

MIX

Applications in Sound Reinforcement

TECHNIQUES

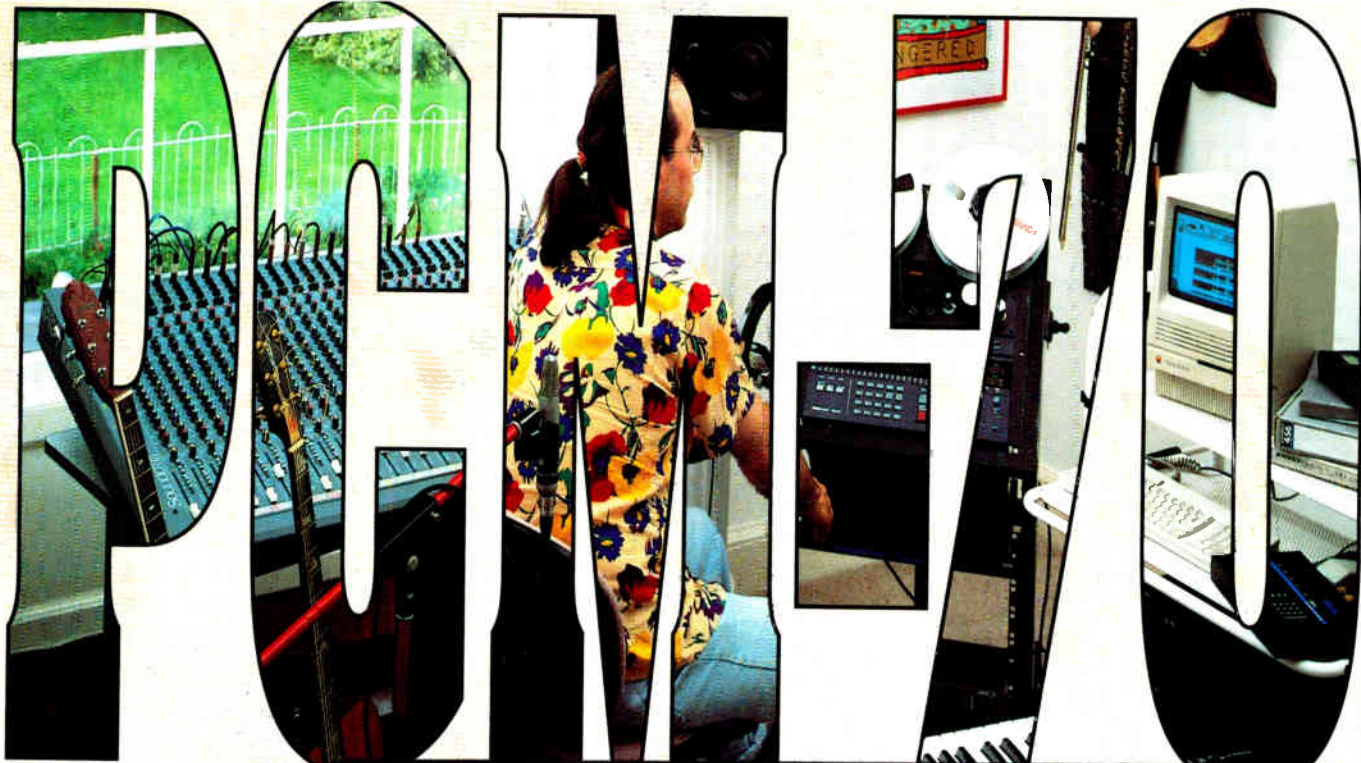
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EQ in the Digital Age



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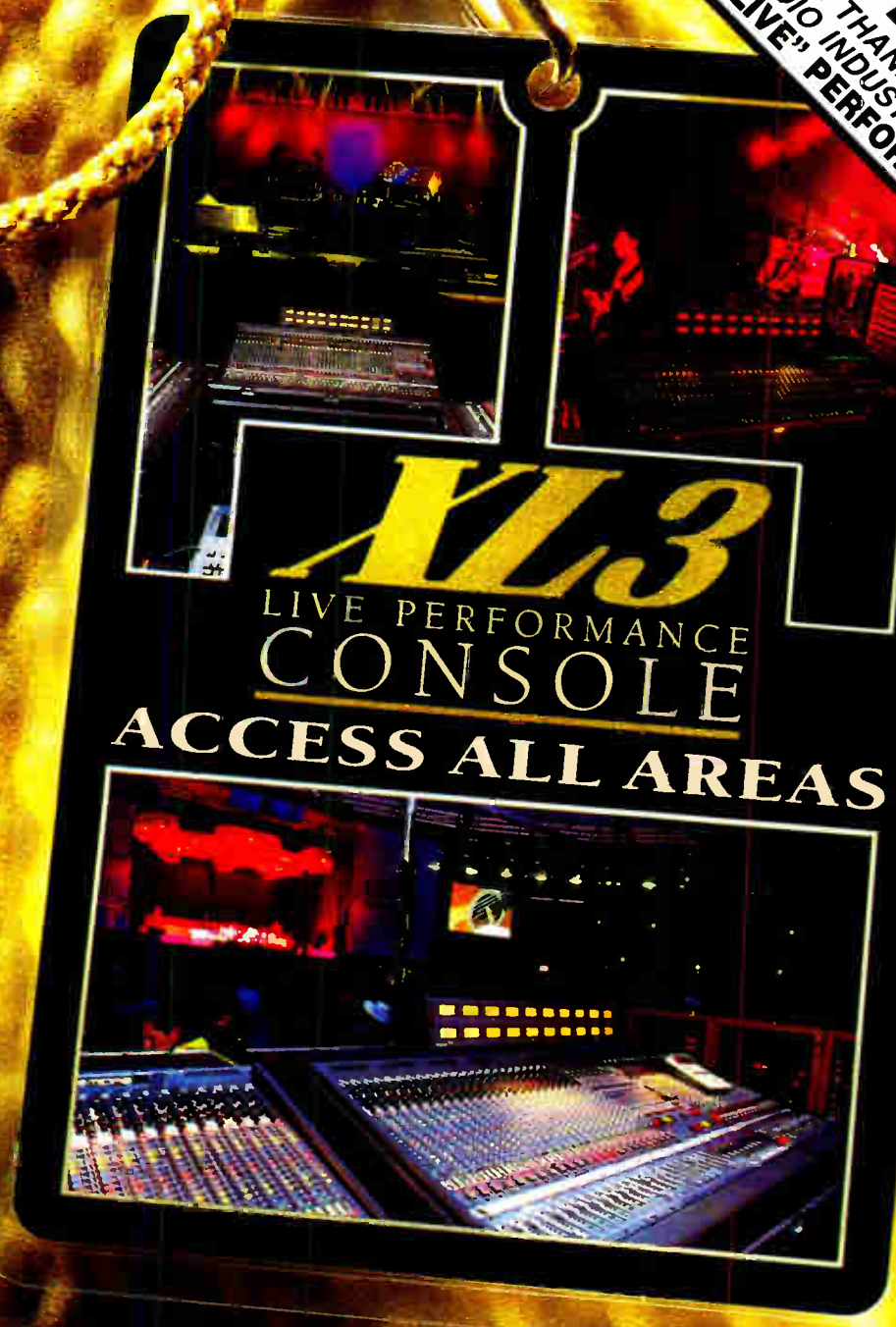
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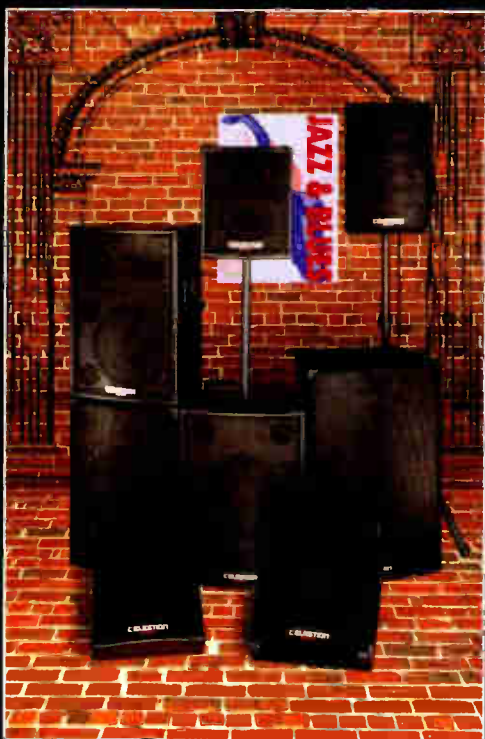
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Applications in Sound Reinforcement

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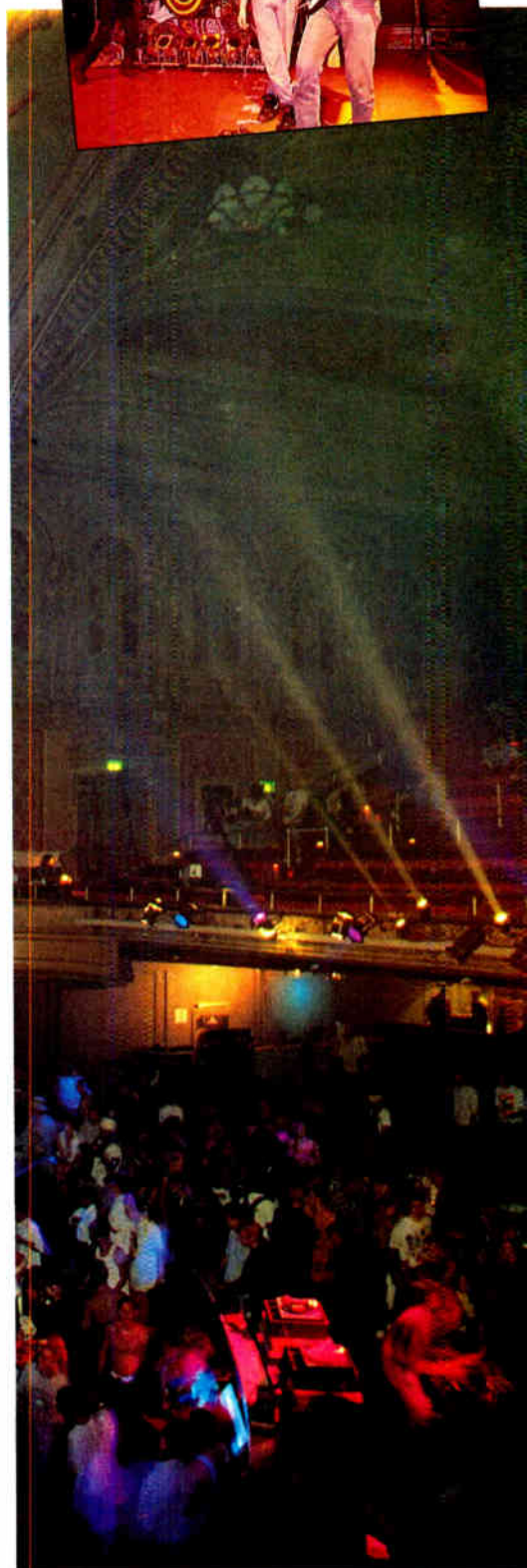
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ON THE COVER:
The Grateful Dead with Ultrasonic at the Sam Boyd Silver Bowl in Las Vegas, Nevada.
See story in September *Mix*.
Photo by Ken Friedman/BGP Archives

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MIX

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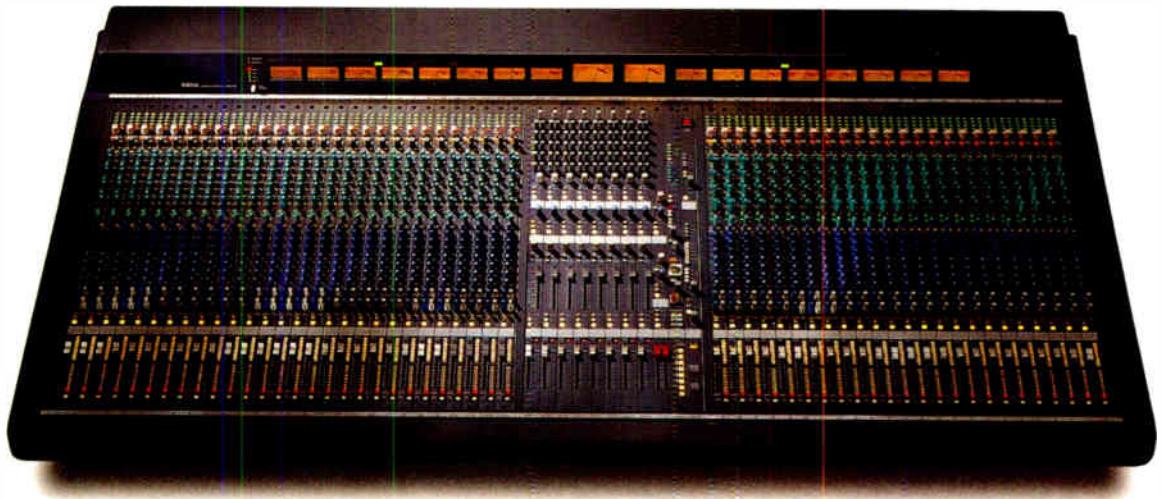
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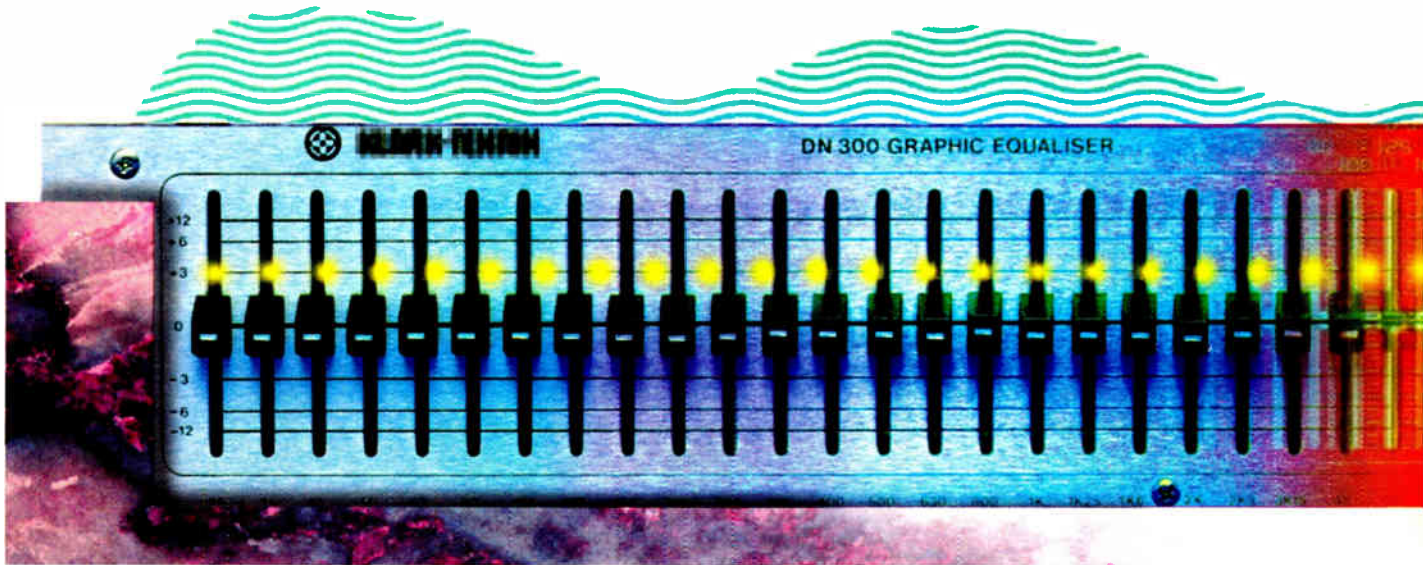


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CIRCLE # 07 ON READER SERVICE CARD

World Radio History

Equalization



by Wade McGregor

The face of equalization is changing.

The familiar sliders and knobs are becoming phosphorescent displays of transfer functions. The process of equalization is also changing as we are offered new tools for measurement and correction of sound systems. The graphic equalizer may become more graphic and less equal as we reevaluate its uses.

The role of EQs in live sound reinforcement is split between installed systems and touring systems. Both require similar facilities, but installed systems may have the advantage of being able to equalize the primary FOH system in detail, while touring systems will change EQ settings to conform with the perceived qualities in each new venue. The parametric EQ has generally been used in touring sound as a problem-solving tool to be inserted into a channel or group of the mixer. The exceptions to this are primarily systems that have been equalized using Meyer Sound Lab's SIM® system, Apogee's CORREQT or other specialized FFT-based approaches. Installed systems have also depended heavily on the 1/3-octave EQ, except where diligent consultants and contractors have

THE Digital Age

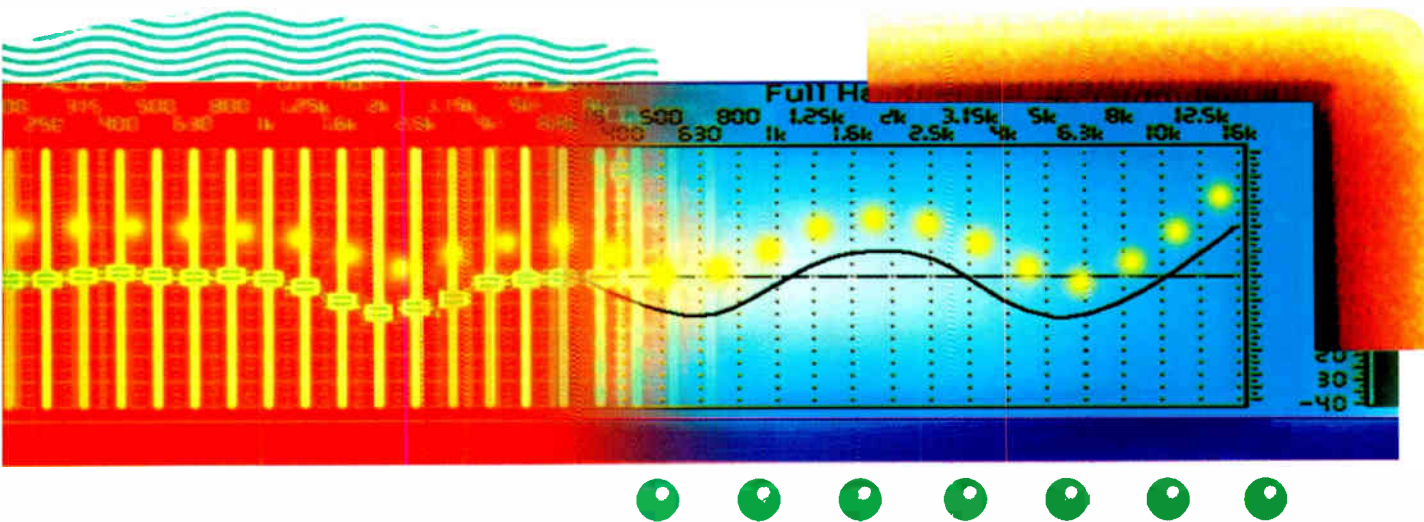
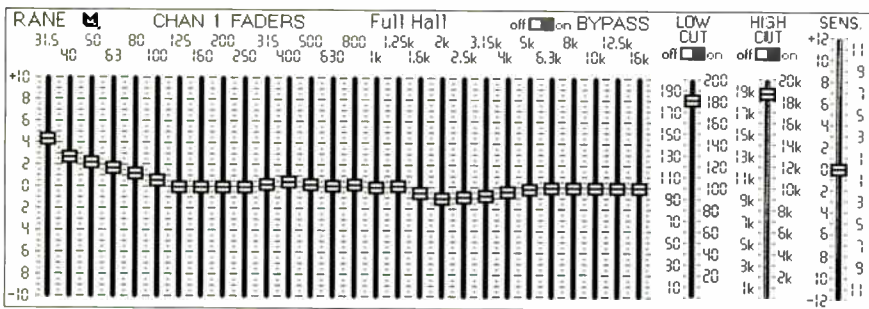
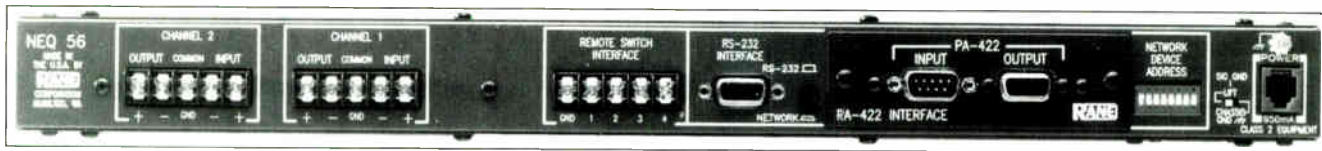


Illustration by Andrew Faulkner

used the Techron TEF, DRA Lab's MLSSA or one of the aforementioned systems to measure the resulting system response.

The graphic EQ offers the user an interface that seems to display what is being done to the amplitude of the signal across the audio band. In reality, the frequency response that results from the combination of 30 bands of EQ may differ wildly from the picture drawn by the front panel sliders, and so too may the phase response. The t.c. electronic t.c. 1128 programmable EQ, for instance, can display the resulting amplitude response of the filters, often with surprising results achieved by radical settings.

It is because we relate to the graphic EQ's front panel so well that it has become such a popular form of EQ. A conventional parametric EQ offers considerable advantage when accurately equalizing a system, but is very difficult to reset reliably or tune in the middle of a live show. The ear-training of many live sound techs is based on the 1/3-octave bands, and skilled users can quickly snap the offending band down as it starts to feed back. This knowledge can be transported between EQs, more or less, and has been regarded as a necessity for both FOH and monitor sound technicians.



The Rane Network Equalizer's blank front panel redefines the "graphic" equalizer (top; back panel also shown). All adjustments are made via computer control software which displays faders (shown above) or an editable frequency response curve.

This approach is not possible with a typical parametric, simply because there are three times as many interacting settings to adjust. It is only through the use of high-speed micro-processing that the parametric can help in live situations, but then the operator is removed from the loop, as in the case of the Sabine FBX-1200 Feedback Exterminator. The lack of direct control makes many live sound techs wary of this approach, and most will supplement a conventional parametric with a graphic if they feel that changes will need to be made on the fly.

One of the problems in using a parametric for FOH or monitor system EQ was the fact that all too often every one of the five or six bands of parametric EQ would be used when ringing out the system. When a problem occurred during the show, there wasn't any extra EQ left to deal with it. If you moved one of the current bands to fix a new ring, you may have found the old one taking off into feedback.

More parametric bands could make this a less risky endeavour. The Apogee Sound CRQ-12 began shipping this year and provides up to twelve bands of parametric EQ plus two sets of high-, low- and bandpass filters. This versatile 2-input/4-output EQ is configured to allow for some interesting possibilities and was specially designed to suit the needs of the CORREQT process developed by

Apogee's president and director of engineering Ken DeLoria. "The equalizer can cascade the parametric equalization to allow a central cluster to have short- and long-throw loudspeakers share the same 12-band parametric EQ but use different shelving and low- and highpass filtering. [This makes it possible] to correct for the low-frequency coupling of the loudspeakers and provides the high-frequency roll-off typically used on the short-throw loudspeakers," notes DeLoria.

Manufacturers have developed EQs that no longer have knobs or sliders on the front panel; in their place is a network connector on the back. Somewhere in the next room or across the country, a computer displays all the knobs and sliders in a front panel equivalent on its screen. The difference is much more dramatic than just remote control—it extends to how and why the controls are adjusted at all.

Networked EQs can be used to develop an individual curve for each loudspeaker cabinet (and typical group of cabinets), which is then stored in the EQ's memory or on disk. When the system is set up, the appropriate preset is recalled. On top of this EQ setting, a file for the typical filter settings for a particular focus is overlaid, to suit the loudspeaker's coverage—long throw, short throw, etc.—and applied to each individual

system EQ. Then the system is voiced to suit the acoustic and artistic requirements for that show by using an offset mode on the entire group of system EQs, essentially superimposing a room-compensating EQ on the pre-existing system EQ curve.

Visual feedback from the computer will allow the operator to see the resulting transfer function of all these combined EQ settings. Any additional system or individual loudspeaker EQ settings can be adjusted with the knowledge of the total result available instantly. Manufacturers could provide the equalization settings specific to their loudspeakers as a file for downloading into the EQs, sidestepping the current practice of chaining several EQs in the form of a *voicing* graphic EQ, a system EQ and a loudspeaker controller EQ.

When we equalize individual instruments, voices or an entire FOH sound system, how often are we really equalizing? It is more common to *voice* a sound source or sound system and not actually attempt to make the audio spectrum particularly equal. This approach works very well for those who have carefully trained their ears and eyes for the pitfalls of this technique. The *voicing* of the sound system is typically a search for the most aesthetically pleasing quality that a specific system can produce for a particular application. But voicing remains a difficult standard to maintain in different venues and especially between different sound-system components.

It is in voicing a sound system that the graphic equalizer became the standard. Through this easy-to-visualize approach, the equalization could be understood directly from the front panel of the equalizer. The operator could quickly develop an intuitive relationship between the graphic EQ settings and the resulting aural effect.

For many years, individuals and even a manufacturer or two have tried to convince the industry that a differ-

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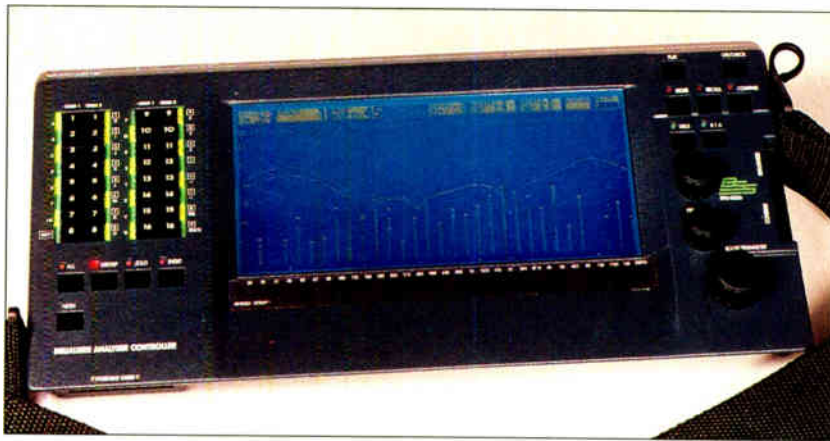


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ent approach would be advantageous to the audible result. Source Independent Measurement is the best known of these approaches and has proven itself in productions that had the budget to apply this sophisticated technique. SIM[®], however, still uses an operator making judgements and turning the knobs of a parametric EQ to

make any and all adjustments to the system response. The SIM operator is presented with a display of the amplitude and phase response of the sound system from a measurement microphone (up to 64 measurement mics can be connected), and the EQ response is inverted and overlaid onto the unequalized system response. The operator adjusts a parametric EQ and can rapidly see the results of the equalization in both amplitude and phase of the system. This system is notable for its use of program con-



BSS now offers a strap-on remote (shown above) for mobile control of their Varicurve equalizer line.

tent as a test signal and therefore its application during concerts as well as during system setup.

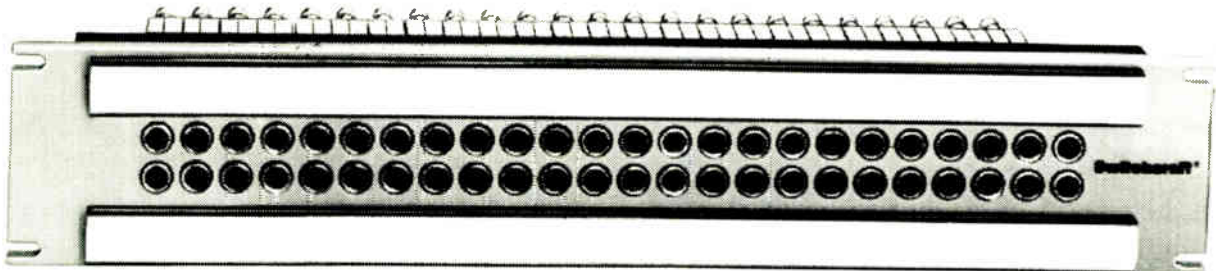
The AcoustaEQ software from Altec-Lansing uses the Techron TEF-20 for measurement, teamed with a precision parametric EQ. A similar two-part computer display shows the response before and after equalization, with the EQ curve inverted over the unequalized response. AcoustaEQ uses the TEF sweep for a measurement signal and is intended for use during the setup of the system. The

adjustment, reset or maintenance, but we are also very close to some other interesting possibilities. One of these is in the area of equalization. If we are able to take a sophisticated time-domain analyzer, such as the Techron TEF, Meyer SIM II, DRA Lab's MLSSA or Hewlett-Packard HP 35665A, and use the resulting information to create a dynamic system response, perhaps then we could unify the concepts of equalization and voicing the sound system. Then the output from the measurement system, using carefully

latest version of the AcoustaEQ software can compensate for any delay through digital processors, which are going to become more common as system EQs and controllers.

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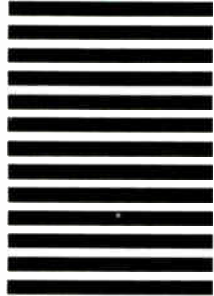
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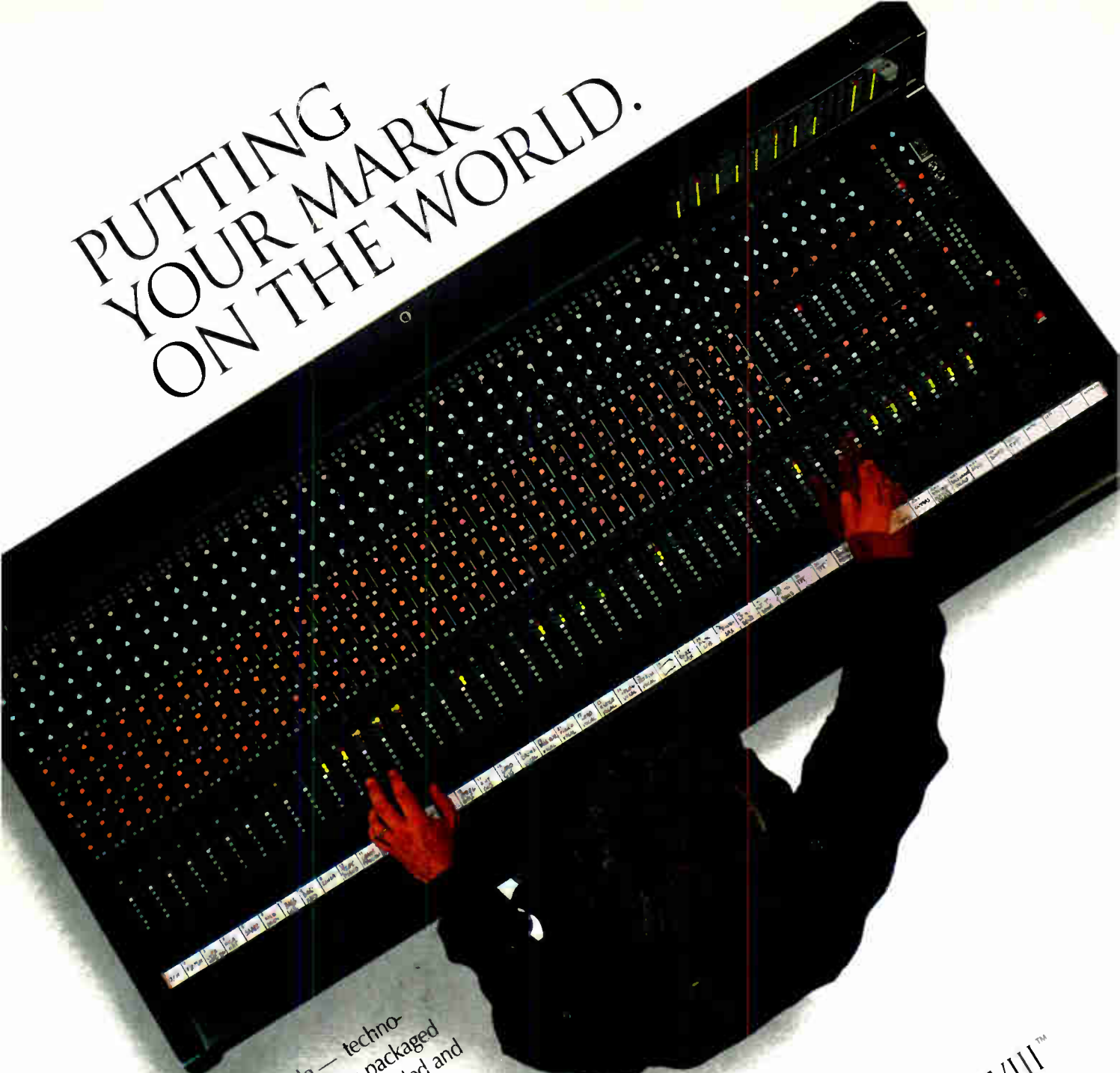
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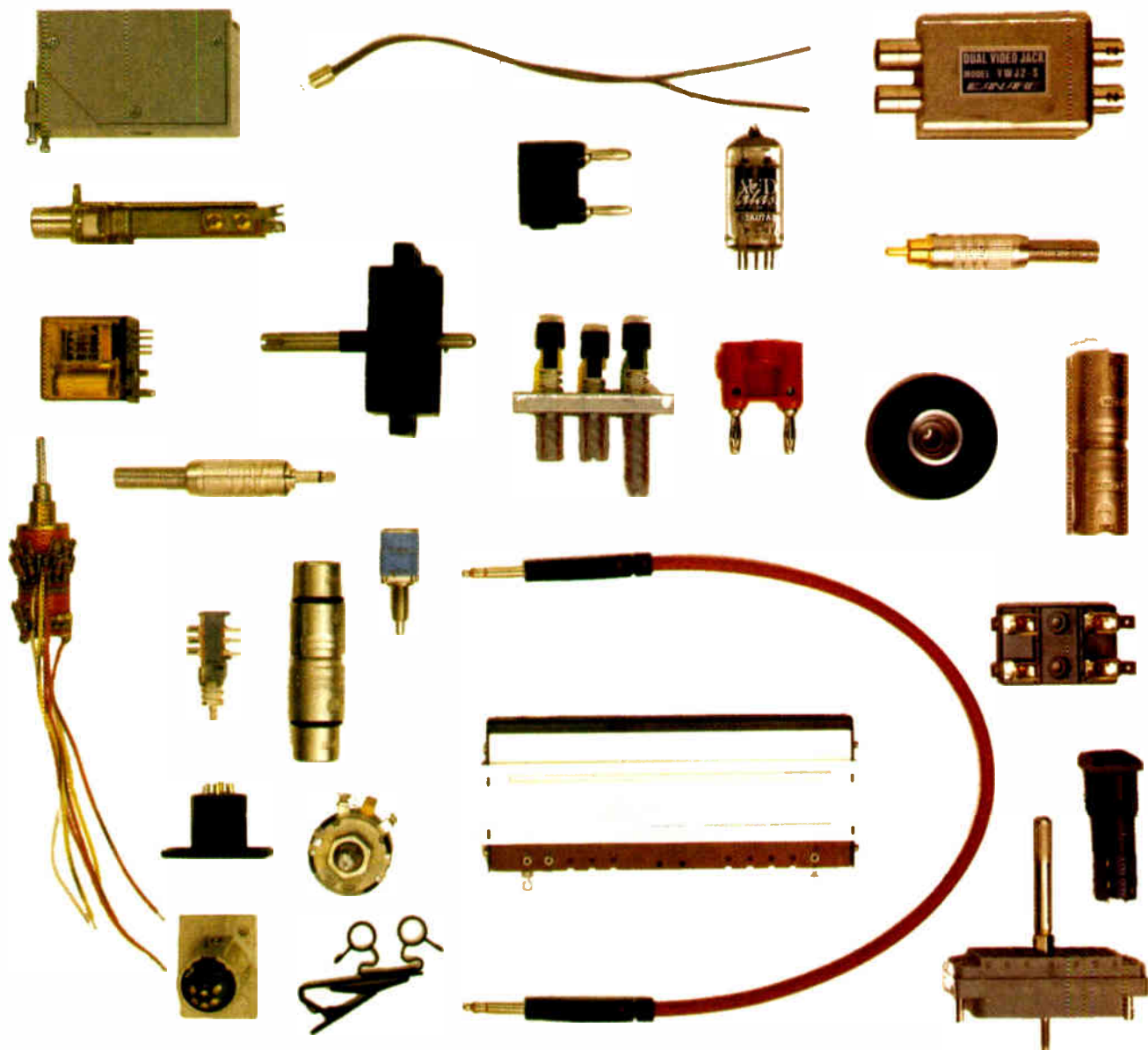
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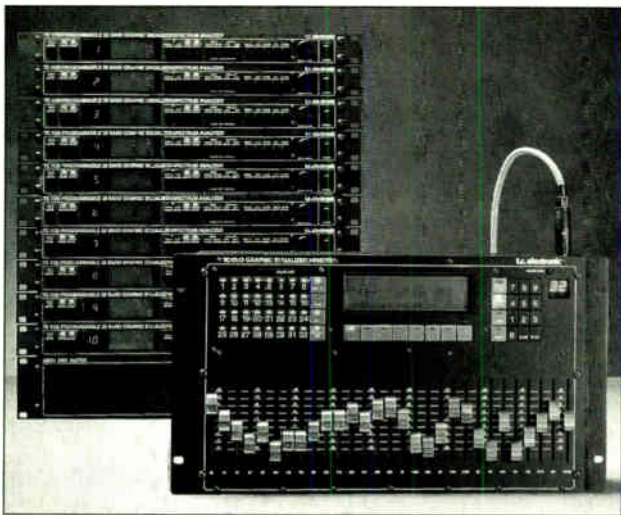
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The t.c. electronic 1128 graphic equalizer and 6032 motorized fader head (top) provide a single master controller (with programmable memory) for an entire rack of equalizers; the Sabine FBX-1200 Feedback Exterminator (below)

placed sampling microphones, will allow us to draw on the computer screen sections of the system response that we would like to have equalized and those areas in the spectrum we would like to modify to suit our aesthetic criteria. We would also be able to decide, with a little help from the instrumentation, which errors in frequency response are not worth adjusting for.

It would seem that using an analyzer to communicate the required equalization curve to an EQ should be pretty straightforward. Unfortunately, the software to make the appropriate decisions on how accurately the EQ tracks the analyzer's output is not as simple to design as it seems. Each measurement location in a room must be intelligently correlated to other locations to derive a signature of the loudspeaker's response in the room. Even when you are only concerned with the response of the direct sound from the loudspeaker, multiple measurement positions may be required. Frequency response will vary across the coverage area of even the most well-behaved loudspeaker system. It takes an experienced operator to understand which measurement positions best represent the

majority of the audience and to weigh the measurements in this respect. It also requires an understanding of which aberrations in the measured response are suitable for correction through equalization.

BSS Audio Ltd. has further developed its Varicurve™ digitally controlled analog parametric EQ, enhancing its ability to automate the equalization process through the facilities of the new FCS-900 remote controller. The Varicurve includes an RTA that can be used to create equalization curves with either six (two-channel mode) or 12 (one-channel mode) bands of parametric equalization. The

output of the FCS-960 EQ/analyzer's RTA is converted to 210 frequency points, and the software sets the parametric filters to create an inverse of the RTA data. If the curves are too complex, a smoothing algorithm is applied to allow the filters to create the best match in response while ignoring response ripples of less than 1 dB. The extreme ends of the spectrum are also ignored when they fall below -3 dB, to prevent the EQ from creating potentially destructive boosts at those frequencies.

The user may select from a series of preset response target curves or create new ones. The first time the system is used for a particular application, the user can start with a preset EQ curve and then manually voice the system to suit their requirements. An RTA measurement is then taken of the resulting response of the system and stored in one of 50 memory locations. This response can then be used as the target response the next time out. This saves considerable time in setting up the filters by hand while still allowing for the fact that a flat response from a sound system is not always wanted or even possible when using an RTA for measurement. But returning the acoustic response of the system to a

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known setting is obviously more than just recalling an EQ setting. BSS has chosen to use the RTA for measurement, as it is the standard tool for most sound system operators and provides a familiar tool for reference. The future may see this approach expanded to include more sophisticated time-domain analyzers that can distinguish between the direct arrival of sound from the loudspeaker and acoustic reflections within the venue.

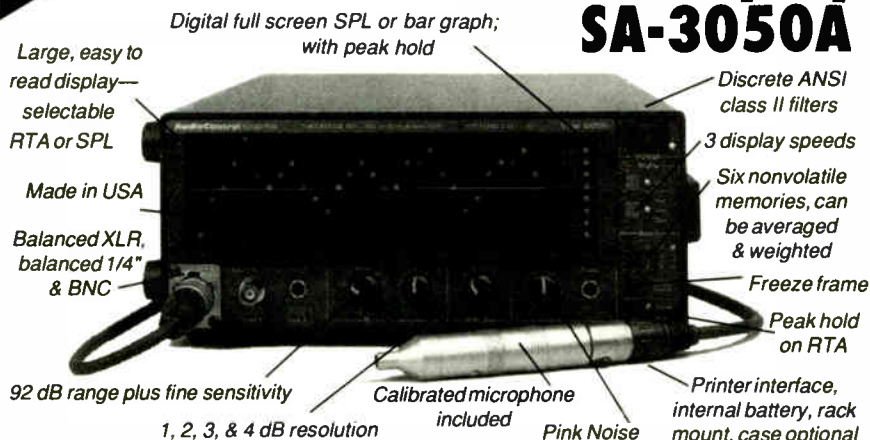
Ken DeLoria related to me a classic story of misuse of a measurement system: "There was a guy walking around this church with an RTA and he would say, 'Look, it's 3 dB down in these seats at 500 Hz.' He would then throw up a horn and build a filter network to just put the 500 Hz band through the horn, focusing it on those seats. He peppered the church with loudspeakers just to get the RTA to read a perfectly flat response at every seat in the church, and yet you couldn't understand a word that anyone said through the sound system! This guy was totally ignoring not just the phase response of the system but also gross time aberrations caused by all these multiple sources."

Another example of the uninformed use of real-time analyzers is the attempt to equalize a dip in the response caused by two loudspeakers covering the same area in the same frequency band. The 6dB drop at 500 Hz on the RTA display may actually be a 30dB cancellation caused by the difference in arrival time of the sound from each loudspeaker that happens to be at 527 Hz. When 500 Hz is boosted on a 1/3-octave graphic EQ, the cancellation at 527 Hz does not change, but the frequencies on either side of it will be boosted to give an M shape to the actual response. This will be audible as too much boost at 500 Hz, even though the RTA will show the response returning to flat. This is because the RTA is looking at the acoustic energy between 440 and 565 Hz, and the peaks created on each side of the null will eventually be great enough to give an equal amount of energy to the 500Hz band. Unfortunately, the cancellation at 527 Hz is at exactly the same relative level as before the equalization was applied.

Equalization manufacturers have tried to overcome this by creating a method of measurement that will compensate for acoustic problems in the venue. t.c. electronic, for example, suggests to the users of its t.c. 1128

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programmable EQ/analyzer that the microphone be placed in four positions (center, halfway to stage left extreme, halfway between center position and rear extreme, and halfway to stage right extreme of the loudspeaker system's coverage pattern) to derive a more accurate measured response of the system. Each position is weighted statistically, and the resulting response is used to create an equalization curve. This method still requires, as always, that the person operating the system have a good understanding of the system's capabilities, its configuration and the pitfalls of 1/3-octave analysis and equalization.

A demonstration of precise equalization and communication between measurement and equalization systems was given at the recent NSCA Conference in Orlando, Florida. The Techron TEF was used to measure a loudspeaker, and then the measurement data (amplitude and phase) was saved to a disk. The disk was then inserted into another computer and the TEF display was overlaid onto the Innovative Electronics Design UDAPS 2000 series digital parametric EQ display. The EQ was adjusted to match the inverse of the measured response of the loudspeaker on those sections that were determined to be equalizable. The resulting curve was then built by the EQ DSP.

The IED 2000 system includes a choice of cards for eight channels of 9-band, two channels of 36-band or one channel of 72 bands of parametric EQ that can be combined into very large system configurations. The system is capable of displaying the amplitude and phase of the EQ's resulting response and can be adjusted on-screen until a suitable curve has been finished, before actually making a change in the current system response. This allows the user to experiment with different settings, examine the transfer function (combining effects) of the filters and then decide whether to insert the result into the audio chain or not, without affecting the current filter setting of the UDAPS EQ.

The process of communicating measurements from the TEF analyzer to the UDAPS system is already well on the way, but the software to directly derive equalization curves from the measurements is still being developed. John Johnson, VP of software engineering for IED, says, "We want to develop more experience with the

type of solutions that are used in real applications before going too far with automating the equalization. The automation should help the user to achieve appropriate solutions, but they must remain in control of the process." It is only by carefully observing the process experienced users follow that a form of automation can be designed that actually assists rather than hinders them.

Sophisticated analysis equipment greatly assists in determining which errors in the sound system can be fixed using EQ and which require mechanical measures such as changes

in loudspeaker placement or absorption of problematic room reflections. Learning to differentiate between the two and providing the most appropriate solution will result in significant improvements in the sound the audience pays to hear. The assistance of computers to speed up the equalization process promises to leave more time to deal with acoustical problems and the aesthetic requirements of the production. ●

Wade McGregor is an electro-acoustic design consultant for Relentless Recording in Calgary, Canada.

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Mix Position & Room Acoustics

BY DAVID (RUDY) TRUBITT

It goes without saying that your mix position has an effect on how you mix a show. But how does one go about making this crucial choice? The subject was covered at Synergetic Audio Concepts' (Syn-Aud-Con) 1993 Live Sound Reinforcement Workshop. Following is a distillation of the workshop staff's advice on this important topic.

Ideally, you should be able to choose the location of your house mix position. In this case, common sense dictates choosing a spot representative of a large part of your audience. Although a point directly between the left and right speaker arrays maximizes one's stereo imaging, it is often not a wise choice.

"With all conventional sound systems," says Showco's M.L. Procise,



"there is an aberration we all live with. When you have two sources in the room, they have to sum somewhere. In the center of the room, you get an additional 3-5dB peak in the low bass of the system."

"You have this thing that we call 'Power Alley,'" explains Audio Ana-

lysts' Albert Leccese. "When you have wavefronts coming from each side of the stage, at low frequencies you're going to have a peak right down the middle."

"When you have this 5dB peak in the low bass," explains Procise, "it's difficult to make sure everybody else

in the room is getting good bass response, since you're being inundated with bass. What we try to do instead is move the console slightly off the center line or in front of one speaker stack, so that we won't have to be subject to that summation in the center."

Note that where there's a peak, a null will be lurking nearby. "Off to either side of the center line," warns Leccese, "you're going to have a narrow area that's going to have no bass in it. That's a null at which certain frequencies are going to cancel. If you happen to choose that spot for your mix position, then you're going to be

first reflection from the ceiling or the side wall is [focused]." In some cases, these reflections can be anticipated by visually scanning the surfaces of a room. Imagining walls as mirrors can help, as sound and light reflect in similar ways.

However, a simple visual inspection is often inadequate in more complicated spaces. Leccese suggests another approach: "Early in the morning, there's a bunch of activity at the stage end of the room. There are boxes rolling around, there are people banging and clanging, rigging is going up—all kinds of noise is originating from the stage area. [While this is happening,] I like to walk around the hall and listen. If I'm in a certain place and my eyes tell me there's a forklift over here, but my ears tell me it's over there, [where I'm standing is] not where I'm going to put my mix position, because at that particular spot there is a nasty reflection coming from the approximate location of where the P.A.'s going to be."

Of course, this selection process assumes that you have a say in the matter. "Sometimes you don't have a choice where you have to set up the console," warns Randy Stiegmeister of Maryland Sound Industries. "You might go into a theater and end up in the back row, too close to the P.A., or clear off to one side." What then? "We live in a world of compromise in audio," says Procise. "You have to do the best you can from wherever you have to sit. You might be sitting in the back, but you should walk the room and know what it sounds like everywhere else—then you can live with the compromise."

"You basically have to do a mental correction factor," adds Leccese. "This is what a particular instrument sounds like when I'm over here. When I go over there, it sounds like that. Therefore, there's a correction factor that you can apply for each and every instrument. After you've worked with a band in a particular place for a while, you get a pretty good idea of what it should sound like [in different parts of the room]."

Even if you have a free hand in choosing your mix position, audience members will be spread throughout the acoustical anomalies of the room. Therefore, "it's your duty to walk the room during the day and check out the system," urges Stiegmeister. "Don't sit on your butt and let somebody else tell you what's happening."

“We live in a world of compromise in audio. You have to do the best you can

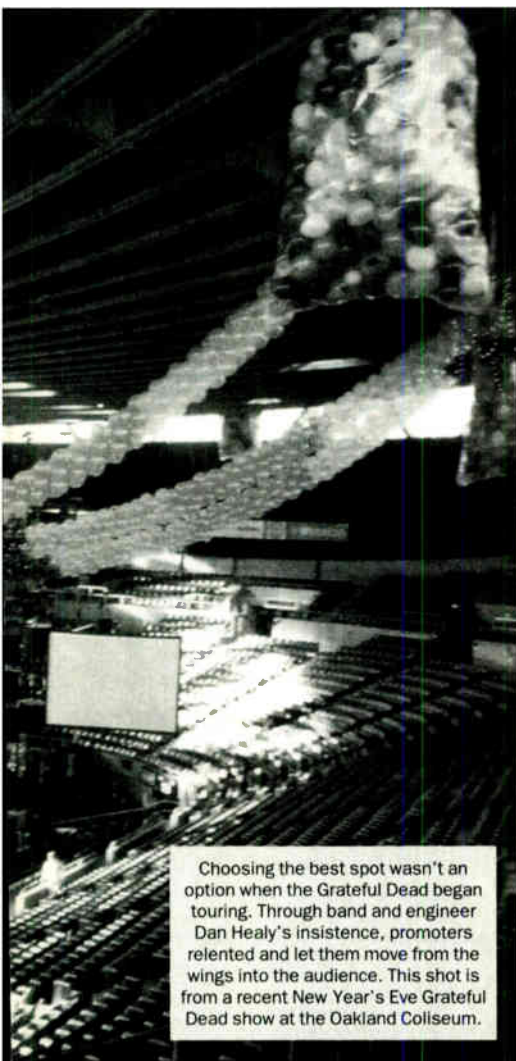
from wherever you sit. You might be in the back, but you should walk the room and know what it sounds like everywhere—then you can live with the compromise.”

—M.L. Procise, Showco

Remember that your mix station itself can color your perceptions. If you're mixing from a riser, obviously your ear level will be well above the audience around you. Furthermore, the space *under* a riser can create a resonant cavity, creating low-end anomalies. And, adds Stiegmeister, "You might have some bass-trapping created by the little pit you create with your console and racks. Maybe if you move your racks a little bit you'll eliminate some reflections that are only coming to you and nobody else. So there are lots of little physical things that can affect your space."

Finally, the ability to mentally project yourself into the sound-space of other parts of the room is equally important for mixing monitors, according to freelance monitor engineer Randy Wietzel (who was recently out with Michael Jackson). "Don't just stand behind the console. It's real important to walk the stage, stand in everybody's area and listen to what they're hearing. You have to remember the sounds in each stage area and correct for those problems, not for what you're hearing [from behind the console]. It's really important that you memorize what the stage sounds like, so that when you make your adjustments, you can 'hear' what's happening on stage."

So bear this in mind next time you set up your mix position. Whether you have a choice in the location or just the option to shift a rack or two, remember that hearing what's going on, as well as being able to imagine the sound in various parts of the audience, is the first step towards a successful mix. ●



Choosing the best spot wasn't an option when the Grateful Dead began touring. Through band and engineer Dan Healy's insistence, promoters relented and let them move from the wings into the audience. This shot is from a recent New Year's Eve Grateful Dead show at the Oakland Coliseum.

DUPLICATE BY ART

mixing bass-heavy, as opposed to bass-light."

Besides anomalies in frequency response at various points in the room, one should also be aware of strong reflections. "Sometimes," continues Leccese, "you may end up putting the mix position where the

Touring With Acoustic Pianos

by Dave Lawler

Illustration by Gary Baseman

The piano only seems to have been around since the dawn of mankind.

In the pre-TV, pre-telephone, pre-life-as-we-know-it era, the piano was perhaps the major source of family (and tavern) entertainment. Stagecoaches and trains transported the instruments across prairies, mountains and deserts, just so that gold rush saloons could have more “cultural evenings.” A generation or two later, the grand piano was on the road again, touring with such artists as Carole King, Elton John and Keith Emerson, among others. ♦ Although the piano always gave the concert stage a certain elegance, the rigors of size, weight, road casing, tuning, acoustic isolation, feedback, and miking problems soon became an unpleasant fact of life for touring personnel. (I know this well, for in the '70s and early '80s I was a frustrated touring upright-piano tuner/player, with a broken back and blue fingernails from trying to get any gain out of that God-forsaken instrument!) ♦ Then came the invention of the digital piano. Although many previous attempts to create an electronic piano were shunned by purists, the digital piano opened up an era where the player could lift the instrument, be in tune at all times (at no expense), and salvage his or her fingers while matching the volume of the guitars. ♦ However, despite ongoing improvements in the quality of digital sampling, the novelty of these advantages has worn off for some. Many players noticed that, no matter how much money they spent, there was still something missing. Electronically



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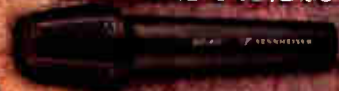
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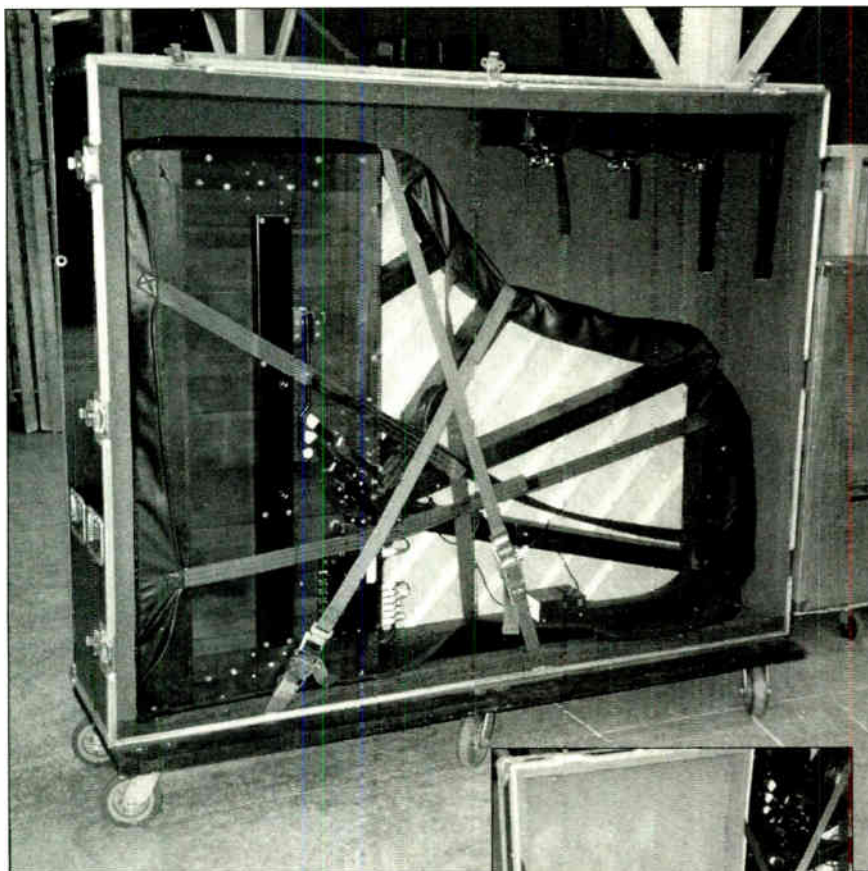
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The author's grand packed for travel, legs and lyre are stowed separately (inset).

re-creating, say, a Steinway B is a very complicated project. The acoustic characteristics of a piano are very difficult to sample, especially when long decay times without sample looping are desired. It is also very difficult to re-create a believable wooden-key grand piano action. So it's not too surprising that we've started to see a resurgence of the acoustic piano in the touring market.

TOURING CONSIDERATIONS

The instrument I own and tour with is a Yamaha C5D 6'6" medium-size grand. It is big enough to be a serious instrument and look like a substantial piano onstage, while still small enough to fit sideways in a truck and to be moved without the Roman Army. The instrument travels on its side in one large Anvil Case, while the legs and lyre are packed separately in a smaller case (see photo). It can be removed from the case and set up with just three people. Also, one thing I have always disliked about digital pianos is that they jiggle and move around when you play them; a 1,100-pound piano has a lot of majesty and doesn't move much.

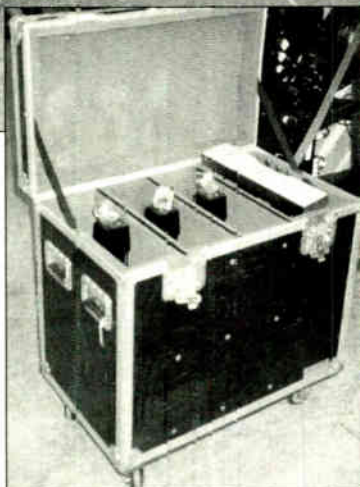


PHOTO BY THE AIR BOLDS

TUNING

On tour, I use the Yamaha PT100 electronic tuner, which has ended the days of interrupting stage setup to tune the piano (and thus cut down union bills). This unit allows you to touch up the piano each day without re-tuning the entire instrument, which saves a lot of wear and tear on the pin block. A switch that moves the tuner's pitch up or down in half-step increments mounts on the tuning hammer, allowing the process to move at remarkable speed (see photo on the next page). The *temper* (relationship of pitches from note to note) and *sharp-ening* or *stretch tuning* of the top octaves (where higher octaves are tuned slightly higher in pitch than exact multiples of the frequencies of lower octaves) can be put into mem-

ory and recalled to the preference of each artist. With this tuner and a pick-up system (described shortly), I have even tuned wearing headphones during the opening act, thus leaving room for the other facets of my job during the day.

MAINTENANCE (DON'T TRY THIS AT HOME!)

The touring world has long been fearful of piano maintenance. Many tours have traveled with their own piano, using a different tuner in each city to perform necessary maintenance. Eventually, the result is usually a butchered piano. However, the biggest mistake made by many artists is touring with a piano that is much too old to withstand the rigors of touring. Even a full-time tech can work eight hours a day trying to keep such a piano alive. I believe that piano duties should take an average of no more than 1-1/2 hours per day, including setup, strike, tuning and maintenance. If it's taking significantly longer, then you've got the wrong piano or the artist is walking on the strings during the show!

AUDIO AND THE INSTRUMENT

Before discussing the audio and mixing aspects of piano sound reinforcement, I should mention the one process that affects an instrument's sound more than anything else: *regulation*. Many people don't understand that you are not stuck with the way a piano sounds (and plays) as it comes from the factory, or even after considerable use. As with a guitar, you can alter some of the physics of the instrument, as well as the way the strings cross the bridge, etc. All of these crafty techniques, which require special, drastically overpriced tools absolutely useless for anything else, fall under the heading of regulation.

With pianos, the most significant procedure is action placement (movement of the hammers forward and backward along the string) and hammer shaping. Obviously, classical music will call for a much mellower tone than a Bruce Hornsby concert. A concert piano in the context of a band, especially in large venues, must be significantly brighter than a solo classical concert. Therefore, one should choose a piano that suits the character of the music that your artist is going to play. Personally, I like a piano that is regulated brightly enough to shoot birds out of the sky! Audio-wise, it is

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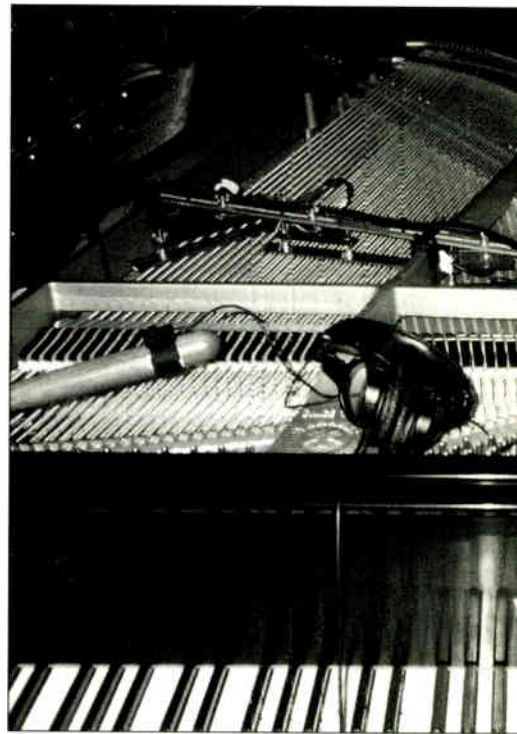
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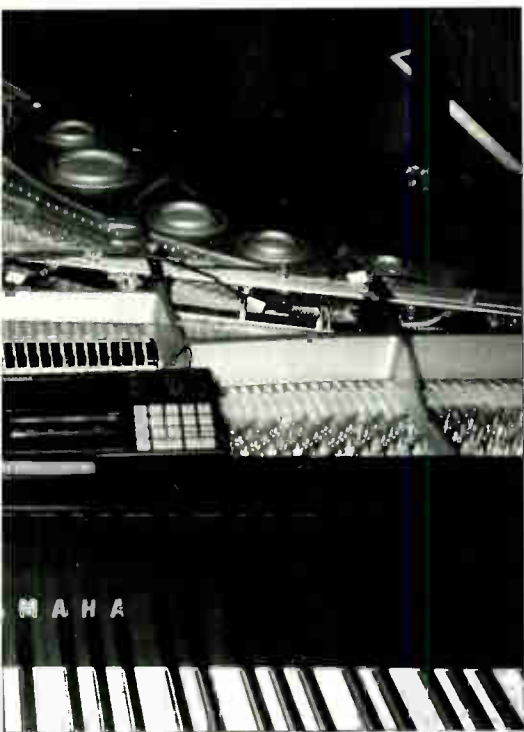
The complexity of the piano's sound presents many possibilities for miking styles. This is further compounded by the various configurations of the lid: totally closed, first section folded open, music rack in or out, short stick, lid fully open or lid off entirely. Each method will create a different set of standing waves between the soundboard and the lid (or lack thereof), altering the apparent tone and/or resonances of the instrument.

For starters, as soon as you are going to amplify a piano with standard microphones, you are going to have an isolation problem. The amount of isolation necessary depends on the ambient dB level onstage and how close other instruments and amplifiers are to the piano. In a folk trio format, you can get away with a short-stick lid and no isolation, while during a Bryan Adams concert, you would have to do everything possible to isolate the piano.

Maximum isolation can be attained as follows: First, remove the music rack and completely close the lid. A piano lid actually has a quarter-inch crack, which can be filled by applying one-by-one-quarter-inch black win-

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dow weather-stripping. Products with a peel-off adhesive on one side are appropriate for this task. Next, four-inch Sonex or other acoustic foam should be cut and inserted into the open spaces between the braces on the underside of the piano, to isolate the soundboard from other amplifiers and stage monitors. Finally, the legs should be lifted from the floor with acoustic isolators, which keep sub-sonic vibration from entering the piano through the legs.

Miking style will depend on the artist. A solo performer may play with the lid open and require standard large-diaphragm condenser mics. A trio or jazz group may play with the lid on short-stick; use PZMs and/or AKG 460s or 414s. As the band gets louder, the lid should be closed, with the mics mounted inside the piano on drum-mic-type clamps or tape hammocks.

Another type of amplification method is the C-Ducer, which has been very popular in the last few years. This is actually a contact pickup and does very well mounted under the Sonex foam on the soundboard. Single or multiple units have been used and exhibit improved signal-to-leakage ratio, higher feedback thresholds and fairly decent tone.

My personal choice is the Helpin-still six-bar pickup system, originally designed back in the '70s. The original preamp was a passive toy with very poor gain, frequency response and

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sonic quality. This unit has been replaced by a unit custom-built by Schubert Systems Group of North Hollywood, Calif., with six independent active gain, EQ and pan channels, as well as a headphone preamp for tuning. The stereo signal leaves the unit at an almost line-level balanced XLR! Each channel for the wound strings has a higher gain stage, as the pickup bars must be further from the strings to allow for increased amplitude of the lower notes. The preamp and its power supply can be permanently mounted under the piano, with a hole drilled through the frame for the pickup cable harness to pass through.

In 1992, I toured the world with k.d. lang and the Schubert piano system, using no isolation techniques and no mics, with the front part of the lid open. The stereo signal was processed with an Aphex Exciter and had an EQ cut of approximately 6 dB at 400 Hz (with about a half-octave bandwidth). Some artists have requested mics to augment the Schubert system, which necessitates some of the isolation techniques discussed above.

Over the years I have seen many configurations of miking and pickups, sometimes using up to eight mixer channels and lots of EQ and notch filters, with results that don't always merit the effort. A simpler system has much less phase interaction, and will usually have better octave balance than many miking systems.

Lately, the newest rage is the MIDI piano. A MIDI unit can be installed in a grand piano to drive a module that augments the acoustic sound. The module may also generate string sounds or any other patches, triggered from the velocity- and pressure-sensitive piano keyboard. This makes it very easy for the pianist to play many keyboard parts without the stage look of a multi-keyboardist. The MIDI unit I have found to be most reliable is the Gulbransen KS20, which can be installed in any grand.

In the last few years we have also seen a resurgence of the acoustic grand piano (and its sidekick, the Hammond B3) on concert stages, which suggests that musical styles are cyclic. Is it really true that we always end up going back to where we came from? ●

Audio engineer, stage manager and piano technician Dave Lawler welcomes your favorite piano pickup or miking techniques; write him in care of Mix magazine.

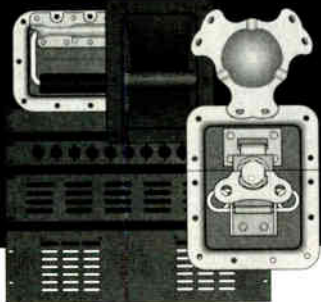
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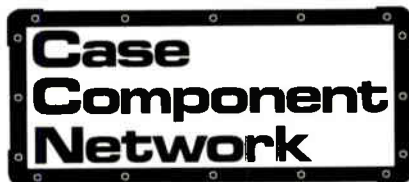
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HERE WAS A TIME, NOT TOO LONG ago, when the circus was truly a spectacle to behold, and watching a black-and-white film played through a mono sound system constituted satisfying entertainment. These

days, the idea of seeing a parade or watching a magician performing magic acts seems quaint to a public that has an insatiable appetite for new thrills.

One person who helped cultivate that collective appetite is filmmaker George Lucas, who for the last 20 years has dazzled audiences with movies that have set precedents for special effects and new applications of cinema technology.

George Lucas' Super Live Adventure

BY RICK CLARK

To bring attention to his body of work, Kenneth Feld (producer of Ringling Bros. and Barnum & Bailey Circus, Walt Disney's *World On Ice* and the Siegfried & Roy magic show at the Mirage in Las Vegas) has put together *George Lucas' Super Live Adventure*, a \$25 million multimedia event that intersperses footage from the movies *Willow*, *American Graffiti*, *Tucker* and the *Star Wars* and *Indiana Jones* trilogies with live action, music, lasers, pyrotechnics, illusions, state-of-the-art lighting and an elaborate sound system.

Feld, the show's executive producer, brought on sound designer Jonathan Deans to help realize the extravaganza's sonic vision. Deans, whose sound design background has ranged from working on numerous operas to events such



Scenes from *Lucas' Super Live* production rehearsals.



PHOTOS: GUY LAWSON

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as *Cirque Du Soleil* and Siegfried & Roy, chose Francois Bergeron as his associate designer.

Deans' previous projects involved focusing the throw of an actor's live voice back onto the actor, rather than forcing the audience to catch the sung or spoken words bouncing off the walls and proscenium. He achieved this through elaborate time-aligned multispeaker setups.

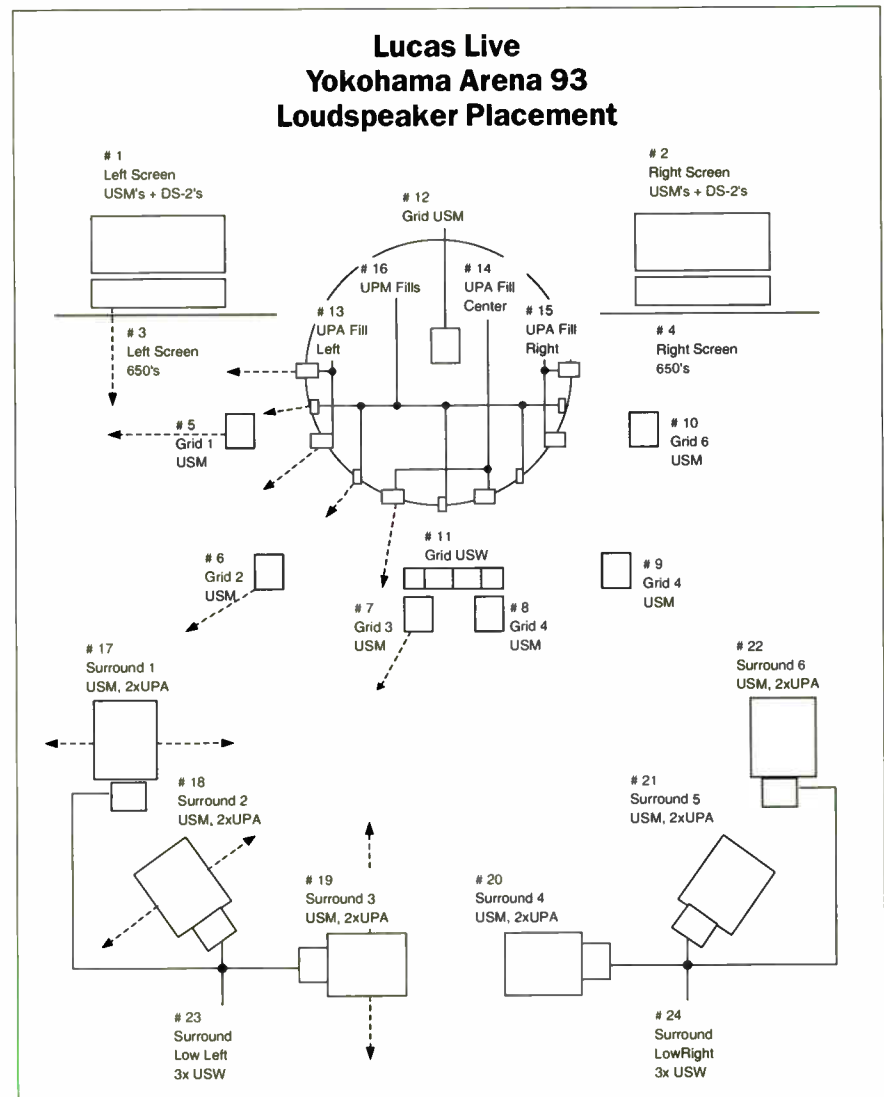
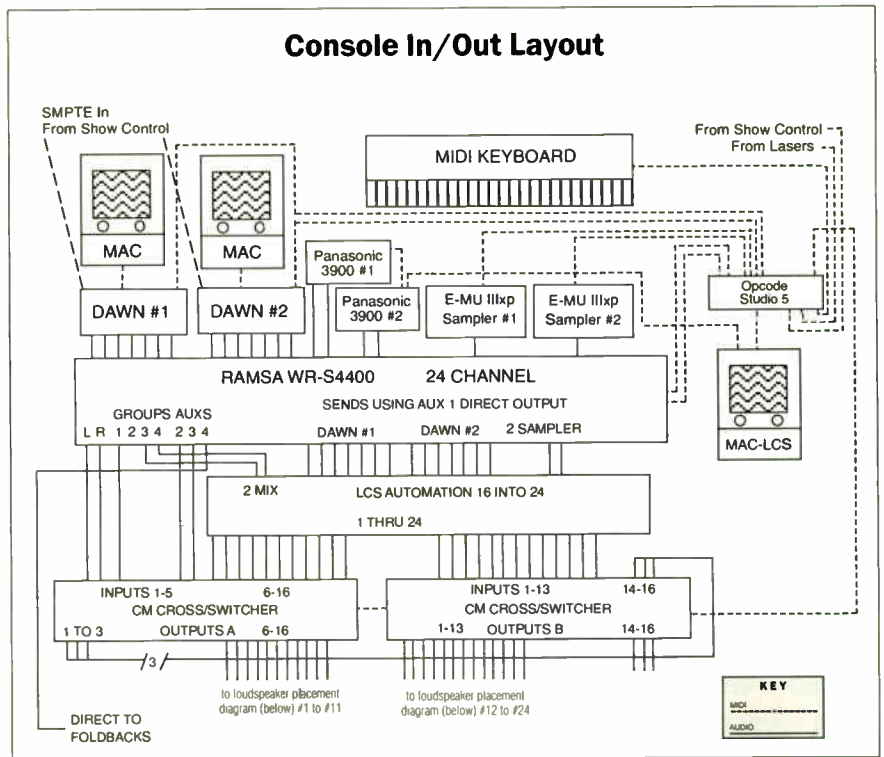
Deans also applied this experience for *Lucas' Super Live Adventure*. The only difference was that this show was entirely pre-recorded. To create the illusion that the sound truly originated from the performers and props, Deans used 76 individual Meyer Sound speaker enclosures arranged in 24 groups around the arena. Crest amplifiers were used throughout.

"The system is made up from various Meyer products, which range from the 650-R2 subwoofers, DS-2 mid-bass, USM-1s, USW-1s, UPA-1Cs, UPM-1s and UM-1Cs applied in different configurations," Deans explains. "We have a very extreme left/right system, as you look at the stage. The edge of the circular 60-foot diameter stage itself is loaded with speakers, as well as a flown grid, which is 40 feet from the stage. Out into the auditorium, 100 feet away from the grid, are clusters or pods of what everyone is calling 'surround sound' speakers. With this setup, we are able to fly sound from the [movie] screen up over the grid, or whip across the stage, around the arena and then back again.

"There are some high-powered USM-1 speakers pointing directly down on the stage, which makes us look where the performers are talking and not somewhere else," Deans continues. "The whole system is time-aligned with BSS 804 delay units and equalized with BSS 926 Varicurves."

Most of the show's sound effects and all of the dialog are accessed in real time by MIDI. A special hardware/software system, called LCS (for Level Control System), was used to coordinate everything. It was created by Deans with Steve Ellison and Carl Malone, both of whom worked with Mackie Designs to co-develop the new OTTO-1604 automation system.

"The LCS is a new Macintosh-based automation system for mixing live sound," Deans says. "We have



Production drawings show audio and MIDI routing at the FOH (top) and loudspeaker placement in the arena (bottom).

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"Show control evolved in the '50s using modified teletype machines for controlling special effects in theme park attractions," explains Golder's Galen Brandt. "Starting in the '60s, you could program a show on programmable logic controllers and let it run itself.

"The situation here is completely different," Brandt continues. "This show is part drama, part musical comedy, part circus act and part theme park. It requires a show-control system that can orchestrate a dozen disciplines, guarantee life-safety conditions for the performers and the crew, and allow the human operator to respond on the fly to the nightly variations in live theater."

At the heart of the system is Richmond Sound Design's Stage Manager 3000 software, with some proprietary Golder software add-ons running on a souped-up Commodore Amiga computer. MIDI Show Control has been a formal part of the MIDI specification since 1991. "But," explains Damon Wooten, Golder's president, "it's new for a lot of the specialty disciplines. Some systems accepted MIDI, but the rest had to be modified."

The Golder team's approach was to construct a large "glue box" with MIDI Show Control input and numerous types of electrical outputs to operate each device's existing controls (i.e., 120 volts AC, 12 or 24 volts DC or TTL logic-levels). "For example, with fog machines," explains Wooten, "we bring the AC power out to a relay and then back. We might do that with two or three different controls—power, heat and the fan or pump—so it's really not the fog machine that has MIDI show control, it's our glue box."

Standard MSC messages are used to operate the glue box. Sending a "fog machine on" message actually has that result, even though the glue box just pulls in a relay. "We have followed the spec very closely, to kind of make a point," says Wooten. "We want to make sure what we do can be used later for reference, and not just as a one-off."

A wide variety of gear is controlled by the system, including sound effects (via MIDI note messages sent to the audio system), four types of lights, hydraulics, compressed air, motors and a robot, not to mention the syn-

chronized bullet and laser pyro hits onstage, the costumes and a huge "flying," laser-shooting replica of the Millennium Falcon spaceship from *Star Wars*.

The system controls all these elements through many individual cue lists. Each cue contains a number (sometimes in the hundreds) of individual actions associated with a particular scene. Once a cue list is activated, these actions may be triggered manually, by time code or by other cues. The system is very fast, with a response time of about 8 milliseconds from "go" to execution.

Although the possibilities for creative control are what excite people most, safety is perhaps the system's most important aspect. For redundancy, there are actually two separate Amigas running simultaneously, each with the complete show in RAM. If one fails for any reason, the other can be switched online instantly, even mid-cue. "You try to imagine what can possibly go wrong," Wooten ponders. "What if the actor does this? What if the tiger does that? And, of course, when you think you've figured it out, the actors come out and do something completely unexpected, and you go back to the drawing board."

During dangerous parts of the show, several people observe the action while holding down a dead man's switch. "If [any operator] removes their hand from the button," Wooten explains, "you disable the gag or prop from operating. The safety side of the system must be failsafe. If an actor is in position 30 seconds ahead of time, things won't happen. If a prop is moving, it has to pass through a certain position and trigger the system to invoke a cue list specific to the next sequence. If [that doesn't happen], the cue list never opens and the contents never fire."

Even though MSC is in its embryonic stages, shows like this clearly show its potential. Wooten is especially grateful to the man without whom, in all probability, the standard wouldn't exist. "Charlie Richmond [of Richmond Sound Design, where Wooten worked for six years] is the one who badgered everybody to accept MIDI Show Control as a standard," Wooten concludes. "I think he deserves a tip of the hat for that. He is a true theater person, and he's really the one that lit the flame in me."—*Rudy Trubitt*

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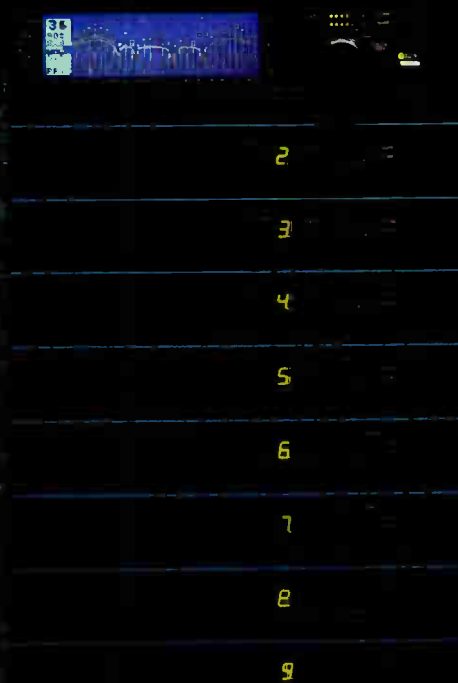
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Sound *For* Raves

By Maria Conforti

Initially outlaw events, raves are crawling out from the underground and moving into clubs and auditoriums. Now these European-inspired, all-night techno blasts are proliferating in a kosher atmosphere—and that could mean new business for sound professionals.

“Recently, because of city ordinances, police, or whatever, most [raves] have moved to permanent spaces, whether it’s nightclubs or auditoriums,” reports Mark Wayne, owner of Electronic Acoustic Research (Pacheco, Calif.). “This spring has been very hard on the underground portion—the fly-by-night, opportunistic promoters renting a warehouse are dying out pretty fast.”

Although these events often are DJ-only affairs, Wayne has serviced “semi-live” raves that sport sampling keyboardists in addition to DJs, and has also miked acoustic



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percussion for some events. Nevertheless, he observes, "About 80 percent of the time, you're just hooking into a DJ/mixer."

However, live music within a rave is becoming more common. This summer, the Divine Playground "touring rave" will feature live acts (specifics were unavailable at press time) as well as DJs, and will also host side attractions in the vein of the Lollapalooza tours. DP will play eight to 10 major markets, including San Francisco, Los Angeles, Dallas, Chicago, Detroit, Atlanta and Washington, DC. "We have places in each city that, in most cases, there's never been a show there before," says Phillip Blaine, co-owner of the L.A.-based Kingfish Entertainment promotion company and the Divine Playground touring company. He adds that area promoters will contract local sound companies for each event.

"A lot of the rave promoters use mobile sound systems that aren't really set up for concerts at all; they're set up for dances," observes Blaine. "I hire concert sound companies and just get them to bring in more bass than usual—I want the clarity of a concert system with the additional bass to make sure that the sound is full enough. If you don't tell that to the concert sound company, they'll just bring in their stuff, which is very good in quality but not very strong on the low end. As long as the bass is adequate enough to where you can feel it in your gut, then that's where it's at."

"One of the keys to a good rave is sensory overload, and humongous amounts of bass power is required, like you've never heard at any rock show," agrees Ken Feldman, promoter for Cozmic 7 Productions (Austin, TX). "People expect to be pushed around, literally, by the music. High end is pretty easy to come by, but good, solid bass is the trick."

Rave clients are divided into two camps, says Wayne: "The ones that tend to go for the tribal beat are interested more in lows than midrange. There are other promoters that want a very hi-fi sound. It certainly doesn't hurt to have a system that does everything."

At least one contact for this article noticed regional sound preferences. Mike "The Shredder" Gutierrez of Shredder Sound Systems and Atlas Sound and Lighting (La Mirada, Calif.) does about four raves per weekend,

two in Los Angeles and two in San Francisco. He says that L.A. ravers are strictly bass-heads, whereas in San Francisco, "they like heavy bass, but the music they play is more house-type with vocals. They want to be able to hear [vocals] on the same level that they do the bass, so I have to readjust my sound system."

Gutierrez uses four bass cabinets for every mid/high box in L.A. and two bass cabinets for every mid/high box in San Francisco. There are several systems in Shredder Sound's arsenal for both club (two-way) and arena (three- and four-way) applications. "I use mostly JBL components, all Crest amplifiers, practically all Brooks-Sirens and JBL/UREI processing" and a Yamaha digital crossover, Gutierrez says. For big jobs, he has a custom-built JBL system and a new TAD system, and he uses Intersonics Bass Tech 7s for anyone who wants to pay for them. "As far as trouble-shooting, the systems are semi-standard, so one drive rack will work for the same systems," he adds. "The only thing that we change around is the speaker configuration, so I consider the key element of my system to be my processing and my amplifiers." Each rack can power either one block or one wall in a large system, or a small club sound system.

Wayne custom-built his two systems. His M-1000 system is a one-boxer with two JBL 2226s, two Electro-Voice EL10s and one JBL 2450 on a custom-made EAR horn. "I'll use anywhere between 16 and 32 of those, depending on the size of the event," he says, adding that a Yamaha D2040 digital crossover/limiter is used with these speakers. Wayne also has his own two-box system, the M-2000, with a Cerwin-Vega 18 in the low box and two JBL E120s and a TAD 4001 driver in the high box. He uses a custom crossover and DBX162 limiters with the M-2000, and his own custom MOSFET amplifiers to run either system.

Cozmic 7's biggest system to date used 12 MTL4s, 12 MTH4s and "a whole bunch" of Bass Tech 7s. This system shook the paint off the walls, Feldman says: "It was a pretty old warehouse, and we literally had to sweep up paint chips from around the edges of the wall. We shook a big piece of wood right out of the ceiling right as we turned it on. We just let it go for a little while and let it shake down for a little bit. That's what rave

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music is all about: pushing tremendous amounts of air."

"As far as front-end stuff, that's the beauty of [raves] for a sound company: You don't have to have a lot of the real expensive gimmicks and gadgets to make a rave system work," Bozeman says, although some sound companies are setting up stacks in four corners, "like you would in a dance club, so you get a lot of intense energy focused toward the dance area. If you use SurroundSound-type processors, you can create binaural imaging and all kinds of neat effects that the DJ can play with." The first Divine Playground event, which occurred in Miami this March, had just such a speaker setup, complemented by a joystick in the DJ booth.

Atlas equips its DJ booths with a custom monitor system. "It's a two-way system with bass cabinets and a pair of full-range speakers," Gutierrez explains, "but we biamplify it and give it its own equalizer, and give the DJ a little bit of control so he can adjust the sound the way he wants to. The monitor system itself is probably equivalent to some small club sound system."

Almost all rave DJs spin vinyl. "I've asked the DJs why they don't do CDs," Wayne says. "First of all, most of the stuff is on vinyl anyway. Second of all, there is a synergistic relationship between the speakers and the turntable and the people jumping up and down. It seems that part of the sound is to get the turntables just prior to feedback; too much feedback, obviously, is a problem," Wayne continues, adding that he usually sets up three sandbag-stabilized turntables with a Rane MT24 mixer.

Most warehouse floors are concrete to begin with, Bozeman notes. He uses either silicon or sand plus foam between the DJ's mixer deck and the surface it rests on. "It turns out silicon or sand is a good isolator for bass, and foam is a good isolator for high frequencies, so that combination works really well," he says.

When setting up two-, three-, or four-turntable booths, Gutierrez places turntable-sized blocks directly beneath the vinyl vehicles to guard against feedback. "My next line of attack would be the equalizer. I use third-octave equalizers on all my sound systems. They're either Klark-Teknik

or UREI equalizers, and I start to notch the very bottom frequencies. Most of the time, people will tell me, 'There's a lot of information at 25, 30, 40 cycles.' It's true, there's bass there, but that's such low bass that a lot of times it's imperceptible. I find that the frequencies that a lot of people like to feel and dance to are the higher bass ones, like 63, 80, 100. Those are the ones that make the sound system really thump."

The requirements for staff are straightforward, although *who* provides the people varies. "Usually we get the promoters to supply us with, say, a half-dozen guys that'll help us unload the truck and stack the system," explains Bozeman. "Other than that, two people can plug everything in and have it running in no time, because it's very simple." Wayne cites a similar manpower requirement, but says he brings his own staff. Gutierrez also brings his staff, although they usually number five at most; he says promoters don't like to see a big sound crew, as some get the idea that's what they're paying for. As for setup time, "We give ourselves an hour and a half," adds Gutierrez. "We

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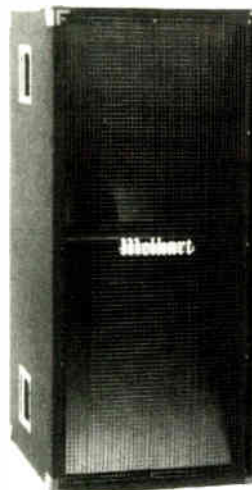
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always ask the promoters for a two-hour lead time. But because there are other sound companies that have screwed jobs up, promoters always ask us to show up at like noon—and the gig doesn't start until midnight or 10:00. We won't do that."

When working a warehouse rave, watch out for that third rail: Large warehouses usually get 480-volt, three-phase service. "Generally, they will have a transformer within the warehouse—if the power company doesn't provide it out of the pole—that will knock that down into 220 three-phase," Wayne says. "Across one of those 220 legs there will be a center tap. What you'll get at the box is two 120-volt legs that are usable and a stinger leg with 240 volts, which should be avoided at all costs. The important thing to remember for an electrician who is used to tying into those is, when you get into a warehouse, you've really got to watch out for that stinger leg. You've really got to carry your voltmeter and make sure that you've got it absolutely measured." Some newer warehouses have a Y system that provides three 120-volt legs.

"These [large systems] have to be accommodated, not necessarily with three-phase power, but their own separate power distro system," Gutierrez says. "The club gigs, you can get away with regular wall power. Our systems will sometimes use in excess of 100 amps for a really large show, so we have to be able to accommodate that."

Just remember to cover your assets, lest you find the police impounding your boxes at a "non-sanctioned" rave, or slick promoters getting a little too slippery with their beeper numbers apres-event. "As far as getting paid, I have a policy, and I suggest it to anybody that's just starting out or when you're working with a new account," Wayne says. "That is, 50 percent down to book the show—which is forfeitable if the show's cancelled, because you're holding the date—and 50 percent when you arrive, before you unload the truck. Most rave promoters are going to tell you, 'Maybe you'll have the 50 percent up front,' but they won't have the rest of it when you get there. What they're going to want you to do is essentially become a co-promoter on the show, but it's a one-way door, because if they make a lot of money, they're not going to give you any more money. And if they don't make any money,

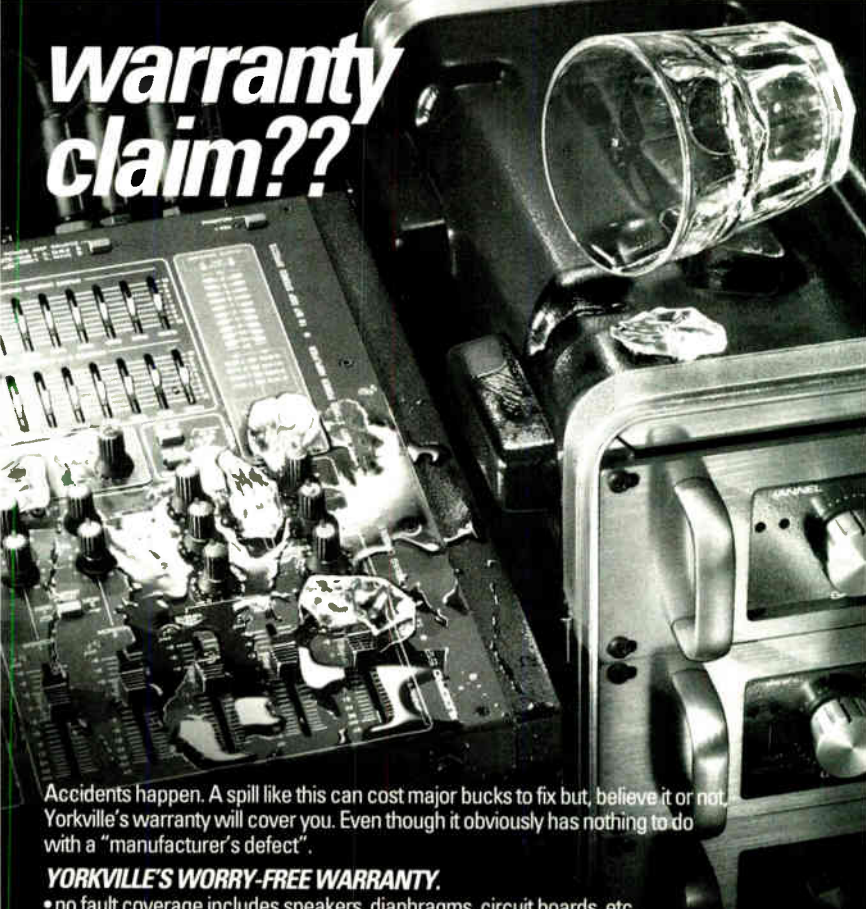
they're going to expect you to take it on the nose with them. You've got to get that straight with them beforehand, and if they're asking you to co-promote the show, what you might get is a small guarantee against a dollar or two on each ticket."

Getting stiffed is hardly a problem any more, Gutierrez says. "We're in a position now where we can select the jobs that we do. So even if the promoter has a total disaster, we always get a 50 percent deposit and we'll let the other 50 percent slide on the word of the promoter."

Still, there's good earning potential

in raves compared to the type of equipment they necessitate, Bozeman says: "A sound company doesn't have to [provide] a big mixing console or multimix monitor system, or the technical expertise of engineers who are good at mixing live acts. Basically, we're talking front-end stacks and racks of power and some kind of relatively simple hookup to the DJ system and a minimal monitor foldback." That plus a couple of hooded sweat-shirts, and you're set. ●

Maria Conforti is a New York-based freelance writer.



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TOUR PROFILE

By Gregory DeTogne

Guns N' Roses

Sound Company:

Electrotec, Canoga Park, CA

House Mixer: David Kehrer

Monitor Mixer:

George "Barney" Barnes

Crew Chief/System Engineer:

David Zammit



GENE HIRSHMAN

ON MAY 24, 1991, GUNS N' ROSES embarked on a world tour that has scorched a path around the globe unabated for over two years. Supported initially by the simultaneous release of their *Use Your Illusion I and II* (both on Geffen Records), the tour has spawned its share of controversy and seen more changes than the sheets in a Thai bagnio. At one time the band gained three background vocalists, a horn section and another keyboard player, before shrinking back to their original size during the "Skin N' Bones" leg of the tour, which was still running strong over the summer. With their act being seen in arenas and stadiums and along the shed circuit, GNR are as rebellious, explosive and preternaturally loud as just about any rock band in his-

tory. To adequately manage their sizable sound reinforcement needs, Canoga Park, California-based Electrotec stepped into the fray to deliver both an FOH system and an enormous monitor rig.

Incorporating a one-off design developed for GNR, the FOH system is a custom version of Electrotec's venerable LAB-Q array called the Q-2. While the configuration of the P.A. changes according to the venue, in arenas it is flown on a curved beam providing 270 degrees of coverage. Numbering 13 columns per side, the arena P.A. incorporates 24 bass bins and 25 mid/high bins. Three of the latter are configured for long-throw use. Near-field coverage for the first ten rows is supplied by wedge-shaped underhang cabinets.



“For 60% of any given show, Axl’s microphone is so hot that it’s always on the edge. I spend the whole night riding each phrase, each word. I can’t just turn everyone else down; it’s not that simple. There is no room for compromise with GNR.”

—David Kehr

Amplification for the system comes from “6400 pounds of Crest power,” says Electrotec’s Mick Whelan. Originally hailing from Coventry, England, Whelan has been with Electrotec for 20 years, 16 of which he has spent here in the U.S. With regards to the power he unleashed for the GNR P.A., he adds, “About a year ago, a magazine asked me how many watts were in the system. I hate talking about watts—they don’t mean diddley to me—so I said, ‘If you want to know how loud this thing is, let’s just say it’s loud enough to blow the head off of a pint of Guinness at 250 feet from the stage.’”

Whelan says that the P.A. was designed to meet parameters delivering clean and loud sonic perfor-

mance. To array such a beast, he began in a scientific manner, using TEF analysis to supply accurate polar plots and ETCs. “If you start out with an array that possesses minimum overlap and lobing and is as good as you can get it, that’s great, but the problem is that it’s not loud enough for rock ‘n’ roll. To make it loud, you need more loudspeaker devices, but you’ve got to be really careful where those devices are pointed. To improve the SPL and on-axis performance in the GNR system, we pushed the overlap a bit. With speech-only reinforcement, you’ve got to be concerned with over-

lap because intelligibility will suffer, but with music we can play around quite a bit.”

At the house console for GNR is David Kehr. A seasoned veteran who has been with the band for most gigs since the beginning, Kehr commands a Gamble EX56 and a Soundcraft Series IV, which is used for sub-mixing. Outboard gear he keeps on hand is essentially the “standard stuff,” with the exception of a lot of Aphex compressors and gates, which pop up throughout the system. No compression is used in the mains, although Kehr has added an Aphex

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Dominator to the overall mix for some brick-wall peak limiting. "The system has so much power that I rarely hit its limit," Kehrer points out. "It's set up so that you never see any of the amps go into clip."

Kehrer won't deny that he mixes loud, but true to Whelan's design goals, the resulting sound isn't painful because it's so clean. Based upon his experiences, other tours that sound louder than GNR just *seem* to be because of the distortion factor. "To be honest with you, I don't even measure SPLs," he says. "I get a groove going, and I know right where I am. There

are a lot of rules governing levels these days—especially in sheds—but we're no worse than any other bands that come through. When things are really strict, we abide by the rules, because when it comes to the bottom line, the band wants to do the show."

As a band, GNR are difficult to mix. "Axl Rose [GNR's lead vocalist] has three different voices," Kehrer says. "His lowest voice barely comes out as a whisper in terms of volume; he has a middle voice, which is normal in terms of gain; and then he has a scream, which can be deadly."

To deal with Axl's dynamic range, Kehrer has inserted an Aphex Expresor and an Aphex Dominator on his mic channel, along with a t.c. 31-band equalizer. Given Axl's reputation for constantly moving about the stage and in front of the P.A. with his Shure Beta 58, Kehrer also tunes the whole system to his microphone. "For 60% of any given show, Axl's microphone is so hot that it's always on the edge," he explains. "In my job, I spend the whole night riding his channel—each phrase, each word. It's almost like punching in just to get him where he should be in the mix. I can't just turn everyone else down; it's not that simple. There is no room for compromise with GNR."

Much publicity has been generated by the number of monitor engineers that have come and gone on the tour. Like the guillotine during the French Revolution, Axl Rose has dropped the blade on a number of aspirants who didn't live up to his demanding expectations. At one point the crew even took to wearing T-shirts provided by lead guitarist Slash emblazoned with an unsmiling "smiley face" on the front and an inscription on the back that read "Friends Don't Let Friends Mix Monitors." Ultimately, Scotsman George "Barney" Barnes took over the position, following a stint on the tour as system engineer. As of this writing, he has spent over two months on the job, which is a positive sign of his further longevity.

Did he have any reservations? "No, I knew exactly what I was getting into," he said during a break in the tour this spring (brought about by a fractured hand suffered by rhythm guitarist Gilby Clarke). "They knew exactly who they were getting, and I felt good about it then and I still feel good about it now. The band is quite loud, but it's not the loudest band I've worked with. The hardest aspect of my job is that oftentimes for the first couple of songs I'm flying by the seat of my pants. That's because Axl needs time to build his confidence on stage. He will come out and won't sing as loud at first, but he still wants to hear himself as loud as he'll be later in the evening. Once he gets up to running speed, however, things mellow out."

By anyone's estimates, the monitor system is a good-sized small P.A. At present there are ten points for flying mid/high LAB-Q cabinets and eight points for flying LAB-Q bass bins, all

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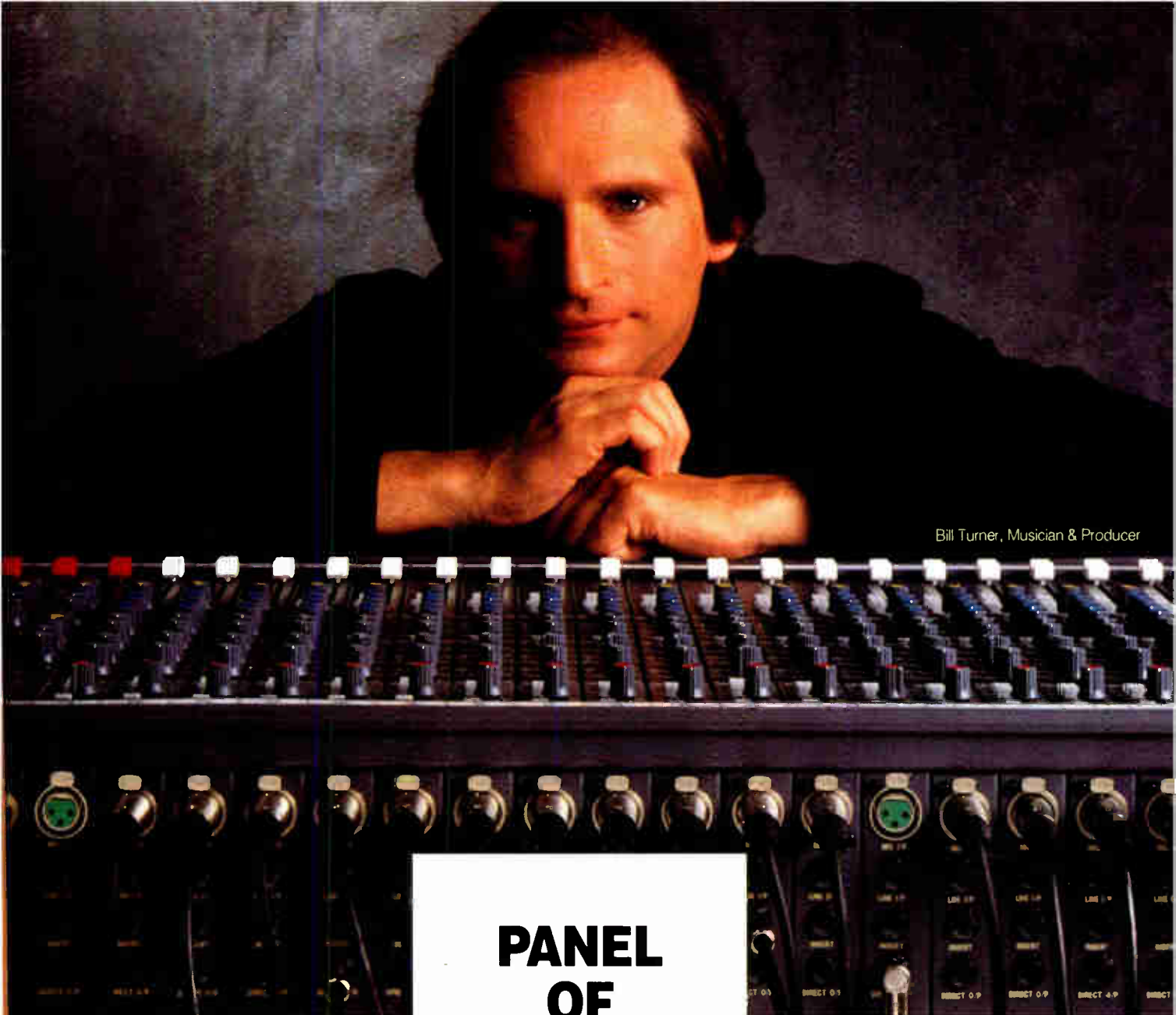
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of which are buttressed by 52 wedge monitors. A Gamble EX Series console handles the mix, while t.c. 1128s with remote heads supply the EQ.

"On an evolutionary scale, this system is probably a step backward when you consider all of the micro-monitors and wireless in-the-ear monitors in use today," Barney jokes. "Perhaps things have gotten out of hand, but it's what the band wants."

Depending on your own personal tastes, a portion of the monitor rig that may have "gotten out of hand" might be found at Matt Sorum's drum kit. "Matt performs with two 2x18 cab-

inets that ride right under his butt," Whelan reports. "We used a Crown Macro-Tech 3600VZ to drive the cabinets, and typically I've measured 140dB peaks produced by the kick and snare drums. When Matt first tried out the rig, he turned to me and rhetorically asked: 'That's loud, isn't it?' To maintain uncompromised power, we wound up adding a specially modified version of one of TOA's L-1102 leveler/limiters to limit the excursion in both boxes."

The process of evolution is making itself felt in the house system as well, as the GNR crew plan the future

addition of digital processing, which will first be used for equalization. "I'm a big fan of digital processing, and every time I've gone from using traditional crossovers to using completely digital crossovers I've noticed a tremendous amount of gain in the fidelity of the system," Kehrer says. "With digital, the high end opens up and becomes more transparent, and it's instantly audible."

The digital processor Kehrer and Whelan chose to supply the system's crossover settings is TOA's SAORI. To bring the unit up to an operational level, Whelan and TOA's John Murray will use both the SAORI and a TEF 20 analyzer to set the loudspeaker crossover parameters for optimum performance.

"When you combine the TEF 20's high-resolution analysis and display with the SAORI's ability to quickly provide any combination of digital crossover and delay settings," says Murray, "you obtain a viable tool with vast capabilities." Working without the benefit of an anechoic chamber, the SAORI/TEF combination allows one to choose symmetric, asymmetric, or overlapping crossovers with frequencies on 1/12th octave centers and from among eight different slopes. All of this, plus precision signal alignment between drivers, can be obtained in a relatively short time.

"The resulting loudspeaker performance is often superior to analog-driven systems," Murray notes. However, he adds "this is due to the flexibility of the SAORI and the resolution of the TEF, not the erroneous 'lack of phase shift' DSP hype that is currently circulating through the industry. The advantages of using the SAORI or *any* DSP-based signal processor are found in the variety of choices obtained for delay times, crossover frequencies, and symmetric or asymmetric crossover slopes, *not* in the device's phase characteristics."

From a human standpoint, the esprit de corps that the GNR crew feels rivals that of soldiers in combat. "What we've been through has been intense," Kehrer says for the record. "This is not a normal tour, and a lot of guys just couldn't handle it when things became larger than life. For those of us who have made it, though, this is a really fine place to be." ●

Gregory DeTogne is a freelance writer and publicist based in the Chicago-land area.

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Axl Rose is shown from the chest up, singing intensely into a Shure microphone. He has long, straight hair and is wearing a white t-shirt with a red and white checkered pattern. The background is a simple, light-colored wall.

Axl Rose



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By Donny Emerick

Spin Doctors

FOH Engineer:
Michelle Sabolchick
Monitor Engineer:
Sean Giblin



PAUL LABRANA

UP-AND-COMING FUNKADELIC rockers Spin Doctors and their independent audio engineer, Michelle Sabolchick, have been touring heavily recently, both supporting and reaping the success of their major-label debut, *Pocketful of Kryptonite*. With appearances on *Saturday Night Live* and the cover of *Rolling Stone*, the band's rise in popularity was reflected in their production gear as they criss-crossed the U.S. twice in increasingly large venues.

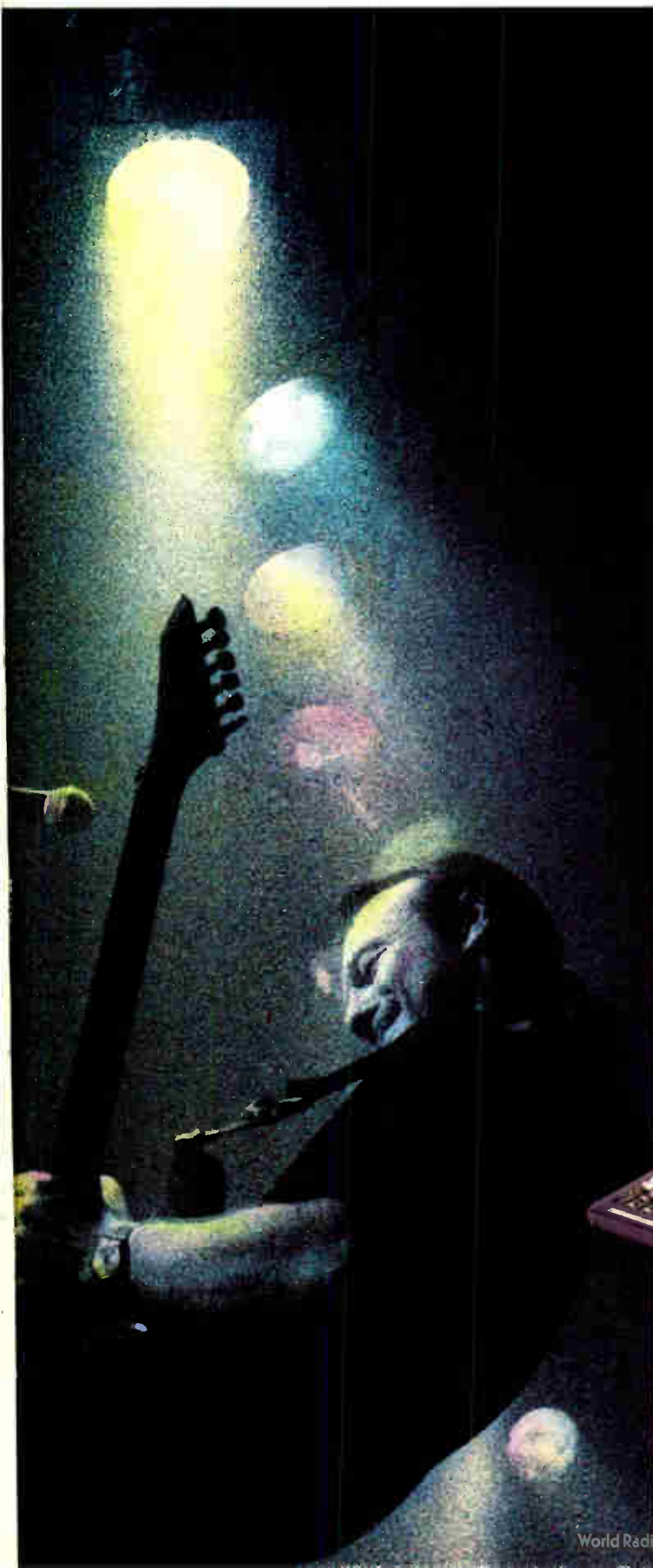
Sabolchick's position with the band opened up after an associate quit midway through the Spin Doctors' summer '92 tour. "He started the tour, but he'd been out for about three years straight and didn't want to be on the road anymore," she explained. "He called me and said, 'I've got

this job and I need to find a replacement.' That's how I got it."

One of the few women in the professional live sound business, Sabolchick said, "Most of the people I deal with are pretty professional about it. Many people say it's neat to see me doing it, because there's not a lot of us."

"On the first tour I started working with the Spin Doctors, last July, we were playing mostly big clubs," she added. "We weren't carrying any production and were just using what they had when we got there. We used a lot of junk. The next tour we started carrying FOH and monitors, and we'd still advance P.A. everywhere we went. It was mainly an East Coast tour, so there were several sound companies we used as much as possible. That way we

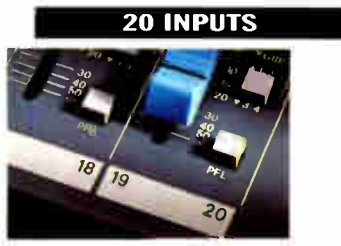
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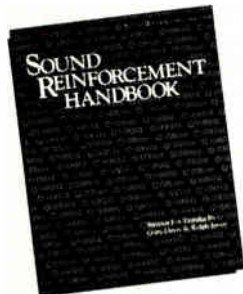


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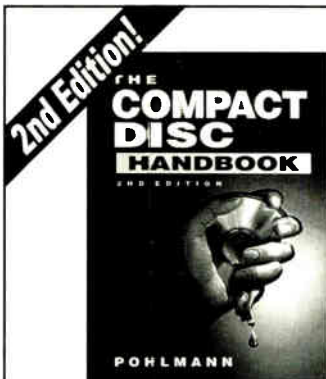
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World Race History

knew we were getting a P.A. we liked.

"This last tour, we decided to carry full production," Sabolchick noted. "We got a good deal from the sound company and we could afford it, so we figured it was better than chancing it and getting stuck. It worked out quite well."

Stacks and racks for the recent tour were provided by Fidelity Audio out of Virginia Beach, Va. Front-of-house and monitor gear was supplied by RSA, of Long Island, N.Y. The P.A. consisted of EAW KF-550s and two Intersonics Bass Tech 7 servos. "All of it was Crest-powered—8001s for the lows and servos and 4001 for the high-mids," Sabolchick said.

The monitor system used custom enclosures built by RSA; the wedges and sidefills contained 12-inch speakers and 2-inch horns. Monitor duties were handled by independent engineer Sean Giblin, who uses a Soundcraft 800B monitor desk.

Sabolchick also used a 40-channel Soundcraft 800B at the FOH. "I really like the sound of Soundcraft boards. They're kind of old, can get kind of noisy, and they have some technical problems, but the EQ on them is pretty nice and they sound really good," she said.

"[The band] doesn't use a lot of effects. In my racks, I had an SPX900, an SPX90 and a Lexicon PCM 70," she added. "The only effects I ever really use are an autopan from the SPX900 that I use on the bass. The drums are totally dry. I use a guitar reverb for one song. The band is very much into having it sound just like it does onstage. I just try to duplicate what's coming off the stage as much as possible."

Sabolchick described her mixing strategy as "just loud enough to get over the stage volume. I try not to mix so loud that it hurts, but their stage volume is loud. To get everything in the P.A. and have a decent mix coming through, it's just got to be loud," she explained.

One of Sabolchick's biggest challenges is making sure lead vocalist Chris Barron can be heard over the band. "I get the vocals as loud as I can over stage volume," she explained. "I mix around the vocals, because that's the most important thing—get them out front and make sure they're clear. Then I bring in the kick and bass, and the guitar comes last."

To bring the vocals out in the mix, she treated them slightly differently

than the band's instruments. "I have the vocals going through two stereo subgroups," she explained, "where everything else has its own subgroup. I have it through two just to get more gain from it. Occasionally I'll throw in a short delay or a few programs on the Lexicon that sound really good—not for effect, mainly just to help his vocals cut through more. Other than that, it's got a compressor on it, but that's it."

High stage levels also led to some experimentation with the lead-vocal microphones. "We've gone through several," Sabolchick said. "We started with a Beyer M88; I really liked the sound of it, but it didn't have enough volume before feedback onstage for the monitor guy. Then we switched to the EV 757. I'm not really crazy about the sound of it, but we get a lot more gain from it. It's working out better. We're still experimenting with different microphones, so that could change."

Instrument mics included a Sennheiser 409 and 421 for guitar cabinets; a Shure SM81, a Shure Beta 57



Band Engineer Michelle Sabolchick

and a variety of Sennheiser 421s, 408s and 409s captured the drum sounds. She ran the bass direct, with an additional 421 on the cabinet.

On the agenda for Sabolchick and the band was a small club tour of

Europe later in the spring. "We won't be carrying anything from the stage except some band gear," Sabolchick said. "Everything else we're going to rent once we get over there. We are going to be carrying our monitor system. RSA, the company supplying our monitors this tour, has a system over there, so [the monitors are] going to be identical to what we have now. We're also going to carry our own mics, but the FOH and P.A. will be whatever we get.

"Production-wise, we're not looking forward to it," she added. "Some of these places, it's going to be like going back a couple of years, playing these tiny clubs. We have no idea what kind of gear we'll get, and we're not expecting a lot in terms of production quality. But it's a very good move for the band, and there's not a lot of pressure to make sure it's the best—it'll just be the best it can be." ●

Donny Emerick has a pocketful of kryptonite to go along with his beard and Dartmouth baseball cap. When you see him out at a club, buy him a beer.

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TOUR PROFILE

By David (Rudy) Trubitt

INXS

Sound Company:

Showco (Dallas, TX)

House Mixer: Benji Lefevre

Monitor Mixer: Bernie Bernil

System Engineer:

David "Cowboy" Conyers



INXS at San Francisco's Warfield Theater, the first date of their US theater and club tour.

THIS SUMMER FOUND more than one well-known act taking their show into smaller venues. One example was INXS, who started with a club tour of Australia, moved up to the States for two weeks and then went on to Europe. These theater and club dates gave the band a string of high-demand, sellout gigs which set the stage for a possible arena leg in support of an upcoming record. It also gave them a chance to return to their roots, according to veteran house mixer Benji Lefevre.

"When I did my first show with them last year, they had a lot of sequenced stuff and the machines ruled a lot of their lives. This time around, I was instrumental in trying to wean them off the machine, because they are really good

players. Although what they did before was really good, I think it was strangling them. Obviously, there are certain songs where some of the sampled sounds are so familiar and important to the melody that you can't get away from them completely. But we have replaced a lot of the sequencing with [manually triggered sounds] rather than running a sequence just to do a specific part."

"Every band starts in clubs," says Lefevre. "The difference in doing them with a band like this is that you can specify the audio exactly, whereas up-and-coming people have to deal with the club's in-house system. But a club is a club. By and large, they are probably more difficult to do than [larger venues] because they are such weird shapes. You also have to involve the stage sound in your mix. It's truly a

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Monitor mixer Bernie Bernil



House engineer Benji Lefevre

reinforcement of what's coming off the stage, rather than being a separate entity. And that's really good fun, because everybody has to work together; otherwise, it ends up being a mess."

Lefevre tries to keep his focus on music, rather than gear. "I'm not a super electronics technician—I can employ people to fix the desk if it

goes wrong. What I like to do is draw a performance out of people. It helps to have a good technical background, but I do enjoy interacting with the musicians. That was one thing that the Stones really enjoyed [Lefevre mixed the Rolling Stones' *Steel Wheels* tour]. I told them if I was going to be away from my wife for a year, they'd

best listen to what I've got to say." And they went "Great, at least somebody is talking to us!" If someone wants me to shut up, just tell me and I will, but until then I'm going to say what I think."

Not to say that Lefevre isn't a good listener—in person, he's extremely relaxed and personable. "I hope that a lot of what people like about what I do," he adds, "is the way that I work with every department—the lights, sound, the band, everybody. I think the sound is the most important, obviously. But I'm not afraid of the big picture."

Part of that picture is monitor engineer Bernie Bernil, who mans a maxed-out Ramsa WRS-840 monitor console. In addition to his regular work with Showco, Bernil is associated with Tennessee Concert Sound of Memphis. He also teaches Audio and Concert Production in the Commercial Music Program at Memphis State.

"In a club situation, I'm only doing 10 mixes," Bernil explains. "Three on the front line and stereo sidefills. A lot of front line is mainly for vocals, like for Michael Hutchence's mix—the only thing that goes in there is vocals. I rely on the sidefills and the stage sound. We take a lot of time adjusting levels because of the different-sized rooms we go into. It's not like an arena tour, where you know the buildings are all relatively the same size and type of acoustics. [On this tour] I find myself pulling and adding frequencies from venue to venue. Throughout the night, you will find me reaching for the graphic to get something out and just change the frequency points, because when it gets hotter, people tend to want a little bit more top end."

"Especially in Australia," recalls Bernil. "Those are hot and sweaty clubs! In one place, Benji set up the front-of-house and then realized he was underneath a massive air-conditioning duct. In the middle of the show the condensation was really bad—it started pouring, so he had to get a couple of people to hold a space blanket over him, taped to the meter bridge. At another gig, I had to set up under an AC vent. So the hands came in with some plywood and scaffolding and built me a little lean-to. The band came in, looked at my area and looked at me. I just sat there and smiled. But I enjoyed it—now I can say I've done the clubs and universities down under!" ●



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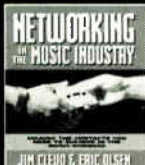
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