

**Profile:
Synthesist
Larry Fast**

MODERN RECORDING

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SERVING TODAY'S MUSIC/RECORDING-CONSCIOUS SOCIETY

VOL. 5 NO. 8
MAY 1980

Chuck Mangione "Live!"



**THE ELECTRIC
PRIMER
—Part VII**

**LAB REPORTS:
Special Cassette
Tape Review**

**HANDS-ON REPORT:
Echo, Reverb and Delay:
An Overview**

Plus!

**NEW PRODUCTS
RECORD REVIEWS**



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D. POMEROY

MR

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THE history of music has forever been a search for new and expanded means of expression in sound. In every age, composers, performers, and instrument builders have sought out new ways to broaden their creative range. By leading in the development of new musical technology, MXR is carrying on this progressive tradition and pushing it to its limits.

We currently produce some of the most sophisticated electronic signal processors in the history of the art. Our graphic equalizers, time delays, and our new Pitch Transposer are just a few of the products we're developing to give the contemporary artist the control and freedom he needs to create what he hears.

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The Pitch Transposer is MXR's newest addition to our professional line. It is one of our most innovative products, and possibly the most revolutionary signal processor in the music industry today. It is a unique, high-quality unit which provides a cost effective and flexible package for today's creative artists.

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A mix control is provided, enabling the unit to be used in one input of a mixing console, or with musical instrument amplifiers. A regeneration control provides for the recirculation of processed signals, creating more and more notes, depending upon the selected interval. This results in multitudes of voices or instrumental chords. An entire new range of sound effects and musical textures, unattainable with any other type of signal processor, is suddenly at your fingertips.

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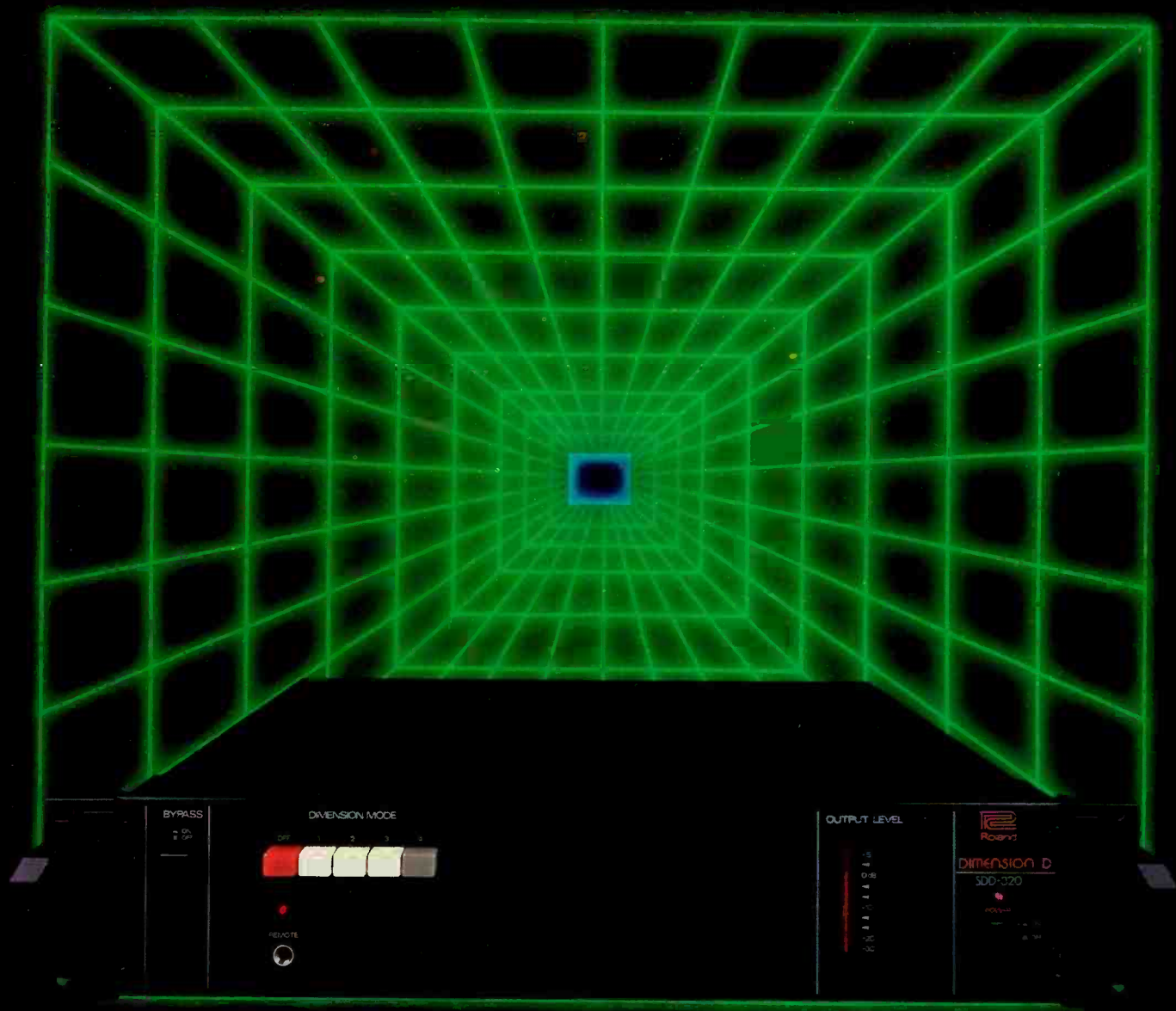
A micro computer based display option allows the user to read the created harmonic interval in terms of a pitch ratio, or as a musical interval (in half steps). This unique feature allows the pitch to be expressed in a language meaningful to both musicians and engineers.

We designed our Pitch Transposer as a practical musical tool for those actively involved in creative audio. It reflects our commitment to provide the highest quality signal processors with the features and performance that will satisfy the creative demands of today's musical artist. See your MXR dealer.

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MXR Professional
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The Dimension D

The problem with many special effects is that they have a tendency to become specialized effects. Rather than being integral to a performance. They become simply the frosting on the cake, used only occasionally because their very nature makes constant use tiresome.

But what if the fundamental sound itself is lacking? What if you want to give it some life without having to put it through a wringer for improvement? For you Roland offers Dimension D—the Uneffect.

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never had before... fundamentally the same, but deeper and richer. Likewise, acoustic instruments and vocals are richened and thickened when you amplify or record them. They're given back the brilliance they had live.

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noise ratio is better than 90 db.

The Dimension D is not an effect, it's really an experience. It won't blow you away—it isn't supposed to. That's because some effects are not measured by their intensity, but by their subtlety.

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MODERN RECORDING

MAY 1980
VOL. 5 NO. 8

SERVING TODAY'S MUSIC/RECORDING-CONSCIOUS SOCIETY

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THE ELECTRIC PRIMER

—Part VII

By Peter Weiss

This month we begin easing our way from the theoretical into the practical realm of recording equipment. Stay tuned, it all starts coming together soon!

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CHUCK MANGIONE "LIVE!"

By Bill Vermillion

A classic example of "Hometown Boy Makes Good" (if, of course, your hometown is Rochester, N.Y.). Mangione certainly deserves the publicity he has been receiving, so *MR* recently covered one of his concert dates on the most recent tour.

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By Fred Ridder

Larry Fast has become one of the premier musicians in the synthesizer field. And he has done it by experimenting and taking chances—going that one step further that is necessary to break new ground.

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By Norman Eisenberg
and Len Feldman

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HANDS-ON REPORT

By Jim Ford and John Murphy

What with all the delay lines, special effects units, etc., cropping up everywhere (and *MR* testing as many as possible!), Messrs. Ford and Murphy felt it was time to step back and get a better understanding of just what these effects can and can not do.

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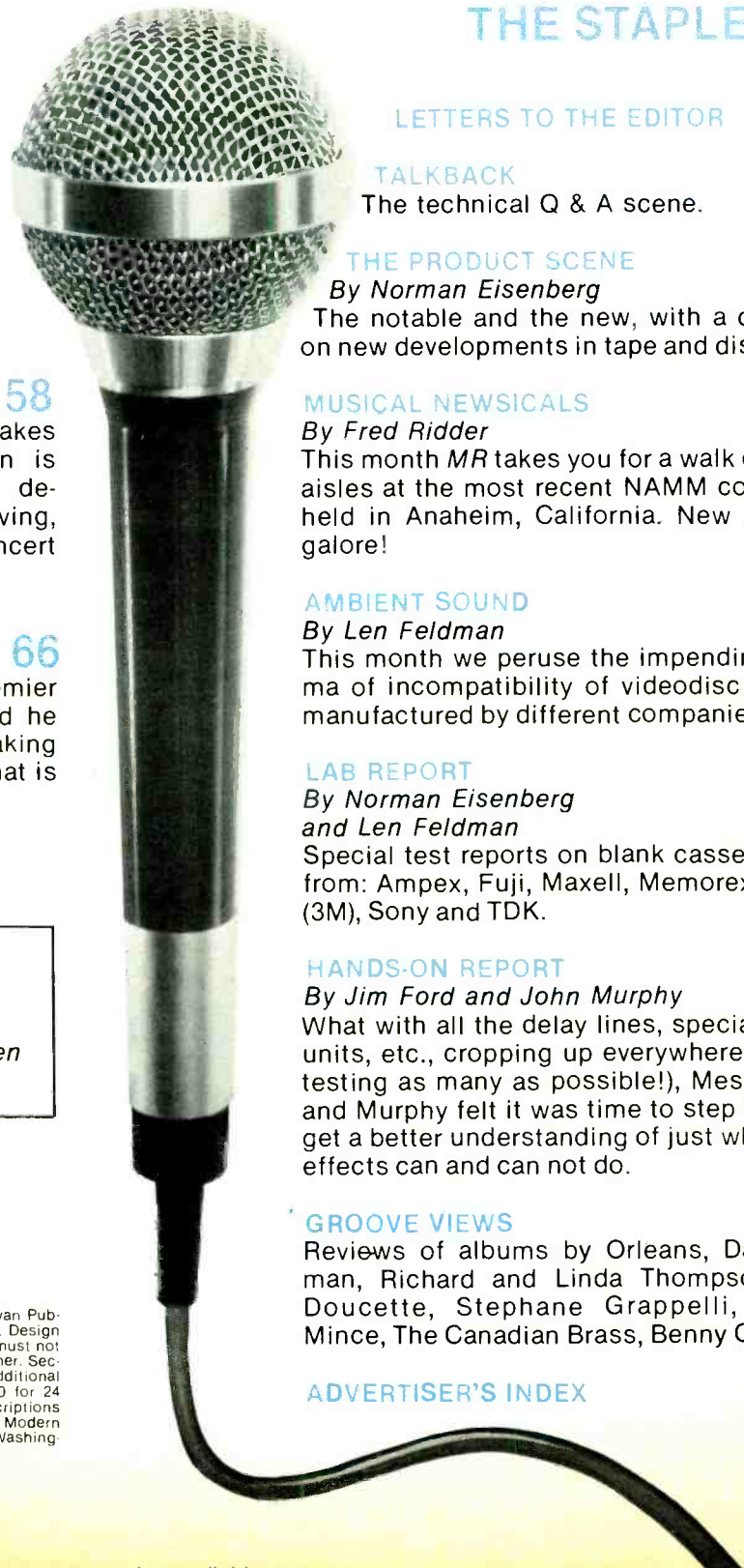
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Mangione Photos: Jim Katt
Larry Fast Photos: Courtesy Howard Bloom Organization

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LETTERS TO THE EDITOR

Malpractice Suit

I am writing to you out of frustration and disappointment.

Our family has been involved in music all of our lives. We have tried always to seek perfection at our work and to get help from people who supposedly are in the upper percentile in their jobs. We have been involved in recording for about eight years, either as studio musicians, or in the engineer's seat. We never claimed to know everything about the studio scene, but instead tried to seek out people with much more experience and understanding than we had. During our search for the truth we have found that no two people think exactly the same on almost every point of studio construction and product selection.

However, certain products stand out as clearly superior units in their respective fields. Unfortunately very few salesmen seem qualified to sell audio products, especially pro-line equipment.

In just eight short months of trying to construct our own studio, we have found that even at the largest audio dealer in New York City, incompetence seems to be their motto. Without fail we have had to return every product to the factory at least once before we could use it. There are exceptions in every case and we have only two here. Our power amp and compressors were the only things that were adjusted properly before we received them.

Our salesman, who was recommended to us through an acquaintance, has been lax in his attitude about demonstrating pieces for us to hear before purchasing them, yet these pieces all range from \$1,000 on up. He has told us that their service department was the most competent around. He has proven himself wrong on almost every occasion. Because of his mis-information, we have wasted over \$2,000. This amount of money is by no means trivial to us as we are not a large company installing a recording studio which costs over \$500,000.

We have found that we were more informed than our salesman and we have very little faith in his work anymore. We have not tried to trick him because it would only hurt us in the long run, but he has put his feet in his mouth or other orifices on almost every occasion. He insists that the service department has checked our equipment before we received it. We have found him to be blatantly lying to us on several occasions.

Even the companies that produce this supposedly highly technical and delicate equipment don't do such a thorough job at building their pieces as they would like you to believe. Our speakers, which are the industry standard, were wired improperly at the factory, and our dealer didn't bother to tell us of their inherent flaws until after we had bought them and found this out for ourselves.

This is not to say that every dealer and company are all bad and uninformed, as we have also found out.

We would like to share these experiences of ours with your readers, who are buyers of audio equipment. Our suggestion to them is not to let the reputation of a company or a salesman's puffing influence their buying of a product. Hear the product first if you can and get several opinions from completely unrelated sources as to whether "X" product is for your needs or not. Try to get these opinions from good authorities, not just another sales-



Studiomaster is Expanding

We have never been ones to sit around and watch others progress. Instead, we prefer to be the leaders. And in our field, that is how many regard us. So we apply our energy to expansion . . . growth in every phase of the development of our products.

Our mixers are expandable. *Studiomaster* was first with the add-on module concept in affordable professional grade mixers. Whether you select our 12X2b or 16X4 units, neither will ever limit your group or studio to its original capacity. By our four-channel-at-a-time expander modules, a 12X2 can become a 24X2 in minutes. A 16X4 will change into a 20X4 almost immediately, and without the hassle of dangling cables that can cause shorting or transporting difficulty.

Our features are expanding. As pioneers in the more-feature-per-dollar area, *Studiomaster* was the first to offer 5 way equalization on an affordable mixer. We still are. Our 16X4 mixer was the first studio quality desk that allowed the operator to have a separate stage (or studio) mix for the performers while still sending an independent, unaffected mix to the tape recorder. No competition yet. And now, our mixers come with direct in/out channel patching as standard equipment, just one example of our expanded features.

Our product line is expanding. *Studiomaster* now has a 16X8

mixing console designed for 8 track studios and live performance. We offer the professional touring band the most affordable 20X8 monitor mixer available. And we now manufacture three and five way stereo crossovers which solve the complex speaker system problems of large concert arenas. We even make the coolest running, smoothest sounding 225 watt/channel amplifier around, too. Did we say we're expanding?

The only thing that really hasn't kept pace with our other phases of expansion is our price tag. It has escalated only a fraction in two years . . . and that only to justify the extras we offer. So we are still the most affordable 16X4 mixer that money can buy in our performance category.

Maybe you should consider expanding your studio's or group's ability to create. Give us a call at (800) 854-6219 nationally or (714) 528-3360 in California. We will give you the name of the *Studiomaster* dealer closest to you. If you visit him this month for a *Studiomaster* demonstration, you can receive a *Studiomaster* T-shirt free from us. Visit him soon to see the continually expanding possibilities of *Studiomaster* products.

For more information about Studiomaster products, please write to Craig Bullington, National Sales Manager, Studiomaster, Box 55, Atwood, California, 92601.

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person. Don't let salesmen sway you one way or another. Sometimes his commission is higher in the product he would like to see you purchase. Also, check to see that your new product can be serviced where you bought it. We have been told that it can, when after we bought it in a faulty condition new, it was told to us that they could not in fact service it. In any case, let your own two ears be the judge, not the salesman's mouth.

Another thing we have learned is that equipment calibrated to within tolerances is not necessarily good enough. Get your equipment calibrated as close as possible no matter what the book says. "Good enough" for one piece of equipment might be fine, but add that to all of your other equipment in the studio and you will find that your tolerances become sloppy for accurate recording — if every piece you own is just within specs, or as most people say, "good enough." You will find that when you play your music back on someone else's system, it just doesn't sound the same as it did played back in your own studio. Unfortunately, most people don't find out these things until after they have dealt with a place for awhile.

Please understand that not all sales-

men and companies are all bad all the time, but have that in the back of your mind so that if you find yourself getting shafted, you will at least be forewarned. We consider ourselves lucky in that we were able to find many people in the industry who indeed are what they say they are and who did indeed straighten us out on most of our misinformation.

I will leave you with this thought. If in medicine we were treated as we are treated by salesmen in audio, we would probably see a lot of deaths or near fatalities and malpractice suits. Why then in such an exacting industry as the audio field is there so much uncalibrated information going around — especially when good publications such as *Modern Recording* are here to make you aware of products available, and their attributes and short-comings.

—Name and address
with-held

An RF Battle Won

I just read the "Talkback" piece in the December '79 issue regarding RF problems in a Teac Model 2 mixer and thought I'd share a similar problem and solution from a recent installation.

Although my problem wasn't in a Teac mixer, it was similar in that the mic cable was acting as an antenna. After trying all the textbook methods; by-pass caps, ground rods, etc., I discovered the problem to be in the cap of the XLRs of the mic cable.

The solution was a jumper from the mic cable shield to the ground post of the XLRs. When the cap was set in place and screwed down, the RF was gone. To insure that the problem was totally out of the system, the same procedure was taken inside the mixer.

Hope this will help. Incidentally, my problem involved a Carvin MP600 mixer. Good luck!

—Lou Sabatini
Chief Engineer
Audio Traks of Roanoke Inc.
Roanoke, Va.

Son of Direct Box

We've been attempting to build the direct box you gave instructions for in the April, 1978 issue. But we have encountered a problem. The United transformer A-27 listed is not obtainable from my suppliers, and does not appear on a cross-reference.



Our Stereo Synthesizer isn't just for old mono records.

Applications of the 245E are limited only by your imagination:

- save tracks by recording strings, horns or drums on a single track and spreading them in the mix
- create stereo depth from synthesizers, electronic string ensembles, and electric organ
- create a stereo echo return from a mono echo chamber or artificial reverb generator
- use one channel to create phasing effects

It's a dramatic, highly listenable sound that's fully mono compatible—just add the channels to get the original mono back. (If you get bored, you can always process old mono records into pseudo stereo.)

Your Orban dealer has all the details. Write us for his name and a brochure with the complete 245E story.

orban

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Altec's Create-Your-Own-Mixer Mixing Console



Nobody but you could ever know exactly how you want to use a mixing console. So instead of manufacturing a cut and dried mixer which defines your system's limits, or giving you a plug-in module approach which might fit one job but not the next, Altec Lansing created the 1690 Mixing Console to give you options rather than boundaries.

No longer do you have to struggle to fit your needs into the circuitry of someone else's idea of a perfect mixing console. A mere flick of the mode switch on any of the 1690's eight input channels lets you select the channel circuitry best suited for your musical or commercial sound reinforcement, recording/overdub or mixdown applications.

If your needs change in an hour, no matter. Just flick the switch and turn the 1690 into a whole new mixer.



PA/REC/MIX Mode Switch

And, two or more 1690's linked together can give you twice the flexibility and twice the performance.

We have written a comprehensive technical letter to explain in more detail just how simply you can turn your ideal system designs into reality.

So go ahead, design your ideal system. With your ideas combined with our technology, you can easily "create-your-own-mixer" on Altec Lansing's 1690 Mixing Console. Another innovative product from the company that speaks with the Voice of Experience—with 43 years manufacturing quality audio products for America and for the world.

For further information write Altec Lansing, 1515 South Manchester Avenue, Anaheim, California 92803 or check the yellow pages under "Sound Systems" for the name of your nearest Altec Sound Contractor.

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DeltaLab Has The Special Effects Digital Delay Line Featuring...

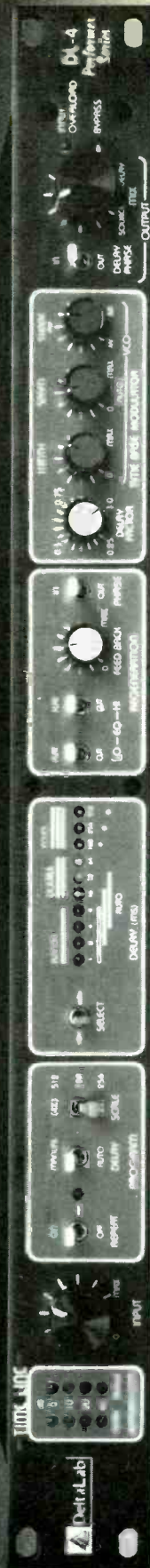
- Unique VCO with infinitely variable waveshape control.
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- 2.5 seconds delay with external memory module
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- Limited 2 year warranty



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Canadian Distributor:

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Tel: (416) 495-0688



DL-4 Time Line™ Performer Series available at quality dealers

Is there a substitute? Perhaps Stancor, Litton, or Thordarson. Or is there an address to which one could send for the UTC?

I found my way into the profession with a lot of help from informative publications like yours. Keep it up!

— William H. Mullin
Studio Manager
Audio Services Co., Inc.
Mishawaka, In.

I recently acquired a copy of your 1979 *Buyer's Guide*, in which you had an article on building a direct box. The recommended transformers were UTC and ADC models. However, after calling nearly every electronics supplier in Seattle, I have yet to find anyone that's ever heard of ADC and the only people that sold UTC had to order them, and there was a six-week wait. I am wondering if you could either recommend some other brands of transformers or tell me of a company where I could order the specified UTC and ADC transformers. The information would be deeply appreciated.

— Mark T. Paslay
Seattle, Wa.

Letters like these lead us to hypothesize that MR articles have infinite half-lives, and we'll never shake the demons written into some of them. On the other hand, it is good to see that we continue to live on, though essentially out of print.

"Building a Direct Box" was reprinted in that Buyer's Guide after we exhausted the supply of April 1978 magazines. To our chagrin, at reprint time we did not update the parts list, which had been giving quite a few readers the same run-arounds you are experiencing. Part of our penance has been to ferret out and report on alternate transformers and such-like, so here goes (again):

First, since the ADC-11-4F is no longer available, look for either a Stancor #A-4407, a Stancor #A-4350, a Thordarson #20A07, or any other multiple primary/multiple secondary audio line-to-line transformer.

Second, consumer or "hobbyist" retail outfits, including radio and TV parts distributors, are unlikely sources for the transformers. More industrial-oriented distributors tend to stock the items, but the catch there is that they generally turn away the one-time, single-item purchaser. Your best bet is to deal directly with the manufacturers, so to speed things up if shipping

TDK's new improvement has nothing to do with the sound. It's the package.



Each TDK package is now designed to catch your eye as never before. Clean, modern lines. Bright new colors. Bolder designations in front. Full tape description in back, including sound characteristics, formulation, bias and a frequency response chart to let you know precisely what you're buying without having to hunt for a salesman.

And don't expect the improvements to stop there. Inside there are complete recording and cassette care tips. Invaluable for preserving the life of each cassette, even though each TDK cassette is protected by a full lifetime warranty.* There's also a convenient, tear-out index card to help you build a perfect reference system.

Once inside, TDK couldn't stop improving. There's now a wider cassette window.

Through it you'll be able to watch two red double hub clamps registering tape direction as they turn. Just when the improvements seem to end, TDK tape technology begins. TDK SA's cobalt adsorbed gamma ferric formulation continues to set the high bias standard around the world. TDK AD, the tape with the hot high end, is now Acoustic Dynamic. You'll see it in brand new blue and silver colors. TDK D, another member of TDK's dynamic series, makes many premium normal bias cassettes sound ordinary and overpriced.

That's all we have to report for now. But there will be more to come. Part of TDK's philosophy is: when every improvement has been made, improve again.



Supplier to the U.S. Olympic Team

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TDK
The machine for your machine

*In the unlikely event that any TDK cassette ever fails to perform due to a defect in materials or workmanship, simply return it to your local dealer or to TDK for a free replacement.

time deflates you, pay extra for quick delivery.

United Transformer Company (UTC) is a division of TRW, with headquarters at 150 G Varick St., New York, N.Y. 10013, (212) 255-3500 and a whole bunch of regional offices. Stancor Products is at 3501 Addison St., Chicago, Ill. 60618, (312) 463-7400. Thordarson-Meissner Inc. is in Mt. Carmel, Ill. 62863, (618) 262-5121.

Four-Track Know-How

I would like to share a few thoughts with you folks—first, I think the fact that a great number of your readers (and the majority of your advertisers) deal with semi-pro equipment would justify more attention to such equipment and how to get the most out of it. All too often, your contributors are quick to run down the lower-priced equipment instead of helping people to get the most out of it. For myself, since I'm not rich, I have to accept the axiom that "professional" is a state of mind.

Second, I'd like to commend your publication for what I believe is the most informative and readable format of any journal directed toward this trade

(craft?) I have yet come across. Given that many of your readers are into the 4-track business, perhaps you could feature a column on 4-track techniques. Sound dumb? Consider that fewer tracks means that more planning, creativity and know-how are required. I'd really like to hear something regarding this idea.

By the way, in response to your request for impressions on the dual limiter article: I enjoyed the project immensely and look forward to seeing more in the near future—especially the hinted-at noise reduction unit.

—Sgt. Anthony A. Silva
APO, N.Y.

Kunkel: *Sui Generis*?

I found Robert Henschen's review of Leah Kunkel in your December '79 issue to be perceptive as well as informative. I'm sure a lot of people wondered what Leah's relationship to Russ Kunkel is and where she's been all this time. I want to remark particularly about the well-put phrase "Ronstadian remakes."

To my dismay, I hear this influence all too clearly on the latest albums of

Bonnie Raitt and Karla Bonoff. Why this shallow approach from such creative people? I don't think that Leah falls into the trap as much as Bonnie and Karla, and I hope she is strong enough to take her chances in a more creative direction.

—Dennis Melton
MDM Communications/Fine Times
Wilmington, Del.

Talking Shop

As a studio manager for a rapidly expanding facility in its formative years, the recent article by James Rupert ("Small Studios: The Lighter Side of Business," *MR*, Feb. '80) is seen as a long overdue source of business information for those of us in the small-to-medium recording operations. Hopefully, forthcoming issues will answer many questions that I have. I will venture to ask a few now, though.

We would like to compare our collection ratio (accounts receivable and bad debts) to those of the industry to see if our policies are effective. These are: cash on delivery when possible, volume discounts for prompt payment or late penalties but we'd like to know if there

The Sound Workshop Series 30 is out of its class

The Sound Workshop Series 30 is like no other recording console in the industry today. Developed as an abbreviated version of Sound Workshop's highly acclaimed Series 1600 Console, the unique Series 30 offers, in a concise modular format and at a widely affordable price, the sonic excellence, flexibility, and reliability found only in world-class consoles.

The revolutionary new Series 30 stands in a class by itself.

The Series 30 will serve the modern multi-track studio facility as a fully modular control center, with a signal flow that is straightforward and logical.

Features include:

- Three Mainframe sizes that accommodate from 8 to 36 inputs.
- Active Balanced Microphone Pre-amplifiers.

- Comprehensive Control Room/Studio Master Module.
- Echo Return to monitor and/or cue.
- Extensive Source Switching on Auxiliary Send Busses.
- Pre and Post Fader Patch Points.
- +4dBm Nominal Output Level (switchable to match other interface levels).
- Pedestal Base.
- Superior Service Access

Options include:

- VCA Input Sub-grouping.
- ARMS Automation (Data compatible with MCI Automation Systems).
- Integrated Meter Bridge with "VU" type back-lit mechanical Meters.
- "B" Format Console Package which includes 3-Band Sweepable EQ, 4 Auxiliary Send Busses, Penny & Giles Faders, and Fully

are any better policies applicable to a small recording studio.

Are such things as production contracts for potentially saleable music talent a good investment? If so, what terms are followed?

How can studio layouts or job designations be best used to increase overall productivity? How can good lines of communication be opened from the sales reps to production people? What percentage of the budget should go toward advertising and promotion and what medium is effective? With the astronomical pace of audio hardware improvements, what should the professional studio be considering to keep from slipping, technically?

Of course, many of our questions are relative to the individual studio's needs and interests in a given marketplace, but we'd like to know what a common denominator might be. Sonically yours,

—William Mullin
Audio Services Co., Inc.
Mishawaka, In.

James F. Rupert responds:

Mr. Mullin, you don't want another article, you want a *book!* But consider the

gauntlet thrown down. I will try to dash off another article dealing with some of the hard business questions and practices (and questionable practices) you are inquiring about. I'll start it as soon as I count all my own operation's extra money Okay, I'm ready.

—James F. Rupert
Lincoln, Neb.

Books (Again)

I'm glad to see that someone has finally compiled a list ("Letters to the Editor," Feb. '80) of recording related books (and not just because you mentioned my stuff!). However, my former publisher, Guitar Player Books, no longer handles either *Home Recording for Musicians* or *Electronic Projects for Musicians*. My new publisher is the Music Sales Corporation (33 West 60th Street, New York, NY 10023); they generally distribute through music and book stores, but also handle direct mail orders for those readers who can't find copies available locally.

I hope that you continue to update the list of books as new ones come out, and that you could perhaps even prepare an article that evaluates the relative

merits of these books (which are best for beginners, which are for experts, which are best for reference, and so on).

—Craig Anderton
Clayton, Ca.

(Craig is also a Contributing Editor to Modern Recording.)

We'll be looking into the possibility of doing such an article. Good idea.

Concern for Kits

Your dual-limiter construction piece in the November '79 issue was great, and I've ordered one from PAIA. In keeping with the semi-pro philosophy of *MR* magazine, I would like to see you continue to offer these kit-building opportunities to those of us who don't have the money to throw at all the folks who sell these various units.

I realize you may incur the wrath of some of your steady advertisers, but I believe that there are enough recordists out there who will continue to insist on sacred-cow brand names to keep your Orbans, Crowns and dbx-s happy.

My suggestions for future kits would make a list of just about *all* outboard audio gear, and maybe even a mixer in-

Wired TT Double Normalled Patch Bay.

The Series 30 reflects the professionalism exhibited in all Sound Workshop Recording Consoles, irrespective of price. Low-noise, high-slew circuitry is used throughout, assuring sonic integrity in all configurations.

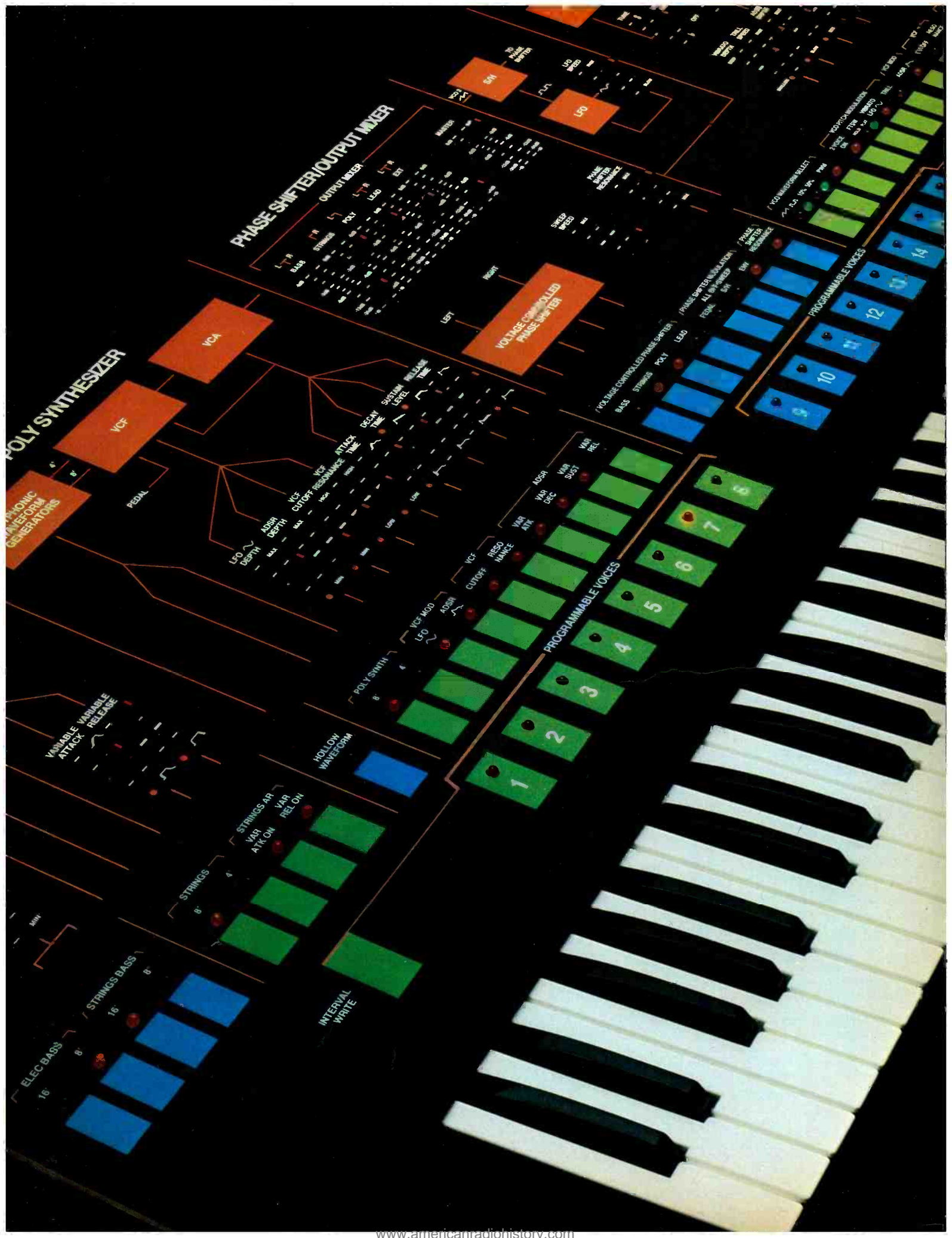
Sound Workshop's Series 30 is perfectly suited for the progressive studio which has current budget or space restrictions, yet demands superior function and performance from its control desk. (It's ideal for mobile applications.) Sonic excellence and versatility in a compact modular format enable the Series 30 to be tailored to present needs, while allowing for growth and modification in the future.

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PROGRAMMABLE VOICES

9 10 11 12 13 14

Take a closer look at the differences between the ARP Quadra and all other polyphonic synthesizers.

At first glance, you may believe that all programmable polyphonic synthesizers are the same.

Look again. The ARP Quadra is fundamentally different in design, function, and musical application.

It's a difference you can hear, see, and feel the minute you play the Quadra. And it's a difference that demands close examination.

Many voices vs. many synthesizers.

All other programmable polyphonics offer 4, 5, up to 10 voices. The result of chording these types of synthesizers is similar to playing an organ or piano—all notes played have the same tonal characteristics.

The new ARP Quadra places *four separate synthesizers* under your control. Chording the Quadra is much like playing an entire orchestra. Each key depressed on the Quadra can produce up to four completely distinct sounds simultaneously. The Quadra's four separate synthesizers are tailored to certain kinds of sounds—string synthesizer, poly synthesizer, bass synthesizer, and lead synthesizer.

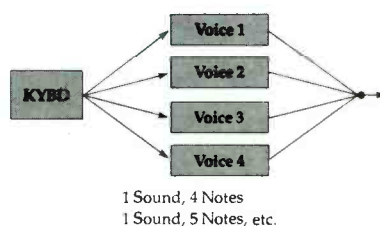
The effect created by mixing and blending these four sections is known as "layering," and is at the heart of the Quadra's tremendous commercial success. It explains why musicians and composers like Joe Zawinul, Ramsey Lewis, Styx, Billy Cobham, Kansas, Neil Diamond, and Electric Light Orchestra, have selected the Quadra for performing and recording.

Programming and live performance.

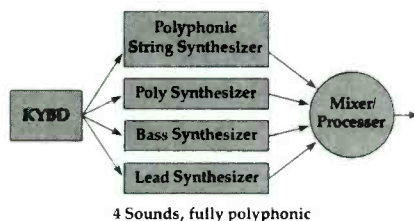
Programming—the ability for a synthesizer to store pre-determined sounds in memory for instant recall—can be a great benefit in live performance. In essence, programming allows you to change quickly from one sound to another. Yet, if not implemented in a sensible manner, programming can lock you into an inflexible group of preset sounds that cannot be changed easily in live performance.

No matter how many programs a synthesizer can store—and some allow as many as 40—it seems there are never enough programs to allow for the subtle changes in texture that live performance ensemble playing requires.

ALL OTHER POLYPHONICS



ARP QUADRA



An illustration of the basic design difference between the new ARP Quadra and other programmable polyphonics.

Here again, the Quadra is different. With 16 programs for *each* of its four synthesizers, the Quadra is uniquely suited to live performance control of the "final touches"—the balance between sections, animation, articulation, and so forth. A simple change in the mix produces a dramatically different sound from the same program position. Multiple use of each program, plus the multitude of live performance controls *always active*, makes each of the Quadra's program positions a source for numerous variations and textures.

How to control programming before it controls you.

When there are too many things to do in succession, *programming can control you*. For instance, take the following typical sequence: "Press button one, press button two, press button three, play the keyboard." To change sounds, repeat this operation. Such serial operations seem more akin to computer programming than musical performance. ARP learned long ago that the best operational concept is the direct approach. That's why the Quadra makes extensive use of "parallel" control—you can get at any part of the instrument, change any sound, any aspect of any sound, *directly*. No sequence of complicated operations is required on the Quadra. And by using the 59 LED status lights, you

will know what's going on inside each program you are using. You can be spontaneous, and change with the flow of the music.

The Quadra's microprocessor works harder.

All the big programmable polyphonics use microprocessors to scan the keyboard and operate the programming. The Quadra's microprocessor does much more.

For instance, try out the Quadra's live performance sequencer. Play a chord on the keyboard, hit the footswitch, and suddenly you have a sequence of the notes in the chord. You can transpose the sequence, extend and modify it, and alter its notes without missing a beat.

The Quadra's microprocessor also makes intelligent decisions, like splitting the keyboard so you never get bass and lead synthesizer parts mixed up, or helping you with phrasing on the string parts. The microprocessor plays trills, intervals, and transpositions, controls the phaser and stereo animation, and even determines what the foot pedals do. In other words, the ARP microprocessor is programmed to let you concentrate on the music.

Creative outputs (and inputs).

The Quadra's rear panel has 24 jacks for uncompromised flexibility. There's an XLR mono output, animated stereo outputs, and even quad outputs for studio work. Systems interface jacks will make the Quadra "control central" for slave units and remote synthesizers. Five audio inputs bring outside signals into the Quadra or allow processing of the individual sections of the Quadra with outside effects devices.

Sound is the bottom line.

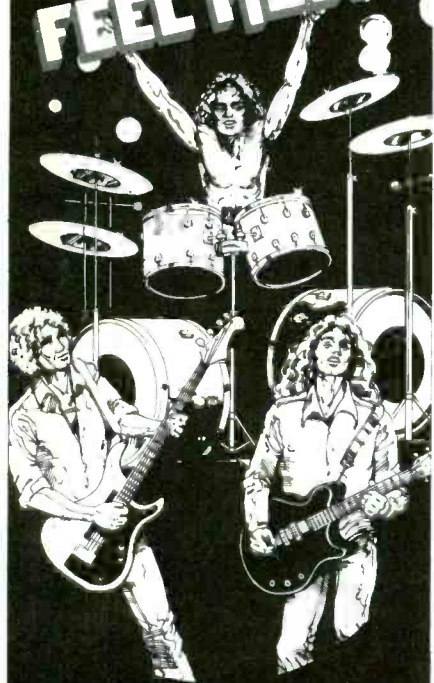
No question about it, four synthesizers sound different than one. It's a difference you'll appreciate the first time you put your hands on a Quadra.

Take a closer look at the new ARP Quadra at selected ARP Dealers throughout the United States and Canada.

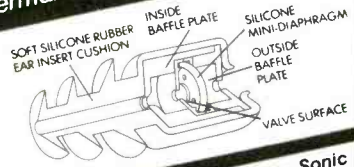


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put strip that could be snapped into a mainframe kit. To start with, how about a spring reverb unit using Acutronics parts, an analog delay line from about 20 to 400 ms, electronic crossover, EQs, and so on.

I would be more inclined to get into these types of kits as long as you did provide a company like PAIA to sell the complete array of supplies. I don't think I would try one from scratch. At any rate, I hope you don't run into heavy advertiser pressure that would force you to discontinue such an excellent reader participation program.

—Michael R. Clancy
Toronto, Ontario

Neither on this piece, nor the other do-it-yourselfers we have offered in the past, have we gotten any flack from our advertisers. They are secure enough in their own quality products and we also doubt that home-built kits are going to squeeze them out of the market. Be well assured that you will see more to put together in future issues. Just be patient.

Hypothetical Vinyl

The following is a hypothetical situation: I have a half-track master tape, want to make an LP on a small label, and a big "monster" label will handle distribution. How could the pressing, labels and jackets be handled from there? I have designed the jacket. I guess what I need to know is the physical handling after pressing.

What is a medium-priced outfit doing jackets? Who makes the labels? How does the money usually change hands with distribution and sale?

—Dean Harris
Jacksonville, Fla.

We published a tidy and practical how-to guide on doing it up in vinyl about two years ago, serialized in three parts and then reprinted in whole in our Buyer's Guide of 1979; "The Making of a Record," by wordsmith and mastering engineer David Moysiadis. As luck would have it, you can obtain the '79 Guide for \$2.75 plus 50 cents for postage and handling from our Back Issue Dept. Just be sure to specify that you want the 1979 Buyer's Guide, (as opposed to the 1980 Buyer's Guide).

A sourcebook for you, in locating suppliers, is Billboard's International Buyer's Guide. Write to Billboard Publications, Inc., 9000 Sunset Blvd.,

Los Angeles, Ca. 90069.

In being aware that your creativity is challenged when you're limited to four tracks, you're way ahead of the game. Bigger multi-tracks cushion you and afford you much flexibility, true, but consider that the bucks that are invested in the 32-tracks represent work into the A.M. planning and creating.

So read our features and just break 'em down to fit your present format.

Grateful Dead

Hoo boy, I really enjoy your mag. It gives me lots of reading every month. I am an amateur recordist and enthusiast, and in the three years I've gotten MR, I've understood about half of what I've read. But the knowledge builds up and articles I read years before all begin to make sense.

One request—how about a Grateful Dead equipment/studio/"live" report? Everyone always deals with the social or lyrical influences of the band, so how about something from the MR angle?

—David Brogren
Troy, Mich.

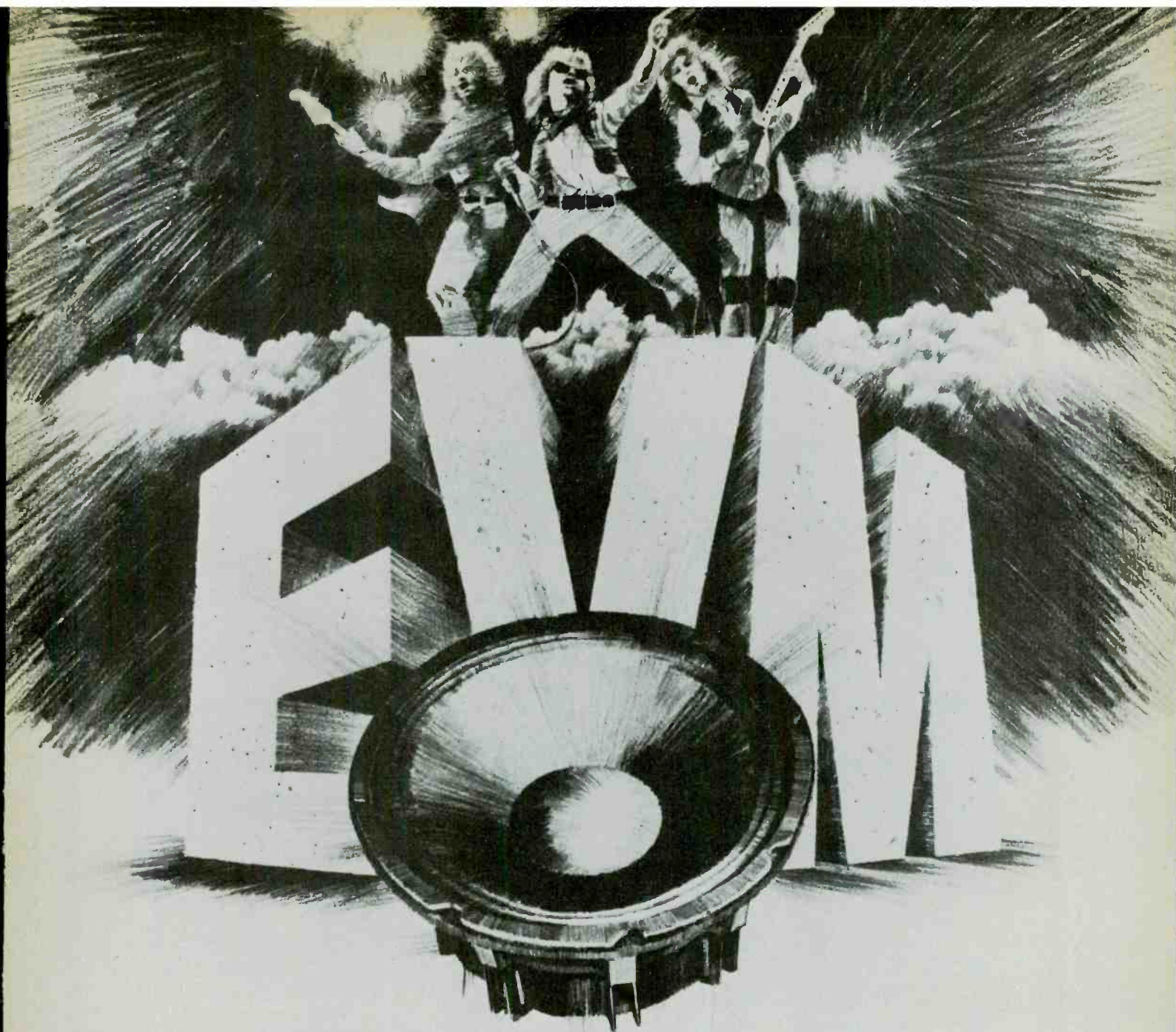
David, we came thisclose or closer to the Grateful Dead "live" in Egypt tour of some moons ago, and we've been trailing the group waiting for another opportunity to do a feature on them: keep looking—it's gonna happen.

Reader and Service

For the past three-plus years I have been an avid subscriber to MR and until now, did not have one complaint to make towards your very excellent magazine. However, I have one little bone to pick with you concerning your December '79 issue.

The articles were all excellent; it's just that you failed to include the reader service card. Incidentally, this is not the first time this has happened. Luckily, I was able to obtain one from another magazine (same issue), as there was some specific information I wanted. As I am in the process of putting together a studio of my own, some of this information was very important.

Also, why is it that some manufacturers refuse to send any literature at all? Especially the professional product companies such as MCI. I've never received any information from them. Does one have to be a full-blown professional recording studio before they'll even talk to you? As it is, I could not



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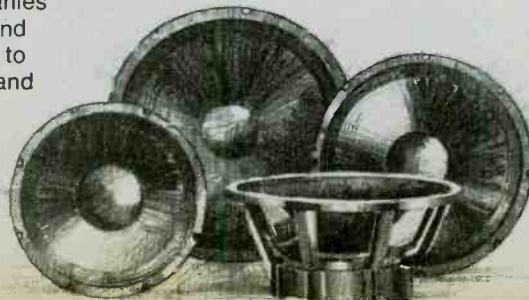
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possibly afford the heavy duty equipment, but not until I get a good idea beforehand of specifications and prices. Maybe you can talk to these people.

Let me close by complimenting you on a very fine magazine. Keep up the good work.

—John W. Frink
Pocomoke City, Md.

The reader service card is provided as a service to both the reader and the manufacturer. We do not know the

policies of MCI and other larger outfits, but it is likely that they might not look at reader service inquiries as you or we might. We'll see what we can do about this. On the other hand you are not at a point where you'd be a likely purchaser of MCI gear...we do understand the desire to read about a Ferrari when all you can afford is a Chevy, but we can also see what might be the manufacturer's point of view.

Damage in the post or the like is the only thing we can think of that would

have made your copies reach you without the R.S. card. It is very unusual when this happens. If it does occur again, write out the numbers corresponding to the products that interest you on a card with your name and address, and send it to us within the normal allotted time, advising that the card was missing.

Big Apple Has Secret

In the February issue of your magazine, Steve Rowe reviewed Spyro Gyra's *Morning Dance* album. While we appreciate the recognition of our studio in the review, Mr. Rowe erroneously locates Secret Sound in Rochester, New York. The band is from the Rochester area but Secret Sound has been operating in Manhattan for some years now.

I hope to see an address correction in your next issue, along with the other articles we enjoy every month.

—Jack Malken
President
Secret Sound Studio, Inc.
New York, N.Y.

Forgive the oversight. We are aware that Secret Sound is in New York City —we surmise that Steve was so overwhelmed by the disc (he evaluated the recording as "first rate") that he went overboard on upstate New York. So it shouldn't be a secret, the studio is at 147 W. 24th St., New York, N.Y. 10011.

On the Fringe

Some months ago, in the December '79 issue, to be exact, I was interested to see your comments on the new Phase Linear 7000 Series Two cassette recorder. At the bottom right of page 67, is printed a graph of the playback response of the aforementioned cassette recorder referenced to a standard test tape (TDK AC-337) recorded full track at -20 dB nW/m. The rising low frequency response which you noted in your graph and your text is actually a relatively common mechanical error associated with this test. On a conventionally recorded cassette there are usually four separate tracks (all supposedly containing, at least to some degree, different information), separated by narrow guard bands. In the case of a full track test tape, not only do all of the former tracks contain the same information, but they also do not have guard bands. Therefore, tape flux in the guard

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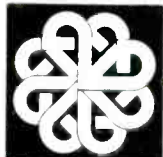
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bands adds to that of the normal track widths. This effect, called "fringing," becomes more pronounced as the recorded wavelengths become longer and hence, in this test, it typically causes an apparent rising bass response. As you noted, the normal playback of pre-recorded tapes remains unaffected.

—John Rutledge
San Francisco, Ca.

You're quite right, and we thank you for the lucid explanation of the "fringing" effect. Actually, Len Feldman and Norman Eisenberg (writers of the Lab Report) are conscious of the situation, and incidentally have observed the "rising bass effect" on other cassette decks tested with the same TDK test tape. The effect, with regard to the Phase Linear deck, for one, is not to be interpreted as a degradation of the product.

Gone, but Not Forgotten

We've been advised that the Uni-Sync Model PMS-2, a metering system, is no longer available and will not be replaced nor reintroduced. Through some editorial confusion, MR's January '80 "The Product Scene" made reference to the unit as a new mixer.

Attitude of a Pro

Thanks for your in-depth interview with Rick Derringer. I have seen him perform a couple of times, once in Santa Cruz, California in 1978, and most recently at the Agora in Hallandale, Florida (of all places!).

The differences in the performances were what struck me most. Both were totally professional, but the latter was special. It was in a fairly small club, located in a small town. Derringer and his band put on an excellent show. But I was most impressed with his attitude.

I know he couldn't have made much money, but he played as though it was his last performance. I think every aspiring musician could learn something from that. When the chips are down, it comes down to the love of music and the positive energy you can produce to make it work for you, as well as for others. I know this valuable lesson will help through me my musical career, and I hope someday I'll be able to accomplish the same excellence. Then I'll know I'm a professional.

—Mark Varian
Hallandale, Fl.



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TALK BACK

"Talkback" questions are answered by professional engineers, many of whose names you have probably seen listed on the credits of major pop albums. Their techniques are their own and might very well differ from another's. Thus, an answer in "Talkback" is certainly not necessarily the last word.

We welcome all questions on the subject of recording, although the large volume of questions received precludes our being able to answer them all. If you feel that we are skirting any issues, fire a letter off to the editor right away. "Talkback" is the Modern Recording reader's technical forum.

Clues for Cues

In the article, "From Tape to Disc, Disc Mastering, Part 2" (September 1977), author Dave Moyssiadis describes the use of blank leader tape to "cue" the Mastering Engineer as to the placement of the selection bands on a disc. However, if one song fades into another, I'd suspect that leader tape could not be used. Does the engineer, in this case, use the tape counter as a cue or what?

—Paul Rumsey
Long Beach, Ca.

First, let's clear up a minor misconception. The reason for leader is *not* to cue the engineer any longer—it is to cue the automatic banding circuit of the lathe. Therefore, using a tape counter, or even a timer, will not work for this purpose. Only if the record were to be banded manually would time cues be usable. And that must be in actual running time (minutes and seconds), not by reading one of those grossly inaccurate tape counters. Professional recorders do not have counters; if they have a timing device at all it is some kind of contraption based on a real-time read-out. Further, at a counter counts on one machine

rarely has anything to do with what a counter counts on another machine. This is why tapes should be leadered.

Occasionally a tape will be sent to a mastering facility by a producer who chose for one reason or another not to insert leader tape between the selections. One of those reasons might be, as you suggested, a segue. Another might be a "live" album where applause spans the gap between selections. On the other hand, there are those who are disturbed by the sudden and total absence of tape noise at the end of a cut, as this "loss of ambience" may sound too clinical or unnatural. Finally there are those who are just too lazy or do not know enough to leader their tapes prior to mastering.

In all cases there are two ways to circumvent the problem, assuming, of course that one wants the album banded. The first way is to make the spirals, or crossovers, at the proper moment manually by turning the lead screw with a crank. This is the old-fashioned way of the craftsmen who cut records before automated lathes were available. Today many lathes still have this vestige of a by-gone era, but others simply have a button which will cause the same effect. (Ironic, isn't it, that we refer to pushing a button as manual work in this age of the computer?) Anyway, there is a better way in which the client can have his cake and eat it, too.

By punching a small hole in or removing a small amount of oxide and backing from the tape, leaving only the clear polyester base material, the lathe will perform all of its automatic functions without leader tape. The trick is to stay between the two tracks on the tape. (Most people would be surprised at the amount of room there is left unrecorded between the tracks on a 1/4-inch, two-track format.) The easiest way is to use an ordinary 1/8 or 1/16-inch paper punch and make a hole exactly in the center of the

tape width and at the end of the selection, or 2 seconds playing time before you want the spiral. Needless to say, it is recommended that the punch be demagnetized first, and that you take care to punch the hole dead center to avoid removing any of the signal or disturbing the program. The whole (pardon the pun) idea of this is to permit light to pass through the tape and trip the photo-relay which causes the automatic banding sequence to start. This will also give both pre- and post-expansion as is normal, which you do not always get with manual banding.

—David Moyssiadis
Contributing Editor
Modern Recording Magazine

Go For the Pro!

I have noticed that most professional recording studios seem to use high-level, low-impedance gear (+4 dBm, 600 ohms). Is there an audible (or inaudible, for that matter) difference between high- and low-level gear? If there is, would I possibly be better off starting right out with high-level gear to avoid having to sell the low-level stuff later on in order to achieve professional sonic standards and high-level compatibility? Any information, thoughts or comments you can provide me with will be greatly appreciated.

—Roger S. Netherton
San Francisco, Ca.

Yes, there are major differences between low- and high-level gear. Low-level gear operates at -10 dB level and 10,000 ohms. Long cable lengths should not be used in connecting the equipment due to line level loss, hum, and R.F. shielding problems. It is possible to run lengths of low-resistance, well shielded cables from 20- to 25-feet without any real difficulty. Low-level gear is designed primarily for the semi-

pro and audiophile user. Its design parameters make it much more cost effective, but, generally, noise and distortion levels are higher and slew rate slower.

On the other hand, high-level, low-impedance gear is designed for the professional user. It can support extended cable lengths without line level loss and with no outside noise or R.F. interference. Generally sonic properties of pro gear tend to be superior to that of semi-pro gear. Noise and distortion figures are lower where slew rates tend to be higher, providing more head room and better transient response. A professional studio may run twenty-four hours a day, seven days a week. It takes a pretty reliable piece of equipment to pass the test of a professional user. Not only must it be sonically superior in design, but it must maintain a physical strength capable of withstanding the rigors of studio usage. You should only start out with pro gear if you plan to have a pro studio. The reason being the costs involved. Professional gear is sometime triple the cost of semi-pro gear. My personal opinion is that semi-pro gear will provide you with a valuable tool from which you can always upgrade to pro equipment.

It's not a good idea to mix low-level gear with high-level gear. It can be done, but not without various line amps and matching transformers which create more noise and distortion in the signal processing line. A complete low-level system (console, tape machines and outboard gear) will provide you with the means of making good, high-quality recordings. What it really boils down to is the person using the equipment and the talent being recorded and the ability and knowledge to obtain the best results from whatever equipment is being used. If your budget is a low one, feel confident commercial quality products *can* be produced from semi-pro gear. If, however, you can afford it and your needs demand it—*go for the pro gear!*

—Hal Hansford
Engineer
Coconuts Recording Co.
North Miami Beach, Fl.

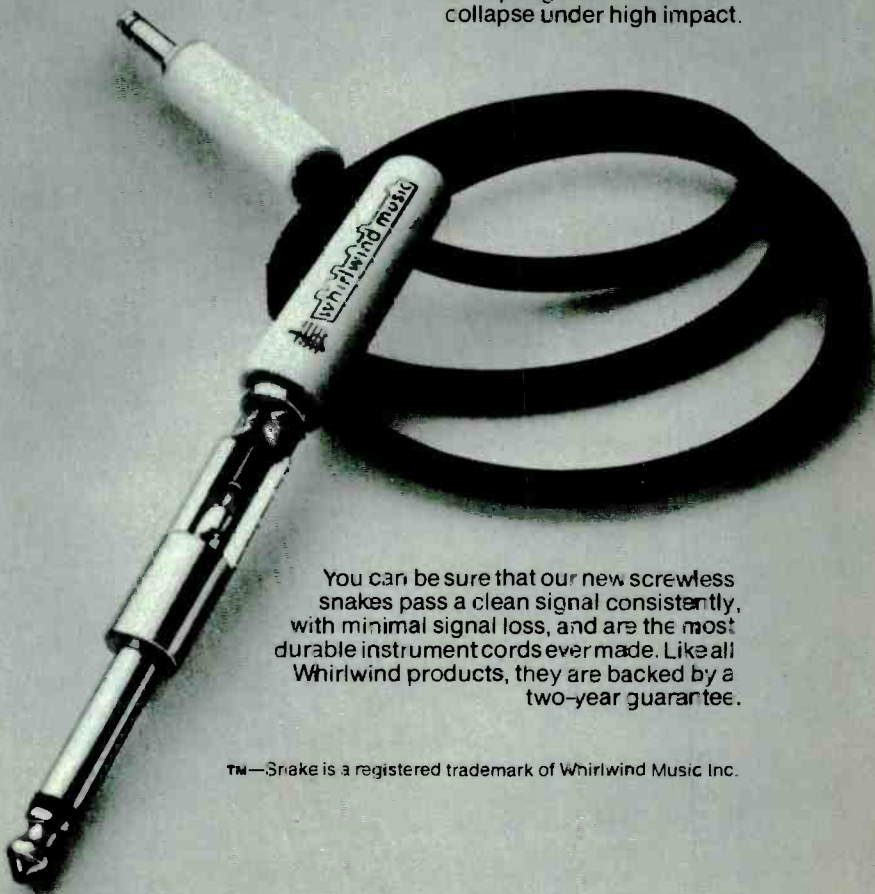
Corrective Measures

After reading the fine interview with John Storyk in the October 1979 issue, I have become very intent on correcting, without the aid of an equalizer, some major acoustical problems in the two

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You can be sure that our new screwless snakes pass a clean signal consistently, with minimal signal loss, and are the most durable instrument cords ever made. Like all Whirlwind products, they are backed by a two-year guarantee.

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- Stereo 2 way or Mono 3 way.
- 18 dB per octave Butterworth filters.
- Continuously variable frequency.
- Lo/Hi frequency level controls.
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- Balanced in and out.

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Slim and trim in size and price. Both the R321 and 341 feature 19" rack mounting in but 1-3/4" of space. Here's the scoop on our model 341.

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- Frequency, Bandwidth and Gain control on each band.
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rooms that I plan to use as a studio and control room. The biggest problems are annoying resonances, upper midrange standing waves, and isolation between studio and control room. I have had very little success in trying to make a "nice sounding room" and an accurate control room. My JBL 4311 monitors are begging for better sounding surroundings!

I do not know of any materials on studio design or the materials used in studio construction. Perhaps you could pass along the names of some informative books or pamphlets on this subject and how (or where) to get them.

— John Lekas
Shrewsbury, Mass.

First, we took a moment to commend you for your strength of character and emotional fortitude in the face of such acoustic adversity—for really trying to solve your problems, not just mask them. Second, after wiping the tears of pride from our eyes, we immediately phoned Herb Schwartz of Sugarloaf View, in New York, who did such a fine job of detailing soundproofing techniques for a garage studio in the January 1980 issue and asked him for the names of some reference materials that had provided helpful information in the past.

At the top of Herb's list was Acoustic Design and Noise Control by Michael Rettinger (The Chemical Publishing Co., New York, N.Y., 1973). For some insight on the right materials to accomplish your goals, he recommended a publication from the Department of Health, Education and Welfare, National Institute of Occupational Safety and Health (NIOSH). This, A Compendium of Materials for Noise Control (No. PB 298307), is now available from the National Institute of Technical Services, Springfield, Virginia 22161 for a cost of \$12. A general architectural reference book, Architectural Graphic Standards also includes material on matters acoustic. Co-authored by Sleeper and Ramsey, it is published by John Wiley and Sons, New York, N.Y. Also of interest to you might be Environmental Acoustics by L. Doelle, published by McGraw-Hill, New York, N.Y., 1972.

You might also take a minute to go over the list of resources supplied by Jesse Walsh of Express Sound in our April 1980 issue. Walsh also endorsed the Rettinger book, as did John Carey in the March issue. Carey, also of Express Sound, included the series entitled "Control Room Acoustics," that Ret-

tinger published in dB, The Sound Engineering Magazine (contact Sagamore Publishing, Plainview, N.Y., for this and request Vol. 8, No. 8, 10, 12; Vol. 9, No. 2; Vol. 10, No. 4, 6.)

Some quick study on your part and your JBL monitors should be quite content to stay in your employ!

Intriguing Transformer

In the June 1979 Hands-On Report, Jim Ford and John Murphy reviewed the Otari MX-5050-B. I was intrigued by their comment about using an in-line transformer for the mic inputs (page 78). I have an Otari and was wondering what type of transformer they used to get a noise result of 47 dB? Also, where was the transformer placed in the chain? Was it at the mic end or at the deck end of the cord? Does it matter? Could I use it with my Pioneer 1020 reel-to-reel as well?

— Frederick Evans
Allston, Mass.

When the MX-5050-B was reviewed, we found that the noise performance with a low-impedance microphone input was not very good, the noise being only about 33 dB below 0 VU for "conversation level" speech at about six inches from a typical low-impedance mic (a Shure SM58). The reason for this poor level of performance is that the input impedance of the Otari is 50 K ohms, which is definitely a high-impedance input. Otari correctly states that the mic inputs can be used with either high- or low-impedance mics. However, the price you pay for using a low-impedance mic is poor noise performance.

This situation can be greatly improved by using an in-line, impedance-matching transformer, such as the A-95 series or the A-97 series from Shure. These are just small, in-line transformers that you plug your mic line directly into and then plug the transformer directly into the tape machine.

When we originally tested the Otari, we used the A-97, which yields about 13 dB of signal gain, which increased the signal-to-noise ratio of the Otari 13 dB. I think, however, that you could get even better performance by using the A-95 series, which gives you 22 dB of gain. This would change the Otari's noise level from 33 dB to 55 dB which is a more respectable figure. What the transformer is doing essentially is boosting the signal level, which could improve your Pioneer's performance in

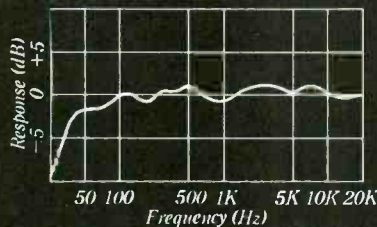
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sion. A large 1" voice coil gives it the ruggedness needed in professional use.

Working together, these precision-matched speakers offer superb stereo imaging, powerful sound levels and wide dynamic range.

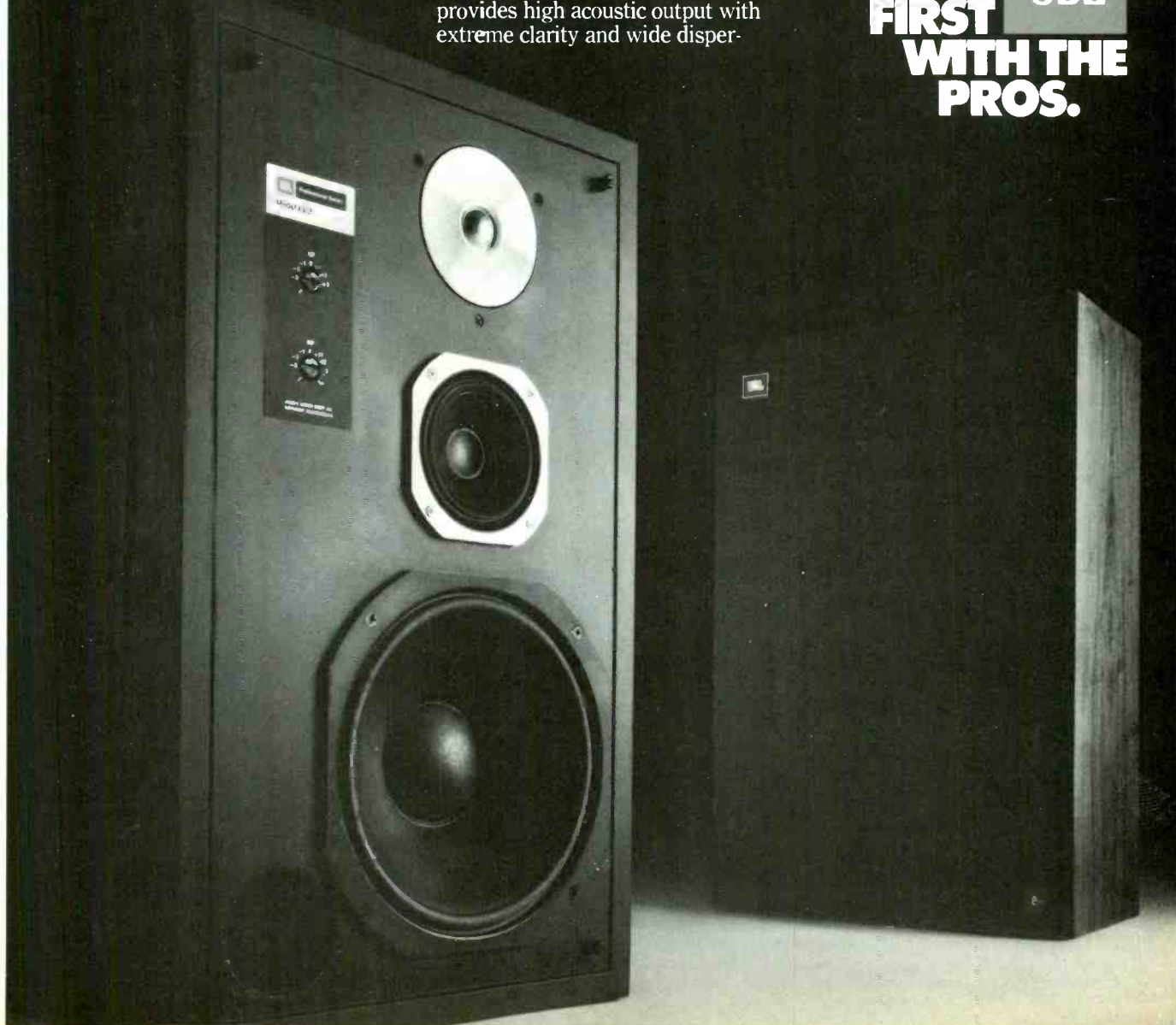
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We think you'll agree that its combination of flat response, power and moderate size flattens the competition.

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HAPPENING
ON THIS PAGE
SHOULDN'T
HAPPEN
ON YOUR
RECORDING
TAPE.**

IT'S WORTH IT.

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It's called print-through.
And if you think it interferes with your
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It happens on tape that has low
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Computer-Aided Design and Laser Holographic Analysis have provided the flattest response and phase uniformity, giving the TD-4001 unprecedented intelligibility.

Precision Machining and Assembly of the highest quality materials result in dependable, predictable performance.

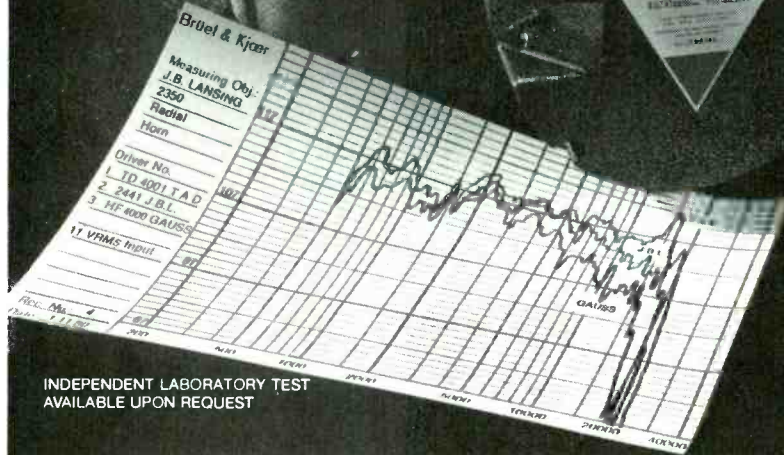
The TD-4001 driver meets the requirements of the uncompromising professional. For additional information, contact:

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INDEPENDENT LABORATORY TEST
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CIRCLE 90 ON READER SERVICE CARD

a similar manner.

As to your questions regarding the placement of the transformer, it should be placed at the deck end of the line. This allows you to run a long, balanced, low-impedance line and convert that balanced line to a high-impedance line at the tape machine.

We would, however, like you to look again at our original assessment of the Otari MX-5050-B. We feel that a machine of this caliber should be teamed with a high-quality mixer, and the use of the mic preamps avoided if at all possible.

— John Murphy
Technical Editor

Modern Recording Magazine

Mixing In Some Excitement

While reading the credits on John Tropea's latest album, *To Touch You Again*, I noticed that it was mixed with an Aphex Aural Exciter. I have heard of this device before, but am still in the dark as to what it is and does. Could you please fill me in on this device? (By the way, the album was recorded at The House of Music in West Orange, New Jersey. The engineers were Char-

lie Conrad, Joseph Intile and Jeffrey Kawalek.)

Keep up the great work!!

— John V. Smith

Electrical Engineering Major
Cal. State University at Fresno
Porterville, Ca.

The Aphex Aural Exciter is a relatively simple device. Electronically, the audio signal is split, one leg being sent through the "Exciter" circuit, the other sent unmodified to the output. The "Exciter" circuit is comprised of a high-pass network and a harmonics generator. The output of the "Exciter" circuit is then added back at a much lower level to the unmodified signal.

The sonic effects are a bit more complex. The phase shift generated by the high-pass network provides the listener with more sonic cues within the same energy envelope. The listener integrates the resultant time delays as an increase in volume (presence, depth, fullness are other descriptions of the phenomenon). Due to this apparent increase, especially in the mid- and upper-ranges which are critical for intelligibility and direction perception, there

is an increase in clarity, spatiality, and detail. The harmonics are amplitude dependent and primarily even order. The upper part of the audio spectrum is comprised of natural overtones of the instruments. These overtones are often lost or buried in the recording and mixing process. The harmonics that the Aphex generates are also phase shifted, thus not buried by the fundamentals. In a situation where the high-end is deficient, for example, boosting it with EQ will often only bring up noise, whereas the Aphex would "resurrect" it by simulating what would have been there naturally.

According to Charlie Conrad, the John Tropea album was mixed with virtually no EQ, compression, or other effects except for two echo chambers and the Aphex Aural Exciter. The Aphex unit was used on all the instruments (piano, guitar, drums, horns and strings) except for the bass drum and bass guitar.

In order for you to make a judgment about what the Aphex does, I suggest you listen again to the Tropea album. The individual instruments should be well defined, natural and occupy a

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With the Syncaset, you can accompany yourself or an existing piece of music, and record the result. Rehearse a tune or create one. Sharpen your ear for harmony and phrasing.

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After you've worked on your own music, enjoy the sounds of others. The Model 124 is an outstanding stereo cassette deck. High signal-to-noise performance. Low wow and flutter. Wide, flat frequency response. There's Dolby* NR (disabled in the "Sync" mode). Memory rewind for fast tape checks. And illuminated VU meters for easy level adjustments.

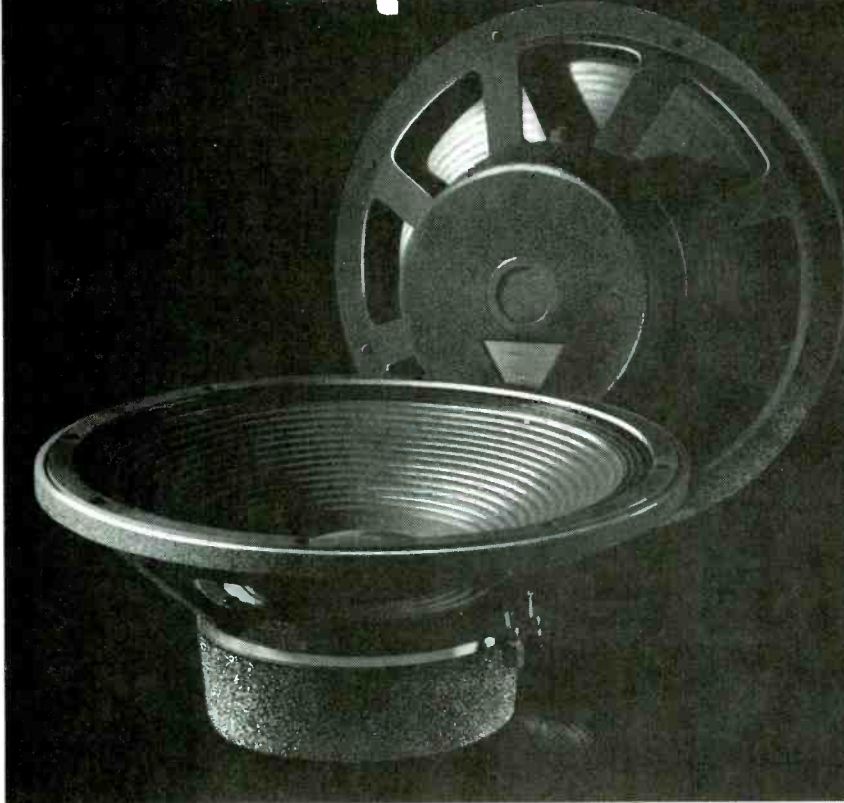
Probably better than anyone, we know the Syncaset can't give you all the multitrack flexibility and open reel performance you want. But at a third the cost of an open reel multitrack recorder, it could be the start-up tool you need. And when you consider the savings on tape alone, you'll find the Syncaset a handy, economical instrument to work with.

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Powerful Alnico Ring Magnets; select high purity materials and precise machining tolerances produce the strong linear fields necessary for demanding applications.

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CIRCLE 93 ON READER SERVICE CARD

front-back image as well as left-right placement.

One last note. The Aphex Aural Exciter is not a panacea for poor recordings. If used judiciously, it can be a very effective tool, among other tools and methods, in the pursuit of the best possible product.

— Marvin Caesar
President
Aphex Systems, Ltd.
Los Angeles, Ca.

Care and Prayer for Tri-amped System

I am in the process of building a tri-amped system for our group. I've read several articles on this subject but none of them address the problem of protecting the speakers from accidentally receiving signals outside their range (i.e., 60-cycle hum into a tweeter). Is there any protection against this, or does one just have to be careful and then pray?

— Joe H. Babb
Knoxville, Tenn.

Well, Joe, a trip to the Eternal City just

won't do it.

Contributing Editor Fred Ridder, when confronted with your problem, assured us that it is possible to protect your system—tweeters included—against low-frequency interference.

Since, by tri-amping your system, you are essentially dividing the frequency spectrum into three parts, first and foremost Fred suggests extremely careful connection. To make it physically impossible to slip up, he advises using a different type of connector on each frequency split. For example, you might use ¼-inch phone plugs on the low-frequency, 3-pin XLRs for the mid-range and 4-pin XLRs for the high-frequency. This would prevent any inadvertent misconnections while setting up.

However, to minimize the possibilities of catastrophic failure, use blocking capacitors in series with the high-frequency drivers. As an example, an 8-ohm driver being crossed over at 800 Hz should get a series capacitance of approximately 200 microfarads. This would introduce approximately 1 dB of rolloff at 800 Hz, in addition to the rolloff at the crossover and will give ap-

proximately 6 dB of protection at 100 Hz. The capacitors for this type of application should be non-polar capacitors. If these aren't available, two electrolytic capacitors of twice the given value can be connected back-to-back to form a non-polar combination. (Connecting back-to-back means connecting the negative terminals of the two electrolytics together and connecting the positive terminals on one side to the amplifier and to the driver on the other side.) At higher crossover frequencies, the capacitor value would be proportionately lower and would offer proportionately more protection at low frequencies. Unfortunately, you must keep in mind that the use of a series capacitor might have an adverse effect on amplifier stability and on phase response of the system, but it is a protection device.

Remember, hum or low-frequency signals at low power levels generally will not destroy a diaphragm. It is only when they get large amounts of it that they start burning up!

Keep in mind that care should be taken in whatever you do... and an occasional declaration of faith couldn't hurt!

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BOSS Wants You to be the Winner!

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Portland • Portland Music

Pennsylvania

Allentown • The Noise Shoppe
Bryn Mawr • Medley Music
Ephrata • Music Center
McKees Rock • Hollowood Music

Tennessee

Memphis • Strings & Things

Virginia

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**We're Crest Audio.
We make the
world's best
professional power
amplifiers.**

Last year we introduced our P-3500 series low profile amplifiers. Delivering 250 watts per channel into an 8 ohm load and standing just 3½" high, the P-3500 was an immediate winner.

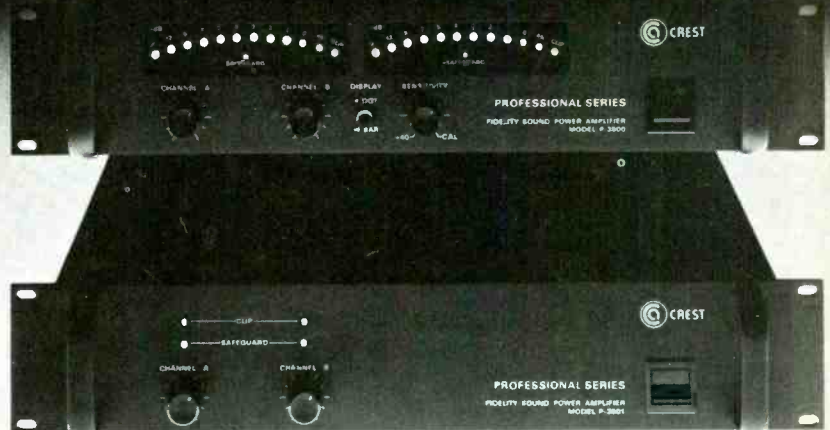
The P-3500 quickly proved itself on major concert tours. It's been put to the test in huge stadiums, small clubs and recording studios. And it's passed every test with rave reviews.

Because the P-3500 isn't just "another" amp. It's a demonstrably better amp. Aside from its flawless sonic qualities, it has a unique combination of design and engineering features that leave it unrivaled in the world of professional amplifiers. Quite simply, it's the best pro amp in its class.

Success breeds success.

Introducing the newest addition to the Crest line:

The P-2500 Series professional amplifiers. They're virtually identical



THE CREST P-3500 SERIES PROFESSIONAL AMPS
250 watts per channel, 8 ohms*/400 watts per channel, 4 ohms*
TOP: P-3500/BOTTOM: P-3501 (without VU meter)

to the P-3500 Series with two notable exceptions: Lower power rating and a lower price tag. Otherwise, they've inherited the same low profile, flawless sound, smart features and rugged reliability of our P-3500 Series. The P-2500 Series is now the best professional amplifier in its class.

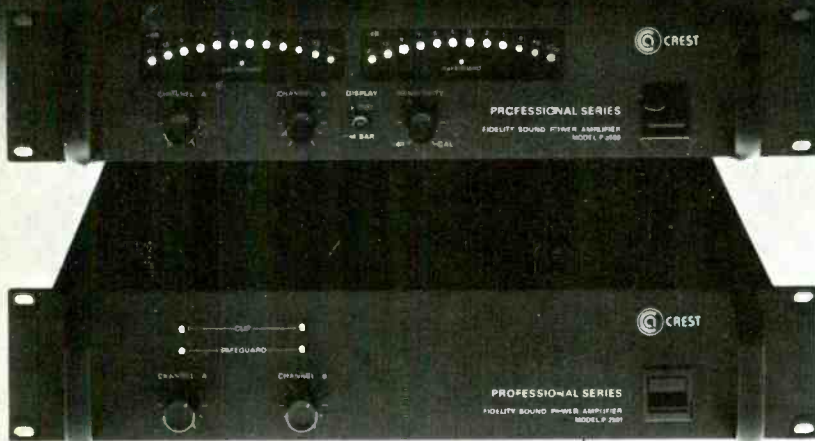
Our low profile.

All the Crest amps pack their power into a rack mountable package standing just 3½" tall. That's ½ the height of conventional amps. And that saves a lot of rack space. Compared to conventional amps of comparable power, Crest amps give you the same power output while using just ½ the vertical rack space.

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You can't buy better sound. It's solid. Tight. Incredibly clean. Undeniably accurate.

a low profile.



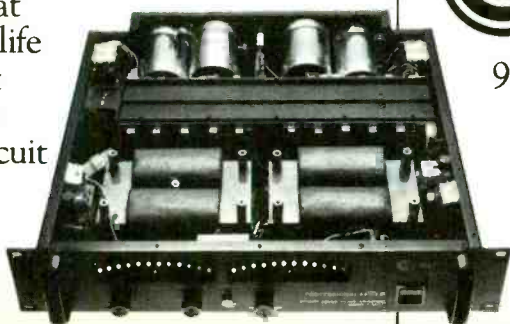
THE CREST P-2500 SERIES PROFESSIONAL AMPE
125 watts per channel, 8 ohms*/200 watts per channel 4 ohms*
TOP: P-2500/BOTTOM: P-2501 (without VU meter)

It's what we put into our amps that accounts for what comes out. For example, we utilize Bi FET operational amplifiers coupled with 10 high speed output transistors per channel.

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Features that make sense.

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Crest amps are practically bomb proof. Inside, everything's snug and tight, securely attached to the protective 16 gauge steel chassis. Although Crest amps are sophisticated, state-of-the-art electronic systems, fragile they are not. Check us out.



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*FTC rated continuous average sine wave over a bandwidth from 10Hz to 20kHz, both channels driven.

THE **PRODUCT** SCENE

By Norman Eisenberg

AUDIO SPECTRUM ANALYZER



Spies Laboratories of Lawndale, Ca. has announced a "low cost, high performance" audio spectrum analyzer that offers $\frac{1}{2}$ -octave resolution. The audio band from 20 Hz to 20 kHz is swept by a single, sharp voltage-controlled filter to obtain the $\frac{1}{2}$ -octave resolution in 91 bands. Dynamic range of the display is 20 dB in 101 distinct 0.2-dB points. Usable with any equalizer, the device provides a composite video output for the display that will drive a TV set (with an RF modulator) or a video monitor. An internal memory can store two complete frequency response curves, useful for making A-B comparisons, before-and-after comparisons, and so on. Inputs include mic and line. Outputs are pink noise, composite video, and X-Y recorder. Price is \$1195.

CIRCLE 1 ON READER SERVICE CARD

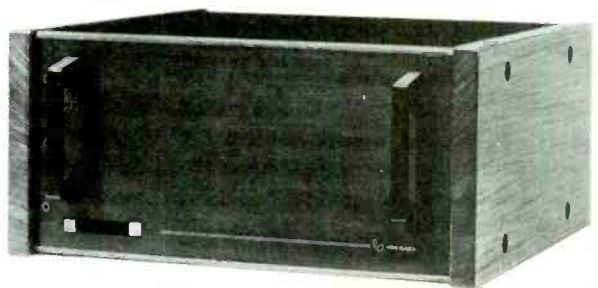
WIRELESS INTERCOM

FM wireless intercom headphones—the model TR-50 from R-Columbia Products of Highland Park, Illinois—are claimed to provide superb two-way communication without wires. An entire narrow-band FM communication receiver and transmitter is built into the standard-size headphone. Operation is claimed for up to 150 yards, and the system is "FCC certified and license free." Price is \$249.50.

CIRCLE 2 ON READER SERVICE CARD

HYBRID AMPLIFIER

Described as a hybrid Class A power amplifier is the model HCA recently announced by Infinity Systems of Canoga Park, California. Tubes are used in the input stage, while transistors are used in the output stage. The tubes are high transconductance pentodes, selected—explains Infinity—to allow a minimum number of devices in the signal path and operated as triodes for higher linearity. Tube life is given as more than 10,000 hours. The output transistors function as twelve high-speed devices per channel in a complementary-symmetry design. The use of transistors here eliminates high and low frequency phase shift and allows direct-coupling to the speakers. Logic circuitry provides automatic functions, and an informational screen indicates operational mode, cause and location of possible malfunction, automatic protective action taken by the amplifier in cases of excessive DC, temperature increase or line-voltage drop. Rated output power is 150 watts per channel (RMS) with both channels working into 8-ohm loads across the 20-Hz to 20-kHz range at a THD of 0.2 percent. With 4-ohm loads, the power rating becomes 280 watts per channel for 1 percent THD. With both channels driving 2-ohm loads, power rating is 400 watts per channel for 1 percent THD. Weighing 95 pounds, and measuring 19 by 19 by 9 inches, the Infinity HCA amplifier is priced at \$4000.



CIRCLE 3 ON READER SERVICE CARD

COMEL MIXER

Comel's MPK 706 POWER offers "roughly all the facilities" of the PMP 402 and ZZ 807 disco-mixers, "but at a price." The unit features two stereo phono inputs with sensitivity presets; four mic/line inputs; and one D.J. input with bass, treble, presence and pan-pot controls. Output channels include one main stereo; one spare stereo; and one stereo headphones. The output channels include a three-band equalizer plus subsonic and high-pass filters. A pre-list of all input channels and outputs is possible, the visual monitoring being made by VU meters routable from outputs to inputs.



CIRCLE 4 ON READER SERVICE CARD

NEW ACCESSORIES FROM AUDIOTEX

The Controller from Audiotex Laboratories Division of GC Electronics is a stereo selector switch that allows hookup and independent control of up to five pairs of stereo speakers. Any one pair, or up to all five pairs, may be played at the same time. In addition, the Controller has two stereo headphone jacks. The unit features built-in circuitry for amplifier protection. The internal protection load may be switched out of the circuit if desired when the speaker load is no less than 4 ohms. Rated at 50 watts continuous power per channel, the unit's power rating is, says Audiotex, "for all practical purposes unlimited with the load switch in the 'off' position." Price is \$49.50.

The Director, from Audiotex, is a stereo tape and input control unit that provides two additional "auxiliary" inputs, two tape-monitor circuits, plus an equalizer input or a third tape monitor, "all at the push of a button." Price is \$38.50.

CIRCLE 5 ON READER SERVICE CARD

NEW DEVICES FROM INTERFACE

From Interface Electronics of Houston, Texas, comes word of a new input module equipped with the Allison VCA (model 104JV, formerly the model 104A), which permits VCA control grouping in up to eight groups without adding any modules. Any slider in the group can master the entire group while the others still may be used to trim their individual inputs.

Interface also is offering a new input module (the 104B) that has three full-band variable Q (0.1 to 2 octaves) parametric equalizers with symmetrical boost or cut of up to 16 dB. This device also is available with the VCA as model 104BV.

A third new item is a "bright low-cost bar-graph type peak-reading LED VU meter which permits among other things the inclusion of VU indicators on every input," a feature now available on most Interface mixers.

CIRCLE 6 ON READER SERVICE CARD

SELF-CALIBRATING LEVEL MONITOR

Audio Logic of Westlake Village, California has introduced its model ALM-1500, an audio level monitor that automatically calibrates itself to any amplifier output through an LED meter display graded in steps of 10 percent up to 100 percent. The monitor is capable of handling up to ten channels of amplification from 0.125 W (1 VAC) to 12.5 W (10 VAC) in its "X 1" position, and from 12.5 W (10 VAC) up to 1250 W (100 VAC) in its "X 10" position. Five channels of temperature sensing provide monitoring of amplifier temperature levels with calibrations for cold, normal and hot.

Separate switching is provided for auto/manual, peak/hold, dot/bar, X 1/X 10 range selection, auto/manual matching indicators and overrange indicators.

The ALM-15MX multiplexer can be used with the ALM-1500 for off-stage monitoring through the multiplexing of the fifteen channels of information (ten channels of amplification display and five channels showing temperatures) down to one low-impedance line connected to the ALM-1500.

The ALM-1500 is priced at \$649; the ALM-15X is priced at \$329.

CIRCLE 7 ON READER SERVICE CARD

PROGRAMMABLE CASSETTE DECK



Sanyo's "Plus D64" cassette deck allows the user to pre-program up to nine selections on a cassette tape. Pushbuttons permit "instructing" the deck as to which selections to play. The system, known as AMSS ("automatic music select system"), works by sensing gaps between selections, which must be of at least four seconds duration. The new deck is metal-tape capable and features a logic-controlled solenoid operated transport. Metal tape specs include THD of 0.8 percent, and S/N of 70 dB. A two-head deck, the Plus D64 uses fluorescent peak-hold meters switchable to standard VU readout. Mic/line mixing is included and price is \$390.

CIRCLE 8 ON READER SERVICE CARD

COMPUTER AIDS DISC MASTERING

Zumaudio, Inc. of Phoenix, Arizona has a micro-processor-based digital computer system that permits users of Neumann VMS series record-mastering lathes to make more efficient use of disc space without requiring mechanical modifications to the lathe. An increase of up to 2 dB cutting level is claimed. In operation, the lathe's existing pitch-depth computer is by-passed, and the preview signals from the tape machine are sent to the Zuma computer which samples and digitizes these signals, and constructs—in its memory—a numerical picture of the groove being cut. Precisely one turntable revolution later, the computer recalls this information and compares it to the numerical picture of the current groove being cut. If the profiles of these two adjacent grooves permit, the computer nestles them together rather than allowing for the absolute value of the peak excursions as do conventional systems. The computer also seeks to maintain a constant land value between grooves by keeping track of the space it creates during each revolution. The computer checks itself with an integral diagnostic routine, and alerts the operator of any possible malfunction. Price of the system, including installation, is \$7000.

CIRCLE 9 ON READER SERVICE CARD

KOSS INTRODUCES DIGITAL DELAY

Koss has entered the "environmental sound conditioning" area with its model K/4DS digital delay system. It uses a patented single circuit conversion unit capable of storing nearly 17,000 bits of information. The price of \$500 includes a built-in 15-watt per channel stereo amplifier. Featuring a range of settings "from a small club to a theater, concert hall or auditorium," the K/4DS also includes an EQ switch for signal balance plus an isolated stereo function with twin jacks and stereo amplifiers.

CIRCLE 10 ON READER SERVICE CARD

COMPUTER-CONTROLLED VCR

The model HS-300U from Mitsubishi via its U.S. outlet Melco Sales of Compton, California is a six-hour computer-controlled video cassette recorder using the VHS format. The unit has five direct-drive servo-controlled motors that eliminate all belts. Featured is a seven-day programmable memory with rapid program search in either forward or rewind. The memory can be set to turn on at a specific time each day for one show, and an additional five shows can be programmed over seven days on any channel. In the six-hour mode, which is always played back in color, six special categories are available—fast forward and fast rewind at 15 times normal speed, slow speeds of $\frac{1}{10}$ and $\frac{1}{3}$ normal, still (freeze) frame and single frame manually advanced in which the tape can be moved forward one frame per second or slower. The unit's microprocessor allows instant switching from one mode to another, controls sequencing and provides 15-function feather-touch electronic tuning. A built-in RF adapter is included. Weighing 31 pounds, and measuring $19\frac{1}{8}$ inches wide, $12\frac{7}{8}$ inches deep and $6\frac{3}{8}$ inches high, the Mitsubishi HS-300U costs \$1350. An optional remote control accessory costs \$100.



CIRCLE 11 ON READER SERVICE CARD

POST-PRODUCTION SOUND TOOL

Designed to simplify sound re-recording, and also to enhance sound mixes is the model CV-150 "Cue Vue" introduced by Ron Alexander of Menlo Park, California. The device provides direct and precise visual indications of the approach, beginnings and ends of blocks of sound on individual sound tracks. It takes the signal from an advance playback head, determines its length and shows each block of sound approaching the regular playback head as a set of traveling lights on a column of LEDs. According to Alexander, the cues are precise to one-twelfth of a second; complicated tracks can be mixed "with ease." When used for looping, Cue-Vue frees the talent to concentrate on interpretation and performance. No special preparation of sound tracks is required. Designed for mounting at a console or on the podium, Cue-Vue works with all tape gauges and speeds. Featuring two adjustable scanning rates with sensitivity control, it consists of a display unit, low-noise preamplifier and power supply (the prescan head is not included). Introductory price is \$695; custom versions available.

CIRCLE 12 ON READER SERVICE CARD

TAPE NEWS AND DISC BIT

BASF has introduced a new LH open-reel tape. Designated "Ferro LH DP 26," it is described as a high quality, high output, low-noise ferric oxide with built-in sensing foil. Supplied in a plastic "library box," LH 26 is said to have been a long time standard in Europe. It will be sold on 7-inch reels in lengths of 1800 feet (\$13); 2400 feet (\$17) and 3600 feet (\$22).

CIRCLE 13 ON READER SERVICE CARD

Ampex has announced its new MPT metal-particle tape, said to be compatible with the new generation of metal-tape cassette decks. MPT is claimed to provide better than 100 percent increase in high-frequency dynamic range over typical high-bias audio cassettes, along with low distortion at elevated signal levels. Initial test runs at Ampex produced audio response using state-of-the-art decks that showed less than 1 dB variation from 20 Hz to 20 kHz.

CIRCLE 14 ON READER SERVICE CARD

Fuji informs us that it now has a complete line of metal tape cassettes for U.S. distribution. Included are the C-46 (\$8.30); the C-60 (\$9.10); and the C-90 (\$12). Fuji claims that its metal tape delivers 7 to 12 dB increased dynamic range over conventional premium formulations, with "inaudible hiss during quiet passages and no oversaturation at . . . high frequency levels."

CIRCLE 15 ON READER SERVICE CARD

TDK, while announcing a popularly priced "second generation" metal audio cassette, the MA (size C-60, \$11.60), to join its earlier MA-R metal cassette, also a C-60 priced at \$12.99 is also emphasizing the other formulations in its extensive line. These include an upgraded version of its AD tape (normal bias), its OD ("optimum dynamic") tape also taking normal bias, and its Avilyn tape which is claimed to be the "world's finest high-bias cassette." The new version is called SA-X and TDK says it rivals metal tape in overall sound.

CIRCLE 16 ON READER SERVICE CARD

Shifting from tape to disc, I have just listened to the latest Telarc digital-tape-to-analog-disc release. It's the "Carmen Suite" by Bizet, with Grieg's "Peer Gynt Suite" on the flip side (Telarc Digital 10048), both performed by the St. Louis Symphony conducted by Leonard Slatkin. There is some groove rumble, which is explained on the jacket as due to the air-conditioner running during the recording session on a very hot day. I am "happy" to report that my system is good enough to reproduce the rumble which does become audible during the quietest passages. This gripe aside, the album has some of the most awesome deep bass I've ever heard on disc—it comes in the cut "In the Hall of the Mountain King" and will really test the response of your system, not to mention the trackability of your pickup. Other sonic interest in this disc centers on the subtle ensemble effects and inner orchestral detailing (rather than socko dynamics) that are found in both compositions, recording virtues that have been overlooked in most of the commentary bestowed on recent super-discs but which are a real challenge to get into a disc groove and which are happily evident in this one.

CIRCLE 17 ON READER SERVICE CARD



MUSICAL

NEWSICALS

The recently held West Coast trade show of the National Association of Music Merchants was one of the biggest in recent memory in terms of new products announced. This month's column is devoted to a wrap-up of those new products shown at the NAMM show.

SYNTHESIZER EQUIPMENT

Roland introduced two new, compact synthesizers at the NAMM Western Market, the SH-2 dual oscillator synthesizer and the SH-09 lead synthesizer. The SH-2 offers the musician the big sound of a dual-oscillator synth in a reasonably priced package with interface capabilities. The first VCO in the SH-2 has four primary waveforms while the second VCO has three, and both VCOs have five different octave ranges. Additionally, VCO-1 has a sub-octave oscillator and VCO-2 is independently tunable. In addition to the VCOs, the SH-2 has a VCF section with cutoff frequency and resonance controls, a VCA section with ADSR envelope generator and hold function, and a modulation section with LFO which includes controls for waveform, rate and delay time. The unit also includes Roland's spring-loaded Bender which can vary VCF cutoff frequency, the tuning of both VCOs or the tuning of VCO-2 independently of VCO-1 for special effects. The Roland SH-09 Synthesizer is a single oscillator model designed for lead use. The VCO section generates three basic waveforms plus noise and two sub-octaves, and has pulse-width modulation from envelope or LFO signals or by a manual control. Also included is a VCF with frequency and resonance controls, a VCA with ADSR envelope generator, response selector switch and hold function and a

modulation LFO with waveform, rate and delay time controls. Rounding out the controls is Roland's spring-loaded bender lever, and controls for bender range and portamento.

CIRCLE 18 ON READER SERVICE CARD

Star Instruments, Inc. is the manufacturer of the Synare line of drum synthesizers. The company's mainstay, the Synare 3, has proved to be a very popular unit with the company, selling over 14,000 units in the last two years. At the NAMM show, Star introduced three new products. First among these is the Synare S3X which features all the controls and functions of the Synare 3 with the addition of a preset selector which produces five of the most popular sounds at the turn of a switch in addition to the manual controls. The Synare S3X has a pure gum



rubber pad, is AC powered and is fully compatible with the Synare Sequencer. The Synare 4 is a new, low-cost model using a real 8-inch drum head and featuring a full complement of eight controls for tuning, modulation depth and rate, upwards and downwards sweep, sweep time, sensitivity and volume. The third new product from Star is the S-31 stand, a chrome-plated steel stand, similar to a rack-tom stand but designed specifically for use with the Synare S3X, Synare 4 and Synare Sequencer.

CIRCLE 19 ON READER SERVICE CARD

On the guitar synthesizer front, Roland introduced a new system which offers the musician a choice of two different guitar controllers to be used with the GR-300 synthesizer module. The more conventional of the guitars is the G-303, which has a laminated maple/mahogany body and a set-in neck of maple with an ebonized rosewood fingerboard, while the G-808 is a full-length neck design with a laminated maple/walnut neck and a walnut/ash laminated body. The fingerboard on the G-808 is ebony, the bridge is brass, and all the hardware is gold plated. Both guitar controllers have a hexaphonic pickup for synthesizer triggering plus two high-output humbuckers for straight guitar sound. The guitars are equipped with controls for overall volume, guitar tone, guitar/synthesizer balance, VCF frequency and resonance, and LFO modulation (vibrato) rate. A single switch on the guitar selects VCO only, VCO plus distortion or distortion only. The remainder of the synthesizer controls are located on a compact, foot-controlled unit. These controls include master tuning for all six VCOs, two variable pitch controls which are instantly switchable, envelope modulation and envelope inversion in addition

to more familiar synthesizer functions. A particularly interesting feature is the string select switch which allows selection of individual strings to control the synthesizer.

CIRCLE 20 ON READER SERVICE CARD

MIXING CONSOLES

Sound Engineering Design (S/E/D for short) makes a modular mixing console system that features total expandability which it designates the 32.16.2. This new mixer is expandable in the number of inputs up to 32, and is also expandable in output configuration from a basic stereo mixer up to a maximum of 16 output channels for subgrouping in "live" mixing or multi-track recording. One interesting aspect of S/E/D's design is that it has special modules for particular applications. For example, it has a special module for bass drum with a custom-tailored equalizer and a built-in compressor/limiter, and a special module for Fender Rhodes piano with a 3-band parametric equalizer, and they are said to be developing additional special modules for cymbals and tom-toms. The basic module has a 4-band equalizer with frequency selection on the two midrange bands because S/E/D felt that configuration was more fool-proof and more repeatable than a parametric design; the three-band parametric is available as an option.

CIRCLE 21 ON READER SERVICE CARD

Acoustic Control has introduced two new powered mixers for sound reinforcement applications. The 904 is a 4-input model while the 906 has 6 inputs. Input channel for both models feature high and low impedance inputs, bass and treble tone controls, a reverb/effects send (Spring reverb built-in) and a main fader. The 906 additionally has an independent monitor send from each input. Faders are provided for master level, reverb return, effects return and monitor level. The power amp section of each model is rated at 100 watts RMS into 4 ohms at less than .5% THD.

CIRCLE 22 ON READER SERVICE CARD

Yet another pair of new products from Roland are the PA-80 and PA-150 powered mixers. The PA-80 is a 6-input/2-output mixer with 40 watt RMS per channel (@ 4 ohms) power amplifier, which will accept low or high impedance inputs via quarter-inch

phone connectors. The PA-150 is an 8-input/2-output unit with a 75 watt RMS per channel (@ 4 ohms) power amp section. The PA-150 also features XLR-type mic input connectors and a 9-band graphic equalizer on each output channel. Common features of both models include a 40 dB gain control, LED overload indicator, a two-section equalizer, a panpot and a selector switch for sends to the internal reverb unit or an external effects device. Each mixer also has two line level input channels for effects returns or cascading two mixers.

CIRCLE 23 ON READER SERVICE CARD

Tapco has built a solid reputation as the manufacturer of small-format mic mixers which offer good performance at an affordable price. Tapco announced the upward expansion of its line with the addition of two new models which comprise what they call the Panjo Series. These new models were designed to offer a near-optimum balance of performance, reliability, features and value. Each input channel features unbalanced line and transformerless balanced mic inputs; gain trim control; channel patching; three-knob/four-frequency EQ; a pre-EQ, pre-fader monitor send; a post-EQ, post-fader effects send; a selectable pre- or post-EQ and fader auxiliary send; overload LED indicator; solo; panpot; straight-line fader; and 24-volt phantom power. The two Panjo models are designated the 7212, which is a 12 input \times 2 \times 1 output configuration, and the 7416 which has 16 inputs, 4 subgroups and a 2 \times 1 output configuration. Other features common to the two models are a built-in headphone amp with automatic solo, two effects return channels with panpots and monitor sends and switchable meter functions. The 7212 has two illuminated VU meters while the 7416 has four fluorescent bargraph meters for the subgroups and two more switchable functions for metering the stereo, mono or solo bus outputs.

CIRCLE 24 ON READER SERVICE CARD

MICROPHONES

Electro-Voice introduced two new microphones at NAMM. One is the PL77A, an electret condenser which replaces the E-V PL77. In answer to requests for increased rolled-off bass response, a bass roll-off switch was added to the PL77. In addition, the



PL77A is (still) powerable by an integral battery and via phantom power. The other addition to the E-V mic line is the PL20—essentially a musician's version of the well-known RE20 recording studio mic. Both mics are to be packaged in a cushioned vinyl pouch, and will retail for \$142 (PL77A) and \$396 (PL20).

CIRCLE 25 ON READER SERVICE CARD

MUSICAL INSTRUMENTS

Original Musical Instrument Co., who are the people who bring you Dobro Instruments, introduced three acoustic guitar models at the NAMM show. This new line is called the Original Hound Dog line and features solid Sitka spruce tops and mahogany necks with adjustable truss rods and rosewood fingerboards on all three models. Where the models differ is in the wood used for the back and sides of the guitars. The top model, the HD-9, has rosewood sides and back and features gold plated machine heads; the HD-6 uses jacaranda wood and the HD-3 has mahogany sides and back with chrome plated tuning machines.

CIRCLE 26 ON READER SERVICE CARD

Over the last half-dozen years RolandCorp US has become one of the major powers in the musical instrument accessory and performing synthesizer markets. At the NAMM show Roland's strength was demonstrated by their introduction of some sixteen new products. Two of these new products were keyboard instruments, the SA-09 Saturn and the VK-1 electronic organ. The Roland Saturn is a new type of electronic keyboard which incorporates elements of synthesizer, organ and piano to produce a wide range of tonal textures ranging from conventional electronic organ or piano sounds to cathedral organ to chime and celeste sounds. Tone generation in the Saturn is controlled by four Tone Selector switches, each with its own distinctly different tonal shading, and four sliders which control the selected



tone in the 1' through 8' octaves. Organ and Percussive envelopes are selectable and are modified by an Accent switch and a Sustain slider. In addition, the Saturn has either Chorus or Vibrato modulation available. The VK-1 Electronic Organ is the latest addition to Roland's popular VK series, and is said to produce the classic tone wheel type of organ sound by purely electronic means. The VK-1 uses either drawbars or presets to control its tone generation; nine drawbars are furnished covering the 16' to 1' range including a 5 1/3', 2 2/3', 1 1/3' group. Envelope is controlled by three Harmonic Percussion switches controlling the 2nd, 3rd and 5th harmonics, and two switches for fast decay and soft percussion. Also included in the VK-1 is a chorus-vibrato section to generate rotating-speaker type effects electronically.

CIRCLE 27 ON READER SERVICE CARD

LOUDSPEAKERS

For many years, JBL's K Series musical instrument loudspeakers have been among the most popular speakers of their type. Recently the raw materials for the Alnico magnets used in the K Series have become increasingly scarce and (not incidentally) costly. The logical consequence is that JBL, along with many other loudspeaker manufacturers, has turned to the various ceramic magnet types. Unfortunately, though, because of several properties of ceramic magnets it is rather difficult to keep the level of second harmonic distortion down to a low enough level in a conventional

speaker design. After extensive research JBL developed a Symmetrical Field Geometry magnetic structure and an aluminum flux stabilizing ring which serve to control the basic asymmetry of a typical ceramic magnet structure and thus reduce 2nd harmonic distortion to levels at least as good as the K Series. The first loudspeaker products to utilize these technological advances are the models which comprise the new E Series, which replaces the old K Series. In addition to the new magnetic structures, JBL developed new high-temperature adhesives and plastic materials and improved voice-coil construction techniques which combine to increase the power handling capability of the E Series some 3 to 6 dB over the K Series. This increase in power handling plus the improvement in efficiency afforded by the new magnet structure combine to give the E Series models 6 to 10 dB greater dynamic range than the K Series. So far the JBL E Series includes 10-inch, 12-inch, 15-inch and 18-inch models.

CIRCLE 28 ON READER SERVICE CARD

A new contender in the deep-bass loudspeaker race is the Vortec 18160, an 18-inch high power loudspeaker designed to produce clean low-frequency fundamentals at high sound pressure levels when installed in a properly designed cabinet. The Vortec woofer uses a special steep-angle, epoxy-dipped cone with an epoxy-reinforced log excursion surround and spider to achieve high SPLs without cone breakup. The speaker is rated at 400 watts continuous, and has a high

sensitivity of 102 dB SPL at 1 meter with 1 watt input making it a real powerhouse. The Vortec uses a 10 lb. magnet in a magnetic structure that totals 30 lbs., and to maintain structural integrity with such a massive structure, the speaker's basket is die-cast aluminum rather than stamped steel. The first commercially available bass speaker systems to use the Vortec 18160 driver are two of the new DB Series bass-reinforcement systems from GLI, which is quite well-known for its high-power disco sound systems. The DB 60 uses one of the Vortec drivers plus two 18-inch passive radiators in an 18 cu. ft. cabinet to cover the 35 Hz to 800 Hz range with a maximum output level of 129 dB SPL at 4 feet at full power. The DB 50 uses one driver in a folded horn enclosure of 36 cu. ft. to produce a maximum 132 dB SPL in the 44-500 Hz range. For even more power, DB 50s may be doubled or quadrupled up, ultimately producing 138 dB SPL at 4 feet in the 30 Hz-200 Hz range. For smaller applications, GLI has four systems using a Vortec 1560 15-inch driver.

CIRCLE 29 ON READER SERVICE CARD

POWER AMPLIFIERS

Fender recently entered the high power amplifier race with their SRA 200 and SRA 400 models. These units are fan-cooled, solid state, rack-mount amplifiers rated at 100 and 200 watts RMS per channel into 8 ohms, respectively. Both models are high slew-rate, fully complementary designs, and feature 22-step detented input attenuators calibrated in dB of gain. A mode switch is provided to select stereo, dual channel mono or bridged mono operation modes, and fast-acting LED displays show clipping level on the SRA 200 and power output on the SRA 400.

CIRCLE 30 ON READER SERVICE CARD

MUSICAL INSTRUMENT ACCESSORIES

Fender was one of the first guitar makers to use brass for some of the string-holding parts of their guitars, so it is only natural that they should introduce a line of solid brass replacement assemblies for their guitars now that brass has become so popular among musicians. One unfortunate property of brass, though, is that it oxidizes and discolors, which most manufacturers of brass guitar pieces

Live... SYNARE S3X Preset Electronic Drums

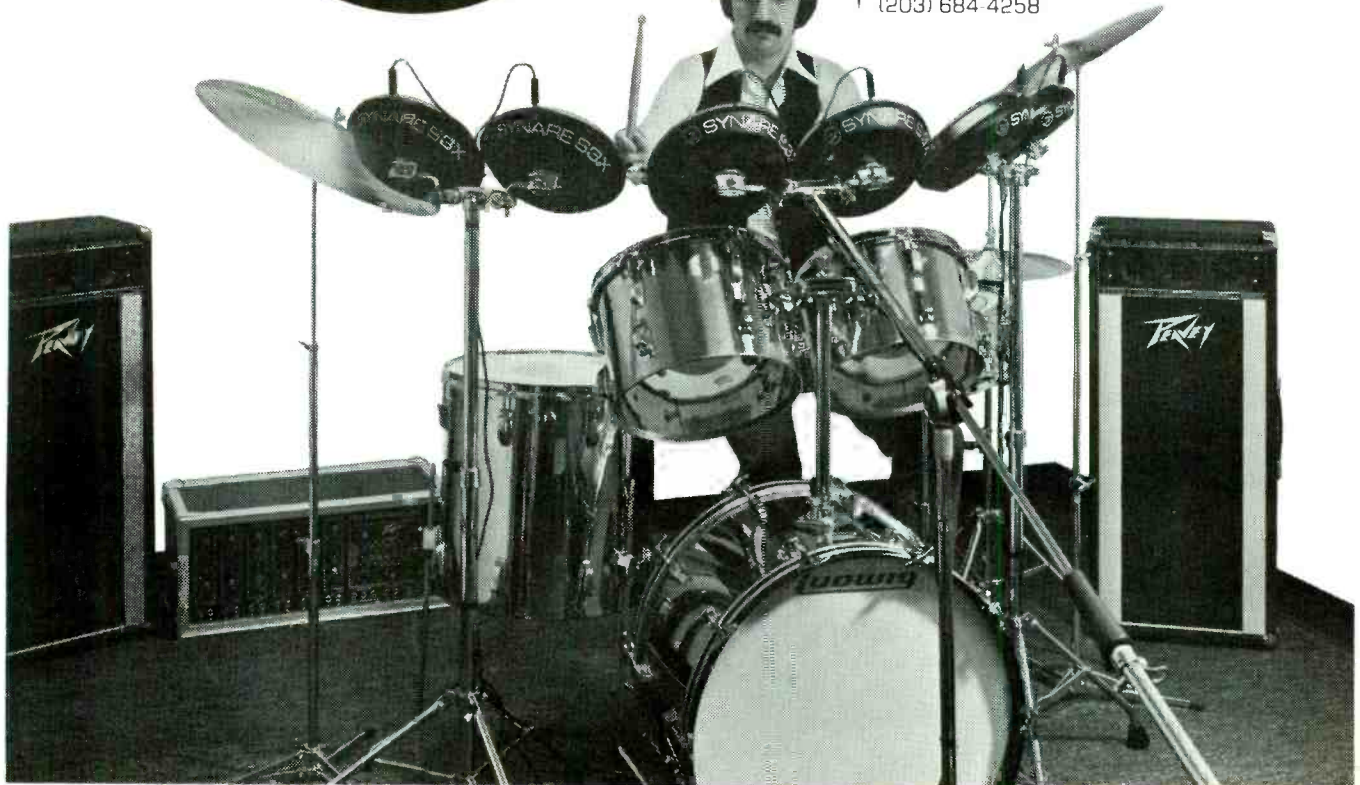
The new SYNARE S3X with its preset selector allows you to switch from sweep with modulation to chime sounds instantly during a live performance. Now you can be super creative because each of the six selections can be individually adjusted and tuned. For the first time in electronic percussion history you will have confidence in finding that hard-to-get sound again and again. Whether you're playing a run or accents, SYNARE preset electronic drumming will electrify your audience and stimulate your performance.

In addition to the preset feature of the S3X, the new model incorporates a thin-

ner, denser drum pad to allow increased dynamics and a better "hit" response. Of equal importance, S3X head sensitivity is adjustable to further personalize the S3X for your needs.

And the new S3X is directly compatible with the SYNARE Sequencer. You simply throw a switch on the S3X and plug the unit directly into the Sequencer. Batteries have been completely eliminated from the S3X, and AC power is used exclusively.

SYNARE S3X suggested list price is \$295.00. Ask your local music store for a demonstration today. Seeing (and hearing) is believing.



CIRCLE 113 ON READER SERVICE CARD

combat with a coat of lacquer over the bare, polished metal. Unfortunately lacquer has a habit of scratching and wearing off, which led Fender to develop a special epoxy resin finish similar to that used on top-quality brass trumpets, trombones and such. Beneath the finish, Fender offers two basic lines of parts, a standard line which basically duplicates the original designs for the various assemblies, and a brassmaster line which boasts advanced, modern designs for improved performance. The standard line includes bridge base plates and saddles for Telecaster, Stratocaster and Fender bass guitars as well as knobs, strap buttons and such. The brassmaster line includes three guitar and two bass bridge assemblies all of which feature a special resonance bar and milled dual tracks for each bridge saddle to prevent lateral motion, and an improved tremolo block for the Strat bridge.

CIRCLE 31 ON READER SERVICE CARD

The 824R Integrated Processing System is an intriguing new product from KB Electronic Music Instrumentation, which also goes by the shorter name Wavemakers. This new product is a single unit which incorporates three signal processing systems which may be selected independently with front panel switches. The unit interfaces directly with low impedance balanced microphones, high impedance instrument outputs or line level sources with the flip of a switch. To keep things as quiet as possible, the 824R has an input compression/output expansion noise reduction system which is switchable. The three effects incorporated in the unit are a balanced modulator (ring modulator), voltage controlled filter and phase shifter. The VCF and phase shifter are controlled by independent contour generators which may be operated in free-running, externally triggered or input-controlled tracking modes for a wide variety of effects.

CIRCLE 32 ON READER SERVICE CARD

RolandCorp US announced the addition of several new products to its Boss line of electronic signal processing accessories. Among the new items is the Boss SG-1 Slow Gear, a voltage controlled amplifier with an envelope generator rather than an envelope follower. The Slow Gear is designed to produce a slow bowing type attack and

decay for simulation of violin (or string bass when used with electric bass) sounds. In the past, this type of effect was only possible if the musician used a volume pedal or learned the art of manipulating the guitar's volume control with his pinkie as he played. The Slow Gear is triggered by the dynamics of the input signal and has a sensitivity control for optimum results, and has an attack control which varies the length of the attack from 50 milliseconds to 300 milliseconds. Also new in the Boss line is the CE-2 Chorus unit, which is basically a compact version of the company's very popular CE-1 Chorus Ensemble. The CE-2 is designed to produce a thickening and deepening of any solo instrument or voice signal fed to it similar to the sound of a chorus of voices or a doubled instrument part. The unit has rate and depth controls for the effect to tailor the sound to a wide variety of input signals. The unit boasts a 90 dB signal-to-noise ratio and uses FET switching with LED indicator for positive and noise-free switching.

CIRCLE 33 ON READER SERVICE CARD

Among the new products from Roland is a new model Space Echo, the model RE-150, and a new phaser, the SPH-323, as an addition to their Roland Rack effects and amplification system. The SPH-323 Phaser is a very versatile device giving the musician or engineer control over a large number of parameters of the phase shifting process. The unit has two LFO sweep oscillators which may be used independently or simultaneously for multi-modulation effects. Each LFO has depth and rate controls and one of them may be controlled by an external control pedal. A manual phase shift control is also provided which may also be pedal controlled. The unit has eight phase shift stages and a switch to select four-stage operation for less intense effects, and a resonance control is also provided for further control over the effect's intensity. The SPH-323 has both balanced and unbalanced inputs on the rear panel plus a guitar input on the front. The new RE-150 Space Echo combines Roland's popular tape-loop echo effects with provision for mixing two microphone and one instrument input, each with an independent volume control. A bypass switch cancels the effect on the instrument input only (bypass foot-

switch is optional). Controls on the unit include a six-position mode selector to choose among three simple repeat effects and three more complex echo patterns, a repeat rate control, a repeat intensity control and an echo volume to control the amount of echo signal mixed with the original signal.

CIRCLE 34 ON READER SERVICE CARD

A formerly neglected accessory item which is finally receiving proper attention from musicians is the connecting cable. Conquest Sound Co. offers a comprehensive line of instrument cables in straight and coiled versions along with a line of microphone cables and amplifier speaker cables. All Conquest Sound instrument cables use a custom-made Belden cable type which utilizes an internal layer of a special nylon tape which reduces handling noise, and are terminated with Switchcraft or ADC connectors depending on the series. The Hush I uses nickel-plated brass ADC phone plugs with shatter-proof plastic shells, while the Hush III uses the familiar Switchcraft #280 plated brass plugs. The Conqueror uses a solid brass military type plug with plastic sleeve, and the new Gladiator's military series plugs have brass shells and a spring-type strain relief, but the ultimate cord from Conquest is the Wrapper which encapsulates the actual connections with epoxy while the cable is strain-relieved with inner and outer sleeves of shrink tubing. Conquest also offers a variety of styles of microphone cables and multi-pair snake cables in 9, 12, 15, 19 and 27 pair configurations. All Conquest Sound products carry a two year guarantee.

CIRCLE 35 ON READER SERVICE CARD

Nady Systems Inc., also known as Nasty Cordless, has announced a complete, low-cost wireless microphone or instrument system based around their Nasty Cordless Black Transmitter. The Black series transmitter is designed to use unused channels of the FM broadcast band, and the system now available from Nady includes a Toshiba FM tuner. This Toshiba unit is said to be a high-performance model which is particularly well-suited to use with the Nady or Nasty systems. Using this tuner, Nady claims frequency response of 20 Hz-20 kHz \pm 3 dB, a signal-to-noise ratio of 73 dB and a transmission range of 250 feet.

CIRCLE 36 ON READER SERVICE CARD

The Sunn Professional Guitarists Sound Check

1 Can you select either or both channels without disturbing preset controls?

2 Are you sure of the same response at all volume levels?

3 Does your footswitch have L.E.D. and memory?

4 Do you have individual channel volume controls and master volume control?

5 Does your amp have C-MOS drive control?

6 Are you effectively patching in effects and/or other amps?

7 Can you achieve the tonal coloration you want?

8 Do your tone controls wash out at high levels?

9 Can you combine the best of tube and solid state sound?

10 Is your amp really portable?

11 Can you control channel interaction so that when you turn treble up, midrange and bass are not affected?

12 Can you use reverb without interference from your tone controls?

If you can't do all this and more with your present amplifier then you're limiting your potential performance ability.

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The Beta Series

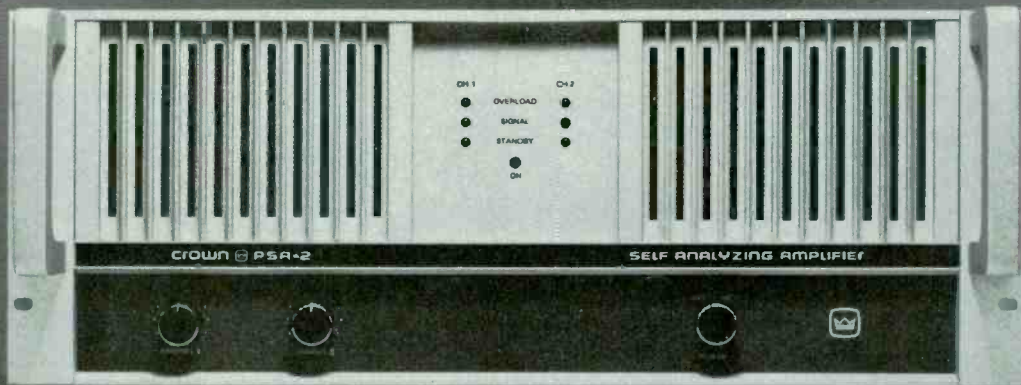
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CIRCLE 76 ON READER SERVICE CARD

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The Crown PSA-2 Professional Power Amplifier*

220 watts per channel minimum RMS (both channels operating) into an 8 ohm load, 20Hz-20KHz at a rated RMS sum total harmonic distortion of 0.05% of the fundamental output voltage. (tested per FTC specifications)

250 watts ± 1 dB per channel, 20Hz to 20KHz into 8 ohms with no more than 1.0% THD (EIA Std. SE-101-A).

400 watts ± 1 dB per channel, 20Hz to 20KHz into 4 ohms with no more than 1.0% THD (EIA Std. SE-101-A).

685 watts ± 1 dB at 1K per channel into 2 ohms, with no more than 1.0% THD.

* Designed for installation and use in professional sound systems



the Crown PSA-2 amplifier will still be unique.

There is unique technology built into the new Crown PSA-2 amp that is not available to other amp manufacturers. Our competitors may try to copy the PSA-2, but only the Crown label guarantees you access to that technology.

You will experience that technology as reliable, long-term performance of the PSA-2. No other amplifier combines such power and dependability.

Here's why.

For over ten years, Crown has tested every output device manufactured for us. We built an electronic wizard — the SOAR III Transistor Analyzer — to determine for ourselves the safe operating area (SOA) of each type of output device. Designers have long understood that the SOA changes as operating conditions change, but until now there has been no way to define and compensate for these changes. The SOAR III has changed all that — exclusively for Crown.

As a result, we can include in the PSA-2 analog computers connected to sensing units which constantly monitor the operating circumstances of each output device. These self-analyzing circuits are programmed at the factory with Crown's data on the SOA. For the first time, the protection circuit actually follows the changes in transistor SOA resulting from operation of the amplifier. If an output transistor exceeds its SOA for any reason, the self-analyzing circuit limits the output, preventing its destruction. If the SOA is not exceeded the output devices are not limited in any way.

New options for the front and rear panels of the PSA-2 are now available. See them at the Los Angeles AES Convention, May 6-9, Booths 75/76.

What good does that do you?

The Crown PSA-2 provides more usable power from each output device. There are no arbitrary voltage or current restrictions on the output.

You get reliable power for less money than you might expect. Output devices are expensive. Only Crown has learned how to use them at maximum efficiency.

In the PSA-2, you'll also find

- ... a two-speed fan and completely enclosed high-efficiency heat sinks
- ... balanced variable gain (XLR) inputs on a back panel plug-in module
- ... switchable high and low pass 3-pole Butterworth filters that are factory-set for 50Hz and 15KHz, with other roll-off points available
- ... a push-button test-tone generator
- ... an adjustable-threshold compressor to limit output at the user's discretion
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- ... switch selectable turn-on delay
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The Crown PSA-2 is a unique professional component. With the PSA-2, the amplification systems you are bidding today will still be state-of-the art years from now. Call us for spec or delivery information at 219/294-5571.



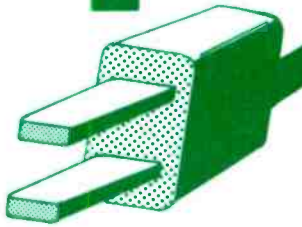
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CIRCLE 104 ON READER SERVICE CARD

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The Electric



-Part VII

Primer

By Peter Weiss

Well, it's back into the muck and mire of the murky mathematical swamp for a little while, but the welcome relief of practical application is near at hand. We will not have to return to the swamp again, but will emerge from it newly armed with the concept of vectors, those "arrows of outrageous fortune" that we will use in analyzing A.C. circuits.

Fig. 1 shows a right triangle along with another triangle of the same "shape" but of a different size. If we form the ratios

$$\frac{y}{x} \text{ and } \frac{y_1}{x_1}$$

$$\frac{1.5}{2} \text{ and } \frac{3}{4}$$

we find that they are equivalent. This tells us that if we have an angle in a right triangle (of any size) equal to θ , the length of the side opposite the angle and the length of the side (not the hypotenuse) adjacent to the angle will always be in the ratio

$$\frac{3}{4}$$

This ratio, between the side opposite the angle and the side (not the hypotenuse) adjacent to the angle is called the "tangent" of the angle. Using the notation from Fig. 8 in Part VI and Fig. 1 here,

$$\tan \theta = \frac{y}{x}$$

$$\tan \theta = \frac{3}{4} = 0.75$$

From a table of trigonometric functions or through the use of a cal-

culator, we can find out that the angle whose tangent is equal to 0.75 is approximately equal to 37° . Written in the usual notation for trigonometric functions:

$$\tan 37^\circ \cong 0.75$$

(the \cong symbol means "approximately equal to")

Let's use the information we have so far to work an example. Suppose we have a right triangle like the one in Fig. 2. The length of side y is 4.5, and $\theta = 42^\circ$. We want to find the length of side x . We know that

$$\tan \theta = \frac{y}{x}$$

The tangent of 42° can be found using a calculator or table of functions, and is 0.900. Substituting all the known values into the tangent formula,

$$0.900 = \frac{4.5}{x}$$

Rearranging according to the rules from the first segment of Math Notes,

$$0.900 \cdot x = 4.5$$

$$x = \frac{4.5}{0.900}$$

$$x = 5$$

What if we know θ , and the length of side y and want to find r ? We could first find the length of side x , as before, then use the Pythagorean Theorem to find r . There is a more direct method. The sine function relates an angle

(other than the right angle) in a right triangle to the length of the side opposite the angle and the length of the hypotenuse. Using the notation from the illustrations,

$$\sin \theta = \frac{y}{r}$$

If we want to find r , knowing θ and the length of side y in Fig. 2, all we have to do is find the sine of 42° and crank through the sine formula just given.

$$\sin \theta = \frac{y}{r}$$

$$\sin 42^\circ = \frac{4.5}{r}$$

We can find $\sin 42^\circ$ using a calculator or tables. It is 0.669. Then,

$$0.669 = \frac{4.5}{r}$$

Rearranging,

$$0.669 \cdot r = 4.5$$

$$r = \frac{4.5}{0.669}$$

$$r = 6.7$$

The cosine function relates an angle (not the right angle) in a right triangle to the length of the side adjacent to the angle and to the length of the hypotenuse. The formula for the cosine of an angle θ is

$$\cos \theta = \frac{x}{r}$$

This trigonometric relationship can be used, like the sine and tangent functions, to find the lengths of unknown sides of right triangles, or the measure of unknown angles when the lengths of

the sides are known.

Summarizing the three trigonometric functions that concern us, we can state the relationships they express, verbally and in formulas: *The tangent of an angle in a right triangle is equal to the length of the side opposite the angle divided by the length of the side (not the hypotenuse) adjacent to the angle.* Using the notation from the illustrations:

$$\tan \theta = \frac{y}{x}$$

The sine of an angle in a right triangle is equal to the length of the side opposite the angle divided by the length of the hypotenuse. As a formula:

$$\sin \theta = \frac{y}{r}$$

The cosine of an angle in a right triangle is equal to the length of the side (not the hypotenuse) adjacent to the angle divided by the length of the hypotenuse. As a formula:

$$\cos \theta = \frac{x}{r}$$

In the examples and explanations given so far, we have dealt only with angles less than 90° and greater than 0° . We will now investigate the behavior of the trigonometric functions at 0° , 90° , and other special angles. In Fig. 3, the length r is 1 unit, and this length is laid out along the x axis. We can say that the angle between r and the x axis, θ , is 0° . The side opposite θ , y , is non-existent, but we can say that its length is zero. The length of the "hypotenuse" (although there is no actual triangle) is 1, and the length of the "adjacent side" is also 1. Plugging these values into the formulas for the functions gives the following results:

$$\sin 0^\circ = \frac{y}{r} = \frac{0}{1} = 0$$

$$\cos 0^\circ = \frac{x}{r} = \frac{1}{1} = 1$$

$$\tan 0^\circ = \frac{y}{x} = \frac{0}{1} = 0$$

Fig. 4 shows r laid out from the origin to the point $(+a, +a)$. Recalling that the sum of the angles of a triangle is 180° , and that a right angle contains 90° , the sum of θ and ϕ must be 90° . Also, from Fig. 4, it would seem that $\theta = \phi$. This is true, because of the geometric fact that angles in a triangle opposite equal sides are equal to each other. Now, if the sum of θ and ϕ is 90° , and $\theta = \phi$, then both θ and ϕ must be 45° . Before we plug values into the formulas, we have to find a value for a .

We can do this using the Pythagorean Theorem:

$$r^2 = a^2 + a^2$$

$$1^2 = 2a^2$$

$$\sqrt{1^2} = \sqrt{2a^2}$$

$$1^2 = \sqrt{2} \cdot a$$

$$a = \frac{1}{\sqrt{2}} \cong 0.707$$

$$\text{Note: } 1/\sqrt{2} = \sqrt{2}/2$$

This can be shown by applying the rules for fractions given in the Math Notes accompanying Part III. Now that we have values for all the angles and lengths involved, we can plug these values into the function formulas.

$$\sin 45^\circ = \frac{\sqrt{2}/2}{1} = \frac{\sqrt{2}}{2} \cong 0.707$$

$$\cos 45^\circ = \frac{\sqrt{2}/2}{1} = \frac{\sqrt{2}}{2} \cong 0.707$$

$$\tan 45^\circ = \frac{\sqrt{2}/2}{\sqrt{2}/2} = 1$$

Fig. 5 shows r (length 1 unit) at an angle with the x axis, θ , that is between 45° and 90° . As is evident from the illustration, side x is now

much shorter than side y , and the length of side y is closer to the length of side r . When θ is 90° , the length of side x becomes zero, and the length of side y equals the length of r , 1 unit. Let's substitute these values into the formulas.

$$\sin 90^\circ = \frac{y}{r} = \frac{1}{1} = 1$$

$$\cos 90^\circ = \frac{x}{r} = \frac{0}{1} = 0$$

$$\tan 90^\circ = \frac{y}{x} = \frac{1}{0} = \infty$$

The symbol ∞ means "infinitely large number." In the segment of Math Notes given with Part III, we said that a fraction with zero as the denominator was meaningless. This is still true, and we use the infinity symbol to indicate an insignificantly, or infinitely, large number. It also serves as a reminder that the tangent of an angle very near 90° will be a very large number.

Although we have mentioned values of the trigonometric functions for acute angles (angles greater than 0° , less than 90°) only, there are values that can be assigned to the functions for angles greater than 90° . For this

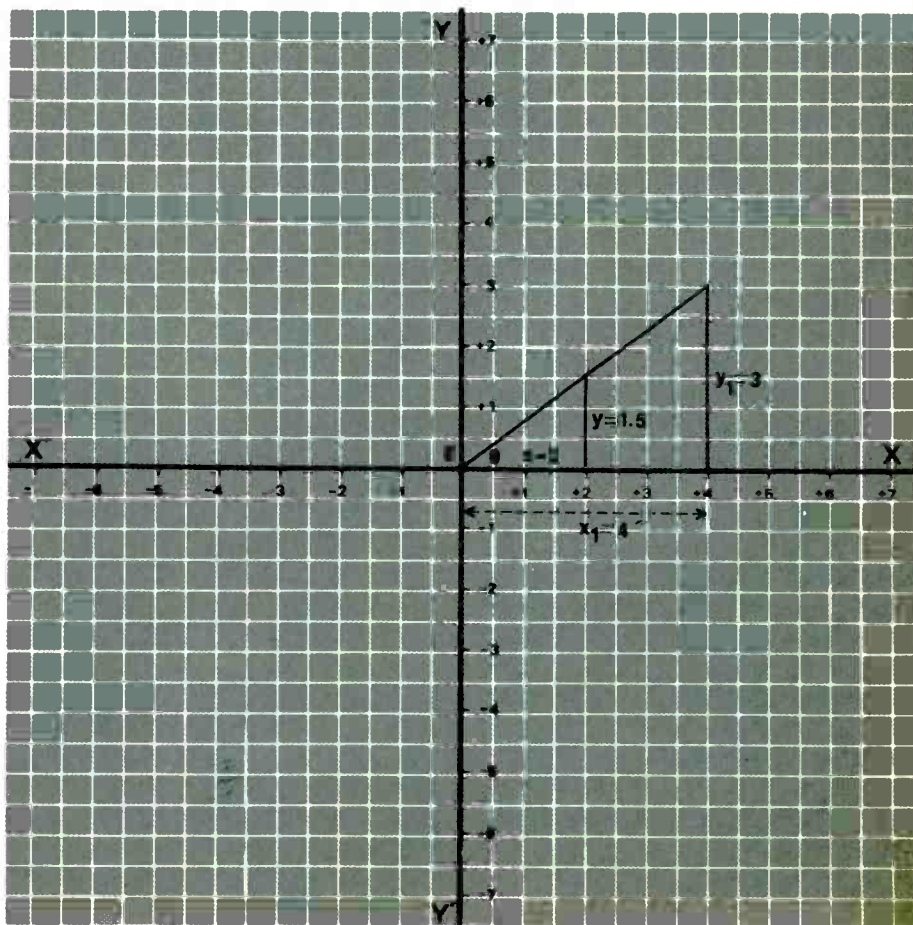


Figure 1.

part of the discussion, the only function we will examine will be the sine function. As shown in Fig. 6, as the rotation of r is continued past 90° , a right triangle can be formed in Quadrant II. It is a mathematical fact (the explanation of which is too cumbersome, even here) that for purposes of computing the value of the sine function for angles greater than 90° , like ϕ in Fig. 6, we can use the angle θ , as shown in Quadrant II. In the second quadrant, the y co-ordinate of any point will be a positive number, while the x co-ordinate of any point will be a negative number. Since the sine function is, as we have been defining it, the result of dividing a y co-ordinate by the length of r , the sine of any angle that is greater than 90° and less than 180° will be a positive number that is greater than zero and less than 1. Continuing the rotation of r until it is laid along the x' axis, θ becomes 0° and ϕ becomes 180° . Following the argument for finding the sine of 0° given earlier, the sine of 180° turns out to be 0. The values that the sine function goes through as r is rotated through 180° (and θ goes from 0° to 180°) are

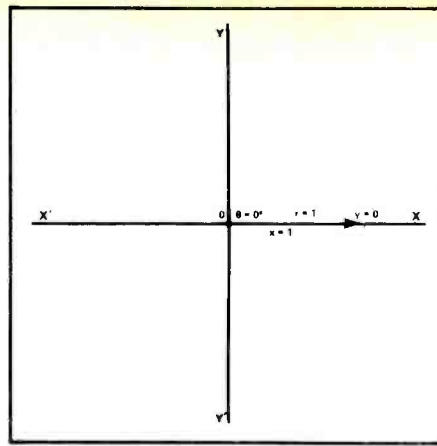


Figure 3.

plotted against values of θ in Fig. 7.

Continuing the rotation of r into Quadrant III, where both x and y co-ordinates are negative, the sine function assumes negative values between 0 and -1 for angles between 180° and 270° . In Quadrant IV, for angles between 270° and 360° , the sine function takes on values from -1 back to 0. A complete plot of the sine function for values of θ from 0° to 360° is shown in Fig. 8. This plot is called a

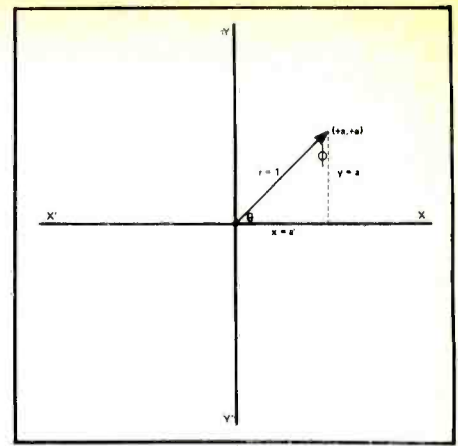


Figure 4.

sine curve, and is a tool that has almost universal application in A.C. circuit theory.

The sine curve, as shown in Fig. 8, is exactly the same shape as the plot of induced EMF in a loop of wire rotating in a magnetic field.

It is this relationship between the sine function and the shape of the induced-EMF plot that makes the sine function such a useful tool in audio and A.C. circuit analysis. The audio applications arise from the fact that audio signals in the form of alternating voltages and currents are produced from acoustical "sound waves" whose intensity varies sinusoidally. Although most sounds, musical and otherwise, consist of a jumble of different sine curve-shaped waves happening simultaneously, we still use the sine curve and sine function to analyze audio signals. The simplest form of sine-shaped sound wave occurs when an object, like a tuning fork for example, is vibrating at a fixed regular rate. This vibration of the tuning fork sets up a similar vibration in the air around the fork, and the vibration can be plotted as a sine curve. The air vibrations are what we call "sound waves," and can be converted into an A.C. signal by means of a device called a *transducer*.

A transducer is a device that converts one form of energy into another. One kind of transducer that is used to convert vibrations in air (mechanical energy) into an A.C. signal (electrical energy) is called a *microphone*. The type of microphone that is easiest to describe using the information we already have is a type called the *dynamic*, or *moving coil* microphone. The basic parts of a simple dynamic microphone are shown in Fig. 9. As a sinusoidal vibration in air

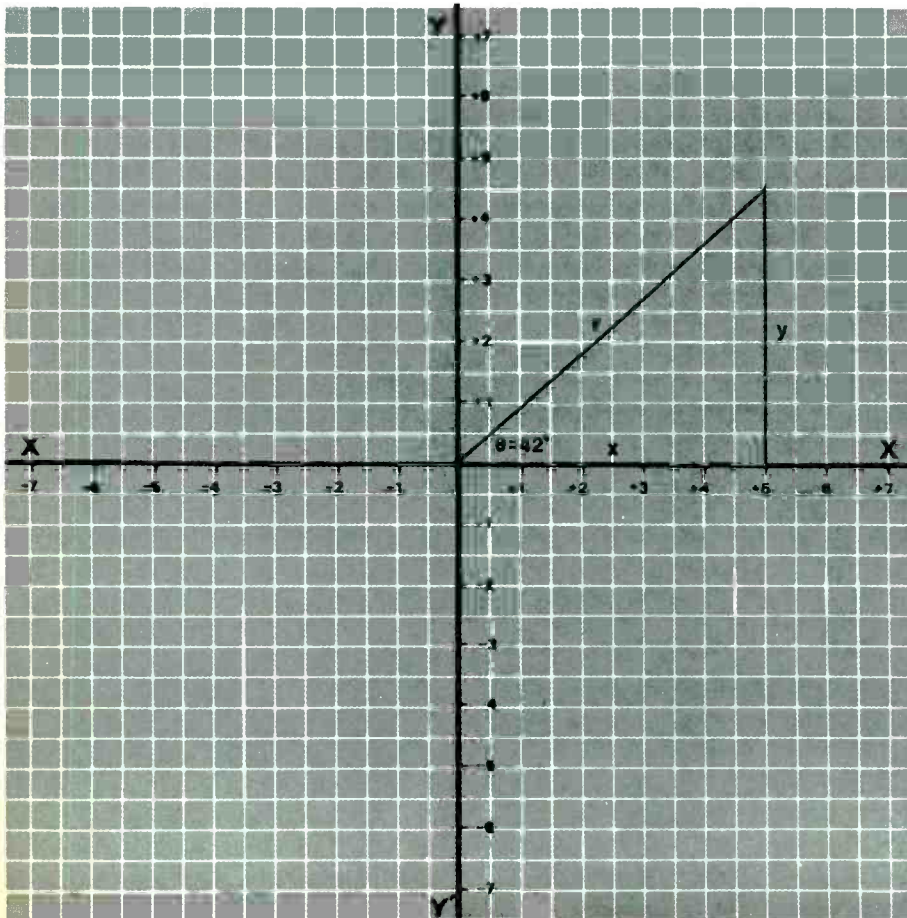


Figure 2.

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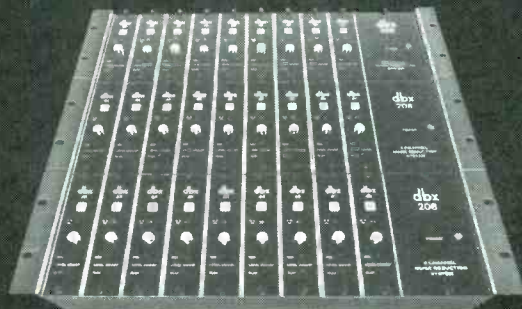
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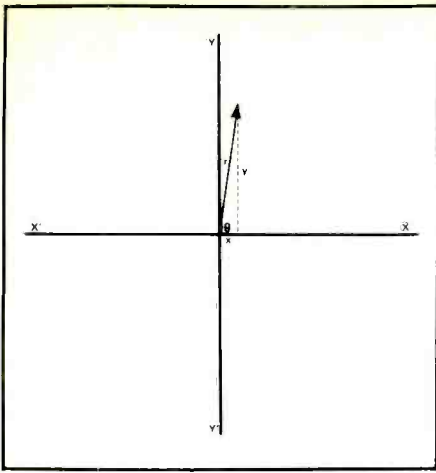


Figure 5.

causes the diaphragm to vibrate, the coil of wire attached to the diaphragm is made to move back and forth in the field of the permanent magnet. This sets up an induced-EMF in the coil, which appears as a sinusoidal signal at the output terminals of the microphone. The variation of this voltage with time is an exact duplicate of the time variation of the sound wave that produced the voltage.

We will investigate sound, sound waves and the A.C. signals produced from them in Parts VIII and IX (the last two installments in this series), but we first have to return to the rotating loop of wire (discussed in Part V) in order to explain some more basic concepts, and obtain more tools for working with A.C. signals.

The idea of the rotating loop is a good place to start, because we can relate its behavior directly to the sine function as we have described it.

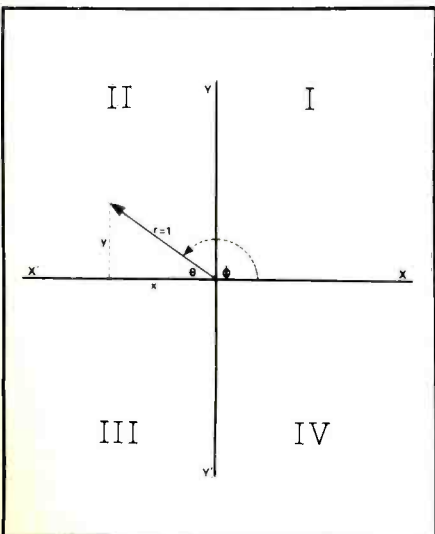


Figure 6.

Fig. 10 shows an "abstraction" of the rotating loop, using r to represent the loop, with the arrowhead end of r indicating the position of the a-b side of the loop. Using this description, all the facts we introduced concerning the sine function will now be true for the induced-EMF plot. That is, as the loop rotates from an initial position at 0° to a position at 90° , the induced-EMF will rise smoothly to a positive maximum value. As the loop rotates past the 90° position to the 180° position, the induced-EMF will decrease from the positive maximum to zero. As the rotation continues through the remaining two quadrants, the induced-EMF will go to a *negative* maximum at 270° , and back to zero at the end of a complete revolution, or 360° . When a line segment like r is used to represent the instantaneous value of an alternating voltage or current, we call r a *vector*. There is a more complete defini-

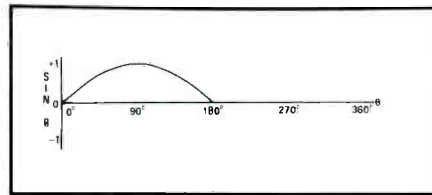


Figure 7.

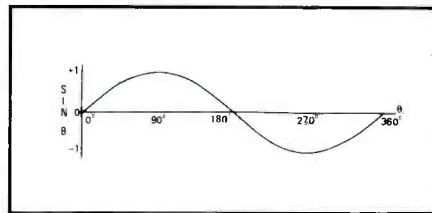


Figure 8.

tion of a vector: a quantity that has both magnitude *and* direction.

The directions of vectors in A.C. circuit analysis is a very important tool. To show how important this concept is, we must first define some terms. The event that consists of a sinusoidal signal going from zero through a positive maximum, through zero again, through a negative maximum, and back to zero, is called a *cycle*. The number of cycles of a sinusoidal signal (and this applies to sinusoidal sound waves as well) that occur per unit of time is called the *frequency* of the signal. The unit of frequency is *cycles per second*. This unit has been given the name Hertz, abbreviated Hz, after Heinrich Hertz (1857-1894). We

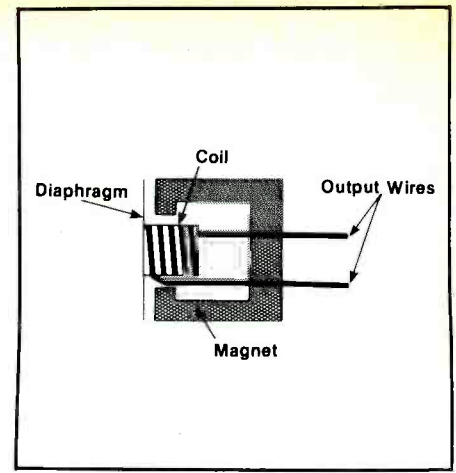


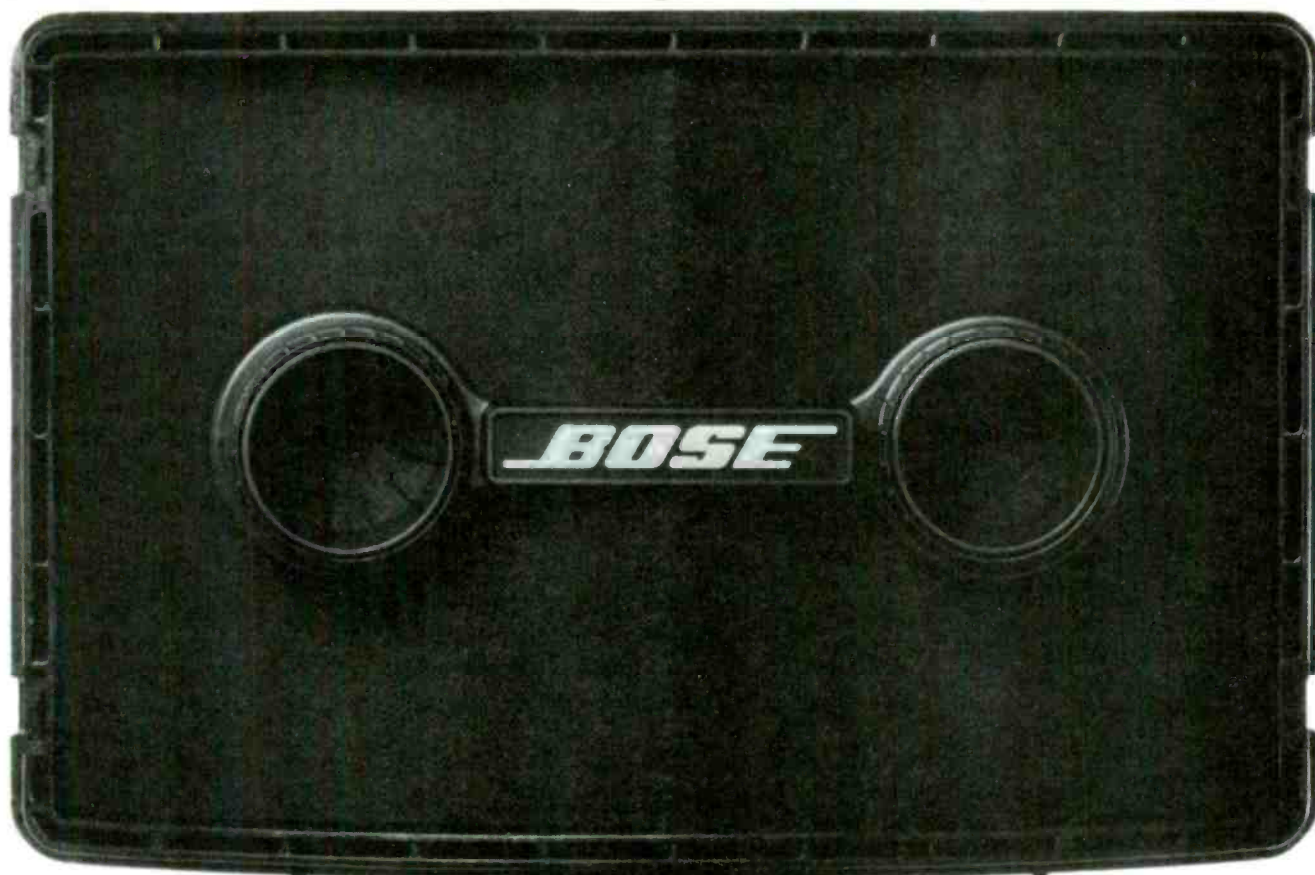
Figure 9.

have to introduce these terms because the circuit elements that we will be dealing with, inductors and capacitors, respond differently to voltages and currents of different frequencies. That is, their electrical characteristics are *frequency-dependent*.

We will begin our discussion of the behavior of circuit elements with a description of how an inductor affects and A.C. signal, and vice-versa. In previous discussions of inductance, we mentioned that the internal resistance of most inductors was very low. This is generally true, but the statement refers only to the opposition to direct current flow produced by an inductor. As long as the current remains constant, the inductor can be considered as just a long wire that happens to be in the shape of a coil. An inductor has different characteristics when the current through it is varying.

In our earlier discussions we also mentioned that the back-EMF produced by an inductor was proportional to the value of inductance *and* to the rate at which the applied voltage was changing with time. Using our new terms, an alternating voltage or current has a frequency, and the higher the frequency, the greater the rate of change of the voltage or current with time. Thus, it would seem that an inductor produces a greater back-EMF for higher-frequency signal voltages than for lower-frequency signal voltages. This is actually the case, and produces two important results. First, the opposition of an inductor to the flow of alternating current, called *inductive reactance* (symbol: X_L , unit: ohms), increases with frequency. Second, as the result of the conditions

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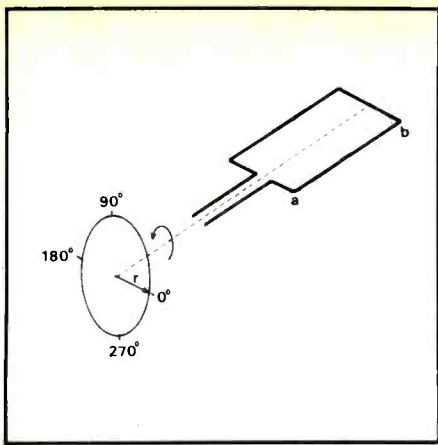


Figure 10.

described in the discussion of the time-related characteristics of inductance, the back-EMF produced when the applied voltage (at a particular frequency) is undergoing its maximum rate of change is sufficient to prevent current flow. Thus, when the sinusoidal voltage applied across an inductor is at its positive peak, the actual current flow through the inductor is zero. As the applied voltage begins to decrease from the positive maximum, the back-EMF *increases* in response to this change, and is sufficient to send current flowing in the *opposite* direction. The relationship between applied alternating voltage across (e) and current through (i) an inductor is shown in Fig. 11. This relationship is expressed verbally by saying that the current through an inductor "lags behind" the applied voltage by 90°. The use of vectors can make this statement graphically, as shown in Fig. 12. The angle between the vectors *e* and *i* is called a *phase angle*. We can say that the voltage and current are "out of phase with each other by 90°."

A vector representation is also useful in describing the events in a circuit containing inductance and "pure" resistance. When an alternating voltage is applied at the terminals *a* and *b* of the circuit shown in Fig. 13, current flows, but not in phase with the voltage. This condition is a

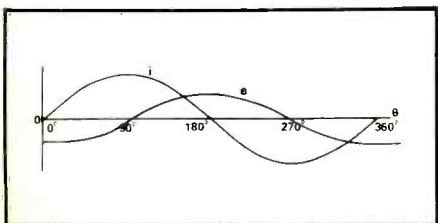


Figure 11.

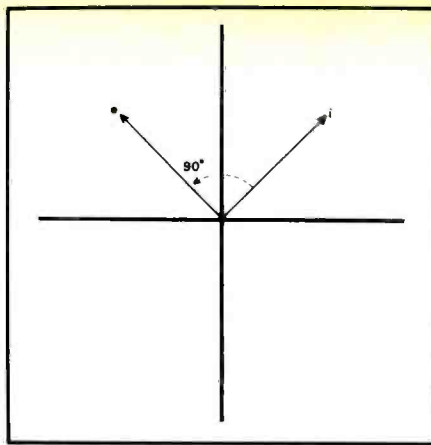


Figure 12.

result of the inductive reactance present in the circuit. The current is not necessarily exactly 90° out of phase with the voltage, either. The exact phase angle between the current flowing through the circuit of Fig. 13 and the voltage applied to the terminals *a* and *b* depends on the relative values of the inductive reactance and the resistance. The current at any instant is the same throughout the entire circuit, just as in a D.C. circuit, so it is in phase with itself. However, the voltage across the inductor will be 90° out of phase with (ahead of) the current, and the voltage across the resistance will be exactly in phase with the current. The result of this phase difference between the voltages across the two circuit elements is that the phase angle between the voltage applied at terminals *a* and *b* and the current through the circuit will be somewhere between 90° and 0°. If the inductive reactance is much greater than the resistance, the phase angle will be closer to 90°. If the resistance is greater the phase angle will be closer

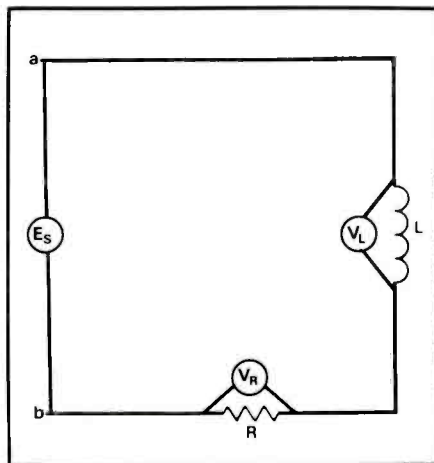


Figure 13.

to 0°. The formula for inductive reactance is:

$$X_L = 2 \cdot \pi \cdot f \cdot L$$

where $\pi \cong 3.14$, *f* is the signal frequency in Hertz and *L* is the inductance in henrys. From this formula we can see that X_L will increase with frequency and inductance. For a fixed value of inductance, X_L increases with frequency.

We can illustrate the relationship between resistance and inductive reactance in a circuit like the one in Fig. 13 by using vectors to represent the quantities. Since the voltage and current across and through the resistance are in phase, we can represent the resistance by a vector *R* laid out along the horizontal axis. The length of this vector represents the magnitude of the resistance. The current through the inductor lags behind the voltage across the inductor by 90°, so we can represent the inductive reactance by a vector X_L , laid out pointing straight upward. Again, the length of the vector represents the magnitude of the inductive reactance. The behavior of the circuit of Fig. 13 will depend on the actual values involved. Let us assign some values. Let *L* = 10 henrys, *R* = 6280 ohms, *f* = 100 Hz. First,

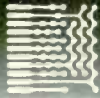
$$X_L = 2 \cdot \pi \cdot f \cdot L$$

$$X_L = 2 \times 3.14 \times 100 \text{ Hz} \times 10 \text{ h}$$

$$X_L = 6.28 \times 1000$$

$$X_L = 6280 \text{ ohms}$$

The vectors X_L and *R* are shown in Fig. 14. The total opposition to current flow of this combination of inductance and resistance is called the *impedance* of the combination. The symbol for impedance is *Z*, and the unit is *ohms*. Impedance can also be represented by a vector. The length of this vector will represent the magnitude of the impedance, and the angle between the vector and the horizontal axis will be the phase difference between applied voltage and current caused by the impedance. By moving a "phantom" projection of the X_L vector to the tip of the *R* vector, we set up a right triangle. The hypotenuse of this triangle represents the *Z* vector. The angle θ is the phase angle mentioned before. The elements of the right triangle shown in Fig. 14 are related to each other in the ways we described while wading through the swamp a while back. We set up an easy situation, that is one in which the X_L and *R* vectors are of



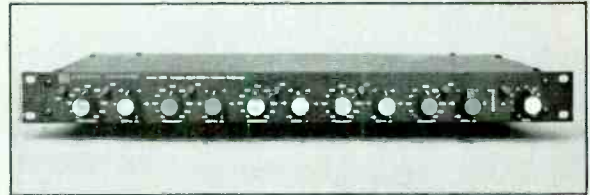
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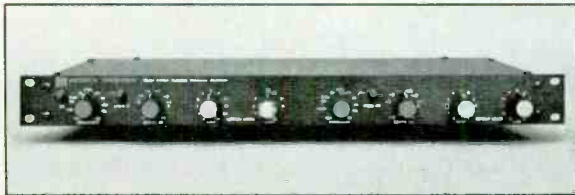
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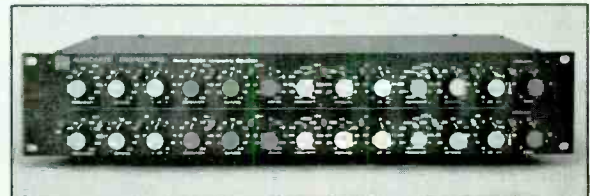
Model 2100A Tuneable Electronic Crossover



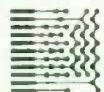
Model 4100 Parametric Equalizer - Preamp



Model 5200A Stereo Mixer/Preamp



Model 4200A Parametric Equalizer



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CIRCLE 47 ON READER SERVICE CARD

equal length, to avoid going through more involved calculations. Based on earlier triangular discussions, we can safely say that $\theta = 45$. To find Z ,

$$\sin 45^\circ = \frac{X_L}{Z}$$

$$0.707 = 6280 \text{ ohms} \div Z$$

$$Z = 6280 \div 0.707$$

$$Z \cong 8890 \text{ ohms}$$

We can see that the impedance of the circuit is greater than either the inductive reactance or the resistance, but it

is not simply the sum of these two quantities.

What about the voltage drops around the circuit? From our discussions of D.C. circuits and Kirchoff's Rule for voltages, shouldn't

$$E_S = V_L + V_R ?$$

This statement is essentially correct for a circuit containing inductance and resistance, except that the "sum" of the voltage drops in such a circuit must be a *vector* sum. Since, in a circuit with inductive reactance and

resistance of equal values the phase angle is 45° , the vector sum of V_L and V_R is E_S , as shown in *Fig. 15*.

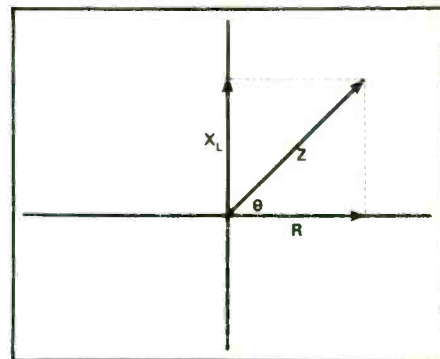


Figure 14.

In Part VIII we will use the vector representation introduced here to develop Ohm's Law for A.C., to examine circuits containing capacitance and resistance, and circuits containing capacitance, inductance and resistance. Finally, in Parts VIII and IX, we will use all of the information previously presented to describe the operation of a variety of devices that are encountered in audio practice. Such a description would become just a glossary of terms if we did not have the basic information that has been

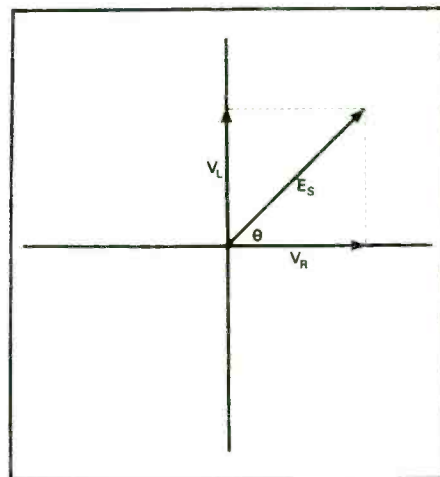


Figure 15.

provided in Parts I through VII. Any of our readers who have the slightest inclination towards a technical career future, at any level, will encounter the same topics that we have covered here. We hope that the Electric Primer series will give this segment of our readership a bit of a head start. For the rest of our readers, the information presented in the series (except the Math Notes) should serve as a meaningful aid in interpreting technical literature accompanying audio or other electronic equipment.



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XR-1200



XR-800



XR-700



XR-600



XR-500



XR-400

With the introduction of the XR Series powered mixers Peavey offers the touring musician a complete line of "self-contained" systems with professional features previously available with highly expensive and much less portable separate mixers, graphics, power amps, etc.

The XR Series has been designed and engineered with the latest computer aided techniques and the most contemporary solid-state devices available to create systems that combine mixer, equalizer, and power amp into a professional package that is as portable as it is versatile!

Six models, ranging from four to twelve channels are available. It would be impossible to adequately describe the advanced performance of the XR Series in this advertisement, but you can get all the specs and features (some of which we've listed here) by writing for our free, full color brochure on the XR Series. We'll also send you the latest copy of the "Peavey Papers" illustrating the entire line of Peavey Professional sound gear.

XR-1200

The XR-1200 represents our largest packaged mixer/amplifier and embodies totally new circuitry throughout. Each of the twelve channels features two separate "pre" monitor sends, full three-band EQ, a post effects send, unbalanced high impedance input, balanced low impedance input, in/out patching jacks, pre-fade listen ("Q") button, as well as a normal output gain trim and slide-type channel fader. The master section has been thoroughly thought out and includes all the usual master functions as well as PFL capability. A unique "SUM" channel has been provided to allow even greater flexibility. Four independent ten-segment LED VU arrays give an instantaneous visual indication of output signal conditions in both main outputs as well as both monitor outputs. The XR-1200 also features two full nine-band graphic equalizers utilizing the latest in active filter techniques to allow incremental control over the audio spectrum. These equalizers are fed from a complete patch panel with total access to most needed points

in the master circuitry, making possible many unique patching options to further enhance the versatility of this new unit.

The power output section of the XR-1200 is built around our field-tested and proven CS-400 circuitry featuring 200 watts RMS output power (4 ohms) from each channel. This rugged and field-proven design has been recently updated with our exclusive DDT® feature.

XR-800

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XR-700

The XR-700 offers versatility and features at a price that is unmatched in the industry. Each channel features totally independent "pre" monitor send, three-band EQ, separate low and high impedance inputs, and in/out patch capabilities. The master section features a full brace of master level controls, as well as a unique control to return reverb and effects channels back to the monitor mixing buss, enabling either reverb

or effects to be blended into the monitor system as desired. The master section also contains a complete patch panel enabling total flexibility and interfacing with external units including the ability to patch around, into, and out of the graphic and a low level input for effects return.

Separate seven-band graphic equalizers allow incremental adjustment of the EQ in both the main and the monitor outputs. A ten-segment LED VU array provides instantaneous and accurate status indication on both of the internal 100-watt RMS (4 ohms) power amps. Each of the internal power amps features our exclusive DDT® ("Distortion Detection Technique") compression circuitry.

The XR-700 is the powered mixer you have been waiting for.

XR-600

The XR-600 features six independent input channels and includes a separate "pre" monitor send, active shelving type high and low equalization, and a "post" effects send on each channel. Master level controls are provided for the main, monitor, and reverb return, along with a complete patch panel. A full nine-band graphic equalizer has been built into the system and utilizes the most contemporary active filter circuitry available.

The newly re-engineered 210-watt RMS (4 ohms) power amplifier features our exclusive DDT®.

XR-500

The XR-500 features five independent input channels and includes a separate "pre" monitor send, active shelving type high and low equalization, and a "post" effects send on each channel. Master level controls are provided for the main, monitor and reverb return, along with a complete patch panel. A full seven-band graphic equalizer has been built into the system, utilizing the latest active filter circuitry.

The newly engineered 130-watt power amplifier features our exclusive DDT® circuitry.

XR-400

The XR-400 features four independent input channels and includes a separate "pre" monitor send, active shelving type high and

low equalization, and a "post" effects send on each channel. Master level controls are provided for the main, monitor, and reverb return, along with a complete patch panel. A full five-band graphic equalizer has been built into the system and utilizes the most contemporary active filter circuitry available.

The 100-watt power amplifier of the XR-400 utilizes four high-voltage, high-speed T0-3 power devices bolted to a massive heatsink.

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The Peavey XR-500, 600, 700, 800, and 1200 have been designed with our exclusive "Distortion Detection Technique" circuitry that electronically senses the onset of clipping and automatically compresses the signal to virtually eliminate overload. DDT® effectively increases the apparent headroom of the amplifier thus maximizing every precious watt of power available while greatly prolonging speaker life.



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CHUCK



Chuck Mangione is an artist with a broad-based audience, and, consequently, his approach to sound tends to be a bit different than most of the other performers in today's marketplace.

This past winter, Chuck played at the Bob Carr Auditorium in Orlando, Florida, the last date in a series of 135 concerts. We're going to look at sound reinforcement for Chuck's show from three angles: the performer's, the sound mixer's, and the production company's. First, however, we'll look at the set-up and what it entails. The guiding force behind this smooth set-up is Ray DiBiase who acts as stage manager but who is also the owner of Northeastern Sound of Rochester, New York. (Ray has owned Northeastern for about five years but has only been on the road personally with Chuck for the past two-and-a-half.)

Northeastern is the production company for Chuck's tours and is responsible for all the lighting, staging and sound. Ray uses house systems only

CHUCK MANGIONE

BY BILL VERMILLION

when he has to such as the Hollywood Bowl concert that Chuck played this past year. Most of the time a house system isn't necessary and Ray travels with his own system. He stresses that the two main factors in his system are quality and reliability—and when you see his operation, you don't doubt him a bit.

The most noticeable thing about Chuck's approach to sound and performances is the complete organization and coordination of the crews and performers. No one rushes yet everything is done and double-checked with plenty of time to spare.

The speaker systems are all JBLs. A 4-way active system which in itself

isn't seen on the road that much, with most sound companies limiting themselves to three-ways at the most. The bottoms are K140s with two 15s in each. Two K140s are stacked on each side of the stage; on top of them are the lo-mids which are JBL 2220s. Two 2220s are stacked on the K140 stack and a third is positioned on the floor, just inside the K140s (pointing inward at a 60 degree angle). The mid-highs are handled by JBL 2440s—two mounted on each outside stack and two mounted on each of the 2220s on the 60 degree stacks. Finally, to cap the system off, are JBL 2405 slot tweeters. The 2405s are mounted three to a box, two boxes per side. They are

placed on the inner 60 degree stacks with one box aimed and the other at a 60 degree angle.

All the power for the speakers is provided by McIntosh amplifiers. On each side, the amp stacks include six MC2100s, two MC2300s and one MC250. The Macs are seldom seen on the road because they are both heavy and expensive, but Ray believes in their high quality and "utter reliability." He says one whole stack of amps fell over on stage recently and dropped four to six feet. They set them back and the amps went on as if nothing at all had happened!

Reliability is a main factor for a touring group, so even though the Macs are super reliable, Ray carries a spare for everything. "But," he says, "I've never had to use a single spare because none of the amps has ever failed." Basic power distribution is such that 100 watts of power is available for each 15-inch speaker in each of the K140s, 52 watts for each of the 2440s and 105 watts for the tweeters on each side of the stage.

Ray brings complete backdrops and lighting for Chuck's shows, along with a rather unusual stage floor—a black plastic dance floor. There are several reasons for its use but the main reason is that—being black—it helps control reflections. Aside from looks and lighting, however, it has several other



“LINE!”

important features. One is that the musicians have the same floor to work on each night, and that helps create some familiarity. It also helps “smooth out” poor stages. On set-ups, it helps keep the same layout each time. As a matter of fact, Ray at one time had tried marking the floor so every set-up could be identical, but, for some reason, it didn’t always work out so Ray dropped the idea. The back of the flooring is curved so that it can be turned backwards for fitting any stages with curved fronts.

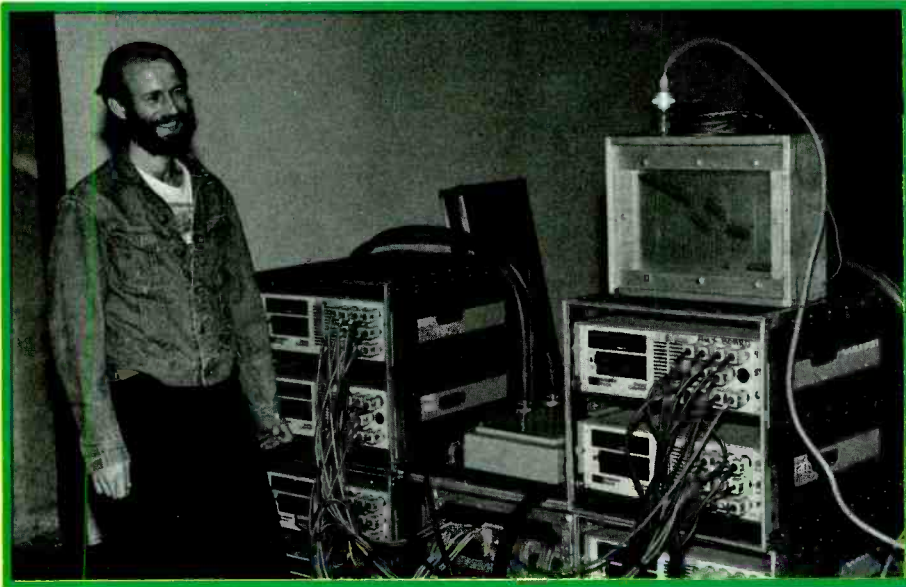
Moving on to the console, it’s an Ashly and is connected to the stage by two snakes: one 150 feet long and the other 250 feet. Ray’s opinion of the console is that it is one of the finest consoles ever made and that Ashly really shouldn’t have stopped making

piece of equipment that is very seldom seen on the road as part of a reinforcement system—an AKG BX-10 reverb system. (Chuck likes to feed reverb to the monitors when they are playing halls too “dry” for the horn players to relate to the acoustics.)

When a house system is used, the parametrics on the Ashly aren’t used and outboard parametrics are used to provide the greater control often needed when working with a system other than their own. The Ashly’s built-in, four-way, active crossover is used when using their own system, normally fed from the left. When using house systems, the feed is from the right. Although the Ashly is a stereo console, the shows are done in mono. According to Ray, only about ten percent of the audience would benefit and

For most halls Chuck plays, this system does no adequate job. “This system has seven 15s on each side and my other system has twenty-eight, but there is no way you could say the other system is four times louder than this one because you have a lot of phase cancellations and things of that nature.

“Most of Chuck’s concerts are 2500 to 5000 seat halls and this system seems to be just about right for Chuck, particularly since he likes intimate jobs, you know. I don’t really think he likes to be up on a big stage way out in the middle of a coliseum . . . but this year he’s been able to accept it much better since we carry our own curtain rig. When we put up our own truss, we can have our own black curtain from the downstage tree all the way back. We don’t have to use them in a place like this [Carr Auditorium] because the system is also designed to use a house system. When we pop up in a gym, we can set up our home system rig. That way, Chuck’s a lot happier!”



Stage manager Ray DiBiase with some of the lighting gear used for the show.

them. He purchased one of the first Ashly consoles made. The console has a 24/4 configuration plus a stereo buss and two sends. Amazingly, the board weighs only seventy-five pounds! The “metering” is all done with LEDs.

One of the nicest features on the console is the patchable four-band full parametric EQ. The EQ is patchable from the back of the console and the EQ controls are directly ahead of the mixer on the “meter” bridge. In use, the four EQs are assigned this way: number one EQ goes directly to the house and is used to EQ the system to the house; numbers two and three EQs are cascaded together to give, in effect, an eight-band parametric EQ, fed by the signals that go to the stage monitors; the fourth and final EQ goes to a

be able to properly enjoy a stereo mix in the theaters where Chuck works. The right and left sends are used on the Ashly to direct the feeds to more than one system at a time. For example, in a concert in Fort Lauderdale, before the Orlando concert, the right send was used to feed to a lawn area and the house system in that area while the left fed the main audience through a four-way crossover to Chuck’s system. (The Ashly console permits a choice of a four-way or three-way crossover.)

The above set-up gives the mixer separate control of both P.A.s from the console so “you don’t have to blast the people up front to cover the people in the other areas.” Says Ray, “It couples well together—it’s very efficient.”



Now let’s look at the system from the standpoint of the mixer. Larry Swist has been mixing Mangione’s sound on the road for about two-and-one-half years. He first started working with Chuck in the studio on the *Children of Sanchez* album. Larry’s background also includes work with Judy Collins, mixing the first Spyro Gyra album, tracking their second and doing the recording on the award winning *Chuck Mangione Live at the Hollywood Bowl* album. Larry feels the reliability of the system that Ray has put together is “awesome,” and he, too, is really in love with the Ashly console.

“The placement of the console in the hall is really critical because Chuck is really very concerned about being too loud,” Larry says. “Chuck is concerned with the quality of the sound, not the quantity. . . .” For the vocal mic, Larry uses a Shure SM-57. “It makes the voice sound right . . . it’s okay.” For Chuck’s horn, an SM-58 is used. This way, Chuck can use its proximity effect to help control the warmth of his horn for certain parts of his performances.

As far as the drums are concerned, Sennheiser 421s are used on the toms and the kick drum. The snare gets an Electro-Voice RE-15 while the hi-hat is

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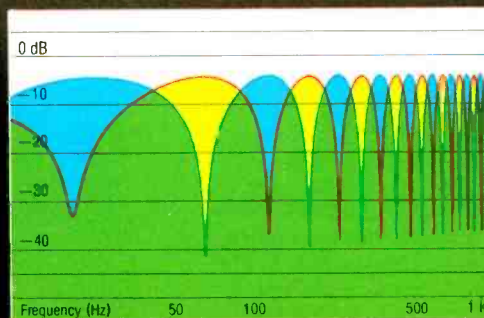
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Not only is the Stereo Chorus musical and versatile, it also provides a means of achieving realistic stereo enhancement. We've included two outputs with complimentary notches and peaks in the frequency spectrum. The exact frequencies which are notched in one channel are boosted in the other. The graph shown is an actual response plot of the two outputs, which illustrates this concept. The Stereo Chorus transforms tones, harmonics and sounds into a lush and shimmering musical environment which surrounds the listener. This differs from similar devices which have one processed output, and one dry output. The Stereo Chorus provides a true stereo image which sounds more vibrant and alive than conventional chorus effects.



The manual control varies the delay time; a width control determines the amount of sweep; and a speed control adjusts the rate at which the delay is swept. A bypass switch provides noiseless accessibility to the dry signal in both outputs.

The MXR Stereo Chorus is equally geared for the studio or the road. We've included

an internal switch which allows the selection of instrument or line level at both the input and output. Its high input impedance reduces the effects of loading when using long lines or other effects devices. Its low output impedance allows you to drive long lines and any other equipment. Superior circuit design has enabled us to maintain a wide bandwidth and dynamic range, ensuring signal fidelity.

The MXR Stereo Chorus is AC powered, ruggedly constructed to withstand the rigors of professional use, and is backed by MXR's reputation and commitment to the music industry. But reading about a product that has no equal is not enough. To appreciate what your music has been missing, see your MXR dealer.

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miked with an E-V RE-16. The drum overheads are Sony ECM-22s. The output from the set of Syndrums [electronic drum synthesizer] that drummer James Bradley uses is fed to a Music Man amplifier. The speakers of the Music Man are miked with a Shure SM-57. Larry says he uses the 57 as a bandpass filter to keep the spurious sounds that are generated by the Syndrums out of the system.

All the acoustic guitars are used direct. They are Ovation guitars with pickups in them. Sharp-eyed concert goers will notice, however, that there also are mics on all the acoustic guitars. These are for emergency use only and Larry indicates that he very rarely uses them.

Grant Geissman's electric guitars are fed into one of the four limiters that are built into the Ashly because he is a very percussive type player. Charles Meeks' bass is fed direct from his Ashly preamp. The preamp has a low-impedance line-level output designed for this purpose. He uses the preamp in conjunction with a Yamaha power amplifier, and a Yamaha analog delay line which is used quite effectively on his solos. Larry can take the signal right from the preamp and bypass his EQ since all the flanging and effects come before the preamp. This way, all the effects are fed to the P.A. before his amps.

This is the first tour on which Chuck has used an acoustic piano, and as of this writing it has only been with them for two or three weeks. As such, it's still in an experimental stage as far as miking techniques go. Larry has tried a lot of different mics including a few condensers, but invariably has encountered severe rumble and "trash" problems on the low end. At the moment, Larry is using an RE-15 wrapped in foam rubber and pushed into one of the frame holes just a bit higher than mid-way on the piano. Larry says it seems to work all right. Larry hasn't had a chance to use the PZM miking principles on-stage yet, but he is familiar with them as they were used in a Las Vegas recording studio where the group was doing some TV sound. The electric piano is a Rhodes; it is routed through a flanger and then to an MXR Phase 90. That feed is also taken direct to the console.

Chuck's horn is miked with a Shure SM-58, and the signal is split. One signal goes direct to the console while the other signal goes to a wah-wah. This

provides a straight and a wah-wah feed at the console. Larry says, "This way when Chuck kicks on his wah-wah pedal, I can mix the two signals in the proper proportion, because the straight wah-wah with the horn sounds a little odd. It's too much of an effect, actually, and you want some of the straight horn."

Sax and flute are played by the same person, Chris Vadala. Both his tenor and soprano sax are run through an MXR flanger which Chris occasionally uses on solos. There is nothing unusual about the set-up says Larry except that when Chris hits the effects you have to EQ the monitor a bit differently . . . but that's only because it tends to put a nice spike in the signal level." The feeds to the MXR are from a Shure SM-57. Flute is taken straight with an SM-58.

Larry feeds the P.A. and the monitors from his position about two-thirds of the way back from the stage. For the monitor mix, he has a monitor off to the side of the stage so the crew can listen and relay any needed changes back to Larry.

One of the most critical parts of the day for Chuck is the sound check. It's during the sound check that the levels and the sounds the musicians want in the monitors are worked out. Getting to know the feel of the room and getting the monitors sorted out is really one of the key things that helps Chuck's shows proceed so smoothly. The crew's monitor is used only to make sure that nothing has changed from the earlier soundcheck. It's also during the sound check that decisions are made as to whether the hall is dead enough to make use of the AKG BX-10 reverb necessary for the monitors. Says Larry, "Chuck is as concerned about the sound quality as he is about composing or playing." Larry's job is to make Chuck and the quartet feel comfortable on stage. From the console's twenty inputs used, Larry uses the four groups as follows: all the drums are grouped to number 1; the electric guitars are grouped to another bus and then that entire bus output is fed to one of the limiters; all the other guitars are put on one of the other submixes; and the fourth and final submixer is used for all the solo work.

Larry says the hardest, or trickiest, part is balancing the stage levels against the main system so that it appears to the audience it is hearing the stage and not the monitors.

Since Chuck's music is a combination of jazz and pop, the audience is composed of people expecting many different things. Because of this, Larry says, "We don't approach rock concert levels, so we have to make up for quantity with quality."

The cleanliness of the system was best demonstrated about four in the afternoon during the preliminary soundcheck. After getting the other musicians set up, EQ'ed and their monitor balances right, Larry started working on Chuck's horn sound. By the time Larry was done, even though we were two-thirds back in a 3000 seat house, when you shut your eyes, Chuck's horn seemed to come from a point about 30 feet in front of the console.



The final look at sound is from the artist's point of view. When asked what his approach toward sound reinforcement is, Chuck replied, "I think that I approach sound reinforcement—anything that has to do with sound—about as carefully as I approach the making of music in any other area, whether it's composing or playing. I guess when people ask what success has meant to me, I say it's meant being able to make myself more comfortable musically on stage for one thing. It wasn't too long ago, maybe three or four years ago, that we were flying by night, so to speak. I mean, calling up a place and telling them a very basic minimum requirement for sound equipment and microphones and just arriving. Then we'd have some guy out there who didn't really know our music or anything running the mix.

"I'm not a technical kind of person. I know what I like when I hear it. I couldn't tell you anything about speakers, boards, amps, frequencies, whatever. A whole lot of people know a whole lot more about that than I do. But what I do know is that, ultimately, we are out here to play music "live" for people. In the end, if the people aren't getting the sound good, then it doesn't matter whether I'm getting it good on stage or not, because the purpose of being out here is to play for the people. So you need an engineer who knows and understands your music and how you like your music to be heard. What I want the people to get out there . . . I want it to be as sim-

ilar as it can be to the sound that we make. I want the sound just as close as it can get to what we do out there . . . without anything really being changed except getting it closer to the people.”

When I asked Chuck why he used recording engineers to mix sound for him he said it was insane for him to rely on someone who didn't know his music or whose qualifications as an engineer were unknown. “My life is in his hands every night we play. I trust and count on Larry because I really have no way of knowing from on stage what the people are getting out there.” Chuck counts on his sound people to tell him if the group is asking for too much in the monitors—or what the limitations of a particular hall may be.

“You know you can get real bugged with the sound in a gymnasium, but if Larry tells you the delay is something like 8 seconds—or something like that—then there's not really very much anyone can do from a sound equipment point of view. I think Larry obviously has a very good understanding of how, through a sound system, to

ferent from a lot of other bands because, even though we use electric instruments, there's still flute, tenor sax, flugelhorn and acoustic piano. The acoustic instruments have to compete with all that power, or electricity, so to speak, so the monitor thing has really gotten to be a critical point.

“I really don't know, but I hear that most groups don't do sound checks; but we do them every day. I'm petrified if we have to do a concert without a sound check. I'm probably safer than most people, but still I'm scared because to me the sound check is the beginning of getting the feel of the hall. Giving Larry a chance to equalize the room and to get comfortable in the room. To get the equipment set up and for us to get with the music and the sound of the music in the room—so that at night, we can be comfortable on stage. There could be problems but at least we know what the place feels like. And we knew the equipment was working in the afternoon and we all agreed that we were comfortable on stage during the sound check.

CHUCK MANGIONE “LIVE” Console Assignments

No. 1	Vocal
No. 2	Flute
No. 3	Sax
No. 4	Horn (straight)
No. 5	Horn (wah-wah)
No. 6	Piano
No. 7	Bass
No. 8	Kick drum
No. 9	Snare
No. 10	Hi-hat
No. 11	Floor toms
No. 12	Right toms
No. 13	Center toms
No. 14	Overhead
No. 15	Syndrum
No. 16	Guitar
No. 17	Guitar
No. 18	Acoustic guitar
No. 19	Classical guitar
No. 20	Grant's vocals

properly on stage then that's the way it has to be. It doesn't mean the audience will get that [thin sound].

“I'm proud of the people I have. I'm proud of our sound company. I'm very proud of Larry in what he does and the way that he does it, and I think our equipment is sophisticated but not by any means extravagant. It's as simple as I could possibly keep it for me. Simplicity is something I admire in many areas. Some people may say that's trite, but when you see or hear something that's clear, then that's what's happening for me. I think that very seldom will we hear about people being 'assaulted' with volume in the house or people complaining about distorted sound or anything. I don't think that music should ever hurt anybody or that people should be assaulted by sound. I would rather have the person in the last row not getting as much of an impact if getting that impact means destroying the first thirty rows of people. Also, our audience is a very diverse audience—not just a young audience. Our audience includes everything from eight-year-old kids to people in their seventies and everything right through the middle. I know that if I go out there [into the audience] and sit down, I'd always rather be straining to hear something than not being able to turn it down.”

Chuck Mangione, Ray DiBiase of Northeastern Sound and Larry Swist, recording engineer—all very talented individuals with one real goal, and that's to make a concert sound just like a recording. And when you hear them in a good hall, you know they have succeeded.



Sound mixer Larry Swist in place behind the Ashly console.

make our music heard properly—and he certainly does that.

“I rely on him and Ray, or whoever else might be involved with sound equipment, to make those judgments about what needs to be changed or what our equipment should be or where we might be hurting. We didn't have a reverb unit in our system until just a little while ago, but we started running into some rooms that were so dry from a horn player's point of view.

“In our group, it's probably a lot dif-

“During the check, each member of the group plays his instrument for Larry in order to get the quality of the sound through the P.A. Larry also adjusts everybody's individual monitor as the player plays alone so that the player hears his own sound as close as possible to the way he wants to hear it. Sometimes that means that Larry has to make the stage sound 'thinner' than I would like to have it sound, but if that means that's the only way he can give me enough of me to be heard

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PROFILES



LARRY FAST

By Fred Ridder

Larry Fast has for some time now been considered one of the country's reigning innovators in synthesizer technique. He has programmed and played the synthesizer tracks on numerous albums including his own, the latest of which will be Games, on the Passport label.

Because the synthesizer is certainly one of the most used and most important instruments in today's music, Modern Recording's Fred Ridder took the opportunity to talk with Larry Fast about Fast's projects past and present, and about the state of synthesizers in general.

Modern Recording: Larry, you've gotten involved in several different ends of the music business—producing and recording your own music, and playing “live” and recording with other people—and I wanted to get your feelings on which of the various roles you prefer and why. I imagine that the Synergy records top the list?

Larry Fast: Yeah, I think they're closer to what I really want to do. Well ... I shouldn't really say that. They're *one* of the things I would like to do, and they're the ones at this point

that I have the most control over. There is the least amount of having to answer to other people about them, having to agree with people about directions and what not. Everything from the pure technological end of it right through to the production and the artistic end of it falls more under my control.

MR: So Passport Records gives you pretty much a free reign over it?

LF: Yeah, it's very free. On the *Cords* album they never really heard it until the mixes were done. There were little bits and pieces they heard along the

way, but it was pretty much just a case of it happening under my own control.

MR: You do most of your work out at the House of Music [recording studio] in West Orange, N.J.?

LF: Mostly the finishing up. That's the weird thing about an electronic album; it is so tied in between doing the writing of it, the programming of the instrument, the recording process, the direction the whole thing is going to take. It's all happening at the same time. The instrument doesn't really end at the Cannon connector going into the

board; it really continues right through, right onto the tape and even beyond that. It's all one instrument. That makes it very time-consuming at the beginning of the album when it's a matter of determining a direction and what course the record is going to take. I do a lot of that at home. I've got an MCI 8-track at home and some related equipment, and it's enough so that I can be real disorganized and slowly let it jell into an organized direction while I'm gathering thoughts. And I don't have to lose them and start over again in the studio because I can keep these first 8 tracks, or more of them with bounces. It's nowhere near a finished product, but it's definitely the core idea of the organization, and certain critical factors in the making of the record are already done. That happens to be a lot more time-consuming than the millions of overdubs because the overdubs are very planned out; they're organized and I know where I'm going with them. It's getting what the piece is going to be, where it is going to travel musically, where the sound is going to develop, what it is all going to be about that is the real time-consuming part of making the record. The decision-making.

MR: It would seem that with a synthesizer record you really have to have a very clear view of the whole picture before you even start.

LF: That's true. There's a lot of what you'd call "scratch-pad" work and editing just getting it all organized so that it's starting to form the way you want it to. If you start in on a 24-track machine doing that . . . it's not so much that having 24 tracks will get you lost, but you're going to wind up booking an awful lot of time at someone else's studio in order to do what the conventional musician would be doing sitting down with a piano or guitar—writing the songs. You're dealing with writing music in a much more expanded way. It's a lot more precise, but it's also a lot more time-consuming.

MR: Do you usually start out with a melodic idea or with particular synthesizer sounds in mind or . . . ?

LF: It depends on the piece. It happens a lot of different ways. I actually try not to restrict the way it's created to a formula. I try to keep it as free-flowing and open as possible in the ideas that are coming into it from the musical and the programming and technical points of view so that it doesn't get real structured sounding. It could be anything. It could be a sound that's going to suggest

some music, it could be some music that's looking for a sound, it could be an interesting concept of interfacing something with a synthesizer and maybe the kind of sound things that develop will suggest an additional music pattern. A lot of different things can generate it.

MR: On the last two or three Synergy records you've written all the tunes . . .

LF: Well, they're all original compositions, but some of the songs on *Cords* were co-written with Pete Sobel who played guitar synthesizer on the album. But there were no covers of anyone else's music.

MR: Right. Was that your choice?

LF: Yeah, another blow for independence! [*Laughs.*]

MR: Was it the record company's choice to do covers on the early Synergy records?

LF: No, it's something that just developed that way. There's always a little bit more recorded for the album than is necessary, and they just felt it would be good on the album. It wasn't any kind of battle. Only now there is even less involvement from Passport during the recording of the album.

MR: They've always seemed to be a real artist-oriented label.

LF: It's been pretty good. It's definitely the kind of label where people who wouldn't necessarily have [had] a chance to start a career, to explore certain areas in music . . . that kind of music doesn't fall into the format of a standard, commercial, hit-oriented label. It's the kind of thing Passport does sort of open up its mind to and listen to and allow to happen.

MR: How long does it actually take you to put an album together?

LF: Months! But again it's hard to put a time limit on it. The actual amount of time spent at House of Music once the album was rolling and once it had gotten past the initial stages was very short compared to most records; it was a few hundred hours right up to the mix. But by the time I hit House of Music, everything was very well planned. I knew what overdubs needed to be done; they couldn't be done on the 8-track, but I knew what had to be done. The amount of experimentation was down to a minimum because at that point the directions had been set. It was really just a matter of executing the ideas that I knew I wanted to carry out. It was less time in working that kind of thing out than you would find in a conventional album doing guitar overdubs or vocal

harmony overdubs or something like that. On *Cords*, the early part of the record, getting it on the 8-track, took some five months before I was ready to move into House of Music in a big way. It wasn't non-stop work because there were a lot of other things going on. I was doing some session work in between, some work at the studio not related to my own record and some computer work. The album that's just coming out now (*Games*) was a project I expected would take about three months, but in the meantime a lot of other things came up. Three of the more time-consuming were a Boz Scaggs project, an album that's just ready to come out now, Hall & Oates' *X-Static* album which came out a few weeks ago and Ian Lloyd's *Goose Bumps*. Ian was sort of slotted between the Hall & Oates which was slotted in around Boz which was bouncing in and around my own project. With all those things going on, it took about six months of time overall to get my own project together. It's hard to put a number of hours on that early kind of work because it's the kind of thing you can be thinking about while you wash the dishes and then an idea strikes you so you fire everything up and go to work for a few hours, turn it off and watch the news and the late movie and then go back to work. It's a much looser way of working.

MR: That's the luxury of having recording equipment in your house.

LF: It [working in a professional studio] requires a certain amount of discipline because there's that certain awesome spirit of being in the studio and knowing that the money is filtering through the work orders and that you'd better produce while you're in there. Some people work very well under that kind of pressure; I think I can work under either kind of pressure. But if it's at the early creative point, there's a certain point you just can't push it—the ideas are just going to happen when they're going to happen.

MR: How well worked out did you have things when you actually went into the House of Music to do the most recent album?

LF: Oh, it was pretty far along. If you listen to the 8-track versions of what made up the album—what became the 8-to-24 transfer, which is how it was worked, those 8 (actually it was 7 actual music tracks and one timing reference track) were just dubbed over to the 24-track—if you heard those 8-track/7-track versions you'd recognize every piece. It was very closely structured.



MR: Did you actually use any of those original tracks you did at home on the record?

LF: Oh, yeah. Sure. They're on the album. I guess every track on the album has parts which were from the original 8-track. In most cases it would be maybe not the lead lines and not the accessory sort of thing, but the fundamental sounds of the track, the things that would follow through from the beginning to end that would be on the 8-track.

MR: In other words, you had tracks worked out well enough on the 8-track that you could just use them rather than trying to duplicate them in the studio?

LF: Oh, sure. I mean there were a couple of times when I would listen to it in the studio and decide maybe I wanted a different sound than I originally thought, so I would go back and re-do it. But in that case again it is not very time-consuming; you can take twenty minutes to re-do a track, but if you try to write the track as you go you can end up spending the day.



MR: At the other end of the scale from the Synergy records is the session work you do. From what you've said, it sounds like you've been pretty busy playing sessions recently.

LF: Yeah, I've been pretty busy lately, although it varies a lot how much session work I do. I wasn't all *that* busy; it wasn't like the people that are firmly in the mainstream of New York session work. I never really got that involved in it. But there aren't that many people doing electronic music in New York either, so you end up being on call a little more than you might expect, just by default.

MR: Do you consciously limit the amount of session work you do?

LF: No, it doesn't really matter. It's just that the Synergy albums take a lot of time and the Peter Gabriel projects take a lot of time too, so that it doesn't really allow that much time to do other things. And I have to leave a certain amount of time to myself. Not so much just to relax—in electronic music you've got to keep up with the developments both in conventional electronic music and in computer development, which is something I've been working in. If you're going to sit down and write some software to do something, that can be as

time-consuming as doing another record sometimes. You've got to have the time for doing that which is going to be very constructive in the long run. Just doing a session . . . sometimes it's better just to take the direction I'm taking, just not be quite as available. I'm not looking to be very active in the sessions scene, it just seems to happen off and on.

MR: You mentioned working with Boz Scaggs. It's been quite a while since he's had an album out, hasn't it?

LF: To tell you the truth, I haven't followed Boz's solo career as closely as I might have. He's had some enormous success the last couple of years. This new one is going to be a very interesting record, I think. David Foster, who was producing the Hall & Oates record was doing some of the keyboard work and various related musical functions on Boz's album. And since I was doing the programming for Hall & Oates and David knew me, one thing led to another and I wound up working with him rather than the producer. We'd already developed a pretty good working relationship during Hall & Oates and that meant we didn't have the basic ground to cover that sometimes happens when you just pop in on a project. We were already into a kind of work flow and it led to some pretty interesting areas, some unique approaches to sound to be taken—especially on an album that is sometimes as mainstream oriented as Boz's is. It shows a different side of his attitudes. Just the fact that he let it happen shows that he has some pretty good instincts.

MR: You were called in mainly to do overdubs?

LF: Oh, yes, it was strictly in the overdubs. In fact, I guess it was near the end of the project—the tracks sounded pretty well together already. Strictly overdubs, keyboard and synthesizer, though it became predominantly synthesizer.

MR: You seem to have become something of a fixture in the Peter Gabriel band. I mean, you and Tony Levin (the bass player) were the only two musicians to play on both of Peter's records, except for Robert Fripp of course. How do you see your role with Peter?

LF: I don't really know how it falls into a pattern. I know Peter and I have a lot of very similar views on the future of

entertainment in general, music at the present and other forms as they are growing up and evolving. Peter's tremendously creative, and with his kind of creativity, which I've always respected, and the kind of technical background which I've been developing over the years, which he has sort of an affinity for, we complement each other in a certain way. Within Peter's solo career I guess there's a particular function I fill for him at this point, which is great because I really enjoy what he's doing. Peter and I really haven't talked about it that much. It's just one of those things where we're both there and working together and it always seems to work out fairly well. We're always pretty happy with it, but it's nothing that's very structured.



MR: Being involved with Peter has put you out on the road doing touring. Do you mind that?

LF: No, I kind of like it actually, or I like it with Peter at least. I've had other offers to go on the road, but so far I've turned them down mostly for time reasons. In this case it's different from most bands. It's a band, but it's not *really* a band. Everybody comes from a very experienced variety of backgrounds. In a lot of bands you kind of lose sight of what's going on beyond that band. The Gabriel entourage isn't like that; we're doing Peter because we want to be. Everybody's strong enough in his own field that he wouldn't be there if he didn't really want to be. It's not as if it's this band or nothing. Everybody's there because he likes what Peter's doing and he likes what his contribution to the total thing is. It's very stimulating in all the different fields we touch, and I think it will continue this way for a long time—as long as it seems to be a viable thing. I wouldn't say it's necessarily going to continue forever, or that it's going to be the only thing Peter does, because he's much too creative to be just a touring singer with a rock and roll band. It's hard to speculate on any of it, but at the moment anyway, it works out very well.

MR: Last year's Peter Gabriel tour ran what, about five months?

LF: Yes, about that.

MR: Did you find that that took too much of a chunk out of your own year?



LF: Somewhat, but not as much as it might seem. We didn't get back real often but often enough that I could maintain the contacts I needed to. I suppose it cuts in a little bit on some of my work—*Games* would have been done sooner except for the tour. But I think it has to be done. It's a matter of doing it that way or not doing it at all... although it is kind of a long time to be away. I'm not sure that a tour that long is ever necessary, or even desirable. I'd like to see things shorter in the future, but I'm not sure that the economies of the music business make that possible.

MR: But you basically enjoy touring?

LF: It's good to get out of the studio for a while. It keeps you from getting too stale, or at least it keeps *me* from getting stale. There are other people who can handle studio work continuously, but I need the change sometimes. I come in with a fresh attitude afterwards.

MR: Do you find it a challenge to play electronic music "live?"

LF: People have always asked about Synergy, and that to me is still pretty much an impossibility to take on the road at this point and be able to do it the way I would want to do it. With Peter, though, being one of the people in the band and not having to worry about being the whole rhythm section and doing all the lead work, it gives me a real good chance to do what I've sort of wanted to do within a band context, which is a textural thing. A few of the electronic show-offy things, but not too much of that. Mainly just building the sound of the band from within and without, the way I wanted to hear it. Peter seems to hear things the same way, which is why it's worked out so nicely, I guess.

MR: Then your musical role in the Peter Gabriel band as you see it is to add some sort of texture to it?

LF: I think so. To make it stand apart from what it would sound like without my role in it. Everyone is a real competent musician—they're all really great—and the band sounds good. Another musician, another licks-player, wouldn't change things as much as somebody who's building the sound of the band up in a more subtle, signature sort of way. When I want to get off my flashiness I can do that through a Synergy record, so I don't feel obligated to press that on the Gabriel band.

MR: One thing I noticed when I saw

one of the shows on the last tour was that you don't have the kind of up-front stage presence that most of the others in the band have.

LF: Somewhat by my own choice. Everybody in the band has sort of fallen into the role that they feel best with and feel contributes most to the band, and I think that's where I am. It constantly changes, we constantly reassess it, and it obviously changes from tune to tune. But for me it's more or less fallen into where I want it to be. I don't really like the pressure of being a performer, and Peter can absorb all the pressure of the star end of things and I can just enjoy contributing, and enjoy the excitement that a "live" show does have.

MR: What instruments do you use on stage? I seem to remember a multi-voice Oberheim up top on your set-up, but is that your primary instrument?

LF: No, not really. At the moment the two instruments that carry the brunt of the work are the Polymoog and the Prophet, the Sequential Circuits Prophet 5. A Minimoog and a whole lot of Oberheims, a digital sequencer and a few analog sequencers and some of the old Moog modular things cover most of the sequencing end of things along with a couple of Micromoogs. Those things do pop up in a few songs, but the basic, keyboard-oriented sound work comes off the Polymoog and the Prophet. They are so easy to get around on and change from sound to sound "live," especially the Prophet with its memory system, and the Polymoog just because it's a very quick, versatile instrument, that they seem to end up with the burden of the sound-making during the course of the show.

MR: The Prophet is a programmable unit, of course.

LF: Yes, completely programmable, with forty memories. It makes it much easier in terms of what I go through during the set. On the early tours there was an awful lot of patch-cord pulling, but that's down to an absolute minimum now. Now it's more a matter of keying the program you want and you're there.

MR: Yeah, I remember on the first Peter Gabriel solo tour you were a very busy man trying to get everything patched together and sounding right.

LF: We've cut down a lot on that. I've dropped a lot of equipment off the road that doesn't have to tour now. Lately

I've been trying to enhance some of the smaller computers to eliminate some of the bulkier, old, quirky analog and early digital sequences. One little microprocessor system can knock all of them off in a fraction of the space and with a great increase in reliability. It hasn't been road tested yet, but it's gradually coming together.

MR: Are you planning on using it on the next Peter Gabriel tour?

LF: Yeah. We'll see if it works and what finally develops.

MR: On the Prophet you just have to access the right program, but you have to operate the Polymoog in real time. How do you approach it? Do you monitor over headphones?

LF: No, it's more a matter of working from a few starting points, presets if you like, and working off them. They're approximations I start with and just fine-tune within each song. The Prophet has managed to take over a lot of the more exotic sounds that I used to go crazy with on the Polymoog, using little masking tape marks just to catch the proper equalizer points. It's got a lot of awfully tiny controls which require some fairly fine settings. I've managed to take the *very* complex sounds and throw them on the Prophet and allow the Polymoog to handle the more expansive orchestral sort of sounds which aren't as critical in their settings. Again, it just means less work on stage.

MR: How do you approach the process of finding sounds? Are you just looking to find interesting sounds or do you start with approximations of real instruments? Or does it vary a lot?

LF: D. All of the above! It depends on what a particular song suggests. With Synergy it can go anywhere from very traditional simulations right through to unheard-of sounds. Within Peter's music and the material he's writing, he doesn't write any two songs the same either, so again there's total variation. There are certain things which suggest a type of sound which might have been realized through the use of a Mellotron a few years ago. We're expanding on that, we're using a starting point of conventional sounds altered at one level and then altered again electronically on another level, and ending up with something orchestrated and orchestral, but not quite. Other things are totally different, very unconventional sounds.

Sometimes Peter's music will suggest that an electronic cliché may be in order; not a cliché as a cop-out, but because it suggests a particular musical role, because it works. Again, it's a matter of keeping everything very open and trying to assess it at the moment. It's this kind of thing, I suppose, which falls somewhere between being a producer and an arranger and a programmer and just being a musician. I guess that's what electronic music gives you the freedom to do or the pitfalls to fall over with. It's a matter of what you make of it.

MR: When you work with Peter, where does your role actually fall? Do you get involved in the production of it in a sense?

LF: In a sense. More so on this album than on the previous ones. Robert Fripp was the producer, so when it came down to it he had the bottom line say on what was really going to happen. It wasn't any of the musicians involved, and in many cases it wasn't even Peter. No matter how you approach it, no matter how close two people are (or three people, or four), nobody's ever going to hear things *exactly* the same. There are things I would have done differently if I had been producing the record, and if Peter was the one producing the record, *he* would have done them differently. And there are differences between the first album where Bob Ezrin was calling the shots and the second album with Robert Fripp in control and the new album. I think that's one thing that makes it all the more interesting.

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MR: On your own projects, the Synergy records, you of course produce yourself. Do you also do the engineering yourself?

LF: Yes, it's just easier. It saves time if nothing else. I can do things as quickly as I can explain to someone else what I want, so I might as well do it myself. It's one less person in the control room. It's not through hatred of any engineers, it's just simpler. And again, at what point do you cut it off and say that the instrument ends here and the recording process starts here. It doesn't really work like that because the instrument itself is nothing but a collection of sound generating devices and filters and controlled amplifiers and such. What's so different

between a VCA and a VCA-controlled fader, or between some kind of resonant filter and a parametric equalizer? They really aren't that different. Right to the point where it's going on tape it's all part of the same sound chain. It's making use of all of that, even if it's over-driving the tape to distort it for effect. It's all part of the electronics of electronic music.

MR: When you record do you try to get pretty much the final sound at the output of the synthesizer and not process it much on the way to the tape or . . .

LF: Maybe about $\frac{2}{3}$ and $\frac{1}{3}$, something like that. I'll use delay lines, flangers, phasers, even in some cases things like limiting and compression to work with the limitations of some of the sounds — to get them where they should be. It's sometimes just a matter of convenience because you could take an envelope follower and a VCA and patch it up and make yourself a compressor or limiter, but if you can just plug into a compressor that's already there with the right knobs it just saves a little bit of time. You're going to end up with pretty much the same effect. It's more a matter of knowing what you're going for and how to get it rather than how you actually do it.

MR: How about equalization? Is that done primarily within the instrument?

LF: Again, it would be a little bit of both. You run into certain limitations in the instrument. Something like the Moog wide-band filter bank may not hit all the frequencies you might want to control. Sometimes a parametric gives you a little more freedom.

Actually there are some developments that have come up in studio technology that weren't there when the analog synthesizers were first developed. Things that weren't economically feasible to package and sell in the late 60s and early 70s that now you'll find in every studio. Delay lines and phasers and flangers and Harmonizers and all those goodies do wonders on an instrument that is inherently . . . I wouldn't say so much lifeless, but it has its own sound; it's a non-ambient sound machine. And putting that ambience in, I think, is a very critical part of what the sound is. There's more to it than just that raw, dry sound. That whole character of the sound comes from more than just where the filters are and what the

waveshape is. It's the environment in which that sound is created, and generating that electronically and having that under control is a very exciting part of electronic music. So I make a lot of use of that — electronic echo chambers and all the digital delay lines and whatever I can get my hands on. When you think about it, the albums have a lot of depth, which I shoot for, a lot of varied depth and a lot of imagery going on in them and it's all generated artificially. That is if you want to call that artificial — it's actually its own reality. It's a controlled, studio-generated reality.

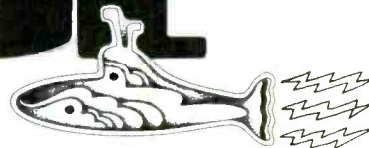
MR: On the subject of putting space and ambience into the records, every engineer has his own favorites as far as what types of echo and delay he uses. What do you find that you fall back on most often?

LF: I think it ends up with a lot of different things. One of the differences in doing electronic albums — I guess that this is a kind of a roundabout way to the answer — is that there's obviously more than 24 tracks going on which means that there's an awful lot of bouncing done. When I do a bounce, when I take my six or eight tracks, or whatever it amounts to, and get them down to a stereo pair prior to mixing, I'll actually put on all of the fixed delays that are going to go on it. It's like a mini-mix in itself. It's not a conventional "bounce them together dry, flat" kind of bounce; it makes use of virtually all the EQ that's going to go on it and all the delay lines. I don't put the chamber echo on it at that point because that's something that's very easy to misjudge early on.

MR: Right. Echo can be really deceptive in isolation.

LF: Yeah, it's very tricky to do that. But all the tape delays, all the digital delay lines, all the Harmonizer effects, all the pitch change effects will go into that stereo pair. I'll end up with a little mini-mix which will have everything but its chamber sounds or Aphex or other kinds of enhancements that may go on it in the final mix. That means that there is no standard fall-back. It also means that the first and second and third mini-mixes will have a lot of different delay times, a lot of different effects going on. If you were to try and do a conventional mix that way, you'd wind up with a stack of about fourteen delay lines all set to different times.

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MR: That's not to say that that hasn't happened. . .

LF: Not that it hasn't [*Laughs*], but I find it easier this way. It also means that the final mix goes a lot more easily. The way it ends up I usually have about eight or so stereo sub-mixes which just have to have their gains ridden, and a group of accessory tracks — percussion and that sort of thing. It's mostly a matter of a little bit of touch-up EQ here and there, what kind of chamber echo to add and where and maybe enhancing a little . . . a bit more delay here, tape echo there and so on. But for the most part, the hard work was behind me by the time it came to the mix.

In answer to your original question [*Laughs*], there is no one fall-back I have. I find the Eventide Harmonizer to be very useful because you can leave it plugged in and punch up a couple of delay times and try out the Harmonizer detuning effects easily. If you find that the required delay time isn't available on the Harmonizer, it's easy enough to plug something else in, but it's real good for getting a quick sketch of an idea. Usually I leave one cue bus on the console going into a Harmonizer and then a flanger. That way I can just punch them in and try a variety of things. Just leaving it set up means that you're not spending a lot of time and losing the musical idea because you've got to find the patch point to set something up. It's just a matter of expediency.

MR: Is the studio you used at House of Music automated?

LF: Yes, both rooms at the studio have MCI 528 consoles which are automated.

MR: Did you use the automation to a very great extent?

LF: No, I found that I didn't. On the first two albums I used the automation all the time, but now I don't use it nearly as much because the sub-mixes make it so much easier to get around. It's now more a matter of storing the mixes for reference rather than relying on automation as essential. On the first two albums there wasn't nearly as much sub-mixing done and it really would have been crazy without it (automation); there would have been no way to get through the mix.

MR: I imagine that if you had every-thing on submixes, the automation func-

tion you used most was grouping.

LF: Grouping made it easy, although the grouping was more or less done already when you think about it. The sub-mixes were their own groups, but I did use the group fader for one fader instead of two.

MR: Just of curiosity, do you ever use actual tape flanging?

LF: No, I haven't *yet*. It's one of those things where whenever I've said "Oh, boy, let's set it up and try it," there's always been one of the two machines aligned for the wrong speed or something. I guess you could call it laziness; I hate to own up to it, but it is. But actually I don't find myself using flanging that much, either. It's something I've always been leery of as being too easy to become clichéd, and I've tried to stay away from it. I try to build my depth and spread — stereo illusions — more out of delays, just different time constants, and a little bit of controlled phase. That's "out of phase," not sweeping phase, using the phase error to generate an image psychoacoustically. I haven't really used that much flanging; when I've used it it's been as an occasional "zound" of its own, and whether it's been traditional flanging or digital or analog simulation for flanging, it's been just a sound. It's just another of the vocabulary to be dealt with.

MR: One thing I noticed on the new album, Larry, is that the percussion sounds are much more prominent than before, even to the point of a short synthesized drum solo on one tune.

LF: Yeah, I'm just getting better at it. No, you know what? The secret is that I had to build something for it this time. I borrowed a waveform analyzer that my brother had and took a look at what some real waveform transients looked like in the time domain. Then I started cranking up my envelope generators, good old ADSR-type envelope generators, and timing them. I found that a pretty reasonable snare drum hit takes about 0.1 milliseconds or less down to a few hundredths of a millisecond to reach from its baseline zero to the top of its "crack," its initial transient, which is of course what gives it that snapping, cracking, percussive aspect. When I looked at the envelope generators on all my equipment I was appalled at how long it takes for a theoretical zero at-

tack time. A zero on the knob on the Moog modular things came in about 1 millisecond to about 2 msec. depending on the module under test. You're talking about a significant delay at that point.

MR: It's almost two orders of magnitude slower!

LF: Yeah, it's *very* significant. Because it's a slow rise, because it's not an instant peak, that's why rather than a "crack" the standard snare drum patch makes more of a "chiff" kind of sound which is your clichéd electronic music drum sound. The Moog modules were about the worst, which I expected since the actual designs for them date back 12 or 15 years, but nobody made it quicker from 0 to a +5 or +6 volt level in much under a millisecond. So I built myself a little spike generator to give myself a front end on my envelopes. A timed spike generator with an instant transient and a controlled decay. I got it down to about 0.1 milliseconds up to full voltage and then I started hearing "cracks" coming out. It turns out that if you just take the spike and deal with it as a signal itself rather than as an envelope voltage, it does a pretty nice bass drum once you roll off a lot of the top because it gives you that initial "thump." You just feed it in with a little bit of sine wave for after-ring and you've got a pretty punchy bass drum. Well, it's not *really* a bass drum. If you A-B any of these things that sound like drums with real drums, there's still a pretty significant difference. There's a lot less going on in the electronic ones; the real ones are very complex sounds, but it's hard to appreciate how much is really going on until you A-B them with a good simulation. But whatever the case, they are now valid rhythmic devices, whereas before they could only be accessories — they didn't have the punch, the crack, the drive to them. When I got this far with the percussion, then I realized I could do a few things with it that I wanted to try. It's part of a continuing evolution and it will continue to get better. These *are* experimental albums. That's something not to lose sight of. Though they are an attempt to be musically creative, there's still a degree of experimentation and each one shows the growth over the past ones both in the musical realm and in the technical realm. There are times when



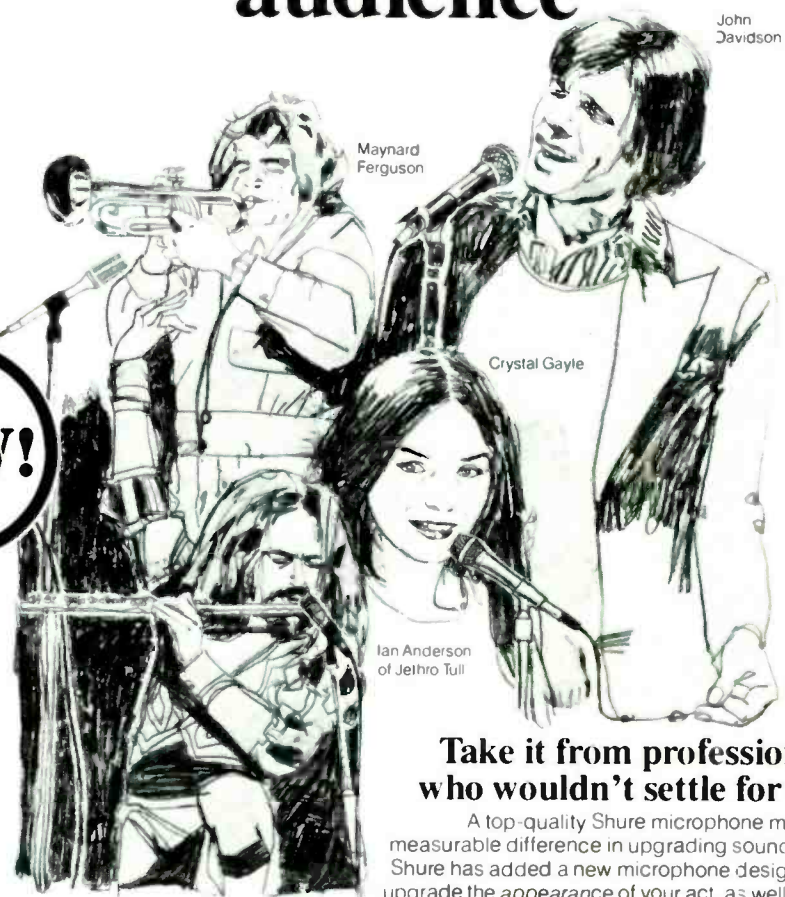
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increasing technology allows new musical ground to be covered.

MR: Speaking of increasing technology, you mentioned electronics echo a few minutes ago, by which I assume you mean digital echo. Have you used some digital echo units that are out now?

LF: Yes, I've used several of them. They've all been pretty exciting, the whole series. I've also been working at home on a system that's still not running, using an Apple computer to do the same thing; the software's written but the input and output devices haven't been built yet.

MR: It seems that everybody who has any kind of digital delay line either has or is hard at work on a digital reverb or echo chamber.

LF: The price for developing a system is down so drastically the last couple of years that you now can go to Radio Shack and buy the parts for one. The real nice thing about digital systems is that once you have the hardware end of things together and set your basic parameters, it's mostly a matter of programming. And then it's all how high you set your standards.

MR: Right. And with microprocessors getting cheaper almost by the day, we should be seeing more and more sophisticated digital audio devices.

LF: It's also the whole future of electronic music, too. Just like analog recording, analog synthesizers will not go away, it's going to be an art in itself and it's going to continue. But the real advantages in synthesis, I think, will happen digitally. And there you'll find that digital synthesis and digital recording will be even more closely fused than analog synthesis and analog recording because it's virtually one and the same at that point. Whether you're creating your sound as a digital algorithm of what you want that sound to be or just recording it as a digital template of an existing sound, the alterations become the same and the whole system becomes one huge, very complex, but very controllable system of the very highest quality.

MR: Larry, I know that a year or so ago you were doing some work in digital synthesis at Bell Laboratories. With your busy schedule has that work fallen by the wayside?

LF: No, no. Some of it even found its

way onto *Games*, the new Synergy record. Two tracks were done partially at Bell. It was Hal Allis's project originally, the digital synthesizer that was created there, and a guy named Gregg Simms did most of the really intricate systems programming. It's still very time-consuming—quite a few nights there to get very small pieces of music—but they do sound quite amazing. It's an exciting thing to be involved in it. It's part synthesis, part digital recording, part computer sciences, a lot of different things. A lot of the future sound sciences are involved in it.

Since then I've also been involved with a guy named Peter Vogel who has developed something he calls the Fairlight CMI—Computer Music Instrument. He's based in Australia. He's developed a system at a fraction of the cost of the Bell Labs system (although it's priced more like a piece of major studio equipment than a synthesizer) that has many of the same capabilities. Of course it's not as flexible; it couldn't possibly be as flexible as the humongous arsenal of computer equipment available at Bell. But in terms of being musically functional it covers $\frac{3}{4}$ of the ground that can be covered before it runs out of steam whereas the Bell Labs machine gives you the last 25% that are truly exotic. Peter Vogel made the instrument available to us for the Peter Gabriel album and it enabled us to do certain kinds of digital processing of real-world sounds like pitch-change processing. It's sort of the world's ultimate Harmonizer. When it's loaded with the right real-world information it makes it into sort of an instant Mellotron, but far beyond. It digitizes a real-world signal and then you can give it pitch information polyphonically, and eventually you can reshape the waveform. (There's still a lot of software to be written.) It allowed us to use some of the latest digital synthesizer techniques on Peter's album without the kind of time-consuming, painstaking detail work that's required on the laboratory-based instrument. It doesn't have nearly the research capabilities of the Bell unit, which is what makes it so exciting as a learning tool as well as a creative tool. The Fairlight is much more a viable instrument, with its own limitations, but also with quite a bit of flexibility, much

more than most of the analog machines have, but it's not as educational.

MR: How is the Fairlight designed operationally? Is it cumbersome to operate or can you approach it in the same intuitive kind of way as an analog system?

LF: The way they've designed it there's a mainframe with a CPU (central processing unit) and a disc drive in it, there's two musical keyboards, regular synthesizer keyboards, a CRT (cathode ray tube) display with a light pen and an alphanumeric keyboard. It looks a little like a computer terminal, which is exactly what it is. The software for the system, which is on the discs, brings up an operating program which allows you to pick one of several different ways to use the system. One way is to draw in on the CRT one cycle of the fundamental, amplitude versus time, and then tell the machine to add whatever harmonic structure you want with all its amplitudes. You can create a sound by additive synthesis that way. You can also just draw in the complete waveform with all its jagged peaks and smooth parts and the machine will compute its harmonic structure from what you've drawn in. A third way—which they're still writing software for—is sort of an analog system emulator which gives you a CRT display that looks like an old EMS pin patch matrix which you just hit with the light pen to cross-patch, and later there will be pictures of sliders which you just draw in the position of the knob on. This way the synthesizer can be operated in real time very much like an analog synthesizer can. But when you use the digital system in its more realistic mode of adding harmonic structures or setting it up for any kind of FM synthesis, that's where it really starts to shine and show off a lot of capabilities. It's a nice system, all done with microprocessors, which aren't normally fast enough for digital synthesis, but if you don't give each microprocessor too much to do they're just quick enough to do it. Its real work interface stores real world sounds which allows you to do analysis. It serves somewhat as an educational tool; you can use it sort of like a storage oscilloscope to see what the waveform was and then play with it and see what it looks like after it's been altered.

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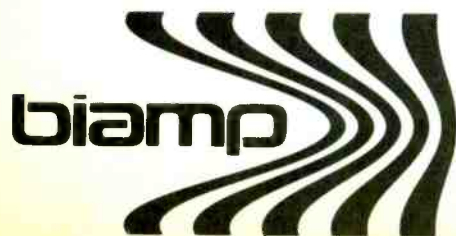
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MR: So, for example, if you had some sound you liked, even one from another synthesizer, you could feed that signal into the CMI, store it, look at it and then play around with it from there changing waveshape and giving it any pitch?

LF: Exactly. And the software is growing constantly; they've only got the most basic software done for it now. It's been very well thought out, what they've done. There have been several false starts in digital synthesis and I think that this is the first one to really grab it in a usable way, just to blow

MR: At this point the system is primarily for studio use, I take it?

LF: It could be used "live" if you can afford it. Actually it lends itself very well to "live" use because all of the storage of a sound, all the complex parameters that go into making a sound, are stored digitally very much the same as a Prophet or an Oberheim OBX or any of the hybrid analog/digital synthesizers which store the parameters digitally but generate the sounds analog. There's not a whole lot different on this; it's just a matter of popping on a disc drive with the sound library and calling them up. The system is very small, very functional. It's quite a lot smaller than the big analog machines, and I think it would lend itself just fine to "live" use.

MR: That's something to look forward to.

LF: Definitely. You know, I think it's really interesting how closely related digital synthesis is to digital recording. In fact it's like half of digital recording, the back half—playback only. You sort of break the code of what happens when a real world sound is digitized; you take what the numbers are and try to break the code and figure out what you would have to plug in from nowhere to get the sound you want. It's going to be a whole new art form. It's going to change a whole lot of synthesizer programming skills because it doesn't allow for much knob-twisting to see what you get as analog synthesis does. It requires a more solid approach, a fundamental approach to know what you're going for.

MR: That's interesting. It's going to have people thinking in Fourier analysis terms...

LF: Or Walsh functions.* It's the same situation with digital recording. You're going to have to watch what

you're doing and there are going to be new techniques and skill to be learned. It's going to separate some of the men from the boys.

MR: Do you think that mixing consoles will continue to keep their familiar analog form with digital recording or will we see new mixing hardware which manipulates the digital-encoded sounds numerically?

LF: I think eventually the system will be digital from the microphone output back to the playback amplifier input, because it's really one system. I don't see it as a digital tape machine and a digital mixing console; it's really just one big controlled storage device. I think that the whole thing with digital tape machines is slightly ludicrous anyway. If tape was the most effective way to deal with digital and manipulate it and alter it, then computer designers would never have developed disc drives for mass on-line memory. Tape makes nice sense for dumping off to data cassette when you're done with the session, but you need the data on-line and rapidly retrievable with random access, and tape is not a random access medium.

MR: That's for sure. Tape also has a number of other shortcomings which all of us should be at least slightly familiar with, but I think there is a sentimental attachment to seeing reels of tape turning on the recorder in the studio.


LF: There's a couple of tape manufacturers who realize that. Selling data cassettes can't be as profitable as selling 1-inch high energy, low drop-out digital tape, and if you establish tape as the medium now in the early days, you've assured yourself of a market for a profitable raw material for some years to come. If you really look at it you realize that you could go out to any number of manufacturers and get a couple of disc drives and design a system with lots of tracks, maybe up to a hundred or so with a couple of disc drives, maybe thirty minutes of program capacity, 15-bit quality, very little drop-out

* Fourier analysis is a mathematical principle which states that any repeating signal or periodic waveform can be expressed as the sum of some particular series of sine wave. Walsh functions and Fourier analysis are powerful tools for mathematical analysis, but there is not great practical use for them. In this context, their mention is of a tangential and theoretical nature.

problems, random access... the world's ultimate, disc-based recording system for less money than the multi-track digital tape behemoths that don't have editing. You could SMPTE-code the whole thing and dump it off to data cassette or floppy disc or half-inch computer tape if you need to take it out of the studio. Cost-effectively I think it makes far more sense to use technologies that have been developed over the last thirty years than to start getting together new ones that will continue to sell tape. I'll probably get boycotted now for saying this. [Laughs.]

But I imagine we'll still wind up with lousy sounding recordings because people don't mic instruments properly and so forth, and digital electronics will get the blame when that's not really where the problem is anyway.

MR: That's always going to be the problem. You may have the best equipment technologically, but if you don't know how to make a good sounding record in the first place, and if you don't have the musical end of things together, too, you're no better off than if you had a Wollensak in your cellar.

LF: Sure, it's no better than the people operating it, no matter what it is. It's all a matter of using these things properly. They're just tools; it's just that the tools keep getting better. You could go out and buy a \$100 saw and still build crooked bookshelves, and it's the same thing with the most advanced audio equipment in the world. If it's not being used correctly it's still going to be terrible. I think that that's one of the things that has plagued electronic music throughout its short history. There's been so much misuse and abuse of it that it's often gotten a very bad name as "cold" and "inhuman" and "improper" and "buzzy" and "bleepy" and all the other disparaging terms that have been thrown at it. Almost entirely I think it's not the instrument's fault. There's not a whole lot of difference between a synthesizer that's making use of 50s and 60s solid-state technology with a little 70s control technology and a trumpet which uses steam engine valves. It's the technology of another era... but it takes people learning to use it to make it into something artful. You can't blame the instrument for the user not being able to handle it. 

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Ambient Sound

BY LEN FELDMAN

Audio, Video, Digital, Incompatibility and Such

The battle lines are forming! As of this writing (and, of course, things could change drastically by the time you read this), it looks as though there will be three major contenders in the videodisc race, each of which could and probably will develop an equivalent digital audio disc that is an off-shoot of the basic videodisc technology supported by each of these contenders. In addition, we have already had announcements for some time concerning a fourth disc which would be intended strictly for digital audio information storage and not for video at all.

If all of the above sounds very confusing, it is. And that's one reason why I thought it would be a good idea to pause and review some of the basics relating to these conflicting information storage systems. In this country, at least, it is unlikely that various competitors within the video or audio industry are ever likely to get together and decide upon a *single* video disc system or on a single digital audio disc system. Federal regulations being what they are in the United States, any attempt to come up with a single system (however beneficial we technical types might think it would be) would be regarded by federal agencies who worry about such things as a clear violation of free trade and a flagrant attempt at monopolization.

That being the case, it will probably be left up to the public to decide which, if any, of these systems deserves to dominate the field in the future. But that public consists of you and me and others who are more deeply involved in audio and video technology than might be the man or woman on the street. So, it's especially important that we understand the differences between the various proposed systems, the limitations of each and even the present availability of software for each of them.

An audio columnist who writes about sound for the lay public in one of this country's most respected newspapers recently attempted to describe the situation vis-a-vis digital audio discs and videodiscs. Like so much else I have read, this columnist repeatedly confused terms and referred to the videodisc as a *digital* video disc. If you think about it, there is nothing "digital" about any of the videodiscs demonstrated

thus far. They are purely analog storage devices, though admittedly their bandwidth potential is greater than that of any previous disc. It is this very bandwidth capability (extending, as it does to beyond 4 MHz) that makes any *video* disc system a perfect candidate for digital *audio* recording. But the videodiscs that have been proposed thus far are all *analog* in nature while their related audio counterparts employ digital storage techniques.

The Different Systems

The only videodisc currently being offered to the public (and, at that, only in selected market areas) is the so-called "laser-optical" system jointly sponsored by Philips and MCA. Since Philips now owns the Magnavox company, it is that company's Magnevision logo that graces the machines that fall into this category. To date, no audio-only version of this laser-optical disc has been shown or proposed, but there is no reason why one could not easily be developed, given the present state of technology. Whether in an audio format or in a video configuration, the optical laser disc has the advantage of not requiring any physical contact between its "pickup" and itself. This purely optical system, therefore lends itself to still-frame reproduction, slow-motion, frame searching or scanning and a host of other conveniences and special effects. Perhaps most importantly, since there is no contact whatever between the pickup and the disc, there should be no wear or degradation of signal quality (either audio or video) regardless of the number of times the disc is played. (It should be pointed out that in the videodisc version of this format, the audio channel is purely analog, not digital, and no provision has been made for stereo or two-channel reproduction as of this date. From a technical point of view, however, it would not be difficult to incorporate two-channel capability into this system, even if the audio channels remain purely analog in format.)

Opponents of the optical-laser system point out the high cost of the player (what units there are available in limited market areas are retailing for well over \$700)

and the critical alignment or adjustment of all the optical elements which are incorporated in this sophisticated system. There are those who maintain that part of the reason for the limited marketing of the first generation of laser-optical discs is the fact that their manufacture involves such critical operations as to preclude mass production—for the present, at least.

Which brings us to the other major American contender in the videodisc sweepstakes, RCA Corporation. RCA, judging from most recent press releases, has now decided to promote its system heavily. To support its system, RCA has entered into certain agreements with CBS, which may put this combination in a good position with respect to program material, both video and audio. As for the RCA system, it seems crude compared with the MCA-Philips-Magnavox effort. The disc itself has familiar grooves which, though much more closely spaced than the grooves in a conventional audio disc, are required to hold a pickup in place as the disc spins at hundreds of revolutions per minute. Instead of “wiggles” in the grooves, however, there are conductive “pits” beneath the surface of the disc which serve as the complementary plates of a capacitor, the pickup itself forming the other part of the capacitance arrangement.

By requiring that a “stylus” of some sort ride continuously in a spiral groove, RCA precludes the possibility of achieving any of the special effects discussed earlier, such as stop-frame action, slow motion or frame-by-frame advance. In addition, the contact between stylus and disc groove means eventual disc wear. Benefits cited for the RCA system, however, are lower cost of the playback equipment, as well as lower cost of the software. It is argued, too, that most people who become interested in owning a videodisc player will want one simply to be able to watch a variety of program material in a totally conventional fashion and that not many would be prepared to spend several hundreds of extra dollars for the “special effects” capabilities already mentioned.

As in the case of the optical laser system, the RCA system lends itself to digital audio reproduction, though as far as I know there have been no demonstrations of a digital audio disc using the now finalized RCA system, which is known as a capacitance pickup system.

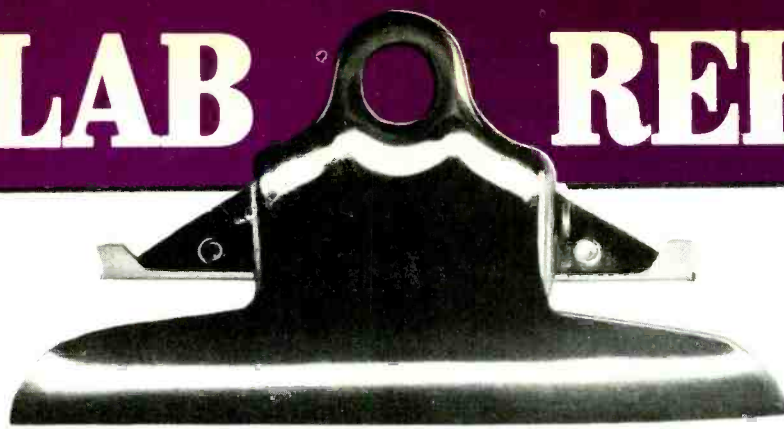
That brings us to the most recent news in the field of video/digital audio discs. Just a few weeks ago, an announcement from Japan indicated that Panasonic and Japan Victor Company (both of whom had successfully demonstrated several types of digital audio and video discs in recent years) had agreed to support a system originally developed by Japan Victor Company (JVC). As an aside, this represents far less of an altruistic gesture on the part of Panasonic (or, more properly, its parent company, Matsushita Electric) than you might suppose, since Matsushita also owns a good chunk of JVC. Be that as it may, with two such giants behind a single system, and the acknowledged ability of Japanese companies to promote new technology (as witness the ever increasing number of video cassette recorders being sold in this country *exclu-*

sively by Japanese electronics firms), the Panasonic/JVC announcement is of particular significance.

As for their agreed-upon system it would seem to offer the best of both worlds. Though basically a capacitance system (a tracking pickup rides atop the surface of the disc) there are no grooves to guide the pickup. Thus, still-frame, slow motion, fast motion—in fact all of the special effects of which the optical system is capable will also be possible in this new system. The disc is normally stored in a protective sleeve or package and is inserted into its player while still in this package to prevent damage or wear to the disc. Almost from its inception, JVC has stressed the digital audio capability of its system, and such demonstrations of this audio capability that I have heard have been truly impressive.

Note that all of the systems described so far would be off-shoots of videodiscs as far as their digital audio capabilities are concerned. More than likely, that might lead to a common video/digital audio player some day, but if such a player is developed, the emphasis would still be on video, and the audio, in digital form, would both literally and figuratively have to be stored “between the lines” and between the video frames. Not so with the proposed Philips digital audio disc, which is less than half the size of any of the many video discs now proposed and is designed strictly for audio storage and reproduction. As such, the disc need not be encumbered with all the signal data which is peculiar to a standard NTSC video signal (sync pulses, horizontal and vertical pulses, etc.). That should make the Philips audio digital disc player less costly to produce—if it ever is produced. At the most recently held Winter CES, there wasn't even a prototype player on display—only a *video tape* (of all things) describing the system in the most general way.

As technical types, we tend to lull ourselves into the belief that the “best” of all these systems will prevail. Our friends in sales, however, know better. Frankly, all of the systems discussed so far produce a very acceptable picture and all of them are capable of producing a very wonderful audio signal, replete with dynamic range, low distortion and “zero” wow and flutter (just like those PCM processors for home VCRs can do). The real issue will be software. Will MCA's giant library of available films and entertainment tip the balance in favor of the Philips/MCA system? Will the joining of forces between RCA and CBS (something that just *never* has happened before in any of the previous technology wars, dating all the way back to the LP and the 45 RPM disc) result in a coordinated program of hardware and software at prices that will have more appeal to the general public than do the laser-discs and their costlier player? And how can Panasonic and JVC hope to win the battle unless they have, or can gain access to program material which will be of interest to an American audience? Finally, if Philips waits too long to introduce its smaller, strictly audio digital disc, will it be too late and will we be into digital audio that is irrevocably linked to some video disc system or other? This promises to be a most interesting decade for audio technology, so stay tuned!



NORMAN EISENBERG AND LEN FELDMAN

Nineteen Premium Cassette Tapes



The cassette format, introduced in 1964 by Philips of Holland, is hardly old enough yet for many of us to have forgotten its modest beginnings as a battery-powered single-channel system of limited response. In its early days the cassette was regarded as an audio curiosity, suited perhaps for non-critical taping of interviews or office memos, but absolutely "nowhere" as a serious recording medium when stacked up against open-reel.

The "baby" has come a long way in a relatively short time. As we look back over the last sixteen years, it is apparent that while a steady upgrading and refinement have been bestowed on this format, there were two singular events that propelled it, each in its turn, to significant new stages of development. One was the Advent 201 deck which appeared in 1970 and incorporated the Dolby-B noise-reduction system, and the circuitry and switching to handle chromium-dioxide tape. The 201 also had an improved Wollensak transport in recognition of the mechanical (as well as electrical) improvement required if the cassette was to be

taken seriously as a quality sound format.

The other major event in the cassette story was Nakamichi's model 1000 which, three years later, really turned on audio enthusiasts with its three head configurations, fast-button logic-controlled transport, on-the-board mixing and lots more—especially, frequency response that ran within ± 2 dB all the way out to 20,000 Hz. The model 1000 soon became to cassette recording what an earlier Ampex pro deck had been to open-reel recording: the "standard." This is not to say that there aren't other models (in either format) that may not be just as great. But the Nakamichi 1000—through its subsequent versions in the past few years—probably remains unsurpassed, except possibly by Nakamichi's own 680ZX which we reviewed here last month and which has metal-tape capability (better, in fact, than in any other deck we've encountered so far). So logically, at least from our standpoint, the Nakamichi 1000 and the 680ZX became the two decks we settled on as the recorders to use in our comparative evaluation of cassette tapes.

THE TAPES

Which brings us to the subject at hand. Over the past ten or so years the tapes offered for cassette use have undergone steady improvement associated with new formulations for the magnetic coating. What is meant by "improvement" here is a complex of inter-related performance parameters such as extended frequency response, linearity of response, reduced distortion, higher headroom, better signal-to-noise ratios and greater reliability in purely mechanical terms. This last item was often overlooked in the earliest days of cassette development and apparently it still is in some of the cheapest cassettes. But somewhere along the line the tape manufacturers began to acknowledge the importance of the physical aspects of the very housing that contained cassette tape. After all, the housing itself becomes literally a part of the tape transport when a cassette is placed onto a cassette deck. Small departures from precise dimensions, or less-than-scrupulous attention to the details of how the two halves of a cassette housing come together at their seam, and so on can prove detrimental to the operation of even the best cassette deck. This physical requirement, as much as pure audio excellence, must figure in any evaluation of a cassette's merit for the serious recordist. Happily, all the tested cassettes showed uniformly excellent construction. In fact, many of them we would guess were made for different brands by the same supplier. On the question of whether a cassette housing is better held together by screws or by adhesion, we pass, since we could not attribute any differences in construction or performance to the method by which the two halves of the cassette housing are held together.

Part of the problem in setting up for the tests was the very choice of tapes. To keep the project within realistically feasible dimensions and not get bogged down in unduly long and overly involved testing, we decided to test the premium offerings of the three classes of tape that require, respectively, normal bias, high bias, and metal bias. With what was available from seven different manufacturers, that came to nineteen different tapes.

The brands represented are, alphabetically, Ampex, Fuji, Maxell, Memorex, Scotch (3M), Sony and TDK. (Informed readers will quickly note the absence of another well-known and respected brand, BASF. The omission of BASF was due to the fact that BASF tape bias requirements differ somewhat from the bias standards that prevail for most Japanese and U.S. brands. As a result, to test BASF tapes on a deck that has fixed bias (for the Japanese and U.S. standards) would have "penalized" those tapes and produced less than their true performance capability. This would have been unfair, but it should be emphasized that with

precisely correct bias adjustments, the BASF tapes can provide generally excellent results. (In our upcoming review of 1/4" open-reel tapes, BASF will certainly be included.)

Of the seven brands we did test, Sony supplied two of the three categories we were interested in, high bias and metal bias. Similarly, Memorex supplied only two categories, normal bias and high bias. That accounts for the nineteen tapes instead of the expected twenty-one (7 times 3) samples.

All the cassettes, except the metal tapes, were C-90 size. Of the metal samples, all were C-60 size except the Sony which was a C-46. Needless to say, perhaps, no C-120 sizes were tested because of their known inferior response due to the thinner tape used, not to mention the possible added drag the C-120 load could place on a transport. We do not regard the C-120 size as suited for serious recording work.

THE TESTS

Using the Nakamichi 1000 for normal-bias and high-bias tapes, and the Nakamichi 680ZX for the metal-bias samples, we ran nine audio tests on each sample:

1. Record/playback response at 0 dB record level.
2. Record/playback response at -20 dB record level.
3. Maximum record level for 3% THD at 400 Hz.
4. Maximum output level at 10 kHz.
5. Playback sensitivity at 1 kHz for 0 dB record level.
6. Playback sensitivity at 10 kHz for -20 dB record level.
7. Signal-to-noise ratio, "A" weighted, Dolby off, re: 3% THD at 400 Hz.
8. Same, with Dolby on.
9. Total harmonic distortion (THD) at 0 dB record level, 1 kHz.

The actual test data obtained for all the tape samples are included in the tables accompanying this lab report. In addition, the following explanations and comments are offered.

Frequency Response and High-Frequency Headroom

Normally, testers do not plot R/P curves for cassette tapes at the 0 dB record level. To do so is to invite a critical inspection of how a given tape becomes saturated at the high end. That, however, is exactly why we did so in this case.

The results (Table 1A) show that of the premium normal-bias tapes, TDK's new OD was ahead of the others with response at the 0 dB level extending to 10.3 kHz for the normal -3 dB tolerance.

Among the high-bias tapes (that also require the 70-usec. EQ), the front-runner was Memorex's "High Bias" tape (Table 1B). What these tests mean in practical terms is this: If you typically record music

**Test 1. Record/Playback Response, 0 dB Record Level
(Hz-kHz)**

Table 1A: Normal Bias Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Grand Master I	35- 9.5 K	2
Fuji FX-I	27- 9.0 K	5
Maxell UD-XL-I	27- 9.3 K	3
Memorex MRX ₃	28- 8.8 K	6
Scotch (3M) Master I	26- 9.2 K	4
TDK OD	27-10.3 K	1

Table 1B: High Bias Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Grand Master II	25- 9.3 K	5
Fuji FX-II	24- 8.6 K	6
Maxell UD-XL-II	24- 9.4 K	4
Memorex High Bias	24-11.4 K	1
Scotch (3M) Master II	22.5- 9.5 K	3
Sony EHF	23- 9.5 K	3
TDK SA	24- 9.8 K	2

Table 1C: Metal Particle Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Metal	11.5-12.0 K	4
Fuji Metal	12.0-14.5 K	1
Maxell MX	11.0-13.5 K	2
Scotch (3M) Metafine	11.5-12.0 K	4
Sony Metallic	12.0-12.0 K	4
TDK MA	12.0-13.0 K	3

that contains a good deal of high-frequency, high-energy content, and do not care to pay the price for metal tape (which still is far superior in this regard), then you can pick a good alternate tape from the top tapes in this list.

If you want extended high-frequency response at more "normal" recording levels, you might note that TDK OD again comes out ahead for normal-bias tapes (Table 2A), while Memorex High Bias does the same for the high-bias tapes (Table 2B). But note too that all the tested tapes in either category are very close indeed, and from a practical standpoint, it may be splitting hairs as to which is "best." Note too that the kind of high-end response obtained in our tests probably could not be realized with a mid-priced deck. Remember, we are talking here of results obtained from high-priced Nakamichi decks, each of which is a three-head model, and each of which was realigned for azimuth before each measurement.

Among the metal tapes, Fuji emerges as the top tape, both in the 0 dB (high-level) response tests (Table 1C), and in the -20 dB (normal level) tests (Table 2C). But again, differences among the various brands are

truly small. All of the metal tapes did much better than the others in terms of high-frequency saturation, a not unexpected result since metal tape's chief claim to fame is its ability to sustain higher recording levels of high frequencies. This advantage certainly was confirmed in our tests for *all* the metal tapes tested.

Mid-Frequency Headroom

The results of our next test (Table 3A) show that all the premium normal-bias ferric-oxide tapes handle mid-frequency high-level signals about equally well. It should be noted, in any event, that the "+6 dB" notation, as well as the other plus-dB notations for this category and for the high-bias oxide tapes, are all referred to the Nakamichi 1000's own reference level of 200 nWb/m. The Nakamichi 680ZX uses a somewhat lower magnetization level for its "0 dB" meter readings. Thus, while the mid-frequency headroom for all the metal tapes seems to be much greater than for the oxide varieties, the improvement is not all that great if you subtract the 2-dB difference in the 0 dB reference level between the two decks.

**Test 2. Record/Playback Response, -20 dB Record Level
(Hz-kHz)**

Table 2A: Normal Bias Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Grand Master I	26-24.0 K	4
Fuji FX-I	26-23.0 K	5
Maxell UD-XL-I	26-26.0 K	2
Memorex MRX ₃	26-25.0 K	3
Scotch (3M) Master I	25-25.0 K	3
TDK OD	26-26.5 K	1

Table 2B: High Bias Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Grand Master II	23-23.0 K	6
Fuji FX-II	23-24.0 K	5
Maxell UD-XL-II	23-25.0 K	3
Memorex High Bias	23-26.4 K	1
Scotch (3M) Master II	22-24.3 K	4
Sony EHF	23-25.0 K	3
TDK SA	23-25.6 K	2

Table 2C: Metal Particle Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Metal	11-23 K	2
Fuji Metal	11-24 K	1
Maxell MX	11-23 K	2
Scotch (3M) Metafine	11-22 K	3
Sony Metallic	11-22 K	3
TDK MA	11-23 K	2

In this test, the high-bias tape with the maximum mid-frequency headroom was TDK SA (Table 3B). The metal tapes all were almost identical in this test (Table 3C), with the Sony Metallic showing a slight edge over the others.

Maximum High-Frequency (10 kHz) Output

This test relates closely to the 0 dB record-level response test discussed above, since it tells us about high-frequency tape saturation. As you increase the record level of a 10-kHz signal on any cassette, you reach a point where any further increase in the input fails to produce an increase in the recorded playback level. Going beyond that point by increasing the recording level further will actually cause a decrease, or compression, in the playback output. This situation produces a severe form of playback nonlinearity that tends to degrade transients and fast-attack signals.

Among the normal-bias tapes, the sample that was able to handle the greatest recording levels and produce the highest output at 10 kHz was TDK OD, with Scotch Master I and Maxell UD-XL-I close runners-up (Table 4A).

The higher bias needed for the high-bias tapes, of course, tends to decrease the maximum output level at 10 kHz. In this category, (Table 4B), TDK SA is a clear winner, coming within 2.5 dB of the 0 dB reference level in playback.

Again, the advantage of metal-particle tape at the high-frequency end of the spectrum is made clear when we examine the 10-kHz maximum output levels shown in Table 4C. The Fuji sample did better than the others, but all of the metal tapes did exceedingly well, delivering a higher maximum output at 10 kHz than any of the high-bias or normal-bias samples.

Playback Sensitivity and "Hot" Tapes

Although not as important as some of the other performance characteristics tested, "playback sensitivity" (referred in dB to record levels used) is regarded by many tape users as an indication of how "hot" a tape is. We measured it therefore at 1 kHz for a 0 dB level (Tables 5A, 5B, and 5C), and again at 10 kHz for the -20 dB record level (Tables 6A, 6B and 6C).

In the mid-frequency (1 kHz) tests, results among the normal-bias tapes were very close, with Maxell

Test 3. Maximum Record Level for 3% THD, 400 Hz (dB)

Table 3A: Normal Bias Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Grand Master I	+ 6	1
Fuji FX-I	+ 5	3
Maxell UD-XL-I	+ 5.5	2
Memorex MRX ₃	+ 6	1
Scotch (3M) Master I	+ 6	1
TDK OD	+ 6	1

Table 3B: High Bias Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Grand Master II	+ 4.0	4
Fuji FX-II	+ 4.5	3
Maxell UD-XL-II	+ 4.5	3
Memorex High Bias	+ 4.0	4
Scotch (3M) Master II	+ 5.5	2
Sony EHF	+ 4.5	3
TDK SA	+ 6.0	1

Table 3C: Metal Particle Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Metal	+ 10.0	2
Fuji Metal	+ 10.0	2
Maxell MX	+ 10.0	2
Scotch (3M) Metafine	+ 9.5	3
Sony Metallic	+ 10.25	1
TDK MA	+ 9.0	4

Test 4. Maximum Output Level at 10 kHz (dB)

Table 4A: Normal Bias Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Grand Master I	- 2.0	3
Fuji FX-I	- 3.5	5
Maxell UD-XL-I	- 1.5	2
Memorex MRX ₃	- 3.0	4
Scotch (3M) Master I	- 1.5	2
TDK OD	- 1.0	1

Table 4B: High Bias Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Grand Master II	- 6.0	5
Fuji FX-II	- 4.0	3
Maxell UD-XL-II	- 4.0	3
Memorex High Bias	- 4.5	4
Scotch (3M) Master II	- 3.5	2
Sony EHF	- 4.5	4
TDK SA	- 2.5	1

Table 4C: Metal Particle Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Metal	+ 1.0	2
Fuji Metal	+ 2.5	1
Maxell MX	+ 1.0	2
Scotch (3M) Metafine	- 0.5	4
Sony Metallic	0	3
TDK MA	0	3

Test 5. Playback Sensitivity, 1 kHz, for 0 dB Record Level (dB)

Table 5A: Normal Bias Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Grand Master I	+ 1.5	2
Fuji FX-I	+ 1.0	3
Maxell UD-XL-I	+ 2.0	1
Memorex MRX ₃	+ 1.5	2
Scotch (3M) Master I	+ 2.0	1
TDK OD	+ 1.5	2

Table 5B: High Bias Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Grand Master II	- 1.5	4
Fuji FX-II	- 1.0	3
Maxell UD-XL-II	- 0.5	2
Memorex High Bias	- 3.0	5
Scotch (3M) Master II	0	1
Sony EHF	- 1.5	4
TDK SA	- 0.5	2

Table 5C: Metal Particle Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Metal	0	1
Fuji Metal	0	1
Maxell MX	- 0.5	2
Scotch (3M) Metafine	0	1
Sony Metallic	0	1
TDK MA	- 1.0	3

UD-XL-I and Scotch Master I leading the others by a small margin (Table 5A).

Scotch Master II also edged out the others (by a negligible margin) in the high-bias oxide tape group (Table 5B).

As for the new metal tapes, their mid-frequency sensitivities were all within a 1 dB spread of each other, with Ampex, Fuji, Scotch and Sony all doing equally well, and Maxell and TDK only slightly behind (Table 5C).

In the high-frequency sensitivity tests, TDK OD did best among the normal-bias tapes (Table 6A); TDK SA did best among the high bias tapes (Table 6B).

In these tests, we noted greater differences among the metal tapes (Table 6C) with Fuji's sample proving to be a full 3-dB "hotter" at 10 kHz than the tape exhibiting the lowest 10-kHz sensitivity (TDK MA).

Signal-to-Noise Ratio

To measure tape noise as an absolute number would provide little information. What is meaningful for a storage medium such as tape is its dynamic range, and that means measuring noise with respect to a known

Test 6. Playback Sensitivity, 10 kHz, for - 20 dB Record Level (dB)

Table 6A: Normal Bias Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Grand Master I	- 17.5	4
Fuji FX-I	- 19.5	6
Maxell UD-XL-I	- 16.5	2
Memorex MRX ₃	- 19.0	5
Scotch (3M) Master I	- 16.75	3
TDK OD	- 16.0	1

Table 6B: High Bias Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Grand Master II	- 22.5	6
Fuji FX-II	- 20.5	3
Maxell UD-XL-II	- 20.75	4
Memorex High Bias	- 23.0	7
Scotch (3M) Master II	- 19.5	2
Sony EHF	- 21.0	5
TDK SA	- 18.5	1

Table 6C: Metal Particle Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Metal	- 21.5	3
Fuji Metal	- 19.5	1
Maxell MX	- 21.0	2
Scotch (3M) Metafine	- 21.0	2
Sony Metallic	- 21.0	2
TDK MA	- 22.5	4

highest recording level.

Common practice is to use the level at which a recorded signal of 400 Hz produces third-order distortion of 3 per cent in playback. That is the approach we used, although to save time we measured THD rather than pure third-order distortion. At 3 per cent, the levels would be pretty close anyway. We also applied an "A" weighting factor, although we are well aware that many may argue in favor of the CCIR-ARM weighting as being more consistent with the way humans perceive (and are annoyed by) noise.

Amazingly, five of the six normal-bias tapes produced the same S/N ratio without Dolby, despite the fact that the reference level from which the S/N was measured varied considerably between them. There was obviously no "winner" in this particular test (Table 7A).

Variations were greatest among the high-bias tapes with Scotch Master II ranking first, followed by Maxell UD-XL-II and TDK SA (Table 7B).

Any lingering doubts about the benefits offered by metal-particle tape could be readily dispelled by the results shown in Table 7C. Scotch Metafine scored

highest here, but all the metal tapes did significantly better than the other types—and remember, these results were obtained with the Dolby-B switched off.

Results with Dolby-B switched on are presented in Tables 8A, 8B and 8C. As may be seen by comparing any group of tapes with and without Dolby, the amount of additional noise-reduction or improvement in S/N is fairly consistent. When any two tapes do not exhibit the same added S/N when Dolby is applied, the explanation is that their respective noise contents differ. The tape that shows the lesser improvement with Dolby added probably has more low- and mid-frequency noise than another tape that shows greater improvement with Dolby applied.

One obvious thing the S/N tests in sum do clearly demonstrate is the undeniable effectiveness of Dolby-B with any tape, and especially so with the metal samples, all of which achieved S/N ratios of 70 dB or better in our testing.

Distortion at Mid-Frequencies

Our final tables (9A, 9B and 9C) summarize THD readings obtained for all the tested tapes at 0 dB

Test 7. Signal-To-Noise Ratio, "A" WTD, Dolby Off, RE 3% THD, 400 Hz (dB)

Table 7A: Normal Bias Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Grand Master I	54	2
Fuji FX-I	55.5	1
Maxell UD-XL-I	55.5	1
Memorex MRX ₃	55.5	1
Scotch (3M) Master I	55.5	1
TDK OD	55.5	1

Table 7B: High Bias Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Grand Master II	55	4
Fuji FX-II	56	3
Maxell UD-XL-II	56.5	2
Memorex High Bias	55	4
Scotch (3M) Master II	57.5	1
Sony EHF	56	3
TDK SA	56.5	2

Table 7C: Metal Particle Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Metal	62.5	2
Fuji Metal	62.5	2
Maxell MX	62.25	3
Scotch (3M) Metafine	63.5	1
Sony Metallic	62.5	2
TDK MA	61.5	4

Test 8. Signal-To-Noise Ratio, "A" WTD, Dolby On, RE 3% THD, 400 Hz (dB)

Table 8A: Normal Bias Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Grand Master I	61.5	3
Fuji FX-I	63.5	1
Maxell UD-XL-I	63.5	1
Memorex MRX ₃	63.0	2
Scotch (3M) Master I	63.0	2
TDK OD	63.5	1

Table 8B: High Bias Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Grand Master II	62.5	4
Fuji FX-II	63.5	3
Maxell UD-XL-II	63.5	3
Memorex High Bias	62.0	5
Scotch (3M) Master II	65.5	1
Sony EHF	63.5	3
TDK SA	64.5	2

Table 8C: Metal Particle Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Metal	71.5	2
Fuji Metal	71.5	2
Maxell MX	71.0	3
Scotch (3M) Metafine	72.5	1
Sony Metallic	71.5	2
TDK MA	70.0	4

recording level using a 1-kHz signal. While relatively small differences among the samples are indicated, distortion in general was comfortably low. The results also indicate that some high-bias tapes actually do produce slightly higher distortion than do their normal-bias counterparts. This was especially noticeable with the 2 percent THD of Memorex High Bias as against the 1.4 percent THD of Memorex MRX₃.

While the THD characteristics of high-bias versus normal-bias tapes may be a standoff, there is no doubt as to the virtues of metal-particle tape here, with overall THD readings significantly lower than those obtained for the oxide tapes.

Individual Comment by L.F.: This test project was not intended to cover every kind of cassette tape available, or even every type made by each of the seven manufacturers represented. If you shop around long enough you probably could come up with more than seventy-five kinds of tape from more than twenty manufacturers. If you then scan such a list, I am certain you would quickly eliminate over half of the

tapes as unsuited for serious recording work.

I have nothing against low-cost general-purpose tapes. They have their place for portable voice dictating cassette machines and the like, but in a study of this sort we wanted to confine our tests to a grouping of top-quality tapes.

Among these tapes, it becomes apparent from a review of the test results that there is no clear-cut answer to the question of "which tape is best?" It all depends on what you are looking for and what you care to spend. We did not consider price in testing the tapes, though I certainly would were I buying them for personal use, as I'm sure you would.

If you want to know which tapes ranked first in their categories for the most measured specifications, I can save you the trouble of counting and tell you the "scores." Among normal-bias tapes, TDK OD was in first place or tied for first place in seven categories. Ampex Grand Master I was in first place or tied for first place in two measurement categories. Both Scotch and Maxell were tied for first place in three categories. Memorex and Fuji were each tied for first place in two categories.

Among the high-bias tapes, TDK SA ranked first in four separate measurement categories. Scotch Master

II ranked first in three categories. Memorex High Bias tape was first in two categories. In general, the spread among the high-bias tapes was greater than among the normal-bias tapes.

Although performance parameters among the metal particle tapes were extremely close, if I had to call an overall winner here it would be Fuji which came out ahead or tied in five of the measurement categories. Scotch Metafine was a close second with first place or tied honors in three measurement parameters. Sony Metallic was ahead or tied for two measurements, while Maxell MX and Ampex were ahead or tied in one category each.

What we really learned from these tests is that while all of the premium tapes are really quite good, some will fill a specific need with a specific machine better than others. Since I don't know which of the nine tests we ran would be considered by you the reader to be the most important for your recording needs (are you, for instance, looking for widest frequency response, or lowest distortion, or greatest high-frequency headroom, or what?), there is no way I can tell you to use one tape rather than another.

However, by studying the tables of data carefully, you should be able to form your own conclusions.

Individual Comment by N.E.: When the idea for this project first came up, we kicked around several ideas about implementing it, including of course test procedures and how to interpret the results. Mindful of the heavy promotion that has been bestowed on recording tapes generally, and on cassette tapes in particular, we also raised the question of: What if we go through all these time-consuming tests only to produce data that points to no clear-cut "winner" among competing brands? This conclusion seemed as likely to develop as anything else, in the light of previous test projects (of both open-reel and cassette tapes) with which I have been involved, not to mention my personal experience with recorders over the years.

We agreed that should that kind of conclusion seem to emerge from the test results, we would not back away from it (any more than we would back away from naming a clear-cut winner if one emerged unequivocally). Well, that is where it's at, and that essentially is what we are saying here.

Another way of putting it would be that the premium tapes offered by competing brands of a generic class are all about equally good overall. The data does show differences, to be sure. Yet the differences, for the most part, are really small. Furthermore, who is to say that the slight superiority of brand A in one category is not offset by the higher mark scored by brand B in another category?

In purely subjective tests, recording the same music with the various tapes on hand, I detected no audible differences between various brands of cassettes within a given generic tape class.

In direct comparisons of normal-bias versus high-bias cassettes, virtually no difference in sound could be documented except—and this may be the most

Test 9. THD at 0-dB Record Level, 1 kHz (%)

Table 9A: Normal Bias Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Grand Master I	1.05	1
Fuji FX-I	1.1	2
Maxell UD-XL-I	1.5	5
Memorex MRX ₃	1.4	4
Scotch (3M) Master I	1.1	2
TDK OD	1.25	3

Table 9B: High Bias Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Grand Master II	1.4	6
Fuji FX-II	1.2	4
Maxell UD-XL-II	1.05	3
Memorex High Bias	2.0	7
Scotch (3M) Master II	0.95	2
Sony EHF	1.25	5
TDK SA	0.9	1

Table 9C: Metal Particle Tapes

MANUFACTURER & TYPE	TEST RESULTS	RANKING
Ampex Metal	0.87	4
Fuji Metal	0.82	2
Maxell MX	0.77	1
Scotch (3M) Metafine	0.87	4
Sony Metallic	0.83	3
TDK MA	0.95	5



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AN OVERVIEW OF ECHO, REVERBERATION AND OTHER DELAY EFFECTS

By John Murphy and Jim Ford

For the past few months we've been reviewing various audio products which generate delay effects and/or reverberation; and we will be reporting on several more of these units in subsequent columns. This month, however, we would like to pause and review some of the basic audio and acoustics concepts important to understanding the operation and effective application of this equipment. This article should be helpful to those considering the purchase of such equipment, especially considering the variety of devices available.

We'll start by discussing echo, then reverberation and, finally, other delay effects. In each case a definition of the effect will be given followed by discussions of: how the effect is produced, applications of the effect and audio quality evaluation of the effects.

ECHO

An echo is simply a slightly delayed repetition of a sound. In our acoustic environment echoes are heard as the result of sound waves being reflected from a surface and returned to the listener. The time difference between when the listener hears the direct sound and when the reflection (echo) is heard is referred to as the echo delay time. This delay time depends on the distances between the listener, the sound source and the reflecting surface, with greater distances resulting in longer delay times.

For example, consider a listener outdoors standing 100 feet from a large reflecting surface (the side of a building maybe). The listener snaps his fingers and hears the snap followed immediately by a single echo. The echo delay time can be easily calculated by considering that sound travels in air at a speed of about one foot per millisecond (msec., one-one thousandth of a second). It therefore takes the sound about 100 msec. to travel the 100 feet to the reflecting surface and 100 msec. more for the reflection to return to the listener. Therefore, the echo delay time in this example would be about 200 msec.

This delay is long enough for the echo "snap" to be heard as separate from the initial, or direct "snap." That is, the listener perceives two distinct snaps. As the echo delay time is shortened, a point is reached where the listener no longer hears two "snaps" but instead the two sounds fuse together and are perceived



as a single sound. It has been observed that this occurs for delay times shorter than about 30 msec. The exact delay time where a distinct repetition is no longer heard is somewhat dependent on the nature of the sound and is shortest for short duration sounds—"clicks" or "pops," for example.

Echo is a sound phenomenon that we are most accustomed to in our outdoor environment; whereas indoors, the sound reflections are so numerous that we usually hear "reverberation" rather than many distinct echoes. It is the inaudibility of the distinct repetitions that distinguishes reverberation from multiple echoes. This can be easily understood in terms of the 30 msec. rule. In a room, the sound reflections arriving at a listener's ear are very closely spaced in time, much closer than 30 msec., and are therefore not heard individually. Instead, the many closely spaced reflections create a different effect: "reverberation" (more on reverb later).

The first popular technique for artificially creating echo made use of the tape recorder. The sound signal was recorded on tape and then immediately played back to provide a copy of the original signal delayed by the amount of time it took the tape to travel from the record head of the recorder to the playback head. When the delayed signal was mixed with the original signal and auditioned over a loudspeaker, the delayed signal was heard as an echo of the original signal. It was quickly discovered that if a portion of the playback signal was fed back to the record head then a series of echoes would result and the resulting effect was found to be musically useful. If either the tape speed or the spacing between the record and play heads was made variable, then the echo delay time could be adjusted for the desired effect. Likewise, the portion of the playback signal fed back to the record head was



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usually made variable so the user could control the echo repeat characteristic. Over the years since its introduction tape echo has continued to be a popular musical effect, both for recording and for performing.

The decade of the seventies brought with it integrated circuit technology. Out of this advanced electronics emerged two new techniques for providing time delay of audio signals by purely electronic means: analog delay and digital delay. Both techniques begin by "sampling" the audio signal at very frequent time intervals (about 50,000 samples per second for good audio quality) and then perform delay processing on the individual samples. Although the techniques for performing "sampled delay" were available well before the seventies, without integrated circuit technology the sheer quantity of discrete devices required would have been prohibitive.

In the analog delay technique, the samples are delayed by shifting the signal sample through hundreds (or even thousands) of sample holding stages at a high rate of speed. The total number of stages and the rate at which the sample is handed from one stage to the next determine the delay time of the system. As the samples emerge at the end of the delay line they are combined to recreate the input audio signal.

The real beauty of this technique lies in the fact that these many hundreds of delay stages are all contained on a tiny little silicon chip (integrated circuit, or simply "IC") that you can buy at your local electronics shop for about \$10. Welcome to the space age!

The digital delay technique is similar to that just described for analog delay except that the samples are first converted to binary numbers (i.e., numbers made up of "ones" and "zeroes" like: 01101011) or "digitized" before entering the delay line. So, rather than passing a continuously variable voltage from stage to

stage as in analog delay, the digital delay passes a string of numbers ("digits") from one stage to the next. At the end of the line these numbers are individually converted back to voltages and combined to form a time-delayed replica of the input signal. Don't forget, this is all happening at a rate of about 50,000 samples per second. Pretty clever, wouldn't you say?

As with tape echo, both the analog and digital delay lines can be fed back, or "recirculated" as it's frequently called, to produce multiple repeats that decay in intensity at a rate dependent on the amount of recirculation used. A typical echo unit as might be seen on the market today would provide front panel controls for: signal input level, echo delay time, echo recirculation and mix of direct signal with echo signal. The latter control allows the user to pan between the direct sound and the echo output, thereby providing any desired mixture of direct sound with echo effects, ranging from direct sound only (no effects) to effects only (no direct sound). In addition to these controls, various available units include signal level monitoring ranging from a simple peak overload indicator to a wide-range LED level display, along with output level controls, selectable instrument or line level inputs and options for use with either balanced or unbalanced signal inputs and outputs. Although there are still tape echo units available, the analog and digital delay types are rapidly making them obsolete.

The audio quality of an echo unit can be evaluated in a straightforward fashion. The delayed signal should simply be an exact copy of the input signal with respect to: distortion, noise, frequency response, bandwidth, wow and flutter (for tape units) and slewing headroom. In the case of tape delay units the audio quality of the echo is simply the same as that for a signal passing through the record/play chain once. When recirculation is used, however, the audio quality is degraded for each repeat to the extent that it would be degraded by several tape generators. Distortion and noise increase and bandwidth decreases. The same is true for analog and digital delays, but digital delay techniques are capable of a higher level of audio quality than typical tape record/play systems. With higher quality for one pass through the delay line, on successive passes (recirculation) the quality is not degraded as quickly. Now, this doesn't mean that digital delay units always provide higher quality than

tape or analog delays. In fact, both analog and digital delay units (with a few notable exceptions) frequently compromise high frequency bandwidth for economy and delay time. In contrast, tape delay can provide full high-frequency bandwidth in conjunction with long delay times. The one outstanding advantage that the analog and digital delays have over tape is that they utilize nothing but solid state electronics. They have no moving parts, require no routine maintenance and can be highly reliable. Tape machines, on the other hand, utilize intricate electro-mechanical systems with many moving parts (and attendant wear) and require that their heads be cleaned routinely and the tape periodically replaced.

REVERBERATION

Associated with interior spaces (usually rooms) is the natural acoustic phenomenon we call "reverberation." In contrast to "echo," where a sound is repeated and the repeat is heard as distinct from the direct sound, reverberation consists of very many repetitions of the original sound spaced so closely in time that no single repetition is distinctly audible. Rather than repeat the original sound, reverberation (or simply "reverb") has the subjective effect of making the sound "linger" and die away slowly.

Auditoriums and concert halls are frequently evaluated on the basis of their "reverberation time," that is, the time that it takes for a sound to decay away to inaudibility. If the reverb time is too long, the room can make speech difficult to understand; too short a reverb time will make a room sound dry and lifeless.

In the recording studio it is frequently desirable to add reverberation to recorded tracks. This can be done by using either an acoustic reverberation chamber or by employing some sort of artificial reverberation unit. The acoustic reverb chamber consists of an isolated room equipped with a loudspeaker and a microphone. The recorded track to which reverberation is to be added is played back through the loudspeaker, thus stimulating the chamber's natural reverberation. The microphone is used to pick up the reverberation in the chamber and is normally placed away from the loudspeaker to minimize the pick up of direct sound. The signal from the microphone is then amplified and returned to the control room where it is mixed with the playback signal so as to add just the desired amount of reverberation. Acoustic reverberation chambers are usually used only where the highest quality reverberation is needed because they require the dedicated use of a fairly large room.

There are two basic families of artificial reverberation devices: the electro-mechanical systems (spring and plate type reverbs, for example) and the newer discrete time delay devices (ranging from simple delay line with feedback to fairly complex digital reverberation systems).

At this time there are probably many more spring reverbs in use than any other type. This is because of

their low cost and small size in comparison to other units. But the small inexpensive spring reverbs also provide the poorest quality reverb; whereas the larger, more expensive spring reverbs can provide reverb quality approaching that of good concert halls.

The operation of the spring units is quite simple. A spring is suspended on an isolated mount and is excited at one end by a loudspeaker-like transducer which transforms the audio signal into vibrations in the spring. The sound waves induced in the spring then reflect all along the length of the spring and excite many reflections, much as sound in a room excites many reflections. Finally, the sound waves in the spring are detected by a microphone-like transducer at the other end of the spring; then the reverb signal is amplified and made available at the output of the unit. The signal is returned to the control room and mixed with the direct signal in the desired proportion.

The plate reverb seems to be the unit of choice in many recording studios because of its bright, highly diffuse sound. Unlike some spring units, plate reverbs are neither inexpensive nor small; but they provide consistently high-quality reverberation. Don't get the wrong idea about spring reverbs though, at the high cost end of the spectrum are some truly excellent spring reverberation units, clearly competitive with plate units in the sound quality of the reverberation they provide.

As with spring units, the plate operates by being excited by a loudspeaker-like transducer at one end setting up sound vibrations in a large steel plate which is carefully suspended in an isolating enclosure. The sound waves are reflected throughout the plate much as they would be in a highly reverberant room. The reverberant sound field is then detected through the use of a microphone-like element attached to the plate. The reverberation signal is then amplified and provided to the output of the unit for return to the control room. For best results the plate enclosure should be located in an isolated environment to minimize the pickup of stray sounds.

Another type of electro-mechanical reverb is the "foil" reverb which is similar to the plate reverb except that the steel plate is replaced by a sheet of gold foil.

The second family of reverberation devices, the discrete time delay devices, is quite young. The first of these appeared shortly after the first digital delay units hit the market. In fact, many digital (and analog) delay lines have provisions for feedback and indeed claim to provide "reverberation" when used with large amounts of feedback. This can be misleading, since the output of a simple recirculated delay line typically sounds very "electronic" and not at all like a room. But there is at least one digital reverb currently available which uses a highly complex system of recirculated discrete time delays to provide very high quality artificial reverberation.

It's difficult to make an objective evaluation of the



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audio quality of a reverb because so much has to be based on subjective listening tests. An overall impression of the frequency response of the unit can be obtained by driving the unit with pink noise (a test signal containing random noise with equal energy per octave bandwidth) and observing the energy distribution of the output reverb signal. For minimum coloration the output should have a flat amplitude response over the audio spectrum. This only tells part of the story though. It's also important to know how the frequency balance tends to change as the reverberation decays away. If the lower frequencies decay more slowly than the high frequencies, then the reverberant sound will have more bass as it decays and may tend to sound "warm." On the other hand, if the highs decay more slowly, the sound will have more treble as it decays and may tend to sound "bright." An idea of the character the reverb will take on as it decays can be obtained by measuring what's called the "signature" of the reverb, or the decay time of the reverb in one-third octave bands. Those frequency bands with longer decay times will tend to dominate as the sound decays. Again, for minimum coloration we would want the reverb signature curve to be flat over the audio spectrum. About the only other meaningful measurement we can make on a reverb unit is to measure the noise level at its output compared to its nominal signal output level.

There are only a few front panel controls on most reverbs. It's appropriate to provide an input signal level control and some sort of signal level indicator. In addition, some of the better spring units, and most of the digital units, provide a means of adjusting the decay time. The best units provide some degree of control over the reverberation signature, typically allowing independent variation of the high and low frequency decay times. This provides a great deal of control over the coloration of the reverb. Some units also provide multiple band equalization on the reverb output; this allows the user to adjust the overall frequency balance of the reverb but does not affect the way the reverb decays (i.e., the reverb signature).

Artificial reverberation devices have become so widely used and accepted that a recording studio is hardly considered complete without one (or more). It's only necessary to look at the prices of the best reverbs (from a couple of thousand to several thousand dollars) to realize that the ear is highly sensitive to reverb colorations, and that the industry is willing to pay big bucks for truly excellent sounding reverberation.

OTHER TIME DELAY EFFECTS

Echo and reverberation are the best known and most widely used time delay effects, probably because both effects occur naturally in our acoustic environment. Besides these two effects, there are other musically useful time delay effects which are not prominent in our environment but which, none the less, can be artificially created through the use of short time

delays. Among these effects are: "flanging," "doubling," and "chorusing."

The effect popularly known as "flanging" was first produced with the aid of two tape machines. A signal was fed to both tape machines where it was recorded while monitoring off the tape continuously; the outputs of the two tape machines were then summed and the summed signal auditioned over a monitor speaker. With the two tape machines running normally, there would be no effect on the sound. However, if one machine was made to run slower than the other (by dragging a thumb on the *flange* of one tape supply reel) it was observed that a very interesting, and musically useful, "swishing" sound appeared as an effect on the original sound. Analog and digital delay lines have now made it unnecessary to use tape machines to do flanging, and as a result flanging has become a very popular effect both for recording and for on-stage use.

Flanging can be explained as follows: When two identical signals are combined there are normally no unusual effects. However, if one signal is delayed slightly in time and then the [two] signals are combined, the net result is a series of cancellations of certain frequencies, the cancelled frequencies depending on the precise amount of time delay between the two signals. This series of cancellations is frequently referred to as a "comb filter" because the frequency response plot of such a filter has many sharp notches which resemble the teeth of a comb. The most interesting part of the effect occurs when the delay of the one signal path is made to change with time. This causes the comb filter to sweep through the audio spectrum and imparts the unique "swishing" sound associated with flanging. When the time delay is increasing the notches sweep from high to low, and as the delay is decreased the notches sweep low to high. The time delays required for the effect are quite short, about one millisecond. However, sweeping the comb filter through the spectrum requires that the delay be varied from about 0.1 msec. up to about 10 msec. The flangers available on the market automatically vary the delay time so that the comb filter automatically sweeps up and down through the spectrum. The user is typically provided control over both the range and the rate of the sweep. The user is also provided with a pan control which allows the flanger output to be varied from all direct signal to all delayed signal or anywhere in-between. The maximum flanging effect is obtained with an equal mix of the two signals. Most flangers also provide for recirculation of the delayed signal which provides an interesting variation on the effect.

"Doubling" is an electronic delay effect which attempts to copy the sound of the recording studio trick known as "double tracking." Double tracking is done in the studio by separately recording two identical musical parts and then playing back the two parts together. For example, a vocalist's lead line is recorded on track one of the recorder; then the tape is rewound and the vocalist gives a second performance

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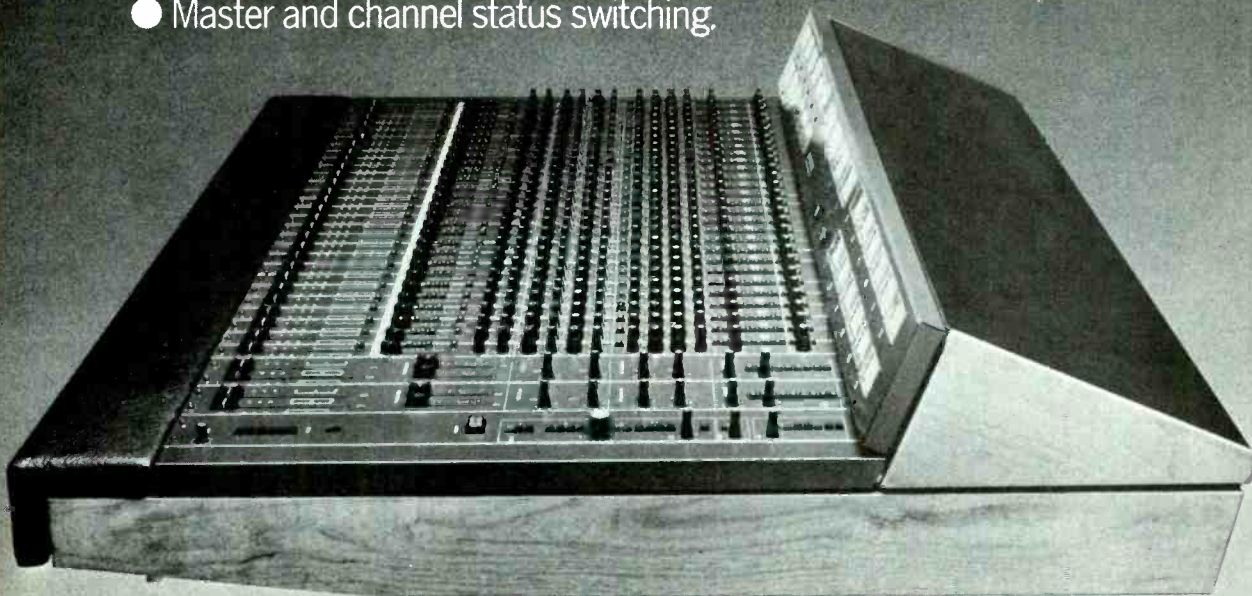
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[of the same part] which is recorded on track two. When tracks one and two are played back together the impression might be that the vocalist and his identical twin [clone?] are singing together in unison, but more often the effect is perceived simply as an enriching or "fattening" of the original track. Doubling is an attempt to copy the double track effect without all the hassle of recording two versions of a performance. Also, note that double tracking is an effect that can *only* be used in recording, that is, it can't be used in a "live" performance (unless the performer has an equally talented twin who doesn't mind hiding).

The currently available devices for doing doubling basically add a short delay (10-20 msec.) to the direct signal. This does not, by itself, constitute a very convincing doubling effect because the "second track" (the delayed signal) is a perfect copy of the original—too perfect in fact. In the studio, when double tracking is done the second performance is always slightly different from the first; so if we're to duplicate the sound of double tracking we need to find a way to make the delayed signal somehow different from the direct signal. The most popular way of "perturbing" the delayed signal is to slowly vary the time delay over a small range. This has the effect of alternately driving the pitch of the delayed signal sharp and then flat by a slight amount thereby introducing a small musical dif-

ference between the direct and the delayed signal. With this improvement, electronic doubling can be fairly convincing, but none of the units we've heard can provide quite the same effect as that obtained with studio double tracking.

The effect generally referred to as "chorusing" is an attempt at producing the impression of many voices singing or many instruments playing in unison, somewhat as if a performance had been double tracked many times over. Chorusing is provided through delay devices by using the approach described for doubling and then recirculating the delayed signal to provide multiple repeats. The results seem to be highly variable in effectiveness.

CONCLUSION

We hope this overview of time delay effects will make future reviews of echo and reverb equipment more meaningful to our readers. In particular, we hope to have made clear the distinction between echo and reverberation and the types of equipment used to produce these effects. Let us note here that the delay effects units typically used to produce echo, flanging and doubling, do not, in general, provide high quality reverberation and should not be purchased solely for that purpose. They do, however, produce some exciting and very useful effects.



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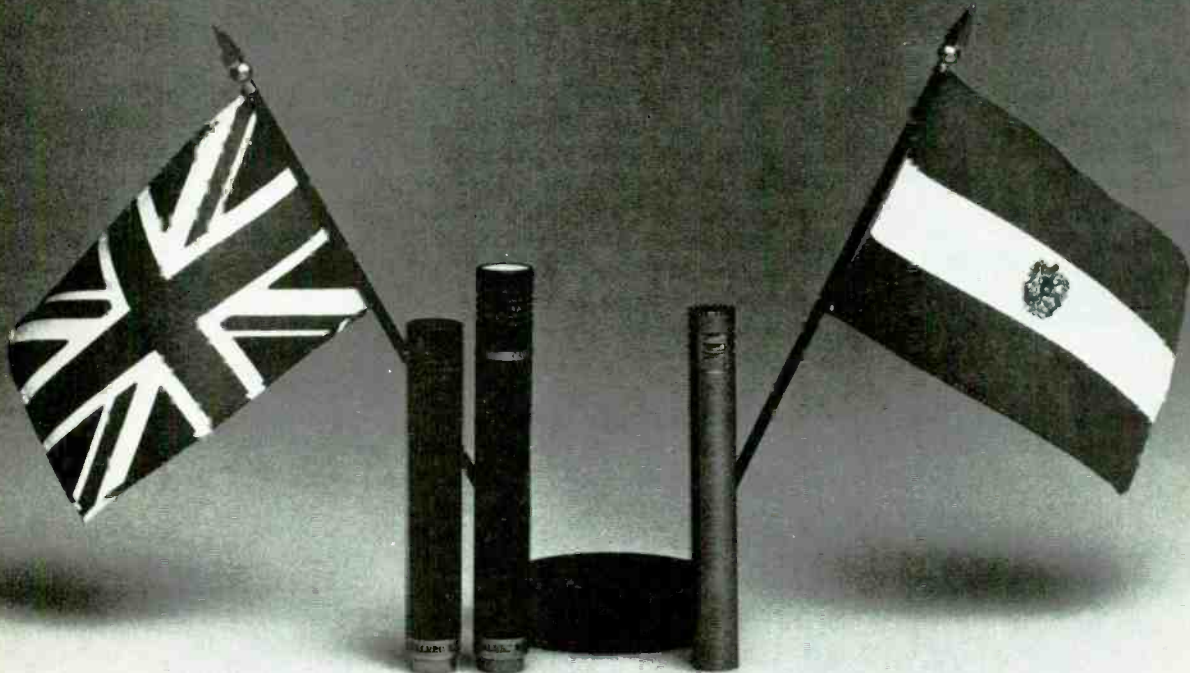
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GROOVE VIEWS

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POPULAR

ORLEANS: *Forever*. [Orleans, with Roy Cicala, producers; Roy Cicala and Sam Ginsberg, engineers; Gray Russell and Steve Marcantonio, assistant engineers; recorded at the Record Plant, New York, October-December 1978; additional recording at Bearsville Sound Studio, Bearsville, N.Y.] Infinity INF 9006.

Performance: **Melodic pop at its best**
Recording: **Clean and very good**

Continuing a tradition of stylized pop-rock that began perhaps with the sound of the Doobie Brothers and now includes a number of pretenders, such as Pablo

Cruise, the quintet known as Orleans has released a classy example of what's right and what's wrong with American pop music today. However, the good outweighs the bad.

First off, the music has melody—catchy, bouncy, identifiable melody. The single drawn from *Forever*, "Love Takes Time," is a fine example of this. A quatrain for the verse, and a shorter quatrain for the chorus, and an extra line or two thrown in, each section with its own melody.

Next, the music has a sense of rhythm. Nearly all the tracks are up-tempo, but not so up-tempo as to submerge the melody or lyrics in a torrent of thudding bass and drums. "Slippin' Away" is a good example, complete with hand clapping on the record that may lead to some foot tapping by the listener.

Also, the lyrics, while certainly not

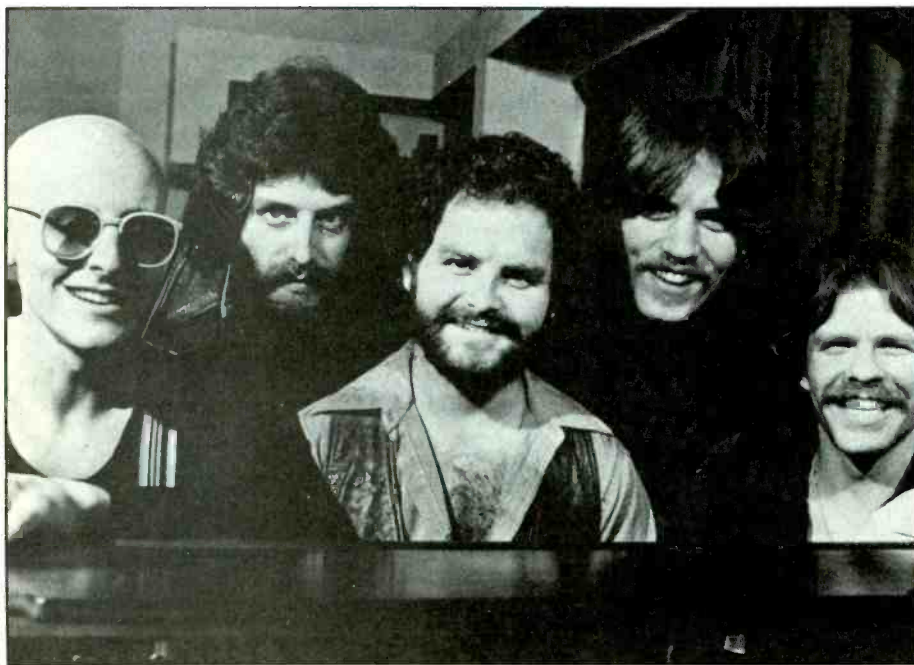
the most profound being penned today, try to avoid triteness without sacrificing basic simplicity. Few of the songs will be cited for expressing a deep emotion or empirical truth that hasn't already been expressed before (and better), but few will be accused of being stuffy or pompous, either.

Then, too, the sound of the record is fine. Some obvious care has been taken in the production of this recording. The balance between vocals and instrumental parts is struck evenly; the sound through either the speaker or the headset is crisp, clear, not muddled. So much expertise seems to have been used here, in fact, that *Forever* sounds much like the great Loggins and Messina studio recordings, which for my money have been among the best-sounding American pop-rock records ever made.

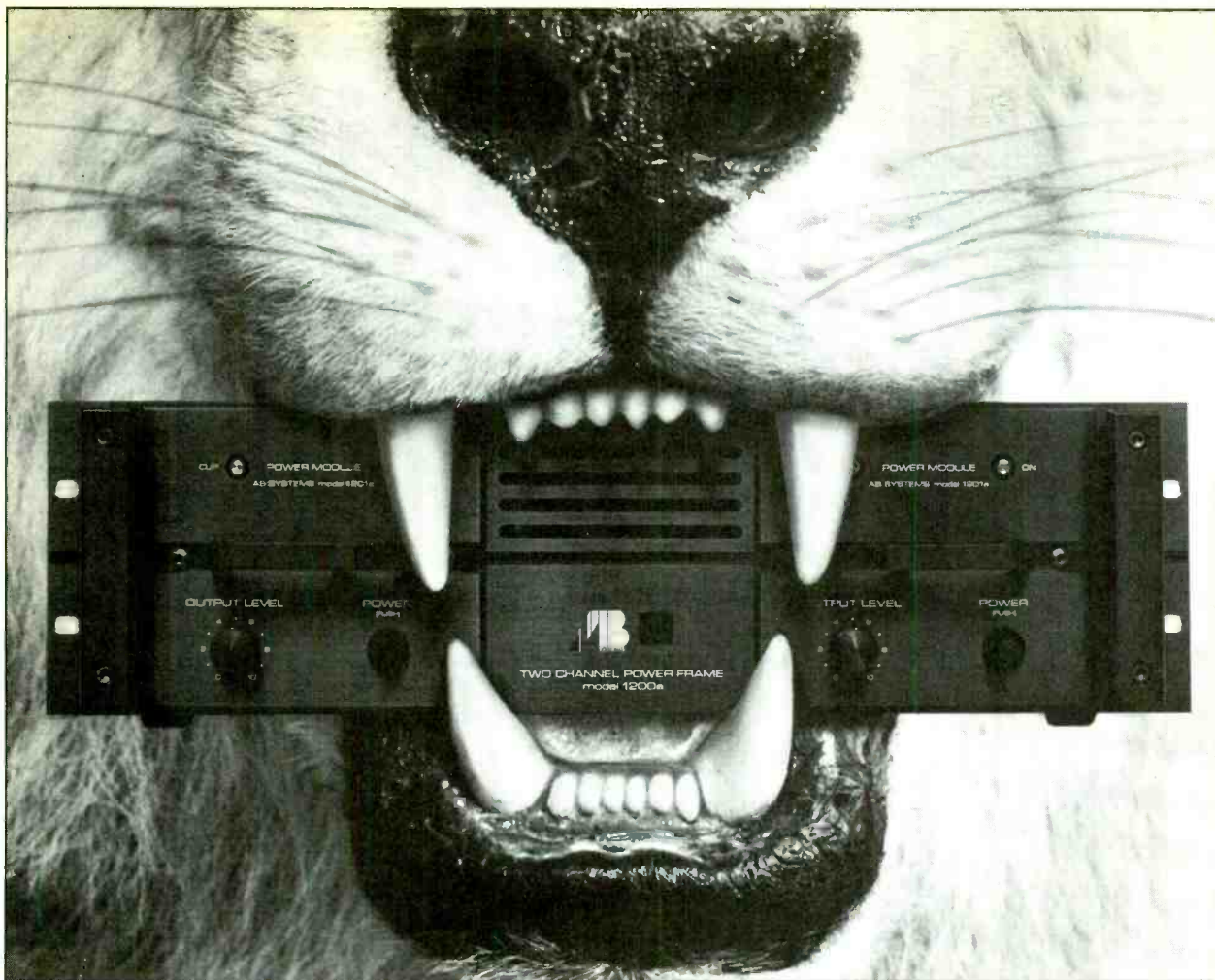
Now, what could be wrong with such a finely-wrought record?

One gets the feeling that we've heard this all before, from somebody, somewhere. Perhaps it was on an earlier Orleans record, or maybe it was on one by Pablo Cruise, or maybe it was on any number of other recent releases. One certainly need not look any further than this for a well-polished, tightly-arranged, musical collection of pop songs, and perhaps this is the trouble.

It's almost as if Orleans were playing spin-the-wheel-and-find-a-hit. The cuts begin to sound a little like they are out of a formula. The basic songwriting team of Larry Hoppen, Bob Leinbach and Marilyn Mason (with Kal David and R.A. Martin also doing some writing) seems to have gone to some school of composition that emphasizes too much sameness at the expense of true creativity. This is what separates *Forever* from Loggins and Messina's *Mother Lode* album, for example. L&M tried some new things on that album, mixing rockers with ballads



ORLEANS: A classy example of what's right and wrong with pop music today



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with extended multi-textured songs and came up with a winner. *Forever* is cut out of the same basic pattern, but without much of the finely detailed stitching.

There is, despite this, much to commend in this album, however. Instrumental breaks are brief but well-played. Piano work by Leinbach, whose lead vocals on five of the album's nine tracks are the best on the record, is quite good, and the rhythm section of Lance Hoppen and Wells Kelly gives good rhythmic underpinning to all tracks. The arrangements never get away from the players and never get too overblown, although the chorus used in some tracks becomes too noticeable.

And there is one totally unexpected plus: the last track on the album, "Forever" which opens with an acoustic guitar and unfolds as a simple ballad of uncharacteristic beauty, much like Kansas' "Dust in the Wind" or Atlanta Rhythm Section's "Imaginary Lover."

The latest Orleans album, minus John Hall, is a bridge between album- or adult-oriented rock and middle-of-the-road rock and will find itself equally at home in either format. A little more creativity could have been shown, but there is plenty of pop expertise here. S.R.

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FELIX PAPPALARDI: Don't Worry, Ma.
[Bernard Purdie, producer; Steve Klein, Don Gehman and Jerry Masters, engineers; recorded at Criteria Studios, Miami, and Automated Sound, New York]. A&M SP 4729.

Performance: **Trite**
Recording: **Cheap**

One wonders what possessed rock veteran Felix Pappalardi to come out with a record like this! With the first track, "Bring It With You When You Come," a sprightly jug band type tune that Maria Muldaur would feel comfortable with, the listener is led to believe that what follows is a gentle excursion into the blues.

One begins to grow uneasy, however, as the second track, "As the Years Go Passing By," moves slowly to its finish. By the time the third track starts, the Latin-reggae-styled "Railroad Angels," the album is sliding away in interest, and nothing among the remaining six cuts can reverse the slide.

This could be one of the most disappointing releases of 1979, all things considered. Pappalardi, who helped bring

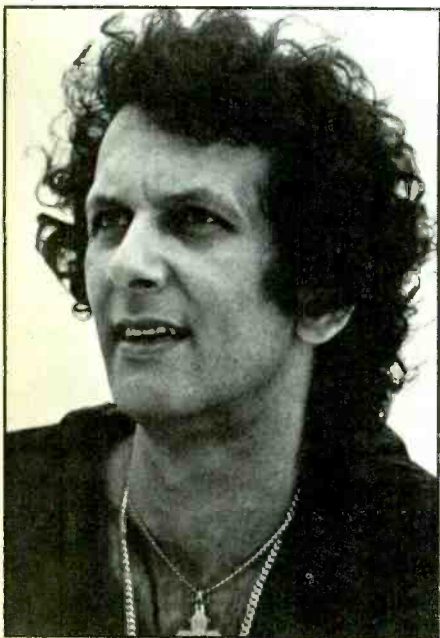
power chord, guitar-driven rock to the masses while he was with Mountain, comes across here sort of like a wimp, a limp-wristed, weak-voiced pop singer whose pop talents either died or were subverted by production personnel.

Maybe it's somebody's idea of a joke, but it isn't very funny. The incredible funk-style female chorus to open the song, augmented with harsh sounding strings, absolutely devastate "High Heel Sneakers," of all things. And the amateurish, grade school chorus sound of "The Water Is Wide" cannot be described very easily. (Credit where credit is due: both these tracks feature horn and string arrangements by Vicky Fabray. Shame on you, Vicky.)

There really isn't much to recommend about this album. Pappalardi reworks the rock classic "Sunshine of Your Love" into a song without the gritty feel of the Cream original. This has a splashier, more patent-leather sound that wouldn't be too bad if we didn't have the original with which to compare it.

The principal faults are two: poor choice of material and terrible arrangements. No one really needed an emotional reading of "The Water is Wide" about now, and the treatment on this album is worse than what Phil Spector did to "The Long and Winding Road." The choice shows an eclectic taste by someone, but the execution is so poorly done. The brass crescendo before the final chorus sounds almost like the end of a game show.

As a recording, the Pappalardi album



FELIX PAPPALARDI: Simple overkill

is not bad. His singing sounds thin throughout, but it is mixed nicely with the accompaniment. All parts seemed well mixed, in fact, so that one can hear just about everything that's going on—for what it's worth. The chief problem in this area is the recording of the strings, which are not even needed, first of all, and when used contain too much treble, giving their sound a shrill, one-dimensional sharpness that is jarring.

The nuggets of some good tracks can be found—"Farmer's Daughter," for example, strives for poignancy in the lyrics, but the feeling is lost because of the overblown arrangement, and lyrics that sound today as hokey as "Teen Angel." "White Boy Blues" has a female chorus that works (a rare feat on this album), and a good up-tempo rhythm behind brassy, gutsy bass and drums.

This album is an example of overkill at its worst. Pappalardi knows better. We deserve better from him. S.R.

DAVID GRISMAN: *Hot Dawg* [Produced and arranged by David Grisman; recorded at His Masters Wheels Studio by Bill Wolf, July 1978, and at 1750 Arch St. Studios by Bob Shumaker, October 1978.] A&M/Horizon SP 731.

Performance: **Splendid, relaxed, even laid-back**
Recording: **Crystal clear**

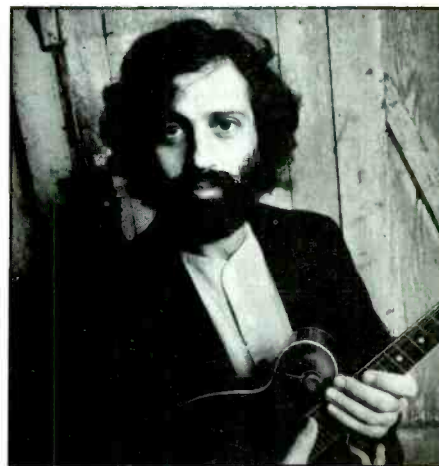
This is not David Grisman's first album, not even his first solo album. You probably have heard his mandolin work on albums by Linda Ronstadt, James Taylor, Judy Collins, Bonnie Raitt, even the Grateful Dead. You might even have found his soundtrack music for *King of the Gypsies* or *The David Grisman Quintet*, a 1977 release on Kaleidoscope. But if you haven't, get this record. This is a most enjoyable album, a fitting successor to *Jazz* by Ry Cooder as an instrumental showcase for fun music.

Grisman is a mandolin player, perhaps one of the best, and this album not only demonstrates his playing, but also his songwriting ability. And, lest you think that this is an album of bluegrass instrumentals, just drop the needle on "Devlin" or "Dawg-Ola" or "Minor Swing." You will find a heady blend of mandolin, guitar, violin and bass (note the absence of drums) that fits into no single category but still fits into many.

Grisman has some splendid accompaniment, too, including violinist

Stephane Grappelli on two of the cuts, and a guitarist in Tony Rice who should try some duets with Cooder sometime in the near future, like Larry Coryell and Phillip Catherine. Other members of the group are Darol Anger on violin and several bassists—Eddie Gomez, Todd Phillips, Buell Neidinger, Lenny Lasher, Bill Amatneek.

And everything meshes perfectly. The eight tracks work so well that one is amazed at how truly fine the music is. One is carried from track to track not only by the catchy tunes, infectious rhythms and considerable skills of all players involved, but also by the clean,



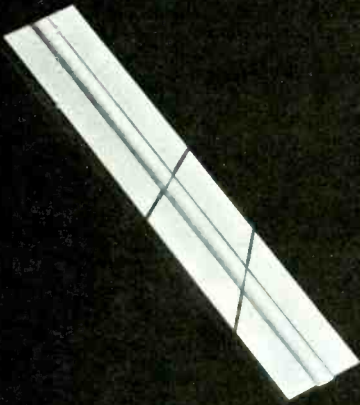
DAVID GRISMAN: A heady blend

crisp sound of the album itself. This was one of the beautiful aspects of Cooder's album before—you could hear everything that was going on. The same is true of Grisman's now—every nuance, every note, comes through. The small ensemble undoubtedly helps, but even small ensemble sound can be muddled if the proper care is not taken.

"Dawg's Bull," which opens the album, is a good example. Four players, four distinct sounds, even though there is some overdubbing here. The song has a bluegrass sound with both guitar and mandolins picked very quickly, but each man plays off the others quite well. The violin is overdubbed onto each channel before the mandolins assume the main theme, in harmony, in each channel. The song dies down in intensity before gradually building up to a spashy close.

The players do a lot of trading off like that, with each instrument taking the lead, even for a brief passage. In some respects much of the material sounds improvised, like jazz, which is a credit to the players' creative abilities and/or to the composers' talents. One will hear a lot of jazz here, and even some near-

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classical thematic development in a song such as "Minor Swing."

If there were any shortcoming, it would be the attention placed on the violin—not that there is too much, but occasionally there is not enough. The violin almost stands outside the recording studio for "Dawgology," a song that is the highlight of side 1. And this is too bad, too, because there is some nice double-stopping by Anger that should be more prominently featured. At other points, however, the violin is given plenty of room to breathe, such as in "Dawg-Ola" and "Neon Tetra."

Very little studio gimmickry is employed—actually, hardly any at all—although one will notice some echo effects on "16...16," the track that brings the album to a close, as Grisman pops some harmonics nicely. The echo is not sustained, however, and does not detract from the song.

Grisman's album has drawn a large following in a variety of musical circles, and it deserves this popularity. The final product seems to be just what Grisman intended it to be—a selection of musical treats played by some friends just for the joy of playing. That joy becomes the listener's as well. S.R.

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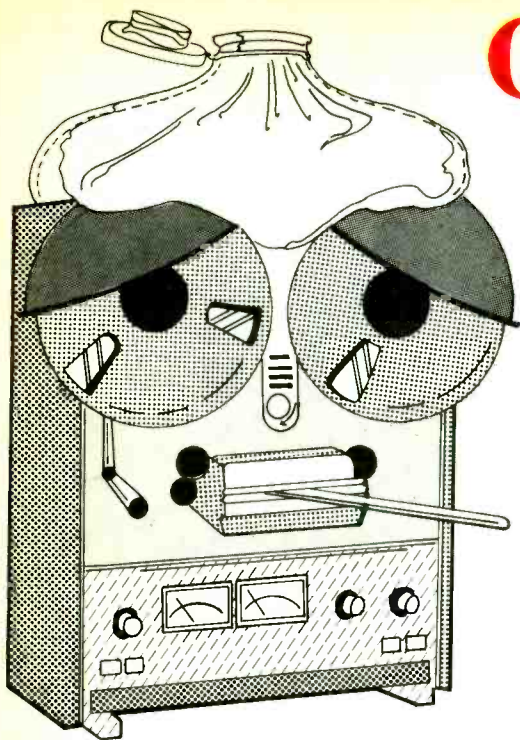
RICHARD AND LINDA THOMPSON:
First Light. [John Wood and Richard Thompson, producers; John Wood, engineer; Jerry Wing and Andy Lunn, assistant engineers; recorded at Britannia Row, Olympic Chelsea and Basing Street studios, London.] Chrysalis CHR 1177.

Performance: **First rate**
Recording: **Ditto**

Even with the demise of Steeleye Span, some fine contemporary music built on traditional English folk foundations can be found, and the latest release by Richard and Linda Thompson is a good example. A wide variety of musical styles can be found here, but the overall sound is not too esoteric to fall beyond the grasp of intelligent listeners. One will find enough of the late 1970s blend with the sound of Fairport Convention to result in a satisfying mix.

This album contains ten tracks, including one terrific instrumental, "The Choice Wife," that features an intricate Irish-sounding melody and accompaniment built on guitars, mandolins and rhythm. One of the tracks, "Sweet Surrender," will prove surprising to many

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listeners who are familiar with the song but who may not have known that Thompson is the composer.

The singing is split pretty evenly between Thompson and his wife, and both voices are just fine. Thompson's is a mellow-sounding voice, fully at home with either the folk-styled song or the up-tempo song. Linda Thompson's voice is a coolly assured instrument, flexible, sometimes husky but always perfectly in tune with the musical and emotional demands of the material. This is an album of songs by singers, and the singers do not become engulfed in the arrangements.

The arrangements, in fact, sound lean and spare even though they sometimes contain quite a sizeable ensemble. The Thompsons have assembled some fine players, too, to mark their first album in three years—drummer Andy Newmark, bassist Willie Weeks, percussionist Dave Mattacks and John Kirkpatrick on button accordion. (Andy Fairweather-Lowe, Ian Matthews and Maddy Prior are among those who help out on backing vocals, too).

Several songs can be pointed to as the highlights of the album, but one sure standout is "Died For Love," with Linda Thompson singing lead. The backup here includes accordion, whistles, guitars, mandolins and drums, and the song itself is a modern subject given a traditional folk-rock setting. A large chorus provides additional support, and the song features also a nice instrumental close. The track is six and one-half minutes long, too long for popular airplay, but it contains the elements of a good single—good vocal line, good melody, good arrangement, good thought.

The listener also will find a little country-flavored ballad in "Strange Affair," and some rock-oriented cuts in "Don't Let a Thief Steal Into Your Heart" and "Layla." The latter, pronounced "Lyla," is not to be confused with the Clapton/Derek and the Dominoes song of the same title. Accordion, cymbals and tambourine, help drive the song with a lively rhythm, and Thompson's lead vocal is quite good. This too represents a contemporary song in a traditional setting.

Only a few tracks don't work really well. "Don't Let a Thief" has some incredibly clean drumming, but the song itself, sung as a duet in unison just this side of disco, is pretty much a throw-away. The title track, which brings the album to a close, sounds a bit like "Sweet Surrender" and the chorus

becomes a little tiresome before the song finally ends.

But the flaws are few and far between on this album, and the folks at Chrysalis should be proud of themselves for having released this and the Sally Oldfield album during the early part of 1979. "First Light," with its rewarding material and tasteful arrangements and recording, has much to commend and is a welcome relief from some of the other sounds that have been so highly touted. There is an understated elegance to this release that I find most pleasing. S.R.

JERRY DOUCETTE: *The Douce Is Loose.* [John Ryan, producer; Bill Drescher, engineer; recorded at Sound City Studios, Van Nuys, Ca., except for "Further On Up The Road" recorded at Lou Blair's Refinery in Calgary, Alberta.] Mushroom MRS 5013.

Performance: **Erratic**
Recording: **Mediocre to sloppy**

Just what or who is "Douce," and why is he loose? And further, you ask, who cares? First, the easy questions. Jerry Doucette is a thoroughly fluid, better-than-average blues guitarist with a less than distinct musical personality. His talent is nebulously displayed on *The Douce Is Loose*, an album which, to put it plainly, could have been better. Much better.

The potential that Doucette shows just never materializes. At his better moments he sounds like an anesthetized Frampton clone, particularly on cuts epitomized by No-Doze Award winner "Nobody." It has all the ingredients necessary to miscreate a really lousy cut. There is poorly arranged synthesizer that is helped along by a uniquely bad mix that displays uniformly poor (or maybe a complete lack of) judgement. There is one of the more notable problems of this album, a sloppily emphasized lead and rhythm guitar that is exacerbated by too much reverb. There is also that same reverb effortlessly rendering most of Doucette's vocals into a muddy, mushy, mumble that occasionally resembles the groans of a drowning hyena.

Other than that, the album's o.k. There is even one half-way decent cut, a version of "Further On Up The Road," recorded "live" (although you can hardly tell) at the famous Lou Blair's Refinery in Calgary, Alberta. For once on this album the sound is impeccably clean, which unfortunately does nothing for



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MARTY GROSZ AND WAYNE WRIGHT: *Goody Goody*. [Jerry Valburn, producer; Dave Smith, engineer; recorded July 25, 26 and September 27, 1978 at Dave Smith Studios, New York, N.Y. and April 20, 1979 at the Westchester Media Center.] Aviva 6003.

Performance: **Goody-goody**
Recording: **Goody-goody, too, if you don't mind a little echo**

This is Wayne and Marty's second LP for Aviva and it's a darn sight better than their first one. First of all, they've been working together longer and getting closer together in their playing. Second of all, Dave Smith is a guitarist himself and his engineering does much more for the sound of two acoustic guitars than their previous try which was recorded at a rock studio by a rock engineer.

The repertoire is interesting, to say the least, going from such over-familiar material as "Honeysuckle Rose" to such rarities as "The Panic Is On." Both are tunes by Fats Waller, but most jazz tributes to Fats remember the former and forget the latter. There are also some Carl Kress/Tony Mattola duets, "Fun On the Frets" and "Blonde On the Loose," which are nice to hear but really don't come up to the original Kress/Mattola recordings which have been reissued on Yazoo records. My favorite track on the LP is Marty Grosz' vocal rendition of one of Jelly Roll Morton's last and least successful attempts to write a pop hit. "Sweet Substitute." Jelly may not have had a winner at the cash register but it is one great tune and I wish it had been a winner so Jelly could have reaped some just rewards rather than dying destitute and in near-anonymity. There is also a beautiful version of "Body and Soul" with Wayne Wright playing a very Les Paul styled solo, as much as an acoustic guitar can approximate Les' electronic wizardry.

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and although it breaks the 20's mood of the Kress/Mattola material and the pop tunes that Marty likes to sing so amusingly and charmingly it is an entirely welcome break.

There's still an excess of pick noise and string slide which always happens when you record an acoustic guitar up close, but Dave Smith has kept it under control and it's not nearly as prominent or annoying as it was on the previous Grosz/Wright album.

If their third LP offers as much improvement over this one as this does over their debut recording, I can hardly wait for it! Meanwhile I'll just keep listening to "Sweet Substitute" and all the other goodies on *Goody Goody*. J.K.

THE CANADIAN BRASS: *Mostly Fats*. [Jay David Saks, producer; Paul Goodman, engineer.] RCA XRL1-3212.

Performance: **Sometimes bluesy, sometimes blistering**
Recording: **The brass shines**

For their American debut recording, the Canadian Brass—a two trumpet, trombone, horn and tuba quintet—have chosen to jump on the *Ain't Mis-*



THE CANADIAN BRASS: Full of spirit

behavin'/Fats Waller bandwagon. Detractors in both the classical and jazz camps will undoubtedly scream that something is lost in the transition from Waller's keyboard style to this brass scoring or that more "serious" repertoire—the brass quintet works of Poulenc and other composers who have written for this instrumentation—might have made for a more suitable introduction to the American market.

Nonsense. As anyone who's seen the Canadian Brass in concert or heard their recordings on the Canadian Boot label knows, this is an ensemble that refuses to be strait-laced. And this collection of short pieces by Fats Waller, Jelly Roll Morton, James P. Johnson et al is full of spirit and lots of fun.

Generally, I find the pieces that work best are those that are given a quiet but colorful treatment—"Lounging at the Waldorf," "Black and Blue," "I've Got a Feeling I'm Falling." The biting sound of a muted, straining trumpet has a natural place in this music, and when it's played over the subdued chordal accompaniment of a brass quartet, the effect is delightfully blue. Equally effective for opposite reasons are some (but not all) of the footstompers—"Ain't Misbehavin'," "Spreadin' Rhythm Around" and "Handful of Keys." In these, the Canadians play with a bright, spunky sound that highlights the often contrapuntal arrangements, as does the stereo mix, which logically places opposing melodic and harmonic figures and statement/answer phrases on alternate channels.

The recorded sound is clean and resonant, giving the effect of a live, spacious hall. This liveness, though, combined with the consistency of the brass quintet sound, varied as the Canadians make it, can be tiring after a while. But both the quality of the recording and the playing are greatly superior to the ensemble's earlier recordings. Best of all, while the playing is absolutely solid, there is also a looseness in interpretation that comes through in the casually bent notes and in the rhythmic give and take, all of which gives these unique arrangements an air of authenticity. Well-played and entertaining, *Mostly Fats* is worth a listen—even if only one side at a time. A.K.

JUNIOR MANCE: *Holy Mama*. [Kyoshi Itoh and Yasochachi Itoh, producers; David Baker and Yoshiro Suzuki, engineers; recorded at Vanguard Studios, New York, N.Y., on May 3 and 4, 1976.] Inner City IC 6018.



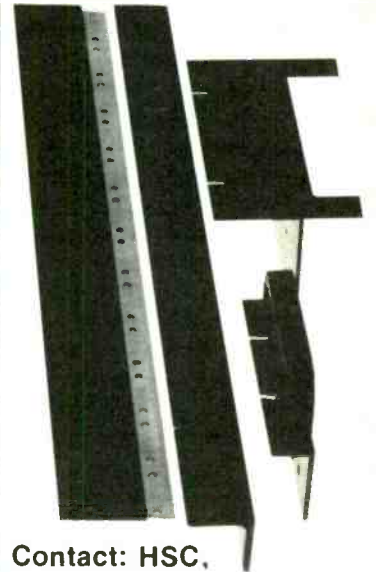
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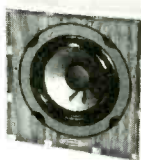
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By Nat Hentoff

After all these decades, there is still no more ardent and easefully swinging a jazz violinist than Stephane Grappelli. Nor has any player of that instrument possessed as glowing a tone and as continually fresh a sense of delight in the surprises of collective improvisation. In *Young Django* (Pausa), the astonishingly resilient Grappelli regenerates songs he recorded with the non-pareil gypsy guitarist, Django Reinhardt, when both were members of the 1934-39 Quintet of the Hot Club of France. It is one of the most deeply lyrical sessions in years—a tribute not only to Django but to the undimmed expressive powers of Grappelli who gets better and better with the decades.

Adding to the stature of the album is the presence of two guitarists with particular understanding of Reinhardt. The Belgian virtuoso, Philip Catherine, was aptly called "young Django" by Charles Mingus; and the American Larry Coryell, who has ranged through rock and diverse avant-garde contexts, reveals here the essential romanticism of his musical temperament. Rounding out this formidable quartet is Danish bassist Niels-Henning Orsted-Pederson whose tone is vibrantly full and whose time is lithely assured.

The sound quality is first-class — spacious, sensitively balanced, with a clarity of presence for the soloists and the ensemble that makes this a perfectly realized celebration of cross-generational empathy.

Another illustration of how jazz can act as an elixir of youth is clarinetist Johnny Mince. In the 1930s and 1940s, his pungent sound and incisive swing enlivened a lot of

big bands—among them those of Ray Noble and Tommy Dorsey. Then, for years, Mince was a member of the house combo on Arthur Godfrey's network radio show, his hot sounds compelling many jazz buffs to tune in that otherwise overly homespun program. Mince has since headed his own units and traveled widely with the Lawson-Haggart World's Greatest Jazz Band.

But *The Johnny Mince Quartet/Summer of '79* (Monmouth Evergreen) is his first album as a leader in many, many years. With bassist Bob Haggart, pianist Lou Stein, and the chronically buoyant Cliff Leeman on drums, Johnny makes clear that, like Stephane Grappelli, age has not at all withered nor custom staled his infinitely inventive high spirits. Among the standards he authoritatively personalizes are "Isn't It Romantic?," "Coquette," and "Poor Butterfly" (a performance of marvelously soaring beauty).

The engineering is fine for Mince — his vibrant, vocal-like sound and phrasing having been captured in the fullness of their impact. The other soloists are also well served, and the ensemble passages come exultantly alive. Alternately biting hot and gently rhapsodic, these tracks provide a round of jazz pleasures that will endure into the next century.

STEPHANE GRAPPELLI: *Young Django*. Joachim Berendt, producer; "Gibbs" Platen, engineer.] Pausa 7041.

JOHNNY MINCE: *Summer of '79*. [Bill Borden, producer; Fred Christie, engineer.] Monmouth Evergreen MES/7090.

Performance: **Funk and games**
 Recording: **A litte bottom heavy**

One of the more interesting aspects of reviewing a record by a musician who I've heard both in his formative years and as a mature artist is to note the growth change. I first heard Junior Mance (we used to call him "Count Mance," which'll give you an idea of how long ago that was) when he was in high school and I was in college. He was one of the early-on-the-scene boppers in the Chicago area but he still had his roots in the mainstream of players like Avery Parrish and Nat Cole, and he could do passable imitations of both. Since then, his playing has gotten bluesier and funkier but then that's a gimmick in and of itself. It's giving the people what they want to hear knowing that the same roots that are in the rhythm and blues genre show up in the funky school of pianists like Junior Mance, Horace Silver, Ray Bryant, Ramsey Lewis and Ahmad Jamal and horn players like Cannonball Adderly and that whole school of Chicago saxophonists who came out of Gene Ammons. It's a music that's easy to boogie to, as the kids say, and therefore it gets a quick and easy, if not exactly cerebral, audience.

Yet there is a subtlety to Junior Mance's funk that many of the other players lack. It shows up in the way he turns a melodic phrase. It's a lyricism that the Bryants and the Adderlys don't seem to find inherent in funky jazz. Horace Silver sometimes catches this same lyricism and so does Bill Evans, although Bill often smothers it by over-cerebralizing it. If you listen to Junior on "Miss Otis Regrets," you'll hear what I mean by lyrical playing.

What's wrong with this LP is that somebody in the control room has put just a bit too much emphasis on Martin Rivera's bass playing and sometimes it sounds like Junior is practically submerged in the bass part.

There's also a problem with Junior Mance's original compositions. There are four of them here but they are sufficiently similar in style and tone that they could just about be run together as one—save for a moment in "The Good Old Days" which almost descends into Boogie Woogie (an earlier form of visceral piano music than Funk but just as effective) and on "Blues for the Schung" which includes allusions to the earlier blues and boogie styles of Avery Parrish and Jimmy Yancey. It's just that the idiom itself doesn't leave much room

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for variety. If the sameness of the record bothers you, you can always take it two or three bands at a time interspersed with contrasting music—which may be the best way after all, at that. J.K.

BENNY CARTER: *Live and Well in Japan.* [Benny Carter, producer; no engineer listed; recorded "live" April 29, 1977, at Kosei Nenkin Hall, Tokyo, Japan.] Pablo Live 2308-216.

Performance: **Swingin' down the main "steam" of jazz**
Recording: **Surprisingly good for concert recording**

Benny Carter, at age 72, has the best of all possible worlds going for him. He's a respected composer and arranger on the Hollywood studio scene, and when he wants to do that, he gets plenty of work. And when he wants to play and arrange jazz the way he did some fifty years ago with the bands of Charlie Johnson and Fletcher Henderson, there's always an audience happy to welcome him home.

In April of 1977 that audience was in Tokyo, Japan (a growing market for jazz musicians). He took a surprising band over with him, when you consider how few of the musicians on the 1977 tour were veterans of his bands of the '30s and '40s, and a whole new book from the one he had with his big band of the swing decades. Rather than turning to such Carter veterans as Dicky Wells and Teddy Wilson, he chose an all-star band of players as diverse as Budd Johnson, who had played tenor saxophone with Louis Armstrong's band in 1933, to young Cecil Payne, who made his big time debut with Dizzy Gillespie's band in 1946. Stylistically, the band goes from main stream swingers like Joe Newman, Nat Pierce and Cat Anderson to beboppers like Cecil Payne and George Duvivier. Budd Johnson was actually a part of both camps—having paid his traditionalist dues with the bands of Louis Armstrong and Fletcher Henderson and having been an important part of such transitional bands as Earl Hines' and Billy Eckstein's.

The concert revolved around the celebration of recently departed giants. There's Johnny Hodges' "Squatty Roo," Duke Ellington's "It Don't Mean A Thing," and a medley in tribute to Louis Armstrong. The talk of the record however, is most likely to be

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Benny's partial waltz arrangement of "Them There Eyes." This isn't the way the tune was done by Billie Holiday in her famous recording of 1939, but it's the way Benny Carter did it in 1977 and, as horrid as the idea looks in print it works and it sounds marvelous.

The interesting thing about Carter's tributes to these fallen soldiers of jazz is that he actually worked with Duke Ellington and Johnny Hodges, having arranged numbers for Duke's band in the early '30s. However, my only memories of Carter playing together with Louis Armstrong was a film made in 1947, *A Song Is Born*, where they appeared briefly in a nightclub sequence with Lionel Hampton, and a 1955 record date for Decca where Carter arranged and conducted but didn't play. Yet what a thrill it is to hear Carter play trumpet again, and especially in a trumpet trio tribute to Armstrong in which Cat Anderson offers "Sleepy Time Down South," Benny plays "Confessin'" and Joe Newman winds up the proceedings with "When You're Smiling." But the primary glory of the album is Carter's ability as arranger and alto saxophone virtuoso (check his solo on "Them There Eyes").

Maybe there would have been more clarity if the band had done this date in a studio, but I don't think the sparks would have flown the way they do here without the appreciative "live" Tokyo audience. The sound's good enough, and the music's even better than that. Also Leonard Feather's informative liner notes are a cut above the average, even for Pablo Records. J.K.

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wonderfully. When it doesn't work, on tunes like "Brittwood Rag" and "Shine On Your Shoes," it just fizzles. The material, including several nice vocals by Max Morath and some Wolverines-style playing with Dick Sudhalter's Bixian horn driving the lead and Vinnie Giordano's bass sax supplying the necessary harumph that all those midwestern rhythm sections had, varies from jazz standards to pop tunes but then so did the repertoire of all but the most slavishly pure jazz bands. There was an advantage to the original Dixieland Jazz Band (of which producer Pete Spargo's father Tony Sbarbaro was the drummer) being able to play pop tunes like "Broadway Rose" and "I've Got My Captain Working For Me Now" as well as "Tiger Rag" and "Fidgety Feet." It got them into better theatres and dance halls and it got their records into more homes than if they'd played nothing but hot numbers. If it doesn't work here, it's because the repertoire wasn't chosen carefully enough. "Shine On Your Shoes" is the kind of a show tune that works better in the swing idiom than in the traditional jazz idiom. "Brittwood Rag" doesn't work primarily because it's not one of Eubie Blake's better numbers. Nobody writes winners all the time. Even Hoagy Carmichael is represented by one of his more mundane pieces, "Moon Country," but that's how it is.

I would like to correct Dan Lanagan's otherwise fine liner notes on the subject of "River Stay 'Way From My Door." I'm sure that it's true that Phil Harris did revive the song for a second life, but he also gave it its first life on a recording of Lofner and Harris' St. Francis Hotel Orchestra. Lofner and Harris (with Harris on drums as well as vocal) recorded the tune for Victor in San Francisco on October 14, 1931, thereby beating Guy Lombardo's Royal Canadians into the recording studio by a month and a half. Morath's "River Stay 'Way From My Door," by the way, is one of the better cuts on this recording with a marvelous clarinet solo by swingin' Sam Parkins, who comes close to inheriting the abrasive sound of the late great Pee Wee Russell here.

I can't complain about the recording job but I can't praise it either. They got it all down on the disc but there doesn't seem to have been much of an attempt to get any special identifiable sound or ambiance. There's nothing much wrong with it, there's nothing much right with it—it just kinda lays there. J.K.

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