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The Pro Audio Applications Magazine

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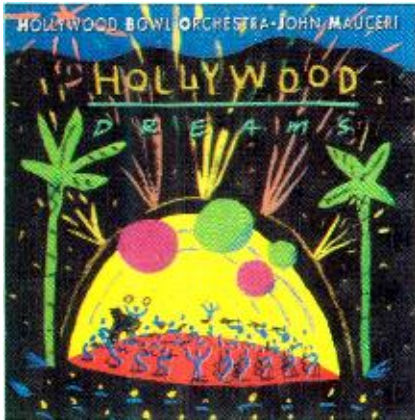
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Contents

Volume 23, No. 3

March 1992



14



30



33

Audio Production

| | |
|---|-----------|
| The R•E•P Interview: Mitchell Froom | 20 |
| The producer shows his brave face. <i>By: Dan Levitin</i> | |
| Gearing up for Video | 24 |
| Considering the purchase of video production-related equipment? Get your priorities straight. And read this ... <i>By: David Leathers</i> | |
| Bad Animals | 30 |
| In with the new ... but let's keep the old. <i>By: Steve Lawson</i> | |
| The Arena | 33 |
| Recording in a studio without walls. <i>By: Erika Lopez</i> | |
| The Falk Console | 36 |
| Have console prices got you down? Why not build your own? <i>By: Gary Falk</i> | |
| Monitoring in Surround | 40 |
| With so many surround sound processors in America's homes, it's important to know what America is hearing. <i>By: Terry Skelton</i> | |
| Hands On: Behringer MK III Studio Denoiser | 53 |
| <i>By: Mike Joseph</i> | |

Sound Reinforcement

| | |
|--|-----------|
| Live & Direct | 45 |
| Education in the Sound Industry. <i>By: David Scheirman</i> | |
| Coils and Windings: Part One | 46 |
| Making a case for the lowly audio transformer. <i>By: Richard Guy</i> | |

Departments

| | |
|-------------------------|----|
| From the Top | 5 |
| Letters | 6 |
| Random Access | 10 |
| Fresh Tracks | 14 |
| Digital Domain | 50 |
| R•E•P: Handbook | 51 |
| Sound Business | 52 |
| First Look | 57 |
| Cutting Edge | 58 |
| Classified | 63 |
| Advertisers Index | 72 |
| Rapid Facts Card | 73 |
| Subscriber Card | 75 |

On the cover: The Arena at Walt Tucker. Photo courtesy of Mike Bloom.

R•E•P: Recording•Engineering•Production (ISSN 1058-9678) is published monthly by Intertec Publishing Corporation, 9221 Quivira, Overland Park, KS 66215. Subscriptions rates are \$26 to qualified readers, \$30 to non-qualified readers per year in the United States, \$50 for qualified and \$60 for non-qualified per year outside the United States. Optional airmail for non-qualified readers outside the United States is also available for an additional \$55 per year. Foreign subscriptions are payable in U.S. funds only by bank check or money order. Adjustments necessitated by subscription termination at single copy rate. POSTMASTER: Send address changes to **R•E•P: Recording•Engineering•Production** P.O. Box 12960, Overland Park, KS 66282. Second-class postage paid at Shawnee Mission, KS 66202 and additional mailing offices.

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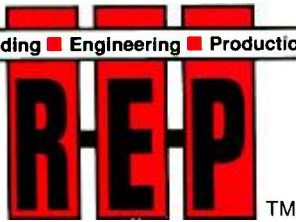
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From the Top

Flash! Important Developments ...

In the past several years, two very important developments have come to light in the audio arena. Surprisingly, few studios have noticed enough to fully exploit the absolute revolutionary nature of these advancements. Like tools in the toolbox, these developments fall in the category of, "I didn't think I ever needed them before, but now that I have them, they're absolutely indispensable!" Got your attention?

The first is very broad in nature. Literally, it is the computerization, or better put, the relegation to computer software, of all that involves synchronization of storage media hardware. From many former MIDI sequencer software companies come hardware and software solutions to the timeless problem of locking together two or more devices containing audio, MIDI and video tracks.

Think about it: Unlike a half dozen years ago, today's normal, average posting or sweetening project probably has analog or digital audio from a multitrack deck, pics from a video deck with LTC or VITC and a window burn, and a Mac computer running a MIDI sequencing program for synths or samplers, all in sync. Which is the master? Which follow the others? What happens if the elements arrive for assembly containing fundamentally different types of time code, whether frame rate or overseas standard in generation.

Previously, it took a large investment in dedicated hardware (choose your brand) to sort through the master/slave/language traumas involved. More often than not, something had to be re-stripped or transferred to clear up the dilemma. But ever more so today, the problems are being addressed in the software world, on-board a computer. For the first time, small, relatively inexpensive boxes, driven by sequencer/sampler-friendly software programs, can handle time code questions on the fly, providing added goodies such as window burns, fail-safe read-out of code type and flavor, and the flexibility to work on separate elements of the project (such as the music bed-only with samplers and sequencer, or voice-over on the tape deck), to the exclusion of other hardware.

Why is this so important? For one, it foretells the day, not far off, when the only thing hardware-like will be the computer and its power supply, and maybe a separate storage *thing* or two. Sync will not be an issue. Want to view absolute time? Elapsed time? Offset time? Arbitrary Index time? Footage? Beats and bars? Video frame numbers? MIDI time code? Time

in Moscow? Lunch time? Time since the producer's last call to his stock broker? It's just a pulldown item on the screen's menu. Then specific location access will be click-clock instant.

Also a portentation of the future is the thought that in the very near distance (two, maybe three conventions away), we will see an all-in-one audio recorder-editor/video editor/sampler/sequencer workstation which ties all the disparate audio/video production genres together in one box, under one operating system. This will be the first true one-man-band technological answer. But who asked the question? We did. All the professionally creative composers, arrangers and producers out there who want more control over their vision and lower delivered production costs.

Is this a good thing or a bad thing? It probably depends on what your current investment is in hardware and business real estate. For the industry, and probably the media world, it's arguably a good thing. It will, however, wreak havoc with engineer's status. But what do you think?

Many studio owners we have spoken to are fearful of a *consumer* production world, where the means of production are affordable to every end-user. Open-for-business studios do have options, though. They can hide from inevitable reality. They can quit. Or, they can put in a back room with everything that modern technology has to offer on a desktop, additionally throwing-in their long-standing "value added service" that made them successful and popular.

Studios *do* have to do something, because they certainly won't be able to beat back the wave of professional all-in-one budget production facilities, which impending affordable technology will foster, piloted by the creative, totally committed members *from our own ranks* who desire to gain control of their own budget variables. More than food-for-thought — it's time to start preparing for the true maturing of our industry, the next step, as it were.

The second major development we began this editorial with is simple and straight ahead: surround sound. Every network's doing it. Every station's broadcasting it. But do you know what that home surround decoder is doing to those stereo music beds you created while monitoring with *only two speakers*? Shouldn't you find out? You might not like it!

Fortunately for you, this month we are featuring two articles, one focusing on video-related gear and the other on surround sound monitoring. Venture on, good readers. And don't say we didn't tell you! ■

Mike Joseph
Editor

Less Hype

From: Timothy Nissen, Avalon Audio, Owatonna, MN.

As a new reader to R•E•P, I wish to comment on your editorial in the January issue regarding advertising and product reviews. As an audio professional, I would like to know up front, before my purchase, what type and quality of product I would be getting for my money. In-depth product reviews and tests are the only way to achieve this, beside being lucky enough to road test the equipment myself. Companies that cannot handle the slight criticism that may appear in reviews are only thinking of the short term profits, not the longevity of the given product line. If they cringe when their product is reviewed, maybe they should fully test the product with industry-common equipment, not their own test lab and personnel, to try and ensure objective testing and documentation.

I know other magazines covering the pro-audio world live for the high gloss pictures that line their pages. But as a user and consumer, I would rather write the factories myself to get the pictures and the fluff. But a magazine like R•E•P that saves me shopping at 10 different stores and listening to a salesperson's pitch, is where I'll put my confidence and subscription dollars.

Helpful and Useful

From: Ronnie Dean, Millikin University, Decatur, IL.

I have enjoyed R•E•P for several years now, but I believe the most helpful and useful article you have ever published was the use of the 2141 and 2142 chip set to balance and unbalance audio circuits, written by John La Grou, in your November 1991 issue.

With the growing quality of signal processing components for home recording studios, I find myself more and more having to match professional (balanced) and home quality (unbalanced) circuits. That coupled with today's economy made your introduction of a very economical circuit most timely.

Please continue to use your magazine to call attention to these types of helpful and inexpensive circuits.

Question: Is there an inexpensive chip and circuit that will allow me to split low impedance microphone feeds and still maintain the quality of the expensive transformers that I must use now?

(Readers? Any suggestions? - Ed.)

Kudos, Continued ...

From: Carmine Fergo, Medford, NY.

Keep up the good work with your unbiased, no-nonsense magazine. We all need it in the "one-hell-of-a-roller-coaster-ride" that the '90s appear to promise us.

Upgrade Contacts

Scot Jon Schweska, SJS Productions, Bristol, PA.

I would like to start off by saying that your magazine is great! I find the technical evaluations very helpful, and the product reviews are always good for finding out what's hot and what's not. The new product section is nice too.

In your June 1991 issue in the "Digital Domain" column by Rick Schwartz, Rick spoke of a gentleman named Jim Williams of Audio Upgrades. Could you send me more information about Audio Upgrades? Thank you for your time and I look forward to hearing from you soon.

(Jim Williams of Audio Upgrades can be reached at Box 7551, Mission Hills, CA 91346.)

Subjectivists

James Somich, Somich Engineering, Broadview Hts., Ohio.

Your editorial in the Jan. '92 issue of R•E•P "Who Do You Trust" addressed a concern that I have had for some time. I have come to rely on R•E•P for the "truth" about equipment and I have not been disappointed. Last year, when I was having compatibility problems with my new Sony D-10 Pro portable DAT recorder, it was a series of articles in R•E•P that gave me the ammunition I needed to straighten out the problem with Sony. Those articles were definitely not "fluff."

I'm sure you are aware of the current war between the subjectivists and the objectivists concerning audio quality. Much of what the high end community touts as gospel borders on fraud. Have you heard of the Tice clock? There are a few sane voices out there to guide the engineers and technicians of tomorrow.

Keep doing what you are doing. Do more. Give us objective test reports and label subjective opinion where it is used. De-bunk the mythology that is contaminating our business. I know you walk a fine line between advertising revenue and editorial content, but that is why they pay you the big bucks (only kidding). Specs still count (if they are the right specs).

Audio is the only field I know of where so much purely subjective "crap" is passed off as scientific fact. The true professionals must show the way. The advertisers with integrity will stay with you.

Strange and Devious Devices?

From: Walter Becker, Maui, Hawaii.

I recently had the opportunity to read R•E•P's review of the Meyer HD-1 monitors. I have been using these speakers exclusively in the studio for a while now, and the Meyer folks have been very helpful in making them available for me

at various studios in New York and Los Angeles. I mention this so that my predisposition toward these speakers is clear up front.

I instantly liked these HD-1s and I still do (I paid for my pair, by the way). Clearly, the author of the review doesn't share my opinion, and so, while grudgingly admitting that they do many things very well, he suggests that the HD-1s are strange and devious devices which will confuse producers and engineers because they are overly revealing of musical detail, because they will make it sound like the mix has too much echo (while elsewhere it is stated that they have less "air" than other speakers), because of their dispersion characteristics, because of various charts and graphs, etc. etc.

Why not simply say that the HD-1s are excellent monitors that I, the reviewer, don't particularly like? Because this is what he seems to be saying, once all this technobabble has been boiled down and disposed of.

It would be possible to refute many of these specific claims point by point, but I think doing so would be to miss *the point*. HD-1s have many of the characteristics of audiophile speakers in their size class, but have been designed for studio monitor applications (which for almost all audiophile speakers are unsuitable in one way or another). They reproduce very natural timbres, with very satisfying depth, at the levels at which I think discriminating listening should be done (I have always monitored at pretty reasonable levels and I don't see why anyone working long days in a studio would do otherwise).

My admiration for the HD-1 is the result of many days of tracking, overdubbing and mixing in actual recording studios on actual recording projects. The author of the review in question evidently didn't do anything like this himself. Perhaps if he had used his mics on a musical instrument and listened through the HD-1s (as opposed to playing test tones through them and then measuring the result through microphones), he would have been more favorably impressed.

There are many types of recording equipment which are difficult for a typical R•E•P reader to assess for himself, in which case one might wish to depend on the judgement of some expert with a folder of graphs and numbers. Speakers do not fall into this category. Your own ears will tell you whether you will be able to relate to a particular monitor.

For me, the HD-1s have filled the need for accurate, transparent, good-sounding monitors that will work consistently and reliably under actual studio conditions. With so much junk and hype on the market, it's really too bad that a product which has achieved such a high degree of excellence should be damned with faint praise. I think it would be a shame for anyone to discount the HD-1s because of this strange review, when it's so easy to judge for oneself whether they are the 'droids you're looking for.

Continued on page 8

"I did a great deal of shopping around while equipping my home studio. When I found the Peavey AMR 2400 console, I was thrilled: It had all the features I needed, was easily understood, looked great, and cost half the price of any other comparable board. Now I have so much production freedom — the 2400's logical layout makes using it so easy. My Peavey AMR 2400 console is the centerpiece of my home studio."

Jerry Goldsmith
Movie Score Composer/Producer



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Continued from page 6

Unwanted Noise

From: Eric Wenocur, Rockville, MD.

At the risk of opening (another) nasty can of worms, I will mention a phenomenon I have noticed concerning Compact Disc fidelity. Recently, an associate mentioned a peculiar non music-related noise occurring sporadically on a CD he owns. After he pointed it out I began to notice it on several other discs. Basically, it's a high frequency tone, somewhere around 15kHz by my estimation, which comes and goes at times and levels unrelated to the musical content of the disc. The tone is not always easy to hear, because of masking and playback system limitations, but can be distinguished on a good studio system or good headphones.

Some specific examples of where this tone can be heard include: Linda Ronstadt, "Lush Life," on the first cut the noise appears exactly at the orchestra entrance; Oleta Adams, "Circle of One," on the first cut the noise appears at the drum entrance, and comes and goes throughout the disc; Yes, "90125," on the first cut the noise appears momentarily in the first few seconds (when the electric guitar enters); Seal, "Seal," very clear on the last cut, coming and going.

This is not an isolated phenomenon or one that only I can hear. Several of my colleagues have also heard these tones, and they occur on multiple copies of the same discs and on different CD players. Frankly, I cannot believe that the engineers and producers of these recordings could have missed this sound in mixing or mastering, so I have to believe it's some sort of manufacturing defect. I am throwing this open to the recording community to see if others can corroborate my experience and possibly offer an explanation. From a fidelity standpoint this unwanted noise is a blemish on the pristine quality we expect from Compact Discs.

Detailed Discussion

From: Paul Hugo, Gauss, Sun Valley, CA.

In response to your Nov. 1991 column. From the Top, "How Much Detail is Too Much?:" I would answer your call for responses from two vantage points. An engineer/producer first needs to know to what he is listening. I mean that both in the sense of what is being played in the studio and what he is hearing in the control room. In having a mind set that determines the sound idea and how it fits the mix, one can overcome all but the very worst of monitoring situations (i.e., blown speaker component).

The above suggests the insignificance of monitors and, in fact, the rest of the recording chain relative to finding your center as an engineer/producer. The more technical aspects of your editorial call for a response as a manufacturer of speakers.

The speaker manufacturers mentioned in your article, such as Gauss and others, have approached phase coherency in their own way. Not to imply that all methods are equal, but one aspect often overlooked is consistency of polar pattern. It may be wider at the bottom of a band than at the top, but hopefully consistent throughout the critical listening region. Because this is usually dotted by one or two transitions between components, it becomes more of a challenge for the designer. A system that advertises (and has) a wide high frequency pattern, may have something quite different just below the crossover point. In this situation, even if you have only a few boundary reflections at the listening position, timbre and special relationships will be compromised.

Another point to keep in mind is that wide dispersion is not necessarily a positive characteristic. A monitor with a consistent 90° + polar pattern may be ideal for bridge top use, but in a soffit eight feet or more away, the reflections noted in your article will play a major part in what the "sweet spot" sounds like. Something more directional might be a better choice, yet may not make a good impression at your next AES Convention.

In the end, one should choose the right monitor for the application, but rely on an internal reference.

It's not the size ...

From: Jim Williams, Audio Upgrades, Los Angeles.

After reading the letter by John Hardy in the November, 1991 issue, I'd like to clear up a few points concerning the "discrete vs. monolithic" debate.

First, I believe the scope of the June 1991 "Digital Domain" column was to show that basic improvements can be made to most audio gear. It wasn't a forum to debate the pros and cons of discrete and IC op-amps, a topic beyond the space limits of the column. Obviously, many valuable points were omitted from both perspectives.

Some of the advantages of the discretely are: Transistors and passive components can be optimized for each part of the circuit; the circuit can be operated at higher voltages and can deliver more power into lower impedance loads; and they can outperform many common ICs.

Some disadvantages include: large power requirements and high heat dissipation; large size, which limits where they can fit; unpredictable stray capacitance and component lead inductances, (which is why many high-speed designs require surface-mount components); and much higher cost.

Some advantages of the monolithics include: low power requirements and low heat dissipation resulting in low thermal (Johnson) noise; low stray capacitance and inductance allowing high speeds and bandwidths; continual refinement of designs and processes; small size which

fits in over 99% of existing equipment; and low cost.

Some disadvantages include: chip resistors and capacitors aren't as good as discrete parts; power rails are limited to $\pm 18V$; and outputs can't drive loads below 600 Ω . However, there are available IC current boosters which, when placed in the feedback loop of the chip are then able to drive 150 Ω loads, or (conversely), discrete power transistors can be used to drive even lower loads. These "boosters" can be operated at higher voltages allowing +30dBm outputs, if needed.

As to the basic 990 design, large improvements can also be made. The input transistor, the LM394, has a noise spec of 1.8nV/Hz squared. The PMI MAT-02 is a direct replacement and offers an improved noise spec of .85nV/Hz, or about half the noise. It also sounds better, at least according to the many people who have had it installed in Sony/MCI tape machines and consoles. 100ppm metal film resistors are good, but 50ppm resistors are even better and are available for under four cents each. Holco and Vishay make resistors down to 4ppm, at a higher cost. Utilizing such parts can make "the best op-amp" even better.

My complaint against Bi-Fet op-amps is basically limited to the TL070 and LF351 types, not all FET op-amps. My beef isn't necessarily with the sound quality, but with the noise. Anyone that has ever tried to push up the high EQ in consoles with these chips knows what the word "hiss" means! Some FET op-amps like the Burr-Brown OPA-627 and PMI OP-275 are excellent, and exceed bipolar op-amps in many ways.

Finally, just because a circuit is "discrete" doesn't automatically make it better — there is still a lot of mediocre sounding discrete stuff out there. The "discrete" coinage is no guarantee of great sound, nor are IC's a curse. It really comes down to how they're applied. Mr. Hardy makes several references that silicon chips of a large "size" makes them better, however many believe it's not the size that counts, it's how you use it!

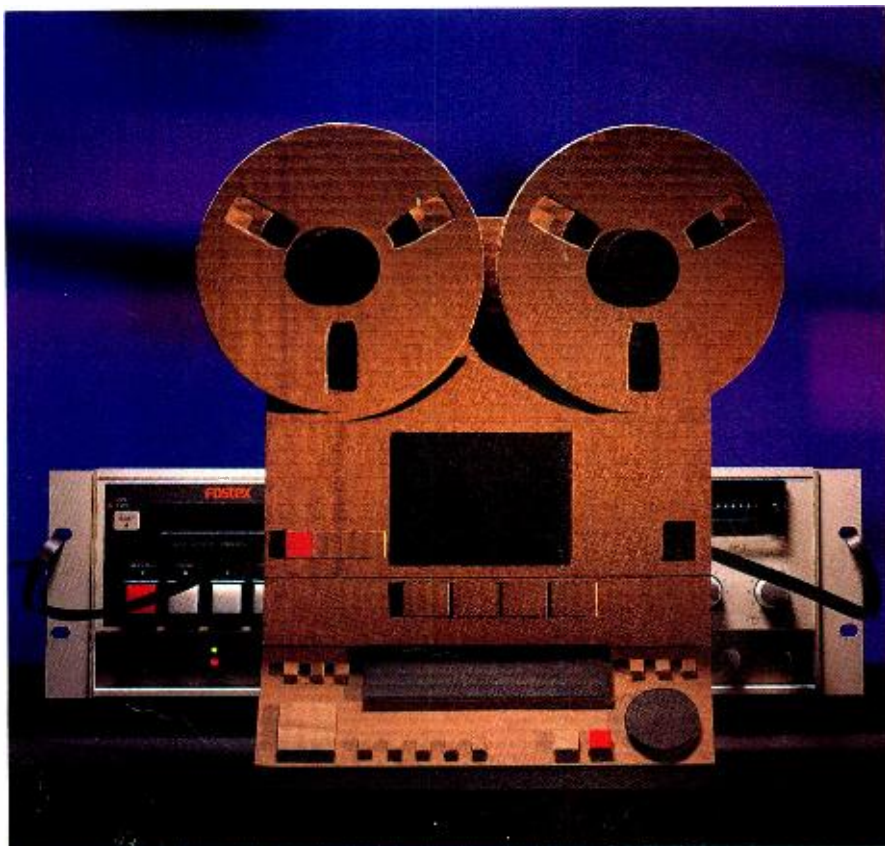
Red Return

From: Maureen Droney, Tower Artists, Los Angeles.

I wanted to tell you that I really related to your December From The Top column, "Rehearsing In Red." I've been there so many times, making records with one other person, and being terminally bored. I keep waiting for that "back to basics" movement. People keep predicting it, but not much of it shows up. As you said, there are tracks being cut "by the seat of the pants" but not enough of them to keep all of us engineers busy! Oh well. ■

Send letters to R-E-P, Box 12901, Overland Park, KS 66282; or fax 913-541-6697. Letters must be signed and may be edited for length and clarity.

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He Wrote The Songs!

While the Stones, Led Zeppelin, The Doors and Cream got the glory, Willie Dixon got the royalties. The blues legend died of heart failure at age 76 in L.A. on Jan. 29th. With us still are "Spoonful," "Back Door Man" and "I Can't Quit You Baby" among others.

Just Point and Click

From the 133rd SMPTE technical conference held in L.A. Oct. 1991:

Apple computer's new QuickTime, extended from Macintosh system software, is a generalized architecture for time-based production environment data control. In QuickTime, an audio icon named "Sound Manager" shares the computer screen with options such as "Movie Toolbox" and "QuickDraw" to allow users interactive control of digitized audio without specific audio expertise. Simple point and click commands manipulate audio within the larger production universe while QuickTime hides the nasty details of implementation and system hardware.

"Looking farther afield, QuickTime and similar technologies have the potential to affect consumer electronics, broadcasting, telephones and publishing, as well as computers. Imagine reading this newspaper on your home computer screen and being able to click on (an illustration) which comes to life as an animated cartoon. A photo accompanying a news story becomes a film clip. Clicking on a sound symbol in a concert review plays a passage from that work." *N.Y. Times* Sunday Jan. 12, 1992.

15 YEARS AGO:

From R•E•P (then-Recording Engineer/Producer) Feb. 1977:

... Cleveland's Advent Recording Corporation announced that the first modern direct-to-disc LP recording (of the Cleveland Orchestra) would be released on the Telarc label ... Expounding on his early career, George Massenburg recalled a remote session in which he was required to go to a pig slaughterhouse and make a recording of pigs "at the moment of their demise," which he later edited into a fatback beat with a "fat pig as a bass drum, a medium pig as a snare, and a little baby pig as the hi-hat."

10 YEARS GONE:

From R•E•P (then-Recording Engineer/Producer) Feb. 1982:

... Kenji Tmaiya, President of Sony Corporation of America announced that MCI Inc., then a privately held Florida company, would become an independent division of Sony Corporation of America. In a feature article titled "The Coming Audio Revolution," RE/P speculated that, "The advent of stereo television will provide a much needed growth for all levels of the audio business."

One World, One Store ...

The Council of Manufacturing Representatives Associations (CMRA) unanimously voted to increase support of their ongoing confrontation of Walmarts' recently announced decision to force manufacturers to cease dealing with manufactures' reps and brokers.

PEOPLE

trend watch

John Hale has been appointed chairman of the board, chief executive officer, and president of Telex Communications Inc. Hale was most recently CEO of Fibronics International ... AKG's **David Angress** has been promoted to the newly created position of vice president, sales and marketing, and is responsible for the company's worldwide marketing activities. Angress formerly held sales vice president positions with One Pass Film & Video and Sound Genesis in San Francisco. Angress then announced the immediate appointment of **David J. Bierut** as AKG's eastern regional sales manager. Mr. Bierut has held key sales and marketing posts at Washburn International, Panasonic, TEAC and Ovation ... Ampex Recording Media has announced the appointment of **Ernst L. Ranft** as vice-president of operations ... B & B Systems, a California-based systems and facility design and engineering company has named **John Bradford** managing director and promoted **David Barolone** to executive vice-president. B & B president **Bill Burnsed** has assumed the position of CEO ... **Phil Keeling** is the new general manager at Magnetic South (Toronto, Canada) filling the position vacated by retiring general manager **Finn Quinn** ... Treasure Isle Records recently appointed **Bill Baynes** as its new marketing manager ... Spraylat corporation has announced the appointment of **Brewster Barclay** as European product manager for conductive coatings. ■

Who really remembers? ... Or Cares?

Video Storyboard tests recently found that only 48% of those tested could identify, without prompting, the sponsors of their favorite TV ads.

Finally!

Warner Brothers recently told retailers to discontinue sales of the enigmatic Biz Markie's album "I Need A Haircut." The unprecedented action took place in response to a New York federal judge's decision to bar sales of the album on the grounds of copywrite infringement. Specifically, Judge K.T. Duffy ruled the "artist" and multiple defendants had used an unauthorized 8-bar sample of Gilbert O'Sullivan's 1972 single "Alone Again." It's about time.

The whole world's watching ...

Estonia, Lithuania, Latvia and at least 12 of the republics that formerly comprised the Soviet Union received the live broadcast of the 34th Grammy awards from Radio City Music Hall on Feb 25th. We assume that viewers in these longer-than-ever bread line societies observed the glitzy extremes of our entertainment culture. Presumably this will advance the cause of western decadence.

At what Price?

"Karoshi," a single word that communicates the act of dying at one's desk from overwork, is being seen as the Japanese equivalent of AIDS, and has become a hard reality of post WWII Japanese society.

Over 10,000 men (mostly) die annually from this phenomena and the number is steadily increasing. In a country where there is implied dishonor in actually taking one's vacation, it is no wonder that the Japanese find Americans to be lazy. ■

"Rock 'n' roll is the pre-pubescent scream of hormonal agony."

— Jeff "Skunk" Baxter reflecting on the nature of the art form while addressing the '92 Syn-Aud-Con Concert Sound seminar about dangers inherent to high dB SPL.

Random Access

STUDIO UPDATE

| Name/Location | Details |
|---|---|
| NORTHEAST | |
| Mystic Recording/Brooklyn, NY | Took shipment of a 40-input Amek/TAC Mozart console. |
| Ironbound Soundworks/Newark, NJ | Installed a 56-input Amek/TAC Mozart console. |
| Platinum Island Studios/New York | Purchased a Neve 8128/56 with Necam 96 and a Studer A-800. |
| Hip Pocket/New York | Recently added a third Sony APR-24 24-track tape recorder. |
| SOUTHEAST | |
| Full Sail Center for the Recording Arts/Winter Park, FL | Opened their "Tascam Lab" featuring six cockpit mixing stations. Each position includes a Tascam M3500 console, SPX900 processors and an Audio Logic MT660 compressor/limiter/gate. |
| Airshow Inc./Springfield, VA | Has installed a Sonic Solutions editing system. |
| Integrity Music/Birmingham, AL | Purchased an SSL 6056 E/G console from Ocean Audio. |
| SOUTHERN CALIFORNIA | |
| Zazen Studio/Malibu | Added a Mitsubishi X-850, 32-track digital tape recorder. |
| Lighthouse Recorders/Studio City | Took shipment of an SSL 4072 E/G and a Studer A-800. |
| Serafine Studios/Venice | Took delivery of an Otari Series 54-P mixing console in its new 4,400-square-foot facility. |
| NORTHERN CALIFORNIA | |
| Musical Infinities/San Francisco | Purchased a Pro Tools 4-track disc recording system from Digidesign. |
| NORTHWEST | |
| Digital One and Pace Video Center/Portland, OR | Have formed a production alliance with Digital One and now operates its four direct-to-disc audio systems within the Pace production facility. |
| CANADA | |
| Reaction Studios/Toronto, Ontario | Have installed an SSL SL 4000G, a Studer Dyaxis, Studer 807 and Dolby SR XP24. |
| GREAT BRITAIN | |
| Chop Em Out/London | Has installed a complete mastering facility for DCC (Digital Compact Cassette) preparation. |
| RUSSIA | |
| "A Privately Owned Studio"/Moscow | Recently installed a Sountracs IL3632 production console with Tracmix 2 automation and an Otari MTR90-2. |
| DESIGNERS | |
| Walters-Stork Design Group/New Paltz, NY | Has completed two new control rooms and three tapeless suites at Electric Melody studios in Los Angeles. |

NEWS NOTES

3M has created the Visionary Award, a program that recognizes music recording engineers and producers who have made significant contributions to the art and science of recording.

T.C. Electronic has announced the formation of T.C. Systems East, headed by David Portugal, and T.C. Systems West, headed by Ed Simeone to provide factory-direct sales in the United States.

New England Digital has named SASCOM Marketing Group (Montreal and Toronto) as its new Canadian representatives.

Adamson Acoustic Design products are now distributed in Canada by Contact Distribution Ltd.

Trevor Cash International and Executive Audio have merged to become TCI. The new company represents EAW, BBE, Samson and others in the European market.

The December 1991 issue of *Inc.* Magazine ranked **Digidesign** at 204 on its list of the 500 fastest growing privately held U.S. companies. In 1990, Digidesign placed 315 on the list.

Eleven Neve VR consoles have been ordered by the internationally based School of Audio Engineering (SAE) for its various colleges around the world.

River City Sound Productions (Memphis) has released their second CD of production library music. Both discs are available as individual buy-outs and feature broadcast, sports, rock, country, hi-tech, urban and mellow tracks in traditional lengths.

Sola, Illinois-based manufacturer of UPS systems, has acquired the UPS division of ABB Drives AG of Turgi, Switzerland. Operationally, the acquisition will function as an international division extending Sola's presence in Europe and the Far East.

Knowledge Industry Publications, Inc. of White Plains, NY, has announced the publication of "Music in Video Production" by Rosanne Soifer. "Music in Video Production" examines the functions and formats of music, and explores the impact of music on various demographic groups. 153 pages. \$39.95 ISBN: 086729-2784.

AT&T is offering a series of training courses for those who need the knowledge, technical skills and hands-on experience to specify, design, install, splice and maintain fiber optic broadcast facilities or television networks. To register for courses or to receive a copy of AT&T's fiber optic training curriculum call 1-800-Trainer or in Ohio 614-764-5317. ■



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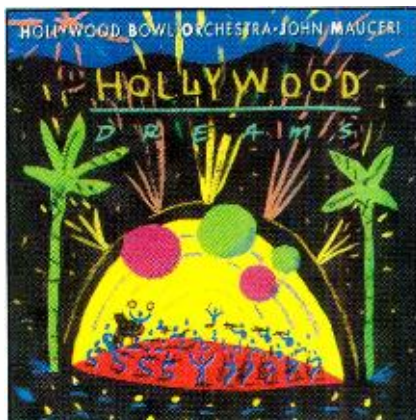
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Richard Marx: "Rush Street"

Label: Capitol
Produced by: Richard Marx, Fee Waybill
Engineered by: Bill Drescher, Peter Doell, Ray Blair, Dave Wittman
Mixed by: Bill Drescher, Mick Guzauski, Brian Malouf
Recorded at: A&M, Lion Share, Sunset Sound, Frantic, Westlake, Capitol, Bill Champlain, Village Recorders, Elumba, Can-Am, The Enterprise (Los Angeles); Right Track (New York)
Mastered by: Wally Traugott at Capitol
SPARS Code: AAD

Comments: "Keep Coming Back" is the kind of classic radio single that I hope will be around for a long time: a cool, understated groove with soulful vocals redolent of Hall & Oates and Paul Young but still unmistakably Richard Marx. Luther Vandross lends back-up vox. The production throughout the album is big and serious, but Drescher never loses sight of Marx's ability to connect intimately with his audience.

Of special interest: Lots of good help from Steve Lukather on guitars and co-writing. Billy Joel guests on piano on "I Get No Sleep." "Playing With Fire" features the killer rhythm section of Terry Bozio and Randy Jackson, with Lukather on guitars; this one gets my vote for second single. ■



John Mauceri and the Hollywood Bowl Orchestra: "Hollywood Dreams"

Label: Philips
Engineered by: Joel Moss
Mixed by: Joel Moss
Recorded at: MGM Sound Stage
SPARS Code: DDD

Comments: We've been listening to "pops" albums for several years trying in vain to find one that we liked. We knew there was something about light classical that would appeal to us, but we just couldn't seem to find any that didn't insult our intelligence, or our sense of aesthetics. So many pops orchestras are just too, well, schmaltzy. Mauceri and the Hollywood Bowl Orchestra are what pops were meant to be. The program features highlights from the silver screen, and includes the main title from *Gone With the Wind*; a *Wizard of Oz* concert suite; John Barry's *Dances With Wolves* John Dunbar Theme, and John Williams' *E.T.* The orchestra brings new excitement to these standards. Also out now is "The Gershwins in Hollywood." An equally outstanding performance by this orchestra, it was recorded at the same location, and features vocal performances by Gregory Hines and Patti Austin on Gershwin classics including "Love is Here to Stay" and "A Foggy Day."

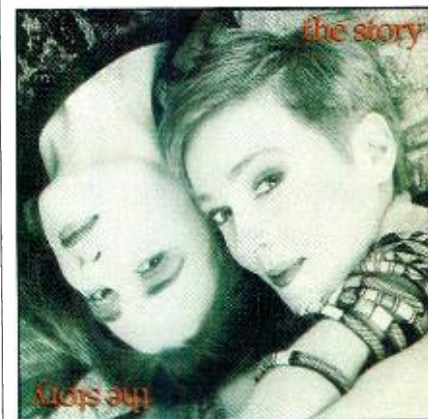
Of special interest: The recording is really very much a part of the attraction of CD. It is spacious, alive and has great depth. The sound of the MGM studio is remarkable — expansive and natural. We found ourselves wondering what it would sound like if Moss got Eddie van Halen in that room. ■

The Story: "Grace In Gravity"

Label: Green Linnet (Redbird)
Produced by: Ben Wittman
Executive producer: Bill Verdier
Engineered by: Coleman Rogers, Mark Tanzer
Mixed by: Ben Wittman, Alain Mallett and Coleman Rogers
Recorded at: Bay Farm Studio, Blue Jay Studio
Mastered by: Suha Gur
Mastered at: Digital Soundworks
SPARS Code: AAD

Comments: Joining the ranks of contemporary folk artists (the likes of Shawn Colvin), The Story is a duo of female talent well beyond the coffeehouse norm. This release features sophisticated, adventurous music, clever, poignant lyrics and engaging, emotional vocals. The recording is clean and unobtrusive, nicely capturing the duo's clear, unfaltering voices. Solid backing and arrangements are provided by producer Ben Wittman and some of Boston's favorite jazz musicians.

Of special interest: Numerous listenings have only served to increase our appreciation of these ladies' delivery. Of obvious note is the challenging close harmony on cuts such as "Over Oceans," though we are more drawn to the catch-in-your-throat sincerity of songs such as "Always" and "Just One Word." Kudos to Green Linnet for expanding beyond Celtic music in such a gratifying way. ■



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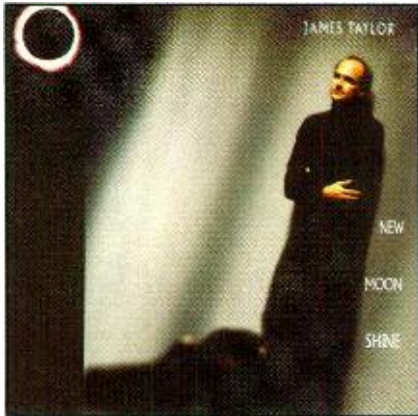
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James Taylor: "New Moon Shine"

Label: Columbia

Produced by: Don Grolnick, Danny Kortchmar

Engineered by: James Farber

Mixed by: James Farber

Recorded at: Skyline, Power Station (New York); A&M (Los Angeles)

Mastered by: Greg Calbi at Sterling Sound

SPARS Code: DDD, DAD

Comments: James' best in 10 years (in our humble opinion), the songs are more focused and the arrangements more inspired. The production livens up already great performances. Of the last three James Taylor records, this one feels the most like an early James Taylor record, but the sound is decidedly '90s. The stereo spread on James' guitar is almost magical. The instruments are all clear and full range.

Of special interest: Steve Jordan's guest appearance on two tracks, "The Frozen Man" and "Stop Thinkin' 'Bout That" feature his famous, massively ringy snare sound, a sound I never get tired of hearing. Jimmy Johnson and Carlos Vega hold down the rhythm on the majority of the rest of the recording, creating a nice platform, reminiscent of the Sklar/Kunkel section of yore but with a more modern feel and sound. The arrangements are full without being too lush, and without sounding "over-produced." ■

FOCUS:

JAMES FARBER, Engineer, "New Moon Shine"

R•E•P: Did you record the basics live?

JF: On both of the last two records most of the band played live. The great thing is when the basic tracks are done, most of the record is really done. The extra small percentage that's added, and the mixing, takes a lot of time, but if you listen to the roughs of the basic tracks and compare them to the final there's not that much different. When it comes time to mix your job is much easier.

R•E•P: So James sings and plays guitar at the same time?

JF: Yes — a lot of the live vocal gets used. I would say he's concentrating a little more on the vocal during the basics because that's what all the other musicians are responding to. He probably pays less attention to the guitar and so some of that gets done over again.

R•E•P: How did you get that beautifully spread sound on the guitar, did you mic the neck and body?

JF: All the guitars were miked in stereo but nothing like the neck and the body; it was always an x-y configuration because I like it when it sums to mono perfectly. If I was to mic the neck and body there would be some phasing problems. I used a matched pair — either (AKG) 451s or 414s. Sometimes I would also include his vocal mic, a Telefunken 251, in there with the x-y. We always recorded the guitar pick-up as well; James puts it through some pre-amp equalizer and he dials it up to make it sound like he wants. The stereo mics got mixed in with the direct left, with an ever-so-slightly harmonized sound on the right. For that I used an Eventide, either the 949 or H3000.

R•E•P: What were the vocal reverbs?

JF: Usually just an EMT plate with some tape delay or Marshall Tape Eliminator delay. No 480s — those are rentals and I only use free reverbs!

R•E•P: How did you get that snare sound on "Stop Thinkin' 'Bout That?"

JF: That was recorded in A&M in LA — that's Steve Jordan's snare drum and he just has that sound. The drums were in the large booth of the big studio. I put up a Neumann stereo mic — it's basically the sound of the small room that trashes it up. There's a bit of EMT 250 digital radiator on it, but mostly you're hearing the sound of the room

R•E•P: What's the DDD/DAD business all about?

JF: We recorded on Sony digital tape recorders, two 3324s slaved. Then we mixed to DAT (Sony 2500) with a Pygmy A/D converter. We also mixed everything to analog 1/2-inch, 30ips on a Studer. When we went to mastering, Greg Calbi thought that three of the tunes sounded better on the 1/2-inch. We all agreed that the analog added a little more sustain to the bass; it had a nicer bass/bass drum relationship. So we chose the analog for three of the tracks, based on how the bottom felt to us.

R•E•P: What equipment do you have in your rack?

JF: I own no recording equipment. I like to show up at the studio and use whatever they have for free. I don't like to become so attached to anything that I can't work without it.

(Other Farber projects include Taylor's previous release, "Never Die Young," and albums for Don Grolnick, Michael Brecker, Dave Holland, Thompson Twins, Talking Heads and Nile Rogers.) ■

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THE R•E•P INTERVIEW:

By Dan Levitin

The producer shows his brave face.

MITCHELL FROOM

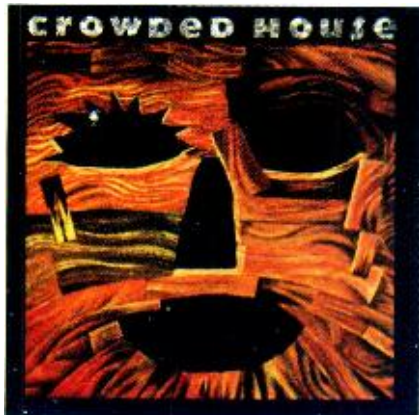
Mitchell Froom worked as a keyboard player, doing sessions for The Bangles, Elvis Costello, Marshall Crenshaw and others for several years before he turned his hand to production. Following a solo album of soundtrack music, he produced Del Fuegos' first two albums. His next record, Crowded House, seemed dead until eight months after its release, when radio stations started to play "Don't Dream It's Over." The album went gold and Froom moved on to work with Elvis Costello, Richard Thompson, The Pretenders, Paul McCartney, Peter Case and Los Lobos.

Froom spoke to Dan Levitin about his production philosophy, musical influences and his likes and dislikes about the music business.

R•E•P: How did you first get involved with McCartney?

MF: Through his manager, originally. I think his wife is a real big Crowded House fan. Paul didn't know anything about me, and when I went to work with him I think he thought my name was Milton. It was more or less that he had worked with quite a few people and it was like, "some people think this guy's good, let's see what he can do." It's not as if he was looking up to me to do anything for him. I decided that I would say what I think, and if he doesn't like it, I'll just go home, because the last thing he needs is someone else to tell him how great he is. So I came up with some arrangement ideas and he was receptive to them.

R•E•P: Like what specifically?



MF: Like on "My Brave Face" putting some breakdowns here or there, and maybe what the drums should do. On "That Day Is Done" I wrote a horn band arrangement for it and that sort of thing. He liked a lot of the things I came up with so it turned out okay.

R•E•P: How would you compare him to Elvis Costello?

MF: I think Paul's more of what you'd call a natural musician. Like maybe the most natural musician you'd ever see in your life. He is more likely to just sit down and play something, maybe not even aware of what exactly it is, but he would just sit down and play something great.

I think Elvis has more of a compositional or arranger mind and Paul is more like the musi-

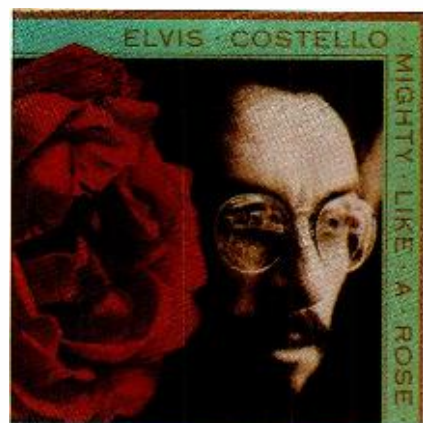
"We did a little (digital) editing and it was a big pain in the ass, so we just went Dolby SR from then on."

cian. You put a guitar in his hand, you put anything in Paul's hand, and something great will come out. It kind of pisses me off, to tell you the truth. As a keyboard player, I work real hard to come up with those really simple things that sound like the songwriter wrote them, parts that sound integral to the song and not just like some guy is trying to show off on his instrument ...

R•E•P: Like your B3 solo on "Don't Dream It's Over ..."

MF: Yeah, like some guy just picked it out on one finger. But Paul would just sit down at a keyboard and come up with it immediately.

He's got that thing on the bass, too, you know. You always try to imagine a bass sounding like his bass sounds. It's mostly because he'll play in the upper range on the bass and then he'll



go down to a low note and it'll sound like the lowest note you ever heard. It's a natural thing that he does that makes the bass sound like a great bass.

I read your interview with Phil Ramone where he talked about putting McCartney's bass through all these Pultecs. But I'll tell you what — my experience with him was different. All I can say is, it took about a minute to get an incredible bass sound. Now granted, Neil Dorfsman was engineering, and he's an amazing engineer, and Tchad Blake recorded some of Paul's bass, too. But Paul just plugged in, he ran through some kind of Bassman amp and we also ran direct. It's in his fingers. It's the easiest thing in the world to get a bass sound out of him. He can get a good sound out of a Hofner, which is really amazing.

R•E•P: Chris Thomas produced the first three Pretenders records. What was it like to follow one of the world's great producers?

MF: Well, I didn't actually follow him — Jimmy Iovine was in the middle (with "Get Close," the Pretenders' fourth album). I really loved the sound of the first two Pretenders records in particular, and a lot of that I think had to do with [guitarist James] Honeyman-Scott; I was a really big fan of his. I think he was one of the greatest guitar players in the world at the time. He wasn't present on the third record, and so obviously, this band changed quite a bit after the third record.

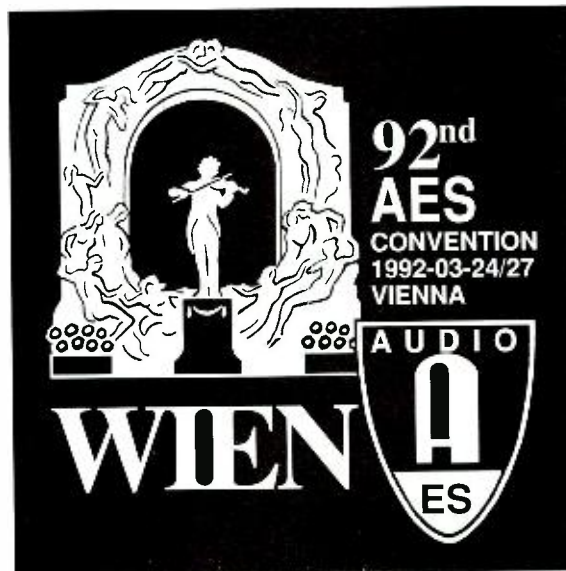
Dan Levitin is R•E•P's music production editor and teaches Music Technology at Stanford University.

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R•E•P: Why do you think Chrissie gave up Chris for the fourth record?

MF: I spoke to her about it. It's inevitable that after you do three records with somebody, you tend to want to see if you can do it with somebody else, or how it would change the formula. Recording's a constant process of wanting things to be fresh. I think she did it to shake up the formula, to try things differently, that sort of thing. Chrissie Hynde speaks very highly of Chris. I think at that point she just wanted to see what would happen.

I'm very much a fan of his work. I would say that he's been involved in some of the great records. You never know how much to credit a particular producer for how a record turns out; very often they won't do anything at all and it will just come out great. But he's been involved with enough good records where I would say he certainly has my respect.

R•E•P: The thing about Chris and you, it seems, is that you have an obvious affection and understanding of Beatles' stuff. Most of the records by both of you have a lot of Beatles influence. There's a feeling of a relationship between the listener and the band, like you're all good friends. And on a musical level, there are these sounds and parts that recur. The horns in "Mean to Me" (Crowded House's first record) are kind of Lady Madonna-like. In the first two Pretenders records, there are Beatles sounding things all over Honeyman-Scott's playing.

MF: I'm certainly not obsessed with the Beatles, but the thing I would say about that is, their influence is really pervasive. They did so much musically that almost any area of music you go into, if you do it with taste, you sooner or later tread on Beatles territory.

Whenever you write an arrangement, for a silver band or strings, or whatever - if you do it in a pop way it often becomes reminiscent of them; as soon as you hear anything that's the real thing and not some cheesy, synthesized backing. They covered a hell of a lot of ground in their short time together.

R•E•P: Looking back, it's hard to imagine that most of all that happened within six years, from 1963 to '69.

MF: Really I think if you're working with a good song, and it's a pop song, and you want it to ring true, you often tread on some territory that they may have tread on.

R•E•P: Do you record basics in analog or digital?

MF: Almost every recording I do is mostly dig-

ital. We'll cut the basic tracks analog because it's easier to edit, and then we'll transfer to digital and then we'll stay there from then on.

R•E•P: Do you do this because you're after that "analog sound" or is it just for ease of editing?

MF: Editing. With the second Crowded House record ["Temple of Low Men"] we decided to record the whole thing digital. We did a little editing and it was a big pain in the ass, so we just went Dolby SR from then on.

R•E•P: There are a lot of musicians I know in bands who know nothing about producers - if they know only one producer, it's you. Your records seem to have a relaxed, at ease feel to them. It sounds very much like a band playing, and not forced, not too music business, and I think that's what a lot of musicians admire about your recordings.

MF: Right. It doesn't sound like everybody goes to their little parts the same way they've done the previous chorus. There's a few ways to approach working on a record. There are parts of a record which may do very well by being orchestrated, and then there's parts that don't. You have to make that decision, whether someone is going after a wild performance, where what they do may change throughout the song or whether it's more planned. Very often it's a combination, and it's not so easily arrived at. It's not an easy thing to get that feeling of spontaneity but still have it sounding like a record, and not just a thrash.

R•E•P: That's got to be what bands love about Mitchell Froom records, they sound true to the band. It doesn't sound like some hot shot producer came in and said, okay, we're going to do all this my way and sell some records.

MF: One thing that I won't get involved with is outside material. I just work with bands that write their own songs. If there happens to be a cover they want to do, that's fine. But that approach makes it really different. Then you know when the person's singing the song it really means something to them. The kinds of records I find objectionable are where people submit to that group of five or six songwriters that are cranking out the songs that everyone hates. And then the band gets their demo, and they do it basically that way, and it all sounds pretty much the same. I think that's one of the real hazards in the music industry right now, is this short-term success. Every record has to be successful. It's hard for people to just look at records as another record in a career. Bands aren't given a chance anymore in that way.

R•E•P: There's a rumor that you bought Booker T's Hammond B-3, the one he used on Green Onions, and that you paid \$20,000 for it.

MF: Really? You want to hear another story? A friend of mine owns a studio where I store my B-3, which I haven't used in eight or nine years. The B-3s that I've used are owned by the studios I'm working in. And Booker T. apparently came by this studio and looked at my B-3 and asked about it and was interested in it, and he said to them, "I've never actually owned a B-3 before."

R•E•P: There seems to be a wide difference in the quality of those things. Some sound great and some don't ...

MF: Yeah, that's right, but I think most of that is probably in the Leslie cabinets. But you're right, some people have really good ones. You know this guy Ian MacLagan [Faces, Rolling Stones, Bonnie Raitt] has a really nice one, really a rock 'n' roll sound. I did a session with him not that long ago and I thought it sounded really good. You know it's really more of the part and if it's right. Hammond is an instrument that if it's in the wrong place it just sounds terrible, if it's the right place it just sounds great.

R•E•P: I really liked the sound you got in "Don't Dream It's Over." This great fat, classic B3 sound; I thought it sounded like "Whiter Shade of Pale."

MF: Well when you get down to that, it's really the drawbars, knowing how to use them to get the sound you want.

R•E•P: Your records often have unconventional drumming, lots of toms, percussion stuff. It's nice to hear a rock record that's not all backbeats.

MF: I try a lot of different things, like using snare drums with radically different sounds, or even having them play the drums with their hands. The idea of having a record where you have a loud snare drum that's the same sound through every song just drives me to distraction; I don't know how you'd do that, you'd just get crazy!

R•E•P: We could ask Jimmy Iovine ...

MF: You should put your comments in here, your asides ...

R•E•P: Yeah?

MF: You could become the least popular man in show business ...

R•E•P: I'd have to write under a pseudonym.

MF: ... and people will start sending you presents. Jimmy will send a thug out to beat you on the side of the head for awhile, you know.

R•E•P: Yeah and then he'll sample it — the sound of my head being bashed in — and use it on his next record ... But anyway, what are you working on now?

MF: I just finished working on the new Los Lobos album; I think they're going to call it "Kiko." Also, I recently finished Peter Case's new one, "Six Pack of Love." Next, I'm going to be doing the new Suzanne Vega record.

R•E•P: That should be interesting. I'm a big fan of hers.

MF: Suzanne felt like taking a totally different approach this time, more of an edge. We're going to start with just her, and a percussionist, Jerry Marotta, and build things up from there. ■

MITCHELL FROOM DISCOGRAPHY

| ARTIST | TITLE | LABEL | CATALOG # |
|------------------|-----------------------|----------|-----------|
| Mitchell Froom | "The Key of Cool" | Slash | n/a |
| Del Fuegos | "The Longest Day" | Slash | 25174 |
| Del Fuegos | "Boston, Mass." | Slash | 25339 |
| Crowded House | "Crowded House" | Capitol | 12485 |
| Crowded House | "Temple of Low Men" | Capitol | 48763 |
| Crowded House | "Woodface" | Capitol | 93559 |
| Richard Thompson | "Daring Adventures" | Capitol | n/a |
| Richard Thompson | "Amnesia" | Capitol | 48845 |
| Richard Thompson | "Rumor and Sigh" | Capitol | 95713 |
| Los Lobos | La Bamba (single) | WB/Slash | n/a |
| Los Lobos | "Kiko" | WB/Slash | 26786 |
| Pretenders | "Packed" | Sire | 26219 |
| Elvis Costello | "Mighty Like A Rose" | WB | 26593 |
| Paul McCartney | "Flowers in the Dirt" | Capitol | 91653 |
| Peter Case | "Six Pack of Love" | Geffen | 24466 |

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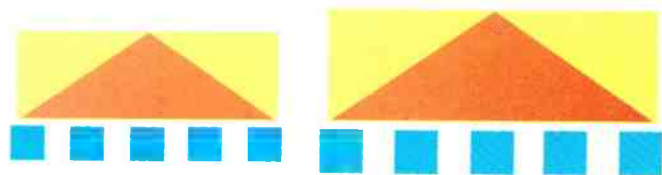


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Control A at Crawford Post features a new integrated TV-style tiered production station and the first full-frequency Storyk/RPG-designed diffractive (rear wall). Room surfacing was totally reworked to accommodate new room geometry for rear tape machine.

GEARING

By David Leathers



UP

FOR VIDEO

**Considering the purchase of
video production-related equipment?
Get your priorities straight.
And read this ...**

New technologies are having phenomenal impact on film and video production as well as pro audio. Traditional ways of producing all types of projects are

changing. Ever more sophisticated off-line editing bays and project studios are performing more of the functions that were once the domain of more elaborate and expensive on-line editing bays and recording studios.

While music production may be the reason that most pro audio people first became involved in their craft, many are looking toward post-production sound as a source of income, and as an important area of future growth and opportunity, creatively and economically. With ever-increasing options, creative and business people are facing new challenges in selecting the best tools to spend their time and money on. It's an environment where ever-increasing price/performance ratios in each rapidly succeeding generation of equipment make it harder and harder to know what and when to buy.

Even though audio is still secondary to pic-

ture in most video and film producers' minds, quality audio has moved up as a priority. As technologies have improved, audiences have become more demanding and sophisticated. The tiny speakers and mono sound of home TV's is giving way to monitor-receivers with line outs to stereo and surround sound home systems. Consumers have become familiar with high quality sound with CDs and now expect that quality with television, video and film as well. Theater sound systems are just beginning to introduce all-digital sound and promise exciting advances.

Only a few years ago, 1-inch videotape, with sound approximately the quality of analog audio cassettes, was the standard for editing and distribution of television programs and com-

David Leathers is a writer/producer of commercial, broadcast and corporate projects in Los Angeles.



Studio 9, the newest control room at Howard Schwartz Recording, features a voice-over booth designed for sports narration.

mercials. Digital video tape formats with four available tracks of digital audio are now clearly taking over as the norm. While 1-inch video tape machines still dominate most television stations, virtually all new acquisitions are digital. Manufacturers have discontinued the production of 1-inch videotape machines. And Sony is the only manufacturer still producing the still widely used 3/4-inch machine.

As with pro audio, video people are trying to function in a rapidly changing environment. In much the same way that low cost, high performance musical instruments, sound processing gear and desktop audio has impacted pro audio in the '80s, low cost, high performance cameras, storage media and computer applications are about to turn the video business on its head. Throw in the advancing technology of multimedia and you have a situation where, well, nobody knows exactly where it's going. One thing is for sure — audio pros who want to adapt to the pre/post sound world need to understand the difference between video/film producers' and music producers' priorities.

ATTITUDES

In professional sound production, music has always been the central focus. But traditionally, video producers have had a different attitude. They haven't seen audio as the most important aspect of their projects. For many, audio has been more of a problem to be solved than a creative opportunity. Many productions involve numerous audio elements, each with differing formats, production qualities and characteristics. Audio problems that could be fixed quickly on a set or location, may have been left to be worked out in post. Assumptions may have been made that audio problems created upstream could be "fixed in the mix." Little forethought to audio requirements, up front, was given.

Most producers and directors still don't understand sound technology or its applications as well as music professionals do. In the past, they've been more interested in making pictures and having a sound track that's adequate to support it. However, audio's improved quality, lower cost and greater popular interest has commanded attention. Producers are begin-

ning to become aware of more of sound's potential to enhance their work.

IMPROVED AUDIO IN VIDEO EQUIPMENT

Another reason for greater interest in sound is that the recent improvements in video sound recording capability means that producers frequently have better tracks to work with than they ever did before, particularly with video shot in the field. Digital audio recording has become the norm for video source material in just the last few years. Sony's betacam SP, (and Panasonic's MII) were first introduced in 1987 with two tracks of digital audio and two tracks of analog audio recording in a camcorder configuration. They represented the first real improvements in video sound in a decade or more. Panasonic's D-3 1/2-inch composite digital video, introduced in 1991, records four tracks of digital audio in its camcorder configuration.

The digital sound quality is also preserved through video editing. D-1 component digital video, D-2 composite digital video, and now D-3 all have four tracks of editable digital audio and have become the editing formats of choice for high end video production. They have eliminated the need for "sweetening" on some projects, because the source sound suffers less degradation in the video editing and duplicating process. At least two other high-end video formats will be introduced within the next year. Inexpensive, high resolution video formats such as Hi-8 and SVHS also have digital audio capabilities, and are being used extensively in low budget corporate, news and documentary work.

HARDWARE DRIVES THE INDUSTRY

One must wonder how so many manufacturers can continue to produce so much excellent equipment in an environment where professional users can barely hope to pay for an acquisition before it becomes obsolete. But time and technology are marching on. In the near future, HDTV, digital sound in movie theaters and multimedia applications all will demand great audio.

What does all this mean to the audio facility, engineer or musician that wants to adapt

to the post sound business? What equipment is necessary? What's a good investment? What will attract the video/film clients?

The answer really depends on what you already have in the way of equipment, the segment(s) of the video/film market that you wish to target, and the depth of your pockets. There is a lot to consider, and you will get different opinions and solutions depending on who you talk to. The terrain is changing so fast that a map won't do. There is no equipment you can buy that won't suffer obsolescence. That's why it's most important to thoroughly investigate your potential market before investing, and to invest in flexible equipment wherever possible. Consider the market research your compass, and then keep your eyes open for changes in the landscape.

UNDERSTANDING THE VIDEO REALM

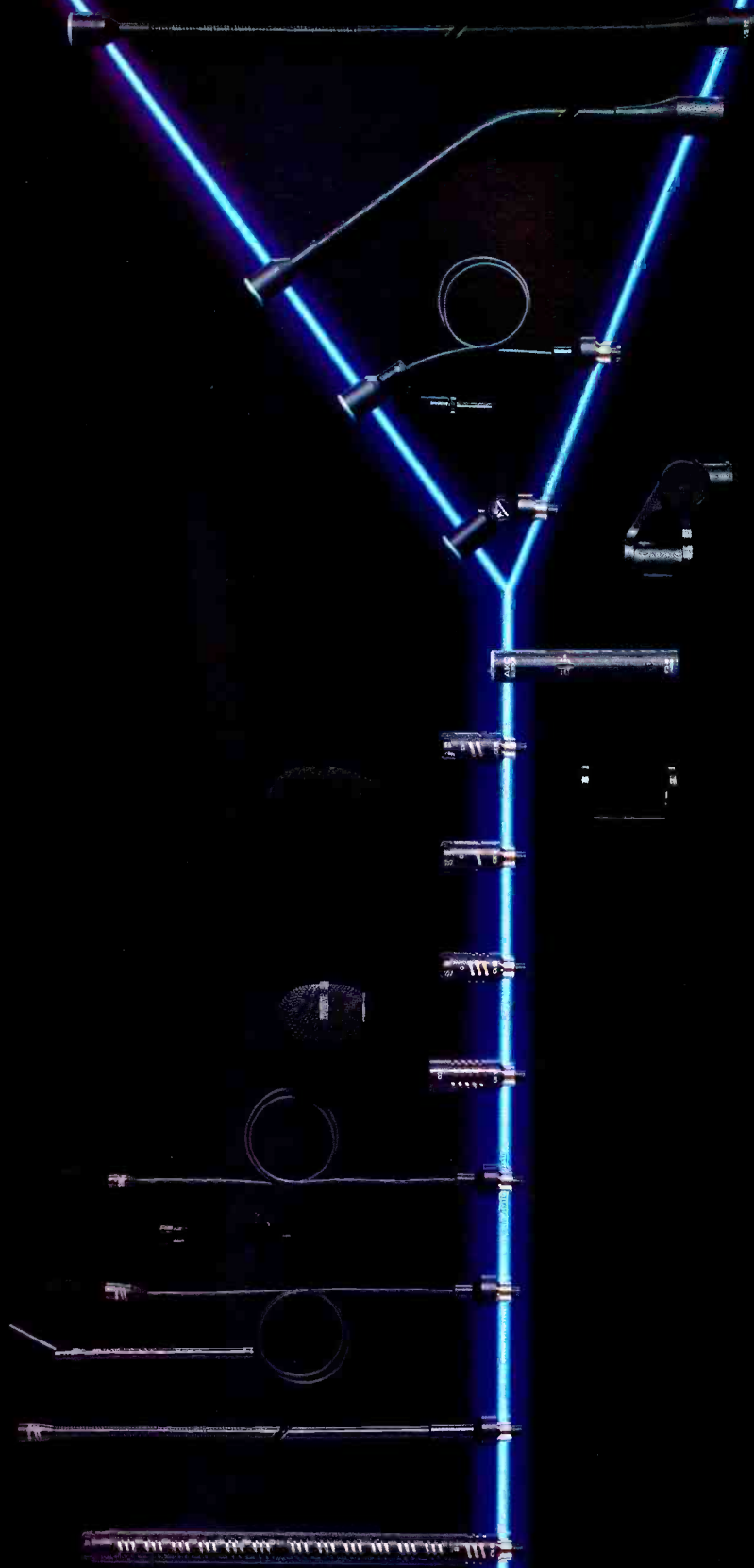
The most important feature of the current landscape is the fact that there are completely different strategies in going for the high end of the video market and the low end. In the video world, producers are used to working either "off-line" or "on-line" in post. Off-line edit bays are relatively inexpensive and are not intended to put out finished product. The off-line editor uses 3/4-inch or VHS equipment to produce an edit decision list (EDL), usually on floppy disk, that contains the SMPTE time code numbers of all the source material and the record master. The list is then used to do a final video edit in the on-line edit bay, using the best equipment the budget allows.

AUDIO SWEETENING

After on-line editing, the "audio sweetening" requirements of a video program vary from show to show. Most programs edited to 1-inch masters will need to be "sweetened". The video producer will want to use a full blown multitrack room for this purpose. For this type of work, an audio facility will need an RDAT machine to receive the tracks from the video facility, a 3/4-inch video deck and a Lynx, Adams-Smith or other synchronizer to lock the video deck to the audio transports. If the project was shot on film and recorded on a Nagra, then you will need a deck to re-access the source audio, even if the sound was properly transferred at telecine.

If the project originated from videotape sources, accessing original sources can present a big problem for audio facilities engaging in this kind of work. The majority of serious video programs have multiple source formats involved and the limitation at the audio studio becomes its ability to access a variety of incoming videotape formats. For these jobs you virtually need to have at least one 3/4-inch, a BetacamSP, and a 1-inch videotape machine in your facility. Other formats will undoubtedly become necessary over time. You may not use them extensively. But if you need them, they'd better be there.

In addition to the ability to interface with as many video sources as possible, extensive music and sound effects libraries, a good voiceover booth with picture, and good signal processing will be necessary. Since many on-line vid-



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Circle (13) on Rapid Facts Card

eo editing facilities have most of these capabilities in their own audio rooms, the extra capabilities of Foley, sound design, digital audio workstations, extensive onboard signal processing, sampling and synthesizers all add to an audio facility's appeal and usefulness, and ultimately bring customers in the door.

The facility should have the computers and software to accept input from computer-based project studios, where more and more work is being done. At the high end, the flexibility to do it all under one roof is the name of the game. Mid-range facilities that can't compete on this level will face tougher and tougher competition from more cost effective digital project studios, and ultimately disappear.

PROJECT STUDIOS

At the far end of the budget scale are project studios that are used for composing scores and completing much of the music preproduction for today's soundtracks.

Many musicians have a small analog multitrack system that they've been using for years to compose and make demos. Usually it consists of a 4- or 8-track machine, a 2-track, a mixing console, a few mics and some outboard gear. Most of the tape machine manufacturers have some sort of box available that will allow you to sync up to a video deck with SMPTE. This will allow you to work with picture. However, the sound quality of this type of system will probably not be adequate for most professional applications, especially in light of today's digital video gear. The reality is that you have to have at least some MIDI sequencing and/or digital recording capability to even begin to become competitive.

Fortunately, with desktop computers, this is not a problem anymore. There are a variety of reasonably priced computers available that perform sequencing, sound design, sampling, digital recording and other useful functions when loaded with the right software. Each computer platform will have its advocates, but the most widely used by professionals is the Macintosh. Using a Mac as the heart of a project studio system will ensure the greatest compatibility with other studios. Atari and IBM systems are also widely used, but not quite to the extent of Mac-based systems.

There are many ways to configure a computer-based digital studio that will work well with video. The essential capabilities include hard disk recording, sequencing, sampling, sound design and editing, a good mixer, syncing to video and a digital input/output format. Various synthesizers, mics, instruments, a multitrack analog recorder and a sound effects sources come into play depending on what you're doing (See Sidebar).

FILLING OUT THE SYSTEM

Sampling programs, sound design, librarian and editing software will provide the flexibility to fix many video sound problems and create great soundtracks. Seamless ADR, the creation and movement of sounds can all be accomplished. Various versions of the computer-based programs and assorted accessories are available from Digidesign, Opcode, Passport, Mark of the Unicorn, C-Lab, Steinberg/Jones, Dr. T's and others. These are to some extent a matter of preference and price. They all deliver very good price/performance by most standards.

INPUT/OUTPUT

DAT machines are turning up in many video facilities and are now a common transfer medium for audio tracks between video and

audio. Time code RDATs are just about to become common and would be a welcome addition to any studio. Panasonic, Sony, Fostex, JVC, Teac, Denon, Marantz and even Aiwa make professional machines with various analog and digital access schemes.

MULTITRACK

Don't throw away the multitracks. Depending on what you're doing, they will definitely be necessary. Some of the reasonably priced units by Otari, Tascam and Fostex are excellent for the video sound project studio, particularly if you are adding a lot of live instruments.

MERGING TECHNOLOGIES AND BUSINESSES

Mac- and IBM/PC-based random access off-line video editing systems are becoming a factor for many video and film editors. Most of these systems produce high quality digital audio tracks with the off-line edit. On-line versions of these systems are not too far in the future.

On-line video graphics and animation are already being produced on the Mac and other computers. Multimedia authoring is also beginning to take shape. Once again the Mac and IBM are right in there. Audio is an integral part of this process.

The interesting thing about all of this is that the same computer hardware is becoming the workhorse basis of all these systems. Some enterprising professionals will be looking for ways to successfully utilize hardware investments by crossing over into other areas. Off-line video editing, graphics, animation, multimedia, as well as a lot of music and film/video sound are all being done on the same computer platforms.

Those who can grasp the changes and learn how to apply and integrate these advancing technologies will find their horizons are expanding. The older tape-based technologies will be less cost effective and efficient. Creative and business minds in video, film, graphics, multimedia, music and sound will find themselves working closer together. ■

APPLE MACINTOSH: THE AUDIO/VIDEO INTERFACE

The specifics vary depending on the computer platform, but since many professionals believe that a Mac-based system is the way to go for delivering affordable, high quality audio for video, in sync and on time, lets start from there. Even within the realm of the Mac, there are many ways to do it. What follows are merely examples. Many other alternatives exist.

Most of the available hardware and software is built for the Mac II family of computers. There are presently the Mac II, Mac IIx, Mac IIcx, Mac IIsi, Mac IIci, Mac IIfx, utilizing a Motorola 68030 CPU. The new Mac Quadra 700 and MAC Quadra 900 employ a faster 68040 CPU and promise even greater performance than the other Mac IIs, but there have been compatibility problems with many existing programs since the Quadra's recent introduction. Most software and hardware manufacturers are working on updates to solve these problems, but as of today, Mac II's are the tried and true workhorses. They vary in price, speed and the number of expansion slots.

The number of expansion slots is very important, because there are a number of good audio products based on slot-insertable cards that require them. Generally, the Mac II, Mac IIx, Mac IIfx and the Quadra 900 offer the most expandability, with six slots or more each. The smaller units have three. For audio purposes, the computer should be equipped with a bare minimum of 4Mbyte of RAM and at least 80Mbyte of hard disk with an access time of 16ms or faster.

HARD DISKS/MASS STORAGE

Smaller hard disks are useable for limited sequencing functions, but as soon as you get into digital disk recording, hundreds of megabytes of additional hard disk capability will be a definite plus. Excluding all else, a minute of stereo program material at common sample clock and bit rates consumes greater than 10Mbytes of real estate. An average serious studio should have at least 300 to 600Mbytes on an external disk. Digidesign makes a 660Mbyte hard disk with fast access time called Pro Store that

is well-suited for hard disk recording. New hard disks are appearing on the market all the time and the price is dropping fast. Other storage technologies are also coming on-line, but for the moment hard disks are still the norm.

SMPTE/MIDI INTERFACES

Most sequencing programs available for the Mac will track the SMPTE time code from a video source when paired with a SMPTE/MIDI interface, such as Mark of the Unicorn's "MIDI Time Piece". Virtual tracks can be built to video playback from any time code video deck and referenced to the video's time code. A disk from the sequencing program can later be loaded into the compatible computer in a full multitrack studio, where additional tracks can be recorded and mixed. Adding Mark of the Unicorn's "Video Time Piece" will give you more capability in handling the video decks and a multitrack machine simultaneously to facilitate locking both multitracks and sequencing to video. It also provides the capacity to read, write and insert visible time code to video. Opcode's "Studio 5" is another good option, with most of the same functions. Opcode's "Vision," Mark of the Unicorn's "Performer," Passport's "Master Tracks" are all viable choices for sequencing software.

DIGITAL DISK RECORDING

Integrated sequencing/digital recording hardware and software are the real advance. This puts the project studio in the position of being able to deliver finished audio for video. Digital audio recording and playback requires a good sound processing card resident in the computer. Mark of the Unicorn has just released the "Digital Waveboard," with the "Digital Performer" software supporting it. Digidesign offers the "Sound Accelerator" card, with "Pro Tools," "Sound Tools" and "Audiomedia" as software. "Pro Tools" comes packaged with sequencing, recording, editing and mixing software. Other software options include Opcode's "Studio Vision" and Passport's "Trax" programs. ■

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In with the new ... but let's keep the old.

BAD ANIMALS

By Steve Lawson

This is a story of growth and of opportunity. It's a story of luck; of being in the right place at the right time. This is a story of careful planning ... and of uncontrollable growth. It's a true story; a story without an ending. With a little more luck and a lot of hard work we hope this story is just beginning.

In the early 1970s, Kaye-Smith studios were built on Fourth Avenue, in downtown Seattle. In 1970 I was a junior in high school. My cousin was a request line operator at Seattle's KJR radio, also owned by Kaye-Smith Enterprises, and he got to peek in at the new facility while it was being built. I had no idea what a "track" was at that time, so I didn't get too excited about the first 24-track studio to hit town.

The studio opened to great acclaim. Two 24-track rooms. Staff composers and arrangers; great engineers. Lots of hits came out of those rooms for bands such as Steve Miller, Bachman Turner Overdrive, Tower of Power, Dionne Warwick and a Seattle band called Heart. One of their biggest hits, "Barracuda," was recorded in Studio B. Three Heart albums were done at Kaye-Smith. And now, Ann Wilson and Nancy Wilson of Heart are shareholders in Lawson Productions Inc., operator of Seattle's new world-class facility "Bad Animals/Seattle," housed in the original Kaye-Smith buildings.

Studio X at Bad Animals is the one getting all of the attention. It's a brand new room designed by Los Angeles architects and acoustical consultants Peter Maurer, George Newburn and Peter Grueneisen of studio: bauton. Studio X features a poured-in-place cement front wall for increased bass response. It's the second wall of this type in the world. It boasts the largest SSL console in the Northwest — a 64-

input G Series with 24 channels of E electronics and 40 channels of G electronics — and the Ultimation, automation system. Producers will have their choice of Sony 3324 digital 24-track recording, analog recording with a Studer 827 or a new Otari MTR-90 Mark III. Dolby SR is

available in-house, as is Dolby A.

The room also features classic gear. Numerous Pultecs and LA-2As share rack space with the Lexicon 480 and Eventide Ultra-Harmonizer. Vintage rebuilt Neumann tube mics sit beside the great-sounding new B & K's. The Focusrite module is complemented by 12 rebuilt Neve modules (4-31105s and 8-1073s).

A lot of thought went into the creature comforts in Studio X. The facility includes two restrooms, a full kitchen, living room and a separate lounge for the producer. It's likely that many of the artists who will record in X will come from out of town. But the main reason for building the room was so Heart could return home after years of being on the road.

A REASON TO BE

The path to "Bad Animals/Seattle" began in 1979 when Lawson Productions opened its



View of Studio X control room glass from the studio room. Note that the glass goes all the way to the floor. SSL is in place.

Steve Lawson is owner of Lawson Productions and Bad Animals/Seattle, along with Nancy and Ann Wilson.



Poured concrete control room front monitor wall, with console wiring trough and PVC conduit.

doors. We started out with one 8-track room and grew to be a three-room facility with a MIDI room. In 1989 we were busting at the seams and needed more room than our existing building could handle. Moving into the former Kaye-Smith facility was a dream come true. By adding our equipment and some new studios to their existing facility, we were able to grow from three rooms to five virtually overnight. Also, Kaye-Smith shared our vision of doing things right the first time; so their rooms only needed updating rather than total remodels. We moved into their former facility with the added dream of one day building a major studio in the 2,500-square-foot that housed Kaye-Smith's film soundstage. As it turned out, our dream came true several years ahead of schedule. Because while we had been dreaming, so had Ann and Nancy Wilson.

Over the last 10 years the Wilsons have traveled constantly. Their last four albums were cut in Los Angeles, and world tours usually followed an album release — tours that lasted up to a year. The Wilson sisters wanted to come home. Rumors had them building a studio in the Seattle suburbs. Heart had recorded album demos in our Sixth Avenue studios, so I had met Ann and Nancy previously, but only briefly. And it was interesting: Ann and I went to the same high school and Nancy went to a neighboring school, so we had a lot of common friends. A phone call to one of those friends led me to Ann and Nancy's business manager. And the paperwork shuffle began.

But we needed a name. Lawson Productions is a great name for a business that deals with other business, but music facilities always have great names: The Record Plant, Hit Factory or Paisley Park. There's also Little Mountain in Vancouver, and Abbey Road in London. We went through our favorites. Nancy liked "Park Place" because we were the first studio she had ever been to that offered indoor covered parking. We kicked around "Regrade Recording" since we're in Seattle's Denny Regrade, and "Bell Town Sound" (because we're located in the Belltown area of Seattle's Denny Regrade). But it was our scheduler, Wendy Brewer who offered the name "Bad Animals." It was the name of one of Heart's biggest records. And as a name, it has such a great attitude about it. In the music community "Bad" has always meant "Great." And we all know that creative people are always referred to as "Animals." What could be better?

"Bad Animals/Seattle" is a six-room complex. Studio A boasts a totally updated 32-input API console with moving fader Diskmix automation and 24 additional brand new mixing-quality returns supplied by API. Studio B features an updated 32-input API with Diskmix automation and a 16-track New England Digital PostPro workstation. Studio C features a 28-input MCI 636 console and an 8-track PostPro. Studio D features a 28-input MCI 636 and 16-track PostPro, and Studio E is our original 8-track room featuring an MCI 8-track and a 12-input Tangent console. The facility's studio manager is Steve Smith, former Record Plant engineer and part owner and manager of LA's Take One Recording.

One might ask, "You've got a world-class facility there... why not dump the old stuff? Especially that Tangent?" The 13 years Lawson Productions has been in business our equipment has been well maintained. We've made it a habit to change our noisy pots, replace motors, regularly lap and replace worn out tape heads. In other words, most of our equipment still works as new. Our 8-track room is still in demand as an inexpensive place to record a



RPG Diffusers along the rear of control room wall.

STUDIO X SPECIFICATIONS

Dimensions: Studio: 35' x 60'
ceiling 25'.
Piano booth: 12' x 14'
ceiling 14' 11".
Iso booth: 8' x 11'
ceiling 13' 2".
Control Room:
25' x 27'.

Mixing console: Fully loaded SSL 4064 G Series with Ultimatum moving fader/VCA automation system and Total Recall.

Tape recorders: (2) Sony 3324-A digital multitracks, (1) Studer A-827 analog multitrack, (1) Otari MTR-90 III, (2) ATR-100's 1/2-inch or 1/4-inch, RDAT.

Speakers: TAD-custom, Meyer HD-1, KRK, Tannoy, Yamaha.

Dynamics: (4) LA-2A, Drawmer 1960, Drawmer DS-201 (2) Summit TLA-100, Summit stereo tube DCL-200, (2) Aphex Expressor, Dominator, 612 gates, (2) LCX-1 comp/gates, (2) Valley DSP, (2) UREI 1176LN.

Mic pre/EQ: (8) Neve 1073, (4) Neve 31105 4-band, Focusrite ISA 115HDP, Summit TPA-200, (4) API-550A, (4) Aphex EQF-2, ITI Parametric/(4) Pultec EQP-1A3, Pultec MEQ-5, Summit EQP-200, Summit EQF, (2) UREI 545 Parametric.

Digital EFX: AMS-RMX-16, Lexicon 480-L, 224-XL, L-300 with SMPTE event control, (2) Eventide H-3000, t.c. electronic 2290, Dynacord DRP-20, Yamaha (2) SPX-1000, SPX-90, Roland SRV-2000.

Microphones: AKG C-24, (8) 414, (6) 460, (3) 452, (3) D12-E; B&K (2) 4006, (2) 4011; Beyers (2) M-69, (2) M-160, (2) M-101; E-V RE-20; Neumann (2) M-49, U-67, (4) TLM-170, (8) U-87, (4) U-47FET, (5) KM-84, (5) KM-86, (2) KM-88; RCA (4) 77-DX, (2) Jr. 44, (1) 44; Sennheiser (13) MD-421, (4) 441; Shure (12) SM-56, (5) SM-57, (3) SM-53, SM-58; Sony (2) C-37P, (4) ECM-54, ECM-22.

Continued on page 32

Continued from page 31

Power amps: Crest.

Cue systems: (5) 8-input mixers or three stereo cues.

Headphones: AKG, Fostex, Sony.

Video and Sync: Sony BVU-800, Time-Line Lynx synchronizers, supervisor and console control unit, (2) Sony multi-sync 27-inch monitors.

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simple voice-over for radio or television. Our tech staff has made that old Tangent incredibly quiet. And we've used outboard mic preamps in that room for years, so quality has never been an issue.

About six years ago we added Diskmix au-

tomation and new preamps to our two existing MCI consoles. That extended their life a great deal. And though no one is knocked out by the sound of the MCI equalizers, we easily get around the problem with outboard EQ. Great grounding and some power supply modifications have made those consoles very quiet as well.

OLD VS. NEW

Our biggest question was whether to replace or update our API consoles. Studio A is our second music room, built to be a great overdub facility and mixing room for many projects. The question was, did we want a brand new console in A, or a rebuilt Neve? How about an older SSL? We asked many engineers and producers ... too many to count. And each of them was quite excited about tracking on the SSL and overdubbing on the APIs. And updating the APIs made financial sense. We wouldn't have gotten half a new console at the cost of updating what we had.

So we've mixed the old with the new. "Bad Animals/Seattle" will not only better serve the music community, but the business community as well. Included in our new equipment purchases was a third New England Digital Post-Pro workstation, a Sony Beta SP recorder for layback to that video format, and a Dolby surround encoder and decoder which will enhance the work of our commercial and industrial clients. Most of the equipment going into Studio X can be shared by the other rooms, so there's more for everyone to play with. Still to come in the very near future: a brand new separate lounge for Studio A, and a new kitchen and lounge off of the lobby.



Skeletal view of studio diffusor cloud showing ribs and damping material.

It's an interesting circle. Ann, Nancy and I didn't know each other in high school. Today, we're operating Seattle's world-class recording facility located at the old Kaye-Smith site, a former "hit factory" of sorts. And a dream has come true for three happy people. ■



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THE ARENA

Recording in a studio without walls.

By Erika Lopez

In the past few decades, traditional recording studios have become more and more sterile, isolated, claustrophobic and dark. As the technology advanced, it seems to be at the expense of the live feel and true performance of the artist.

Many musicians and artists miss the "good old days" of jamming in the living room with friends, or listening to demos that somehow sounded more lively and fun than the finished product. The Walt Tucker Group's state-of-the-art studio, The Arena, offers a refreshing break from traditional studios, without sacrificing the technology of the 90s.

Founded in early 1989 by veteran saxophonist Scott Page (of Pink Floyd, Toto and Supertramp fame), The Walt Tucker Group is a consortium of businesses joined together to offer full services to the entertainment industry. At the core of the music production end of Walt Tucker is The Arena, a one-of-a-kind multitrack recording facility. The Arena features an innovative recording technique dubbed EarMax, which reopens the doors to

Erika Lopez is principal of Audient Marketing Services, Mission Hills, CA. Photos courtesy of Mike Bloom.

creative recording. EarMax is a unique audio recording and mixing system that has been developed to capture the essence of live performance in a recorded environment. It employs techniques common in live sound, studio recording and rehearsal situations and combines them into a cohesive technique that allows technology to work with musicians, instead of against them.

"EarMax takes the original techniques and concepts of recording from the early 1950s (where a group of musicians gathered in a room and faced each other to record song) and combines that with the advanced technologies and

equipment that are available in the 1990s," says Page. "EarMax endeavors to bend technology around musicians, allowing the spirit of live performance to be captured on tape."

THE ARENA

The heart of the system is in the physical set-up of the studio itself. The Arena is a 5,000-square-foot open air room, featuring vaulted ceilings with skylights, plenty of daylight and no feeling of isolation whatsoever. The relaxed, comfortable surroundings of the studio immediately put musicians, producers and engineers at ease, opening up the mood to creativity.

The band is set-up on tiered risers in a circular configuration (hence the name The Arena) and surrounded by a ring of speakers. These speakers encircle the studio and the musicians, and become the "walls" of the audio environment. They can then be used to generate the size and shape of the room for recording or re-mixing. The engineer can alter the EarMax environment by manipulating the speakers, routing systems, etc. using a Richmond Sound Design show controller.

Each musician is assigned an Instrument Station, with multiple sets of near field monitors. A standard pair of JBL Control 5s, as well as a pair of Wolcott Omnispheres (a 360° x 120° sound source) form a controlled "listening zone" to each musician's specification. They can hear their own instrument, a secondary mix of the other performers, and the sound of the mix in the room. Monitor power is provided by QSC Series 3 amplifiers.

"There are three main benefits of using individual speaker monitoring over headphones," says Page. "One, it keeps band members from feeling isolated from each other. Two, musicians hear their instruments the way they are accustomed to. And three, it prevents listening fatigue. Consequently, the performance retains its natural feel and the performers don't 'burn out' so quickly."

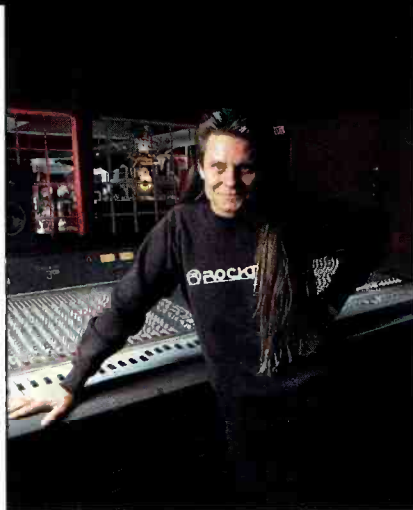
SOUND ENVIRONMENT

One of the obvious questions upon entering The Arena is how the problem of leakage is dealt with. "The keyboards go direct for the most part, and all of the guitar amplifiers are isolated outside of the main recording area," says Page. "The only microphones out in the room are on the drums. Because the monitoring in each listening zone is kept at a low volume, it keeps leakage to a minimum. But despite the volume of the monitors being so low, it still sounds really full because you are in such close proximity to the speakers.

"Leakage can be your friend. It can help the overall sound of the recording, but it can cause severe problems, too. The key is to control the leakage, and not let it get out of hand. We do this by using proper microphone techniques. Of course, there is some leakage, but it's a small

THE WALT TUCKER GROUP

In addition to The Arena, Walt Tucker is home to several other businesses specializing in multimedia and entertainment productions. Working together and separately on a variety of creative and interesting projects, The Walt Tucker Group offers comprehensive creative services in video post production, advertising, merchandising, public relations and music publishing.



Scott Page of The Walt Tucker Group.

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trade off for the great feel that we achieve when recording. Listen to some of the old Motown and Hendrix albums — what a great feeling of spirit! By today's standards, some might say they aren't that sonically clean, but look how well they've held up. Our goal is to achieve the best of both worlds by using today's technology to produce a superior recording, and also provide a creative and comfortable environment that encourages the spirit of yesterday's performances."

In re-mix, the EarMax system provides the engineer with multiple mixing possibilities. The engineer can send an original, unaltered mix back through the system exactly as it was recorded — with all the character, ragged edges and spontaneity intact. Since the playback can be routed through the same speaker set-ups that it was recorded with, the effect is as if the band was still in the room playing live. This allows overdubbing musicians to blend their sound in with the original feel of the recording by hearing it exactly as it took place.

Another option during re-mix is to bring individual instruments through the entire EarMax system. At this point, "sonic retouching" can begin — where the engineer can make the room sonically larger or smaller to

enhance the sound of single instruments. This is done by assigning EQ tracks to multiple speakers with varying EQ and effects. This essentially forms an ambient mixing system that mixes through air, rather than through an entirely electronic system. As an example, the engineer can send a kick drum out into the system and use the room to reshape the sound of the drum by miking the room, and then blending the reshaped room sound back into the mix.

The Arena recording system has been built utilizing a completely modular concept. All auxiliary racks, tape machines, video equipment and consoles are connectorized to be totally interchangeable between the control room and the 100' x 50' main recording area. This gives the ability to customize both the recording and production systems, so that the functionality of The Arena can be changed for different projects. By moving the main Soundcraft 3200 console out of the control room and into the main recording area it essentially turns the studio itself into a huge control room or video post production facility. The control room can then be used as an isolation booth for more traditional recording or overdubs.

"Both The Arena and the EarMax system have been designed by musicians who believe that capturing the moment of a performance should not be secondary to technology," says Page. "The basic philosophy at The Arena is one of bringing musicians into an ultimate listening environment to stimulate a more comfortable level of performance, which results in a more magical, yet technically superior-sounding recording." ■

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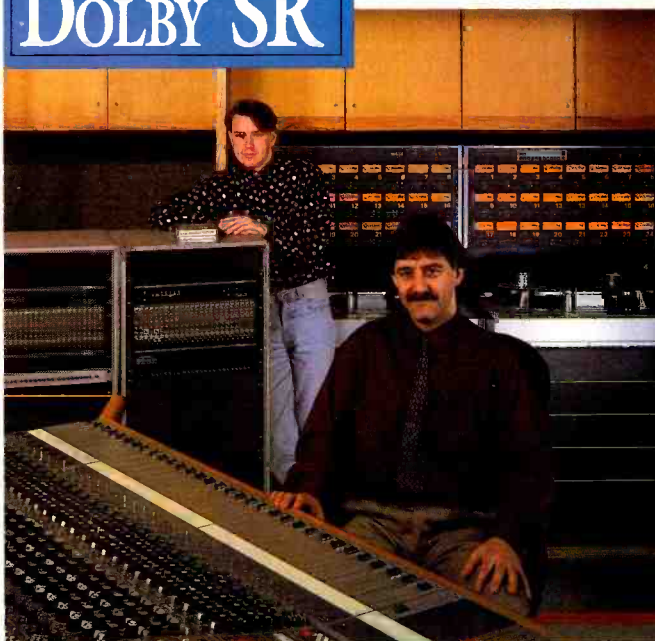
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THE FALK RECORDING CONSOLE

By Gary Falk

Falk Recording Service was started in Louisville, KY, in 1971 as a small recording studio for demos and jingles. Today Falk Recording still proudly bears the "small business" title with seven employees who operate a multitrack recording studio and duplication facility (real-time and high speed cassette duplication, label printing and shrink-film packaging). Falk also does custom tape loading of audio cassettes and VHS videotapes. Besides maintaining the equipment in daily operations, we occasionally take on custom electronics projects such as mixers, direct boxes and PA gear.

My background is primarily as a musician and electronics buff who still plays the saxophone professionally, and who came up through the do-it-yourself world of amateur radio and audiophile hi-fi (the much forgotten world of the wonderful kits from Dynaco, Knight, Heath, EICO and others).

What led me to embark on a project of this magnitude was not so much the desire to create something new, (or revolutionary) but simply to have as the centerpiece of our studio a piece of equipment that would perform reliably, sound good and be easy to maintain. With the factory-produced board we owned previously, we had the features but not the reliability or ease of service that we considered essential.

The project took one year from conception to completion, with about three months spent in circuit layout and information processing. It began with a pow-wow between studio engineers Tim Haertel and Andy High to determine what it was that we wanted on this board, where we should place certain functions and how we could make the device a uniquely serviceable piece of equipment within the constraints of our budget. In all, we ended up with a \$14K investment, with many features of consoles several times that amount.

CONSOLE LAYOUT

After spending years with commercially made mixers, several things became important in this project. In the world of ergonomics (human engineering factors), control functions should follow a logical order of sequence, from an operators armrest to the console meter

bridge. These design choices are not necessarily driven by cost factors, but simply require some armchair logic about placing things where they are needed most.

We chose to put the 100mm faders first, with two slots on each channel — one for the fader itself and one for a reference slider so that the engineer could ID a second fader position (bad news for the masking tape industry). Next came the ID strip, followed by the channel on/off mutes switch (a well-lit control with the channel number on the button). Then came the line/mic switch with the preamp gain control next to it. I have been scratching my head for years trying to figure out why the most important control on a console — the gain pot, which sets the entire gain structure — is way out of reach at the rear of the channel apron. I have asked several manufacturers about this and no one seems to know how it ever happened.

Following these functions are the monitor section and pan-pot, which concentrically controls both monitor and main stereo bus sending (two section potentiometer). Above this are the four effects sends, an EQ section, mic-input function section (10dB pad, phase reverse and phantom power) and finally the channel matrix with odd/even panning. This console is 24in/24 out.

In the area of console manufacturing, companies have attempted to please the consumer by adding more and more features. In this attempt, in my opinion, the concern for basic hardware quality has been compromised. Every rotary potentiometer in our console is con-

Gary Falk is owner of Falk Recording Service located in Louisville, KY.



The completed Falk inline recording console features 24 inputs and outputs.

When looking for hardware that may appear to be "custom," a walk through the aisles of your local hardware store can be invaluable. Not to leave any stone unturned, those fancy-looking legs are nothing more than steel pipe screwed into closet flanges with gray painted PVC pipe on the outside.

ductive plastic of either Clarostat or Bourne manufacture (there are other good ones on the market). The appropriate element taper (linear, log or reverse log) has been carefully chosen for each function. Even though carbon element pots are nearly universal in consoles under \$50K or so, I feel that they have no place in serious audio. In my 25 years in pro-audio I have never found a carbon pot that did not require having Cramolin R-5 nearby.

We also avoided push-button switches except for channel mutes and talkback, mainly because at any distance, you cannot be sure if they are up or down, and most control panels don't really identify what function occurs in "up" and which in "down." We used toggle switches for virtually every key function, mainly because they are clearly visible as to position. Every critical switch, especially those at low audio levels (such as microphone) had to be gold-plated to ensure long service. All mating surfaces on connectors, harnesses, etc. also had to be gold-plated.

Regarding control legends, I had seen some clever ways to ID control surfaces, but we selected engraving directly into the .062 aluminum anodized panels. Engraving is basically permanent, but it is also expensive. Silk-screening is unacceptable because it simply does not last.

Lastly, we chose analog meters (Selco) — was a matter of personal preference, and maybe I'm old-fashioned, but LEDs and bargraphs just don't appeal much to me. We made the meter bridge fully tiltable for the best viewing angle.

FRONT END

The microphone preamp is the quintessential component of any console. Without the right quality here, all is lost. I know that there is much discussion about different design types (such as transformers vs. transformerless), but it is my opinion that even though there are good designs of both types, the very best-sounding and performing mic preamps simply must use a transformer. The type of transformer is absolutely critical. I based the mic preamps on a design which was sent to me by (the late) Deane Jensen, which uses the Jensen JE-115K-E

transformer. A transformer of this type allows two distinct advantages over transformerless designs, one being the added voltage gain from the turns ratio (in this case almost 20dB before the first active stage) and the galvanic isolation from the world outside the console.

I believe that most manufacturers avoid transformers for one reason: cost. A quality transformer costs nearly \$50, vs. the low cost of an op-amp. Multiply \$50 by the number of input channels, and pricing soars. If anyone wants further information, I can offer a good money-saving transformerless design for those who cannot go the extra expense.

PART CALLS

Consoles are complex products based on systems within systems, using thousands of discrete components. It is never a question of whether a component will fail, but when. This is one of my major criticisms of even the finest consoles. In a quality board, all operational amplifiers (and microprocessors in general) must be socketed for replacement. We chose double-wide AMP sockets.

We designed three modules per channel: fader, main channel module and matrix module. The main and matrix modules were attached to the mainframe rails by two easily removable thumbscrews. The modules can be removed, laid flat and serviced (or examined) while still attached to the buses! The modules connect by way of a pigtail and gold-plated 25-pin Sub-D connectors. This is also true of the master module, with its monitor section and

summing amplifiers. Also, the fuse-type lamps on the VU meters can be quickly and easily replaced.

Each channel in our design utilized three modules, two of which carry the active functions, on a total of five circuit cards. For the most part, the various panel controls and indicators cable up to the appropriate cards, allowing us to change positioning and location as we got deeper into the project. This involved quite a bit of point-to-point wiring, which translated to time spent.

One thing that I considered important was a minimum signal path design. From mic input through the matrix, a total of seven op-amps plus a meter driver exist. Depending on the use of EQ and matrix, the signal can pass through as few as two active devices from input to direct out, because defeat control functions route the signal around, not through, a particular circuit.

MAIN MODULE

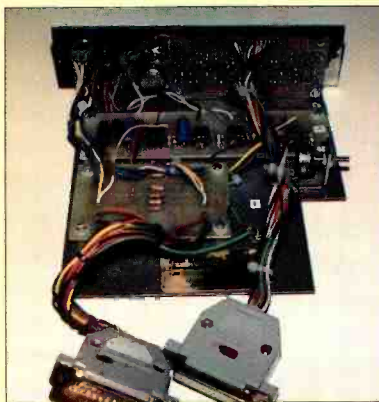
The main module contains the bulk of the processing circuitry. This is the largest module and it is built around two circuit cards, each measuring approximately 3" x 4". The first circuit card to actively signal process is the microphone preamp/line driver. The front panel preamp gain control and mic/line selector switch wire directly to this card. It receives the incoming microphone level signal, which is fed directly into the input transformer, and then into the preamp, which consists of a single Signetics 5534AN operational amplifier. When the

TO BUILD OR NOT TO BUILD

Being a part of the recording scene in the early '70s, I saw what is almost a lost art today — the unique quality that recording studios had in being a visual and aural reflection of the technical skills of their operators, who not only built the studios themselves, but much of the equipment in them. This consummate skill is how such greats as Bill Putnam (Chicago, San Francisco and L.A.), Wally Heider and others became so indelibly associated with the profession.

In the hurry-up world of today we seem to be unwilling (or perhaps unable) to take the time and effort to create any of the hardware of our trade. We acquiesce to the world of pre-packaged, mass-produced equipment. Even though

hours of design, tedious verification of assemblies, etc. It is not a project to be approached casually. Experience in kit building is important, but most recording studio people I know have the essential instincts in place to accomplish such a task if given the proper guidelines. In spite of these cautions, I feel that the final product offered a sense of pride and accomplishment that went far beyond that felt from having purchased a manufactured or "turnkey" mixer. My experience, which I am willing to share, could make the effort for others much easier, because we have worked out the sub-assemblies and sources nationwide for the hardware required. Even employing the circuit techniques that I describe, the basic



Closeup of the matrix module showing the connectors to buses and the matrix harness. Note the simplicity of construction detail.

most engineers will not choose a project such as we undertook — designing and building our own full-sized recording console — I hope that this article will offer some insights on things to look for in a commercial production board that may not be mentioned in the promotional literature.

Before considering a construction endeavor such as this, a studio must consider the commitment involved — hundreds of

topography, number of inputs, sends, etc. gives a builder great latitude in a design that can be unique to his or her requirements.

For information on assembled and tested sub-assemblies (mic pre, EQ, matrix, etc.) or questions, comments or discussion, feel free to contact Falk Recording Service at 7914 Fegenbush Lane, Louisville, KY 40228; 502-239-1010 or 239-1044. ■



Individual modules can be removed and worked on while still connected and operating.

front panel selector is in the line position, the transformer is out of the circuit and the op-amp functions as a line driver for the incoming signal (typically our multitrack recorder).

Each card which uses active devices requires the usual dc smoothing and bypass capacitors. Electrolytics of 100 μ are in place between \pm voltage rails-to-ground, as well as .1 μ ceramic disc or metal film caps right at the device. Each

card also has non-polarized dc blocking caps where needed. The gain pot (10K Ω) uses a reverse log taper to work within the characteristics of the feedback loop of the op-amp.

The second main module card is for EQ. Three toggle switches wire up to the card and three rotary pots (linear taper) solder directly onto the card. This is a straightforward but versatile card using only three op-amps: a 5534

in the 100Hz hi-pass filter circuit and two 5532 dual op-amps in the EQ circuit. The hi and low EQ consists of a gradual shelving characteristic and the mid-range is peaking with a selectable (overlapping) 2K or 3.5K center point. I believe in simplicity in board EQ. The desire for more and more EQ becomes almost insatiable at times, which, in my opinion lies within the domain of outboard graphics and parametrics.

There are four effects sends on this main module: sends 1 and 2 are selectable using an on-on-on toggle switch between pre-fader, post-fader and post-monitor pot. The other two sends are post fader. In addition to being numbered, each knob is color-coded using Selco collet knobs (11mm) with color inserts. The effects are sent (through a 10K resistor) to the collective buses via the Sub-D connectors and into the summing amps for each, which are returned to the main buses with pots for both left and right returns on the master module.

MATRIX MODULE

The matrix module is smaller than the master module but contains important functions which come before and after the former. There are three circuit cards on this module, two passive and one active. The card designated "mic input card" receives the microphone feed from the rear apron and the phantom power from the power supply. The phase reverse, 10dB pad, and phantom toggle switches (as well as phantom "On" LED) all connect to it. The other two cards on this module are mainly for the 24-channel matrix. The twelve gold-plated sub-mini DPDT toggles (to select channel pairs), as well as the associated resistor network all mount to one pc card. This card cables out to

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the matrix harness, the panning network and the adjacent circuit card, which contains the summing network for that channel (two 5534 op-amps in a combining circuit and inverter).

The direct/matrix toggle switch allows the channel's direct output to receive its signal from either the matrix or the channel directly, which bypasses the matrix entirely. The other op-amps on this card are the buffer for the fader return (5534) and the meter driver (TL071). The meter driver receives its signal from the line input (normally the tape machine). When the matrix module is mounted in the console, the VU adjust pot (with screwdriver slot) is accessible through a rubber grommet on the console's back panel.

POWER UP

The power supply, which is mounted in an adjacent rack cabinet, consists of four separate supplies on a single chassis, and requires two rack spaces. There is low voltage ac for all of the incandescent lighting functions, low voltage dc for all LED indicators, dc for phantom powering and the bipolar dc for all signal functions. The power supply connects to the console via a mil-grade multi-pin connector on the console rear. The most critical power supply function is the bipolar dc, which needs to be tightly regulated.

Because of the current requirement, most of the 3-pin regulators on the market that I am aware of are inadequate. To regulate this voltage, I used two power transistors (each able to dissipate in excess of 100W) — an NPN for the plus supply and a PNP for minus. This allows the use of a Zener diode at the base of each transistor to set a voltage reference with respect



Mic pre-amp/line driver card, with Jensen transformer.

to ground. I chose a nominal 17V for this function. The four power supplies are each provided with appropriate overcurrent protection and the chassis is well ventilated with a whisper-type fan.

Using my Lofttech TS-1 test set, the internal VU meters and the dB scale on my VOM, I measured frequency response from mic input through the L/R summing buses to be flat within 1/2dB from 14Hz (the lowest usable limit on the test equipment) to 26K. Even at 30K (the upper limit of the TS-1), I was down only 3/4dB. From mic input to direct out I was down less than 1/4dB at 30K.

Practical Advice: When looking for hardware that may appear to be "custom," a walk through the aisles of your local hardware store can be invaluable. Not to leave any stone unturned, those fancy-looking legs are nothing more than steel pipe screwed into closet flanges with gray

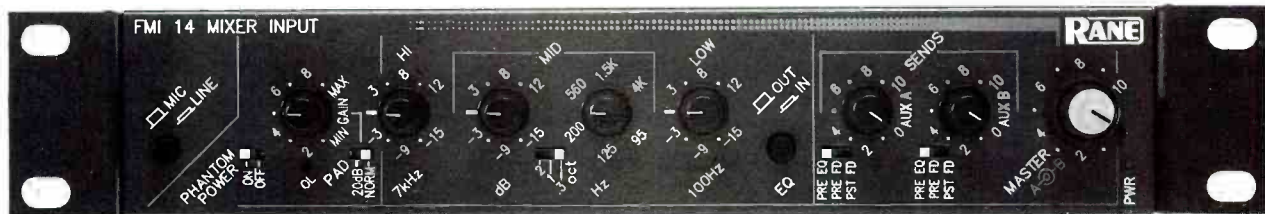
painted PVC pipe on the outside. Pipe caps on the bottom hold the PVC in place and make excellent feet. The supports are 1/2-inch conduit (EMT) painted gray. I found that 6/32-inch storm door screen retention thumbscrews make excellent module retainers. Bending your thoughts through several technologies can yield interesting results.

I have tried to provide an overview on how a production console can be designed and built by its user. Once the basic circuits are worked out, this design becomes fundamental and can serve as a basis for all types of audio mixing hardware, from a simple portable mixer to a full-blown production console. Keep in mind, there is tremendous redundancy in a mixing console. Knowing the essentials of mic and line preamps, equalizers and summing amplifiers allows you to accomplish any task imaginable in an audio production environment. And there is untold pride in saying that you did it yourself (with a little help from your friends).

Personal thanks goes to many individuals who offered assistance along the way, including quality work done by Louisville companies Trace-Tech (CAD circuit card layouts), KC Electronics (board fabrication), Harpring metal fabricators and Markco engravers.

Thanks to our studio engineers Tim Haertel and Andy High for keeping me in touch and to Brenda Barnett and Neal Burris for countless hours of soldering and assembling. My appreciation is extended to Rick Crampton of Sonic Services (Van Nuys, CA), and to the late Deane Jensen to whom all members of the audio community owe a great debt. Deane moved the audio world forward a full step. ■

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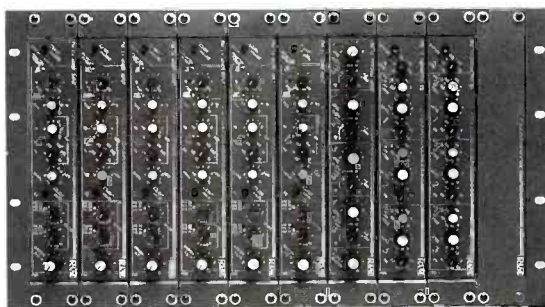


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MONITORING IN SURROUND

With so many surround sound processors in America's homes, it's important to know what America is hearing.



By Terry Skelton

Television audio, when processed by surround sound technology, can now deliver a truly multi-dimensional aural experience to home theaters — America's living rooms. These encoded TV soundfields can actually outsize the picture, and envelop the listener/viewer, creating a whole and balanced multimedia event.

At the production level, however, there is a potential downside. Home surround sound decoders can present undesirable audio information from stereo mixes, information that wasn't intended for surround sound playback. Mixing audio-for-video is impaired because these anomalies can't be heard through traditional stereo control room monitoring systems. The bottom line is that, while near field stereo monitors are fine for traditional playback, they leave the audio-for-video mix engineer without a reliable reference for surround sound applications.

So, as the approximate four million surround sound decoders now in use increases (even Radio Shack sells decoders these days), the argument grows for in-the-mix application of surround sound monitoring theory and operations. In fact, decoder-based program monitoring is the only way to really trust a mix which may

receive surround sound playback. An additional benefit to surround sound monitoring is that many common problems will become apparent to the audio-for-video mixer/producer no matter whether a program is mono, stereo or surround-encoded. Good mono will stay firmly anchored in the center speaker. Phase or azimuth problems, whether from tape head mis-alignment or other ills, are heard easily, and an out-of-

polarity signal will suddenly pop out of the rear speakers, making it practically impossible to miss.

CINEMATIC ROOTS

Surround sound was developed out of a system for encoding quadrasonic sound into two channels. This quad system, patented by Peter Schreiber, was used for the CBS "SQ" matrix quad system, among others. In the early 1970s, Dolby Labs, looking for a way to create the same type of effect as the revered Todd-AO 6-channel discrete theater sound format of the late 50s and 60s (See Figure 1), discovered how to get four channels of information on the two available optical tracks of 35mm film. Todd-AO required expensive 70mm prints to accommodate six audio tracks on two separate magnetic stripes, one on each edge of the film. Dolby used Schreiber's system, but "rotated" the quad box to get front left, front center, front right, and a rear channel called "surround." The resulting "4:2:4" system took four original audio tracks, encoded them to two (See Figure 2), and recovered the original four, with some degree of approximation, upon decoded playback. It was also more or less downwardly compatible with standard stereo and mono optical playback, and was named the "Dolby Stereo" format.

The original discrete 6-channel theater system provided five speakers behind the screen and a mono surround, as Figure 1 depicts. The mono surround signal is meant to be reproduced by two or more speakers, preferably in a diffuse fashion. Later 6-track variants traded off front channels for true stereo surround channels, and/or "boom" channels for dedicated low-frequency reproduction.

Dolby's 4:2:4 system didn't quite provide the excellent localization information that discrete 6-channel provided, but it gave a good result with greatly reduced costs in theater hardware and print production. As a result, more than half of the theaters in the U.S. are equipped with Dolby Stereo systems and most, if not all, movies are produced and released in the Dolby Stereo format. Other products spawned from

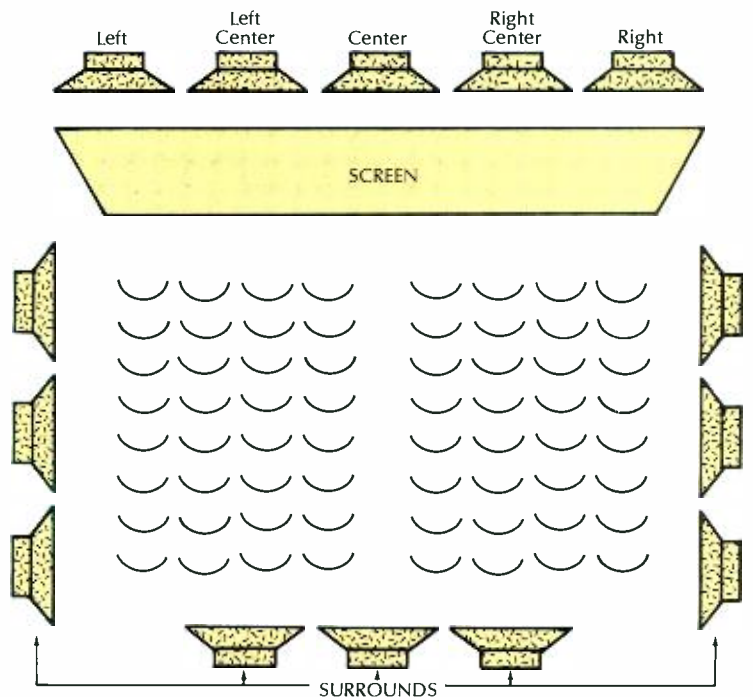


Figure 1. Original discrete 6-track cinema sound plan.

Skelton is a Bucks County, PA, audio consultant, and a former audio/MTS trainer with NBC-TV, New York.

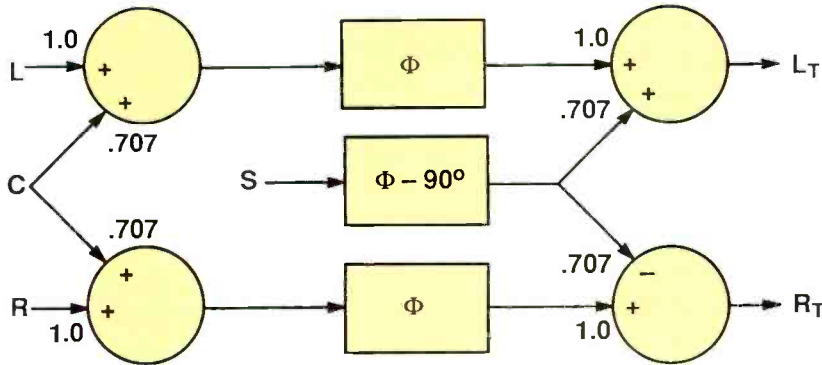


Figure 2. Block diagram of Dolby Stereo encoding process. Note all-pass networks with frequency-dependent phase response.

this basic technology were the early home format, Dolby Surround, and its later refinement, Dolby Pro Logic.

FIVE CHANNELS FROM TWO

The basic concept of Dolby Stereo is to get five channels (including subwoofer) in the movie theater out of two film soundtrack outputs on the projector. The fifth (subwoofer) channel — some would refer to it as a “half-channel” due to its bandlimited nature — is passively derived on playback in this system, by high-pass filtering the center channel, after the directional decoding matrix. The result is that any two audio signal channels, well-matched in frequency response, level and phase, could provide

these five output channels. So movies on videocassettes or any program broadcast over stereo television could be in surround, too. Even records, tapes and radio could be in surround. Today, “home surround theaters” are the fastest growing segment of the consumer audio/video market.

Dolby’s most advanced system, the Dolby Pro Logic system, incorporates noise reduction for the surround channel, and includes the derived subwoofer output, and a “steering” logic system that considerably increases separation between channels (See Figures 3 and 4.) While Dolby Labs concentrated on the cinematic industry, Shure Brothers was convinced that the other producers should be in the market as

well, so they created their HTS (Home Theater Sound) division, and began marketing its surround sound encoders and decoders under licenses from Dolby and Scheiber, working with broadcasters and audio producers to further their use of surround sound and thereby provide more programming for the home systems. Others, such as Lexicon, have advanced the state-of-the-art digital home decoders.

MATRIX THEORY

In technical terms, the encoding matrix shown in Figure 2 for Dolby Surround takes four signals (L, C, R, and S) from a 4-bus console, and encodes them to the two channels. A decoder reverses this process, and sends the signal to the four outputs (L, R, C and S). With the decoding logarithm used, there is high separation between C and S, and between L and R, but only 3dB separation between L and C, R and C, L and S, and R and S (See Figure 4).

To a high degree, the signals are both stereo and mono compatible. For stereo playback, the center-channel buildup that naturally occurs in a phantom center reproduction is compensated for because the center information is reduced in level by 3dB at the encoder. The surround signals appear “out-of-phase,” and therefore seem to localize outside of the speaker’s placement, generally an appropriate spot for them. On a mono system, the L, C, and R signals again sum at the proper proportion, with the surround signals canceled, and therefore not reproduced.

Figure 3 shows how the refined, full-logic surround system recovers the original four audio channels more faithfully using steering circuitry, and how “pseudo-stereo” surround out-

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puts are generated. The resulting L, R, C and S signals have greater isolation from each other, and thus, little center-channel or surround audio appears in the left and right speakers, and vice versa. The recommended physical layout of such a system in a professional environment is shown in Figure 5.

ENCODING TECHNIQUES

An encoder's use of purposeful summing, polarity-reversing and phase shifting are really all that are involved in treating the four channels and combining them into two. Since a decoder's recovery of these four signals is based upon recognition of those manipulations of amplitude and phase, it is possible for such decoding action to be caused by similar phenomena that occur unnoticed in normal stereo audio signal. For example, material with bad phase correlation (a piano recorded in stereo, panned wide, with one mic out of polarity, or certain DDL/reverb settings), can create serious placement confusion when decoded.

In a surround sound home, the broadcast audio signal's in-phase material of equal amplitude will be routed to the C channel, and (with a logic-equipped decoder) essentially removed from the other three (L, R and S). Meanwhile, equal amplitude, opposite polarity audio will be routed to the S channel(s) and essentially removed from the three front channels. This surround-channel audio in a program produced without an encoder is referred to by some in the industry as "magic surround".

In this "accidental" form, what's going out in stereo may sound very bad in surround sound. This is not a mutually exclusive situation, however. Just as there are some audio techniques that provide effective stereo and compatible mono, and some that don't, there are some stereo techniques that provide "proper" surround sound, and some that don't.

The trap here is not that audio-for-video might be broadcast, but that stereo A-for-V might be listened to via any medium in either mono or stereo. This puts a mixer who is producing audio-for-video which may be broadcast in the position of making choices:

1. Use an encoder to encode and control your own productions, and a decoder to monitor all programs in surround.
2. Just monitor programming via a surround decoder, and adjust your stereo or mono mixes, mic replacement, reverb and other effects based on what you hear ("magic surround").
3. Ignore the whole thing and have no idea

what will go out over the air to the surround-equipped viewer.

The last choice disregards another aspect of surround sound, the subwoofer output. While the broadcast audio bandwidth for TV is considered to be 50-15kHz, there really isn't anything to limit energy below 50Hz unless it is purposely being rolled off. Most broadcast monitors and many audio control rooms won't reproduce a good output at 50Hz, let alone 30 or 40Hz.

Listening to a good sub-woofer reproducing an off-the-air signal will often surprise people with what's being recorded or transmitted. To experience this phenomena, turn up your home system and zap between MTV and/or some curbside CNN news actuality. The street rumble can be unbearable. Other low frequency invaders such as HVAC noise and boom rumble are positive proof of the increased vigilance required to control low frequency signals that were traditionally ignored.

THE PROFESSIONAL MONITORING ENVIRONMENT

Figure 5 shows the suggested placement of speakers in a surround listening setup. For front speakers, especially the center one, magnetically shielded transducers are recommended to avoid affecting your video monitors if they are in close proximity.

When making the conversion from stereo to surround in an audio production environment, a tendency exists to add an inexpensive center speaker, perhaps based on the misconception that the left and right "stereo" speakers are carrying the main load. In reality, just the opposite is true. Most stereo program material contains a large percentage of signal common to both the left and right channels. Because the surround decoder routes this material to the center speaker, this speaker should be capable of a full frequency response and power handling capacity. The center channel is not just the "dialogue" channel; it is carrying the bulk of the program.

Referring again to Figure 5, the subwoofer

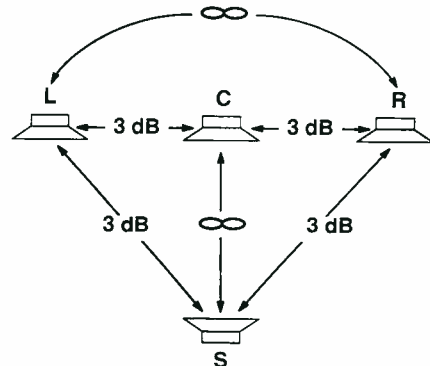


Figure 4. Separation relationships between output channels without (or prior to) logic decoding.

could be placed in a corner, or perhaps under the console. Usually we cannot detect where low bass frequencies are emanating from, but in some environments, it is possible to localize to the subwoofer location. Therefore, putting it in the center is probably warranted.

Verifying that no significant energy above 80 or 100Hz is coming from the subwoofer is also

In order for the phantom center to work convincingly, the listener must be exactly on the center line between the speakers.

important; frequencies higher than this become progressively easier to localize. Also, because of the long wavelengths involved, standing wave cancellation in a room is common, and a hole (null) might fall right at the mixing position. Some recommend using two subwoofers to help minimize this, locating them in corners to get some additional room coupling.

Next, look at the surround speakers. There is currently much discussion in the industry over the optimal location, number and design of surround speakers. Proper use of the surround's almost subliminal ambience effect means that the listener should not even be aware the surrounds are there until the signal is taken away. That's why theaters have so many surround speakers. Remember, however, that the surround signal is mono, so the more speakers there are, the more comb-filtering and timbre changes you have. Many home decoders use time-based stereo synthesizers to "de-correlate" the mono surround signal, and thus minimize these problems.

In the average size control room, the best approach is to use just two surround speakers, one on either side wall, even with or slightly behind the listening position. In large production suites, where producers sit in the very rear, some recommend another pair be located on the back wall or in the back corners, and the levels adjusted accordingly. Tomlinson Holman, corporate technical director at Lucasfilm Ltd., has spent a lot of time investigating timbral changes between the left, center, and right

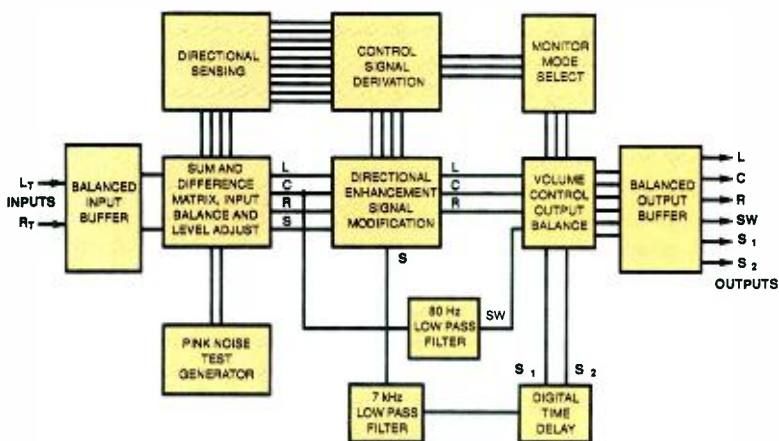


Figure 3. Block diagram of a logic-equipped surround sound decoder.

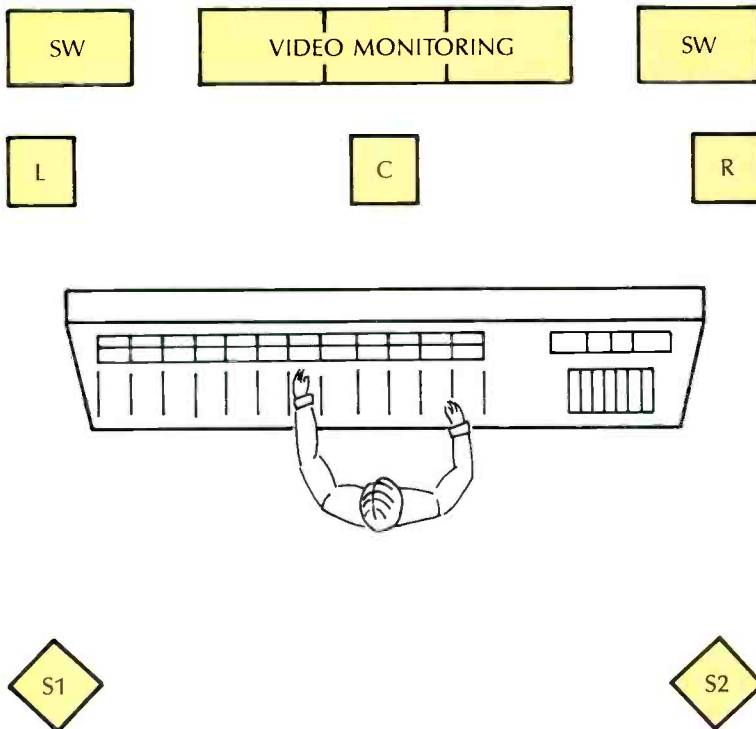


Figure 5. Plan view of a suggested control room surround monitoring system.

TV SHOWS PRODUCED IN SURROUND SOUND

Saturday Night Live - NBC
 Cubs Baseball - WGN
 KTLA's Rose Parade - KTLA-TV
 Late Night with David Letterman - NBC
 The Arsenio Hall Show - FOX
 Hull High - NBC
 Twin Peaks - ABC
 Beverly Hills 90210 - FOX
 Zorro - Family Channel
 Rin Tin Tin - Family Channel
 K-9 Cop - Family Channel
 Tales From the Crypt - HBO
 Austin City Limits - PBS
 Nature - PBS
 The Great Los Angeles Earth Quake - NBC
 Star Trek, The Next Generation - Paramount
 "Plymouth" Upcoming TV movie/pilot
 Hitchhiker - various cable networks
 Philadelphia Orchestra - KYW-TV
 Pre-season Eagles NFL games - KYW-TV
 Madonna Concert - HBO
 1990 World Series - CBS
 All-Star Baseball - CBS

speakers, and between them and the surround speakers as part of the research for Lucasfilm's THX systems. Of course there should be no apparent changes to the sound as it moves from speaker to speaker. He feels the fewer surround speakers the better, and the surround speakers for THX surround reproduction systems are bipolar, with the side null directed at the lis-

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ACOUSTIC IMAGING DESCRIBED

The most effective way to create a consistent sound-localization impression for a wide viewing area is to put a speaker where you want the sound source to appear to come from. In the theater, dialogue is generally kept to one center channel, to "anchor" the dialogue to the center of the action. This also prevents tonal coloration from "comb filtering" that results when the same sound originates at the same time from more than one source in a space.

Obviously, the problems of localization of audio to the matching visual image are considerably intensified when one tries to create multi-channel sound for television. The small screen in no way allows for "stereo" effects to match the action, as it does on the large theater screen. (See Figure 1.)

With any 2-channel audio reproduction system, material which needs to emanate from the center area between the two speakers depends on a phantom center channel created when that audio is fed to both speakers at equal level and phase. In the MTS system, critical soundtrack elements, such as most dialogue, must appear in this center area, in order to create the illusion that it is coming from the actor's mouth or from on-screen effects.

But in order for the phantom center to work convincingly, the listener must be exactly on the center line between the speakers, thus limiting the viewing area considerably. If the viewer moves even slightly to one side, the phantom center image collapses into the nearer speaker. This is known as "center channel pull". Secondly, comb filtering can noticeably affect the frequency response of the dialogue or any other center material. Further, these spectral anomalies can cause even more damage to the stereo image because of the various localization cues that psychoacoustic research has proven to be frequency dependent. A dialogue-intensive medium, such as TV, is thus severely limited by a 2-channel audio system, as the movies would be, if a solution to the problem had not been devised.

Current cinematic technology conquers these difficulties by using a "hard" center channel, as opposed to the phantom center, then further heightens the experience with the sub-woofer and the surround speakers. These same benefits can be applied to a viewing environment with a surround sound system. ■

tener. In any event, at the primary listening position, one should not be able to localize sounds to surround speakers.

In either a home, theater or a control room, it's possible to be seated closer to a surround speaker than to the front speakers. Because much information is fed to both the front speakers and the surrounds, in such a position, one could hear some sound elements from the surrounds first, causing improper localization to the surrounds (by the so-called "Precedence Effect:" what you hear first is where you localize to, within a defined time window). Better decoders include an adjustable delay for the surround so that the sounds common to the front and surrounds always reach the listening position from the front speakers first. These units also include a built-in pink noise source to "calibrate" monitor levels.

The last requirement for the professional surround monitoring system is a switching arrangement that allows selection between mono on the center speaker (only), stereo on the left and right speakers (only), or full surround on all speakers. This facility should be simple (three buttons) and immediately accessible to the operator, because compatibility between these three conditions should be checked constantly, and direct A/B/C comparison is the best way to accomplish that. It's also helpful to be able to listen to each of the decoder outputs separately (through the center speaker only, and/or in their proper place) for fine-tuning the mix or troubleshooting purposes.

OBTAINING DECODERS

Presently, three major manufacturers are seriously involved with audio production houses: Dolby Labs, Shure HTS and Lexicon, Inc. Dolby licenses other companies to build home units, but only Dolby makes the professional decoder that carries their name.

Shure builds both a home and professional decoder without the Pro Logic label, using its own "Stereosurround" moniker instead. The professional unit does not have the modified Dolby-B noise reduction in the surround channel that the other manufacturer's units have, because they feel it is unnecessary. Shure calls their steering circuitry "Acra-Vector" logic, and equips their units with a unique display screen that gives a graphic display of the instantaneous soundfield energy.

Lexicon makes home decoders that carry the Dolby Pro Logic label, which do all the decoding with digital signal processing — a first. These units automatically correct for incoming phase and level errors, and the modified Dolby-B noise reduction on the surround is switchable in or out, another feature peculiar to them. For many professional applications, top quality home decoders such as these will work well with a professional audio interface box attached.

Whether or not an actual encoder is used for local surround sound productions, a decoder should always be used for monitoring any material which might hit the television airwaves, home theater environment, or, I believe, CDs or records. It is the only way to evaluate what is being delivered to the listener/viewer. This is the standard practice in the movie industry, primarily because even with state-of-the-art encoders, the process is imperfect — what comes out is not always exactly what went in. ■

Dolby Stereo, Dolby Surround and Dolby Pro Logic are registered trademarks of Dolby Laboratories, Inc. THX is a registered trademark of LucasArts Entertainment Company. Stereosurround and Acra-Vector are registered trademarks of Shure HTS. Thanks to Robert Schlein at Shure HTS for artwork.

Education in the Sound Industry

By David Scheirman

It has been said that education exists to serve the needs of society ... and that education must evolve as the society in which it exists evolves [Phillips, "Education: Success and Failure"]. Culture changes over time, and the knowledge and technology available to society also changes. Proper education systems allow us to keep from having to "re-invent the wheel," yet, they must be flexible in order to cope with the changing needs of the student community. In short, if there is to be continuity in any society, there must be a transmission from generation to generation of knowledge, and that system of transmission must not remain fixed or rigid, but must be able to respond to the changing times.

Within every industry in our society, managers and employers are currently faced with some serious considerations about personnel hiring. Catch phrases such as "the information explosion," "brain drain" and "future shock" are used, and these terms only begin to describe the changing world that we live in today. As the global media net grows in power (American college students sent news info via fax machine from halfway around the world to rebellious Chinese students who were subjected to local news blackouts by their own communist government), and as the calendar rushes us toward a millennium marker (only eight years until the year 2000!), more people in the world seem to know more about what other people are doing. However, fewer people seem to take the time to learn basic, fundamental education skills that can lead to a deep, working knowledge of technical subjects. In short, more of us know a little about a lot, and fewer of us know a lot about anything in particular.

That affects sound industry managers and employers, just as it affects decision-makers and hiring officials in the automotive, textile, chemical, consumer electronics, aerospace, travel and leisure, communications and any other industry we may care to mention. One sound company manager asks, "Where do you go to get good people these days?" while another asks, "How can I get my existing staff up to speed on new technology?"

The sound industry is a "specialized" industry. It takes special skills, tools, interests and training to be an effective participant in the in-

dustry. The subtle differences between the desired sound for a Broadway show or a corporate theater presentation ... the not-so-subtle differences between the type of gear used and how it is adjusted to present a symphonic performance or a heavy-metal rock concert to a large crowd ... each takes a specialist who knows his or her own field of expertise.

Where have today's specialists been trained? Where are tomorrow's specialists honing their newly-learned skills? How is the knowledge being transmitted to those who will fill positions of responsibility in an exciting, dynamic industry?

The sound industry is a specialized industry.

Today's student has several options available ... some more viable than others, some hard to find or expensive to participate in, some worth their weight in gold, some not so effective. The specialized information regarding sound system equipment, operating techniques and general industry perspective is not so hard to get. What is more difficult to get, and what takes both time and discipline, is the basic educational foundation that can allow one to turn a hobby into a life-long career, or a part-time job into a professional position.

Let's consider a few ways of learning about sound systems and their operation, starting with some more commonly-available information sources and programs.

THE TRADE PRESS

Publications such as the one that you are reading contain timely information about the sound industry, its equipment, vocabulary and major players. *R•E•P* and *Live Sound! and Touring Technology* focus on portable systems; *S&VC (Sound & Video Contractor)* presents information on installed systems and technology. A variety of others are available from different publishers.

BOOKS AND VIDEOTAPES

Authors and industry professionals have assembled a substantial library over the past two decades of material that gives the student or working professional some good information about the subject. Whether at an introductory level, "Successful Sound System Operation" by Everest, available through TAB books; mid-level "Sound Reinforcement Handbook" by Davis and Jones, available through Yamaha; or advanced "Acoustical Engineering" by H. Olson, available through Professional Audio Journals, Inc., there are many published resources available. A basic-skills instructional videotape "Live Sound! How to Operate Your P.A. System"

is available from Sound Concept, P.O. Box 831, Julian, CA, 92036 USA.

MANUFACTURERS' LITERATURE

Most professional audio manufacturers offer catalogs, spec sheets and other literature that explains their own product line to the end user. Some are technically accurate, others less so. Some firms also have invested energy in producing educational information that is centered on basic sound system knowledge, rather than being product-specific such as E-V's "P.A. Bible" series of educational papers; Rane Corporation's "Note" series; and JBL's "Handbook for Flying and Rigging."

REGIONAL SEMINARS

Music stores or pro audio sales companies often help to sponsor local evening or weekend events, often featuring product specialists from equipment manufacturers (which brands the presenting company usually sells).

COLLEGE COURSES

A growing number of community colleges, state universities and private schools are realizing the importance of live sound training. Many recording school programs are adding a live sound component to their curriculum. For example, Orange Coast College (CA) offers a Concert Sound Engineering program. Columbia College (Chicago) offers a Sound Reinforcement Engineering degree. Full Sail Center for the Recording Arts (FL) offers a 3-week entry-level concert sound intensive. There are many others. Some focus more on in-class learning, others on hands-on vocational-type training. The cost varies considerably from program to program. Some are valid, others less so. For those serious about their sound education, there is probably no real substitute for a full 4-year degree program from a credentialed college or university with a double major in electrical engineering and music. Don't forget physics, mechanical engineering, communications, and economics while you're at it.

MANUFACTURERS' CONFERENCES

Major companies such as Altec-Lansing, Bruel & Kjaer, JBL, Renkus-Heinz and others have all staged technical conferences, week-end educational programs and other formats for industry professionals, favored dealers, consultants and the trade press that can have nationwide impact. Some are recurring, others have been temporal. Most major manufacturers also produce training seminars for their own dealer network and regional representatives. Don't expect to be involved unless you work closely with a particular company's product line in a professional capacity.

TRADE SHOWS AND CONVENTIONS

The sound industry enjoys a high profile at several major industry events, which are scheduled on a regular basis in cities such as Los Angeles, Chicago, and New York. The NAMM (Na-

Continued on page 63



Making a case for the lowly audio transformer.

One of the more popular audio-sports ... if you peruse the current pro-audio magazines ... might be labeled "transformer bashing." Articles abound touting the advantages of electronically balanced circuitry, citing savings in cost, weight, size, freedom from hum, etc. Advertisements for mixing consoles and outboard gear proudly proclaim "transformerless" as if this is a major performance advantage or benefit. Many engineers are lead to the belief or presumption that audio transformers are simply relics that are left over from the days of fire-bottles (vacuum tubes).

My work in sound system design, installation and operation has led me to the conviction that audio transformers are in fact virtually indispensable in large high performance audio systems and complex recording studios. This article will discuss some of the historical background and reasons for using transformers, the common myths about transformers and outline their advantages. Next month, we'll delve into typical use applications, and share some well-kept secrets (tricks-of-the-trade) on using transformers to their best advantage.

Richard Guy is president of EXCEL Audio Systems, in Placentia, CA.

COILS AND WINDINGS

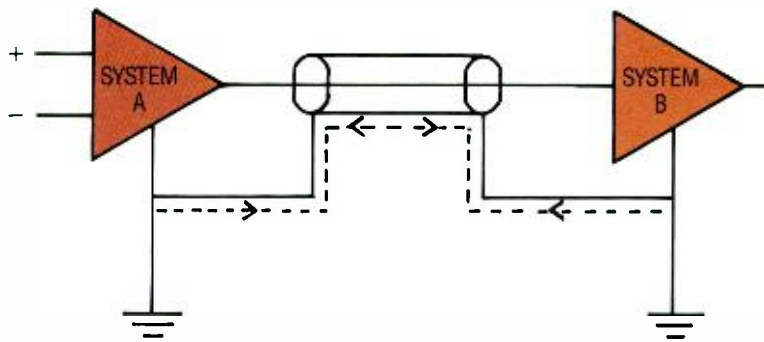
PART ONE

By Richard Guy

An audio transformer is an electro-magnetic device usually made with two or more coils of wire wound on a magnetically conductive core material. These devices may employ special grain-oriented silicon steel core materials, or more exotic alloys of iron, nickel and other metals. Unlike ac power transformers, audio transformers must couple electrical signals over a wide frequency range, at varying levels and with minimal distortion.

A transformer operates by magnetically coupling its input (primary) to its output (secondary). There is no direct electrical connection between input and output as the signal is coupled entirely magnetically. A signal applied to the input winding generates a magnetic field, which varies in accordance with the electrical source. This magnetic field passes through the magnetically conductive core and induces or generates an electrical signal in the output winding.

Transformers may be wound with coils having the same or differing numbers of turns of wire. The ratios of input to output windings (turns-ratios) of coils selected permit stepping up or down voltage (and inversely, current), and the matching of impedances. Transformers are designed for specific applications, and generally, input, output and interstage transformers



A typical direct unbalanced output feeding an unbalanced input, indicating ground current flowing on the audio signal lines.

are not interchangeable. They are manufactured with characteristic input and output impedances and are sensitive to source and load impedances. Correct selection of transformers and correct terminations are important for frequency response and distortion performance to be optimum.

There have been many reasons for using transformers over the years: impedance matching, low impedance balanced lines, common mode noise reduction, "noise-free" gain, bandwidth (RF) limitation and ground isolation. Let's take a brief look at these reasons, and explore which still have validity today.

IMPEDANCE MATCHING

When professional audio components were made with electron tubes, audio transformers were required to convert the high impedances of tube circuitry to the low impedances re-

quired for signal transmission. Tube input circuitry varied from 50,000Ω to a million ohms or more, and, when used without input transformers, was very susceptible to all sorts of program degradation. High frequency losses and the sensitivity to pickup of stray ac fields is still a part of the high impedance circuits used by electric guitars.

Power output tubes once required output transformers in order to deliver usable power into low impedance lines and the varied loads of low impedance loudspeakers. Here, impedance matching was critical in order to achieve maximum power transfer, (i.e., an 8Ω loudspeaker connected to an 8Ω tap). Mismatched impedances led to degraded frequency response, increased distortion and shorter tube life.

While most solid-state input circuitry is still fairly high impedance, modern circuits have been "optimized" for use with low impedance sources. Impedance matching is generally disregarded in most systems. Audio transformers are now routinely left out of most audio products. While this practice is usually touted as an improvement, such is rarely the case.

Most common-emitter input circuits (the usual differential, balanced input type of circuitry)

power amplifiers have constant output voltage irrespective of load impedance, (as long as you watch their minimum load impedance). This has freed us from concerns of power impedance matching.

BALANCED LINES

Transformers made possible the use of low impedance balanced lines, (two signal carrying lines above ground). This greatly extended the working length of audio cables, reduced high frequency capacitive losses and increased immunity to ac hum fields.

True balanced lines, also called transmission lines, (where a transformer center tap is grounded), made possible the very long lines of many miles that made telephone transmission a reality. And, until the fairly recent advent of microwave links, high fidelity FM broadcasts were made possible by the use of balanced telephone lines.

Input circuitry today offers the user dynamically balanced lines using one to three ICs. Many of the same advantages of transformers are now available at a much lower cost. Balanced output circuitry is commonly provided with two out-of-phase signals above ground.

An important note, however, to be covered later: Transformer balanced lines are usually ground isolated, while active balanced lines are not ground isolated.

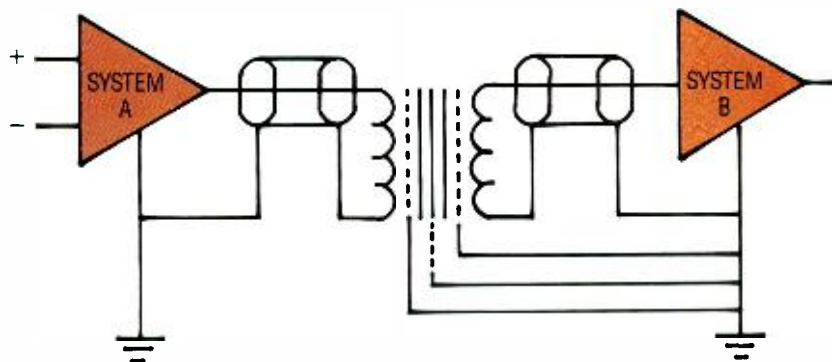
COMMON MODE NOISE REDUCTION

Beside making longer low-impedance lines possible, transformers traditionally reduced hum, static, RF and noise pickup. Noise on low-impedance balanced lines, (where the induced noise is equal on both wires of the cable), is brought into the transformer's "common mode" and canceled out by the transformer. Because each side of a balanced line is out-of-phase with the other, the in-phase noise is not passed along with the signal.

Designers are often quick to point out the high common mode rejection of modern IC-based balanced inputs. Unfortunately, much of this falls into the category of "what you read may not be what you need or what you get." Spec sheet CMRR is often quoted only at 60Hz, and it is easily degraded by variations in cabling, poor PC board layout, and stray capacitance, as well as frequency band and level of the noise.

In real world applications, when the interference gets really tough, such as spikes from ubiquitous SCR dimmers, transformers win hands down. Noise spikes on the input lines are often magnetically induced into cables, and when interference exceeds the CMRR limit of IC inputs, CMRR figures become academic: All the noise is passed with the signal.

Modern transformers, with static-shielded windings and balanced capacitances, block substantially higher levels of common mode noise (SCR noise spikes and RF) than is possible with IC input circuitry.



An unbalanced output to unbalanced input connection, using transformers to isolate ground and provide a static shield. No ground current flows along the signal lines.

required for signal transmission. Tube input circuitry varied from 50,000Ω to a million ohms or more, and, when used without input transformers, was very susceptible to all sorts of program degradation. High frequency losses and the sensitivity to pickup of stray ac fields is still a part of the high impedance circuits used by electric guitars.

have a minimum input noise point around 10kΩ to 15kΩ, and for most, the use of a quality input transformer would result in a substantially quieter input circuit (5dB to 6dB), in addition to other benefits.

Today, transformers in loudspeaker circuits are virtually obsolete, with the exception of 70V background music systems. Transistor

COILS AND WINDINGS

PART ONE

"NOISE-FREE" GAIN

Tube designs (and later many solid-state designs) took advantage of impedance matching and used the voltage setup of transformers for "noise-free" gain. Input transformers with primary windings of 250Ω and secondary windings of 50,000Ω provided 13dB to 15dB of gain ... and some designers stretched it to as much as 20dB, with higher step-up ratios.

Such practices tended to bring along other problems: Generally, the higher the step-up ratio, the poorer the frequency response and the higher the distortion. In fact, in most designs, the input step-up transformer limits the

overall system performance.

Modern ICs offer reasonable input noise performance, as long as they are driven from optimum impedances. Unfortunately this is usually 10kΩ to 15kΩ. These systems could realize many benefits from input transformers with

Many engineers are lead to the presumption that audio transformers are simply relics left over from the days of fire-bottles.

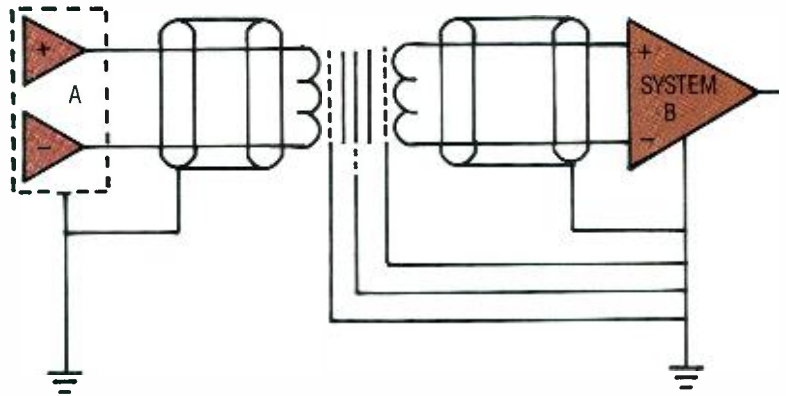
modest step-up ratios, such as 1dB to 5dB (typically +6dB S/N ratio improvement).

Modern transformers, with static-shielded windings and balanced capacitances, block substantially higher levels of common mode noise (SCR noise spikes and RF) than is possible with IC input circuitry.

BANDWIDTH (RF) LIMITATION

Transformers have always provided system designers with another benefit: high frequency noises (whether continuous radio frequencies or ac line noises) were stopped at the transformer. Beside common mode rejection, the transformer limited high frequency response to 100kHz to 150kHz. The inductances, interwinding capacitive losses, internal electrostatic shielding and various core losses result in roll-offs of 12dB/octave or greater beyond the upper limits of the transformer.

With ICs being inherently wide-band devices, great care must be exercised that bandwidth limitation schemes don't reduce slew-rate or affect transient overload recovery. Properly terminated transformers automatically limit the magnetically transmitted response, and static-shielded transformers block capacitive coupling of noise and RF through the transformer.



An active balanced output configuration feeding an active balanced input. Note that once again, current flows on the signal lines, as there is no ground isolation (unless ground is lifted via a "telescoping shield") and no static shielding.

GROUND ISOLATION

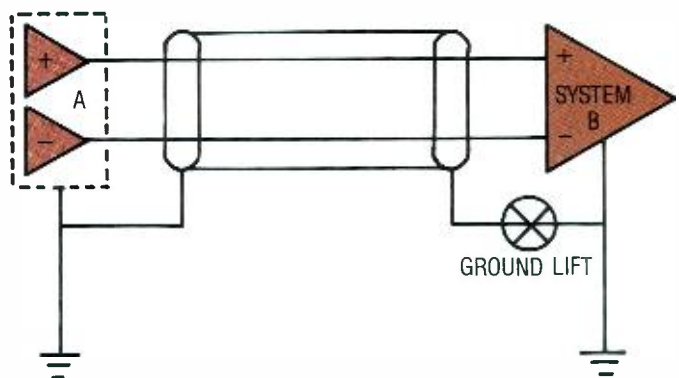
Early tube mixing consoles often had remotely located amplifiers. The very long lengths of wire required to interconnect the racks of amplifiers and mixing desk created grounding nightmares. Transformers provided a means of preventing ground loops and ground currents from flowing between differing portions of the system.

The need for "audio-iron" within consoles is largely past. The miniaturization alone provided by solid-state devices and ICs has made it possible to build large mixing consoles with fairly small ground planes. Ground loops within consoles are at least reasonably under control, if only by the brute force mass of these ground planes.

balance, and the buzzes are back.

This is where transformers in complex systems really shine. Not only can branching grounds be eliminated, but balanced/unbalanced noise injection is eliminated as well. In addition, the actual working signal-to-noise ratios are improved, as high frequency stability is enhanced.

Much has been written on the subject of grounding, and it is incredible how complex it seems to have become in the process. Having had the good fortune to work with one of the industry's real pioneers, system grounding was hammered home to me early. And to this day ... I'm not sure how it can be done without transformers, or without truly extraordinary modifications to each piece of equipment.



A fully active, isolated and static-shielded balanced signal connection, where no ground current flows between circuits.

Interconnections between systems (components and consoles), are an entirely different matter. In most systems, ground isolation (hum/buzz rejection) is usually approached in a haphazard manner, such as trying different combinations of ground points and ground lifts to lower hum and noise levels. Unfortunately, the addition of anything new usually upsets this

Many times it was stated that, "You can usually get away with one ground loop, sometimes two, maybe three, never four!" Years of experience have repeatedly confirmed this wisdom. Reduced to the simplest terms, state-of-the-art system grounding can be spelled out in a few simple statements:

- Use single point (or plane) grounding.

COILS AND WINDINGS

PART ONE

- No multiple paths to ground.
- No ground currents carried on shields.
- No ground currents flowing on signal-carrying lines (including the low side).

Every other grounding "rule" can be traced back to one of these, or reasonably extrapolated from them. The last of these rules brings us back to the audio transformer, and this is the most important point in this entire article: Electronically balanced lines coming out of any component feeding electronically balanced inputs on another component *do not provide grounding isolation.*

Common mode rejection might be good, but ground currents will flow between systems on these

signal-carrying lines. Electronically balanced lines coming out of any component feeding unbalanced inputs on another component absolutely cause ground currents to flow, thus injecting noise into the signal.

DEFINITIONS

Before we look at some practical issues concerning transformers, let's do a little defining. 1) A system is any component or mixing console that has a separate power supply.

2) Differences in ground potential absolutely exist between systems/components with separate power supplies.

3) Any ground differences which exist and flow between systems on signal-carrying lines are impressed into the signal (whether unbalanced or electronically balanced), and the differential is amplified as signal by the next stage.

4) In order to maintain reasonable signal-to-noise ratios of even 70dB, ground differences would have to be a small fraction of a millivolt. This is *not possible* within today's technology and UL grounding requirements, without using audio transformers!

How does all this relate to real life? The average recording console has 48 to 96 lines or more in and out of multitracks, innumerable effects, outboard equipment, etc., all connected to a console. How many of these inputs and outputs are truly ground isolated? How many have ground currents flowing on the signal-carrying lines? Probably more than four. What's the net result? Degraded signal-to-noise ratios, buzzes, heightened sensitivity to RF problems and reduced system stability.

How about live music reinforcement: House PA and monitor consoles get tied together through stage bridging boxes, usually via the microphone shields (absolutely the worst ground loop!). Then rackfuls of large power amplifiers are connected to these mixing consoles, usually without transformers. The fun is further increased by the fact that power amplifiers are often connected to different phases of 5-wire, 3-phase ac.

The results: unexplained failures of loudspeakers, constant presence of SCR dimmer noise from stage lighting, a degraded signal-to-noise ratio and RF problems that seem to

come and go. The most insidious part of it is that the most expensive, high frequency speaker components often don't even reproduce the hum and noise, they just sit there and soak it up as heat ... and then die.

ENTER THE LOWLY AUDIO TRANSFORMER

Short of optical couplers, or fiber optics, the audio transformer offers the most practical real-world solution to these everyday problems. Left out of most audio components, primarily because of cost and the manufacturer's need to remain price competitive, the grounding isolation solution is left to the next component in line ... or more often, the poor unsuspecting operator.

Audio transformers provide the only simple, reliable means of eliminating ground current flow on signal-carrying lines. Because there are *no direct* electrical connections, but only magnetically coupled audio programs, ground potentials can be many volts apart between systems without ground currents (noise) flowing and becoming impressed into the audio signal.

The use of high-quality, low-ratio transformers provides the audio engineer an easy and elegant solution to a wide range of input/output grounding isolation problems. A number of manufacturers offer small, reasonably priced items with excellent electro-static (noise) and electro-magnetic (hum) shielding characteristics. These transformers provide flat frequency response typically 2-octaves beyond the audio bandwidth, and with distortion as low as most integrated circuits.

Next month, we'll examine typical applications with a variety of input and output examples and share the secrets of making transformers transparent. ■

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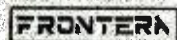
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Small Wonders

By Rick Schwartz

In response to last year's column titled "10 Great Products that weren't at the AES Show," it's time for "10 Great Products that may never win a TEC Award." We all know the TEC awards are nominated by readers, right? Wouldn't it be great if a small company (that wasn't a large advertiser) won an award for one of their products. I love hearing about little-known, but high-quality devices. Here are a few I have come across in the past month or so.

THE SHAPE OF THINGS TO COME

Ever wonder why studio designers go out of their way to design rooms without parallel surfaces, but most speakers still come in square cabinets. Los Angeles-based designer Ron Reznik has started from scratch with his unconventional loudspeaker called the "Trapegon." The unusual name comes from its trapezoidal-pentagon shape that was chosen to minimize edge diffraction, standing waves and to reduce rear-wave energy inside the enclosure. The speaker utilizes Kevlar drivers with extremely powerful magnets and employs an exotic transitional gaussian 3rd-order filter network with inductance compensation, HF contouring and a high-order rolloff slope to minimize driver overlap. Although it would take an AES technical paper to fully describe the benefits of this technology, all you need is ears to experience it. The sound is extremely smooth and open with solid imaging and a well-defined soundstage. Call RR Audio Laboratory at 818-843-8212 for more info.

MIXER MOD

Low- to mid-range consoles usually offer very-good performance at a reasonable price, but sometimes skimp on their mic preamps. Audio Upgrades has created an after-market upgrade with performance comparable to out-board mic-preamps using discrete circuitry. The 3/4" x 2" board installs in most consoles in minutes with only six connections. The high slew rate circuit offers world-class performance for only \$50 a channel. Specs: Frequency response of 5 to 200kHz +0, -1dB with distortion of 0.0014%. The company also makes a low-cost summing amp card. For more info call 818-780-1222.

SPATIAL PROCESSING

Looking for a true 3-D sound processing system for less than the price of a good digital reverb? Plug a Focal Point 3-D audio card into your IBM-compatible or Macintosh computer and you're ready to "fly" sounds in space. 3-D

Rick Schwartz is a contributing editor to R•E•P and director of post-production at Music Animals, Los Angeles.

audio can be played back through any 2-channel speaker system or headphones. Real-time control of horizontal, vertical and depth is possible using a mouse or any external MIDI controller. According to the manufacturer, the card uses a mathematical process called convolution to turn a mono input into binaural outputs for each ear. Cards cost \$1,495 per channel. Use of multiple cards requires an external mixer. Call 416-963-9188 for more info.

THE VOCAL SPLICER

This little wonder has been around for years, but many people have never heard of it. The Splicer routes one of eight inputs to a single output and is perfect for bouncing vocals. The switch smoothly crossfades between inputs and patches directly into the back of your tape machine to bypass all console busing. Available at your favorite rental house or call 818-406-6178 for more info.

I love hearing about little-known, but high-quality devices.

EVENTIDE EDITOR

If you've been waiting for an Eventide H3000 editor for the Macintosh, your wait is over. RZ Cybernetics has created a new interface for the popular signal processor, using Opcode's Max software for the Macintosh. All of the unit's many parameters can be displayed and edited using on-screen faders or via direct numeric entry. Presets can be stored onto disk and selected by name from a set of pop-up menus. All front panel controls can be operated remotely using a mouse. The price: \$175. Call 818-985-9189.

H3000 MOD

The Mod Factory is a new effects algorithm package for the Eventide H3000, and includes more than 25 new presets, such as manual and triggered flanging, envelope filtering, detuned tremolo, a new Leslie simulator, a dual-band compressor and gain-ducking, which ducks delays during busy phrases to prevent signal build-up. It also has better control over BPM delays with quarter-note subdivisions and a master BPM control, new dynamic effects modulation filters and gain with envelope followers. The Mod Factory is available from Crescent Engineering. For more info call 201-746-9417.

MELISSA

If you need help tweaking your studio's acoustics or want to make acoustical measurements, you may want to consider the MLSSA (pronounced Melissa) acoustical analyzer from

DRA Labs. MLS stands for maximum-length sequence and differs from other systems in that it uses a special type of pseudo-random noise. According to the company's literature, the MLS technique has several advantages over conventional swept-sinewave and dual-channel FFT methods. With the MLS approach, neither frequency nor time range is compromised and complete system response is achieved through a single measurement. Measurements include 3-D waterfall charts, Wigner distribution charts, energy time curves, polar plots, absolute SPL, NC ratings and more. MLSSA requires an IBM-PC or compatible computer. To find out more call 703-430-2761.

A NEW CLASSIC?

If you are looking for a reasonable priced alternative to a Neuman U-87, VTL has something for you. The CR-3A is almost identical in appearance to the German classics, with a gold-coated polyester membrane, cardioid pattern and -10dB pad for \$800. If price is no object, consider the Manley Reference Series all-tube condenser mic with a classic C12 sound, manufactured to critical tolerances with a 5 micron gold diaphragm and custom-built output transformer with pure nickel laminations and humbucking windings in a MU-metal case. Its 24-karat-gold finish sets it apart from any other. Call Vacuum Tube Logic of America at 714-627-5944.

MATCHLESS AMPS

While on the subject of classic tube sound, who can forget the classic sound of Vox amps? Matchless Amps of Los Angeles got their start selling replacement parts for vintage amps. Now they are the only company in the world that makes an 85W Class A guitar amp. Their military-grade version of the classic design includes heavy-duty hand-wound transformers (vacuum impregnated with resin, instead of bees wax), high-grade tubes and improved components for lower-noise performance. Prices start at \$1,700. Call 213-933-3659.

SPECK SUBMIXERS

It doesn't matter how big your console is, there never seem to be enough inputs for all of the keyboards, drum machines and signal processors on the market. Speck Electronics has an alternative to noisy keyboard mixers. They have been selling a very-low noise mixer direct to top session players for years now, with a user list like a "who's who" of top players for film and television. Their flagship is the SSM-24 synth and sampler mixer, with 12 stereo inputs (expandable to 72). Designed for placement in the studio, it includes talkback facilities, separate studio and control room feeds with balanced outputs and ground lifts. It also has eight aux sends, sweepable stereo EQs, tuner feeds, a click input and more. Call 619-723-4281.

Not all of these products are new, in fact some of them have been around for years. One thing is for sure, all of them incorporate fresh ideas that have been under-exposed ... until now. ■

Analog Deck Equalization

By M. Raymond Jason

Last month's column presented four biasing methods with a common goal: minimization of distortion and noise. One method, overbiasing, relies on reduction in the retrievable amplitude of a short wavelength, such as 10kHz, relative to medium wavelengths. Changing relative amplitudes of different frequencies is also called equalization, of course. In analog magnetic recording, bias and equalization are inextricably linked. This month I discuss why equalization is required, which electronic and mechanical factors affect frequency response, and what to do when you find an EQ problem.

EQ'S RAISON D'ETRE

Troubleshooting EQ problems is easier when you understand why EQ is used and which factors affect tape recorder frequency response. Equalization in analog magnetic recording is necessary compensation for two playback head effects. The first, known generically as the velocity effect, produces a constant 6dB/octave rise from low to high frequencies. All playback amplifiers therefore incorporate a non-tweakable 6dB/octave cut. The second effect, thickness loss, applies only to short wavelengths. Playback head frequency response departs from the 6dB/octave rise as a function of domain-to-gap distance:

[1] Loss in dB = $20\log(e^{-2\pi d/\lambda}) \approx 55(d/\lambda)$ where:
d = domain-to-gap distance
 λ = wavelength of interest.

Considering the tape's entire oxide layer, not just those magnetic domains at one distance, the relation is:

[2] Output loss in dB = $20\log[(2\pi T/\lambda)/(1-e^{-2\pi T/\lambda})]$ where:
T = oxide thickness (and l as before).

A rule-of-thumb that approximates this equation is that playback output decreases 6dB per rising octave starting at a wavelength equal to 10 times the oxide depth. For tape with a 0.5 mil oxide layer, thickness loss becomes significant at about 3kHz for 15ips and at about 6kHz for 30ips.

M. Raymond Jason is an electronic engineer at National Public Radio in Washington, DC.

Standard reproducer equalization is specified by the NAB in America for 7.5 and 15ips speeds, and by the IEC/CCIR in Europe for those and 30ips, in terms of time constants in units of microseconds. Translate time constant T (in seconds) to corner frequency f_c using the relation $f_c = (2\pi T)^{-1}$. For example, the NAB 50 μ s time constant produces an f_c of $[(2\pi)(50 \times 10^{-6})]^{-1} = 3,183\text{Hz}$.

The 3180 μ s EQ is a low-frequency pre- and de-emphasis intended to reduce playback hum, but is often used to partially correct for head-bump. Record equalization complements playback EQ to match particular tape stock (including bias effects) to the standard reproduce curve. Some recorders use two or more record EQ poles to permit flatter overall performance.

MECHANICAL ERRORS

Deviations from optimum tape-to-head interface degrade frequency response. Azimuth is critical, but so are wrap, zenith, penetration, height, play-mode tension and head wear. Next month's column will consider these aspects of mechanical alignment in detail. Uncover wrap, penetration, low-tension, and some wear problems by playing a 20kHz tone at 15 or 30ips. Increase supply-reel tension by applying drag to the reel or by adjustment. If playback level increases, mechanical alignment is required.

In analog magnetic recording, bias and equalization are inextricably linked.

The same test, in sync playback, exposes record-head problems. Scrape flutter modulates medium-to-high frequencies, and can be perceived as distortion or an EQ problem. Find scrape flutter with a wide-bandwidth flutter meter. Check for misaligned or tape-grooved guides, or severely worn heads, as sources of scrape flutter.

Equation [1] explains the problem with dirty heads: tape/head separation of one wavelength produces loss of 55dB! At 7.5ips, a fiber from a cotton swab will knock 10kHz down about 6dB. When the sound is dull, reach first for a bright flashlight.

ELECTRONIC ERRORS

The NAB/IEC equalization-option can be a trap. Don't assume incoming 7.5 or 15ips tapes are recorded "NAB", or even that both channels use the same EQ. Most NAB/IEC switches are rarely used. If your machines use me-

chanical switching, a wildly-wrong EQ might be caused by a dirty switch. Avoid this problem by exercising these switches every time you align. Switching speeds means re-routing audio as well as changing capstan velocity. Check mechanical and solid-state components of EQ speed switching as potential failure sites. Switching components are more likely to fail than EQ circuitry proper.

Electronic failure is best distinguished from tape/head interface problems using a flux loop. Wind small-gauge magnet wire, vertically, once around a small rectangular form (such as half-inch cube of wood). Connect the magnet wire, via a 22 Ω , 1W resistor, to a low-Z-output oscillator at 10kHz and +10dBu. Protect the head with adhesive tape, then position the loop directly against the play head, in Repro Cal mode, for maximum signal level. Reading the recorder's output, attempt to align the play electronics for 10kHz = +10.0dB (reference to above) and 100Hz = -1.4dB relative to the 1kHz level (in NAB mode for 15ips!). Verify 20kHz = +15.7dB and 20Hz = -9dB. If you can achieve this alignment, the head windings, cabling, and reproduce equalizers are functioning correctly; any play-mode EQ problem must be caused by poor tape/head interface or a bad alignment tape.

THROUGH THE GENERATIONS

With analog recording, EQ problems can be a bit like industrial chemical exposure: sometimes nothing untoward shows up until the second or third generation. The head bump that is hardly noticeable on the master becomes a booming annoyance on the copy. High-end bumps get worse through the generations as well. Given a choice in alignment between a small dip and a bump, psychoacoustics says you'll generally fare better down the road with the dip. Fast-swept tone alignment tapes provide a real-time display on an oscilloscope of the mid-to-high frequency playback response, facilitating optimum alignment.

ALIGNMENT ERRORS

Sometimes there's a problem, but nothing's wrong with the tape recorder. For example, during record/EQ alignment, either the bias or the playback/EQ can be mistakenly tweaked in place of the record/EQ. The cure here is obvious. Prevention is better, requiring just a quick Input/Tape A/B check, using pink noise, as a final step during alignment. ■

R.E.P. Handbook April 1992 will cover tape path failures.

Diversify Your Mind!

By Paul A. Christensen

It's a familiar story — most of us got into the recording business because of our love for the music. Remember seeing your first session and realizing that people were actually getting paid for something that you would do for free? And they got to do it all day for hours on end — what a life!

Well, the studio business changed, and so did we. In order to survive and grow, we found that we had to accept and embrace the changes. Many of us became involved in audio-for-video, be it as simple as locking one 24-track machine to picture for scoring, or as complex as providing multi-machine audio editing and post-production for television and film. We mastered the complexities of MIDI and computer-controlled music production. The digital revolution forced us to study sampling rates, investigate bit stream choices and learn the pitfalls of the many divergent recording formats. Market forces led us to embark on our own quest to locate the "Holy Grail" of random access workstations. And all we wanted was technology that made sense and a chance to recoup some of our investments.

Can't you just kick yourself for not seeing the writing on the wall? In another 10 years, will you be kicking yourself again for not seeing what is happening today?

In spite of our best hopes and intentions, the changes never stop. To me, this means we need to understand the reasons for change and anticipate ways to stay profitable. If you take a look at the history of the computer industry you may notice a few interesting parallels with the recording industry. In the early years, computer hardware commanded exorbitant prices. Even in the late '70s, some mainframes were costing millions of dollars, while software investments involved much less money.

Paul A. Christensen is president of Omega Productions, Dallas.

POWER BITS

The advent and evolution of the personal computer, with its low cost and "off-the-shelf" standardized design, forced IBM and others to realize that the average user could now make use of this new power. Soon there was less emphasis on hardware and more attention on software. Making computers do the job (software) became the most cost-intensive part of the equation. Hardware became not only reliable and simple, but inexpensive as well. Suddenly, the computer as a product was free to diversify into hundreds of tasks and industries, rather than being relegated to primarily data-based management jobs. Can't you just kick yourself for not seeing the writing on the wall? In another 10 years, will you be kicking yourself again for not seeing what is happening today?

Let's look at the changes taking place in the recording and television industries. Cameras, video recorders and editing systems have become simpler, more reliable and less expensive. Audio manufacturers continue to release more standardized equipment for less cost than ever before. Many exceptional projects are now recorded with equipment in facilities that have only a fraction of the gear once needed for the "mega studio". As this trend continues, there will be more emphasis on the music (software) and the people who create and record it. Look for less concern with what hardware was used.

Change can be seen as either a curse or an opportunity. In light of recent developments, the recording industry can benefit as never before. Continued changes in audio production will be brought on by the accelerated development of personal computers and the resulting economic market pressures.

The "multimedia" revolution in personal computers is under way. In a few years, it will be possible to edit all the elements of a television show — audio, video, graphics and still images — on a system as small and convenient as your personal word processor. And chances are it won't cost much more than your PC. Production of a show will be an integrated function done at one time, on one system, with one editor/mixer/jack of all trades. Roles will become more blurred with multi-skilled individuals handling more projects. Producers won't look around for who has the equipment, they will look for who has the skills. This means that many video houses will handle the audio as well. They might also provide the sound design and the music. Video houses will assimilate existing audio-post operations or hire their own people. Editors and graphics personnel will learn audio, while audio personnel will increase their job security by mastering new skills. Many clients of audio and video post houses, as well as studios, will decide to do a lot of the work themselves. Production will take on a "cottage industry" profile. As this cost-effective process grows, the old rules will no longer apply.

So how can we stay user-friendly with the future? What stance can give us a "win-win" situation no matter what occurs?

First, get to know the trends and recognize

So how can we stay user-friendly with the future? What stance can give us a "win-win" situation no matter what occurs?

them as new opportunities for success. Second, learn all you can about personal computers and how they work. If you don't own a PC, get with the program. Read the computer trade journals like you read the audio trades. The desktop production workstation is further materializing as every day goes by.

Third, get with the big picture. As much as we all love audio and music, let's realize that it is only one aspect of the entire media industry. It is important, but for your long-term success it's also important to learn about other disciplines. Develop relationships with video and film personnel. Read their trade magazines. Learn what an editor does. Become familiar with graphics and computer animation. Take a course on how to run a camera. Arrange to go on shoots and understand how the product is created. The more you know about these many fields, the better prepared you will be for the production environment of the future.

Fourth, be ready to apply your new talents wherever they are needed. Open up your attitude of "audio" and be ready for change. The studio of tomorrow does not exist today — but you might be one of the first to recognize it when it arrives.

A good step in the right direction is to join SPARS. By sharing your knowledge and networking with other professionals you can prepare for the future by participating in its creation. ■

Correction: In the SPARS Perspectives article from R•E•P December 1991, Guy Costa questioned, "What happened to the great independent operations like Gold Star, A & R, and Bell Sound?" He was referring to Bell Sound New York. Apologies to other Bell Sound Studios who have not "... disappeared into the ever-changing market structure of the modern recording industry."

The Society of Professional Audio Recording Services is the industry's best source of business information. For details on membership or activities, contact SPARS at 4300 10th Ave. N., Suite 2, Lake Worth, FL 33461; 407-641-6648; fax 407-642-8263.

HANDS ON:

BEHRINGER®

MK III STUDIO DENOISER



Audio Computed Single-ended Noise Reduction System

By Mike Joseph

Yes, the sad and unfortunate news is that noise is still with us. Even with digital storage and transmission becoming an ever growing part of our audio landscape, we can't escape the fact that noise is all around us. It comes from many places — high gain electronic circuits, multi-stage processing, recorded ambience, interference, you name it. The irony is that 16-bit digital recording, with its almost attainable 96dB SNR, shows up the dirt in all the corners that our former -60dB noise floor hid very effectively. What's a mother to do?

More than one company has an answer to that question, namely the single-ended noise reducer. Unlike double-ended Dolby, dbx or comparable schemes that rely on some form of compansion/equalization process, single-ended units act exclusively on the program material once, either before or after storage (your choice).

Most of these apply a variation of a sophisticated sliding low-pass filter, literally sweeping in from the top when there is no identifiable

(read: wanted) high frequency program signal present. There are a few units that use one or more bandpass filters, addressing multiple frequency bands (low or mid) in addition to the highs, but for most, noise is synonymous with hiss, so the attention goes to the top.

How difficult is noise removal to accomplish? The trick to a successful design is in the electronic identification of what is or isn't useful signal. A frequency-specific voltage detector is not all that is required. What if the noise is a high-pitched hiss, whine-like in nature, of very high level? Or if the signal is buried knee deep in it? Or if the noise alternates transient bursts with steady drones? Short of sophisticated computer workstation programs, (such as the Cedar or Sonic Solutions systems) that crunch in longer-than-real-time values, what options exist? Especially in a unit that is affordable enough to mount multiple channels-worth in the rack?

For one, a well-known and highly respected German audio equipment manufacturer, Behringer, has recently started importing studio-quality equipment into the U.S. One of their first pieces in the U.S. is the Studio Denoiser MK III (hereafter referred to as the Denoiser for simplicity sake). The basic single rack-space unit comes in two flavors, with options. The model reviewed here is the 2-channel Studio Denoiser, which includes both a filter section and downward expander for each chan-

SPECS AND DESCRIPTION

| | |
|-----------------------------|---|
| Manufacturer: | Behringer Spezielle Studiotechnik GmbH |
| Contact: | Samson Technologies Corp. 262 Duffy Avenue Hicksville, NY 11801 516-932-3810 Fax: 516-932-3815 |
| Model: | Studio Denoiser MK III 2-Channel |
| Description: | Audio Computed Single- Ended Noise Reduction System |
| Price: | \$599.99 |
| Controls: | Filter threshold, expander threshold, release and ratio, by- pass, stereo strapping |
| Nominal Operating Level: | +4dBm |
| Max Input/Output Levels: | +25dBm balanced, +21dBm unbalanced noise and hum |
| Unity gain: | -89dBm |
| THD at +4dBm: | 0.04% typical |
| Size: | 1 U rack-mount |

Mike Joseph is editor of R•E•P.

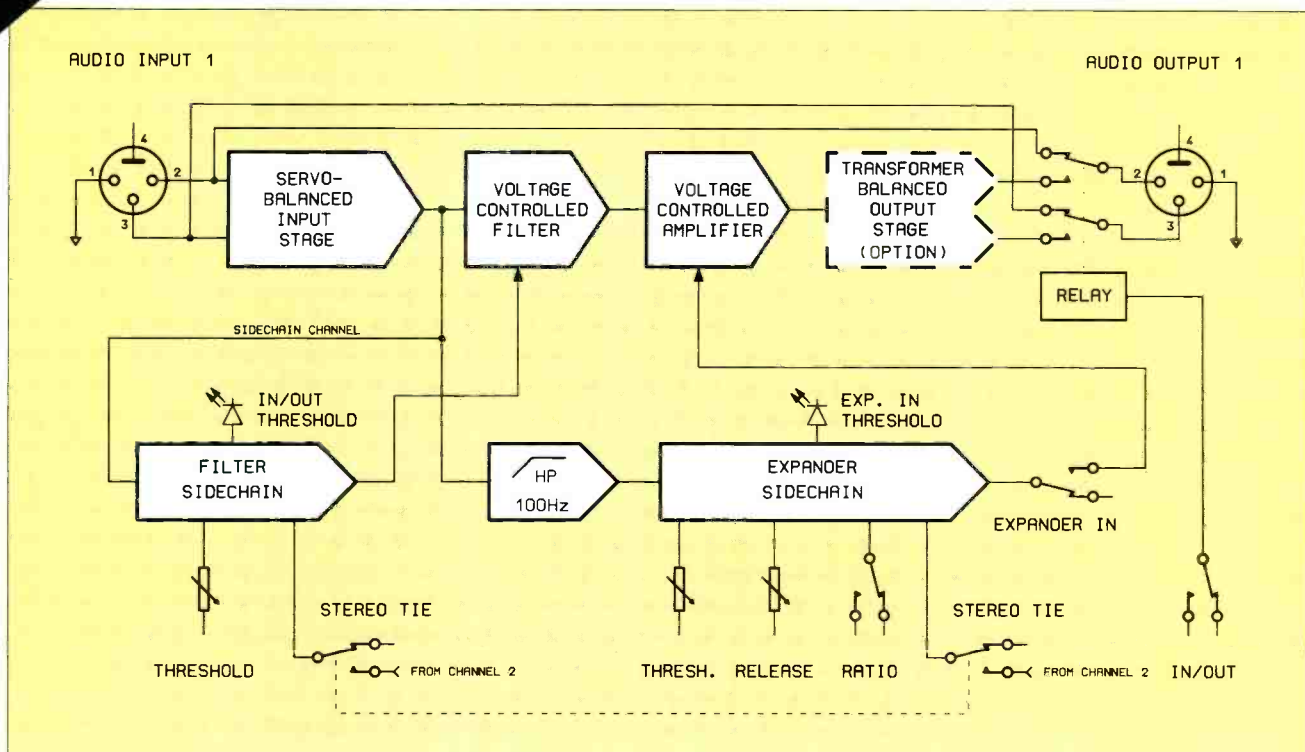


Figure 1. Behringer Studio Denoiser signal flow block diagram.

nel. An 8-channel filter-only version is available also, offering channels that forego the expander sections.

Professional Denoisers in both channel configurations are also available. They include XLR connectors (the Studio unit comes standard with TRS 1/4-inch balanced input jacks and tip-sleeve 1/4-inch 2-conductor unbalanced jacks) and output balancing with transformers. The Studio unit we reviewed was delivered with 1/4-inch jacks, input balancing only, and no transformers.

In addition to a very complete and enlightening manual, filled with the theory and concepts surrounding noise reduction of all flavors, the Denoiser is backed up by a 5-year warranty, clearly indicating Behringer's faith in the reliability of the device.

THEORY OF OPERATION

In understanding how the Denoiser does what it does, it's important to grasp some basic ideas concerning steady-state or "stand-alone" noise — the type most effectively addressed by virtually all single-ended noise reducers. Owing mostly to the physical and psychoacoustic properties of how we hear, mid- and high-frequency hiss and buzz is more noticeable and objectionable than noise in other frequency bands, including even big "hum." Loudness curve sensitivities and tone masking phenomena have a major influence on this perception. For that reason, the majority of filter-based noise reducers deal with eliminating steady-state mid- and high-band noise.

Because of the nature of psychological familiarization and masking (listen to something long enough and it will "recede" into the background, unnoticed), hiss is most bothersome when it comes and goes, such as in the form of tape modulation noise, often made worse by older noise reduction schemes on bass or kick drum tracks, where no high-frequency masking signal exists. We've all heard this breathing or pumping, even if only

caused by a high-gain mic preamp stepped-on with a compressor. Killing that "stand-alone" hiss is where single-ended units such as the Denoiser shine. They also perform admirably on track pre-rolls, fade outs, musical rests, noisy processor or preamp outputs, unwanted ambience or high-frequency "air" (room noise) and on voice-over tracks, where the naked voice is susceptible to anything occurring in the background.

Simply lovely. Smiles all around. Room agreement was unanimous: We want this thing on all our tracks!

To address these target noises, the Behringer Studio Denoiser's filter sections utilize a dynamically controlled low-pass filter, with a single shelf sweeping down from 20kHz to 800Hz, the cutoff knee, speed and depth dependent on the program material's level, frequency spectrum content and the filter threshold setting. The control circuitry's attack time is fast (less than 1ms). The threshold control allows settings from 0 (maximum filtering action) to -50dBm (minimum filtering). Each channel has a hardwired bypass switch.

The expander section in each channel has its own in/out switch to allow filtering without expansion, and also features controls for threshold (-40 to +10dBm), release time (0.2 to 4 seconds/20dB) and a ratio switch (2:1 low or 6:1 high). No level controls exist as the channels

are unity gain. Input impedance is stated as 40k Ω , and output is 40 Ω . Levels are optimized for +4dBm operation, although the total dynamic range is such that it can be fed with -10dBv and still have an 80dB SNR. Max level capability is stated as +21dBm unbalanced and +24dBm balanced operation.

As can be seen from the block diagram (See Figure 1), each channel's input feeds an active servo-balanced receiver op-amp, whose output feeds two control sections (a filter sidechain and a high-pass filter prior to an expander sidechain), and the next stage, a VCA fed by the expander control signal, and then an optional balancing transformer before hitting the outputs.

Simple in theory, the unit is basically a voltage-driven swept filter and a VCA expander, one after the other, controlled by "smart" circuitry. The servo-balanced input automatically senses when one side of the balanced input connector is shorted to ground (which, for example, a standard 2-conductor tip-sleeve 1/4-inch plug would accomplish on the phone jack version), and makes up 6dB of corrective gain. Switchable stereo cross-tie capabilities allow dual mono or strapped-stereo configurations.

MAKING IT DANCE

In operation, the setting of parameters and fine-tuning are simplicity incarnate. Mounted in a rack and incorporated into a console-integral patchbay, the Denoiser worked extremely well in unbalanced and balanced situations. During tests, we had the opportunity to use the unit extensively for simple overdub tracking, and again in mixdown situations.

The tracking dates included a Hammond Porta-B (L-100 in a case) piped through a rather hissy Leslie 910 cabinet, which was miked and run through the board's preamps; an older Mirage keyboard driving a noisy FX unit taken direct; and a single coil electric bass taken direct, but suffering some buzz from prox-

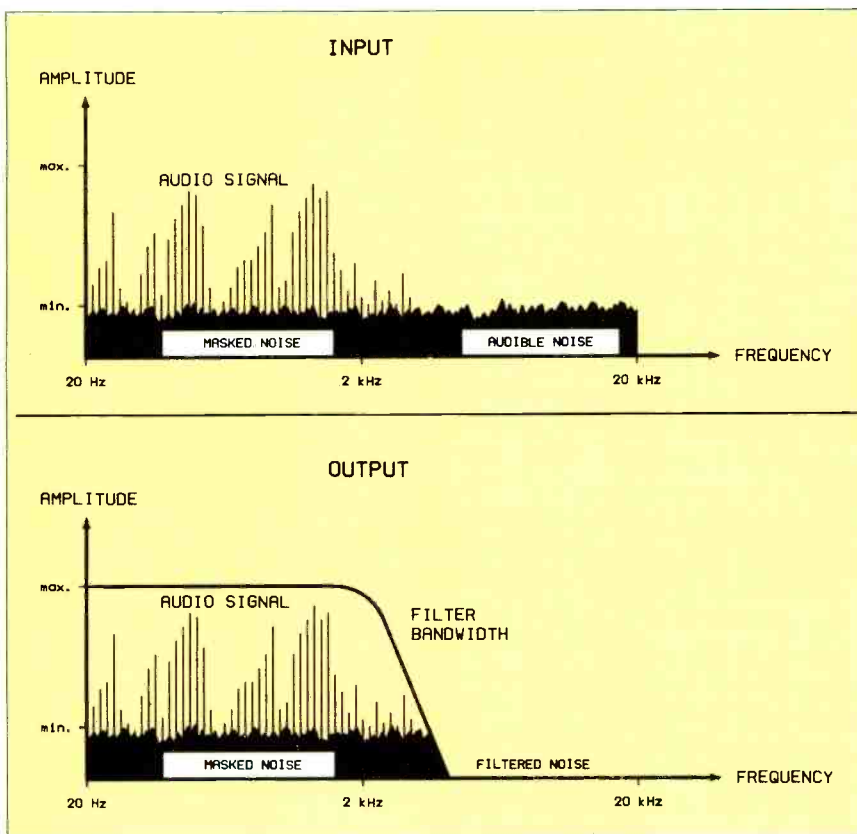


Figure 2. Effects of the dynamic sweep filter on high frequency background noise.

imity to video monitors and the spinning hard disks of a Mac MIDI stack. The Denoiser filter sections alone were able to knock fair quantities of hiss and buzz off of the pre-tape signals from these instruments. Surprisingly, there were none of the filtered highs or frequency rolloffs we have sometimes found on units similar to this. The difference between switching the device in-line and hard-bypass was negligible, although clicks were audible when bypassing with signal present (not uncommon with hard-wire bypasses).

On vocals, the unit performed flawlessly, in fact, nothing short of sensational.

Generally, with the single filter threshold control, it took us less than 30 seconds to find a satisfactory setting. Although it was possible to filter the signals too much, the 2-color green/red LED indicators assisted in making the setup quite easy. And even when hit hard, the timbral balance of the signal was never abandoned, merely muted in a very smooth manner. The disappearance of the high-frequency noise was quite impressive. Including the expander section in the operation, it was possible to drop the signal to complete subjective silence between notes.

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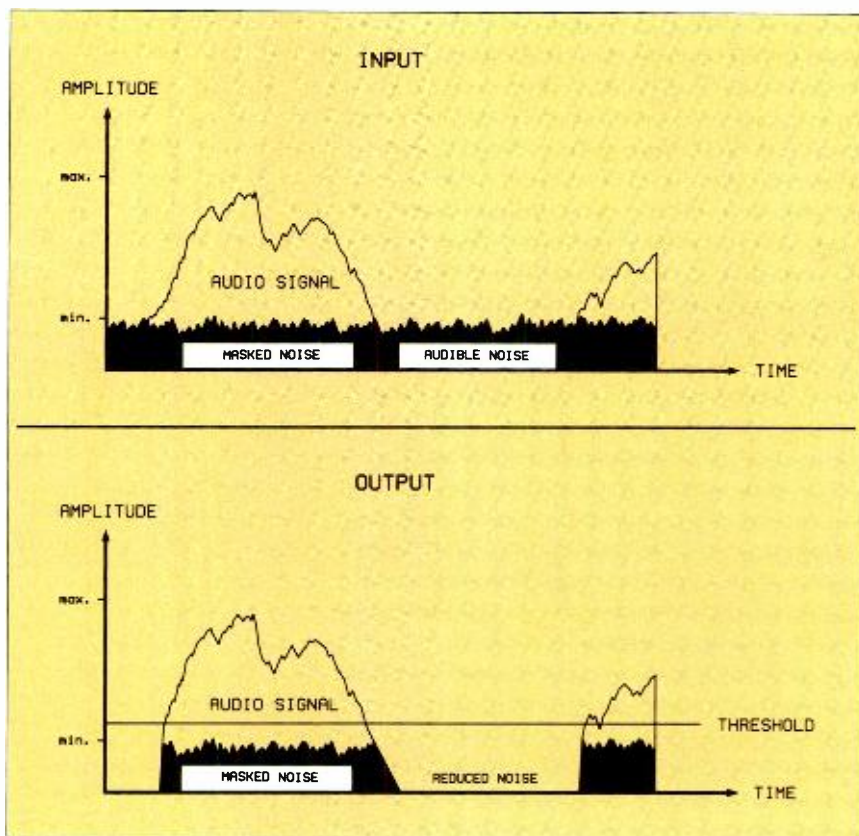


Figure 3. Operation of downward expansion, determined by expander threshold setting.

By judiciously adjusting the expander threshold and release controls, the expander could be made to automatically follow the envelope and level of the various signals quite effectively. Even previously unobjectionable background hum and undefineable clutter (buzz, clicks, low-frequency noises, etc.) disappeared, with virtually no breathing or ugly artifacts. Simply lovely. Smiles all around. Room agreement was unanimous: We want this thing on all our tracks!

On the mix dates, we dealt with a small format multitrack tape that suffered greatly from lack of any noise reduction. Acoustic and electric guitars, dimmer-buzz bass, vocals (with lots of huffing and shoe shuffling), stab piano, kick, snare and percussion all suffered in some way from mid- and high-frequency garbage.

CLEAN MACHINE

The combination of sweep filter and expander did a marvelous job of removing raw hiss from the acoustic track, allowing 8kHz to be boosted broadband by a fistful of dB, brightening up the guitar to where it needed to be, yet killing *all the noise* without thumping or pumping. The net result was a night and day difference.

On vocals, the unit performed flawlessly, in fact, nothing short of sensational. If anything, the Denoiser seems to have been designed with vox in mind. At no point were we able to affect the signal in any way that sounded bad, save a little high-frequency pumping from wanking-in way too much filter. But the noise we dumped was the difference between a useable track and a throw-away. All the tape and preamp hiss, headphone leakage, sharp breaths, etc., were smoothly, unnoticeably removed. Again, even with large amounts of dynamic filtering and between-the-notes down-

ward expansion, the timbre or spectral balance remained very much intact.

The Yamaha CP-70 piano was much more difficult, resulting in a considerably greater amount of time having to be spent tweaking the thresholds. The nature of the instrument, at least the way it was played on these tracks, was that much of the tape noise and hiss, although audible if you concentrated, was buried in with the signal and therefore well masked. It was only between the phrases that the hiss stood out, and here the expander found its own. However, without careful adjustment, pumping and gain riding were clearly audible. A lighter touch with the expander threshold and a longer release time minimized the breathing (no surprise here). The conclusion we drew was that full spectrum, wide bandwidth material needed to be approached with caution. Less was more.

On the noisy bass guitar, the analog tape hiss was mixed with dimmer and/or RF noise — quite a stew. Although not as nice as with the vocals, the combo of filter action and downward expansion removed over 90% of the high-end buzzy garbage, with virtually no effect on the “brightness” of the instrument, which we wanted to maintain, and in fact add to, with more (bigger, faster, harder) EQ. The predicted breathing of expanded hiss modulation could be created, but only by trying. Easy, comfortable amounts of noise removal left few side effects.

Amazing, too, was the effect on the kick track. Like the bass guitar, we were able to remove virtually all of the hiss and leakage (tape crosstalk, as well as mic-to-mic). As an experiment, we boosted the mid EQ to ridiculous levels, before *and* after the Denoiser, in order to bring up the beater. The operation of the unit became even more impressive — it almost

seemed as if the more noise the Denoiser had to work with, the better it worked! This was clearly a case of a single device turning a floppy, muted, noisy track into a winner.

**It's very smart, fast,
and used properly,
extremely transparent.**

Finally, we patched the unit into a mix bus, to get an idea of how well it worked across a full spectrum mix. The result? As expected. Adjusted properly, with sections where noise was not masked by program material, the Denoiser worked extremely effectively. Spaces between program sections were rendered completely silent, and the outro fade, which on one track was long and very smooth, was made to slide smoothly into dead silence. Compared to its former incarnation — slipping painfully into a seabed of burbling noise, the improvement was extreme. True, too much filtering or expansion could cause pumping or excessive squelching of reverb or ambience in the fade section, but that was more up to the operator's settings than anything. The net effect, to generalize, was that the device seemed to tighten everything up, without harming ambience and spectral balance.

To balance the impression that the Denoiser is the ultimate, perfect gadget, there were several small issues we'd like to note. The unit did click when switched into bypass, possibly due to dc or polarity issues (we didn't have time to investigate either). Also, the ratio switch in the expander section, which we found usually worked most effectively for us (and our nominal console 0dBm insert points) at the low, 2:1 setting, definitely affected output level, even with the green “no-action-being-taken” LED lit. With the expander dialed in but signal above threshold, the ratio switch dropped level 3 or so dB. Admittedly, this may have been primarily a function of where we were on the gain curve, but one would think being above threshold would dictate unity gain, yes? I'd like to talk to the designer on that one. This was a minor point only, and detracted in no way from the device's performance. In fact, some signal just didn't lend itself to such a steep 6:1 downward expansion ratio.

POSITIVE CONCLUSION

In total, we liked this device a lot. For a most reasonable price, we believe the average project will get considerable mileage from having two or more channels of the Behringer Denoiser around. It's very smart, fast, and used properly, extremely transparent. And the first time you use it to “save” a track, you'll be a hero, and it will have paid for itself. That's a good thing, yes? ■

Circle (100) on Rapid Facts Card

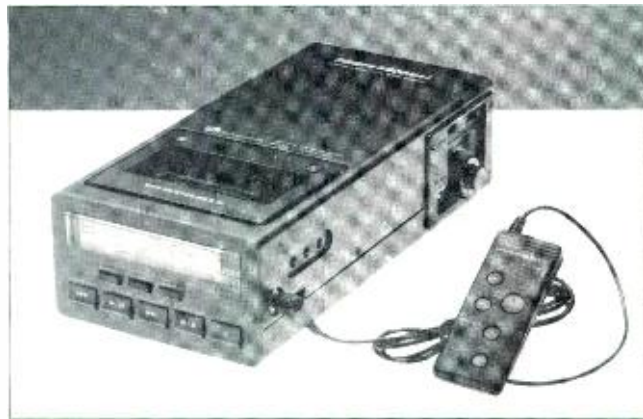
First Look

By Laurel Cash-Jones and Fred Jones

SEE ME, FEEL ME, TOUCH ME, RECORD ME

It was just about one year ago in this column that we discussed the Marantz CD recorder. By way of a little background information, Philips purchased the Marantz name and is re-introducing it to America and the world. At this time last year, Marantz had a small booth at the Winter NAMM show in Anaheim. While they had product on display, there was no information on specifications, delivery or pricing.

What a difference a year makes. This time, they had a somewhat larger booth with products that they were willing to discuss and commit delivery dates and pricing information to. Before we get to the CD recorder, let us tell you about the PMD 700 Portable DAT Recorder. This unit is said to be the smallest and lightest portable recorder available with fully professional features. To their credit, there are both AES/EBU and S/PDIF inputs and outputs, plus analog inputs and outputs. The S/PDIF is available via standard RCA connectors, while the AES/EBU is a DIN plug that requires an adaptor to XLR connectors. This adaptor is included.

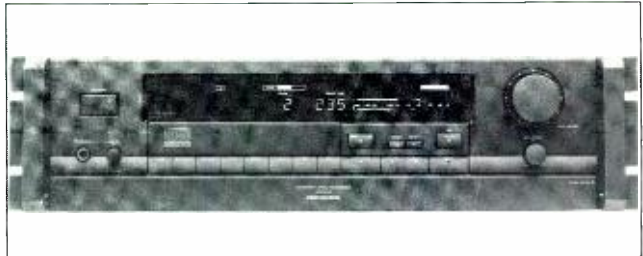


Mic/Line One is via a 5-pin Cannon connector and an XLR stereo adaptor is included. The analog line two inputs and analog outputs are unbalanced RCA jacks. Because this is considered a professional unit, there is no implementation of the SCMS copy protection system. (An interesting side note: Every time we do a spell check on this column, the computer *always* stops at SCMS and tells us it should be SCAMS. Hmmm...)

Back to the task at hand. The unit records and plays back via digital inputs 48kHz, 44.1kHz and 32kHz. The analog side can playback any of these, but can only record at 48kHz. Availability is now, and pricing is approximately \$2,500.

Now we get to the long-awaited CDR 600 CD recorder. This 3U device is a complete stand-alone piece that delivers a fully Red- and Orange-book compatible CD, playable in any CD player *after* you record the TOC (Table of Contents), which is after you have recorded all the audio you care to. Until you record the TOC, you can play it back only on the CDR 600 or a compatible player. The unit has S/PDIF and optical

digital inputs and outputs, but lacks AES/EBU connections. Analog ins and outs are via XLR and RCA connections. SCMS is not implemented.



One especially nifty feature is a special circuit that constantly monitors the recording process and adjusts the speed and laser power to compensate for dust and fingerprints on the disc.

The Marantz CDR 600 is said to be available in April of this year at a list price of \$7,500, thus making it the lowest priced unit we know of at press time. Stay tuned.

Circle (101) on Rapid Facts Card

IS YOUR EQUALIZER MISSING A "Q"?

If so, you will positively love the new DEQ 5 and 5E digital equalizers from Yamaha. Occupying only two standard rack spaces, the DEQ 5 can be programmed to be either a dual-channel $\frac{1}{3}$ -octave graphic, or a 6-band parametric equalizer. This spiffy unit also sports both digital and good old analog inputs, and the "old timers" among us (Us included) will appreciate the fact that there actually are electronically balanced XLR connectors on the analog ins and outs that can handle a peak level of up to +24dBm.

Digital ins and outs abound due to the fact that the DEQ 5 has the Yamaha format, as well as the standard AES/EBU format. The A/D converters are of the 20-bit variety on the outputs and are 19-bit delta-sigma (does this mean they went to college?) type on the input. Programming the DEQ 5 is greatly simplified due to the inclusion of the rather large LCD screen (240 x 64) that can graphically display the EQ curve, as well as text displays of the various utility menus and parameters. Three rotary encoders (why don't they just call them knobs like we do?) are used to control the unit, and are labeled F, G and Q. As you have probably guessed, these function as Frequency, Gain, and bandwidth in the parametric mode. In the graphic EQ mode, the F control selects the band while the G control adjusts the level of the selected band.

The DEQ 5 digital equalizer is joined by its little brother, the DEQ 5E. It is a single rack-space expander unit that offers all the capabilities of its big brother, but lacks front panel displays and programming controls. Up to 23 DEQ 5Es can be controlled by only one DEQ 5 master unit. You, the "user" (don't you hate to be called a user?) may store up to 40 different settings for later recall, and these same settings may be transferred to another DEQ 5 or DEQ 5E, or stored to a computer via MIDI or RS-485.

One very nice feature that we should mention is that no muting of the signal occurs when changing preset programs. The DEQ 5 changes the EQ settings one band at a time with the entire change process requiring only one second. In addition to all of these other wonderful features, the unit also has 1,300 milli-seconds (as opposed to milli-vanilli) of delay that is adjustable in about 20 micro-second increments, depending upon the selected sampling frequency. The DEQ 5 also has an on-board time code reader and can be programmed to change memories at a specific time code location, making this an extremely useful unit in the world of television or audio-for-video post production.

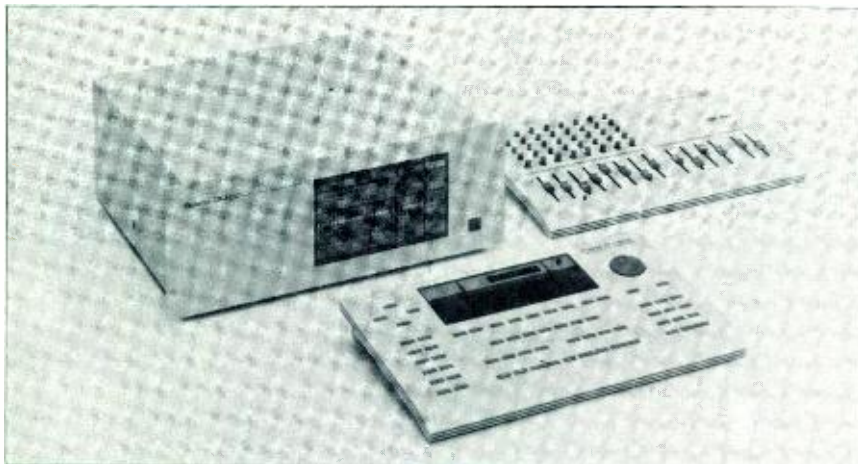
Last but not least, the unit features an auto hum canceller and reduces system hum by attenuating the power mains fundamental and harmonic frequencies whenever the input signal falls below a specified threshold, and is activated via a switch on the front panel.

Circle (102) on Rapid Facts Card

Laurel Cash-Jones is a writer. Fred Jones is a free-lance engineer, producer and writer, best known as the engineer/producer for the legendary comedy group, The Firesign Theatre. Among his many credits are an uncountable number of commercials and TV shows. He has won almost every advertising award, and several of his recordings have been nominated for Grammys.

Cutting Edge

ROLAND DM-80



Roland's DM-80 multitrack disk recorder is now available. In its basic 8-track configuration, the DM-80 offers functions such as non-destructive editing and random access recording. Suitable for a variety of applications including music recording, audio-for-video production, dialogue editing and broadcast production, the DM-80

offers users a choice of interfaces including an optional remote hardware controller (DM-80-R), hardware mixer interface (DM-80-F) and Macintosh "Track Manager" (DM-80-S) software, making it easy for users to select an appropriate control interface.

Circle (106) on Rapid Facts Card

AT&T FIBER OPTIC CONNECTORS

A new fiber optic connector assembly for CATV and broadcast applications designed by AT&T Bell Laboratories is available from AT&T Network Cable Systems. It can accommodate cables with outside diameters from 2.5 to 4.0 millimeters, and is well suited for installations requiring multiple connections. The single mode assembly with protruding fiber polish ensures fiber-to-fiber physical contact for low loss and reflectance while the multi-mode assembly assures fiber-to-fiber contact through its flat polish.

Circle (120) on Rapid Facts Card

BMI POWER MONITORS

The new PanelProbe measuring cable lets studio engineers use BMI's PowerVisa to monitor phase-to-phase or phase-to-neutral power up to 250Vrms at a power panel. This extended capability means the PowerVisa can go further in tracking down the cause of power disturbances affecting electronic recording equipment.

Normally, the simple-to-use PowerVisa monitors single-phase 90-290Vrms from the outlet used to power the unit. PanelProbe allows PowerVisa to be connected at a location that might be closer to the source of a disturbance, and thus provide additional clues about its origin. PanelProbe also makes it possible to individually monitor each phase of a 120/208 3-phase wye system, a single-phase 3-wire system, or a 240 delta system.

Circle (130) on Rapid Facts Card

MYRIAD SYSTEMS MANAGER

Xymox Systems has just announced several enhancements to the scheduling segment of its Myriad Facilities Systems manager. Included in this upgrade is automatic scheduling of bumper time for each session, single keystroke access to research search, and a resource time-off function. A daily notes feature has also been added so notes can be attached for a day's schedule as well as for each session.

Circle (127) on Rapid Facts Card

ESE/SMPTE-SMPTE/ESE CODE CONVERTERS

The new ES-2743A is an ES-461 SMPTE time code generator that automatically jam-syncs to ESE time code instead of SMPTE time code. The model ES-2695 is an ES-453 with Option "P" (1 3/4" x 19" panel and chassis, the chassis extending 10 inches behind the panel) which

converts SMPTE-to-ESE time code, providing output from the rear-mounted BNC connector. The ES-2695 will drive a maximum of 100 ESE time code slaves, with a maximum total cable length of 4,000'.

Circle (125) on Rapid Facts Card



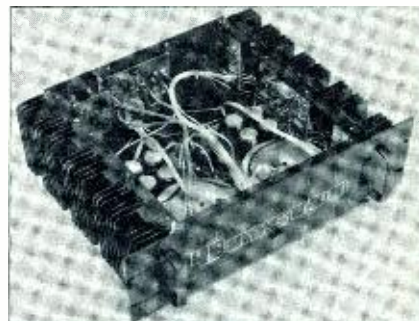
ECLAIR TUBE DIRECT BOXES

Eclair has recently announced availability of two new vacuum tube direct boxes. Both the single channel Model 90 and the rack-mount dual channel Model 92 are based on Class A tube circuitry and feature variable +4dbm and -10dbv outputs. Instruments can be tracked directly to tape bypassing the consoles' preamps. A special soft start power supply protects the tubes from potentially damaging surges at turn-on.

Circle (123) on Rapid Facts Card

BRYSTON 4BNPB AMPLIFIER

Bryston has introduced its new 4BNPB amplifier. The new 250W/channel unit features new input design with a proprietary buffer circuit



to reduce distortion in the source by maintaining completely linear input impedance. The 4BNPB also features a new clipping LED circuit and a new power supply which is directly coupled to the channels, thus eliminating the need for a wiring harness.

Circle (109) on Rapid Facts Card

CROWN CM-31

Intended for inconspicuous miking applications, the new Crown CM-31 miniature condenser microphone features tubular in-line electronics and comes equipped with a 30-foot cable that connects to a cylindrical electronics interface. This balanced, low-impedance interface adapts the microphone for phantom powering, and it is protected against static and radio frequency interference. The CM-31 is designed for wide-range frequency response while extreme low frequencies are filtered out to reduce pick-up of room rumble.

Circle (110) on Rapid Facts Card

AMBER PRECISION AUDIO MEASUREMENT SYSTEM

Amber Electro Design has released its new precision audio measurement system. The 7000 system, is a self-contained, programmable generation(10Hz-100Hz) and measurement (500kHz bw) system that combines high-performance analog measurement capabilities with the digital processing and measurement functions required by modern mixed-signal systems. Powerful computing resources create a flexible user interface and extensive programming facilities.

Circle (132) on Rapid Facts Card

STUDIO TECHNOLOGIES IFB PLUS

Studio Technologies, Inc. has debuted a small, reliable, sonically advanced interrupted fold-back (IFB) system for ENG trucks, SNG trucks and remote production applications. The IFB Plus Series supplies high performance, affordable interrupted foldback (talent cueing) for remote production situations and allows newscasters, reporters, and other on-air talent

to hear program audio and receive audio cues from directors or producers.

The IFB Plus Series consists of the model 2 Central Controller, the model 22 Access Station, the model 32 Talent Amplifier, and associated products. The model 2 Central Controller provides two independent IFB channels and fits in one space of a standard audio equipment rack.



Circle (112) on Rapid Facts Card

SPIKE & MIC



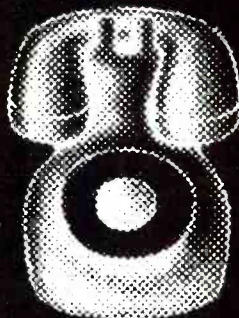
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Cutting Edge

JLCOOPER MIXERS AND MIDI AMPLIFIERS

JLCooper Electronics' recently released MixMaster as an affordable automation system that can interface with any console to provide fast, real time audio control. MixMaster is compatible with many sequencer programs such as Performer, Vision, Notator, Cubase, Beyond and KCS, and can be controlled by the sliders on a master keyboard controller.

MixMaster can also be used as a stand alone 8x1 or dual 4x2 MIDI automated line mixer/sub-mixer, while the stereo mix input allows cascading of multiple units to form a larger system.

JLCooper's two new MIDI line amplifiers, the MLA-1 and the MLA-10 are specifically designed for sending MIDI data over long distances, with the capability to send information in excess of 1,000 feet. These amplifiers convert MIDI signal to a digital protocol that can travel over common twisted pair wire before being reconverted to MIDI by another amplifier at the receiving end. The MLA-1 and MLA-10 can also be networked to multiple locations.

Circle (121) on Rapid Facts Card

TIMELINE CONTROL SYSTEMS

TimeLine has introduced the machine control system "Micro Lynx" for synchronizing audio and video tape transports and MIDI. Consisting of a compact rack unit and remote keyboard, the basic Micro Lynx supports two transports plus MIDI and features SMPTE time code generator, MIDI time code generator, two transport synchronizer/resolvers with wide band reader MIDI-to-SMPTE synchronizer comput-

ART DIFFUSERS

The two new diffuser versions of the Model P from ART Diffusers maintain five octaves of response while requiring minimal installation costs. Easily painted, and light weight (less than six pounds), each Model P delivers the same advantage as a coaxial speaker dispersing sound in two axes from one point. The rigid polyurethane unit is designed for simple mounting with construction adhesives.

Circle (135) on Rapid Facts Card

YAMAHA MULTIMEDIA INTERFACE

Yamaha's new MAGIC, three-chip set has been engineered to provide all major functions for full Level-1 compliance for MPC multimedia personal computer protocol. Addition of an audio mixer and CD ROM interface to MAGIC (Multimedia Audio & Game Interface Controller) creates an upgrade surpassing all Level-1 hardware specifications. Contained in the MAGIC chip set are the YMZ263(MMA) Multimedia Audio LSI, YMF262(OPL3) Advanced Algorithm Synthesizer LSI, and the YAC-512-M Stereo Serial DAC.

Circle (136) on Rapid Facts Card

AUDIO TECHNICA AT4033



The AT4033 studio condenser microphone is a direct-coupled, floating element, cardioid condenser mic designed primarily for studio work, vocals, and voice-overs. Using a transformerless design, the AT4033 establishes a direct-coupled signal path from the condenser element to the microphone's output to maintain accurate reproduction of delicate transients. The symmetrical open-air housing minimizes acoustic and phase anomalies, resulting in a uniform polar pattern at all frequencies and linear off-axis response. The AT4033 combines low noise output and high SPL handling capability (140dB) with low-end response and extremely flat response from 30Hz to 20kHz.

Circle (111) on Rapid Facts Card

PERMA POWER SURGE SUPPRESSORS

Perma Power Electronic, Inc. has redesigned its line of telecommunications surge suppressors to incorporate advanced SIDAC voltage-triggered surge clamping devices. Compared to the gas discharge tubes, avalanche diodes or metal oxide varistors (MOVs) typically used in telephone line surge suppressors, SIDACs offer greater power handling capability, faster response time and longer life.

Circle (133) on Rapid Facts Card

AUDIOMATION SYSTEMS

Audiomation is now offering its updated versions of the Uptown 2000 series moving fader console automation systems and the Series 990/live system intended for live theatrical applications.

Circle (134) on Rapid Facts Card



SAKI MAGNETICS REPLACEMENT HEADS

Saki Magnetics has developed high quality ferrite replacement playback heads for Studer and Otari quality control decks. Saki heads are completely interchangeable, without modification, for Studer models A-80-QC, plus model 710, 720



and 721 cassette decks. The Saki head for Otari model DP1610 is designed to last 10 times longer than the factory supplied replacement.

Circle (139) on Rapid Facts Card

LEMO MINIATURE CONNECTORS

Lemo USA has introduced its smallest line connectors to date. Similar to its miniature 2 and 3 contact connectors, these units are also available in Lemo's standard quick connect/disconnect version or a screw-threaded version for underwater or high pressure applications. Each connector accommodates a 30awg wire and contact spacing is .045 inches with a tested reliability of 5000+ mating contacts and are capable of 5000Vdc and 300Vac at 2 amps per.5mm contact.

Circle (115) on Rapid Facts Card

LEADER INSTRUMENTS CORPORATION

Leader has introduced the new Model 326, 100MHz ultra-compact portable oscilloscope. The 326 is a 2-channel dual time base scope ideal for use by field service engineers and technicians. The Model 326 has a 3.5-inch, 12kV PDA CRT with an illuminated graticule. Alternate sweep with calibrated delayed time base permits simultaneous display of the observed waveforms and the time-expanded sections. Two asynchronous signals are displayed at the same time by the 326 because of an alternate triggering mode and complete triggering facilities common to all Leader oscilloscopes.

Circle (126) on Rapid Facts Card

ATLAS/SOUNDOOLIER

The Modular System V, by Atlas/Soundolier provides the flexibility to design a coordinated custom enclosure configuration with the advantages and cost efficiency of standard components.

Circle (140) on Rapid Facts Card

Hardware and Software Updates

PRODUCERS SOUND EFFECTS LIBRARY

The Producers Sound Effects Library has released a Sound Designer's Series. The new CD is a combination of some of the most well-known designers in Hollywood. It is guaranteed to be more usable than any other library, and promises to revolutionize the meaning of sound effects and sound effects editorial. Individual CDs and sets are available.

Circle (118) on Rapid Facts Card

SOUND TOOLS II

Digidesign, has introduced Sound Tools II. Like the original Sound Tools, Sound Tools II is a stereo, direct-to-disk recording and playback system with integrated signal processing and editing functions. Sound Tools II supports 4-channel recording and playback with Digidesign's DECK 2.0 multitrack recording software or other programs such as Studio Vision, Digital Performer and Cubase Audio.

The stereo editing software, Sound Designer II, has been rewritten to take advantage of the new Sound Accelerator II digital signal processing card which, boasts a Motorola 56001 DSP chip and allows advanced functions such as time compression/expansion and real-time EQ. Beside the four balanced analog inputs and outputs on the audio interface module, available hardware includes digital I/O in the AES/EBU and S/PDIF digital formats.

Circle (103) on Rapid Facts Card

DIGITAL DAWN

Doremi Labs has released the Digital-Dawn audio editor, a new product that will replace the existing Dawn signal processing unit. Dawn is now completely analog and digital offering eight inputs and eight outputs in either analog or digital. Dawn units may now be linked to create up to 48-track systems and Dawn synchronization is enhanced and capable of outputting in word clock (32K, 44.1K, or 48K). The Dawn digital outputs are in sync with this clock

and can be fed to virtually any digital machine without synchronization problems.

The new rack mount Sound Storage Unit (SSU) for Dawn peripherals such as hard disk drives and removable optical drives, can house two peripherals and allow instantaneous removal and replacement of hard disks so new sessions can be immediately launched without backing up the original disk.

Circle (104) on Rapid Facts Card

OPCODE STUDIO AV

Opcode's Studio AV, is a single rack-space video/audio deck transport control for music scoring which connects to the Macintosh via MIDI to provide master transport control. The Studio AV reads and writes VITC (Vertical Interval Time Code) and stripes synchronous SMPTE locked to black-burst or video signal. It also provides SMPTE window dubs, black and white streamers, punches, and on-screen text display for markers or other uses. The Studio AVx Expander provides control of additional decks with master/slave chase-lock control. Studio AV software is OMS (Opcode MIDI System) compatible for complete integration with Opcode software and has special links to provide for transport control directly from Vision. Studio AV also includes a software transport control panel for use with other sequencers and a set-up window for defining streamers, SMPTE striping and the screen placement of graphic images.

OpCodes' re-released Vision and Studio Vision (versions 1.4) feature upgrades which include real-time editing, loop play and record, SMPTE locked markers, quantize-on-input, re-clock command and a redesigned control bar with fast forward/rewind controls and auto-locate buttons. Studio Vision is compatible with Pro Tools multitrack digital audio recording system for up to 16-track playback.

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Cutting Edge

APHEX DISTRIBUTION AMP

ApheX' new model 8126 transformerless, modular distribution amplifier contains servo-balanced, RF suppressed input modules featuring a ± 15 dB gain range and remote/local switching of A/B sources from six servo-balanced output stages.

Gain adjustment for the 8126 ranges from +0 to -15dB with 20-turn recessed trimmers for I/O control. The signal/clip LEDs indicate power status (steady green), signal present (flashing green) and input clip (red) and each rack contains power sensing for switching to backup supply. The compact 8126 mounts as 11 modules per rack and is fuse and diode protected from back voltage on each leg.

Circle (119) on Rapid Facts Card

MARTECH ECHOPLATE UPGRADE

The technology division of Martinsound, Inc., has introduced a complete upgrade kit for the EMT 140 Echo Plate. The stereo upgrade features complete replacement of all the EMT electronics, pickup transducers and cables with new low-noise, low-distortion components. Installation of the upgrade kit requires approximately two hours.

Mono EMT 140s can be easily converted to stereo by installing an optional mounting bar kit to attach the preamp for the second channel. Designed for +24dBu peak input and output levels at 1kHz, the Martech upgrade features improved headroom and very low noise and distortion compared to EMT tube and transistor electronics packages.

Circle (122) on Rapid Facts Card

AUDIO PRECISION

Audio Precision adds to its new portable instrument family with the introduction of the Portable One *Plus* audio test set for field, studio and benchtop test & measurement applications. The Portable One *Plus* is a complete 2-channel audio test set which adds graphic sweeps and versatile hard-copy output to printer to the already comprehensive measurement features such as numerical data from frequency, phase and distortion sweeps, instrument settings and bargraph displays. External source sweeps are also supported, making the Portable One *Plus* ideal for recorder and disc repro measurements as well as end-to-end broadcast and telecommunications transmission channel measurements.

Circle (128) on Rapid Facts Card

ODC PQ EDITOR/GENERATOR

Optical Disc Corporation recently introduced the new model 538, IBM PC/AT compatible PQ editor/generator for CD mastering. Contained on a single circuit board, the 538 can easily edit TOC and PQ action point tables, write them to any ATR or VTR audio track and supply any mastering facility with a digital audio master on $\frac{3}{4}$ -inch videotape complete with TOC/edit list information.

Circle (137) on Rapid Facts Card

BGW GTC

The BGW GTC amplifier is a 45-pound two rack-space unit. GTC features include, looping XLRs with ground lift, Neutrik NLAMP Speak connectors for each channel and bridged mono output plus a switchable low frequency over-exursion protection filter. Output power ratings are 2200W at 4 Ω when bridged mono and 700W at 4 Ω in dual channel mode.

The GTC is configured to accept two internally mounted BGW crossover cards to permit multi-amping without a dedicated dividing network. A solid state time delay for turn-on protects speaker system components from transients while the intelligent cooling system switches from fan free operation to high air flow depending on system demands.

Circle (113) on Rapid Facts Card



MASELEC PARAMETRIC EQUALIZER

The new Maselec 9001 is a 4-band parametric equalizer with high-pass and low-pass filters incorporating vintage performance with the advance technology of a modern studio system. A direct replacement of all resident equalizer boards on SSL 4000 and 6000 consoles, the Maselec 9001 requires no wiring, no soldering and no trims. It offers a direct, plug in, changeover of an entire 48-channel console in less than one hour.

Features include ultra low noise, low distortion with interactive Q and cut/boost for constant loudness curves. Units are low-mid frequency switchable to $\times 3$, high-mid frequency switchable to $\times 3$ and work with the SSL console RECALL system.

Circle (116) on Rapid Facts Card

DRAWMER SPECTRAL COMPRESSOR

The new dual channel Drawmer DL251 Spectral Compressor simulates the action of a 2-band compressor and actually increases high frequency dynamics without affecting the overall output level. The combination of the existing DL241 and the new DL251 offers switchable hard knee/soft knee compression with a threshold offset to minimize level changes when switching back and forth.

Peak Level (limiter) circuits have been improved and the Stereo Link function includes the ability to switch between two types of stereo detection: Averaging, for most music applications, and Peak Hold compression for post production and special effects. In Stereo Link mode all slave channel functions are controlled by the master channel. A sidechain input with a front panel sidechain monitor switch, improved metering and a peak level indicator LED are standard as are switchable automatic/manual Attack and Release.

Each DL251 Spectral Compressor has electronically balanced I/Os with XLR connectors and is switchable between -10dB and +4dB operating levels.

Circle (117) on Rapid Facts Card

API 525b

The API model 525b includes improvements and changes to the 525 compressor/limiter. The new design includes a noise gate that works with the original compressor gain control element, and a passive, frequency-selective de-esser that has a range from 2.5kHz to 8kHz. Neither the gate nor the de-esser add additional circuit to the signal path, and provide for an external side chain input. All three processors have a threshold control, adjustable from -20 to +20dBm. The compressor/limiter and the gate have adjustable release times. API has not altered the signal path circuit design of the 525b from the 525.

Circle (107) on Rapid Facts Card

ARX AFTERBURNER

The ARX afterburner is an advanced dual mode audio processor that performs as two independent compressor/limiters, with variable threshold, ratio and output gain. In this mode, the Afterburner offers an "Enhance" function which provides frequency restoration to preserve the spectral balance of the audio signal, compensating for the sagging low- and high-frequency response of compressed program material. A front panel switch puts the Afterburner into its integrate mode, configuring it as a single channel, 2-band compressor/limiter with separate dynamics control of both low and high frequencies and opens up a wide range of gain control techniques. The Afterburner features comprehensive LED indication of function and status in either mode, including LED metering of output level and gain reduction. A stereo link switch permits both channels to track as a stereo pair in dual channel mode. The Afterburner also offers balanced inputs/outputs on both XLR and TRS connectors, a true hardware bypass, passive RFI filter on the input and a side chain insert point for frequency sensitive compression, etc. The Afterburner is intended for studio, broadcast and sound reinforcement environments.

Circle (108) on Rapid Facts Card

tional Association of Music Merchants) show, the NSCA (National Sound & Communications Association) annual meeting, and the AES (Audio Engineering Society) annual conference all feature both display booths for manufacturers, and educational workshops of different types.

CONFERENCES

The Audio Engineering Society's first International Conference on Sound Reinforcement (Nashville, TN, May 1988) was a milestone. For the first time, a well-organized and academically structured event existed to bring together leading participants in the sound reinforcement industry from around the world. (The published proceedings are available through the AES ... a highlight was Cliff Henricksen's presentation, "Sound Reinforcement in the Year 2000," that strongly stressed the need for education about sound throughout our society.)

The 1992 Concert Sound Reinforcement Workshop, featuring instructors from major United States touring sound companies, was a resounding success, bringing students and working professionals together for a hands-on look at the latest in live sound technology and for an examination of current issues including hearing protection, computer-control of sound systems, and other topics. Sponsored by Synergetic Audio Concepts with the assistance of major sound industry trade press publications, the sold-out event proved that a high degree of interest exists for timely, accurate knowledge about sound systems and their use.

In summary, I'd like to make several observations. First, there is currently no single 'best' reliable source of well-trained entry-level sound technicians for employers seeking the guy or gal with 'the right stuff'. Second, it takes a combination of most of the above information sources for an entry-level person to become an effective 'sound specialist' who will make a valuable employee. Third, even industry veterans and working professionals must constantly be learning and renewing their own knowledge base in today's changing industry. Remember the old axiom about a skill (rigging geometry? stress calculations? circuit design?), "If you don't use it, you lose it!" And finally, tomorrow's successful sound system specialists must demand the information, knowledge and technical awareness that they need today from any and all sources.

Do you need to know something about this industry? Do you have something to share about it, based on your years of active participation? Then get involved in education, whether as a student or as a teacher ... whether in a classroom, or in the pages of a magazine like this one. The sound industry becomes 'better' in the future in direct relation to the ways in which we all actively participate in the educational process of it. ■

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Tape; Otari MTR90 II, \$25K; MX80, \$19.5K; Studer A800, \$33K; MCI JH24, \$17K; 3M M79, \$11K. Otari MX70 16tr, \$9K.

Processing; Sony PCM601 conv, \$850; AMS RMX16, \$4.5K; 1580, \$2.8K; Eventide H3000B, \$2.2K; Pultec Mavec, \$1.4K; Mics; Neumann U67 tube, \$2.5K; AKG C12A (tube), \$1.4K.

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Classified

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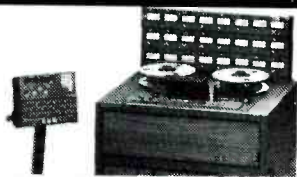
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For Classified Advertising Information

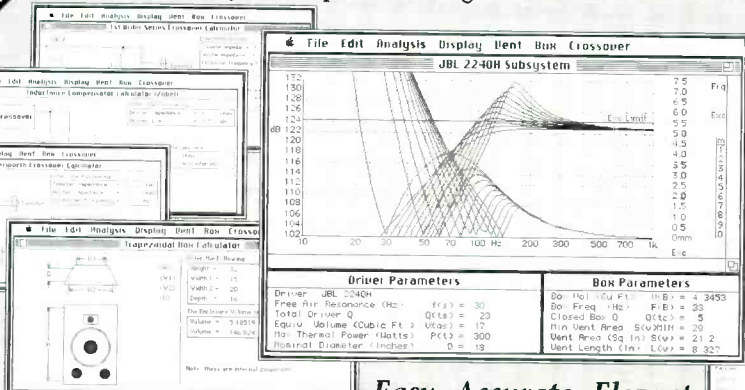
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One 2 inch i.d. Tube
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Three 2 inch i.d. Tubes
Four 2 inch i.d. Tubes

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Calculate Response RT
Clear & Calculate Response RG

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 Phase Response RJ
 Group Delay Response RK
 Excursion Response RL
 Impedance Response RM

0 dB
 dB SPL @ Pt

1 dB per division
 2 dB per division
 3 dB per division

Delay Range = 1.5 msec
Delay Range = 3.0 msec
Delay Range = 7.5 msec
Delay Range = 15 msec
Delay Range = 30 msec

Excursion Range = 1.5 mm
Excursion Range = 3.0 mm
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Classified

FOR SALE

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- Adjustments that enable you to position mics correctly for optimum performance.
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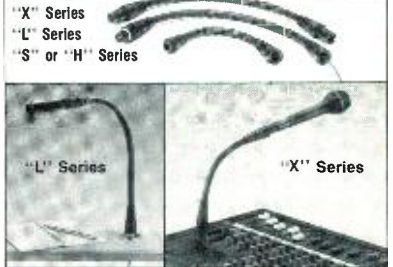


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USE R-E-P CLASSIFIEDS

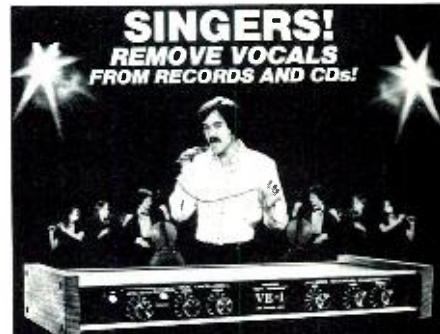
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Agencies & Producers Welcome.

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Every tape checked and guaranteed Fantastic Quality
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Classified

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- Three 32-track digital recording studios SSL and Neve consoles
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- Film and video field and studio production — Arri and Sony Beta SP
- 3D animation and paint Vertigo, Wavefront, Edison
- Video Production and Marketing

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- Artist development coordinator to work with contracted recording artists
- Animation artist to work with 3D and paint systems and aid in implementation of new software
- Teleproduction services account executive to work in sales to the regional advertising and corporate community

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| Frontera | 49 | 23 | 619-727-3410 |
| Innovative Audio | 66 | 41 | 818-986-7103 |
| Klipsch | 17 | 10 | |
| Markertek Video Supply | 67 | 42 | 914-246-3036 |
| Mercenary Audio | 65 | unlisted | 617-784-7610 |
| Micor Video Equipment | 65 | 47 | 312-334-4300 |
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| New Music Seminar | 23 | | 212-353-3162 |
| Ocean Audio | 66 | 39 | 213-459-2743 |
| Peavey Electronics Corp. | 7 | 6 | 601-483-5365 |
| Pro Audio & Light Asia | 38 | 17 | |
| Rane Corporation | 39 | 18 | 206-355-6000 |
| Reliance Plastics & Package | 70 | 45 | 201-473-7200 |
| Russ Berger Design Group, Inc. | 41 | 20 | |
| Saki Magnetics | 55 | 26 | 818-880-4054 |
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| Systems Development Group | 44 | 22 | 800-221-8975 |
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