."

Guitarist **LEE RITENOUR** is the leader of the group that bears his name and Friendship. He is one of a handful of first-call, triple-scale players, and his list of credits includes just about everyone in the business: Brothers Johnson, Barbra Streisand, Leo Sayers, B.B. King, George Benson, Aretha Franklin, Carly Simon, Four Tops, Debby Boone, and dozens more.

The type, size and characteristics of the appropriate amplifier are determined not only by the musical style, but also by the function of the part within the context of the piece. Orchestration is the key to all music, be it live or recorded. Placement, register, and tone are essential ingredients that must be taken into consideration when building a song step-by-step. For example, guitar and keyboard rhythm parts tend to want to be in the same audible range; they must interact, but not clash rhythmically or mask each other by occupying the same frequencies. To recap: even though the guitar may not sound good when soloed, it's how it *blends* with the other instruments that really matters.

Ritenour strives for a big, fat sound with a spread when playing both lead and rhythm. As he says, most producers and artists like the depth that that technique gives a record: "I use a lot of stereo applications, and that kind of guitar takes up a lot of space. I have to be very careful to play less, so that the other instruments have plenty of room to set around it. On occasion, I have to cool the stereo thing, because it takes up too much space, or it's too thick.

"Musicians that don't have a strong understanding of orchestration will put two keyboards together down low, and they'll come up with a low guitar part. And if you add that to the bass that's already down there, all of a sudden the track is muddy and nobody knows why. They blame it on the arrangement or the engineer, when it's not the case. If a track sounds good, it's because everything is in the right place at the right time!"

Keeping those criteria in mind, choosing the correct amplifier becomes . . . at least a little easier.

Isolation Between Instruments

Leakage is the most important

consideration during ensemble work. Loud, Marshall/cone-cry rhythm guitar necessitates isolation in a separate room, or else the part is saved as an overdub. Using smaller amps eliminates this kind of hassle by maintaining the guitar at a moderate volume, and limiting isolation to a few gobos and packing quilts or blankets. For everyday pop, R&B and jazz, rhythm guitar can be done through a small practice amplifier.

With solo work done almost exclusively as an overdub, isolation doesn't matter, as Lee Ritenour explains: "I can put the amp right in the middle of a wood floor, have a close and a distant mike, and open up the Marshall — or any amp for that matter — to get a rock 'n' roll rhythm, solo, or a lot of sustain." (If a DI is used in conjunction with the two mikes, the DI and close mike should be placed in-phase, as with the bass setup. The distant or room mike becomes a random phase, and is selectable according to the artist's taste.)

As he mentioned before, Ritenour uses several amps. His newest and favorite is made by Jim Kelley of Active Guitar Electronics, Tustin, California. It has small pre-amp tubes like the old Fender Delux Reverb, the same capabilities as a Mesa Boogie, but is more quiet, durable, versatile, and has better sustain. He uses it instead of a Fender Vibrolux amp. For a crystal-clear rhythm guitar sound he recommends a Roland Jazz Chorus amp.

Choice of Microphone

Jeff Baxter, who does a great deal of engineering and producing (see: *View, April 1981 issue of R-e/p*) as well as playing, never uses anything larger than a Fender Delux, and "a lot of times just a modified Princeton. For that chain-saw sound that we've made so popular in Southern California, I generally use a good, inexpensive Shure mike, like an SM-56 or -57, because they have a gentle roll-off on the top end starting about 800 Hz, and a good bottom end. They can take a lot of air moving against the diaphragm; they don't choke up. When you couple an amp's speaker with the corner of a room, a U-87 may be good as long as it's not close enough for the capsule to collapse. To tell you the truth, my favorite guitar sound is a good, clean, direct single-coil pickup sound."

Baxter records his pedal steel through a Vox Super Beatle head to get a basic country, get-down sound: "It has a nice hole in the middle; not a hollow sound, but a scoop out of the middle. It's got ice on top, and balls on the bottom!"

He'll also put an Orange Squeezer compressor between the guitar and the pedal to maintain signal integrity to the pedal — "to keep the signal fairly consistent, and to add some pop. I also do that when I record direct."

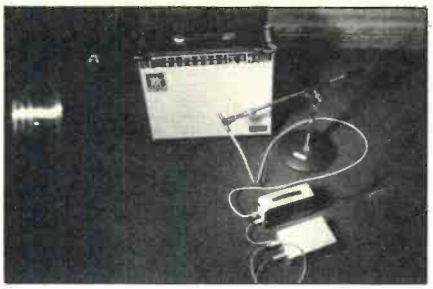
If you're the type of engineer who wants the exact sound emanating from an amp, Paul Grupp recommends a Danish-made

— *continued overleaf . . .*

B&K condenser microphone: "It's probably the most true microphone I've ever heard; it adds and subtracts nothing — totally colorless."

The Bruel and Kjaer mike is a measurement microphone that's comprised of three separate units: a capsule, preamp, and power supply (Figure 3). Although a system suitable for recording applications is manufactured by B&K, Grupp feels that he's gotten more of what he wants by doing the modification himself: "I matched level impedances to the application I had in mind. I changed the gain structure by using half of their pre-amp, and disabling the second half. The second half of their pre-amp has incredible headroom, but you pay for it by getting more noise. I put a transformer right on the first half of the pre-amp and came directly out. I can't record a gunshot anymore, but I'm not picking up the noise of the second half either."

B&K has capsules available in sizes from 0.125 to 1 inch: the smaller the capsule, the higher the frequency response, and the less output it produces. Grupp chose the ½-inch capsule that has a frequency response extending to 20 kHz before it starts to fall off. The readout on the microphone is almost totally flat. There's a slight 2 dB rise above 18 kHz, and B&K points out this slight flaw before selling it as a "flat" microphone. But, as Grupp has discovered, "even though most people can't hear that high, there are harmonics that add an openness or a transparency above the audible frequencies. The listener can pick those up subconsciously. If you listen close, you can *feel* the difference."



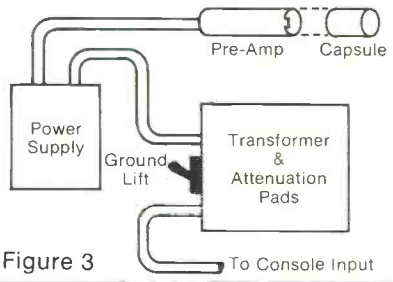


Figure 3

Recording in the Control Room

A minor inconvenience while doing overdubs is the fact that the studio and control room are sound-proofed, thus making communication between the engineer/producer and artist a time consuming, one-way-at-a-time madness via the talk button and cue system. Bringing the artist into the control room on the end of long cord makes communication much more efficient, and the thought of playing to the studio monitors rather than through headphones is certainly good for a guitarist's morale.

The cable can extend up to 50 feet with a minimum of loading complications. As long as the artist adjusts the amp controls while he's using the longer cord, he'll be assured of obtaining the tone he wants.

"You can put a transformer in the line and make it low impedance," Paul Grupp concedes, "but I've found that in most cases the transformer will affect the sound more than the long cord. Low impedance is *supposed* to be the correct way, but I find that the technically correct way won't always give me the sound I'm looking for."

Use of Special Effects

"I think before you start considering effects," says engineer Jim Isaacson, "it's important to get the basic signal on tape with the most dynamics, and as much frequency response as possible. Trying to add effects to a signal that's deficient in some way gets you nowhere, because you have nothing to work with."

What's that sound he's looking for?

"It should be bright without being harsh; good bottom end without being 'oomphy' to the point that it's obscuring the rest of the track. It's hard to put into words. I've had producers tell me the sound should be more 'yellow', or that it needs more 'blue.' Any instrument — guitar, bass, keyboards — should be capable of giving me a full range of frequencies to work with. Anything less and I'm starting out trying to fix a problem."

Sometimes how the sound is arrived at is as important as the sound itself, as Jeff Baxter discovered: "I believe that it's worth the time to find the right guitar and amplifier, or spend five hours tuning a snare drum to get it just right. Radical EQ gets on my nerves. Depending on the console, the board can load up, go into oscillation, or do all kinds of ugly things. I've seen a board literally start vibrating around 3 kHz when four or five modules were run down the EQ rail."

The following are some miscellaneous thoughts and suggestions for special effects:

Max Bennett: "I have a pedal board for effects like flanger, fuzz tone, chorus, a couple of limiters, wah-wah and a mini synth that doesn't work as well as it's supposed to. I don't use them very often, except for weird sounds on TV or movie scores. The trouble with most effects is that they're designed for guitar and don't work well on the bass. But if I record direct, I can get the full signal on tape."

Lee Ritenour: "On the *Feel the Night* LP everything was recorded live, except for the horn overdubs, a couple of solos, and a fix-up of the melody. I had two Vibroluxes set up with a Chorus in stereo, and sometimes a

little repeat on an Echoplex. All the lead parts were in stereo, and I used a compressor to get more sustain on my Gibson 335.

"I'm not a great fan of direct — only when I want a dry rhythm guitar sound. On my new album, *Rit*, there's a solo I play with a lot of distortion, fatness, and sustain. Umberto Gatica, my engineer, added in a little dry, direct guitar with this huge rock and roll sound. You can't notice there's a direct sound mixed in, but there's a definition among all that distortion that you normally wouldn't achieve."

Paul Grupp: I used to use a lot more distant miking, but since technology has come up with so many new inventions for simulating acoustics and delay times, I normally mike things a lot closer. I have more control, and don't have to take into account the acoustic parameters of the room. Synthetically, I can change the dimensions of the room rapidly, and save time with a maximum number of choices to make the decision".

Jim Isaacson: "A well thought-out patchbay is imperative; I would rather have a good patchbay than all the knobs on the board. If a guitar player comes in with a pedal board, I have only one channel coming off the guitar that may be very effected. I have no control over that. What I would prefer is to record the guitar straight. If I do want an effect, I would print that on another track. Let's say the straight track is #12. I can feed the effect — chorus, flanger, phase shifter, etc. — with the recorded signal from track 12, or split the live signal as it's coming into the board, and feed 12 and the effect simultaneously. I print the output of the effect on another track. Now I've accomplished two things: 1) I'm not locked into the effect if I change my mind later; and 2) it gives me the chance to pan the effect away from the guitar. There's quite a bit of that on the Doobie Brothers' *One Step Closer*. By panning one hard left and the other hard right, and by adjusting the levels between the clean track and the effect, I can bring the image of the guitar into various positions. I have the effect as well as the spread, which is much better than trying to spread out one effected track. If I don't want the spread, I use only one track in the mix.

"I can do the same thing during the mix if I can't afford two tracks for the guitar while we're recording. I feed the effect with channel 12 (first generation), bring the output of the effect up on 16, let's say, panned hard right, and run that right to the two-track master; it's still first generation going on the two-track. I also pan 12 hard left and feed that to the two-track at the same time. I have two first-generation signals — the spread and the effect — and I've used only one track for the guitar.

'On "Real Love" I ran the straight guitar recorded signal out into the room, and through two Leslies that were separated by about eight feet by a couple of gobos. I miked each Leslie with an AKG C414, brought each of the effected signals back through its own fader on the board — one panned hard left and one panned hard right — and put the clean signal in the center. Both Leslies were spinning randomly to each other while panned around the clean signal in the middle. It's not a lead part; it's very subtle, but you'd notice if it wasn't there.

"Sometimes I'll do a stereo guitar mix on two channels before mixdown. It's a stereo pair of the same performance, but it may have five or six different sound sections —— maybe delay to pitch change to phasing to whatever. It's one guitar feeding more than one piece of outboard gear: the guitar on one side and the effect on the other; to the guitar in the center with the effects panned around it; to phased guitar soft left; and so on. It's three mixing positions, but they're all on two tracks, just like a two-track mix has an infinite number of panning positions. There would be no changing it when it came time to mix. Whatever I choose ahead of time is what I have to work with later."

But doesn't that sum up the entire recording process?

□□□

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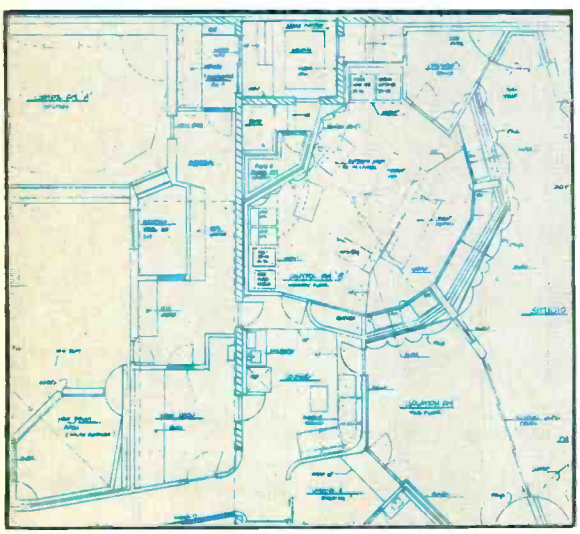

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"MATCHING" SIGNAL INTERCONNECTIONS OF PROFESSIONAL AUDIO COMPONENTS

by John G. McKnight
Magnetic Reference Laboratory

Suppose you have a bunch of line-level audio components — for example, mixer inputs and outputs, signal processor (equalizers, noise reduction systems, delays, etc), inputs and outputs, tape recorder inputs and outputs — and you need to interconnect them variously so that they all work correctly. Well, a circuit-theory expert, given a computer and some time, can hook anything to anything else, and make it work pretty well. But that's no help when you're setting up for a recording session and the producer says: "Hook that up, and I want it ready to go in five minutes!" So you would like to have your circuit designer come up with a system such that you can hook any line level unit to any other one, without having to think about circuit design.

You might answer: "Just match them together." The expression "matching" has become rather an audio buzz word, but what does it really mean? Let's start with a general definition of matching. Dictionary definitions that come closest to the usual audio meanings are: "To fit together or make suitable for fitting together"; and "To put in a set possessing equal or harmonizing attributes." So yes, matching properly *names* our requirement "to interconnect so they work right," but it does not say anything about *how* to do it.

In what way does the "interconnecting" affect "working right"? Well "works right" really means that the signal should not be changed (distorted) in the interconnection process: the signal received at the input of a component should be identical to the signal transmitted by the output of the preceding component. Two kinds of distortion are are likely to be introduced in the interconnection: first, the signal amplitude versus frequency at the "receiver" input could be different from that at the "transmitter" output; and second, the signal amplitude at the receiver input could be so small that it gets lost in the noise.

So our quest is to find an answer to the question: "How do we make an interconnection that has flat frequency response and does not reduce the dynamic range of the signal?"

Modelling a Transmission Line

So far we have mentioned inputs and outputs, but haven't said anything about a very important part of the interconnection: namely the *line* that connects one output to the next input. A generalized line is very complicated; a schematic of a generalized line is shown in Figure 1. This model consists of many series inductances and resistances (representing the distributed shunt capacitance and conductance of the line). You may be thinking that Figure 1 looks like a filter, not a line. And, in fact, it *is* a filter: it has a complicated frequency response, and even introduces losses at low frequencies. These losses and response depend not only on the line itself, but on the source and load impedances connected to the line. Thus, it would probably have a non-flat frequency response, and (because of the losses) could degrade the dynamic range of the signal.

Actually, this transmission line model must be used when the interconnecting line is more than about a tenth of a wavelength in that particular transmission medium for the highest frequency to be transmitted. For audio signals in "free space," which involve a 20-kHz bandwidth, one wavelength is 15 km, so the complicated model must be used for lines longer than roughly 1,500 yards. Thus, for telephone work this model is necessary and, in fact, telephone engineers developed the theory and practice of designing and using such lines starting around 1890(!). By the late Twenties they had codified it in textbooks on transmission networks, such as the 1929 book by Shea (Reference #1).

This transmission line has a characteristic impedance that is determined by the physical properties of the line — wire size and spacing, and insulation dielectric constant. The transmission line and filter theorists developed the simplifying concept of "image-impedance matching" of telephone lines (filters); briefly, at each interface (one output to the next input), the impedance was the same looking toward the source and toward the load. Since telephone "open-wire transmission lines" being used in those days had a characteristic impedance in the order of 600 ohms, all telephone equipment had an input and an output impedance of 600 ohms. The components were

. . . continued overleaf —

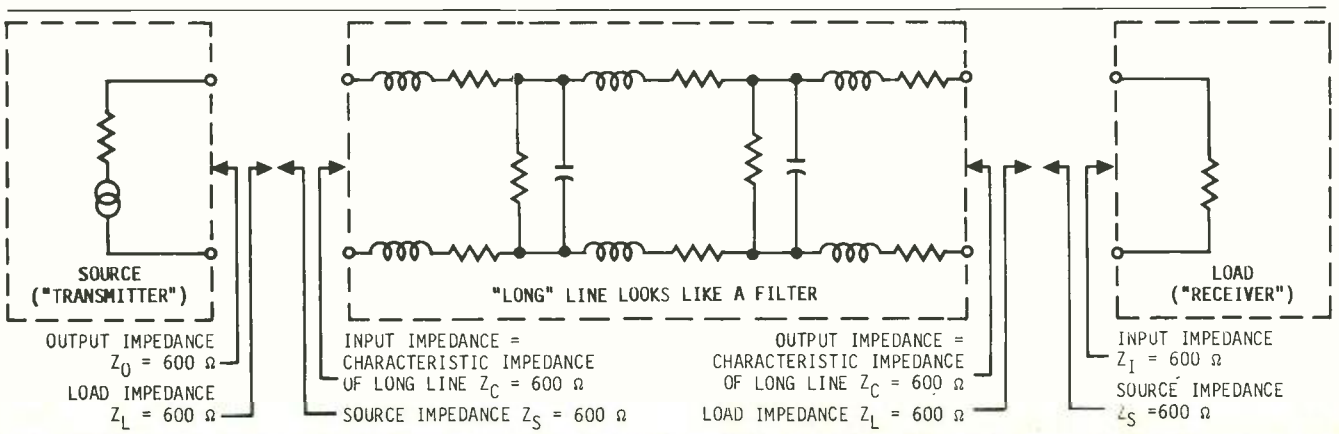

Figure 1: Schematic diagram of a long transmission line with a characteristic impedance shown as Zc=600 ohms, image-impedance matched to a source Zs=600 ohms, and a load of Zl=600 ohms. The lumped resistors, inductors and capacitors represent the distributed resistance, inductance and capacitance of the line, and constitute a filter whose response depends on the nature of the source and load impedances connected across it.

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designed so that the system would have a flat frequency response and minimum loss when each source was connected to one load - no more and no less.

Most of the audio systems that we now consider to be professional audio — that is radio studios, motion-picture studios, sound-reinforcement systems, and sound-recording studios — were originally developed by telephone company engineers, based on the telephone theory, and often actually using the practical telephone equipment then available. After all, a telephone system has (at a given instant) one talker connected by one line to one listener, and that pretty well describes the original professional audio applications. In those systems there was often a telephone line between the microphone and the loudspeaker. "Audio perspective" experiments conducted in 1933 by the Bell Telephone Laboratories, for instance, were sent from Philadelphia to Washington, DC, by a carrier-system telephone line. Therefore, it is not surprising that these systems were assembled from 600-ohm, image-impedance matched components, and that they performed their jobs very satisfactorily. Note that image-impedance matched systems work equally well with either telephone line

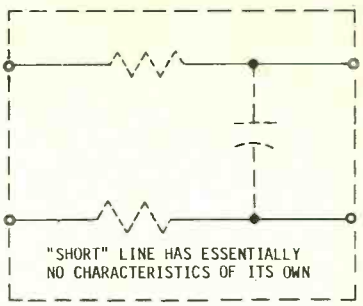

Figure 2: Schematic of a simple transmission line. The line has some series resistance and shunt capacitance as shown in dashed lines, but they are so small that they may be neglected. From an electrical design viewpoint, the line does not exist.

interconnections or with the very short lines that are used within a studio. Consider also that active components (such as amplifiers) in those days were large and expensive, and were only used when absolutely necessary.

Contemporary Studio Practice

Now jump 50 years forward from 1930 to 1980. The telephone company and long lines are still there; they still have one source and one load; and they are still image-impedance matched with 600-ohm (or now often 150-ohm) sources and loads. Now, however, there are also large studio operations in sound

What About Microphone and Loudspeaker Interconnections?

I'm glad you asked, because they are "constant-voltage matched," too! But the reasons are different.

In microphone systems a very important consideration is obtaining the maximum ratio of the desired signal output to the noise generated by the microphone and the following amplifier. Early Western Electric microphone input systems loaded the microphone with 50 ohms. By the late Thirties, engineers had discovered that a 3 dB gain in dynamic range could be obtained by operating a microphone *not* into an equal-impedance load, but rather into an open circuit. RCA microphones and microphone pre-amplifiers starting in the mid-Thirties were designed in this manner, and essentially all microphones and mike pre-amps since then have used this "constant-voltage matched" principle. (Snow gives the details of the theory in Reference #2.) The IEC Standard for interconnecting professional microphones (Reference #4) calls for a microphone source impedance of 200 ohms or less, and a microphone amplifier input impedance of 1 kohm or more. Essentially all microphones and microphone amplifiers in use today meet these requirements.

In loudspeaker systems other factors are important: we want the maximum power output from the amplifier with minimum distortion; and we want the amplifier output impedance to "damp" the loudspeaker. Both of these goals are served by making the amplifier output impedance small compared to the loudspeaker input impedance — therefore you will find that all commercially available loudspeaker driving amplifiers and loudspeakers are "constant-voltage matched."

Amplifier output impedances are typically less than 0.4 ohms, and loudspeaker input impedances typically 4 ohms or more.

The "damping factor" value given for loudspeaker amplifiers is the ratio of loudspeaker impedance to amplifier output impedance. Typical damping factors are in the range of 30 to 100, verifying that the systems are constant-voltage matched.

Thus, the constant-voltage matched system is used in microphone systems, in line-level systems around a studio, and in loudspeaker systems. So where will you find "image-impedance matched" systems? In three places:

1] where the interconnecting line is long.

2] where the system was designed and installed prior to about 1960 or 1970, and

3] in audio articles and text books in which the authors have not recognized either the operational needs in modern systems, or the fact that hardly any modern audio equipment is image-impedance matched.

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MATCHING SIGNAL INTERCONNECTIONS OF PROFESSIONAL AUDIO COMPONENTS

recording, sound reinforcement, television and motion-picture facilities, wherein a very complex system of microphones, amplifiers, signal processors (equalizers, mixers, delay lines, noise reduction systems, etc), recorders, and loudspeaker systems are all used within a single studio. The result is that transmission lines are all short compared to a wavelength. Hence, a line can be modelled as shown in Figure 2; only a relatively small series resistance and shunt capacitance need be considered.

This line has no characteristic impedance to be image-impedance matched. But, on the other hand, the operating requirements are now quite different: sometimes a source — say a mixer output — is only connected to its output meter, and not to any other "receiver" (for instance, during preliminary setup and testing of a studio session). Conversely, sometimes that same source needs to be connected to several receivers, such as an equalizer input, one or more tape recorder inputs, and a monitor-speaker amplifier input. Thus, it would be convenient if receivers could be connected at will in a flexible way, in any number, without affecting the signal's level, frequency response, or dynamic range.

How might this be done? Very simply, and in just the same way as the power company delivers constant voltage to your house, and you connect to it whatever you wish, limited only by the total current made available by the power company's installation. If each audio component output is low impedance (say, less than 50 ohms), and designed to work into loads of, say, 600 ohms or greater, and each input is high impedance (say, greater than 10 kilohms), and designed to work from impedances of zero to 300 ohms, then any number of loads from none to 16 can be connected.

Figure 3 diagrams these input and output impedances. The level change from no load to five minimum-impedance (10 kohm) loads, with a maximum-impedance (50 ohm) source, would be 0.2 dB; the maximum level

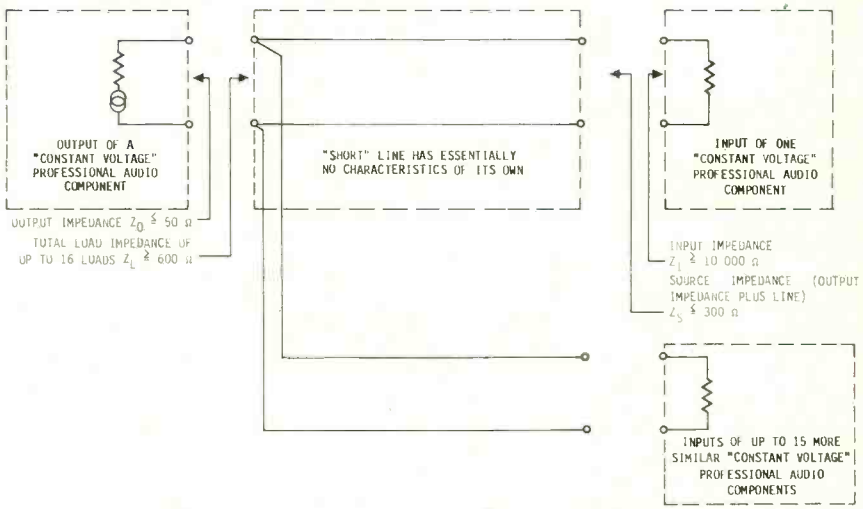

Figure 3: Requirements for source, output and load impedances for a "constant voltage distribution system", using the short line shown in Figure 2.

change in the worst condition — 50 ohm source and 600 ohm load — will be 0.7 dB. With practical audio lines, the level loss due to the series resistance of the line, and the frequency response change due to its shunt capacitance, are both negligible.

An Ideal Solution?

Surely, you will say, we can't get a fully-flexible, ideal system for nothing. Of course not; amplifiers and any transformers used must be designed to work properly over the stated impedance range; and more amplifier gain is needed than for a 600-ohm, image-impedance matched system, but amplifiers these days are small and inexpensive.

And surely, you will also say, it can't be this easy or people would already be doing it this way. Ah, but they are! A tutorial review of this kind of system was published by Snow in 1953 (Reference #2) and 1957 (Reference #3). This system has been in use in Europe for many years, and it has recently been standardized by the International Electrotechnical Commission (Reference #4). The values given in Figure 3 are taken from that standard. The use of such a system in a new ABC TV studio is described by Hess in Reference #5.

But more: have you looked at the input and output specifications for a contemporary professional recorder, such as an Ampex ATR-100, MCI JH-110, or Scully 280B, or a noise reduction system such as a Dolby unit? *All* of these units meet the IEC constant-voltage distribution systems standard! In fact, you would be hard-put to find any stock commercial professional audio equipment that has an *actual* input or output impedance of 600 ohms.

Are these IEC-standard systems matched or not? Unfortunately many people in audio think that "matched" can only mean image-impedance matched and, of course, the IEC standard constant-voltage distribution system is not image-impedance matched. But, in the general sense of "suitable for fitting together," the IEC system most certainly *is* "matched."

In Summary:

1) Although image-impedance matched connections work on long or short lines, they are only *necessary* when working with long lines, such as the telephone-company lines. If you *need* image-impedance matching, then remember that hardly any US-made professional audio equipment has an actual 150 ohm or 600 ohm input or output impedance.

2) For interconnections with short lines, such as those within studios, constant-voltage matched connections give much greater flexibility of interconnection than image-impedance matched connections.

3) Constant-voltage matched connections are not only the IEC standard, but are also the *actual* standard for a large portion of the present-day US-made professional audio equipment. Even equipment that does not conform exactly to the IEC standard is usually much closer to the constant-voltage distribution system standard than to image-impedance matching. □ □ □

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- audio on the road...

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Sound Reinforcement For Barry Manilow

by Patrick Maloney

On the road during the Fall 1980 tour with soundman David Morgan

The success of a show has to do with many things, not the least of which is presenting the talents of the artist in their best light. Where sound is concerned, this means providing the type of equipment and personnel that will bring out the best of an artist and his style of music, and which will successfully reproduce his "sound" for his fans. Sometimes an artist is so well known for lush arrangements, wide dynamic range, and a particular vocal sound, that it is up to the sound engineer to bring out those characteristics in concert, or else the fans will be disappointed. If this is done successfully, then the concert becomes an event that will be remembered and enjoyed by all.

Just such a situation was presented last year to independent soundman David Morgan, when he was asked to mix the sound for a nine-month tour with Barry Manilow. The show was to consist of Mr. Manilow, 11 musicians, a 30-voice choir, and would occasionally be augmented with a full orchestra. Some venues would be small and only require stage level concert-sound systems; other shows would sell out huge coliseums, and necessitate a full hanging system. But the one thing all the shows had in common was a requirement that they faithfully reproduce the quality and intimacy of Barry Manilow's records.

With years of touring experience under his belt working with the Doobie Brothers, Little River Band, Alice Cooper and Bob Welch, to name but a few, David Morgan was considered to be eminently qualified for the job. Although rock and roll was more his forte than mainstream MOR, David saw the opportunity to work with a full orchestra, 30-voice choir and some of the top musicians in the business — a challenge he couldn't resist.

He became involved in the project originally when asked by Al Siniscal of A-1 Audio, Hollywood, California, to come in one day to demonstrate a PA system to Barry Manilow's producer, Ron Dante, tour manager, Greg Hanley, and stage manager,

Author's Note: The conversation with tour engineer David Morgan on which this article is based took place during November 1980, and is concerned with the concert-sound system, stage miking, and effects devices utilized on the Barry Manilow Tour of Summer and Fall 1980. Since this interview took place, David Morgan has left A-1 Audio, the suppliers of the sound system for both the 1980 and upcoming Manilow Tour. Morgan is now with Innovative Audio.

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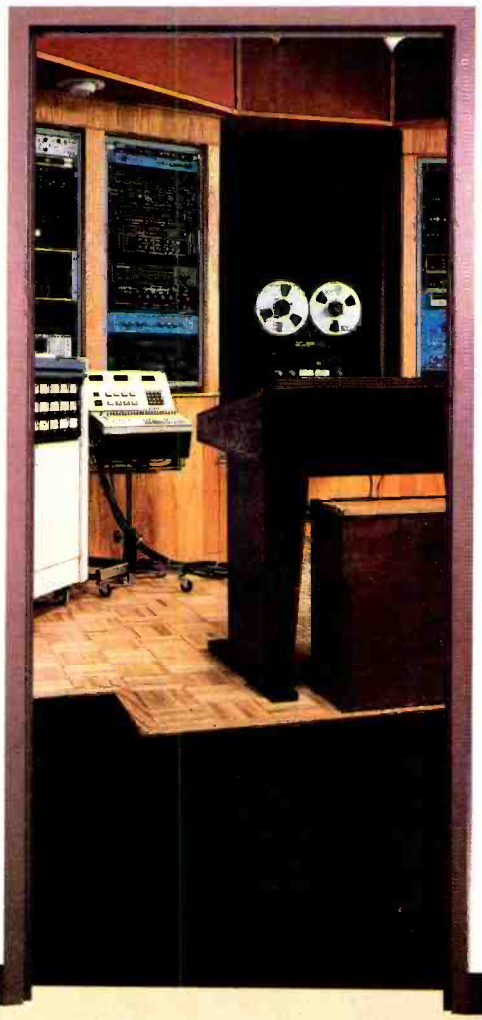

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Gary Lanvy. Many of the acts that David had worked with in the past rented their concert-sound equipment from A-1, so he was well qualified to give a demonstration and explanation of the full line of available equipment. After agreeing to accompany the equipment as chief sound mixer, David then set to work choosing microphones, working out signal processing effects, and developing several innovative techniques which, I feel, are noteworthy enough to warrant their being passed on to others in the field.

There was no opening act on the Manilow tour, so David's job was somewhat easier than it would have been had there been a set change to deal with. The lack of a set change, however, was more than balanced out by the magnitude of the one setup. For instance, there were a total of 18 stage monitors which were fed from 10 individual monitor mixes. The "self-contained" version of the show, involving Barry, the 11-piece band and the choir, took up 60 inputs, while the show with additional orchestra brought the number up to 78.

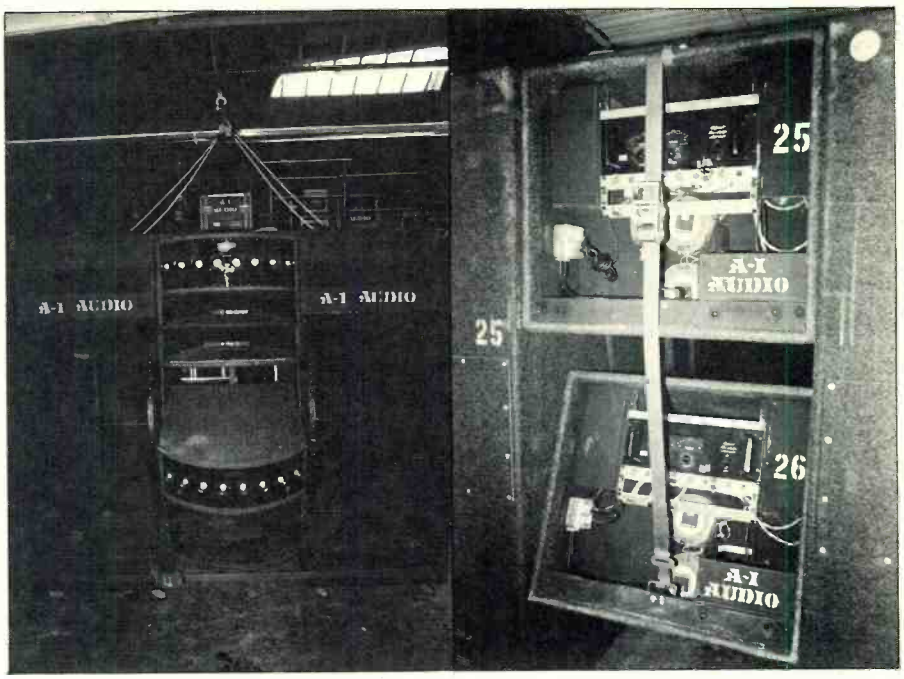


Figure 1 (left): Close-up of a VIP hanging cluster, showing layout of driver units. Figure 2 (right): Rear view of VIP clusters, with fully adjustable rigging straps.

Hanging P.A.

The Fall portion of the Manilow Tour involved the biggest venues and the largest quantity of equipment. Because of the sheer magnitude of the show, it was absolutely essential that both lights and sound were up and out of the way by lunchtime. Load-in for sound began between 10:30 and 11:00 a.m., and fortunately — due in part to the design, reliability and efficiency of the equipment — the whole flying PA was up in the air, completely wired and pink noised by 1:30 p.m. The set was then constructed, monitors placed in position, and mikes connected in time for the afternoon soundcheck at 3:30 p.m.

Each hanging cluster consisted of two VIP three-way speaker systems, arranged so that the two bass cabinets flanked the two mid/high-end cabinets to form a single sound source measuring approximately 7½ feet high by 8½ wide by 4 feet deep, as shown in Figure 1. (A detailed description of the VIP system is to be found in the article entitled *Singing in the Rain; R-e/p August 1980 issue;* Volume 11, No.4.)

A total of six clusters were used on the tour and, although each exhibited a full 90-degree dispersion pattern, they were each set to cover only 30 degrees when hung in an arc. Such a considerable overlap of coverage helped protect against the total loss of sound to any one part of the hall, should a cluster malfunction during the show.

The top horn/tweeter cabinet points straight ahead and remains parallel to the floor, as do the two bass bins. The angle of the bottom cabinet is adjustable via a ratchet strap attached to the back of the cabinet itself (Figure 2). The angle of this cabinet can then be individually adjusted according to how high the cluster hangs, and how far away it is from the audience. The sound level to this cabinet is independently variable from the Yamaha PM-2000 house-mixing console, and is generally run about 3 dB down from the rest of the system. This compensates for the shorter distance between the PA and the front half of the audience covered by the cabinet.

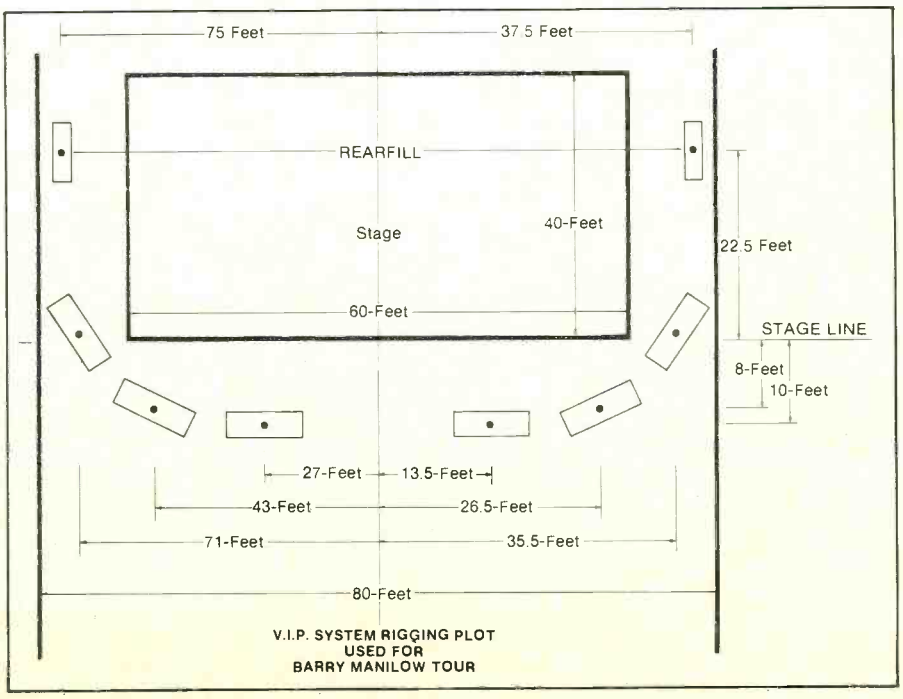
The eight matrix outputs of the PM-2000 are routed as follows:

1. VIP house-left bass bins and top horns
2. VIP house-right bass bins and top horns
3. VIP center channel; all angled horns
4. Flying backfills
5. Center and sidefills
6. Show tape
7. Auxiliary feed
8. Headphones

All of the first three outputs are sent to each of the individual VIP cabinets, where the appropriate signal is then selected via a three-position switch mounted on the rear of the horn cabinets.

Not only was David Morgan aware of and responsive to the different level requirements throughout the hall, but he also dealt with the different frequency response requirements. For example, those people sitting in the front rows next to the stage had need of, and got, front -fill speakers that increased the intelligibility in this area. However, no bass speakers were incorporated into these front fills as David felt enough low-frequency information was coming out of Mr. Manilow's side fill monitors as well as directly off the stage. Instead, each cabinet contained a single 110-degree Smith midrange horn, and two JBL 2402 tweeters (Figure 3). This design was initiated by Grey Ingram, formerly soundman for the Doobie Brothers and now with Solid State Logic, and refined by Morgan.

Far from being a lightweight aluminum



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INTERMODULATION DISTORTION:
Less than 0.1% from 40 mW to 400 watts RMS into 4 ohms. Typically below .05%
TOTAL HARMONIC DISTORTION:
Less than 0.1% from 40 mW to 400 watts RMS, 20 Hz to 20 KHz into 4 ohms. Typically below .04%

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FREQUENCY RESPONSE:
+0, -1.0 dB, 5 Hz to 40 KHz
RATED POWER:
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(Both channels driven)
400 watts RMS into 8 ohms
(In Bridge Mode)
INTERMODULATION DISTORTION:
Less than 0.1% from 20 mW to 200 watts RMS into 4 ohms. Typically below .05%
TOTAL HARMONIC DISTORTION:
Less than 0.1% from 20 mW to 200 watts RMS, 20 Hz to 20 KHz into 4 ohms. Typically below .04%

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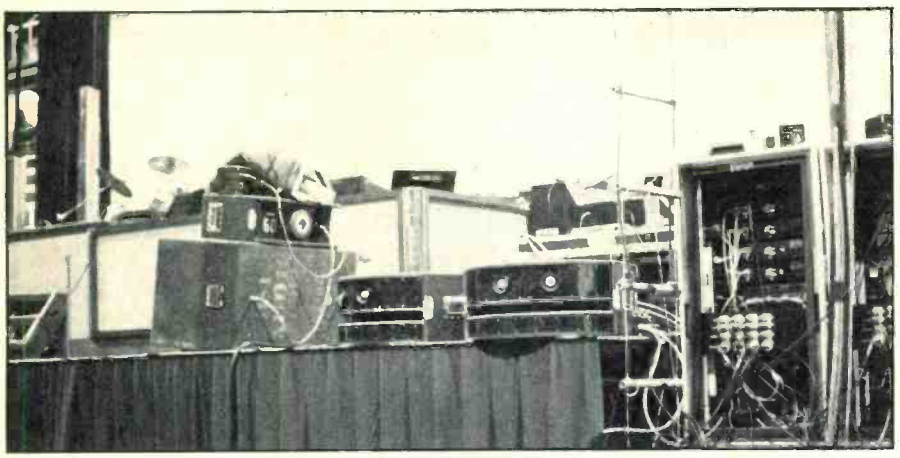


Figure 3: Side-fill stage monitors and front-fill speakers at the Maple Leaf Gardens, Toronto, Canada.

support structure, the hanging truss used by A-1 is a study in engineering itself. Built by a government contractor, the trusses are constructed entirely of steel by government-certified welders. Each weld is then X-rayed for flaws, the whole system proof-tested, and then a complete stress analysis run on all the hanging hardware.

Each system is hoisted into position with a one-ton capacity chain climbing hoist. The hoists are specially modified to provide for 65 feet of lift as compared to the standard 50 feet. The extra 15 feet of lift makes it that much easier for the riggers to locate hanging points. Steel cable ½-inch in diameter is used to actually support the system from the hoist.

"Some companies will use ⅜-inch cable," David states. "But I don't think Al Siniscal ever wants to drop a PA and be put out of business, so he uses the ½-inch for the extra margin of safety and reliability. The thicker cable doesn't take up that much more space in the truck ,and it's just one less thing that I have to worry about."

Power Supplies

Separate 30-amp AC circuits were run to each hanging speaker cluster: one for the power amps, and another for the chain hoist motor. Even though the amplifiers only drew between 3 and 4 amps during the show, separate circuits allowed the power to the hoists to be cut after the cluster was hanging in the correct position. This prevented the possibility of a faulty switch causing the whole cluster to move up or down during the show.

"The idling-current draw of the entire PA, including both the house and monitor systems, was about 29 amps per leg — single phase," said John Hill, second engineer and system technician for the tour. "The most I ever saw us draw per leg was perhaps 45 amps or so, peak. That's about 4,000 watts of audio, of which perhaps half was going on to the stage. An average show would run maybe 2,000 watts, with 3,000 watts at the absolute peak — and that's everything in the house!" Total system output capacity was 16 kilowatts.

A good deal of time and labor saving resulted from the fact that the speaker clusters were never broken down, and remained strapped to their trusses throughout the tour. They were simply rolled off the trucks, attached to the hoists and flown as was. According to David Morgan, production manager Gary Speakman never had to pay any union overtime costs because of sound — a pretty good indicator of design efficiency.

Speaker Selection

Whether they were being used as front fills, side fills, rear fills, or monitors, great care was exercised in choosing speakers and cabinets that were especially suited for their particular application. For example, depending on exactly where they were sitting, the audience on the immediate sides of the stage listened to one of two versions of side-fill speakers patterned after JBL 4320 studio monitors. Both speakers were three-way bi-amplified units that passively crossed over to a single JBL 2402 tweeter; one contained an exponential midrange horn fitted with a JBL 2482 driver, and the other housed the same driver on a 50- by 40-degree elliptical McCauley horn. The McCauley version was set up level on the stage, and aimed at the people sitting in the first 10 or so rows of the side sections. The exponential horn version was placed next to it, and angled back slightly so as not to overlap but rather enhance what was coming out of the McCauley. This unit took over where the pattern of the elliptical horn dropped off, and completed the coverage pattern up to the top of the side seating section (Figure 4).

Figure 4: Side-fill speakers with attached lids.

An interesting and useful feature of both these cabinets is the fact that their wheels are attached to a removeable lid, and not to the cabinet itself. This prevents the wheels from rattling around on the speakers during the show; provides for easy movement of cabinets during load-in and load-out; and ensures that the speakers travel in a manner least stressful to the support mechanisms — i.e., face down. Also, there is a lip built around the back of each of the cabinets so they can be stacked inside the truck, one on top of the other, thereby lessening the chance of the load shifting in transit.

Shock-Mounted Console Case

An item of interest to any sound mixer who has ever seen his console dropped as it was being taken out of its case is the combination road case and stand for the Yamaha PM-2000 mixing console, which was designed by Lou Mannick, head carpenter at A-1, with assistance from Al Siniscal and David Morgan. A double-action shock absorber allows the console to be permanently attached to — and supported by — the case itself, whether travelling vertically or tilted horizontally in the standard mix position.

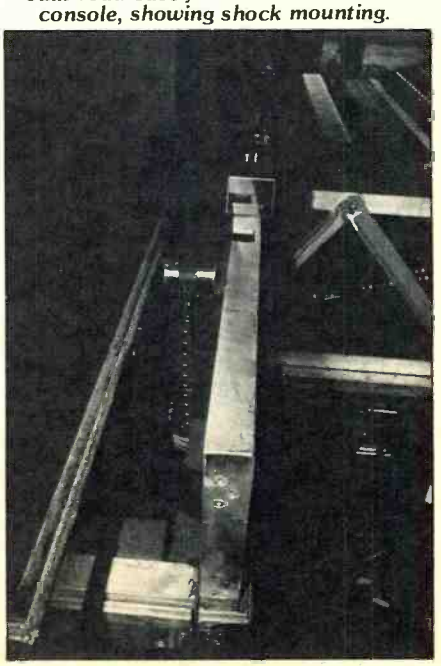
"Whereas the usual practice has been to grab six stagehands away from someone else when it came time to set up the console, I could usually get away with only one," David offered.

The design of the case further provided for extra space at the bottom, so that all the patch cables and cords could be left plugged in when the console was rotated vertically for packing and shipping. Patching time and errors are said to be reduced drastically, and it takes a total of about three minutes to clear all the cables and fold up the console. David estimated that the case design accounts for a savings of about 45 minutes in setup time, and half an hour on the strike (Figure 5). Input cables are all on pigtail connectors, or "squids," which remain patched at all times and simply connect to the main snake lines during installation using military-type half-turn screw connectors with gold-flashed pins.

The folding case design came out of the necessity and desire for speed and reliability on this tour.

"Lou Mannick and I kicked some ideas back and forth and soon it became everybody's project at A-1," David

Figure 5: Close-up detail of custom-built road case for Yamaha PM-1200 console, showing shock mounting.



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remembered. "Everyone started getting involved with this aluminum framework monstrosity that was starting to take shape back in the fabricating area. Lou and I spent about a week deciding how and where we wanted to pivot it; how high we wanted it to sit; and how we were going to shock-mount it. I even went to a Yamaha motorcycle shop hoping to find a shock with that name on it. But they didn't have the right kind, so I ended up with a Monroe instead!"

The off-road shock that was chosen has a stiff spring to accommodate severe jolts, and a lighter adjustable spring that can be set to the weight of the load. They were mounted on either end of the case and then attached to the console, so that the case could move but the console would remain stationary. Even the most solidly built console can suffer from the vibrational effects of thousands of hard road miles, and the somewhat less than delicate handling of stage hands. This shock-absorbing integrated console case/stand seems like a great solution to these problems; it should be welcomed by any soundman who has ever tried borrowing six people from the lighting crew on an already late installation!

Should the use of the case prove to be impractical at any particular installation, however, the console can be quickly and easily removed by simply unscrewing two bolts on each shock saddle joint.

Submixer Rack

At the house mix position, and situated to the left of the Yamaha PM-2000, were two Yamaha M-916 sub-mixers mounted in a piggy-back arrangement (Figure 6).

"I had originally hoped to use a second PM-2000 for submixing, but space and budget considerations dictated using the two 916s instead," Dave explained. "The final decision on this matter didn't come until the last day of rehearsal before the Fall tour, however, which left me with one day to come up with an alternative. So, at about 4:00 in the afternoon I went in to see Lou Mannick and said: 'Lou, I've got a problem. You've got to build me some sort of piggyback rig so I can set two 916 consoles on top of each other. And you've got to take the top one and move it back to where I can still see the VU meters on the bottom one.' I came in at 10:00 the next morning, and there was a little aluminum piggyback rack which also collapsed flat for easier packing. It was so structurally sound it could have held up two elephants! It worked out beautifully and turned out to be the same height as the PM-2000 once it was set on top the crossover rack. The most remarkable thing is that Lou

Figure 6: Piggyback stand for M-916 submixers (left), PM-1200 front-of-house mixer, and processing racks

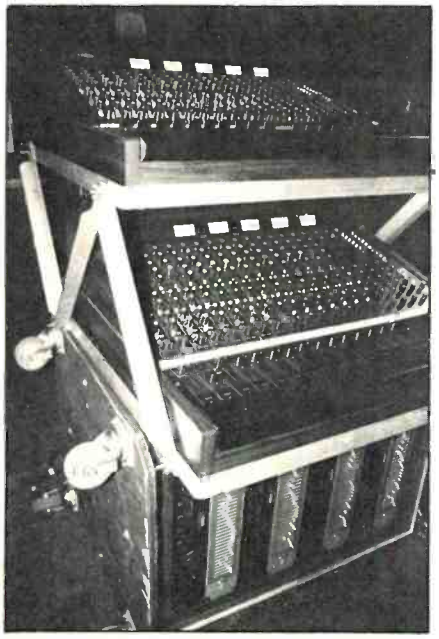


Figure 7: Close-up detail of the collapsible piggy-back stands for M-916 submixers, located on top of crossover rack.

didn't even have a console to work with — all he had were the dimensions listed on the product information sheet!"

Setting this stand on top the crossover rack presented a problem that David hadn't anticipated. The crossover rack was originally designed to stand upright, but spent the duration of this particular tour on its side, since it doubled as the base for the two Yamaha 916 submixers mentioned above (Figure 7).

"It took a little while getting used to reading the UREI 539 third-octave equalizers at a 90-degree offset, and underneath another piece of equipment," David recalled. "But I got used to it after a few shows." He cautioned against using the 539s for anything other than minor touchup work: "Once you go past 6 or 7 dB you get a phase lag that may cause coloration. We try to work more with the Yamaha F1030 active crossovers than with the equalizers, and generally keep all cuts down to a minimum."

Effects Rack

As was indicated earlier, processing electronics were to play a large part in reproducing live the sound of Barry Manilow's records. What follows is a description of the use of several of the more interesting pieces of equipment located in the effects racks to be seen in Figure 8.

David Morgan found that Manilow's voice was capable of putting out severe transients, especially in the more sibilant vocal range, so a UREI 1176 was used for moderate peak limiting. His vocals were further enhanced with the new Eventide H949 Harmonizer® set in the random delay rather than pitch-change function. About 18 milliseconds of delay was chosen as a base doubling rate. From that point David varied the delay plus or minus 5 to 7 milliseconds on a totally random clock sweep. The proportion of the actual mixed vocal blend coming from the H949 depended on how strong Manilow's

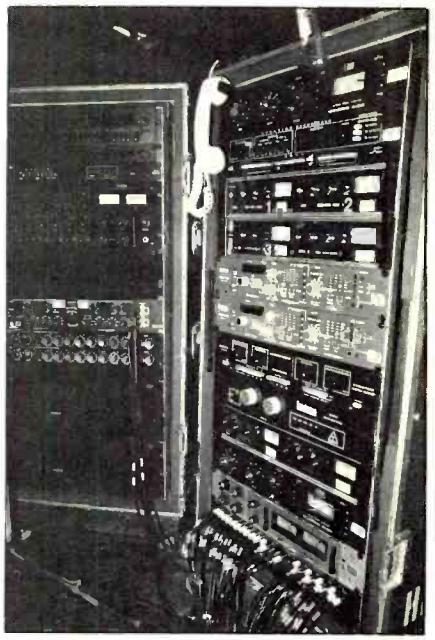


Figure 8: Electronic processing racks, housing Lexicon DDLs, Eventide Harmonizers®, dbx compressor/limiters, and other ancillaries.

voice was, and how many days off he had had between gigs.

David would then take the delay-only output of the H949 and set that for anywhere from 75 to 275 milliseconds of additional delay. This extra delay was then routed back to the input of the same Eventide H949 for recycling. The Harmonizer reverses the phase of the signal when it is in the feedback

mode — a characteristic that would either enhance or detract from what David wanted to do. So, in order to have a phase reversal option as well as EQ and level control, this separate delayed output was routed to its own input on the PM-2000, and then from there back out to the H949.

"Straight reverb didn't do as much for Barry's voice as recycle delay," David remembers. "His songs are built on magnitude. The arrangements build to crescendos, and the modulations psychologically take you to larger and larger places. There was actually a lot of psychology in his presentation. I didn't want to make him sound more distant; I wanted to make him sound more omnipresent, as if his voice were in the middle of the hall hanging right next to you. Actually, the long delay times worked to our benefit in extremely echoey halls. Rather than having a very short-duration event (i.e., the note that Barry was singing) I extended the event with the added short delay. Then I used the long delay to defeat a lot of the extraneous reverberation of the hall by inserting the time delay before the natural first reflection — thereby reducing the apparent size of the hall.

"It is the intitial time delay gap, not the total RT60 that affects intelligibility. Those people nearer reflective surfaces heard a spaciousness similar to that heard in the middle of the hall. I found that if I could keep these events occurring for as long as it would have ordinarily taken for them to decay due to natural reverberation, then I was one step up on the hall."

EFFECTS RACK INVENTORY & ASSIGNMENTS

Eventide H949 Main Output	HR-201	PM-2000/28	Barry Vocal
Eventide H949 Delay Output	HR-201	PM-2000/29	
Lexicon Model 93 #1 — A Output	HR-201	PM-2000/22	Backing Vocals
Lexicon Model 93 #1 — B Output	HR-201	PM-2000/23	
Lexicon Model 93 #2 — A Output	HR-201	PM-2000/24	
Lexicon Model 93 #2 — B Output	HR-201	PM-2000/25	
MICMIX MR-IV Short Tube	Tie-line #4	Mixer EFX1	All Vocals
MICMIX MR-IV Long Tube	Tie-line #5	Mixer EFX2	Reverb
Eventide H910 Main Output	HR-201	M-916 #1/13	Woodwinds
Eventide H910 Delay Output	HR-201	M-916 #1/14	
Lexicon Model 92 A Output	HR-201	M-916 #1/15	Synthesizer
Lexicon Model 92 B Output	HR-201	M-916 #1/16	
MICMIX XL-305 Left-Channel	HR-201	PM-2000/8	Percussion
MICMIX XL-305 Right-Channel	HR-201	PM-2000/1	Keyboards
Tape Playback Left Output	HR-201	M-916 #2/15	
Tape Playback Right Output	HR-201	M-916 #2/16	

Each time the Harmonizer recycles the delay its level drops about 3 dB. As a result, instead of an event and then an abrupt cutoff with its resultant reverberation, David created longer events that seemed to tail off more naturally.

This idea of tailoring the length of the sound occurrence to match the reverberation characteristics of the hall is one that has plagued musicians, composers and especially acousticians and architects for many years. Up until this century composers, usually had a particular performing environment in mind when they wrote their music. Bach, for example, composed his concertos with the knowledge that they would be performed and listened to in small halls with fairly short reverberation times, which would allow for the definition necessary for his particular contrapuntal style of music. His *Toccatta and Fugue in D Minor*, however, was written for and absolutely necessitated the longer reverberation characteristics of large churches and halls.

A good deal of contemporary music, on the other hand, is generally written without regard to the actual live performance environment. There are any number of types and styles of halls to play in nowadays, especially in the U.S.A. Modern music is more often than not written for the acoustics

of the recording studio and the living room — two not terribly over-reverberant fields, to say the least! So David Morgan is basically changing the propagation of the event — in this case the length of Barry Manilow's words and phrasing — to match the various acoustics that he encounters on the road. Bach would have been proud.

"I also used a MICMIX MR-IV reverb chamber on Barry and the four back singers," Morgan related. "It is set for very long delay decay times of 5 to 7 seconds. It's just another thing that I found out through trial and error: the more you can blend in the reverberation of the effects that you are creating with the natural reverberation of the hall, the more natural it is going to sound, and the less like an obvious effect it will seem. Most of the big arenas we played had average RT60s of at least 4 or 5 seconds!"

The effects rack also contained four dbx Model 160 RMS compressor/limiters, which were used on the four backup singers. Since the singers were very professional and familiar with blending among themselves, the 160s were used only slightly "to smooth things off somewhat." In order to blend in with Manilow's electronic enhancement, outputs from the backup singers' individual channels were also connected to a pair of Lexicon Model 93 one-in/two-out digital delay lines. The first Model 93 was used as a simple vocal doubler; a common setting would be 15ms on the A output, and 25ms on the B output. Occasionally the DDL would be run in the VCO mode, which varies the delay times a little to create a slight phasing effect. The output of this first Lexicon Model 93 was then routed to the input of the second unit, and all four outputs made available on individual faders of the PM-2000 mixer.

"With the cascading possiblities of the two 93s," Morgan explained, "I was able to make them sound like four vocalists singing really tight, or like 12, 24, or 48 singers in a huge choir simply, by bringing up different combinations of faders."

Choir Miking

One of the biggest miking challenges Morgan had to deal with was adequately picking up the sound of the 30-voice choir. Hanging shotgun mikes was out of the question due to staging restrictions, so he opted eventually for six AKG 451s set for full bass rolloff and mounted on regular stands.

"I also wanted to use PZM™ mikes, but their attached plexiglass baffles were vetoed for visual reasons. And we couldn't put them on the floor due to foot noise from the choir," David recalled.

Since the choir was placed behind a black scrim directly behind the strings and horns, the six AKG mikes couldn't be placed far enough away to get the kind of pickup David really would have preferred. It was at this point that all the delay effects on the four backup singers really came into play. The choirs were picked up locally for each engagement, and sometimes were a bit tentative, off-key, or otherwise didn't quite measure up to the high standards of the rest of the show. Whenever this was noticeable David would cascade the delays on the four professional backup singers to create the illusion of another 48 or so vocalists, and then blend them into — and sometimes above — the sound of the choir.

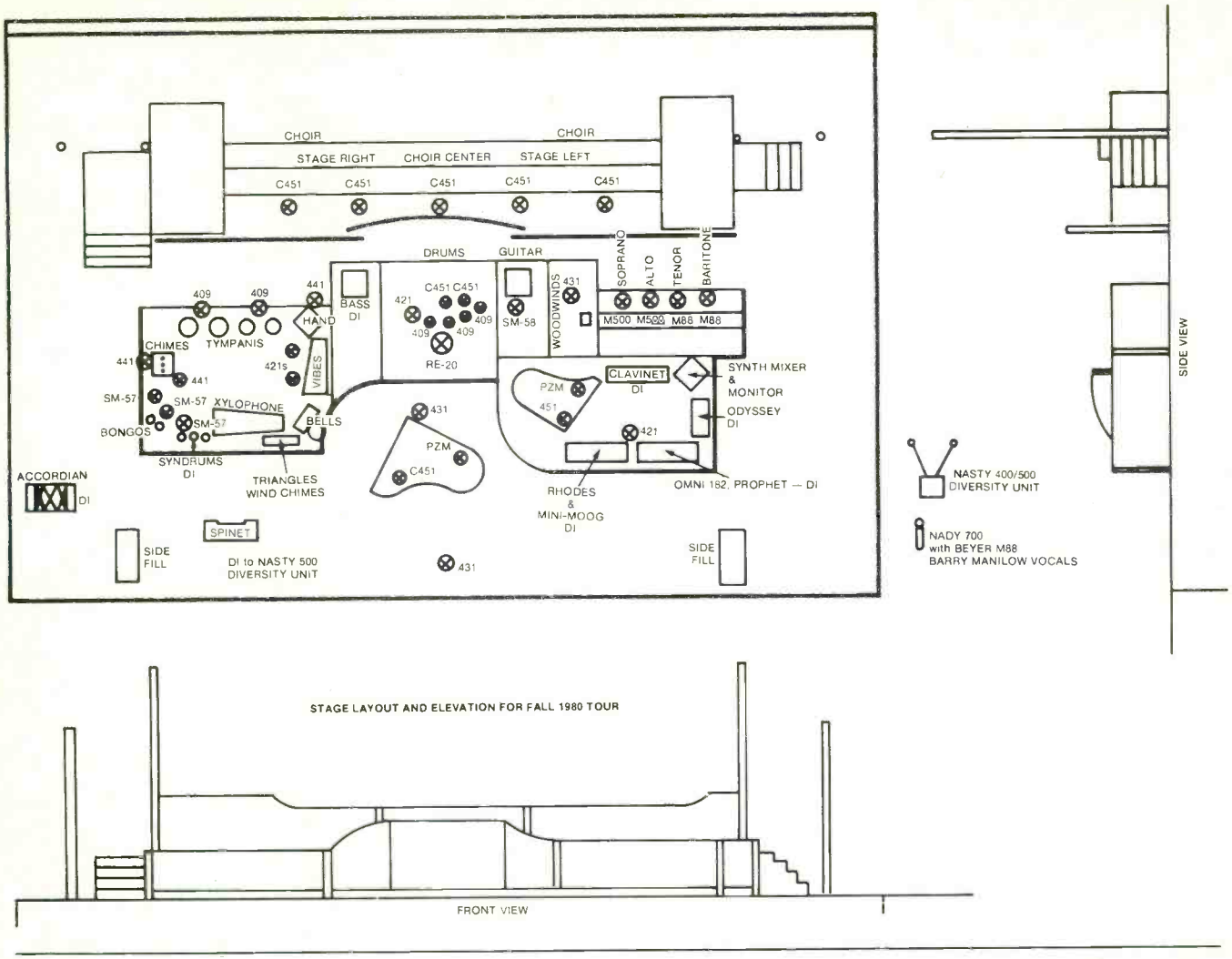
Stereo PA Balancing

On those occasions when the physical layout and acoustics of a hall allowed it, the concert-sound system was run in a stereo mode. The non-delayed vocals were placed in the center, while the various delayed signals were progressively placed from the center on out to extreme hard left and right. The effect, according to David, was that of a huge, bigger-than-life sound that extended out beyond the physical boundaries of the speaker clusters.

"But I never panned anything beyond 3:00 or 9:00 on the dial, except the delay returns on the backup singers," he emphasized. "There is simply no way in a live show that you can run the overall PA hard left and hard right. There are always people who are sitting too far to the side to hear the stereo correctly, and to accommodate them I wouldn't spread it very much. Generally, the people who were sitting in the center of the theater got incredibly good stereo, and the people off to the extremes heard a normal, good quality mono signal."

When the venue dictated a mono setup, the chosen delay times were typically longer in length, since all the sounds had to eminate from the same point sources, and couldn't rely on the natural delay inherent in the distance between left and right speakers.

Returning to the effects rack we find



another dbx Model 160 compressor/limiter, this one being used for RMS compression of the electric guitar. David wanted the rhythm guitar parts up real strong. However, since the guitarist tended to vary his volume by considerable dynamic proportions when he switched to lead parts, the compressor was set to kick in hard when its threshhold limit was reached. The bass guitarist's signal ran through a UREI 1176 set for moderate compression of 8:1, with an extremely fast attack and a slightly slower release.

A MICMIX XL-305 reverb unit was used on the drums and percussion (left channel), as well as on all the keyboards and guitars (right channel).

Moving down the rack we next encounter an Eventide H910 Harmonizer that is used on the sound created by reed player, Bill Page. Many of the featured parts that Bill played were double reed parts, and David Morgan felt that the true character of the English horn, oboe, and bassoon were very hard to bring out with just one microphone. So, rather than simply raising the gain on the microphone to what could have been an untenable level in terms of feedback or leakage, he would have Bill play tight to the microphone, and then use the H910 to add gain. Once in a while he would use the Harmonizer function to add a parallel third or a note an octave above or below the fundamental, but for the most part it was used just to add punch and clarity. Anywhere from 15 to 60 milliseconds of delay was used.

David also discovered an additional benefit of using a delay in this application. He found that some of the low end on stage that was bleeding into the reed mike could be cut out, while conversely boosting the low end of the doubled parts generated by the Eventide H910.

"I could get a rounder sound out of the woodwinds without getting an incredible amount of low end from the electric guitar amp, which was no more than two feet away from the reed player's mike," he says. In addition to the Sennheiser 431 that David provided, Bill Page used a pickup of his own design that worked remarkably well, according to David: "He ran his pickup through the Roland 501 Chorus Echo, which has finally achieved a decent signal-to-noise ratio. It doesn't sound like a PhoneMate anymore!"

Robert Marullo was the synthesizer player responsible for creating the sound of string and horn sections when a full orchestra wasn't used. He accomplished this using a Prophet 5 synthesizer, Fender Rhodes, two Arp Omnis, Mini-Moog, an Arp Odyssey, and a Clavinet. Each instrument fed a separate input of one of the Yamaha M916 submixers at the main mix position. David would then take the mixed output and run it through a Lexicon Model 92 digital delay line. Then, using slightly separated delay times of between approximately 45 and 75 miliseconds on the A and B outputs of the Model 92, he would add some spaciousness to the synthesizers. David could also make them sound a little less like oscillators, and a little more like string and brass instruments. The Prophet 5 synthesizer particularly impressed him: "It had amazing capabilities and could sound like an entire brass section in itself."

The keyboardist ran all his instruments through a custom-modified Yamaha PM170 (6-in/2-out) rack-mounted mixer, to provide control over his own monitor levels. The second output from this mixer went to the stage monitor console operated by Ira Seigel. This console was a Yamaha PM-1000 modified by John Windt to provide 28 inputs and 10 discreet output channels. Not wanting to be dependent on the mix from the keyboard player, however, David had Jensen transformers and XLR connectors installed across the PM170's input channels, thereby effectively transforming the mixer into a 6-in/6-out direct box. Such a configuration enabled him to obtain his signal *after* whatever effects the keyboard player was using, but *before* the mixer, so he wasn't a slave to the keyboard player's mix.

Microphone Selection

David Morgan's choice of microphones is very specific, and every mike is chosen for its particular sound and function. What follows are some highlights from the complete list

given in the accompanying sidebar.

"With Mr. Manilow's voice I found that the most pleasing microphone to use is a Sennheiser 431. It has an almost totally flat response, a very large pop filter, and it is well shock mounted to deal with handling noise. Barry's voice has very strong midrange sibilance at about 2 kHz, and that microphone kept him warm sounding rather than harsh. He is also in the habit of working the microphone an average of 6 inches away from his mouth. He doesn't like the visual effect of apparently swallowing the microphone and, besides, people do want to see his face! The 431's uniformity of response within one foot is ideal for this application."

Barry Manilow also used a wireless mike for the summer portion of the tour: a Sennheiser 431 on a Nasty Model 500 VHF transmitter. Although he objected somewhat to the appearance and weight of the transmitter, Manilow was impressed with the sound and used it nonetheless. As soon as John Nady, designer of the Nasty Wireless System, came up with an integrated microphone and transmitter with no visible antenna, David Morgan approached him to incorporate the 431 into the package. This proved extremely difficult, however, owing to the design of the 431, and so a Beyer M88 head was used instead. This new Nady Model 600 UHF Diversity System was subsequently used on the Fall tour with much success.

Piano Miking

David Morgan and monitor engineer Ira Seigel had the opportunity to experiment with a lot of different piano pickups on this tour: five- and three-bar Helpinstills; Countryman pickups; dynamic mikes stuck in the sound holes; mikes under the sound board; condensor mikes mounted inside the piano; etc. They finally ended up with a combination of a PZM and an AKG C451 condenser microphone. The 2- by 3-inch PZM plate was mounted on a 4- by 6-inch rectangle of Ozite indoor/outdoor carpet, and backed with a bead of silicon for shock mounting. The whole unit was then taped to the exact middle of the underside of the grand piano lid, and the lid then closed. The Ozite cut down on vibration next to the PZM, and softened the sound somewhat. A CK-1 unidirectional capsule was orientated at an angle using the AKG A-51 swivel adaptor on one of the cross braces inside the piano above middle C, and angled up toward the high strings. An Atlas mike clamp gripped two pieces of plywood on each side of the crossbrace, to hold the mike in place without damaging the finish of the piano.

"This combination turned out to be exactly what we were looking for," David professed. "It sounded exactly like a grand piano. I rolled off most of the high end on the PZM, yet retained just enough to keep that pleasing percussion quality on the low strings. The 451 was rolled off all the way up to about 700 Hz, and I used it for brightness only."

By changing the phase of the PZM in relation to the 451, David found that he could totally change the sound characteristics of the piano. The sound of a tack piano could be obtained by running the 451 in phase and the PZM out of phase with Manilow's vocal mike, which leaked into the piano slightly via the monitors. Changing the phase relationships and the relative balance between the two mikes resulted in piano sounds ranging from that of an upright to a nine-foot grand.

David worked closely with piano technician and tuner John Borland to determine which combinations sounded like which pianos: "We would just go through and work out piano sounds that enabled me to segue from "Could This Be Magic" — which is heavy Chopin — into "Mandy", which required a much more delicate piano sound. All it would take would be changing the level relationship of the faders and, if necessary, flip-flopping the phase."

The piano was also acoustically treated by installing 3-inch glass fiber insulation to the inside walls of the piano, as well as to the underside of the soundboard. White masking material was then used to cover the beige-colored glass fiber under the piano so it wasn't apparent from the audience.

"This fiberglass worked very well to cut down the low end that was entering the piano from underneath the soundboard,' explained monitor mixer Ira Seigel. "Putting it on the interior walls all the way around the harp was done for a different reason: Barry's Yamaha C-2 grand was an incredibly bright piano, and with the lid closed the high-end resonance was a little more than the PZM's hemispherical pickup pattern wanted to deal

— *continued overleaf . . .*

— Barry Manilow Fall 1980 Tour —
SIGNAL ROUTING AND MICROPHONE ASSIGNMENTS

Snake #	Input	Mike	House Input	House Notes
A-1	Barry Wire Vocal	Sennheiser 431	PM-2000/26	1176 LN
A-2	Barry Wireless Vocal	Nady 700/M88	PM-2000/27	dbx 160
A-3	Barry Grand Piano	PZM	PM-2000/15	Low
A-4	Barry Grand Piano	AKG 451	PM-2000/16	High
A-5	Helpinstill Spinet	DI	PM-2000/14	
A-6	Conductor Grand Piano	PZM	PM-2000/12	Low
A-7	Conductor Grand Piano	AKG 451	PM-2000/13	High
A-8	Electric Guitar Amp	Shure SM 58	PM-2000/10	dbx 160
A-9	Acoustic Guitar Pickup	PZM/Lawrence	PM-2000/11	
A-10	Woodwind Microphone	Sennheiser 431	M-916 #1/1	
A-11	Woodwind Effects	DI/Roland 501	M-916 #1/2	
A-12	*open*			
A-13	Conductor Microphone	Sennheiser 421	M-916 #2/12	
A-14	Intercom: Monitor Desk to House		CS-100	
A-15	*open*			
A-16	*open*			
A-17	Audience Pickup to Monitors	AKG 451		
A-18	Intercom: Monitor to Conductor	Clear-Com		
B-1	Soprano - Pat	Beyer M500	PM-2000/18	dbx 160
B-2	Alto - Robin	Beyer M500	PM-2000/19	dbx 160
B-3	Tenor - Kevin	Beyer M88	PM-2000/20	dbx 160
B-4	Baritone - James	Beyer M88	PM-2000/21	dbx 160
B-5	Rhodes	DI	M-916 #1/8	
B-6	Mini-Moog	PM-170/DI	M-916 #1/6	
B-7	Arp Omni 1 & 2 "Y"	PM-170/DI	M-916 #1/4	
B-8	*open*			
B-9	Odyssey	PM-170/DI	M-916 #1/5	
B-10	Clavinet	PM-170/DI	M-916 #1/7	
B-11	Prophet	PM-170/DI	M-916 #1/3	
B-12	Choir - Stage Left "Y"	AKG 451 (2)	PM-2000/30	
B-13	Choir - Stage Center	AKG 451	PM-2000/31	
B-14	Choir - Stage Right "Y"	AKG 451 (2)	PM-2000/32	
B-15	*open*			
B-16	*open*			
B-17	Synthesizer Mix to Monitor Desk	PM-170 Output		
B-18	*open*			
C-1	Bass Guitar	DI	PM-2000/9	1176 LN
C-2	Kick Drum	E-V RE20	PM-2000/1	
C-3	Snare Drum	AKG 451 10db pad	PM-2000/2	
C-4	Hi-Hat	AKG 451 10db pad	PM-2000/3	
C-5	Rack Toms 1 & 2	Sennheiser 409 (2)	PM-2000/4	
C-6	Rack Tom 3	Sennheiser 409	PM-2000/5	
C-7	Rack Tom 4	Sennheiser 409	PM-2000/6	
C-8	Floor Tom	Sennheiser 421	PM-2000/7	
C-9	Percussion Overhead	Sennheiser 441	M-916 #2/10	
C-10	Tympanis — Low "Y"	Sennheiser 409 (2)	M-916 #2/1	
C-11	Tympanis - High "Y"	Sennheiser 409 (2)	M-916 #2/2	
C-12	Quinto, Tumba "Y"	Shure SM-57 (2)	M-916 #2/3	
C-13	Conga, Bongos "Y"	Shure SM-57 (2)	M-916 #2/4	
C-14	Vibes "Y"	Sennheiser 421 (2)	M-916 #2/5	
C-15	Xylophone	Sennheiser 421	M-916 #2/6	
C-16	Orchestra Bells	Sennheiser 441	M-916 #2/7	
C-17	Chimes/Snare	Sennheiser 441 (2)	M-916 #2/8	
C-18	Syndrums/Accordian	DI	M-916 #2/11	

Left Channel UREI 1178

Right Channel UREI 1178

with. So the same insulation worked very well in two different problem areas."

In addition to the Yamaha grand piano, Manilow played two additional instruments during the course of the show: a Helpinstill portable electric piano, and an accordian. The Helpinstill has a mike-level output that fed a Nasty Model 500 VHF wireless transmitter and receiver. The piano was carried on and off the stage during the show, and the wireless setup was chosen to facilitate the move. "The accordian Barry played was the tackiest, ugliest electric accordian that roadie Gary Zipperman could find!" David recalled. "It was used only during the comedy part of the show, and was wired to a direct box."

On those occasions when a full orchestra was used, additional miking of the strings and horns was required. For string pickup, Morgan prefers the AKG 451 with the CK-1 unidirectional capsule.

"You encounter a certain amount of leakage with this mike, but one of the things I like about it is the fact that the leakage sounds good. I don't like the sound of clip-on mikes, so I traded a little leakage for a more natural string sound." One mike was used to pick up every two players, and was placed just peeking over the front of the music stand, parallel to the floor and angled away from the drums.

Electro-Voice PL95s used on the orchestra horn section were favored for their excellent off-axis rejection.

An AKG 451 was also used for harp pickup; this time, however, it was wrapped in 1-inch foam and dropped into one of the instruments sound holes. Orchestra bells were miked with an AKG 441, and the electric guitar amp had a Shure SM-58 — "The world's best guitar mike," according to David.

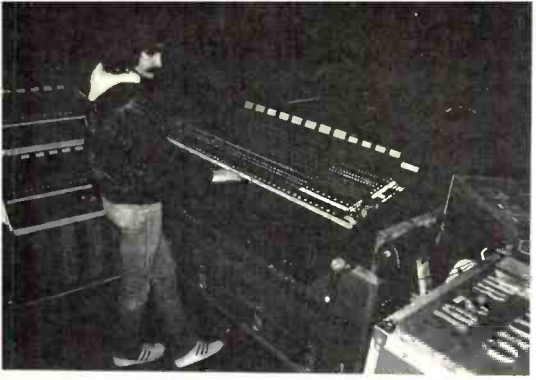
"On the tom-toms I'm very partial to Sennheiser 409s," he continued. "The Doobie Brothers used 409s on congas and I was really impressed with the sound, as well as the amount of side rejection they provided. They are spec'd flat at only about 200 Hz to 12 kHz, but when you place them only a ¼-inch away from a tom-tom the proximity effect takes over, and the low-end rolloff no longer exists. Its shape coupled with its incredible side rejection allows you to mount this mike very close to one tom, and the drum next to it will be 20 dB down. The drummer, Bud Harner, was especially happy with the 409s, because there was just a little square black and gold mike sitting over his tom-toms instead of huge Neumann U-47s or -87s and a whole forest of mike stands."

AKG 451s on VR-1 extension tubes were used on both the snare and high-hat. By remoting the CK-1 capsule via the VR-1 and an A51 swivel, the effective size of the microphone from the drummer's viewpoint was considerably reduced — as was the chance of it being hit by a wildly flailing drumstick!

An E-V RE-20 was placed just inside the front head of the kick drum, and angled a little down and to the right — away from the direct frontal pressure wave from the beater.

Beyer M500s were used on the cellos for most of the summer.

"The double ribbon of the M500 placed in



David Morgan at the Yamaha front-of-house mixing desk.

front of the F-hole reproduces the true character of the cello better than anything I've used," Morgan related. "Unfortunately, we had to change to 421s because M500s have the tendency to turn into marracas if they travel on the road too long!"

So, do tours with big name entertainers, top technicians and equipment and knowledgeable, experienced soundmen always run without a hitch? Hardly. A show David Morgan considered to be somewhat less than magnificent came at the beginning of the Fall tour, and took place at the Rosemont Horizon outside Chicago.

"I don't think anybody is ready to deal with what the place sounds like their first time going in!" he recalled with chagrin. "It's a brand new building, and people are tearing their hair out about it and its 13-second RT60! They swear they've gotten it down to 5.6 seconds, but I think it's 5.6 at about 16 kHz!"

As if this wasn't difficult enough to deal with, another problem materialized during the course of the show itself: a 100-amp circuit breaker that fed power to the entire house left side of the PA decided to choose this particular time to malfunction and shut off, leaving David with only half a PA in an overly reverberant hall. The faulty breaker was soon bypassed, although the show was soon over, the entire episode was one he would sooner forget.

Taping the Show

Any live sound mixer who has ever been asked by the artist for a cassette of a show should appreciate the following description of David Morgan's taping technique. We all know the futility of explaining that the lack of bass, the overbalance of vocals, and the thin guitar sounds are due to the ratio of live versus reinforced sounds in a room. Even on those rare occasions when you mistakedly think that the artist really *does* understand that it sounds better in the hall than it does on tape, you're hesitant to hand over the cassette, are you not? Well, we may have a solution for you if you can afford the luxury of a DDL and a separate mixer.

Basically, David's solution to this problem involves taking a mono composite output from the Yamaha PM-2000 house mixer, and routing it to a DeltaLab Model DL3 one-in/one-out digital delay. From there the delayed signal goes to a Yamaha PM180 6-in/2-out mixer, where it is combined with the outputs of two AKG C414 microphones that are set up in the room for live pickup. The delay is then set to match the distance between the house speakers and these microphones, and a synchronized combination of live and direct off-the-console sound recorded.

The room mikes were set up in the area of the console for security reasons, yet far enough apart for good stereo pickup. They were panned hard left and right, while the delayed mix from the console was used for center imaging and definition.

"We ended up with a combination of about 60% microphone pickup and 40% board output," David remembers, "because Barry wanted to hear both the crowd reaction, and essentially what it sounded like out in the house. So far this is the closest approximation I've found that shows both what I'm doing, and what it actually sounds like to the audience. The result was a live tape that Mr. Manilow was very pleased with and which was, by his own admission, the only sound representation that he could trust. There were people in the audience who would come back and tell him what it sounded like, but for him to have some kind of auditory guide to talk to me about the next day, he had to use the cassette as a reference point. So it behooved me to create the best tape possible.

"Of course, Barry was aware of how the tape was made and, in fact, we worked out this system more or less together. He understands fully that if the bass player is playing really loud on stage I'm not going to put too much low end into the mix — but he still wants to hear it on the tape! So this system worked out quite well."

The actual delay setting for the console feed was chosen during sound check "by ear and by eyeball." You can figure that you will need about 0.87 milliseconds of delay for every foot of distance between the speaker cluster and the mike position out in the house. That can be a bit tricky to measure sometimes, especially if the closest cluster is 20 feet in the air, so Morgan usually listens for the point of maximum gain from the PM-180 mixer via headphones. Maximum gain occurs only when the output from the mikes and the console are in sync, and therefore indicates that the delay to the console feed is correct. This synchronization is also apparent at the point of maximum needle deflection on the PM180's VU meter; a technique similar in theory to observing the needle deflection when setting head azimuth on an analog tape recorder. Similarly, you can pass a few phantom peaks along the way, so David recommends the combination of listening to the combined signal while watching the meter. All the taping equipment, including the Technics RSM95 three-head cassette recorder, were mounted in a rack next to the PM-2000 for easy access and rapid tape changes.

On the short notice that they had (Manilow booked the system in February 1980,and rehearsals began in March) David credits A-1 Audio for "the incredible job they did outfitting me with the proper equipment, personnel, and support for the tour. The crew I received — Ira Seigel, John Hill, and second engineer/stage technician Gary Revere, was the smallest and the best I have ever encountered on a show and tour of this magnitude." □□□

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For additional information circle # 57

The Sound Technology Model 1500A Recorder Test Set

— *a studio's operational assessment . .* at RUSK SOUND STUDIOS

by Roman Olearczuk

The seemingly endless variety of equipment available these days for use in recording studios demands from its owners a sophisticated degree of maintenance in order to uphold the original manufacturer's specifications of performance. At the base of any solid maintenance program is a good selection of test equipment that is readily adaptable to every piece of recording hardware requiring regular service. The purpose of this article is to document a case study of one such choice of test equipment, the Sound Technology Model 1500A Tape Recorder Test System, by explaining how it was evaluated, justified, and applied in use at Rusk Sound Studios.

The criteria for determining what test equipment should be purchased by a studio is dependent upon principles that govern its operations. Ever since its opening three years ago, the operational philosophy of Rusk Sound Studios has always been to provide our clients with the utmost in privacy, service and quality. In order to satisfy this purpose from an equipment standpoint, a heavy emphasis on preventative maintenance was instituted early in the studio's operating procedures. In our case, a survey of tape machines in current use revealed that we have a total of 16 audio recorders, ranging from the various multi-track machines for audio and film, on through semi-pro ¼-track and cassette decks. It has been our experience that the best way to keep all these different units up to specifications is to maintain them ourselves, instead of "farming out" the defective machines to external maintenance services, even during periods of warranty coverage.

Once an efficient shop practice has been established —that is, skilled technicians, plenty of spare parts, adequate test equipment, and so on — the turn-around time on faulty or "down" equipment becomes fast compared to the time spent on locating, arranging and waiting for servicing of a defective machine by non-studio personnel. Also, the cost of a

. . . continued on page 92

— the Author —

Roman Olearczuk *is Technical Director for Rusk Sound Studios in Hollywood. After earning a BS Degree in Electronic Engineering from Purdue University, he held electronic design positions at Zenith Television Research, and later at Litton Guidance and Control Systems. His professional audio career started at Kendun Recorders/Sierra Audio, where he was a maintenance/field engineer. He joined Rusk over three years ago, supervising the initial construction stages. In addition to his present duties, which include responsibility for the maintenance and engineering staff, Roman is currently involved in development of recording artists, in association with Rox and Ross Communications.*

— *the functional design objective . . .* at SOUND TECHNOLOGY

by Sonny Funke

Sound Technology was started 12 years ago to bring state-of-the-art test equipment to both the professional and consumer markets. The company's approach was to specialize in audio test equipment, combining speed and accuracy with ease of operation to reduce set-up and measuring time. Our basic philosophy was to find solutions for specific problems encountered in the entire spectrum of audio-related products.

Nearly four years ago we perceived a requirement for an instrument that would provide all the basic functions needed in one box, to maintain professional tape recorders, but which would still be affordable for the hi-end consumer market; an instrument that would be portable and easy to operate, while capable of delivering a new standard in performance, accuracy and technology.

Development of the Model 1500A

In order to accurately define the desired features, applications and benefits, the company decided to interview professionals working in the recording and broadcast industry, manufacturers, pro and consumer audio dealers, and maintenance service companies. Having analyzed several preliminary design approaches, it became clear that the most practical way of providing such measurement versatility was to combine microprocessor-controlled analog measuring circuits with digital processing and "videograph" display capabilities. Fifty percent of the total engineering time has been spent in the developement of software for the 1500A; total engineering time to date for both software and hardware exceeds seven man-years.

Conceived and designed primarily as a precision test instrument for tape recorder analysis, the 1500A uses a combination of modern technologies, including microcomputer-controlled integrated circuits for test-signal generation and measurement; digital memory and data analysis capability; and a built-in video display with both graphic and alphanumeric readout. One half of the 1500A's electronics consists of a digital computer, utilizing the Z80 microprocessor with a reprogrammable EPROM software base. Such a combination of modular plug-in hardware and software was designed to grow with the user as new developements and options become available.

Videograph Display

The instrument's main contribution is clearly represented by the built-in video display and microcomputer software. In

. . . continued overleaf

— The Author —

Sonny Funke *is Marketing Manager of Campbell, California based Sound Technology.*

combination, these enable high-performance testing to be executed on the integral CRT, highlighting an adjustable cursor for detailed data analysis. For example: two independent channels of graphical and alphanumerical test data can be stored in memory, and simultaneously displayed. Test results can be superimposed or split apart on the same display for direct comparisons. Data storage allows two test results from the same channel to be simultaneously displayed for evaluation of audio tape quality. The vertical scale factor can be expanded for higher resolution, and data moved up or down relative to the displayed grid. An adjustable cursor reads data values relative to the input reference level, or relative to any displayed reference level by selection of the vertical reference "display" pushbutton.

Sound Technology feels that the videograph display presentation used in the Model 1500A is superior to the more conventional technique of X-Y or strip chart recording, for several reasons:

1) Two test-result graphs can be easily displayed, superimposed on the same display for direct comparisons.

2) The appropriate test graticule is generated by the digital-video circuits; many of the tests require different graticules.

3) Data values can be read approximately by referring to the graticule vertical and horizontal lines; similiar to an X-Y recording. The videograph presentation includes a vertical cursor line for detailed data analysis displayed alphanumerically.

4) Several pushbuttons are provided to manipulate the displayed graphical data for easier analysis; the vertical scale factor can be expanded for higher resolution.

System Features

The unit incorporates a two-channel, asynchronous input/output capability. The asynchronous input measuring circuitry is capable of independently analysing and displaying data from any external audio source. This facility enables extremely fast and accurate real-time analysis of a three-head tape recorder, both the reproduce and record head alignment and complete electronic characteristics being measured and displayed.

A built-in audio oscillator automatically displays a two-channel digital readout calibrated in RMS volts and dBm, along with an autoranging analog bar display. The oscillator level is controlled by a single-turn potentiometer and two pushbutton attenuators, providing pre-set levels of -20 dB, -40 dB, and -60 dB. The output level autoranges with respect to full scale readings (1 mV to 10 Vrms in 10 dB steps).

Channel selection is accomplished by means of three interlocking pushbuttons: left, right, and L & R.

Test Data and Displays

Azimuth is displayed as a measurement of left channel relative phase error with respect to the right channel relative phase error at four discrete frequencies — 2.8, 5.7, 11.8 and 15.8 kHz. A built-in character generator projects the appropriate test grid for each test selected. In the case of azimuth, the four test frequencies are displayed by four bars, the height of each bar indicating the relative negative or positive phase error; vertical scale factor is 60° per division. All tests are performed in real-time, and can be stored in memory for detailed digital readout analysis via an adjustable cursor.

Second- and third-order harmonic distortion test is a measurement of level versus distortion. The display's horizontal axis indicates level from +10 dB to -20 dB with respect to the reference level, while each vertical line represents 5 dB per division. Percentage distortion ranging from 10% to 0.03% is indicated on the vertical axis. The cursor displays data in percentages and dB with respect to the unit's input level.

Frequency response is automatically swept from 20 Hz to 40 kHz. One hundred and twenty-three frequencies are measured and displayed for detailed response versus level analysis. Third-order harmonic distortion can be displayed simultaneously with the frequency response measurement, by setting a specific low-frequency limit set.

Three selectable sweep modes are available: manual, single, and repeat. In the manual sweep mode the cursor controls the oscillator's output. Any discrete frequency versus level function can be measured and displayed numerically. One useful application of the manual mode would be for fast and accurate bias adjustments at high as well as low-frequency. This is achieved by simply moving the cursor over the desired test frequency and adjusting for correct bias and equalization settings. In manual mode the 1500A will analyze and display frequency versus level from an unknown audio source, and performs like a combination autoranging digital frequency-counter and a tuned dB voltmeter from 20 Hz to 40 kHz.

The single-sweep mode will allow one automatic sweep per channel, while the repeat mode enables repeated sweeps for high-end bias adjustments while monitoring test results. In this way, the trade-off between third-order harmonic distortion and high-end frequency response can also be adjusted properly and displayed repeatedly. A low-frequency limit can be set in any mode to automatically control the frequency sweeping range.

The unit also incorporates four programmable level offsets: -20, -10, 0, and +10 dB. The attenuators only affect frequency-response and channel-separation measurements.

Channel separation is accomplished by selecting either the left or right channel, then sweeping the opposite channel from 20 kHz to 20 Hz (third-octave frequency resolution), while plotting crosstalk on the selected channel. The CRT vertical scale factor is calibrated in 10 dB increments, while the horizontal axis resolves frequency (20 Hz to 20 kHz).

Delta speed and drift is plotted over a measurement time/range of 10 to 610 seconds. Instantaneous speed error is presented numerically every second, along with a statistical 10-second averaging readout of speed error. A plot of delta speed and drift is simultaneously plotted against time. Upon completion of the test procedure, the cursor displays speed error versus time in seconds. A display reference can be set to analyze drift from one reference point with respect to any data test point (10 to 610 seconds).

Weighting networks are built in for noise — NAB, ANSI, and CCIR/ARM — and flutter — NAB JIS, and DIN/ANSI; measurements can be performed weighted or flat. During flutter measurements the dynamic bargraph indicates instantaneous flutter, while a digital readout displays two sigma-averaged values (95% total composite reading).

Signal-to-noise is measured relative to the unit's input reference level, and displayed with a dynamic bargraph (100 dB scale), plus a digital readout of total composite noise figures weighted or flat.

A built-in speaker allows audible analysis of the flutter components, azimuth and maximum output levels, etc. A self-check button verifies that the unit is operating properly.

System Options

A video printer can be supplied for hard copy data storage. The thermal printer will provide a record of all alphanumerics, graticules and graphical data, just as it appears on the videograph display.

A plug-in, third-octave spectral analysis card facilitates measurement of noise components from 20 kHz to 20 Hz; spectral flutter from 200 Hz to 0.5 Hz; improves channel-separation measurements; provides an accurate tuned dB voltmeter from 20 kHz to 20 Hz; and enables an exclusive two-channel analysis of on-axis/off-axis room response with respect to calibrated microphone placement, utilizing a pink noise source.

With SCO8 software, the character generator displays the third-octave frequency noise spectrum grid. Sweep type filters have approximate sweeping times of 15 seconds per channel for noise. The test results display spectral noise versus frequency (20 kHz to 20 Hz), and also enables detailed analysis of dynamic range versus frequency.

A computer interface bus for the Model 1500A is presently in the developmental stages.

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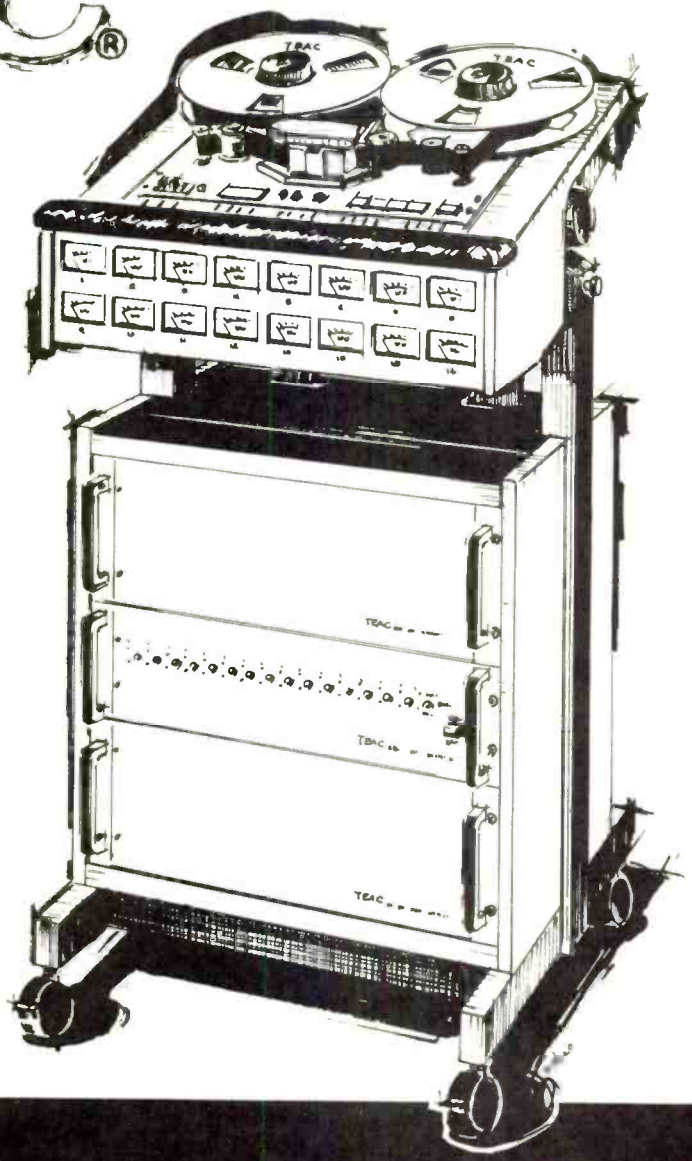

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technical test record is manufactured by Victor Company of Japan, Ltd. A companion Model 1110A Test Pre-amp comes complete with variable loads, moving-coil cartridge inputs, auxiliary inputs and two phono terminals for rapid cartridge comparisons. The Sound Technology 1500A production test tape was designed and engineered to provide the highest degree of professional quality and accuracy. Each test tape will be comprised of the following test signals:

a) 1 kHz reference tone
b) azmith test tones (2.8 kHz, 5.7 kHz, 11.8 kHz, 15.8 kHz)
c) fast, high-end frequency response sweeps (20 kHz to 1 kHz)
d) fast, low-end frequency response sweeps (200 Hz to 20 Hz)
e) fast, detailed frequency response sweeps (20 kHz to 20 Hz)
f) 1 kHz reference tone
g) 3.15 kHz flutter tone

Summary

Sound Technology is presently discussing several additional options for the 1500A. A modular plug-in system design allows the unit to expand to suit user requirements. The presentation of graphical test data in a highly-automated test instrument is, we feel, providing an important new level of convenience to the user. For the first time, the Model 1500A makes it possible to maintain a level of performance that was previously impractical to achieve with conventional technology and traditional test equipment.

— continued from page 88 . . . The ST 1500A Recorder Test Set:

an Operational Assessment at Rusk Sound Studios

. . . the author using the 1500A with his proprietary multitrack interface —

regular equipment maintenance service, when coupled with the cost of renting replacement gear, warrants a careful consideration of the latest test equipment by any studio owner in order to keep overhead outlay under control in today's complex, yet competitive, marketplace.

A year ago, Rusk Studios had determined that a sophisticated "all-in-one" test unit would be needed to satisfy our present needs, as well as anticipated maintenance requirements for future purchases of audio recorders. We had hoped to obtain a unit that was reliable, portable, multifunctional, well-constructed and cost effective. At that time, there were several units available, including the following:

Amber 4400A Audio Test Set
Ferrograph RTS2 Audio Test Unit
HP-8903A Audio Analyzer
Leader LAS-5500 Audio Analyzer
Sound Technology 1500A Tape Recorder Test System
Tektronix TM 500 Modular Test Series
Signal Analyzer and Test Set.

All these units offered test measurements that included AC voltage, frequency response, noise, harmonic distortion, and featured a low-distortion reference tone generator. Some units also provided a wow and flutter meter.

The methods by which measurements are performed on these test instruments varied widely in terms of complexity and ease of operation. In addition, there were numerous manufacturers, including some of those just mentioned, that offered test equipment ranging from a single test, to partial combinations of those tests included in the larger products. After extensive research on all of these audio analyzers, Rusk chose the Sound Technology 1500A Tape Recorder Test System.

The Model 1500A is an automatic two-channel, microprocessor-based test system that allows its owner to completely test, adjust, and calibrate any audio tape machine. The test set gives every appearance of having been designed around the old saying: "One picture is worth a thousand words." Every test measurement is stored and displayed as a representation of a graph on a built-in CRT. The frequency response test, for example, looks like the conventional pen and paper graph obtained from traditional plotters. This visual aid represents the ultimate in meter movements: there are no needles to adjust for parallax, or balance to obtain the proper readings.

All tests are identified by an abbreviation in the upper lefthand corner: for example "FR" standing for frequency response. In addition, depending upon which test is in progress, various items of information are displayed at the top and bottom of the screen.

Once an output reference voltage is set, individual tests are chosen by the push of a button, and commenced by pushing the "start output" and/or "start input" button. The unit analyzes the test information for either or both channels, and then displays the results graphically across the video screen. After any graph test has been performed, a cursor is provided that allows different data points to be "read out" and displayed, simply by moving an electronic dotted line across the graph. In addition, there are numerous other features that will be described in the application portion of this article.

A subsequent visit to Sound Technology's factory confirmed our expectations that this unit was designed, constructed and supported by a company with the highest standards of quality and integrity. Various used test equipment dealers verified the company's claim that a Sound Technology product holds its resale price in the same manner that a used HP or Tektronix product retains its value. Rusk Studios purchased the 1500A unit after an arrangement was made to evaluate the test system for 30 days on loan, with the understanding that if it did not perform as expected, or did not satisfy our needs, we could return it for a full refund.

Studio Applications

The Model 1500A's primary function is the routine alignment of various tape recorders. Initially, we have been using the unit to set up Ampex ATR-102 tape machines prior to each mixdown session. We presently align the playback electronics by using an STL test tape, and setting the level, high-frequency and compensated low-frequency adjustments for a relative zero level on the ATR-102's VU meters. The 1500A is not used for this portion of the alignment because it requires a swept-frequency playback test tape to present a graphic representation of playback response. We have not yet found a stable swept-frequency playback test tape in a professional configuration to make this portion of alignment reliable for our recorders.

Although single discreet frequencies will be displayed on the unit when an STL playback test tape is used, there is no provision to momentarily mute the input information to the unit. As a result, the dialogue that announces each frequency band (typical on most test tapes) will be displayed as erroneous random frequency data points. There are two alternate solutions to this problem: (1) replace the dialogue segments with blank recorded tape of similar stock; or (2) purchase a custom tone tape with a similar set of tone frequencies of greater duration. By ordering additional discrete-frequency tones beyond the normal set usually found on most stock alignment tapes, a good approximation of a swept-frequency test tape can be achieved. Although this solution is a more costly choice, it does allow a technician to accurately set up the playback frequency response of the machine being aligned.

As for playback azimuth, the Model 1500A uses an

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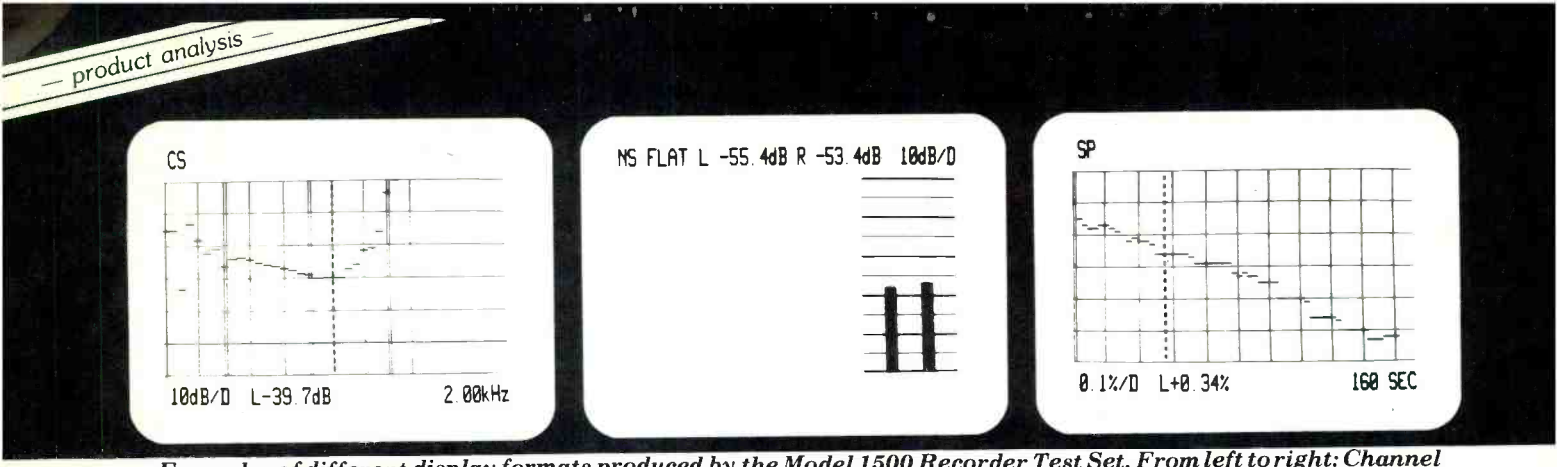


Examples of different display formats produced by the Model 1500 Recorder Test Set. From left to right: Channel Separation, with the left channel 39.7 dB below the right at the cursor position (2 kHz); a Noise Level below reference level shown on a 100 dB scale; and Speed Error, showing that at 160 seconds after the start of the test (cursor position), error is +0.34% compared to reference tape on an expanded scale of 0.1% per division.

alternating four-tone (2.8, 5.7, 11.8, and 15.8kHz) sequence tape (supplied in cassette form only by Sound Technology). This tape is analyzed by the test unit, and displayed with a phase reading for each tone. Azimuth is then adjusted by starting with the lowest frequency, and adjusting the playback head for minimum error. Such a procedure is then repeated through each higher frequency. Although a four-tone azimuth test tape is available from STL in ¼through 2-inch formats, Rusk presently uses the standard 15 kHz azimuth tone on the multi-frequency STL test tape for its azimuth alignment. The Model 1500A will analyze and display phase error for azimuth, so long as the tone falls into a "window" of about 13% frequency deviation centered around each display point. In our case we just set the phase error reading for minimum with each azimuth adjustment.

Bias Record Level and Adjustments

The most dramatic performance test occurs during the bias adjustment procedure. By setting the low-frequency limit on the 1500A for 2.1 kHz, a faster sweep time is made possible, and at the end of each sweep (in the repeat mode) a thirdharmonic distortion reading is displayed. This procedure enables a studio technician to set each machine for an ideal bias with Ampex 456 tape that can be at least 12 dB lower in distortion than is possible with the commonly used 2 to 3 dB over-peak bias method. (For a discussion of this tape phenomenon, which is also exhibited by the new Scotch 226 tape, see: *How to Select and Treat a Mate — Your Studio Mastering Tape, by J. Talmage Ball and W. Jeffrey Ball, Re/p, October 1978 issue, page 70.*)

After the bias is set, the next adjustment is record level. By using the Model 1500A in the AC volts mode, a low-distortion 1 kHz tone is made available to the tape recorder for proper level adjustment. Record/playback frequency response can now be adjusted by using the expanded 2 dB per division scale for both channels. By comparing the curves between

successive sweeps of each channel, original specifications can be obtained by adjusting the record EQ and low frequency playback EQ trims. The channel under alignment can be analyzed and displayed between adjustments by alternately engaging the reverse switch after every other measurement. This button redirects the data storage to the opposite channel, so that alignment changes can be constantly updated and viewed on the CRT. Data can be obtained regarding which low- and high-frequency tones should be printed as a reference set for that particular master tape. At 30 ips, the low-frequency response tone becomes crucial, due to the head-bump level variations. With this graph of frequency response, a technician can choose the best low-frequency tone, preferably one that crosses the zero reference set level, that will provide consistent "low-end" as a particular tape moves from machine to machine.

Record azimuth is adjusted in a similar fashion as described earlier, through the use of the alternating four-tone generator enabled in the azimuth mode. Frequency response can easily be checked again to compensate for any differences due to azimuth. Also, by printing the swept frequency response tones on tape along with a normal set of reference tones, this travelling master tape can have its response optimized to a much greater degree on any machine at studios using a 1500A during routine alignment procedures.

Quick checks can be made after such routine alignment for second- and third-harmonic distortion, noise level, flutter, and speed error. Values obtained can thus be compared to a "house standard" for a minimum acceptable performance. With the Model 1500A test system, the entire audio recorder and tape as an integral system can be tested within the same time span it would take a technician to perform just a normal playback and record level/equalization alignment.

Multi-Track Alignment

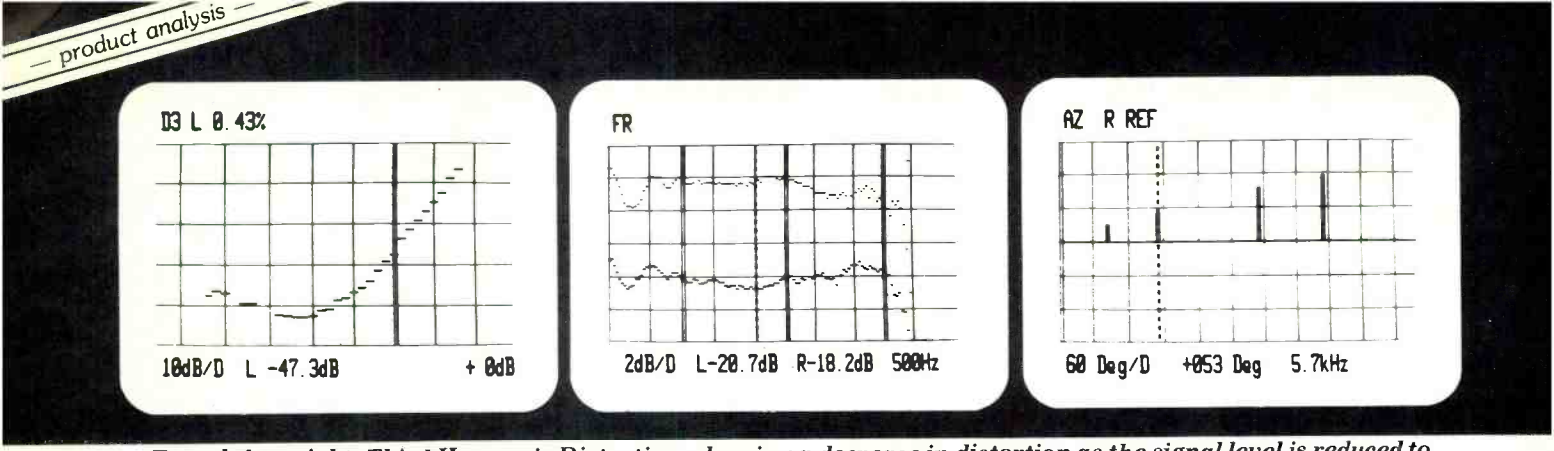
The alignment procedure for an Ampex MM-1200 24-track is the same as that just described for the ATR-102. A simple prototype interface was built to facilitate the switching of individual tracks through the Model 1500A test unit. This auxiliary device helped reduce the time it took to repatch each channel as the alignment progressed. Another modification Rusk Studios has included is the addition of a buffered and normalled oscillator patch point on our Harrison 3232B console. These changes allowed the output from the 1500A to feed all 24 tracks at once. Now only the outputs from the MM1200 have to be switched into the test unit.

Annually, we recontour our 24-track head stack to re-establish the original manufacturer's ramp angles and radii for proper contact between the head gaps and tape. After the last process, we were able to accurately verify the recontouring by observing the frequency response plots on all 24 channels with the Model 1500A. On a few leading tracks of the reproduce head, we found that the head-bump anomolies in frequency response occurred at a higher frequency and with a larger level variation than on other tracks. A closer, magnified inspection of the head gap revealed a slight flatness at the top of the head stack. A second recontouring brought the response closer, so that all the tracks were within the original frequency-response specifications, and all head-bumps anomolies lined up evenly across the low-frequency spectrum.

Full-Range Capability

The recent addition of a film-transfer room enabled Rusk Studios to use the 1500A to the full range of its measurement capability. For example, the initial setup of three-track 35 mm heads on a custom RCA/MTM film recorder required height, tangency, tilt, and azimuth adjustments. These were easily set by using a combination of tests provided by this measurement unit. The channel separation test allowed us to observe crosstalk between any two adjacent tracks. While playing back a SMPTE three-track 35 mm 1 kHz test loop, we

. . . *continued overleaf* —



From left to right: Third Harmonic Distortion, showing a decrease in distortion as the signal level is reduced to residual noise; two channels of Frequency Response on a scale expanded to 2 dB per division; and Azimuth Misalignment, for which the tape machine heads are adjusted for minimum vertical bar height.

noted the values of channel separation between adjacent tracks after each height adjustment. Correct height alignment for the head stack was reached when the channel separation was at a maximum value. Optimum tangency and tilt were verified with the AC voltmeter and frequency response tests, after an initial playback/record response alignment was performed. Also, mechanical motor-drive linkage was properly aligned after obtaining a minimum flutter test reading.

The second-harmonic distortion test, which is automatically nulled by the 1500A as distortion is measured versus level, enabled us to adjust the factor-set trim pots inside the MTM RA101C record/playback amplifiers for minimum distortion values. The final set-up adjustment — a noise measurement test which has a 100 dB scale reading — provided the information to allow us to properly ground and shield critical interconnections, *without* having to listen at loud monitor levels for almost inaudible buzzes and static.

Semi-professional Tape Recorders

Without a doubt, semi-pro tape decks and cassette recorders require the most maintenance. The Model 1500A has enabled us to consistently maintain a high standard of performance throughout our collection of equipment, including Technics M63, Tandberg TCD-330, and TEAC A100 cassette decks, plus Technics RS-1520, TEAC A-7300 and 7010SL reel-to-reel machines. In addition to routine repair of our older machines, we have to constantly set up brand new recorders to within original specifications. Usually tape speed, frequency response and azimuth all need "fine tuning" on these *factory-inspected* units. The time saved and headaches eased in this application are immeasurable.

Other Studio Uses

The 1500A is described as a tape recorder test system, yet it can be used to measure other audio gear as well. The tests are

confined to AC voltmeter, frequency response, noise level, and second- and third-harmonic distortion. Generally, the unit works best with unity gain equipment. Immediate applications include the testing of equalizers, limiters and noise-reduction units. Presently Rusk Studios are experimenting with non-unity gain equipment, such as preamps, line and power amps, and console input/output modules, as well as unity gain time-delay equipment. As of yet, however, we have not settled on an accurate measurement technique.

When testing non-unity gain equipment, caution must be used since it is important not to exceed the maximum input level of 10 VRMS. Properly designed input attenuators should be used between the device under test and the 1500A, since the input impedance is rated at 100 kohms.

One of the best features on this unit is the ability to present hard copy through an optional paper printer. However, through a slight circuit modification made available by Sound Technology, the video output that drives the printer can also be recorded on a half-inch VHS or Beta video recorder for permanent record-keeping. At the present time, we are implementing an additional modification that will allow us to playback the videotape through the Model 1500A's video monitor. Also, the accompanying user-added audio commentary track will be played back through the 1500A audio amplifier and speaker circuitry. With the flip of a switch, we will be able to compare a test measurement of a defective machine against its original specification measurement stored earlier on video tape.

Future Expansion

It's hard to believe that such a versatile and powerful measurement system, with already seemingly endless applications, still has room in it for future expansion. Sound Technology recently introduced a spectrum analysis board, which plugs into one of the two empty slots inside the 1500A mainframe. With a new face plate and buttons, the unit will be able to perform audio and wow-flutter spectrum bandwidth measurements. The unit can also be used as an acoustic room analyzer, with a set of properly calibrated microphones and a pink-noise source.

Our suggestions for other future measurement additions are an intermodulation (I.M.) distortion test measurement, and a popular computer interface bus. Also we would like to see an additional mode in which the test unit could analyze tape for dropouts. The Model 1500A already has a mode to analyze tape speed, but only over a period of 10.5 minutes. By adding a drop-out analysis test and increasing this time length to 15 minutes or more, a standard reel of tape running at 30 ips could be examined and displayed while a studio tape machine records a tone on the tape under test. Such a test would be equally useful for carrying out quality-control tests on 35 mm magnetic tape — whose consistency quite often leaves a lot to be desired, to say the least!

An audio and visual alert could also be added to call attention to the specific period of recording time when the tape experienced possible drop-outs. If this application could be practically developed, many trying moments in the control room could be eliminated! The studio could realistically control the quality of tape on which it stakes its reputation.

Our Conclusions

In summary, the Sound Technology 1500A Tape Recorder Test System has proved to be an essential and time-saving maintenance tool at Rusk Sound Studios. Through its computer technology, multiple diagnostic measurements and tedious data logs are reduced to a fraction of the time that similar tests would have taken using conventional test equipment. Rusk Sound Studios feels that, by providing instantaneous measurement information in a video format, the Model 1500A is truly the first test system that keeps pace with the complex circuit advances in studio equipment today.

□ □ □

New Products

SONY PCM-3324 STATIONARY-HEAD DIGITAL MULTI-CHANNEL RECORDER

The PCM-3324 is described as the cornerstone of the Sony system of professional digital audio recording equipment. It provides 24-channel recording with 16-bit full linear quantization. Dynamic range is stated as greater than 90 dB, frequency response is flat from 20 Hz to 20 kHz, and harmonic distortion is less than 0.05 percent with unmeasurable wow and flutter. The recorder uses half-inch tape and provides up to sixty minutes recording time on a 14-inch reel.

The new Sony unit fully translates all of the functions of conventional analog multi-track recorders while affording many additional features offered by digital technology. Overdubbing, ping-ponging, punch-ins and punch-outs are said to be much smoother than parallel analog operations, because edit points can be digitally cross-faded. Punch-ins and punch-outs can be automatically repeated with precisely the same edit timing. The rehearsal capability of the PCM-3324 permits final checking of the signal by simple cross-fading without actually recording.

The PCM-3324 has two additional analog tracks to allow razor-blade editing in the same way as with conventional recorders. Splicing points can be easily cross-faded for smooth sound-level transitions.

A separate SMPTE time code track is provided which allows synchronized recording of up to 72 tracks. The SMPTE track also permits compatibility with video tape recorders.

Conventional A/D (analog to digital) and D/A (digital to analog) converters use complex circuitry requiring extremely precise adjustments. Sony has developed advanced integrated circuits for the A/D, D/A converters, assuring 16-bit accuracy with no adjustments.

The PCM-3324 incorporates a newly developed error correction system called the Cross Interleave Code, which is claimed to possess far greater error correction capability than competitive systems. This three-step system prevents loss of the music source, even if up to 88 percent of signal is interrupted within a constrained length of tape.

SONY PROFESSIONAL AUDIO
9 WEST 57TH STREET
NEW YORK, NY 10019
(212) 371-5800

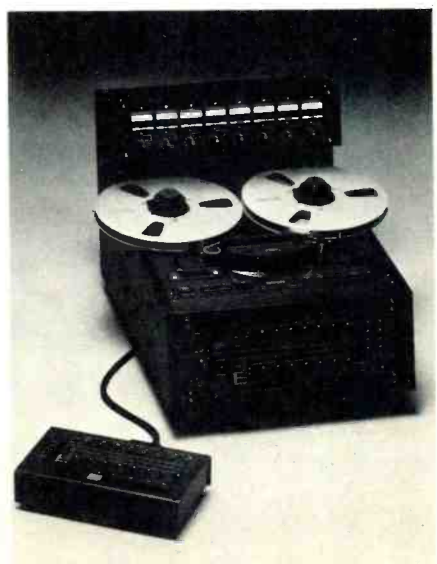
For additional information circle # 65

OTARI INTRODUCES NEW GENERATION HALF-INCH EIGHT-TRACK RECORDERS

Announced as the successor to the proven design of Otari's MX5050-8D, the new, compact 5050 Mark III/8 ½-inch eight-channel machine retains all the proven features of its predecessor such as: 15 and 7½ IPS tape speeds, variable speed D.C. servo capstan, selective reproduce for overdubbing, built-in dual frequency test oscillator, easily accessible electronics adjustments, and true, three-head design.

New features of the 5050 Mark III/8 include proprietary microprocessors to provide real time counting with LED display, dynamic braking and transport logic, automatic monitor switching, headphone monitoring for each channel (selectable combinations), and peak reading indicators on each channel.

Additional professional features which are



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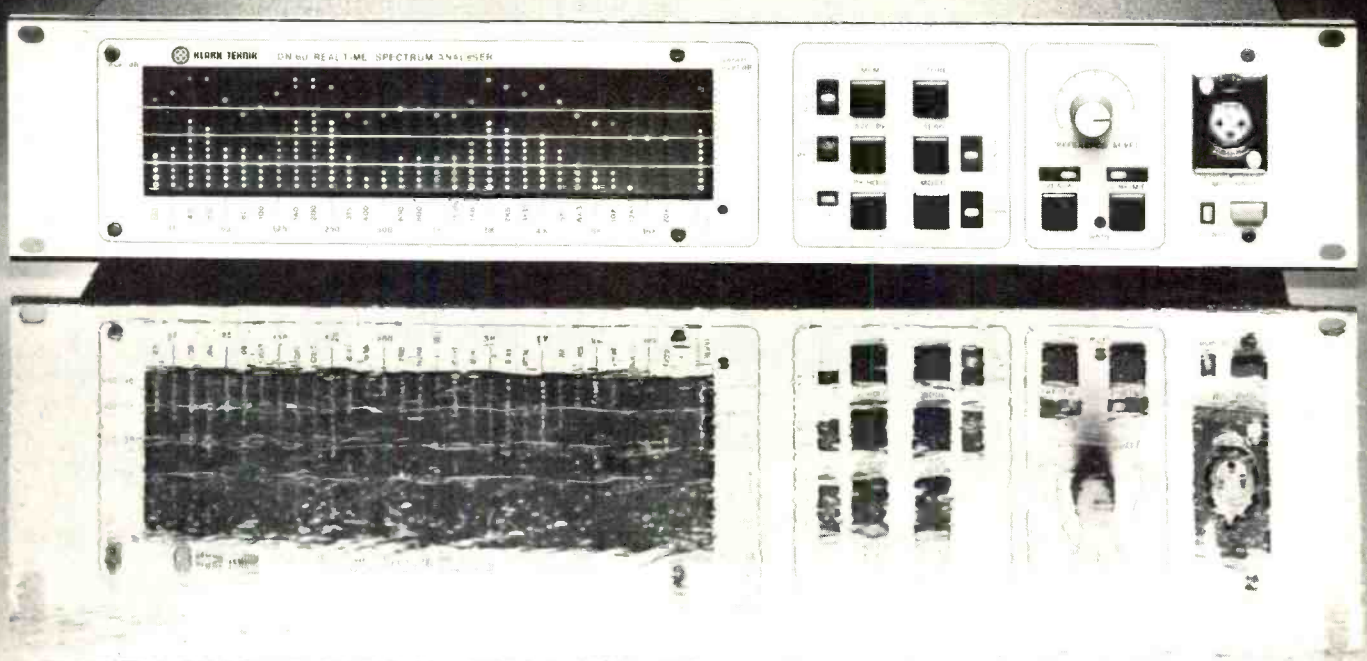

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The "DN60 REAL TIME ANALYSER" is the heart of a new audio measurement system from the engineers at KLARK-TEKNIK and is the perfect compliment to the new DN27A Equaliser shown below. Using Micro-Processor based circuitry, the DN60 is capable of performance checks on virtually any audio equipment, and is especially well suited for aligning audio tape recorders. On-site performance verification, whether of a 10,000 seat arena, or a studio control room, is easily facilitated with the DN60; and is an excellent method of building your customer's confidence.

If you're a recording or broadcast studio, include the RT60 Option and provide quick and accurate alignment for your reverberation systems (plates, springs, digital). The DN60 incorporates a pink noise source internally, and occupies only 3 ½" (2U) in a standard 19" rack.

If you take your sound on the road, the DN60 can help make that 5 p.m. sound check go easy, leaving enough time for a quick dinner before showtime. With the inclusion of Three Memories, and a Peak-Hold function, you can expand the scope of your sound check, and provide that extra edge of excellence.

The DN60 is Micro-Processor technology at a price you will like.

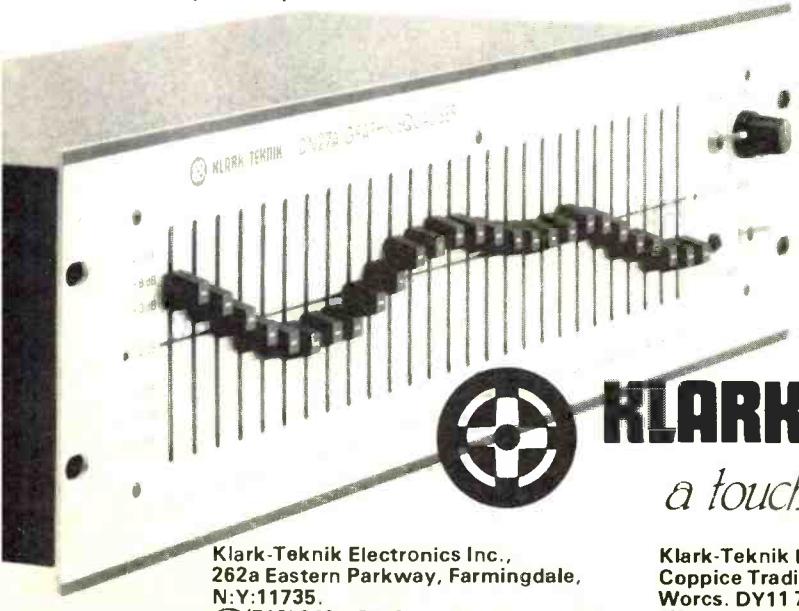
Other useful features include:- "A" Weighting , Average or Peak Reading and Selectable Response Time.

DN60 Options:- • Calibrated microphone • RT60 (Reverberation time) package • X/Y Plotter and oscilloscope interface • Dot matrix printer interface.

Now complete your system with the new DN27A ⅓rd OCTAVE EQUALISER and quickly adjust your sound to perfection.

The new DN27A is the successor to the DN27, acclaimed world-wide as the industry standard in graphic equalisation. New features include improved headroom, earth lift facility and fail-safe system bypass plus the legendary reliability and performance of it's predecessor.

Please contact us and get our DN60 and DN27A data sheets and related literature.



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New Products

said to make the 5050 Mark III/8 an excellent production machine comprise: separate controls for record status and channel monitoring; master mode switching; memory rewind; and transparent punch-ins and -outs.

The Mark III/8 will be available for delivery from all Otari dealers in July.

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

For additional information circle # 69

NEUMANN PRICE REDUCTION ANNOUNCED; NEW BROCHURE OFFERED FOR FET 80 CONDENSER MICROPHONE LINE

This six page, four color brochure features the complete line of microphones, including the new KMR 82 Shotgun, USM 69 Stereo microphone, and the U89 with its revolutionary new capsule design. Descriptions of each microphone as well as complete technical specifications are included. Also featured are Gotham's special products, including colored windscreens, the N80 power supply, and colored cables.

On April 15, 1981, Gotham reduced prices on many microphones in the Neumann line. These lower prices are made possible by the strengthening of the U.S. Dollar relative to European currencies. The popular U87 Studio Condenser Microphone is now available at suggested retail price of under $1,000. Other models including the U89, KMR 82 Shotgun, U47 fet and KM 82/4/5 are reduced in price by as much as 12% from 1980 prices.

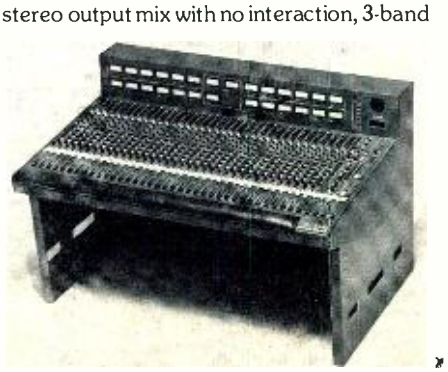
The new Neumann fet 80 Condenser Microphone brochure and the new microphone price list, PL 2, are available from:

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

For additional information circle # 70

MCI JH-636 MOBILE RECORDING CONSOLE

The JH-636 Mobile Recording Console is available with 36 or 72 inputs in a frame size requiring floor space of only 36-inch width by 62-inch length. Features include 24 output busses with VU metering, in-line monitoring with stereo/mono outputs, capability for simultaneous multitrack recording and stereo output mix with no interaction, 3-band



equalizer with HP and LP filters on each input, 6 effects/foldback sends, VCA grouping with 4 dedicated group master faders, a true PFL (pre-fader listen) system with built in speaker and amplifier, and 8 auxiliary communication input/outputs capable of tying into external intercom systems.

The console is designed to securely mount to the bed of a van or truck, and as such all inputs/outputs and maintenance access is available from the front. Although 36 inputs are standard, an input module with dual microphone pre-amplifiers summing into a single fader output is optionally available, thereby providing a maximum of 72 inputs. Five echo (line) returns, built in oscillator with pink/white noise source, and Monitor source selections with level controls are standard.

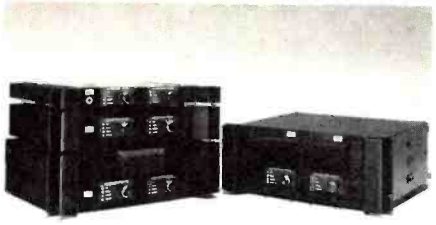
The MCI JH-636 Mobile Recording Console is claimed to be the only console specifically designed for mobile recording facilities.

MCI
1400 WEST COMMERCIAL BLVD
FORT LAUDERDALE, FL 33309
(305) 491-0825

For additional information circle # 71

UREI ANNOUNCES CHANGES IN AMPLIFIER FAMILY

The former model 6400 has been redesignated the Model 6300, and has been re-engineered to fit in a more compact cabinet only 5¼ inches high (vs the previous 7-inch). Power output remains 225 watts per channel at 8 ohms, and pricing remains as previously announced.



Model 6500, 275 watt per channel amplifier is currently being delivered, and the additional three amplifiers in the family are expected to be ready for delivery during the summer of 1981.

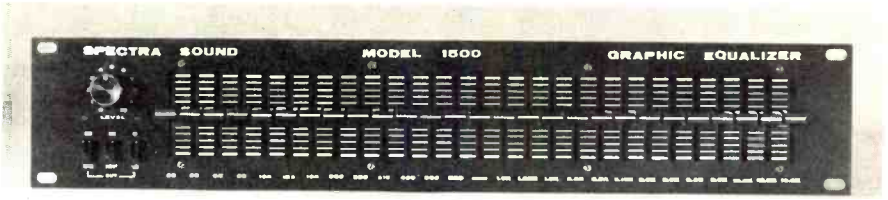
UREI
8460 SAN FERNANDO ROAD
SUN VALLEY, CA 91352
(213) 767-1000

For additional information circle # 72

SPECTRA SOUND MODEL 1500 THIRD-OCTAVE GRAPHIC EQUALIZER

With performance in noise and distortion said to be significantly superior to that previously available, only the highest quality components and precision machine work have been incorporated in the design of the Model 1500. The unit is intended for use wherever low noise and low distortion are important.

Twenty-seven bands (ISO frequency standard) of equalization are provided with a switchable boost and cut range of either ±6 dB or ±12 dB. The Model 1500 features a constant impedance input level control with a range from ±10 dBv to full signal attenuation. A green LED is provided for power indication, and a red LED indicates audio signals approaching overload.



The Model 1500 will mount in a standard 19-inch electronic equipment rack, and is available for either 110V AC 60 Hz or 220V AC 50 Hz operation.

SPECTRA SONICS
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(801)392-7531

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New Products

EIGHT TRACKS ON QUARTER-INCH TAPE ANNOUNCED BY FOSTEX

Believed to be the first in this format, the Model A-8 was designed by many of the same engineers who originally developed the 8 track, ½-inch tape format nearly a decade ago.

The recorder operates at 15 IPS with 7-inch reels to combine high production values with the economy of standard tape; records up to four tracks at one time on alternate tracks; and provides full sync overdub facilities.

With a new transport system said to be designed specifically for multi-track recording and not an adaptation of conventional hi-fi open reel recorders, the A-8 is driven by three light-weight, cool-running DC motors with the capstan motor controlled by an FG servo.

Reliable IC logic replaces ordinary relays in the A-8's transport control section, with motion sensing in every mode to prevent tape stretch, and automatic shut-off switches on both tension arms to prevent tape spill.

Record and monitor switches are separate, and the A-8 automatically plays back previously recorded tracks when in the overdub or Sync mode. A large LED-readout digital counter has memory to permit return to a pre-designated spot on tape.

For remote punch-in/punch-out operation, the A-8 accepts nearly any remote footswitch from a guitar amp, reverb, or other musical instrument.

A ±10% pitch control permits the user to "re-tune" any instrument already recorded or during recording, gives singers a broader range, and provides special effects.

A built-in Dolby C noise-reduction system is included as a standard component of the A-8, to provide expanded headroom and excellent tracking of high-frequency transients.

The Fostex Model 350 Mixer (8x4x2) is available separately as a mate to the A-8.

For easy portability, the compact recorder/reproducer weighs only 29 pounds, and measures 13½ by 14 by 6¾ inches (H x W x D). Suggested retail price is $2,500.

FOSTEX CORPORATION
15431 BLACKBURN AVENUE
NORWALK, CA 90650
(213) 921-1112

For additional information circle # 76

QUAD-EIGHT INTRODUCES 248 BUILDING BLOCK CONSOLES

The new 248 Component Series consoles start with a building-block frame which can be configured in many ways. The user starts with two basic requirements — number and kinds of inputs and outputs. The unique "building block" housing sections each feature slots for four module strips with three dedicated modules in each strip. Any series of modules may be replaced with any other in its series. Input and output sections can be added as needed: 8 to 32 in (and up); 2 out, 4 out or 8 out; plus 4 auxiliary outputs for echo, cue, foldback, etc.

The 248 System's flexibility allows totally different configurations within the same mechanical frame. To name a few: recording, broadcasting, sound reinforcement and combinations of features from one

New Products

configuration to another.

QUAD-EIGHT ELECTRONICS
11929 VOSE STREET
NORTH HOLLYWOOD, CA 91605
(213) 764-1516

For additional information circle # 79

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According to the manufacturer, over three years of comprehensive R&D has gone into this simple yet innovatively designed mounting assembly. There are numerous recording and broadcast industry applications in both fixed and mobile environments, for the installation of speakers, video monitors, lighting equipment, etc. How about a stand for your auto-locator?

An attached object or device may be aimed and precisely locked into position once the desired angle of adjustment has been chosen. This is accomplished by tightening a single main bolt which passes through the clamp/flange. In this way, speakers may be focused so that a balanced stereo image is directed to any point within a wide listening area.

OMNIMOUNT SYSTEMS
P.O. BOX 2789
LOS ANGELES, CA 90068
(213) 876-4355

For additional information circle # 80

BGW SYSTEMS INTRODUCES MODELS 75 AND 320B POWER AMPS

The Model 75, an all-new replacement for the Model 50A, is a 2-channel power amplifier FTC rated at 25 watts per channel into 8 ohms or 37.5 watts per channel into 4 ohms. A rear-panel switch converts the unit to monaural bridged operation, delivering 75 watts into 8 ohms. The Model 75 features an ultra-low noise torroidal main power transformer, discrete differential input amplifiers, and a front-panel headphone jack. Other standard features are detented potentiometers, and a rugged welded steel chassis.

Professional net price for the Model 75 is $379.

From input to sheet metal, the Model 320B is a completely re-designed replacement for the Model 320 2-channel commercial power amplifier. Rated at 100 watts per channel into 8 ohms (direct output), the 320B also is equipped with output autotransformers for driving 25-volt or 70-volt distribution lines. All new, transient-free discrete circuitry is said to yield silent operation during turn-on and turn-off, while a new front-end improves overall performance. Other features include a magnetic circuit breaker, chassis-mounted sockets for optional input transformers, and precision stepped attenuators.

Professional net price for the Model 320B is $799.

BGW SYSTEMS, INC.
13130 YUKON AVENUE, SO.
HAWTHORNE, CA 90250
(213) 973-8090

For additional information circle # 81

SPECTRA SONICS MODEL 510 BANDPASS FILTER, MODEL 802 SIGNAL GENERATOR INTRODUCED

The battery-powered Model 510 Bandpass Filter is a 20 Hz to 20 kHz (-3 dB) amplifier/filter with 18 dB/octave slopes. This unit allows the user to directly measure the audio noise output of any electronic equipment, or system, using an ordinary voltmeter. The unique battery-powered design of the Model 510 eliminates grounding problems associated with conventional audio

noise measurement systems, and may be used in the field (with no AC) with a battery powered voltmeter. Price: $27.

The Model 802 is an audio signal generator

with five selectable output frequencies. Output level is adjustable to a maximum of +11 dBv. The Model 802 is battery powered, thereby providing ground isolation between equipment under test. Intended for use in sound equipment testing, calibrating, and trouble-shooting, the Model 802 is compact, durable, and ideally suited for field application. Price: $150.

SPECTRA SONICS
3750 AIRPORT ROAD
OGDEN, UT 84403
(801) 392-7531

For additional information circle # 82

OMNI Q TL SERIES OF SYNCHRONIZER/EFFECTS MODULES

From Commercial Electronics, the TL Series is a low cost, high-quality modular system comprising the TL1 and its expander modules, the TL2 and TL3. According to the manufacturer, the units were designed with the Tascam/Otari market in mind but, owing to their unique flexibility, are finding acceptance in larger installations as well.

The TL1 will slave virtually any tape transport incorporating a D.C. controlled capstan motor (plug-in interfaces are available for some A.C. and frequency-controlled drives as well) to its master or an internal clock. A synchronization accuracy between master and slave of better than 50 microseconds (dependent on the transport) has been achieved. This enables a studio to expand its multi-track capabilities simply by adding another recorder.

The TL1 generates a time-code in minutes, seconds, and frames that is recorded on one track of each machine. If a certain amount of care is exercised in the selection of the program material, the two sync tracks can still be used for audio. The frequency response of the two time-code channels is down 3 dB at 15 kHz and continues to roll-off at 24 dB/octave.

For special effects production the TL1 provides a phase control to allow manual phasing of ±1 frame. Very impressive flanging effects are said to be feasible in this way. A set of advance and retard controls allow a continuously variable offset of up to 29:59:29, thus allowing delays from zero to almost half an hour!

The TL2 features a large LED read-out showing the clock time, the master or slave, or the difference between them. A phase meter provides a more accurate representation of the action of the phase control on the TL1. A dual auto-locate feature is also added that enables the slave to search for the parked master, and either stop when it finds it, or start the master and sync to it. The master can similarly locate to the last time read from the slave machine. Both machines can simultaneously locate to a jammed clock time.

The TL3 is still in the prototype stage at the present time and should be available by the end of this year. Essentially, it comprises a remote control for the TL2 providing: remote display, remote status LEDs, remote transport controls, a keypad for time entry, ten memories, and punch-in/punch-out facilities.

The TL Series will be marketed in the U.S. by Omni Q Inc. of Blaine, Washington.

COMMERCIAL ELECTRONICS LTD
1335 BURRARD STREET
VANCOUVER BC, CANADA V6Z 1Z7
(604) 669-5525

For additional information circle # 83

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YOU SAW IT IN R-E/P

— continued from page 24 . . .

—AUDIO/VIDEO— RECORDING

A NATIONWIDE SAMPLER

building.

"We do some storyline pieces," continues Weiner, "but most of the business is concert work. We tap right off the main audio mixing board to complement the two or three cameras we use on a shoot. Some groups come to us with masters already in the can. We cue it up, and shoot the footage to that on our soundstage. Music Vision just finished a 200-person party on that stage that we did live in conjunction with TCA. As you can see, we can handle some pretty big projects."

The structure also houses Guinn-Brown and Associates, a jingle and commercial firm that is independent yet non-competing. Staff at Third Coast are hoping that their presence will attract outside movie work and more commercial accounts into their area.

Continuing east brings us to **Nashville,** the home of country music, although many inhabitants of that fine city would like to broaden that outlook. Nonetheless, the Grand Ole Opry is the town's main music venue, and the number of television productions originating from there has been on the increase during recent years.

Kramer/Rocklen Studios and A & M Soundstage — A Creative Symbiosis

Kramer/Rocklen Studios has done work for practically every record company in Los Angeles and, on occasion, for the major movie studios, doing trailers, music-promotion films, concert videos, special-effects montages, title work, and documentaries.

A short while ago, A&M Records hired Kramer/Rocklen as consultants in regards to the Charlie Chaplin Soundstage, which the studio was using for storage, rehearsal, or the occasional music biz party.

"It was a great opportunity for us," explains Gary Rocklen, executive vice-president of K/RS. "My partner, Jerry Kramer, and I are always on the lookout for good stages and, through our consulting, were able to make it what it should be for us and others who wish to rent it. It's suitable for all types of production, but we started with the idea of making good music films on it. With that in mind, we added a 3-wall cove — an infinity cove — so we can shoot any kind of commercial or special effect there. It's also one wall away from one of A&M's great 24-track studios."

Any group on the stage can be recorded live during the shooting, and the synchronizing of video or film with the audio recording is done via SMPTE time code. In addition to the new dressing rooms, showers, lounge, control room, and offices, the excellent acoustics have convinced Peter Frampton to record his newest album there, as well as attracting such stellar talent as Toto, the Doobie Brothers, Joe Walsh, and the Brothers Johnson.

"After the consulting phase," continues Rocklen, "A&M hired us to stay on as managers for the stage; we now handle all the bookings and billing. We advised the company not to put in a very extensive complement of video gear, for the simple reason that there is as much film done as video. As video producers, my partner and I agree that we like to have the flexibility of bringing in what we need for the particular shoot. We prefer to rent what we need when we need it with our own company, and recommended that A&M do the same. By its very nature, video equipment becomes obsolete so quickly, and maintenance is so high that it didn't make sense to invest. The only gear used on that stage on a permanent basis is lighting, and grip equipment which can be used for either film or video.

"How the piece is distributed doesn't matter. We're doing video programming. We shot and produced The Tubes live at the Greek Theater, Hollywood. They're a good example of a group that's breaking now; they've never sold a ton of albums, but have had a loyal following. Norman Lear's company, one of the largest syndicators in the world, is taking the product for foreign cable TV, foreign syndicated TV, and video cassettes. We have a deal with Pioneer Video Artists of America for pressing it on LaserDisc, and another deal pending with JVC for a VHD-type disk. In addition, it's been shown on ON-TV, will be on SELECT-TV in the next two months and, I suspect, another two dozen cable outlets throughout the country before its useful life is exhausted. It may last forever.

"The point is, you create programming; it really doesn't matter what the format is. There are certainly plenty of recognized outlets for this material. Everyone wants to see it and buy it." □□□

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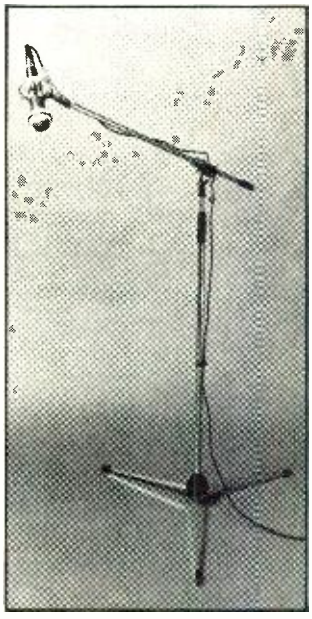

five Beyer microphone stands and booms. A full range of mic mounts for floor and desk use, with fixed and folding bases. Available with collapsible tubes for easy packing. Also heavy-duty stands for speaker cabinets.

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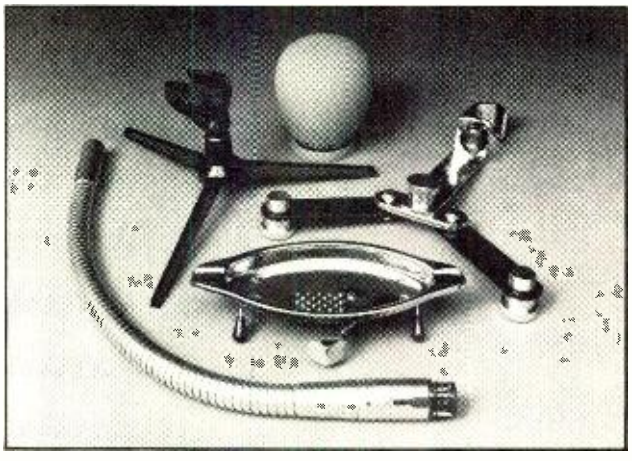

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—AUDIO/VIDEO— RECORDING

A NATIONWIDE SAMPLER

The Opry has a video/audio facility rivaling the best in the world — both at the venue and mobiles. A percentage of their remote overload assignments are handled by Fanta Professional Services' 24-track audio mobile unit. Fanta's president, Johnny Rosen, estimates that "about 50% of our work so far in 1981 has been video related: music for commercial TV, syndicated TV, or promo for groups. We concentrate on audio only. You can call Opry Land and book our audio truck, or call here and book their video truck. We do all the producer-type work, regardless of whether the initial call is to Opry Land or us. The video gear is all 1-inch helical, C-format, and we average about three calls like that per month.

"The cost is so high," Rosen continues, "It's not feasible to buy our own [video] truck with so many great ones available to us at reasonable prices. Maybe down the road, but I'd have to learn a lot more about it first. Everybody thought the cost of VTRs was gonna drop with the introduction of the 1-inch format but, in actuality, they cost about as much as 2-inch quad machines by the time you get all the bells and whistles. The only advantage now is that there are some very sophisticated, high-quality editors available — both in the form of people and equipment."

John Rosen (left) and TV producer Curtis Davis in Fanta's audio/video mobile truck.

Florida is the home of the Bee Gees, Jimmy Buffet, and Ponce de Leon's Fountain of Youth (the latter, unfortunately, has been forced out of business by skyrocketing real estate prices). Even though Miami is primarily known as a winter alternative and a great place to visit, Criteria Studios has been able to turn out a string of hits that would make anyone in New York, Los Angeles, or Nashville very proud.

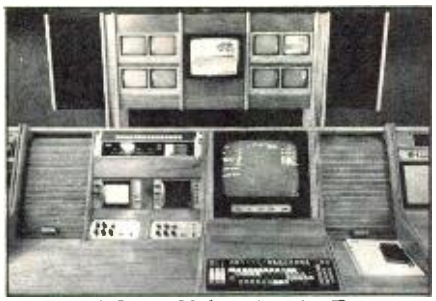
"We feel that the record business, at this point, is a dinosaur," says Criteria's vice-president Ron Albert. "There is no record business without video. We feel that in the near future Criteria will be thought of as an audio/visual concept house, as opposed to a recording studio for making records.

"For example: we did a Jimmy Buffet video shoot a couple of weeks ago — six-camera, 1-inch format with dual 24-track recording capacity. It was done on stage in Tampa and Orlando, on location in Key West, where Jimmy's from, and on our soundstage. We're dealing essentially with the professional music market, and most of our clients are from out of town, although we certainly would be open to commercial accounts.

"Locally, Miami is very healthy, because of the commercial business. The Governor of Florida is very supportive in helping to keep it an open market, and allowing commercial and motion-picture directors to come to this area to shoot their projects for much less money than they can in a union town."

Not surprisingly, 75% of the businesses interviewed derived a large portion of their income from sources other than music group work, be they industrials, commercials, training films, documentaries, sales films, and so on. That percentage is sure to climb to over 95% as the sample of studios contacted becomes sufficiently large.

The capital of **Massachusetts** is the atypical-typical town; maybe a better way to state it would be: "more typical than most other major cities across the country." Commonly referred to as "demo city," (see: *The World of Demo Recording*, by Paul Lehrman, *R-e/p Views April 1981 Issue, page 188 — Ed.*) Boston has an active original music scene around the Cambridge and Back Bay sections, thousands of music students from Berklee, the conservatories and scores of college music departments, as well as a large number of professional musicians playing clubs and showrooms throughout New England. Despite that unique reservoir of talent that the majority of U.S. cities do not come close to matching, "there's no record business here that would support our facilities," claims Rob Cavicchio,



Third Coast Video, Austin, Texas
CMX 340-X video tape editor

owner and president of Soundtrack, a three-studio complex with a fourth under construction.

"The people who depend on just music groups are hurting, because there's no money in that here in Boston. We record music groups in the 24-track room during our downtime at night, but they're buying by price, not by the quality we're offering. The only reason we can afford to spend a half million dollars on a new studio is because we're so deeply entrenched with the advertising agencies. They're the only people paying for quality."

"Bean Town" has built a reputation on the output of prestigious schools — Harvard, MIT, etc. — and the accomplishments of hi-tech industries, — including Polaroid, dbx, and Digital Equipment. These assets, coupled with the close proximity to New York, makes the commercial and industrial markets particularly lucrative options. In addition, WCVB-TV Channel 5 in Boston is one of the biggest independent programming producers in the country. With those opportunities, does it make sense to enter the video marketplace?

According to Cavicchio, "We'll do no shooting, just editing. If you have the cameras and all the rest of the shooting aspects, then you're selling yourself like an arranger or musician. But if you have just the post-production facilities, then you're selling yourself as a service, and all the people out there busting their asses to shoot that commercial bring the work to you. We'll ultimately have a 30- by 30-foot control room with 1-inch CMX post video editing gear. If a client wants a video shot, we'll suggest people we like working with, but we *don't* want to be on the shoot, or know anything about it."

These thoughts seem to echo the feelings of owners across the United States. With the ad agencies and industrial accounts comes the money and that, in turn, affords the

Florida's Criteria Studios ties in with Large Music-Video Complex

"Video music is the way of the future!" How many times have you heard that said? Probably more times than you care to recall, and it's still just a pipedream as far as many studio operations are concerned.

But Mac Emerman, who is quoted above, dreamed up Miami's Criteria Studios in 1953, and today it has one of the top reputations in the world. In 1981, Emerman is at it again, but this time he's not alone. Ken Chambliss, President of Video Tape Associates, is just as excited about the audio/video marriage as Emerman. To prove it, the two have merged their respective companies to form what is probably the largest video-music enterprise in the world.

Appropriately, the hybrid organization is called The Video Music Group, Inc., and will go into production for all types of media, including network, cable, videodisk, or a series of musical video shows.

Designed by John Storyk with the input of Criteria's Albert brothers, the engineering staff, and producer Tom Dowd, the new superstudio is nine-sided: its ceiling rises to a height of 27 feet, then stairsteps down to 8 feet. The video future has been taken into account with the installation of lighting controlled via motorized dimmers. Subtle lighting effects can be achieved while the proper light level is maintained for shooting.

Video Tape Associates is said to be one of only four video houses equipped with the Bosch FDL60 digital CCD telecine, a revolutionary new film scanner that circumvents the need for video tubes.

The Florida-based Video Tape Associates also owns four remote trucks. A 30-foot truck, designed and built by VTA about 18 months ago, is equipped with six cameras and four VTRs.

"With clients like the Bee Gees, Ambrosia, and B.B. King," says VTA president Ron Albert, "we want to give them the best we can. They're too valuable to us not to." □□□

—AUDIO/VIDEO—
RECORDING

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luxury of investing in costly video equipment. But very few studios showed any interest in the possibility of getting involved first-hand with the shooting process itself. A solid 60% preferred to refer their clients to established video companies, or develop affiliations with those that had made the investment and gained the experience already.

"We have no plans at this time to do video for video," repeats Sigma Sound's Joe Tarsia. "We may develop an association with someone who does video, but our business is audio. I don't think there's any big future for video production inside a recording studio where the recording studio is a set. That's a novelty that would wear pretty quickly."

Applewood Studios in **Denver**, Colorado, does mostly music groups and a few soundtracks, and has no future plans to enter the video race. Caribeso Studios, **Atlanta**, Georgia, rents equipment per project, and **Tampa's** Hayes Recording just completed a 24-track renovation to give support to the video companies moving into that area. Scott Chance of Live Oak Sound Recorders, **Norfolk, Virginia,** rents out space to an outside technical director for commercials, but is considering taking a shot at producing videodisk software of music groups in live concert. Audiocraft Recording Company, located in **Cincinatti, Ohio,** tried video five years ago, and found that there was no market in that city at all.

Chicago may not be very far from Ohio, but the audio/visual marriage has been carrying on there for some time. According to Murray Allen at Universal Recording: "There are more production facilities in Chicago than anywhere else. It's the center of post-production in the country."

Universal has racked up a score of 13 albums on the charts with groups such as the Blues Brothers, Styx, and the Manhattens; has been into film and music production since 1957; and offered video sweetening facilities since 1971. Allen claims that his studio does 12,000 sessions per year, and even with that volume, they don't own their own video equipment either.

On the other hand, Kathy Newman of the recently remodeled Gerim Recorders (formerly Chess Records), also based in Chicago, reports that she's had music groups asking about video recordings, and feels there's enough interest among her clients that they may expand into that area within the next year.

By far the most intriguing recording studios are those that are located in substantial cities surrounded by sparsely populated terrain such as farm land, mountains, and so forth. Such facilities usually draw their clientele from vast areas, support themselves with commercial accounts as well as local and network TV assignments, and offer practically every service under one roof. Kaye-Smith Studios, **Seattle,** is probably the biggest house in the

Northwest. Bonneville Productions in Salt Lake vies with the Osmonds' facility in Provo as the most magnificent in **The Mountain States.**

Tulsa Studios provides innovative film facilities in their mid-west area, but subcontracts video work, while Communicreations subcontracts only its post-production work. Sound Recorders, **Omaha, Nebraska**, whose activities are high-lighted in the adjoining sidebar, is representative of this type of venture.

Regardless of where a studio is located, when it comes time to reinvest your money, keep these points in mind about the video alternative. Even though the demand may not yet be obvious, it might be waiting for the right opportunity or proper vehicle through which to show itself. The initial investment for video can be enormous, but you don't have to have the best equipment or facilities all at once. Video is a relatively new industry. This could be the right time to get in on the ground floor, whether it be shooting weddings, lectures or covering the news as a television stringer. Whatever you decide, just remember that you're only limited by your imagination and determination. □□□

news

MCI ADOPTS SONY MULTI-CHANNEL STATIONARY-HEAD DIGITAL AUDIO RECORDING STANDARD

MCI, Inc., and Sony Corporation announced recently that MCI has adopted the common format for multi-channel stationary-head digital audio announced last year by Sony Corporation and Willi Studer of Switzerland.

In making the announcement, MCI president G.C. "Jeep" Harned said that the company is confident the Sony format will be widely accepted in the industry as an international standard in multi-channel stationary-head digital audio recording.

According to Mr. Morizono, senior managing director of Sony Corporation, "Sony welcomes MCI's decision to adopt our format. Along with MCI, Sony expects to explore possibilities for mutually utilizing technology for future research and development in a wide range of digital audio applications."

BGW SYSTEMS ASSUMES EXCLUSIVE MARKETING OF EMILAR PRODUCTS

Manny Mohageri, President of Emilar (a division of Systems Magnetics Corp.), and Brian Wachner, President of BGW Systems Inc., have jointly announced an agreement whereby BGW will take over the worldwide sales and marketing of Emilar's existing line of low frequency loudspeakers, compression drivers, horns, and crossover networks, as well as newly developed products. Products to be offered include a new series of woofers and a new bullet-style supertweeter: the Model ECVH-175 ultra-high frequency driver with self-terminating horn. Acquisition of the Emilar line now enables BGW to offer complete sound reinforcement amplifier and speaker systems.

Last year BGW acquired exclusive U.S. marketing rights to the popular British-made Tannoy studio monitor line.

Emilar products, respected for their precision, durability, and superb sound quality, will be sold under the BGW name.

OTARI MOVES TO NEW U.S.HEADQUARTERS

The new building located in Belmont, California, with 20,000 square feet of offices, labs, and warehousing, more than doubles the company's previous facilities. Otari took occupancy in early April.

The telephone remains the same, with an expanded internal system: (415) 592-8311.

OTARI CORPORATION
2 DAVIS DRIVE
BELMONT, CA 94002

JVC OFFERING DIGITAL TAPE RECORDING/EDITING SYSTEM FOR RENT

Tom Nishida, vice president of the JVC Cutting Center (Hollywood, California), has announced that rental digital recording and editing equipment is now available in Nashville, New York and Los Angeles. The following independent facilities are currently "on-line" with the JVC DAS Series 90 system:

Master Technologies (an allied company with Masterfonics), 28 Music Square East, Nashville, TN 37203. (615) 327-4533.

Dickinson Digital, 9 Westinghouse Plaza, Bloomfield, NJ 07003. (201) 429-8996.

Capitol Recording Studio, 1750 North Vine Street, Hollywood, CA 90028. (213) 462-6262.

The recording/editing system is fully portable, and sufficiently compact to be carried in a small car or an airplane as standard baggage. The system has already been used by many major recording artists. JVC will arrange a free trial recording session, on location, for qualified studios and independents on an "as available" basis.

The JVC Cutting Center is located at 6363 Sunset Boulevard, Suite 500, Hollywood, CA 90028. (213) 467-1166.

news

"PLAYBACK" — A NEW VIDEO NEWSLETTER FROM JVC

Contained in the first issue of a new free video newsletter from US JVC Corporation are a host of useful items of interest to recording studios contemplating the perhaps inevitable move towards a greater involvement with video recording. Articles range from a basic introduction to the subject of selecting a video camera, through abstract video art and the use of special effects, to an in-depth feature on the video studios at the University of Tennessee.

Copies of "Playback" are available free of charge from:

US JVC CORPORATION
41 SLATER DRIVE
ELMWOOD PARK, NJ 07407
(201) 794-3900

For additional information circle # 112

STUDER REVOX TO BUILD DIGITAL LASER COMPACT-DISC RECORD PLAYER

Studer ReVox has entered a license agreement with N.V. Philips/Sony Corporation for the production of Compact-Disc record players.

An agreement with Sony was signed a few months earlier, on a common digital format for professional longitudinal (fixed head) recording on magnetic tape.

The Compact-Disc accommodates 60 minutes of recorded sound on a disk, which is only 120 mm (4¾ inches) in diameter. The recording is scanned without physical contact by a laser beam via an optical system. The number of playings of such a disk is said to remain without influence on the quality of sound reproduction. Combined with an outstanding system for error correction (CIRC) an optimum of reliability is achieved: even scratched discs will play without interferring noises. The audio signal is represented by 44,100 samples of information per second, each sample being stored on the disk in the 16 bit (linear) code.

The obtainable performance values are: signal-to-noise ratio better than 90 dB; stereo crosstalk better than 90 dB; total harmonic distortion less than 0.05%; and quartz accurate speed stability.

TRIDENT OPENS U.S. BRANCH

Known as Trident (U.S.A.) Inc., the United States Corporate Headquarters in Stamford, Connecticut will be headed by Vice President Ken Bray, who previously was responsible for sales in Europe and the rest of the world.

The office will be selling and providing service support on a direct basis to the North Eastern U.S.A., and in addition will be providing support as necessary to the existing dealers in the South and West: Wilson Audio Sales in Nashville, and Studio Maintenance Services in Los Angeles.

TRIDENT U.S.A. INC.
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(203) 357-8337

STUDIO UPDATE

Northeast:

☐ **RECORD PLANT**(New York City)has taken delivery of a custom T.S.M. 56-channel automated recording remix desk built by Trident Audio Developments and supplied by Empirical Audio, Ossining, New York. Trident's tradition has been to have an independent input and monitoring section. This new board, however, which was built to Record Plant's exacting specifications, necessitated extensive modifications to accommodate 56 channels of automated remix capability. The T.S.M. console at Record Plant is of an "in-line monitor" style, and is fitted with Melquist VCA bypass faders on each input. *321 West 44th Street, New York, NY 10036. (212)581-6505.*

☐ **MINOT SOUND** (White Plains, New York)has recently installed a fully-automated 36-input Harrison console, and the new Sony Digital Reverberator. *Minot Sound, 19 South Broadway, White Plains, NY 10601. (914)428-8080/(212)828-1216.*

☐ **DAWN RECORDING STUDIOS**(Farmingdale, New York)announces the completion of their new 24-track studio, which features an Audio Processing systems 24-track, automation-ready console feeding a 3M 24-track recorder with full dbx noise reduction, and Studer A700 mix and copy machines. Outboard gear includes Eventide delay lines, Harmonizer®, Phase Shifter and Flanger, Loft delay lines, AKG reverb, and a wide assortment of microphones.*756 Main Street, Farmingdale, NY 11735. (516)454-8999.*

☐ **NORTHSTAR RECORDING STUDIO**(Portland, Oregon)has opened a new 16-track facility, which features the new Sound Workshop Series 30 console with fully sweepable EQ, Penny and Giles faders, etc.; TEAC Tascam 85-16 recorder; Otari stereo mixdown machines; MICMIX reverb, Lexicon Prime Time DDL, UREI limiters, JBL monitors, and BGW power amps; plus Neumann U-87, KM-84, AKG C414, Sennheiser 421, E-V RE-20, and Shure SM-57 microphones. The control room is said to feature a unique acoustic design, while the studio allows for a wide flexibility of recording environments.*3716 Southeast Ramona, Portland, Oregon 97236. (503)760-4342.*

☐ **SOUND TECHNIQUE, INC.**(New York City)is the name of a new disk-mastering facility owned by **Gladys Hopkowitz,** who for the past 15 years was chief disk cutter at Mastertone Recording Studios. Ms. Hopkowitz has mastered all types of music, ranging from classical through contemporary, including jazz and reggae/dub. Sound Technique is also equipped to produce audio-visual records in all formats, including DuKane.*130 West 42 Street, New York, NY 10036. (212)869-1323.*

☐**SYNCRO SOUND**(Boston, Massachusetts), a new facility owned by the **The Cars,** has engaged architect **John Storyk** to provide design services. Originally the home of Ross Cibella's respected Century III Studios, the new facility will feature a two-level studio environment complete with a spiral staircase, and a speaker monitor system co-designed by Storyk and **Ted Rothstein.** Syncro is a cooperative venture of Cars' leader **Rick Ocasek** and the group's producer/manager **Roy Thomas Baker**. In addition to serving as the focal point for future Cars product, the studio will be available for sessions of other recording groups. *Boston, MA.*

☐ **SORCERER SOUND**(New York City)has announced the opening of its new upgraded recording facility, which includes an automation-ready Acoustilog GB-1 30-input console with VCA grouping, 4-band sweep EQ, and Multilyzer plasma metering; Studer A80 24-track and 2-track machines; Dolby 24-track noise reduction; and EMT plate and Lexicon digital reverbs. **Charlie Walden** and **Dan Dryden** from Austin, Texas have been in mixing **Dan Del Santo's** forthcoming album *That's life in the Big City*, with engineer **Greg Curry**. *19 Mercer Street, New York, NY 10013. (212) 925-1365.*

—NORTHEAST ACTIVITY—

Currently at **CELEBRATION RECORDING STUDIOS**(New York City) are producers **Richard Perry** and **Trevor Lawrence** working on the new **Pointer Sisters** album, with engineer **Piers Plaskitt.** Also working with Plaskitt is **Vaughn Harper** of WBLS Radio producing **The Nobles**. Additional projects include **Bernie Hoffer** recording his first album with engineer **Michael Farrow.** *2 West 45th Street, New York, NY 10036. (212) 576-9095.* ■ At **SIGMA SOUND STUDIOS**(New York City) **Lou Rawls** is commencing work on a new album with producers **Mtume & Lucas**; engineer is **Jim Dougherty**. Combining on 60-second commercials for Kentucky Fried Chicken are **Gladys Knight** and **B.B. King,** with producer **Debbie McDuffie**, and engineer **Carla Bandini**. *1697 Broadway, New York, NY 10019. (212)582-5055.* ■ **SOUND IDEAS**(New York City)having completed its first totally in-house 32-track 3M digital album for CBS/Sony's Terumasa Hino, is keeping the jazz flowing with artists like **Gallery** for ECM, **Manfred Eicher** producing, and various quartet albums featuring Japanese saxist **Mabumi** paired with **Tony Williams, Miroslav Vitous,** and **Kenny Kirkland. Richard Beirach, Al Foster, George Mraz** and **Mike DePasqua** combined on a set for Trio Records. In non-jazz related fields, engineer **Jim McCurdy** has recently completed the movie soundtrack for *Most Likely To Die. 151 West 46th Street, New York, NY 10036. (212)575-1711.* ■ Recent sessions at **BLUE ROCK STUDIO**(New York City) include: **Brian Eno** working on a project with **Michael Ewasko** engineering; **The Waitresses** recording an album for Ze Productions, with **Kurt Munkacsi** engineering and co-producing with **Chris Butler**; and **Allan Schwartzberg** and **Dave Matthews** producing **Jim Dawson,** engineered by Ewasko. *29 Green Street, New York, NY 10013. (212) 925-2155.*

Southeast:

☐ **DUDLECK SOUND STUDIOS**(Burlington, North Carolina)has been re-opened under new management by **Good Vibes Productions.** Along with the 6½-foot Baldwin grand piano, G.V.P. has added an Arp Axxe and String-ensemble, a Yamaha YC-30 organ and a CP piano, a Ludwig drum kit, a Musser M-55 vibraphone, and a Degan Marimba. The facilities are owned by **George Dudleck,** with **Deborah Bulla** acting as general manager and **Wesley Bulla** as engineer. *1921 Trail 5, Burlington, NC 27215. (919) 226-0189.*

☐ **SPECTRUM RECORDING STUDIOS**(Deerfield Beach, Florida)has announced completion of their newly rebuilt 16-track facility. Featured is a Live-end/Dead-end™ studio and a control room designed by Studio Supply Company, Nashville. New equipment includes a Sound Workshop Series 3028MB 20-in/16-out console, Ecoplate reverb, Lexicon Prime Time, a UREI LA-4 compressor/limiters, Eventide Harmonizer®, new microphones by Neumann and AKG, custom built Ivers & Pond grand piano, and Sequential Circuits Prophet 5 synthesizer.*999 S. Federal Highway, Deerfield Beach, FL 33441. (305)428-0119.*

—SOUTHEAST ACTIVITY—

STRAWBERRY JAMM STUDIO(West Columbia, South Carolina)reports the release of **Eddie "Sweet Thang" Brown's** album, *Has Anybody Seen "Sweet Thang."* The LP was produced and engineered by **Rob Crosby,** and features vocals by **Patti Blair.** Other work out of the studio to be released includes the new single by **Jim Chappell** on the Doko label, and a 45 by **Second Nature,** who are planning work on an album soon. *3964 Apian Way, West Columbia, SC 29169 (803) 356-4540.* ■ **ARTISAN RECORDERS** (Fort Lauderdale, Florida) Mobile Unit recently recorded **Point Blank** live at the Sunrise Musical Theatre in Fort Lauderdale; **Terry Manning** and **Peter Yianilos** engineered. The Mobile Unit also recorded British stars **Gerry and the Pacemakers** live in Miami Beach, 16 stories high atop the Saxony Hotel. *1421 Southwest 12th Avenue, Pompano Beach, FL 33060. (305)786-0660.* ■ **Bill Cosby** has been at **CRITERIA RECORDING STUDIOS**(Miami, Florida)doing voiceovers, with **Steve Kimball** engineering. A new LP by **Third World,** *Let's Rock The World,*

. . . ***continued overleaf*** —

to be represented in the next available issue, write:
R-e/p STUDIO UPDATE
P.O. Box 2449
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STUDIO UPDATE

recorded and mastered at Criteria, has been released internationally. The reggae album was produced by Third World, with **Bruce Hensal** engineering, assisted by **Patrice Carroll. Mike Fuller** was the mastering engineer. Fuller also recently mastered a digital album by **Rachel Sweet,** produced by **Peter Salley**. *1755 N.E. 149 Street, Miami, FL 33181. (305) 947-5611.*

South Central:

☐ **COLUMBIA STUDIOS**(Nashville, Tennessee)has just installed a new low-noise mastering system called CX (for Compatible Expansion). Developed by CBS, the system will soon be used to master all CBS releases, and will be made available to all labels and clients at no additional charge. The CX system is an audio process that is said to reduce surface noise of records by 20 dB via a compression/expansion system that extends the dynamic range. Although a decoder is needed to realize the noise reduction benefits, such records are compatible with conventional stereo equipment. *34 Music Square East, Nahville, TN 37203. (615)259-4321.*

—*SOUTH CENTRAL ACTIVITY*—

OMEGA AUDIO(Dallas, Texas)has been keeping its 24-track mobile rig busy lately with a variety of projects. Recently the facility was used to cut 24-track material for **Merle Haggard** at the Longhorn Ballroom in Dallas, Texas; engineering was by **"Fuzzy" Owen, Paul Christensen,** and **Russell Hearn**. In addition, Omega has purchased a BTX computerized system that allows three-machine control of audio/video interlock. Recent 24-track video sweetening projects have included commercials for **Six Flags Over Texas** recreational park, documentary projects with **Catholic Charismatic Services** of Dallas, and a children's show pilot called *Sunshine Factory*, with Dallas producer **Michael Meece**. *2805 Clover Valley Drive, Garland (Dallas), TX 75043. (214)226-7179.* ■ Recent sessions at **MUSIC CITY MUSIC HALL**(Nashville, Tennessee)includes: Husband and wife team **R.C. Bannon** and **Louise Mandrell** working on their first single for RCA, with producer **Tom Collins** and **Bill Harris** at the board; **Leon Russell** cutting a double album's worth of country standards with **Harold Bradley, Jerry Reed, Billy Byrd, Buddy Spicher,** and **Bill Harris** engineering with assistance from **David Debusk;** and **Roger Whittaker** teaming with producer **Chet Atkins** for his next RCA release. *30 Music Square West, Nashville, TN 37203. (615)244-1060/255-9084.* ■ At **SOUND EMPORIUM**(Nashville, Tennessee)**Joe Waters** recently produced a digital mix on his first nationally-released single, *Queen of Hearts*, using a JVC digital two-track recorder system, with **Billy Sherrill** engineering. Producer **Steve Gibson** recently completed an album with artist **Marc Speer** for Kat Family Records. **Rick Schirmer** engineered the sessions. **Buffalo & Brandy,** a male/female duo from Buffalo, New York, recently started work on a new album, with engineer/producer **Jim Williamson,** assisted by **Cathy Potts**. *3102 Belmont Boulevard, Nashville, TN 37212. (615) 383-1982.*

Mid- & Southwest:

☐ **R.M.J. RECORDING STUDIO**(Detroit, Michigan) announces the opening of its new studio, which features a 24-track MCI JH-500 Series console with full automation, and UREI 813 monitors. Outboard gear includes a Delta-Lab DL 2, dbx limiters, Lexicon 224 reverb, and Echoplate II. **Dwight West** is studio manager, with **Ron Johnston** acting as engineer. *18301 West McNichols, Detroit, MI 48219. (313)533-8511.*

☐ **SOLID SOUND INC.**(Ann Arbor, Michigan) reports the acquisition of two new 9-foot concert grand pianos; an 1897 Steinway and a 1905 Baldwin. Delivery has also been taken of several new microphones, including some old tube models and PZMs. *P.O. Box 7611, 1289 Dixboro Road, Ann Arbor, MI 48107. (313)662-0667.*

☐ **WESTWOOD RECORDING STUDIOS**(Tucson, Arizona)has installed another MCI JH-114 16-track recorder with Autolocator II and TVI, a BTX Model 4500 SMPTE Time Code Synchronizer, and a BTX Model 100 Time Code Generator. The new MCI 16-track is currently being used in sync with the studio's existing MCI JH-114 24-track recorder. The pair of multitracks with SMPTE provide 40-track capability with 38 usable tracks (less two tracks for SMPTE). Westwood Recording Studios claim to be the first studio in Arizona with SMPTE for +24-track applications, as well as having facilities for complete automated mixdown with the MCI JH-636 console. Recent clients to utilize the new 40-track set-up have been **Up With People,** who have just completed two new albums. Also just completed: new albums by **Gable Wales, Street Pajama,** and **Chris Buck. Just Arrived** for Ariana Records. *964 West Grant, Tucson, AZ 85705. (602)622-8012.*

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STUDIO UPDATE

☐ **UNIVERSITY RECORDING STUDIOS**(Columbus, Ohio) has opened its doors, according to owner **Tom Howard**. The new facility is equipped with a Soundworkshop console feeding a TEAC Tascam 80-8 recorder, as well as a ½-track and ¼-track machines. Parametric and graphic equalizers are offered, plus digital delay, reverb, and echo units. Mikes are by AKG, Beyer, Neumann, Sennheiser, and Shure, while rental instruments are supplied by **The String Shop** a short walk away. *1869 North High Street, Suite 35, Columbus, OH 43201. (614)291-7800.*

—MID-WEST ACTIVITY—

At **SOLID SOUND INC.**(Ann Arbor, Michigan) recent projects completed include an LP by country artist **Evelyn Clark,** tracks for Cherie Records' artist **Jerry Carr,** and **Jack Mollette's** *Borderline Express* album. The sessions were all engineered by **Rob Martens** and **Will Spencer**. *P.O. Box 7611, 1289 Dixboro Road, Ann Arbor, MI 48107. (313)662-0667.* ■ **FIFTH FLOOR RECORDING** (Cincinnati, Ohio) has **Zapp** in recording a new album for Warner Brothers Records, with **Robin Jenney** engineering assisted by **Greg McNeily. Dayton** is also in mixing a new single for Liberty Records with the same control-room crew. *517 West Third Street, Cincinnati, OH 45202. (513)651-1871.* ■ **UNIVERSITY RECORDING STUDIOS**(Columbus, Ohio) has been recording remote and session work with A&M artist **Willie Phoenix**, as well as handling studio dates with **The Deltones, The Cockroaches** and **The Rick Luckie Band**. Engineering chores were split between owner **Tom Howard** and chief engineer **David Sheward**. *1869 North High Street, Suite 35, Columbus, OH 43201. (614)291-7800.* ■ **THE RECORDING CONNECTION** (Beachwood, Ohio)mobile 24-track studio was used recently by **Sister Sledge, Rick James** and **Stephanie Mills** at the Meadowland, New York; the **Parliament Funkadelics** in Dayton, Ohio; plus **Todd Rundgren** for the NBC Live Satellite Network from Woodstock, New York. *23330 Commerce Park Road, Beachwood, OH 44122. (216)464-4141.* ■ Recent sessions at **HEDDEN WEST RECORDERS** (Schaumburg, Illinois)includes **Sport of Kings, Apprentice, Jeff Grosser,** and **Heavy Manners** and **The Phonics** projects with producer **Michael Freeman. Western Echoes, Privateer,** and **Gene Phillips** have been working with engineer **Bill McQueen,** and **Greg Holland** and **Gregg Perkins** working with **John Nevin.** *1200 Remington Road, Schaumburg, IL 60195. (312)885-9378.*

Southern California:

☐ **SPINDLETOP RECORDING STUDIOS**: In a'Studio Update' item published on page 202 of the April issue of *R-e/p*, the incorrect telephone number was included for Spindletop Recording Studios, a new MCI-equipped facility recently opened in Hollywood, co-designd by **Hal** and **Vio Michael** and **Scott Putnam**. The correct telephone number for Spindletop is: (213) 851-1250.

☐ **CINESOUND COMPANY**(Hollywood) has announced a $250,000 update of its motion-picture mixing equipment. A state-of-the-art mixing console has been in full operation since January with a complement of new Multitrack Magnetics reproducers. Cinesound president **Rose Green** commented: "After 38 years of service to the small independent producers in Hollywood, Cinesound now can offer the most modern of facilities to its many loyal customers." The console was designed by Frank DeMedio, since 1965 a top engineer and designer of consoles for the music industry. *915 N. Highland Avenue, Hollywood, CA 90038. (213)464-1155.*

☐ **DISK MASTER STUDIO**(Hollywood) has been opened by engineer and cutting specialist **John Stachowiak,** who has mastered disks for such clients as **The Beatles, Neil Diamond, Herb Alpert,** and **Kenny Rogers**. The mastering facility is equipped with AEG-Telefunken Magnetophon M-15A Preview and Copying machines; Neumann's transformerless SP-79C Transfer Console, featuring Neumann compressors

and TTM noise reduction; Neumann SAL-74B Cutter Drive Logic driving a Neumann SX-74 cutter head; and a Neumann VMS-80 recording lathe, Stachowiak has worked as an independent recording engineer for such studios as The Record Plant, Filmways-Heider, and Columbia Studios, London, and intends to run Disk Master Studios as a one-man operation to ensure personal quality control at every step of the mastering process. *6363 Sunset Boulevard, Suite 720, Hollywood, CA 90028. (213)469-1949.*

☐ The Remote Recording Division of **RECORD PLANT**(Los Angeles) has added a fourth recording truck to its fleet, designed specifically for the smaller television or film shoot, home recording or live radio show. The interior, designed by **Michael Rubenstein** of Michael A. Rubenstein Associates, Healdsburg, California, with acoustical and electronic design by Record Plant's **Jack Crymes**, accommodates a single multi-track digital or analog tape machine (plus a second machine if necessary); a nominal quantity of microphones, stands and outboard equipment (including closed-circuit TV); and a crew of two audio technicians. Whereas Record Plant's three large trucks rent for an average of $2,500 per day, Truck #4 will rent for $1,500 a day, including the aforementioned equipment. Additional equipment will be charged for on an "as necessary" basis. The truck's console, designed by Record Plant and built by Auditronics, features 32 inputs, 24 multi-track outputs; simultaneous 2-track and mono facilities that can accommodate video and radio productions; and outputs for headphone mixes, stage talkback, stage foldback, PA mixes, stage monitors, etc. Monitoring is via a JBL 4311 loudspeaker system. *8456 West 3rd Street, Los Angeles, CA 90048. (213)653-0240.*

☐ **KENDUN RECORDERS**(Burbank)has announced the addition of **Mallory Earl** as staff engineer. Earl, who will be available both as senior mixer and as a producer, has an impressive list of engineering and production credits covering 15 years in Los Angeles, San Francisco, New York, London, and Paris. Gold record artists include **Jefferson Airplane, Hot Tuna, Graham Central Station, Larry Graham, Ronnie Laws, Neil Diamond** and **Helen Reddy,** to mention a few. Earl is currently producing and engineering **Doll** for Family Productions, and **Kim Lawrence** for The Rainbow World Production. *619 S. Glenwood Place, Burbank, CA 91506. (213)843-8096.*

—SOUTHERN CALIFORNIA ACTIVITY—

HARLEQUIN SOUND RECORDING STUDIOS(Northridge) recently played host to **Black Sabbath,** in doing pre-production work for their upcoming album with engineers **Les Martin** and **Ronnie Dulac**. While in the studio, the band's vocalist, **Ronnie James Dio,** produced a Heavy-Metal project by his friend **Richard Bakalyan,** engineered by Dulac and **Corky Hallal**. *19347 Loneline Street, Northridge, CA 91324.* ■ **ELDORADO SOUND STUDIOS**(Hollywood) finds **The Sue Saad Band** in mixing tracks for the upcoming **Irv Azoff** film, *Heavy Metal.* The band is also set to mix their upcoming album for Planet Records, with **Jim Saad** producing and **Dave Jerden** engineering. Meanwhile, **The Pigs** are cutting an album for the Distributing Music Group, with **Jeff Weston** producing and **Richard Digby Smith** at the console. *1717 North Vine Street, Hollywood, CA 90028. (213) 467-6151.* ■ **HERITAGE STUDIOS**(Hollywood) currently has seen **Jim Ed Norman** doing overdubs andd polishing new sides on artist **Jennifer Warnes,** with **Erik Prestige** at the board; and **Tony Peluso,** producer/engineer, co-producing artist **Leonard Allen** with **Gary Sims** and **Juli Burson** assisting. *1209 North Western Avenue, Hollywood, CA*

STUDIO UPDATE

90029. ■ At **SUNSET SOUND STUDIOS**(Hollywood) The **Doobie Brothers** have been doing production for songs to be released in Japan: **Ted Templeman** producer with **Jim Isaacson** engineering and **Stephen McManus** assisting. **Dennis Kirk** was in producing and engineering **Bette Midler's** new single; **Terry Christian** assisting. Other recent sessions include **Humberto Gatica** mixing an upcoming release of **Peter Noone, The Tremblers** for CBS; tracks for a new **Bill Champlin** release with **David Foster** producing, Gatica at the console, and **David Leonard** assisting; producer **Arif Mardin** doing synthesizer and horn overdubs for **Aretha Franklin,** with **Jeremy Smith** engineering; and **Toto** mixing a live single for CBS with Gatica engineering. *6650 Sunset Boulevard, Hollywood, CA 90028. (213)469-1186.* ■ At **KENDUN RECORDERS**(Burbank) **REO Speedwagon** have been in Studio D for an NBC video project, **Kevin Beamish** and **Tom Cummings** engineering; **George Benson** tracking and overdubbing with **Wayne Henderson** producing, **Mallory Earl** assisted by **Bob Winard** at the Solid State Logic consoles in Studios I and D; CBS artist **Gladys Knight,** producing herself, supervised instrumental and vocal overdubs and mixing sessions in Studio D, with engineer **Barney Perkins; Herbie Hancock** producing himself for David Rubinson & Friends cutting tracks and overdubbing various instrumentals in Studio D, with engineer **Leslie Ann Jones,** assisted by Winard; producer **Greg Perry** mixing **Mary Wells** project with engineers **Barney Perkings** and Winard in Studio I; **Ollkie Brown** producing vocal overdubs in Studio D for Motown's **Billy & Syreeta** project, with **Bobby Brooks** and Cummings engineering; tracks, overdubs, and vocals for **Latoya Jackson** on Joe Jackson Productions in Studio I, with Brown producing; *619 South Glenwood Place, Burbank, CA 91506. (213)843-8096.*

Northern California

CUSTOM RECORDING/STUDIO C(Stockton) has acquired a new Synclavier II 32-Voice Digital Synthesizer; Studio C has also upgraded to an automated 24-track facility. Recent sessions include a soundtrack for a City of Stockton promotional film, several jingles and radio stations ID's produced an engineered by **Drew Palmer** and **Ralph Stover**. *2220 Broadridge Way, Stockton, CA 95209.*

—NORTHERN CALIFORNIA ACTIVITY—

Recent activity at **DIFFERENT FUR RECORDING** (San Francisco)includes: **Walter Hawkins** overdubbing vocals for a new Light Records album project, with **Melvin Seals** engineering and **Don Mack** assisting; **J.D. Burrise** and **9th Creation** of 20th Century Records tracking a demo, produced by **Pat Gleeson,** and engineered by **Dan McClendon** and Mack; and **The Crayons** overdubbing vocals and mixing their new single, produced by **Glen Frendale,** engineered by **Stacy Baird** and **Johnston**. *3470 19th Street, San Francisco, CA 94110. (415)864-1967.* ■ At **BEAR WEST STUDIOS**(San Francisco)**Automatic** is working on a new album, **Doyle Williams** and **Mark Needham** engineering, **Larry Kronen** assisting. **Chuck Vincent** and Shuffle, featuring Chuck Vincent on bass and vocals, **Pee-Wee Ellis** on sax, **Mark Isham** trumpet and synthesizer, **Greg Douglass** guitar, **James Levi** drums, and **John Turk** on piano, are in the middle of thier second album; Ellis producing, Needham engineering and Kronen assisting. *915 Howard Street, San Francisco, CA 94103. (415)543-2125.* ■ Sessions in Studio B at **RUSSIAN HILL RECORDING**(San Francisco)include **Stuart Glasser** and **Stephen Hart** of Corasound mixed the debut album for **The Visitors;** ex-Doobie Brother **Tiran Porter** producing and playing with his new band The Press, with **Neil Schwartz** engineering

STUDIO UPDATE

and **Mike Sak** assisting; and **Chris Michie** and Doobie Brother **Keith Knudsen** producing tracks for Michie's second album for WEA in Holland, with **Jack Leahy** engineering. *1520 Pacific Avenue, San Francisco, CA 94109. (415)474-4520.* ■ At **SONIC ARTS CORPORATION**(San Francisco) the finishing touches have been completed in the transfer from PCM-Digital to disk masters of six recently-recorded sessions. **Stephen Kates,** cellist, accompanied by **Carolyn Pope-Kobler** on the studio's recently-acquired Boesendorfer Concert Grand piano recorded an album of Rachmaninoff, and one album of French composers for their new release on the Sonic Arts Digital label. **Leo de Gar Kulka,** owner and chief engineer of Sonic Arts, met with Maestro George Cleve for the final editing and transfer from Digital to Master of Mozart's Clarinette Concerto in A, featuring **Mark Brandenburg** as soloist. The Hungarian piano virtuoso, **Tibor Szasa,** recently recorded an album of Liszt, Mendelssohn, Bartok and Schubert for the Sonic Arts Label, also on SAC's PCM-Digital Recorder. *665 Harrison Street, San Francisco, CA 94107. (415)957-9470.*

Northwest:

□ **NOVA RECORDINGS SERVICES**(Seattle, Washington) a division of the Nova Music Group, is now operational for studio and location work. Equipment includes a one-inch MCI eight-track, transformerless recorder, BTX SMPTE time code (supplied by Pro Audio Systems), Studiomaster 16-channel console, and an URSA MAJOR Space Station. Current projects, include **Daryl** and **Renee Redeker's** fifth album and soundtrack work for Pacific Northwest Bell — both engineered and produced by **Paul Speer**. *1001 4th Avenue, Suite 3618, Seattle, WA 98154. (206)447-1696.*

—NORTHWEST ACTIVITY—

At **KAYE SMITH STUDIOS**(Seattle, Washington) the **Steve Miller Band** have completed tracks for an upcoming Capitol LP, featuring **Gary Mallaber** on drums, **Gerald Johnson** on bass, **Bryon Allred** on keyboards, and Steve on guitar, Miller also used the studio's soundstage for a five-camera video shoot of a live performance of the album; **Rick Fisher** engineering, **Steve Miller** producing. Other recent sessions include: **Judas Priest** doing vocal over-dubs on their live tapes, and mixing tracks for the radio program *The Source* with **Dan Formento** (NBC) producing and **Reed Ruddy** engineering; and **Dixon House** continuing a project for **Mike Flickers'** record label, Flicker producing with Perkins and **Reed Ruddy** sharing engineering duties with Mike. The Film/Video department, in addition to working on the Steve Miller album project, also completed work on two projects for **Heart,** which were broadcast earlier this year. The shoots were directed by **Gary Noren,** camera work by **Gary Payne** and post-production by **Lorne Morris.** and **Heart.** *2212 4th Avenue, Seattle, WA 98121. (206)624-8654.*

Canada:

□ **ROUND SOUND STUDIOS**(Toronto)has now upgraded to 16-track. According to vice president **Gerry Eschweiler,** Round Sound is the first studio in Canada to install a Soundworkshop Series 3020/20 recording console, supplied by Gerr Electro-Acoustics Ltd. Other control-room hardware includes an MCI 16-track with autolocate; bi-amplified JBL4343 monitors with Bryston amplifiers; and JBL 4311s and Auratone 5Cs. Cassettes are recorded with two new Alpage decks. The newest addition to the studios effects rack is a Lexicon 224 digital reverb unit (3.2 version). *357 Ormont Drive, Weston, Ontario, Canada M9L 1N8. (416)743-9979.*

STUDIO UPDATE

☐ **THE OCEAN SOUND CORPORATION**(Vancouver)is in the process of constructing a new, two-studio complex. The new location will feature six acoustically isolated areas, including two identically equipped control rooms, two studios, isolation booth and sound-lock area. All areas have visual communication with each other. *3127 West 8th Avenue, Vancouver, BC, Canada V6K 2C4. (604)733-3146.*

☐ **PRODUCSON RECORDING STUDIO**(Montreal)has added a brand new Soundcraft 1624 mixing console to its existing 16-track facility. In addition to the console, a Delta-Lab DL-2, MICMIX XL-305, and two Symetrix SG-200 have been installed by Richard Audio, Inc. A MICMIX XL-500 and a second Delta Lab DL-2 are planned for installation by late summer. *2302 Belgrave, Montreal, Quebec, Canada H4A 2L8.*

—CANADA ACTIVITY—

MUSHROOM STUDIOS(Vancouver)is now recording on 40 tracks using a new 24-track Studer A-80 synchronized with a 16-track Studer slave. **Loverboy,** described as the hottest new group to come out of Vancouver since B.T.O., is currently laying down basic tracks for their next album, and is the first group to debut the new machine. Pictured (left to right) in front of the Studers are: **Paul Dean,** leader of **Loverboy, Bruce Fairbairn,** producer of their album; and **Keith Stein,** engineer on the project. Other recent sessions include: **Straight Lines** working on a new album with producer **Jeffrey Lesser,**

. . . at Mushroom (Left to Right) Paul Dean of Loverboy, producer Bruce Fairburn, engineer Keith Stein

whose previous credits include **Pat Travers, Barbra Streisand, Sailor,**and **Strawbs,** and engineer **Rolf Hennemann;** and **The Wires** laying down four original tunes written by lead guitarist **Kenny Geatros,** with engineer and producer **Keith Stein.** *1234 West 6th Avenue, Vancouver, Canada V6H 1A5. (604)734-1217.* ■ At **LE STUDIO**(Quebec) **Terry Brown** has been producing **Toronto's** second album for Solid Gold Records (Canada) and A&M (U.S.A.). The group's debut album is nearing double platinum status in Canada. *Morin Heights, Quebec, Canada J0R 1H0. (514)226-2419.*

Sweden:

☐ **POLAR MUSIC STUDIOS**(Stockholm),**Abba's** own recording studio has purchased a 3M Digital Mastering system, comprising of 32-track and four-track recorders and electronic editing equipment. Polar's two studios have already been equipped with state-of-the-art 24-track analog recording and mix-down facilities. *Stockholm, Sweden.*

West Africa:

☐ **DECCA WEST AFRICA**(Lagos, Nigeria)has placed an order with Neve Electronics International for a large turnkey installation contract for a major new music recording studio complex. The contract, reported to be worth over $500,000, forms part of a major planned expansion programme which will result in Nigeria having the most modern and comprehensive music recording facilities in the whole of Africa. For the new studio complex, Neve is to supply a microprocessor-controlled Model 8108 console complete with a NECAM computer-assisted automation system. As part of their total turnkey responsibility, Neve are also supplying all the auxiliary studio equipment, such as Studer tape machines, monitor loudspeakers etc., as well as carrying out all the system engineering, cabling, installation and commissioning work. *Lagos, Nigeria.*

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STUDIO UPDATE

AUDIO/VIDEO UPDATE

Eastern Activity:

☐ **REEVES TELETAPE** (New York City) found London based director **David Mallet** in editing a video tape of **Jethro Tull** live at the Los Angeles Sports Arena. The tape was produced by Chrysalis Records for release on videodisk, and features six musical pieces edited on one-inch tape by RT staff editor **Barry Waldman**. The three-day sessions utilized three VPRs, a Quantel DPE 5000, and a four-track audio mix. Waldman's last musical editing work was on the promo for **David Bowie's** *Fashion. 304 East 44th Street, New York, NY 10017. (212)573-8888.*

☐ **F&F PRODUCTIONS, INC.** (Saint Petersburg, Florida) will increase its field tele-production capabilities this year with the addition of a new 55-foot mobile video truck with equipment manufactured and installed by RCA Broadcast Systems. Included are four TK-47T automatic triax cameras, a TK-781 studio/field production camera, and a TK-86 hand-held camera which will be operated in the triax mode. *Saint Petersburg, FL.*

☐ **EAST COAST VIDEO SYSTEMS, INC.** (New York City) is a new video consulting and construction firm formed by **Rich Bisignano** and **Paul Krucik,** both formerly staff members at JSL Video Services, New York City. Current projects include the complete plant design of audio and video facilities for one-inch editing at Broadway Video, Inc., and a system for off-line editing and duplication for Syncrofilm, Inc. *548 Broadway, New York, NY 10012. (212)431-7453.*

☐ **DEVLIN PRODUCTIONS** (New York City) has expanded its two channel Quantel DPE-5000 digital special effects generator with the addition of a Zoom In unit, and a computer that permits pre-programming of up to 280 consecutive edits. Artists utilizing the facilities have included **David Byrne** of **Talking Heads,** who was provided with a one-inch CMX video system to edit the music track of a 4½-minute film by **Bruce Connor.** Working with Byrne was Devlin staffer **Peter Ringer,** who also edited the *Jungle Dreams* video promo for Danish Rock star **Kim Larsen.** This piece was produced and directed by **Kenneth Madsen.** Devlin was also used to master for broadcast **The Beach Boy's** upcoming *Twentieth Anniversary Special,* produced by Zanya Productions in Association with Holmes and Associates. *150 West 55th Street, New York, NY 10019. (212)582-5572.*

Western Activity:

☐ **VIDEOWEST PRODUCTIONS** (San Francisco, California) the producers of *Backstage Pass* and *Videowest* television shows, has formed a video production division to cater for independent producers of rock videos. Videowest recently received a Northern California Emmy for the video production, *Two Triple Cheese, Side Order of Fries,* featuring **Commander Cody.** 735 Harrison, San Francisco, CA 94107. (415)957-9080.

☐ **VIDEOGRAPHY STUDIOS** (Los Angeles, California) has formed a videocassette and videodisk music division, and is currently producing its first album for the production company's in-house Synthetic Symphonies label, which will be devoted exclusively to the production of video music presentations, according to president **Bob Kiger.** First product on the new label is the *Video Christmas Symphony, No. 1,* due for release for the 1981 holiday season, and which combines original arrangements by composer **Richard Audd** of classic Christmas songs, along with visuals by special effects master **Chuck Cirino.** The album will be released in VHS and Beta formats, as well as both videodisk formats simultaneously. Music for the album was recorded at the firm's 24-track studio, which is a new addition to the Videography complex and a joint venture with engineer **Maurice Leach,** owner of Silver Bullet Sound. *552 Norwich Drive, Los Angeles, CA 90048. (213)659-0380.*

☐ **RUSK SOUND STUDIOS** (Hollywood, California) has added an audio sweetening service for video, in addition to its present multi-track recording capabilities. Technical Director/Engineer **Roman Olearczuk** reports that the addition of an Audio Kinetics Q-Lock 310 synchronizer allows lock-up of three audio and video machines in any configuration via SMPTE time code. The system was applied recently during a sweetening session for a live concert video of the rock group **Rox.** *1556 North La Brea Avenue, Hollywood, CA 90028. (213)462-6477.*

☐ **AUDIO-VIDEO RESOURCES** (San Francisco, California) has opened its newly remodeled facilities, including its new 24-track audio sweetening room, and announces the formation of its new division, A.V.R. Productions which ,the company says, is capable of video and audio production from conception to final dub. Plans for the near future include expansion of the production staff, a new editing system, video cameras, and new digital audio effects. *60 Broadway, San Francisco, CA 94111. (415)781-2603.*

☐ **GOWERS, FIELDS & FLATTERY PRODUCTIONS** (Los Angeles, California) have been out on location recently shooting three concerts: **Joe Cocker** in Calgary, Canada; **Van Halen** in Oakland, California; and **Chaka Khan** at the Roxy, Los Angeles. The Cocker and Khan concerts are destined for eventual release on videodisk, while the Halen performance is intended for personal use by the band. The company is also currently compiling a "sampler" video tape of previous shoots with the likes of **Blondie,** the **Rolling Stones, Rod Stewart,** and **Michael Jackson.** *550 Norwich Drive, Los Angeles, CA 90048. (213)652-3780.*

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