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MODERN RECORDING

JANUARY 1978

VOL. 3 NO. 4

SERVING TODAY'S MUSIC/RECORDING-CONSCIOUS SOCIETY

THE FEATURES

LOU REED
—MIXING IN BINAURAL 36
By Tim Bomba
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A SESSION WITH LYNKYRD SKYNYRD 46
By Russell Shaw
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—THE STUDIO GAME! 52
By Bob Berliner
We know, you've never been any good at games, and your little brothers, sisters, nieces and nephews are always showing you up at family functions. Well, before you cash in your chips and go hide in the drum booth, play a game that is guaranteed to help you . . . even if you lose. Follow the arrows . . . No cheating, please.

COMING NEXT ISSUE!

A Session with the Jefferson Starship
Inside a Sound Man's Tool Box
Led Zeppelin "Live!"

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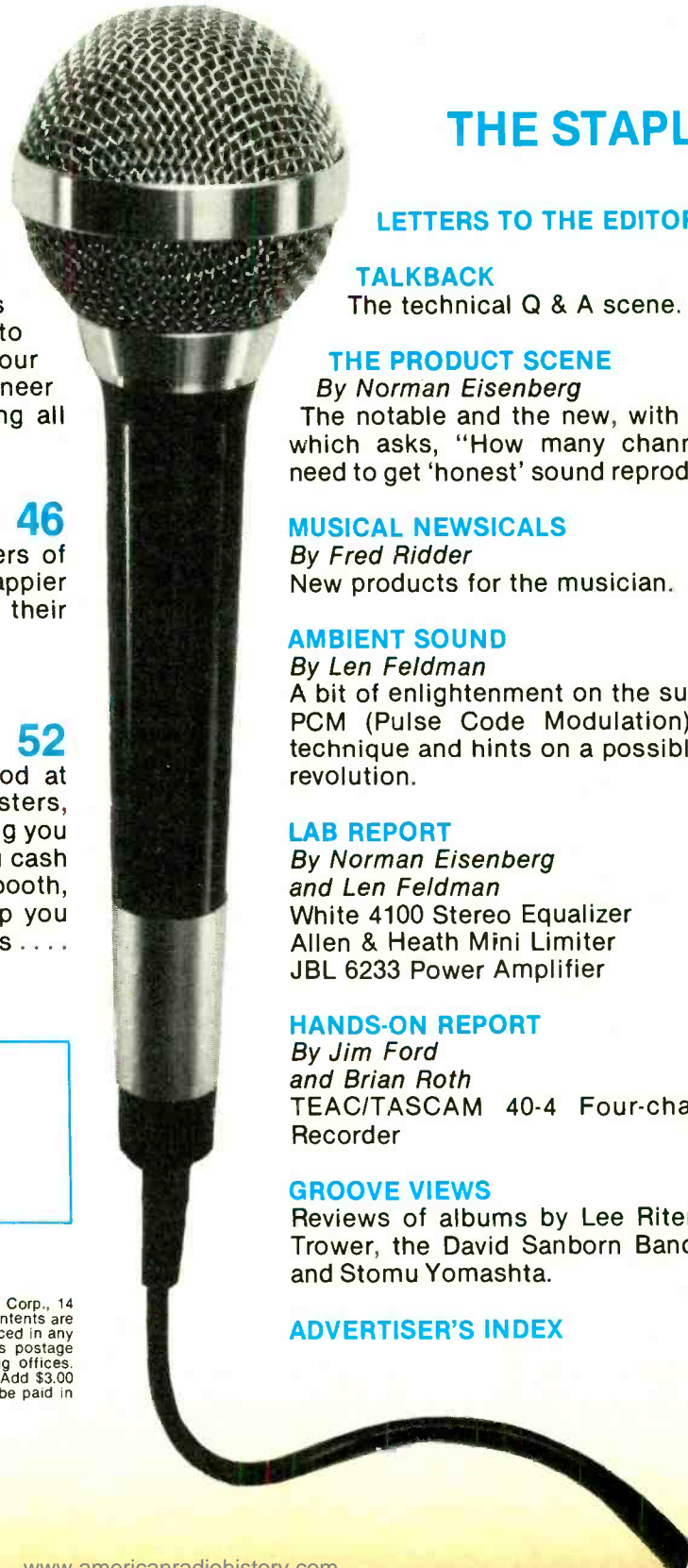
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LETTERS TO THE EDITOR

The Pros and the Cons

In response to Michael Columbus' letter to the editor in the October 1977 issue; I must disagree and take side with your very excellent reviewer Russell Shaw (see "A Classic Recording," page 4). Russell's reviews have always been accurate and leave no question to his being an "informed" musical journalist. To judge an album's "brilliance" on its commercial success or the presence of a certain guitarist (who incidentally, is *not* playing anywhere near his potential irregardless of his knowledge of how much to play when), shows a musical maturity firmly entrenched in Top 40.

As far as the content in *MR* is concerned, I must admit your crew is doing a better job than most. *MR* has been leaning towards gadgetry in its more recent equipment reports rather than dealing with the how-to's of recording and recording equipment. Len Feldman's articles are still geared with a hi-fi attitude and although very good, lack something in a truly definitive technical aspect. Feature articles on performing artists have been uneventful at best and not truly indicative of what is involved in producing an album, broadcast or tour. Outstanding articles were John Woram's introduction to microphones ("John Woram Presents Mike Graphones," May 1977, page 31), tape to disc mastering by David Moyssiadis ("From Tape To Disc—Disc Mastering, Part I," August 1977, page 24 and "From Tape To Disc—Disc Mastering, Part II," September 1977, page 44), noise reduction by George Klabin ("Noise Reduction—A Current View, Part I," May 1977, page 44) and acoustics with Jeff Cooper ("How Acoustics Affect Recording," July 1977, page 36); all excellent common-sense writing. Well done, gentlemen!

Overall, *MR* does have a lot of good info and even more in potential. *But* the high point of each issue without a doubt is the Groove Views column, staffed by what has to be the most consistent crew on any magazine in North America. These guys ask no quarter and give none. Although I don't always agree with their views, I am impressed with album variety and their mature "professional" attitudes in deciding whether an LP deserves recognition or to be chucked. Congratulations, gentlemen, your column is *MR*'s best point in my opinion.

Best wishes to all the staff at *Modern Recording* and continuing success.

—Mark J. Dabielski
Victoria, B.C., Canada

An Enterprising Recordist

Recently I completed a new room in my home in which I am interested in building a four-track home recording studio. I would like to know if you can send me the names of a few companies that I can send stereo tapes to and have stereo records made.

Any information regarding this will be appreciated. Names and addresses of this type of company are all that I need to get my home recording enterprise underway.

—Charles E. Hammersmith
Leavenworth, Ks.

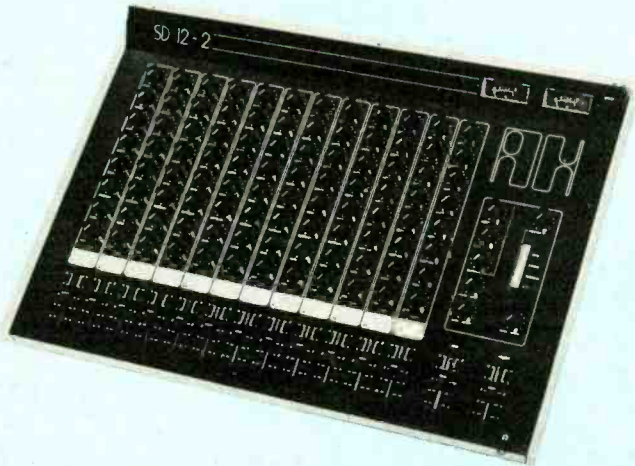
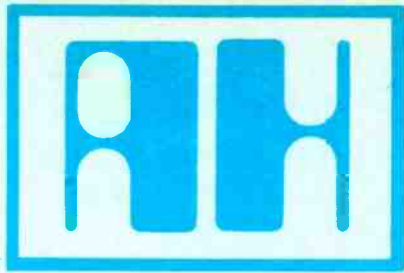
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Before you begin to deal with the intricacies of the record pressing and/or mastering plants, you should have a good idea of what you're getting into—what to look for in a facility, what can go wrong (but should go right), what prices to expect, etc. For a close-up look at this facet of the industry, check out David Moysiadis' article, "A Guide To Better Record Pressings" on page 56 in the December 1977 issue of MR. We spoke with David about the specifics of your question and his advice was for you to grab the nearest Yellow Pages. Record pressing plants are located in most major cities and dealing with a local plant can save you a lot of time as well as aggravation.

A Word of Praise

In the May, 1977 issue of *Modern Recording*, Len Feldman wrote an excellent article on Pre- and Post-Equalization (Ambient Sound, page 52). What particularly delighted me was Mr. Feldman's statement, "It is not uncommon for system gain to be improved by ten or more dB by careful adjustment [of filter equalizers]—always *downward* (italics his)—of a few of the appropriate level switches."

It's the words "always *downward*" that I like. So glad the message is reaching the masses.

Mr. Feldman goes on to say "Nor is power output capability of the sound reinforcement amplifier a problem for, as we said, in most instances of P.A. system equalization, the levers are pulled *downward* and not adjusted to provide boost at any of the frequency bands available on the particular equalizer." However, after the high peaks are "brought down" the *overall signal* is then turned up by the master gain control, thereby necessitating greatly increased power demand in a majority of cases.

—Carolyn Davis
Synergetic Audio Concepts
Tustin, Ca.

Your Own Label

Could you give me the address of the agency in Washington D.C. where I can get my record label registered?

—Herbert Gilchrest
Memphis, Tn.

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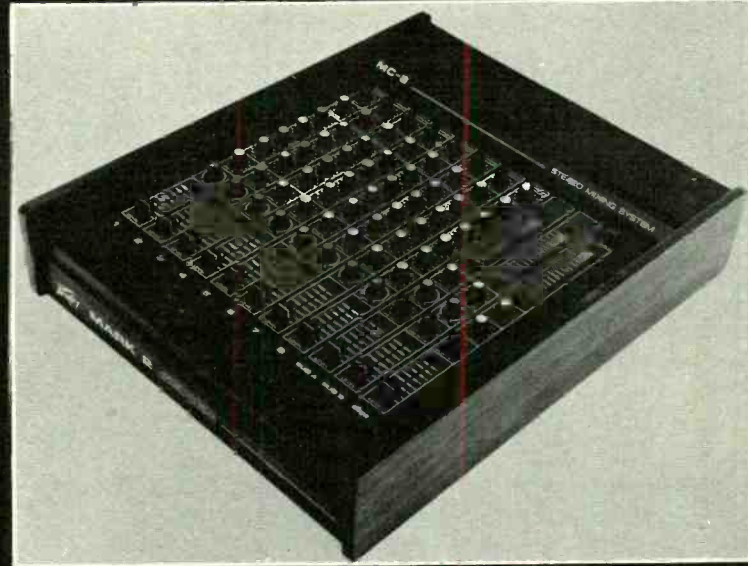
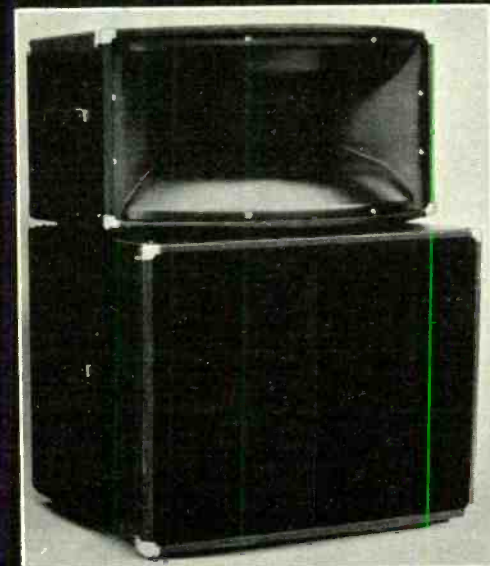
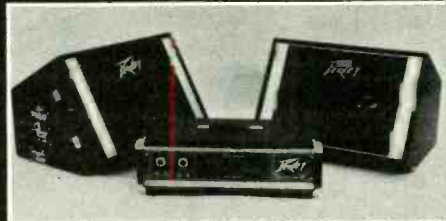
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CIRCLE 76 ON READER SERVICE CARD

the procedures involved in setting up your own label and can steer you through these sometimes confusing waters. If you are financially able to undertake the start of your own record company, a lawyer will eventually prove a necessity, so it's best to take the safest route and find one early on.

Who's Got My Mixer?

I was wondering if you could help me out with some advice about mixers. I am in the process of acquiring an Akai GX-270DDS 1/4-inch, reel-to-reel deck and I was hoping you could put me on to some good mixers with the features that I desire/require:

- 1) 4 inputs, 12 outputs (minimum, more is acceptable, but not needed).
- 2) Panpots (all inputs, if possible, at least more than one).
- 3) Separate EQs (desired, but an overall EQ is adequate).

I also have in my possession a Sony 2-track reel-to-reel, so the mixer will be used for combining the four tracks on the Akai into two (stereophonically balanced) tracks on the Sony, rather than for mic mixing.

Any information you can supply is most greatly appreciated, and I thank you for your time.

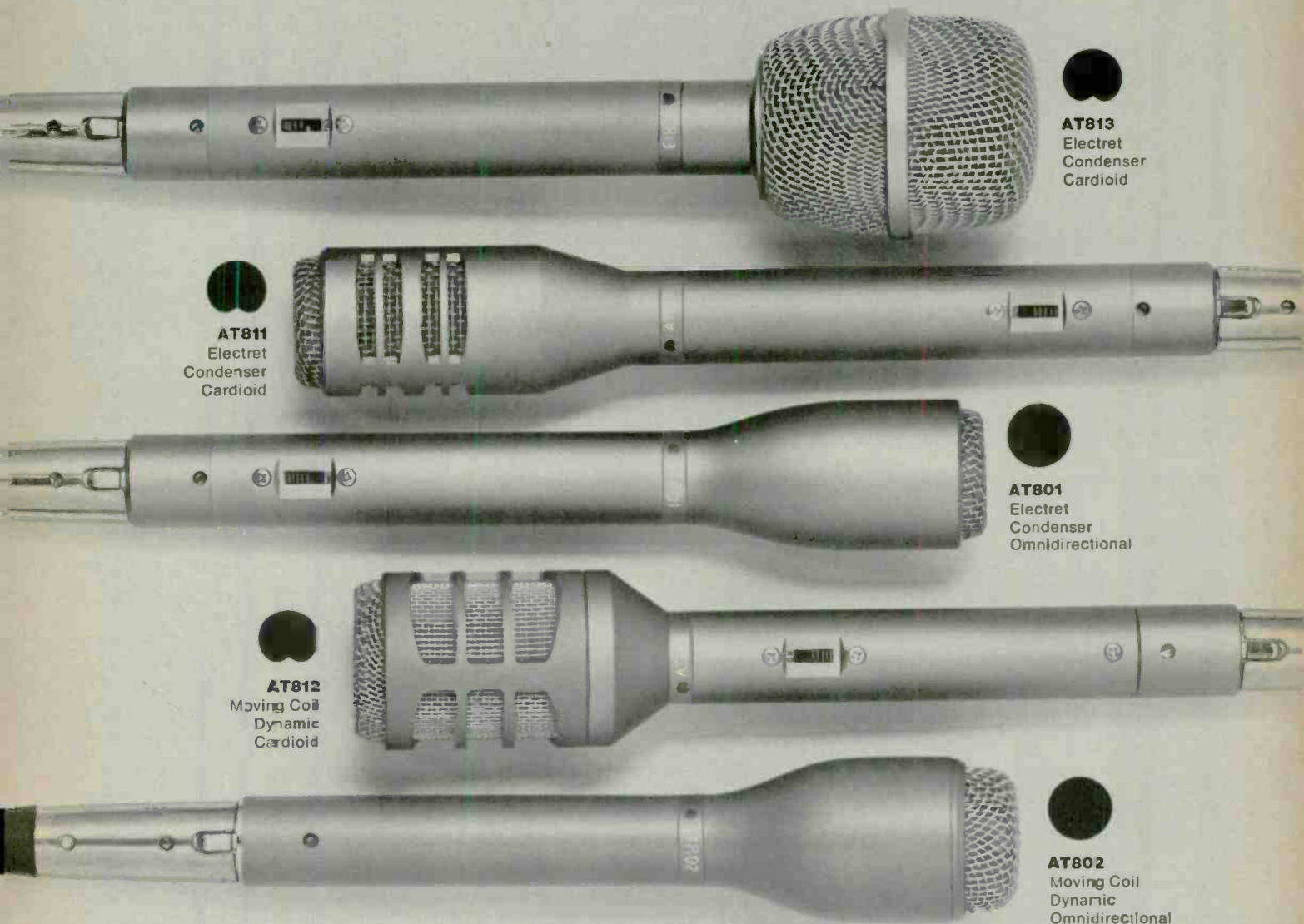
—R.J. Brown
Ossining, N.Y.

Despite the information you give us, it would be next to impossible—as well as unfair to many manufacturers—to attempt to list all the mixers which might suit your needs. Instead, we advise you to look through the Modern Recording Buyer's Guide where you will find the specs of many mixers broken down onto easy to read (and compare!) charts. If you don't have a copy of it, info on ordering a copy of it appears in the back of every issue. You might also re-read the Hands-On Reports of the April 1977, July 1977 and September 1977 issues of MR where mixers are dealt with in greater detail.

Cassette Deck Controversy

The August 1977 issue was the first Modern Recording I'd ever read. My compliments. You've gained a reader. I do have one complaint, however. Norman Eisenberg stated at the end of the Advent 201 A review (Lab Report, page 46) that performance and control flexibility aren't common in cassette decks in the \$400.00 range. If that is the case, then all Nakamichi 500 owners,

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Harmon Kardon 2000 owners and Maranta 5420 owners (to name but a few) have been duped.

I seriously doubt if this is the case, though. There are cassette decks in the \$300.00 range that equal the Advent 201 A. The Kenwood 920 is an example. (I think the Kenwood 720 has the same specs and is \$50.00 less.)

My advice to Norman Eisenberg is to be more attentive to detail—especially with all the *fine* products that are available today.

—Paul Beckwith
 Las Vegas, Nv.

It is hardly too revealing of relative product performance to compare published specs for product A against lab test results of product B. Be that as it may, the reader should be aware that the Advent 201A is rated (and was tested) for response that is held within ± 2 dB, which is fairly rigorous and quite rare among cassette models, most of which use the wider variation of ± 3 dB. Also, the Advent's S/N ratio is among the best. Then, too, we tend to place a fair amount of emphasis on mechanical reliability, and the Advent is known to employ one of the most rugged transports in the cassette-deck field.

All this notwithstanding, I am willing to concede that you do have a valid point in that there are cassette models in the \$400 or so price range that do rival the Advent's audio performance overall, and which also offer more control flexibility. In light of this, our enthusiasm for the Advent may have been somewhat "overstated."

—Norman Eisenberg
 Audio Editorial Board
 Modern Recording

Valuable Insights

Your magazine is excellent and I am especially pleased with the recent articles on "Disc Mastering" by Dave Moyssiadis (August and September 1977). He manages to pack his articles with quite a bit of technical information while presenting it in an interesting and sometimes even humorous manner. These articles (along with everything else in the magazine) are very informative, providing valuable insights into the recording process.

I am an amateur recordist and articles such as "Disc Mastering" inform us of the "trials and tribulations" encountered by those who make a living doing this sort of thing.

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utilizing purely electronic synthesis equipment is such an expanding field, how about some articles written about or by Walter Carlos, Tomita, Morton Subotnik and other artists in this field?

—Jay Rumberg
Portsmouth, N.H.

Glad to hear that we're keeping you informed of the "real" world of recording. Your point regarding the continually increasing use of electronic synthesis equipment is true and in keeping with this trend we featured an article on synthesizers (see "The Synthesizer: An Unfathomable Sound Generator," by Edd Kalehoff, page 30) in our Feb/Mar 1976 issue.

Filling the Void

I would like to take this opportunity to congratulate you for publishing a magazine that serves the semi-professional through the hobbyist in the art of sound recording. This is an area which I feel should be dealt with in greater detail in more hi-fi magazines since it has been almost as popular as 35mm photography in recent years. Your magazine has taken a giant step toward filling this void.

Thank you for your time.

—J.R. Barylski
St. Louis, Mo.

Where To Begin

After reading the Shelly Yakus profile (August 1977, page 30), I was delighted to learn that a young person like myself could actually train in this field without necessarily going through a recording school. My question is how exactly can a young person obtain training from a studio? I have been very interested in engineering for the past few years and have been making "live" tapes lately and have worked with a mixing board several times.

Being fresh out of high school, I fear there may be some age discrimination projected by studio executives. Any info you could give me on this will be greatly appreciated.

—Ross McIntyre
Nanaimo, British Columbia, Canada

While it may be that you can get to work in a studio without having any prior experience, we maintain that it is infinitely wiser to try to get some background from a reputable recording school before looking for employment in the field. As for how you get



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into a studio—you have to make the rounds of the studios in your area and express your interest to them. Also, we have never heard of anything akin to age discrimination in this field—everyone has to start somewhere.

A Very Together Magazine

I was recently introduced to *Modern Recording* magazine by one of my students. I must admit, when he showed me the magazine, my first impression was, "another 'Mickey Mouse' magazine."

So as not to look foolish, if my student were to ask me about a specific article, I started to thumb through it. To my surprise, on page 24 of your August issue, I noticed the article entitled "Disc Mastering, Part I" by Dave Moyssiadis. Although I do not know Mr. Moyssiadis personally, I do know his name and reputation as they are well-respected in the business.

I have been producing successful records professionally for the past twenty-two years, and this article is really together. Your editor obviously has his thing together also, as he cleverly split the article into two issues. His psychology worked, but I haven't been able to locate a September issue containing Part II for love or money!

Aside from my producing functions, I own and operate a music business school which turns out over three hundred graduates per year. I would like to use Parts I and II in future lectures or class open-discussion periods, and have already included a pitch to my students to subscribe to your magazine.

I am delighted that such a magazine exists and I intend to use future articles in my classes. Again, *bravo* and thank you for your time and consideration.

—Marty Kugell
President
Business Academy of Music
Ansonia, Ct.

A copy of the September 1977 issue can be located very easily, and for not a lot of money—\$1.75 to be exact. A form for ordering back issues, which September (Vol. 2 No. 9) now qualifies as, appears in the back of each issue of MR.

"How To" Info

I am interested in putting some sort of headphone system together that would allow everyone in our group to hear the same thing simultaneously. Could you tell me how to go about it? Is it possible for me to build such a system myself? If

so, could you explain what is required?

Any information you can supply or direct me to would be greatly appreciated.

—Keith Evans
The Glass Band
Villa Rica, Ga.

We most certainly can tell you how to go about building such a system! Robert E. Runstein's article, "Build Your Own Cue System" dealt with just this information. That piece appeared in our April, 1977, issue on pages 44 through 50. If you missed that issue for some reason, it's still available from our back issues department at \$1.75 per copy.

Time Marches On

Here's something for you lovers of trivia—MR celebrated its second birthday in October of 1977. This auspicious occasion necessitated some changes on our cover. Our more observant readers will note that our issue number jumped from Vol. II No. 11 on our November 1977 cover to Vol. III No. 3 on the December 1977 cover. We hope this didn't cause any confusion—it was just our way of getting up to date. —Ed.

Something For Enthusiasts

With the advent of *Modern Recording* along with *Guitar Player* and *Contemporary Keyboard Player* magazines, we musicians as well as music and recording enthusiasts finally have something worth reading.

Congratulations on your second anniversary.

—J. Pardo
Stanhope, N.J.

A Suggestion

Have just started reading your magazine and find the information in it very helpful for a "budding" recording engineer such as myself.

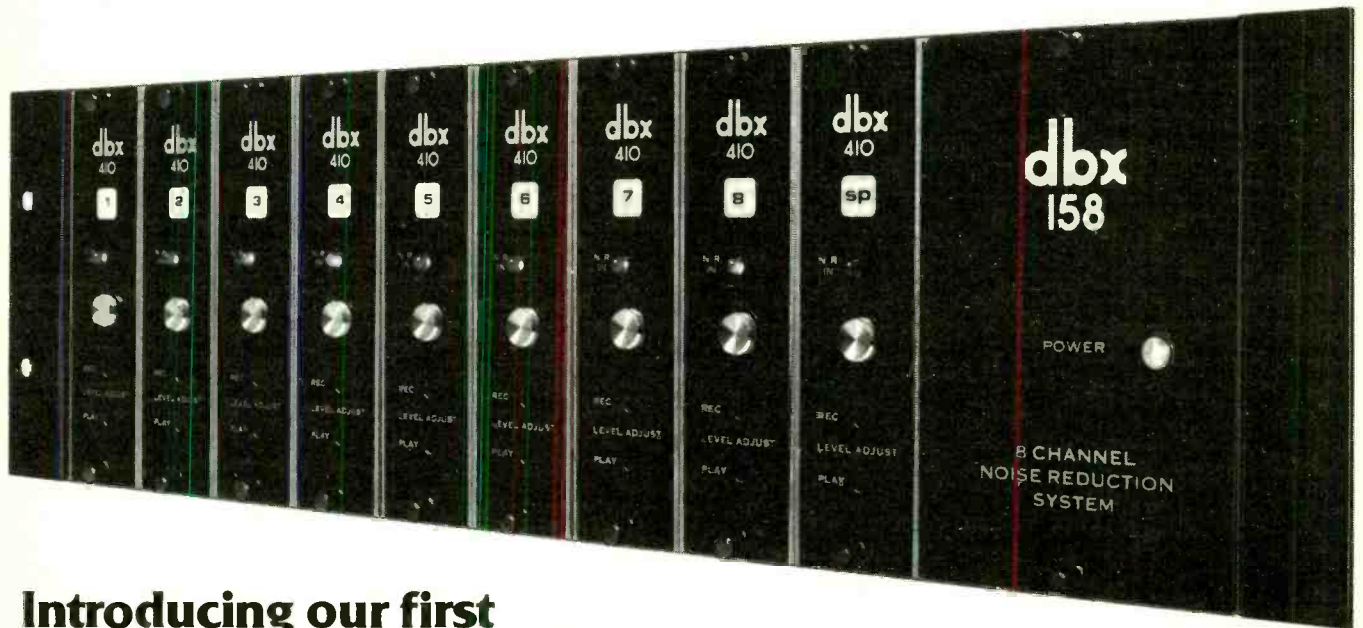
Why don't you do record reviews of some of the contemporary Christian groups around, such as Michael Martian, Phill Keaggy, Paul Clark, Petra, etc.? There are many fine groups of this type around cutting vinyl and I would like to pick up on their studio styles and such.

—G. Pyle
Long Beach, Ca.

We have no plans at this time to do stories on the performers you mention. But please consider your suggestion well-taken.



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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.

Class-y Amps

Jim Ford and Brian Roth neglected to mention the different classes of amplifiers in their three-part "PA Primer" article (June/July, Aug/Sept, Oct/Nov 1976). Would you please explain the differences between class A and class B amplifiers, with some comments on their respective advantages and disadvantages?

—Bill Blank
Milwaukee, Wi.

While it seems almost impossible that Jim and Brian missed anything in their Primer, your question is a valid one. So valid, in fact, that Len Feldman has decided to devote an upcoming Ambient Sound column to it. You can look for the explanations you need in MR next month.

Grounding An Illegal CBER

I have a big problem and that is interference from CB. I have tried everything that I have been told might help, such as grounding everything, running wafer capacitors from the hot side to ground, etc., etc. *Nothing* will keep this gal from splashing onto my recorder! She's about one mile from me, but I can't pinpoint her exact location. I have a TEAC 2340 4-channel. When I run ground lines, she

comes in stronger!

Maybe someone else has had this problem and can offer a solution. I sure need help before I flip!

—O. D. Kincaid
Boardman, Oh.

We tried our very hardest to find a method of eliminating the RF interference that you hadn't tried that would save both your sanity and your recordings. Unfortunately, the consensus of opinion was that she must be running a linear operation and transmitting illegally above the 500 watt limit for CBs. With a linear placed between her set and antenna, she can operate at a frequency many times the legal limit set by the Federal Communications Commission (who govern such things) and can render you almost defenseless. Your only recourse would be to report her illegal operation to the FCC (there is usually a branch in major cities, you might look them up in a Cleveland directory) but keep in mind that it is very difficult to track these people down—even if an exact location is known. If any of our readers has experienced such a problem—and dealt with it successfully—please drop us a line and let us know how.

A Question of Perfection

I have a friend that says that the perfectly engineered record (if, indeed, there is such a thing), when played on your turntable, should actually sound excellent without boosting or cutting

Thanks for any information you can give an engineer-to-be.

—Paul J. Karlis
Lackawanna, N.Y.

If a record could be "perfectly engineered" (that is, the balance of levels and frequencies being ideal), then one would have to play it back on a "flat system" to appreciate its qualities.

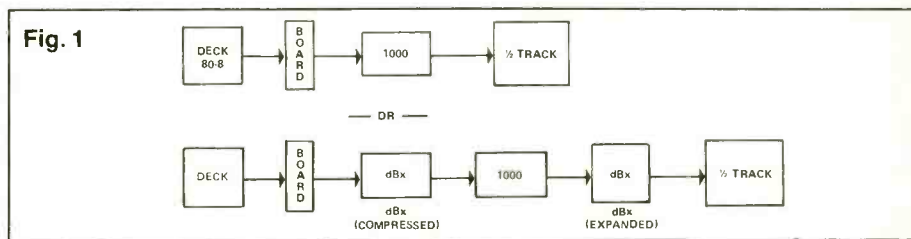
A "flat system" is one which has had pink noise pumped through it while using a real time or spectrum analyzer to relate to the relative flatness of the system. The use of a third-octave equalizer such as a UREI 529 room equalizer would enable one to then adjust for speaker and room deficiencies, thereby obtaining a "flat system."

Of course, although everyone *does* hear differently, all things being equal, with a perfect record and a perfect playback system one should not need to add or cut bass or treble to obtain excellent sound.

—Bruce Staple
General Manager
Soundmixers
New York, N.Y.

A Proposal for Phase Linear

I use a Phase Linear 1000 for noise reduction in the following fashion: (see Fig. 1.) The Phase Linear takes hiss off preamps and hum out of the board or the taped signal and, with or without dbx encoding, helps to make "no-hiss" mixdowns. What I don't understand is



the bass or treble controls, in other words, flat. Is he right? It seems to me you should tailor the sound to your ears.

why Phase Linear doesn't make an eight-channel auto-correlator for insertion into a board? I have also used it

when doing overdubs on a four track and I can do eight tracks very easily with almost no noise by using it to remove hiss when putting tracks 1,2 and 3 onto 4, etc. You can also put a bit of high boost (Dolby) in front of the 1000, suffer no extra hiss because of it, and even get a bit of pickup to compensate for tape loss.

—George Rigby
Downey, Ca.

The Phase Linear 1000 is a single pass noise reduction system, as you have pointed out, and requires no encoding in order to take the hiss off records or tapes. It is very useful in many operations because you do not have to have the encoding of the source in order to eliminate the hiss that would come down from the final recording.

Your question, which is a very good one, is why we do not have an 8-channel autocorrelator for insertion into a board. Bob Carver has been working on this project for over a year and one-half now, and we hope that at some time in the future we will have a correlator that could be used in that fashion. It is not a trivial project to take the autocorrelator as it is in its present stage and to expand it in a workable size that can be used with 8 channels. Bob also feels that there are certain characteristics that can be changed in the unit to make it better able to function in the mixdown operation, and that is one area where he is spending a particular amount of time.

The project is proceeding, though at the present time it still is not close to completion. In the meantime, the 1000 can be used in the manner you have described and it can be very useful in eliminating the noise in the final tape. Your suggestion is very valid and the only thing we can say is that we are working on exactly what you have suggested.

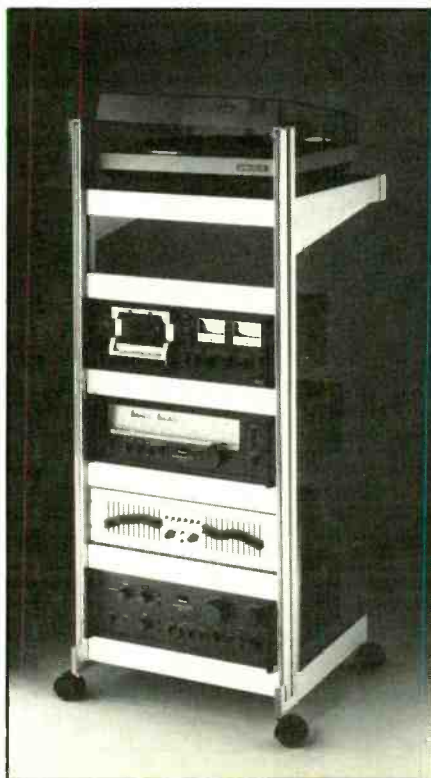
—Donald F. Prewett
Executive Vice President and
General Manager
Phase Linear
Lynwood, Wa.

Advice for a One-Man Band

I am a "one man band," so to speak, in that I play all my own instruments and sing all vocals. Being an obvious candidate for simul-sync recording, I recently purchased a TEAC/Tascam 80-8 reel-to-reel and a Model 5 mixing board. I am mixing down to a half-track mastering machine. I am green from the

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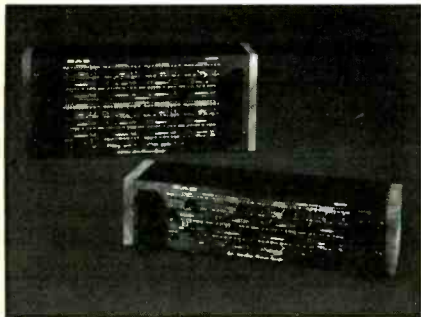
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word go as far as proper techniques. I have been told that it is proper to record all vocals and instrumentals with no EQ and then add it when I do my final mix. I got the same info about adding reverb. I was also told that I need only one stereo equalizer to add EQ on my final mixdown. Are these points correct? What are the proper techniques?

—Marty Friend
 Bristol, In.

After reading your letter it occurred to me that your one-man recording situation might lead you to *want* to record tracks with no EQ, simply because you would have to spend a lot of time waiting for playbacks in order to evaluate any EQ changes. Recording flat (no EQ) is okay, but it is also acceptable, desirable in my opinion, to get each element of a recording sounding “right” (excluding special effects and reverb) as it is being laid down on the multi-track tape. This end can be accomplished by getting the source itself (instrument or voice) sounding the way you want it, proper microphone placement, *subtle* EQ, and dynamic range adjustment (limiting, compression) as required. Additional or more drastic signal processing, special effects, and reverb can be introduced during mixdown. The reason for saving special effects, heavy-handed EQ and reverb for mixdown is this: Since multi-track recording was developed to give the user maximum decision-making flexibility, it would seem unwise to counter this aim by locking in an effect, or excessive EQ or reverb on a track. The same processing can be applied with much more flexibility during mixdown. This approach requires a lot of leg-work in a one-man studio, but I believe the final results will be worth it.

Please note the distinction made between the “subtle” EQ sometimes required to overcome less-than-ideal miking situations and the “heavy-handed” EQ often employed during mixdown to “rework” the sound of an instrument or voice. For either version you will probably use the inboard EQs on the Model 5. Once you have a stereo mix you like, but one you feel needs a touch of overall EQ, you can employ a stereo equalizer between the mixing board and your half-track machine. Ideally, an outboard equalizer should be connected before the stereo master fader. Check your Model 5 manual for the proper input and output levels and impedances required of such a unit as well as the correct method of installa-

tion. If you find yourself using an outboard EQ to a large degree on a particular recording, it might be best to go back and remix.

—Peter Weiss
 Engineer
 Columbia Recording Studios
 New York, N.Y.

A Little More On “Or What”

In the Talkback section of the April 1977 issue in response to the question about why European consoles “sound” different (see “Different Sounds,” page 12), engineer Charles Flynn used the example of how the Beatles’ drum mix sounded “different.” I had noticed this myself before when trying to reproduce it. What was done to get this sound? Was it the choice of microphones, the equalization that American engineers are afraid to use or what?

—Robert W. Moye
 Jacksonville, Fl.

The reference to the Beatle drum sound was a case in point in regard to different techniques used by English and American engineers. There are many variables in recording and mixing and the drums have more variables than any other instrument.

Avoiding the question no longer, the answer is—you’re right. It was the choice of microphones (and placement) the equalization (and stereo placement) and “or what.”

—Charles J. Flynn
 General Manager
 Westlake Audio, Inc.
 Los Angeles, Ca.

A “Kool” Sound

I’m an experienced but still amateur soundman for a local band. I study each issue from cover to cover and have found *Modern Recording* to be extremely informative. It’s a most cherished possession to us—the “ground-floor” little people in this world of sound. I would like to commend you on a truly fine publication.

I would be very pleased if you could furnish me with some information or at least point me in the right direction. I’m having quite a time trying to get an address for the company that did sound reinforcement for this year’s Kool Jazz Festival—the McCune Sound Service. I would like to know what kind of equipment was used, particularly the board, monitor and house speakers.

Thanks for making the road a little

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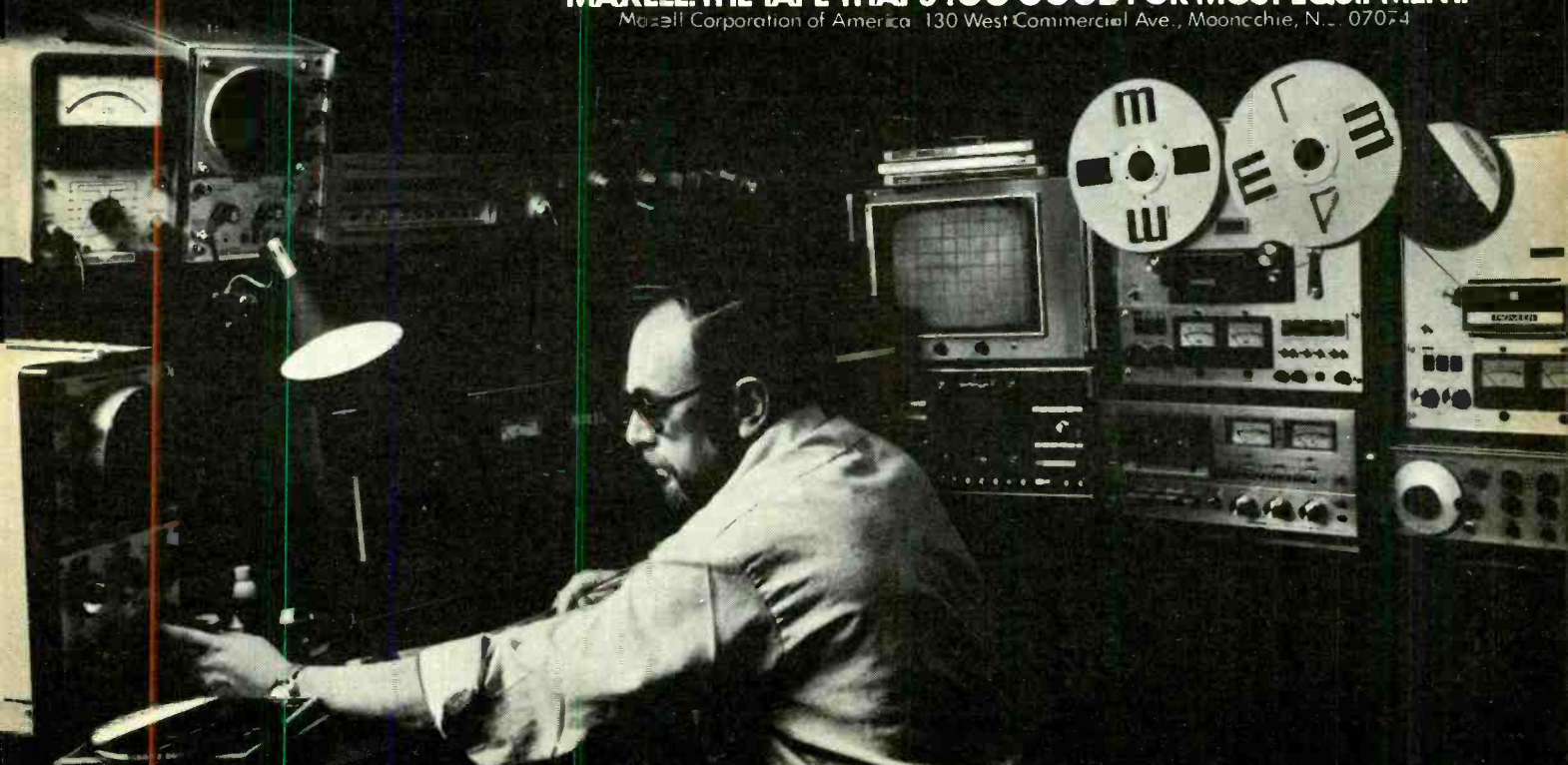
problems that plague other tapes.

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smoother for us—and for opening a few of the doors to the world of sound and the techniques of recording it.

—John E. Hardy II
Flint, Mi.

Mort Feld, Technical Director for McCune Sound Service, very kindly took some moments out of a typically busy day to chat with us and answer your questions. As Technical Director for the fifth consecutive year for the Kool Jazz Festival (which was a nationwide series of concerts held this past summer featuring such artists as Natalie Cole), Feld was responsible for designing the sound reinforcement set-up for halls and stadia ranging in size from 10,000 to 50,000 seats. For this task they used all custom-made pieces.

The JM-10 amplifier/speaker system was in fact perfected for this occasion. The JM-10 is a 3-way system and is capable of handling up to 15,000 watts per stack. Feld says he used just two per hall. Likewise, the SM-3 monitor system is of their own design. It is a bi-amped midrange horn system.

The board used, the MC-8, is also a unique McCune custom piece designed, not with recording, but reinforcement

in mind. The key words to describe this board are flexibility and versatility. Bob Carvin (who also worked the festival for McCune) expounded further. The basic board has 22 inputs/4 outputs with eight submasters. It is easily expanded an additional 12, 16 or 22 outputs with eight submasters. It is also equipped with two echo sends (pre- and post-) per channel. (Each echo send is treated as a separate channel.) There's also a 6-band EQ on each input and output. The board can do three separate mixes simultaneously (i.e. an 8-track stereo mix, a mono mix and the house/PA mix). The board utilizes a double-matrix system and was designed because McCune wanted a board that would be quieter than those currently available. (Their board has a much better S/N ratio than most.) There's no patch bay for, as Bob explains simply, "we have no time!"

As if the sound didn't present enough of a challenge, they also produced giant screen video shows featuring the performer on stage and video "pong" games during intermission.

This should answer all your questions, but if you still want to know more you can write to McCune at either of their

two California addresses. In northern California, write to them at 951 Howard St., San Francisco 94110 (or phone 415-777-2700). In the southern regions of the state, write to McCune at 1773 W.Lincoln Blvd., Bldg. I, Anaheim 92801.

No Change Possible Here

I'm waiting for my Philips Lab turntable (the GA222) to arrive from the mail order house from which I ordered it. I'm wondering if I could reduce the mass of the tone arm by putting a different headshell on it. The headshells that I am considering include the Audio Technica ATS Universal, the JVC PL1 and the shell that comes on the Sony 8750 turntable. Could you tell me which of these shells are the lightest and if they are compatible with the GA222?

—Paul Beckwith
Las Vegas, Nv.

The GA222 incorporates a one-piece tone arm; therefore, changing the headshell would not be possible.

—Ronald O. Barber
Product Development Manager
Philips High Fidelity Laboratories
Fort Wayne, In.

ASHLY P.A. PROBLEM SOLVERS

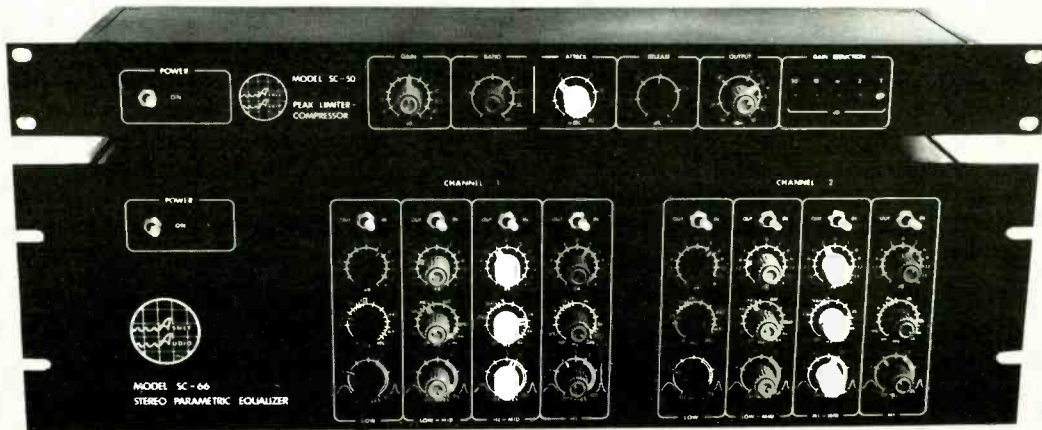
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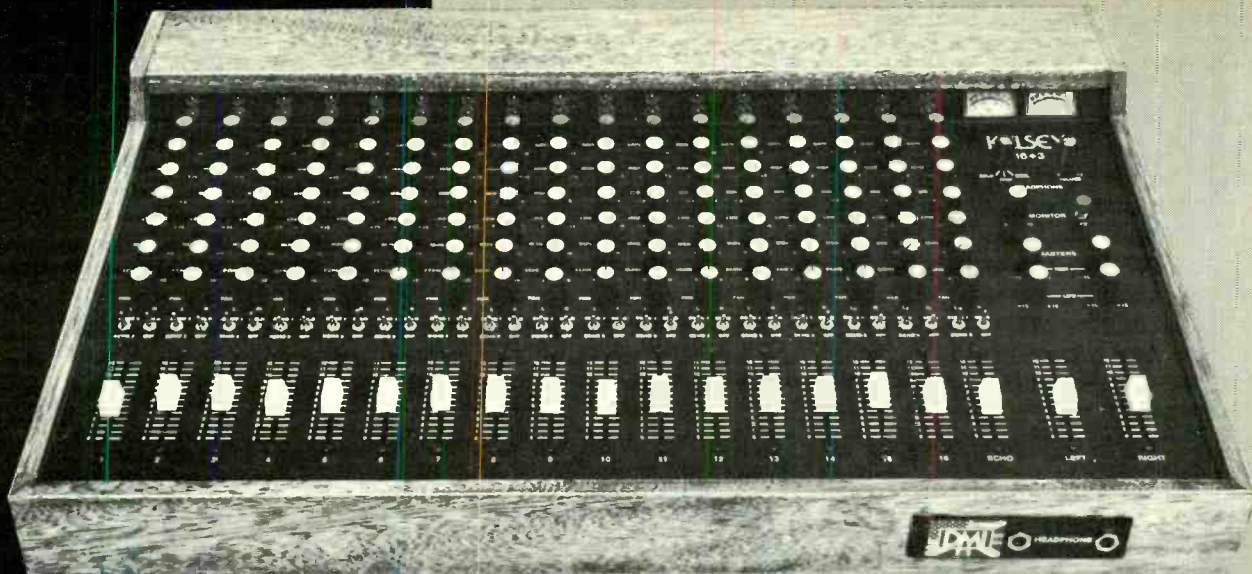
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SPECIFICATIONS:

INPUT

IMPEDANCES: Hi Z = 50 K unbalanced; Low Z = 200 Ohm transformer balanced. **MAX. INPUT LEVELS:** Hi Z = +20dBm; Low Z = +8dBm. **GAIN:** Hi Z = 0-46dB, continuously variable; Low Z = 12-58dB, continuously variable. **EQ:** High ± 15 dB at 10K, shelving; Middle ± 9 dB at 2K, peaking; Low ± 15 dB at 100 Hz, shelving. **MONITOR:** Pre-EQ, unaffected by off switch. **ECHO:** Post-EQ, Post-fader. **LEDS:** Green lit from -10 to +21; Red lit from +15 to +21; 6dB headroom left when Red lit. **EQUIVALENT INPUT NOISE:** -110dBm from Hi Z input; -122dBm from Low Z input. **T.H.D.:** @ 1kHz, any level up to clipping typically less than 0.1 percent.

OUTPUT

IMPEDANCE: Nominal 600 Ohm unbalanced. **MAX. OUTPUT LEVEL:** 8.8V RMS @ 10K Ohm (+21dBV). **GAIN:** Mike in to line out +60dB. **EQ:** Hi ± 15 dB @ 3.5 kHz; Low ± 15 dB @ 35 Hz. **V.U. METERS:** "0 VU" = +4dBm at output of buss amp, switchable from stereo mix to monitor mix. **FREQUENCY RESPONSE:** Mike in to line out ± 1 dB, 30 Hz - 20kHz. **SIGNAL TO NOISE:** Mike in to any output - typically 70dB. **T.H.D.:** Any output 1kHz any level up to clipping typically less than 0.1 percent. **POWER REQUIREMENTS:** ± 15 V DC @ 1/2 Amp.

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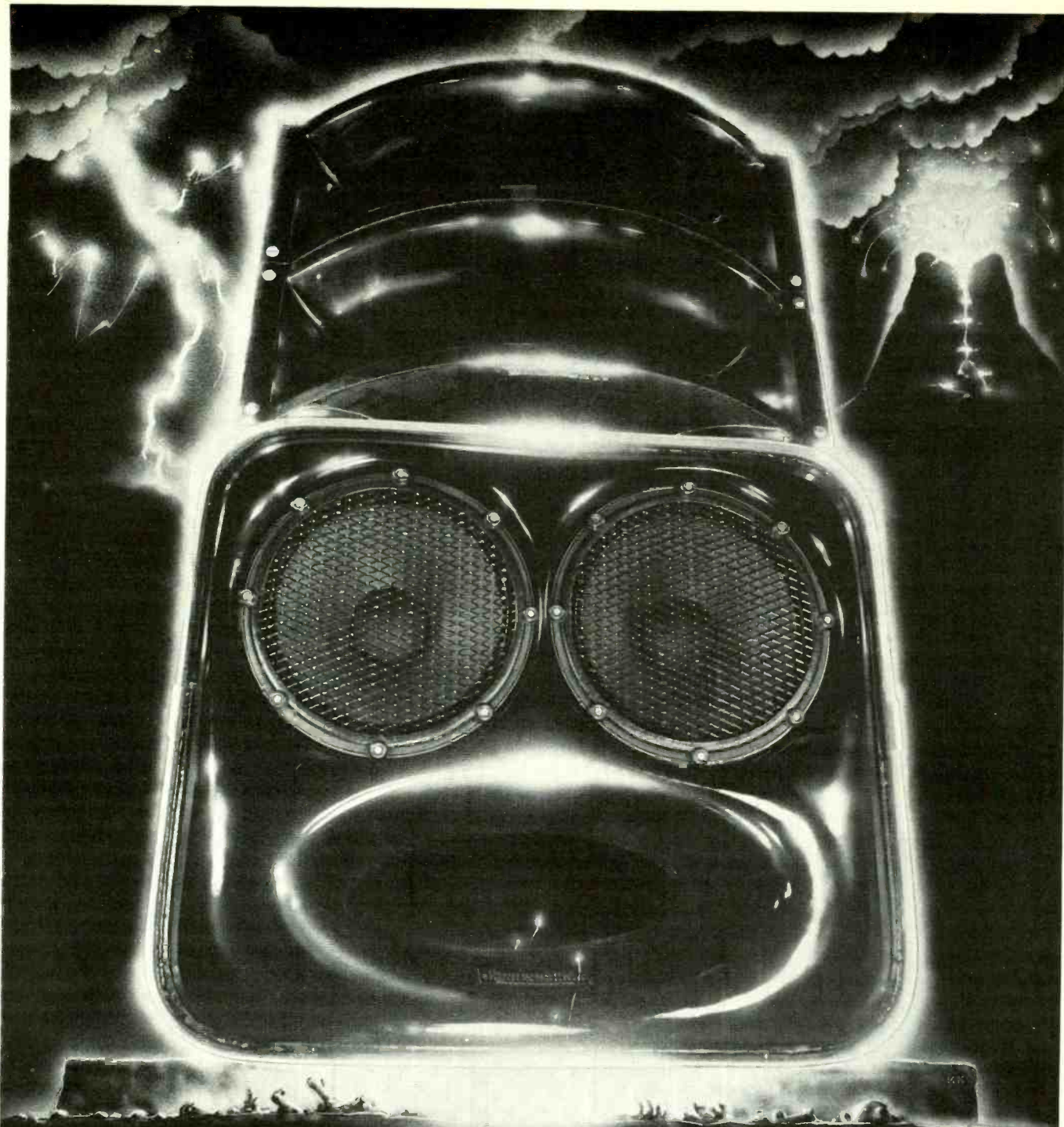
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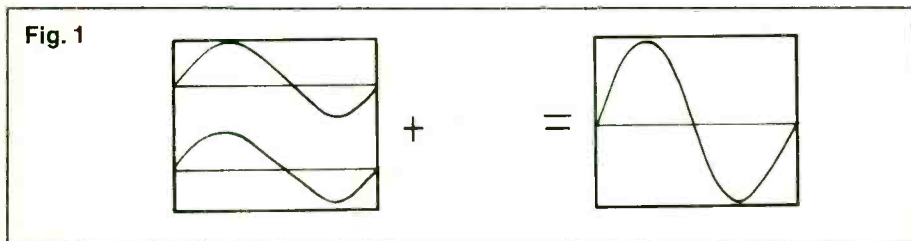
Some Facts on Phase

In recent months I have noticed continual references to the importance of equipment being "in phase." What is phase and what are its effects on an audio signal? How can one tell if everything is in phase and correct it if they aren't?

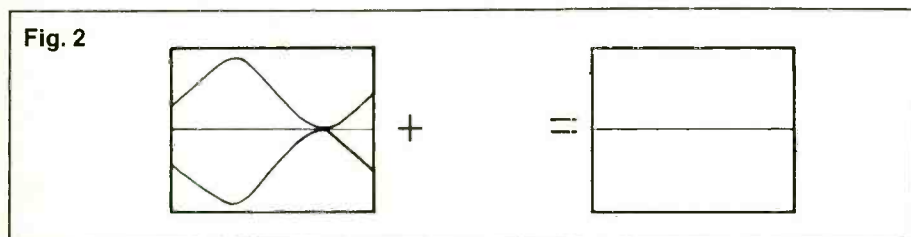
—Josh Bridges
Tacoma, Wa.

Phase is the stage that a waveform has reached in its cycle. When waveforms of the same frequency are at the same stage in the cycle at the same time, they are said to be "in phase." If the waveforms of the same frequency are not at the same stage in the cycle at the same time they are "out of phase."

We can illustrate this with a pure sine wave. Two sine waves of equal amplitude and frequency completely in phase can be combined like this:



At the other extreme, two sine waves of equal amplitude and frequency mixed together 180 degrees out of phase will effectively cancel each other out.

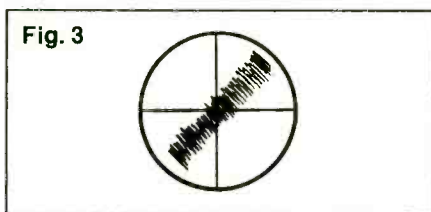


These are extremes. Slight phase differences between waves of equal amplitude and frequency will affect the combined output to a lesser degree.

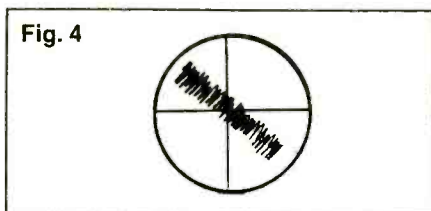
Phase shift problems can occur at almost any stage of the recording process. There are two kinds of phase cancellation: electrical (caused by a wiring reversal) and acoustical (caused by poor mic placement). Assuming your recording equipment has been properly wired at the factory, to correct electrical phase problems, try replacing mic cables, headphones and check inputs and outputs of all outboard equipment in the recording chain.

An oscilloscope connected to the output of the stereo bus or your tape

machine is probably the best way to determine if your overall program is in phase. If in phase, the image on the scope will look like this:



If out of phase, it will look like this:



Speakers can also be out of phase. A

mono signal sent to in-phase speakers should sound like it is coming from a point equidistant and between the two speakers. If the speakers are out of

phase, the signal will come from the outside, having no center, and can often produce a slightly dizzy feeling. Try reversing the leads to one of the speakers.

Acoustical phase problems occur when one source reaches two microphones at different times. If there are phase cancellations and the source is placed left and right in a stereo mix, the signal will be significantly degraded when played back in mono even though it will appear all right in stereo. To correct this, try a phase reversal transformer, or the phase reversal button on the console, or rotate the microphone. Ribbon and bi-directional microphones should not be placed very closely together as one side is out of phase to the other. They



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In the May 1977 issue of Modern Recording Magazine, the performance of the new Burwen Research 1201A was described as "vastly improved by at least a whole order of magnitude." If Audio Magazine said of the original Burwen 1201 that "the impact on the immediate ear is incredible" and High Fidelity Magazine raved that it was "the best of the general purpose dynamic filters," can you imagine what the performance of the new Burwen Research 1201A must be like?? Probably not. So why not visit your Burwen Research dealer for a complete demonstration of the amazing Burwen Research 1201A. Do it now and get to know what quiet is really like. For more information, write to Burwen Research, Inc., 30 Cross St., Cambridge, Mass 02139

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should be at least three times the distance from each other as they are from the source, or at right angles to each other.

Phase reversals can also occur during the tape to disc process resulting in center-placed information lacking presence and source definition when listened to in stereo.

When in doubt, use your ears!

—Liz Saron
Staff Engineer
Mediasound
New York, N.Y.

Optimum Op-Amps

In the Hands-On Report in your October 1977 issue (page 74), Jim Ford and Brian Roth noted that the op-amps in the board they had tested (the Tangent 1202) may not have had a high enough slew rate. Manufacturers' specs on op-amps are sometimes incomplete and confusing, so I was wondering if you could tell me what you have found to be a good slew op-amp for use in quality mixing boards.

—Daniel Harriman
Dallas, Tx.

Slew rate limiting is a little understood and often ignored phenomenon of *all* audio amplifiers and is usually the main factor that will establish the sound character of an op-amp, particularly with program material containing highly transient signals and/or strong high frequencies.

Slew rate limiting occurs when an amplifier is too "slow" to follow the input signal accurately. This effect is acute at high output levels. Engineers express the "speed" of an amplifier by stating what amount of the output voltage can change in a given amount of time. Spec sheets will give slew rate in terms of volts per microsecond. Thus, if an amplifier exhibits a slew rate of 5 volts per microsecond, it is capable of making an output voltage swing of 5 volts in one microsecond. Note, however, that if the input signal to the amplifier requires an output change of 5 volts in one microsecond, the amplifier's output will not be entirely distortion-free. Consequently, it is desirable for the amplifier to be capable of a higher slew rate than will be required by any signal.

Walter Jung delivered a paper to the AES convention in May, 1977 and has written a four-part article in "The Audio Amateur" magazine (1977 series) concerning slew rate limiting. He states that slew rate limiting is the major in-



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SPECIFICATIONS

Type Speed: 15 ips

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impedance: greater than 20K
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Line Output: -10 dB (0.3V)
load impedance: greater
than 10K Ohms, unbalanced*

Record Level Calibration:
C VU referenced to 3 dB
above 185rWb/m tape flux

Wow And Flutter
0.03% RMS (NAB), weighted

Overall Frequency
Response, Sync Mode
40 Hz - 18 KHz, ± 3 dB

Signal To Noise Ratio
(With DBX)
55 dB weighted, 90 dB
unweighted, referenced to
5% THD level (3 dB above
0 VU) at 1 KHz

Distortion
1% at 1KHz, 0 VU

Cross Talk
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Dimensions, Overall
24 7/8" (W) x 47 1/4" (H) x 28 5/16"
(D) (Console included
*optional + 4/600 ohm
balanced kit available

TASCAM SERIES BY TEAC

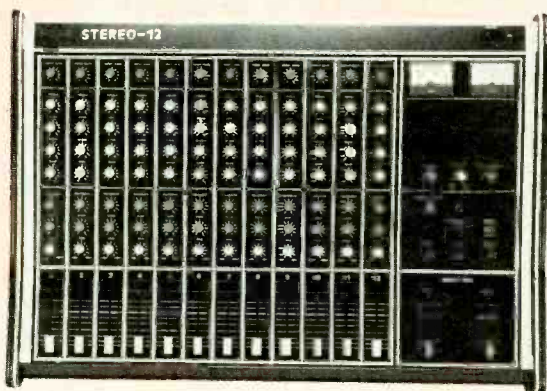
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accuracy in op-amps. He has established several criteria for selection of op-amps (or any amplifier) for audio applications.

He recommends the slew rate of an amplifier be *at least* 1/2 volt per microsecond per peak output volt. Thus, if an amplifier is required to produce 10 (peak) volts which is 7.07 volts RMS, the amplifier should be capable of *at least* 5 volts per microsecond slew rate.

Since most audio equipment can produce 7 volts RMS output level, it should be obvious that many op-amps are not fast enough for accurate audio reproduction. The popular 741-type op-amp has a slew rate of only 1/2 volt per microsecond, and yet it finds its way into much audio equipment.

Other slew-related factors are that the slew rate should be symmetrical (equal slew rate going in either the positive or negative direction) and be "unenanced." This last factor was discovered in several op-amps that have a special input design that operates at a low slew rate for low output voltages, but kicks into "high gear" for large output voltages. These "slew enhanced" devices are not nearly as desirable as devices with an inherently high slew rate.

The moral of the story is to be sure that the slew rate of the op-amp being investigated fits the above rules; i.e. slew rate *at least* 5 volts per microsecond for line level audio gear (mixers, limiters, etc.) and be symmetrical and "non-enhanced." There are numerous op-amps that meet these requirements. Mr. Jung gives a basic OK to these devices: LM318 (National Semiconductor), CA3140 (RCA), OP-01 (Precision Monolythics), TL084 (Texas Instruments), NE536 (Signetics), TDA1034 (U.S. Philips), and others. Factors such as noise level and output drive capability will also affect the ultimate results of any op-amp circuit.

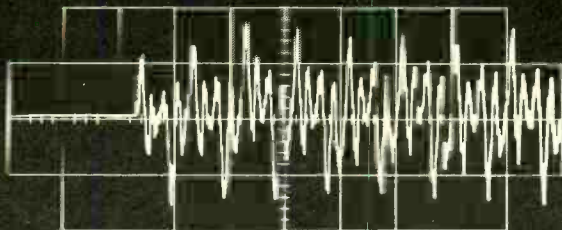
I refer you to Mr. Jung's papers for more information.

—Brian A. Roth
Contributing Editor
Modern Recording

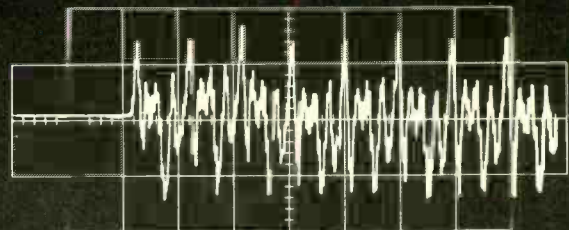
Encountering—and Countering—Difficulties

In checking on the adjustments of the erase current and bias and recording bias on an Ampex tape recorder, I am encountering a few problems. The manual for the recorder is for Models AG-300 and AG-305, but the recorder doesn't have any model number on it. It is in the electronics maintenance portion

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SB-6000A

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CIRCLE 81 ON READER SERVICE CARD

(section 5) that I am encountering difficulties. The machine has a Lipps, Inc. 8 channel head for one-inch tape and has the corresponding 8 channels of amplification.

Page 54, paragraph 5.2.6 of the manual says to check the erase current in the electronic assembly at the back of the head connector (with the erase head connected). Does this mean that I must remove the electronic unit, open the circuit and insert the current meter in series with the erase head? Also, where do I connect the frequency counter? On page 55, Paragraph 5.2.8, Step 3, it says to turn the record level control to achieve either a +8 or +4 dBm indication on the vtm (level will depend on whether the particular equipment is strapped for a +8 or +4 dBm operating level output). On this machine I get 8 on 4 channels and 4 on the other 4. Exactly how do I determine which is the correct setting?

We are also using a Yamaha PM 1000 16 in-4 out board. What is the proper method to set up the board and recorder together?

We would appreciate any other tips you could pass on on adjusting this equipment.

—Joseph G. Bloechl
Sevilla, Spain

Due to the amount of space allotted for each question, a call placed to Alastair Heaslett (an audio engineer at Ampex) convinced us that the best advice we could give Mr. Bloechl would be to send him to an Ampex representative on the continent. In France, Ampex can be reached at Ampex SARL, 17-23 Rue de Dome, 92100 Boulogne, France, telephone number 609-9155. In Italy, there is an Ampex service rep at Ampex Italiano SPA, Via Flavio, Domiziano 10, Rome 00145, telephone number 0651-38-341. Mr. Heaslett felt that since there is never a cut and dried response to a unique technical problem, conversing with a serviceman closer at hand would be a wiser move. Unfortunately, there is no Ampex office in Spain.

As for the second part of your question regarding the best way to interface your Ampex tape machine and Yamaha mixing board, Roger Balmer, Product Development Manager for Yamaha, graciously sent us an operations manual for the PM-1000 series boards which he was confident would answer whatever questions you might have. We are sending it on to you and hope that you are on your way to better recording.





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STUDER REVOX

PRODUCT

By Norman Eisenberg

HEGEMAN PREAMP/CONTROL

A preamplifier/control unit—the model HPR/CU—has been announced by Hegeman Laboratories, Inc. of East Orange, N.J. The preamp and the control unit are mechanically separated for added flexibility in what designer Hegeman characterizes as



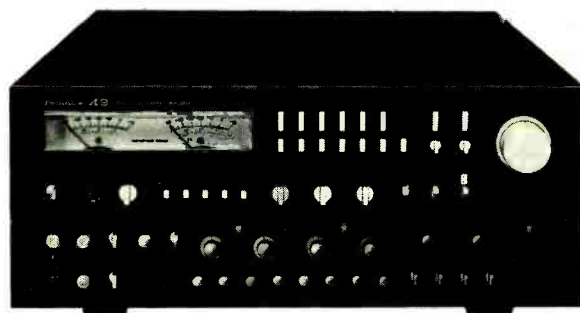
state-of-the-art equipment. Normally powered by the control unit, the preamp itself (HPR) also can be used with an external regulated power supply (HPS) to work with other audio components. Featuring wide bandwidth and extremely low noise and distortion, the HPR uses op-amp techniques with flat gain and passive EQ to assure equal time delay for all elements in the musical spectrum. In place of the RIAA equalization supplied, NARTB or any other tape EQ also is available for a small added charge.

The control unit (HCU), with its own regulated power supply, includes input selection for four high-level inputs, gain and balance controls, mode selection for either channel as mix or stereo; a tape monitor feature; and loudness compensation. No tone controls or filters are included. Noise, according to Hegeman, is only 2 microvolts referred to the phono input of the preamp, or 114 dB below a 1-volt output. Announced prices are: HPR/CU, \$645; HPR, \$270; HCU, \$375; HPR/C HPR/PS, \$320.

CIRCLE 9 ON READER SERVICE CARD

PREAMP WITH PARAMETRIC EQ

The functions of a control preamp and parametric equalizer are combined in the model SU-A2 recently announced by Technics of Panasonic. All stages employ class A amplification, said to eliminate completely switching and crossover distortion. Rated THD is 0.003% for output levels from 1 V to 10 V across the audio band. No coupling capacitors are used in the signal path, and a DC-equalizer circuit is claimed to ensure ideal waveform fidelity. The unit has a built-in test signal generator, a "universal" frequency equalizer and rapid-response peak meters. The built-in oscillator can produce sine waves, square waves, pink noise and warble tones. A separate circuit with level-control handles headphones, and the mic terminals have switchable input impedance.



In addition to the usual inputs (including one for moving-coil phono pickups), the SU-A2 offers independent level control for left and right channels in six frequency segments with up to ± 10 dB boost or cut, and variable Q from 0.7 to 7.0. Additional features include filters and fade-in/fade-out switches.

CIRCLE 4 ON READER SERVICE CARD

NEW SANSUI CASSETTE DECK

Sansui's model SC-3100 front-loading cassette deck features two new Sansui exclusives on which patents are pending. One called "Direct-O-Matic" facilitates loading and unloading the machine and also allows for fast visual checking of the amount of tape remaining, while also permitting easy access to the heads. The other feature, "Tape Lead-In," allows the user to skip the beginning portion of a cassette, bypassing the leader or where the tape formulation may not be suitable for optimum record-



ing. The SC-3100 uses what Sansui calls an advanced frequency generator-equipped servo motor which is claimed to reduce wow and flutter to only 0.06 per cent. Frequency response with normal tape is listed as within ± 3 dB from 30 Hz to 13 kHz; with CrO₂ tape, response is spec'd from 30 Hz to 14 kHz. Included are three-position bias and EQ switches, plus Dolby noise reduction, mic/line input mixing, and other features. The deck lists for \$430.

CIRCLE 16 ON READER SERVICE CARD

BGW POWER AMP



The model 410 from BGW Systems of Hawthorne, California is a power amplifier rated to deliver 200 watts continuous power into 8 ohms with less than 0.05% THD. The front panel features an arc-scale; dual-channel, peak-reading ten-segment LED display; and a switchable sensitivity control that allows full dynamic range to be shown at any volume output. Also on the front panel are gain controls for input sensitivity, speaker selectors and a low-impedance headphone output jack. Internal design is modular, and the unit incorporates "Mag-nagard"—BGW's trade-mark for its high-speed arc-interrupting relay speaker protection circuitry. Suggested retail price is \$699.

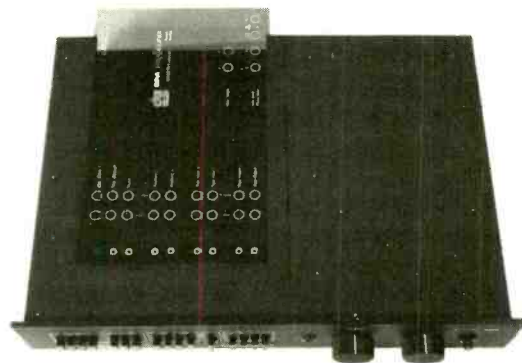
CIRCLE 8 ON READER SERVICE CARD

HIGH PERFORMANCE PREAMP

Dayton Wright's new model SPA is described as a professional preamplifier designed to yield outstanding results in the phono section. It permits direct use of very low-output phono pickups of the moving-coil type. Credited with high slew rate, the SPA is said to have very low TIM distortion and exceptional definition and detail without harshness.



A separate DC power supply energizes the preamp. Designed to operate with two tape recorders, with monitoring and cross-dubbing facilities for both, the SPA is priced at \$1225.



CIRCLE 11 ON READER SERVICE CARD

SEVEN-ELEMENT EQUALIZER

JVC's model SEA-20 is a graphic equalizer that can be switched into the tape-recorder circuit for simultaneous equalization while recording. Compactness is achieved by the use of transistors in place of coils—a design approach that also is credited with reducing hum and expanding the dynamic range.

The seven-zone controls cover the audio band with center frequencies at 60, 150, 400, 1 K, 2.4 K, 6 K and 15 kHz. Each control has a range of ± 12 dB. A two-position attenuator (0 dB and -6 dB) switch, a tape-monitor switch and an EQ defeat switch are included.



CIRCLE 13 ON READER SERVICE CARD

VERSATILE FLANGER

The Flanger 900-A from Wasatch Music Systems of Salt Lake City, Utah is a new audio delay device said to be capable of such effects as positive and negative flanging, doppler, vibrato and chorus,



pitch-shifting, double-tracking, Leslie speaker simulation and cardboard tube echo. Delay times of more than 20 ms will create flanging effects of over six octaves. According to WMS, the device—which has undergone almost two years of research and development—produces the lowest noise and distortion of any similar unit now available. Special filters eliminate input aliasing and output quantization noise. The 900-A's front panel allows versatility and ease of operation in both studio and "live"-performance applications. Rack-mountable, it is powered by a dual IC built-in regulated power supply for operation on 117-volts AC. Tentative price is \$350. Additional options include a Balance Input/Output, \$50; foot pedal, \$30; road case, \$90. Detailed features and specs are available from the manufacturer.

CIRCLE 15 ON READER SERVICE CARD

AUDIO SPECTRUM ANALYZER

The ADI 1000 from Audio Developments International of Palo Alto, California is an octave-band real-time audio spectrum analyzer with many advanced features. Recommended applications include room response and speaker testing, environmental equalization, tape recorder testing and calibration, program material frequency content analysis, before and after "freeze" comparisons, and real-time analysis, collection and storage of data. Mic and line inputs are provided. The ADI 1000 has a built-in pink-noise generator which may be used continuously or "gated." Also supplied with the device is a calibrated condenser microphone. An LED display gives real-time data of all bands, plus SPL information. The LED readout can be switched to read in increments of 2 or 3 dB. Frequency response is listed as within ± 0.5 dB from 22 Hz to 22 kHz, and all tone bursts are met with an accuracy exceeding ± 0.5 dB.

CIRCLE 17 ON READER SERVICE CARD

DECORATOR STYLED RACK MOUNT

Another new rack mount that gets away from the traditional equipment-gray steel look is the Sansui GX-5, finished in genuine walnut and with casters designed for carpets. The new rack also solves the mounting compatibility problem often encountered when installing Japanese-made components in U.S. relay racks. While all rack-mountable units have the standard 19-inch width and side notches, Japanese designers have rarely restricted the panel heights of their components to the 1 $\frac{3}{4}$ -inch multiples of the U.S. standard. As a result, in some setups it has been necessary to leave blank spaces between units in order to line up the mounting notches with the predrilled screw holes. To overcome this unsightliness, the Sansui GX-5 uses continuous side slots together with rear-mounted clamps so that units designed for 19-inch racks all can be neatly and efficiently accommodated regardless of panel heights. The GX-5 stands 37 $\frac{1}{2}$ inches high, is 21 $\frac{3}{4}$ inches wide, and 17 inches deep. Up to 31 $\frac{3}{4}$ inches of free panel height is afforded.



CIRCLE 12 ON READER SERVICE CARD

"UNIVERSAL HOT BOX"

Going under the catchy name above is a new device from Pyramid Electronics of San Rafael, California which is more functionally described as an "active direct box/microphone substitution device." What it does is accept direct inputs from guitar, bass, crystal pick-up, amplifier speaker output, or other line-level signal and translates that signal into two balanced mic-level outputs, and an unbalanced output for consoles, monitor amps, or remote feeds.



Claimed to be capable of solving 90 percent of the soundman's or musician's needs when interfacing an instrument with a sound system, the UHB is said to be in use now by PA companies, recording studios, film companies and radio stations to replace microphones and to provide better control and separation in mixing work. The device has inputs for instrument level and for amplifier-speaker level outputs. It has five separate outputs of varying impedance and level capability including two isolated balanced-line outputs for feeding mixing or monitor consoles. Announced price is \$166.

CIRCLE 18 ON READER SERVICE CARD

FOUR CHANNELS, OR THREE, OR TWO-AND-A-HALF?

The oft-stated notion that a sound buff should attend "live" performances to help re-establish some basic appreciation of how "live" sound actually does sound was forcibly underscored for me as I sat through a performance of the Berlioz *Requiem* given by the Boston Symphony under Seiji Ozawa at the Tanglewood Music Festival in late August. In addition to an augmented orchestra plus a giant-size chorus and tenor soloist Kenneth Riege on

stage, four brass choirs were deployed at the perimeter of the audience, near left stage, left rear, right stage and right rear. I had a choice seat that enabled me to hear everything in ideal perspective and sonic balance. It was, all things considered, the most exciting "live" sonic presentation I have ever experienced.

With the sonorities of this super-effort still "ringing in my ears" I pondered once again the whole idea of quadraphonic sound as it has been presented to us by the various competing systems. While acknowledging the ingenuity and achievement of all the efforts to put four-channel sound onto discs, I still must say that the nearest replica to the kind of "live" sound I heard at that concert is the four-channel open-reel tape medium—and while the specific offering I have in mind (the Berlioz *Requiem* on two reels, Vanguard VSS 2/3) remains, several years after its release, supreme among quadraphonic recordings, it still only comes close to the real thing.

Which raises a very relevant question. Just how many "real things" are there that demand the full quad treatment? Or that can stand up under directorial experiments with instrument placement as an "excuse" for purposely recording it for a four-channel playback? The answer to this one is essentially artistic rather than technical, but so far precious few examples from the centuries of music we know (both classical and popular) have been chosen for such treatment. Likewise, the once-heralded "wave of new sound" that would be created by our own contemporaries for the four-channel treatment has by now dwindled to a mere ripple, if that.

On the other hand, there is no doubt that any music gains in playback by some kind of controlled ambient enhancement. For this, however, it is doubtful that we need an elaborate four-channel system. It is even more doubtful—judging from the sales record to date—that large numbers of listeners will buy and install the added equipment needed for such a system. What does seem more sensible at the present state-of-the-art, both from the acoustic and the sales point of views, would be an emphasis on one added speaker in a playback system for ambience enhancement. And, as has been demonstrated by such devices as the Dynaco Quadaptor, this addition does not even require more amplification, extracting as it does the added "signal" from source material played over a normal stereo amplifier.



MUSICAL

NEWSIGNALS

■ SOUND REINFORCEMENT ■

Moving first to the electronic devices, we come initially to the IP-1 instrument preamplifier from Peavey (711 A Street, Meridian, Miss. 39301). The IP-1 is a two-channel, solid-state preamp which mounts in 1-3/4" worth of 19-inch rack space. Unlike the usual two-channel amplifier which has a "normal" channel and an "effects" channel which are virtually identical except for the effects, Peavey has designed each of the channels of the IP-1 toward a different set of objectives. Channel 1 could be called the "clean" channel, since the emphasis was on maximum dynamic range. The low-frequency and high-frequency equalization circuits in Channel 1 are of an active, minimum phase shift network design for maximum range and flexibility of EQ. Channel 1 also has effects send and return jacks for post-preamp, pre-EQ insertion of effects devices such as phasers, echo units or delay lines; the effects send is low impedance and may also be used as a pre-EQ direct output for P.A. use. Channel 2, on the other hand, could be called the "dirty" channel since it was designed to allow most electric instruments to overdrive it. Field effect transistors (FETs) are used in this channel to make its overload characteristics more "tube-like" in sound. Low-, mid- and high-frequency EQ controls are included in Channel 2, and the circuitry is a passive type of EQ which sounds very much like the familiar bass, mid and treble controls on con-

ventional instrument amplifiers. The IP-1 also sports a master gain control for control of the overall playing volume without changing the sound of the individual input channels. All outputs from the IP-1 are located on the back panel. Besides the effects send and return, three output connectors are provided, including a 3-pin XLR connector for the balanced, low-impedance (600 ohm), high-level (+20 dBm maximum) output, and another phone jack for an unbalanced, high-impedance, high-level (+14 dBm) output, a phone jack for the unbalanced, low-impedance, high-level, (+14 dBm) output, and another phone jack for an unbalanced, high-impedance, low-level output designed to feed a conventional instrument preamplifier input.

CIRCLE 2 ON READER SERVICE CARD

■ MUSICAL INSTRUMENTS ■ ■ AMPLIFIERS ■

Atlanta was the first showing to the music retailers of the new musical instrument line of speaker systems from KHS Manufacturing Co. (108 Birch, Park Forest, Ill. 60466). KHS makes a variety of specialized purpose full-range speaker systems using their patented design for top-quality, high-level sound reproduction using a moderate size enclosure. The KHS line includes models specifically designed for bass guitar, guitar, piano, synthesizer, Chapman Stick, and various voice and monitoring applications.

Cetec Audio (13035 Saticoy Street, North Hollywood, Ca. 91605) has responded to popular demand by introducing an extended range 10-inch speaker for use as a musical instrument speaker, a mid-bass P.A. driver or in voice-monitoring applications. The new

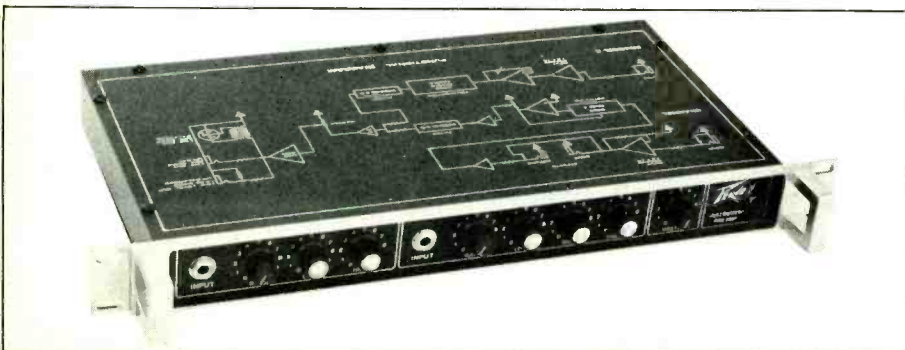


speaker is rated at 100 watts RMS, has an EIA sensitivity of 54 dB, frequency response from 55 Hz to 8.5 kHz and a nominal impedance of 8 ohms. Like other Gauss speakers from Cetec, the new 10-inch model features a 3-inch edgewound ribbon voice coil, double spider, die cast frame and ceramic magnet for high power handling capacity, high efficiency and maximum ruggedness. Price of the new model will be \$130.

CIRCLE 5 ON READER SERVICE CARD

■ GUITAR SYNTHESIZERS ■

In the August, 1977, Musical Newsicals we featured a brief discussion of guitar synthesizers in general and the 360 Systems Slavedriver in specific. The Slavedriver, you may remember, is an interface unit which can be used with any solid-body 6-string guitar and any patchable 1 volt/octave synthesizer. At the NAMM show, we saw two new guitar synthesizer systems, one from ARP which uses your own guitar but which includes all the requisite synthesizer circuitry as well as an interface, and one



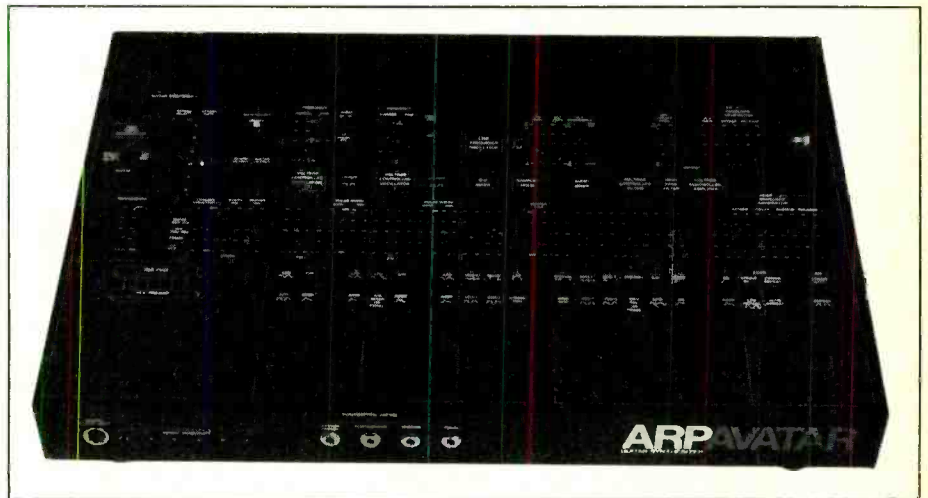
from Roland which is a complete system including its own specially equipped guitar.

The GR-500 Paraphonic Guitar Synthesizer System from RolandCorp US (2401 Saybrook, Los Angeles, Ca. 90040) comprises a GR-500 electronics unit and a special GS-500 guitar/controller. The guitar is a high-quality, solid-body instrument which has been fitted with a variety of switches and knobs to provide fingertip control of the final mixture of guitar and synthesized sounds, and which connects to the electronics unit via a multi-conductor cable and special multi-pin connectors. The GR-500 system actually has five separate sound generating sections which can be used individually or in combinations, and which can be mixed together or amplified separately if desired; Roland calls this system "paraphonic" to indicate that it produces several parallel notes in its output rather than being truly polyphonic. The first of the five sections is the guitar itself. The signal from the guitar's humbucking pickup is preamplified in the electronics unit where it can be mixed with the various synthesized signals. Controls are provided on the guitar for volume and tone, plus switches for guitar/synthesizer selection and normal/hard/soft equalizer modes. The other four sections are Polyensemble, Bass, Solo Melody and External Synthesizer, and each of these has a level control and an on/off switch on the guitar. The Polyensemble section is basically a tone modifier acting on the guitar output and is thus "polyphonic." The Polyensemble section has four "voices" or preset timbres, labeled "woodwinds," "soft reeds," "brass" and "strings," which can be mixed in any proportion, and the output of the section is controlled by an envelope generator with attack, decay and sustain (ADS) controls. The Bass section is a monophonic bass note generator acting on the output of a special split pickup which has separate outputs for each string. This section uses a last-note priority system which suppresses all but the most recent note played, and which is switchable from all six to the last three or just the 4th and 6th strings. Tone is controlled by mixing three different voices, and the dynamics are determined by another ADS envelope generator. The Solo Melody section is basically a monophonic synthesizer complete with VCF, VCA, LFO ADS envelope generator, and a four-source mixer with two modulated pulse wave oscillators; the section is

driven by the split pickup and uses the last-note priority. The last section, as the name implies, is used for interfacing the GR-500 with an external synthesizer such as the Roland System 100 or System 700. Separate outputs are provided for each of the five sections, plus there are three mixing buses to which any or all sections can be assigned by switch for maximum versatility.

CIRCLE 7 ON READER SERVICE CARD

ARP Instruments, Inc. (45 Hartwell Ave., Lexington, Ma. 02173), is offering their Avatar guitar synthesizer, which has been available since late 1977. The Avatar takes a similar approach to that of the 360 Systems device, using a "pitch extractor" or pitch-to-voltage converter and an envelope follower to control conventional synthesizer circuitry. The most major difference in the Avatar is that the synthesizer hardware, roughly equivalent to an ARP Odyssey, is included as part of the system. A special 6-output split pickup is mounted on the guitar and connected to the electronics unit via an ultra-miniature, multi-conductor cable and special, Swiss-made miniature connectors with gold-plated contacts. Each string feeds



its own low-noise preamp with individual gain control and individual fuzz circuit. This latter makes possible "clean fuzz" because intermodulation distortion (which causes muddiness) is greatly reduced by distorting the notes separately and then mixing them. The pitch extractor and envelope follower circuits of the Avatar follow every nuance of the guitar signal including bends, finger vibrato and picking dynamics and their outputs are used as control voltages in the synthesizer circuits. The synthesizer section itself includes two VCOs with phase synchronization, a VCF, a VCA,

ADSR and AR envelope generators, LFO, high-pass filter, sample and hold, noise generator and ring modulator.

CIRCLE 10 ON READER SERVICE CARD

ACCESSORIES

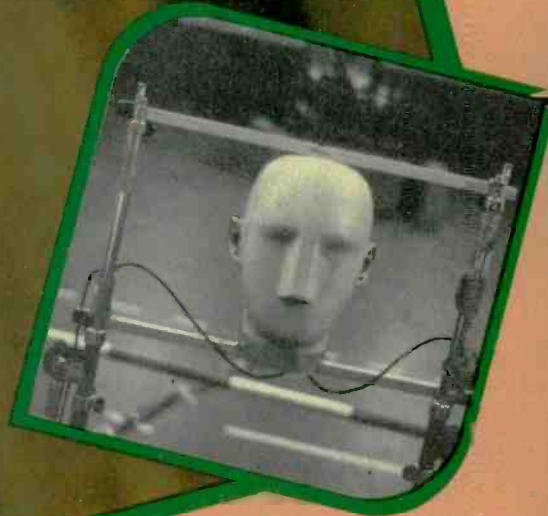
AB Systems Design, Inc. (P.O. Box 369, Fair Oaks, Ca. 95628) has introduced their model 710 amplifier known as the Bi-Amp. As the name implies the model 710 is designed for bi-amp applications and, in fact, has a built-in two-way crossover. The unit is supplied with 300 Hz, 12 dB/octave crossover cards, but optional plug-in cards may be purchased for any frequency from 50 Hz to 16 kHz with 6, 12 or 18 dB/octave slopes. The front panel of the unit has a pre-crossover level control and post-crossover controls for controlling overall system level as well as bass/treble balance. Power amplification is provided by two totally independent amplifier sections; separate power supplies are used for the two sections to eliminate all possible interaction. The low-frequency channel is rated at 125 watts RMS into 8 ohms or 200 watts into 2 or 4 ohms, while the high-frequency channel is rated at 65 watts RMS into 8 ohms or 100 watts

into 2 or 4 ohms. Normalized frequency response (using both channels to account for the crossover) is ± 0.25 dB from 20 Hz to 20 kHz, and distortion is given as less than 0.25% THD or IM distortion, with 0.07% given as typical. Input to the unit is via paralleled phone jacks to facilitate bridging several units together, and the input circuitry includes a socket for an input transformer in addition. The model 710 occupies 5 1/4 inches of rack space and weighs in at a very reasonable twenty-four pounds.

CIRCLE 14 ON READER SERVICE CARD



LOU REED



MIXING IN BINAURAL

By Tim Bomba

"Live" albums have, during the past few years, been becoming more and more popular. Advances in recording technology and remote recording procedure have made it much more comfortable for the artist and producer to work and not worry whether or not the music is being properly recorded. Also, many artists believe that by performing to a concert audience more energy will be put into their music, consequently creating a better "feel" on the album; the sound that can be achieved

in a big theatre is preferred by many over the sometimes sterile sound of the studio. However, by the time the majority of the "live" albums get to the home stereo, there have been so many overdubs that the only thing reminding you that this is supposed to sound like a concert is the audience clapping and some theater reverberation. Wouldn't it be great if after attending a concert you really enjoyed, you could buy the album, put it on your stereo and have yourself transferred back to the center of the crowd at the concert? Well, Lou Reed's new Arista album *Street Hassle* has been done in such a way as to put the listener into that

crowd and surround him/her with a concert. This "live" album sounds just that . . . "live."

The idea behind Lou's album was to record it "live," as Lou much prefers to record in theaters in order to capture the above-mentioned ambience. This idea expanded to the fact of: If you're recording in a theater to get the ambience, why not preserve the theater sound on the tape? So, Lou decided to record the album "live" in both a standard multi-track format (i.e., a mic on each instrument) and in a binaural technique. The standard multi-track system I'm sure most of you are familiar with. But the real secret to this album is the recording and mixing using binaural techniques, some established, and some new.

Perception Factors

The science of binaural acoustics is based on two factors—your ears. Binaural systems perceive sound just as your ears do, not as stereo systems do. You hear sounds from all around you—front and back, above and below, and in a stereo left and right. When you hear a sound from some direction not directly in front of or behind you, one of your ears perceives the sound as being louder than the other does. And speaking again of the off-center sound source, there will be a difference in time for the sound to reach each ear; this is caused by the seven inches or so separating the ears. So we see that the delays in perception of each ear have something to do with why we hear the way we do. So, you might ask, why couldn't somebody set up two mics seven inches apart and have binaural?

Well, the reason for the development of the binaural head (see photo) is that all of us have something separating our ears (remember how our parents questioned that?) and this is one factor in our sound perception. When sound hits the outer part of the ear, some is reflected off our head and some is

picked up by the ears. The binaural heads have a condenser mic at the outer part of each ear. (To place the mics in the aural canal would alter the sound, as everybody's inner ear is different. Recording the signal going through the ear canal and then listening to the signal again through the canal—your own this time—would be allowing the ear canal to alter the sound twice, an unwanted situation.) The mics are omni-directional but acquire directional characteristics when placed on the head because of the reflective qualities mentioned previously. Also, if the headphones are used on playback, the location of the headphone and microphone (when recording) are about the same place, right at the outside of the ear.

A second important factor is that something resembling the pinnae (ear flaps) must be included in the design. Tests have shown that were someone to listen over headphones to the output of two omni-directional mics seven inches apart surrounded by speakers, they would not be able to discern any directional pick up through the headphones when signals were sent through the various speakers. When

the microphones were fitted with flaps, the listener could identify the source and also had developed a front/rear perception. So the system is fitted with flaps for achieving better directional perception.

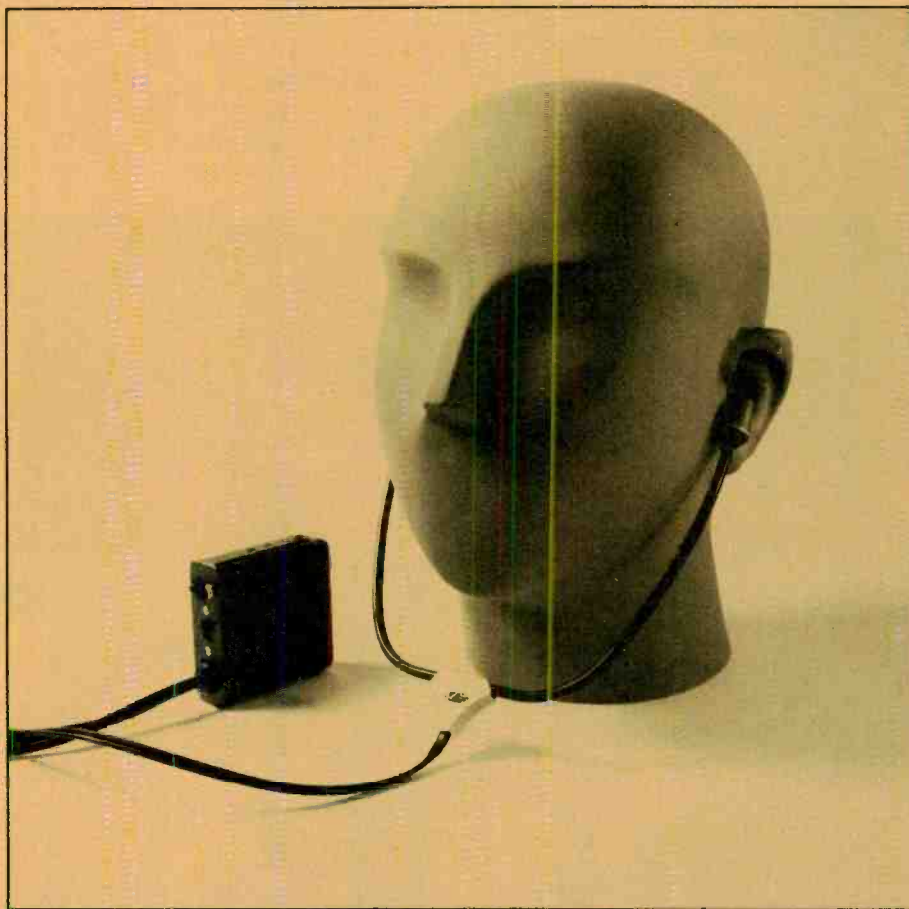
Now that you know a little about how it works, it is important to say that a binaural system will work best with a waveform which is something other than a true sine wave—e.g., music, voice or any complex wave shape—and when the frequency spectrum of the signal extends over 7 kHz. The complex wave form is more easily localized, because a complex wave contains a variety of frequencies which, when changing, have a series of delays related to the physical length of each frequency. All this meaning that the changing wave which contains a lot of frequencies is a lot easier to locate than a simple sine wave. And, as you know, the higher the frequency, the more directional it is (you can hear the bass sounds from your stereo anywhere in the house, but you must sit near the speakers to hear the high end). So if the binaural head is to record sounds and give some directional picture, the more high frequencies the more complex the signal you are recording, the more directional the sound recorded and the easier to locate its point of origin on playback.

Two Heads

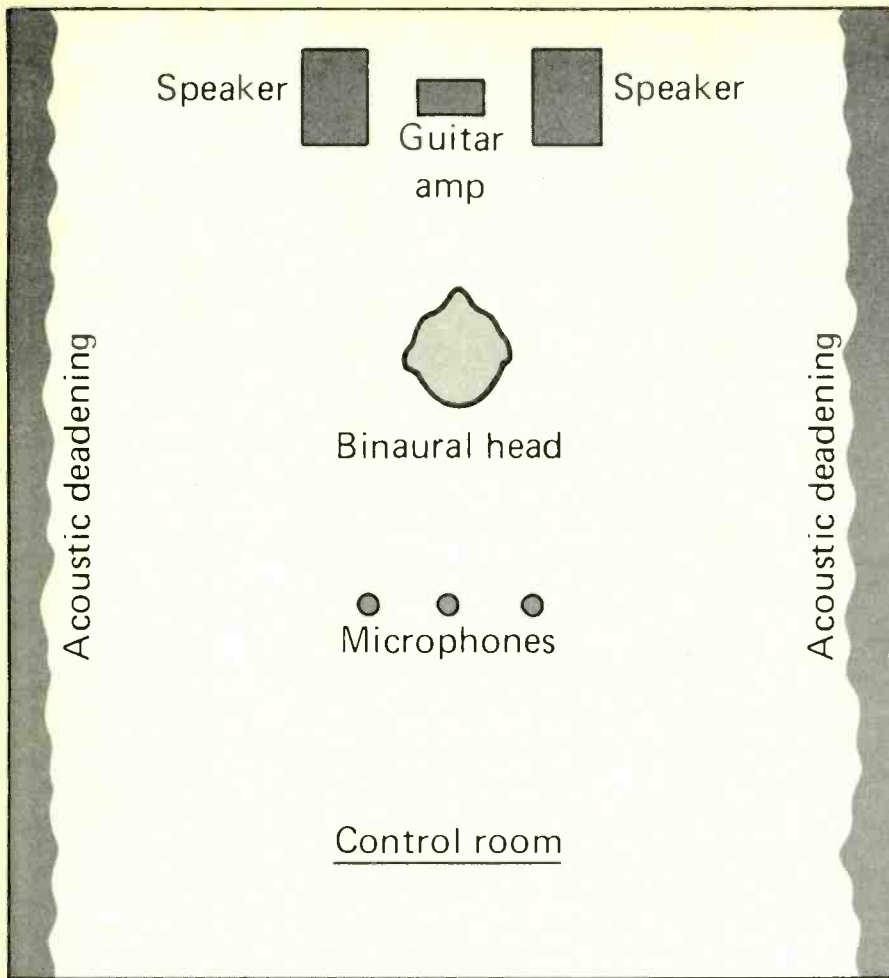
The heads used in this project were of two types. The head used to record the shows in Germany was developed by Manfred Schonke of Delta-Acoustics in Germany. Manfred's binaural system has been in the experimental stage for the past two years and came to Lou Reed's attention prior to his European tour. To get a model for the head, Manfred measured the heads of forty Germans and took an average. The head which was used in the studio for mixing was the Sennheiser model MKE-2002, a system that has been available for a while but has never really been used in a heavily promoted commercial product to introduce itself to the public.

Signal Combination

The reason this binaural project is different is that the final project is a combination of the binaurally recorded music and the multi-track signals. This



The Sennheiser MKE-2002 binaural system used during studio mixdown.

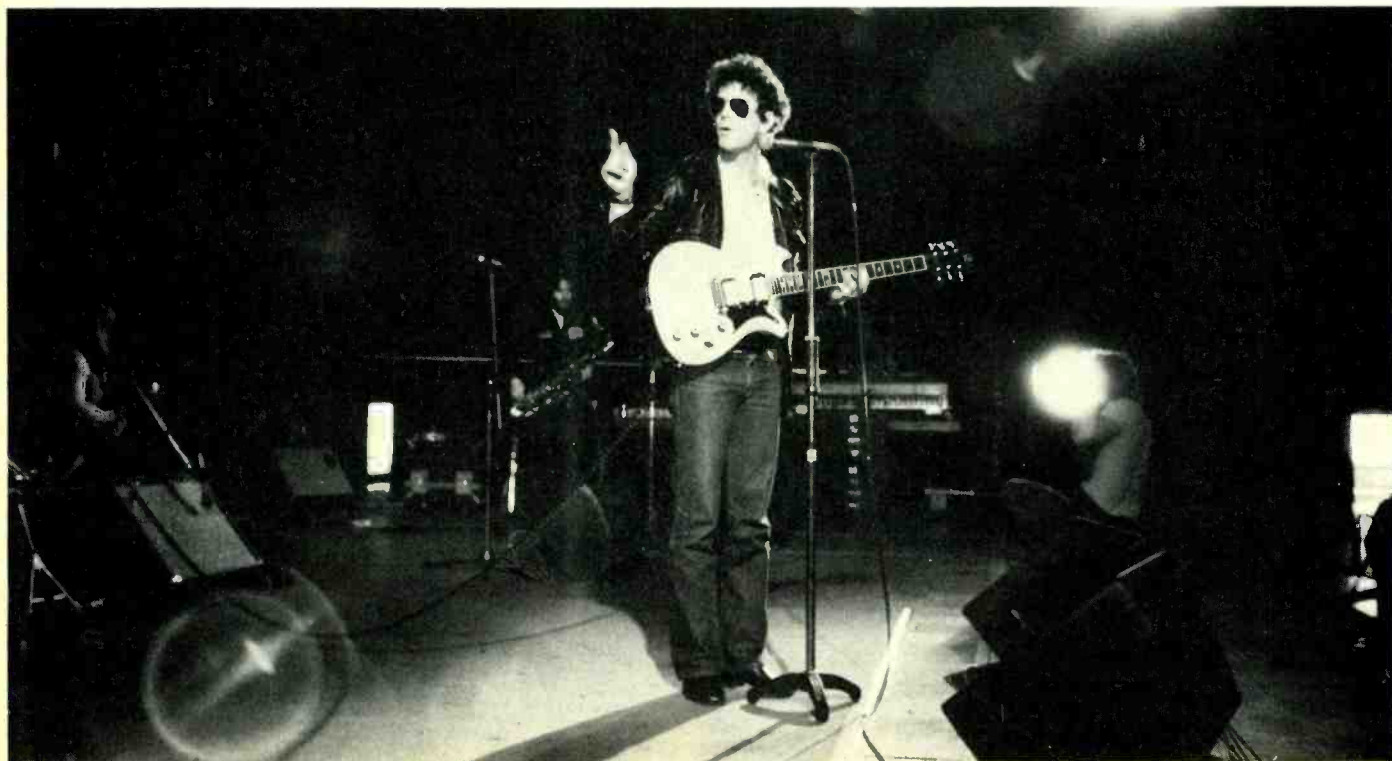


Set-up for binaural mix in studio
(acoustically dead)

is a difficult procedure because to mix a tracked signal (one instrument per track) directly on top of a binaural signal will create an effect of the tracked signals being very up front with a general sound of the entire concert in the background. This would destroy any concert feel on the record. And any overdubs done in the multi-track format would also destroy a "live" effect. This problem was solved by Manfred with a solution which makes this album unique.

The diagram (Fig. 1) shows the mix set up in the studio at Record Plant, New York. Under Mr. Schonke's direction, Lou and engineer Rod O'Brian set up the system to the centimeter. The head will receive the new mix in the binaural fashion it is designed for. The mics placed behind the head will pick up signals to create the more spatial effect during the mix down. The diagram is only a rough sketch, but all dimensions were made exact through the use of numerous calculations. As for the overdubbing, instead of recording all dubs on separate tracks, the binaural studio was set up so the guitar amplifier shown in between the feed speakers would send to the binaural system and be recorded binaurally. We now have a total binaural system in the studio!

Another interesting point about Manfred's system is that you don't need headphones to get the spatial effect. I heard three of the mixes at the



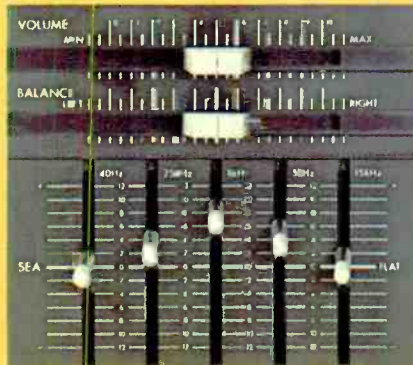
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studio on the regular monitors and then a second time while sitting in the stereo chair—a plush semi-enclosed chair with small speakers mounted close to the ears. The effect did become more pronounced as the sound source came closer to the ear (for the optimum effect, headphones may be worn, but as opposed to previous binaural recordings, are not necessary).

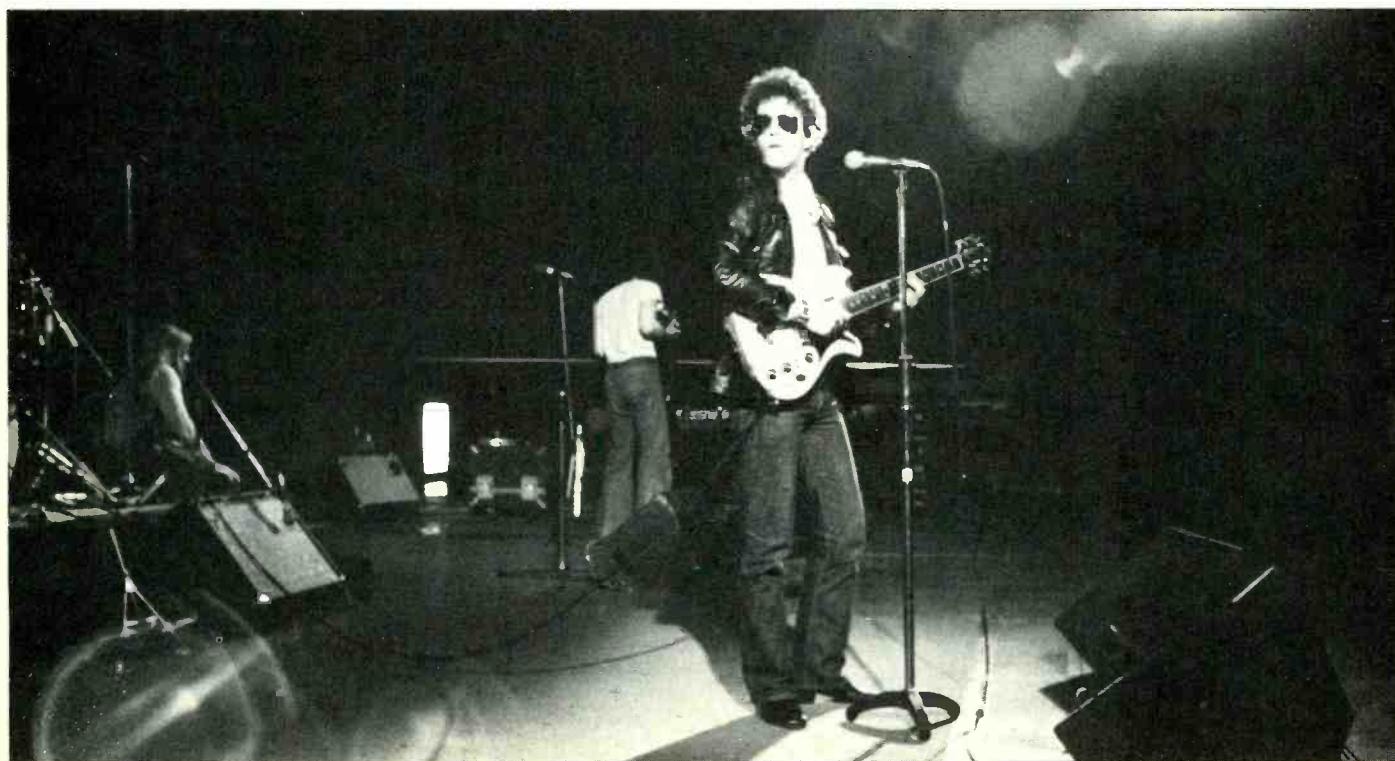
Ducking Reality

While listening to one tune, "Shooting Star," I couldn't help but feel that, upon closing my eyes, I was

in the concert hall. The music sounded just as it would had I been in Row Seven, twenty feet from the stage, the PA rumbling in the hall reverberation. The vocals are not as up front as they are on most albums, but that's the way vocals sound in a lot of concert halls. The effect is so real that it's scary. And believe me, after doing three years of concert touring, I have a good idea of what concert sound is like. The audience surrounds, and, yes, it's conceivable that you might even duck from the sound of a firecracker. Upon hearing "I Want to Be Black," the sound of the background voices and

especially the saxophone put the vision of the whole thing happening right in front of me. It is just as you hear it in concert.

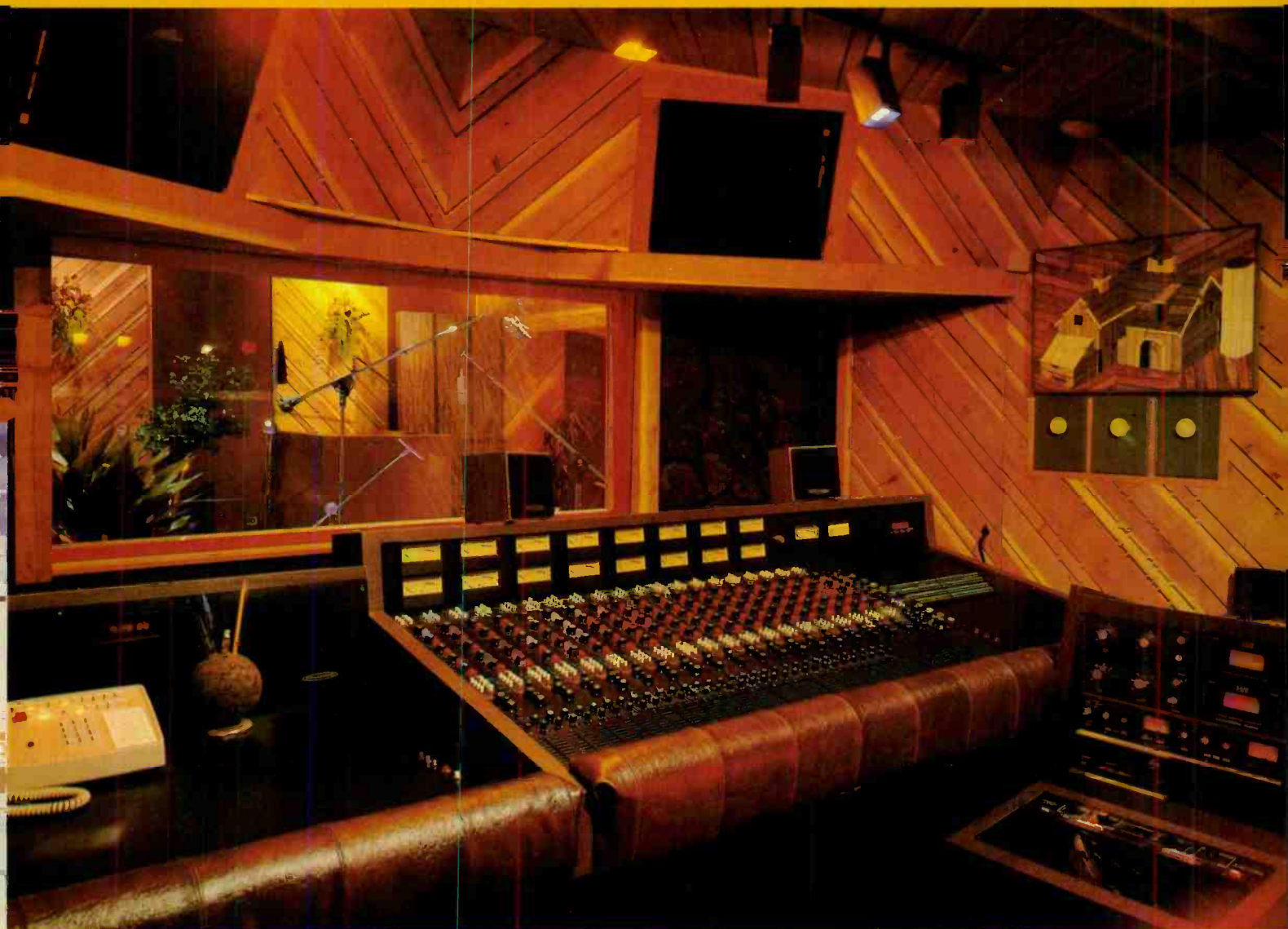
On this project, Manfred used two of his newly developed \$2000 heads to record the shows. One was suspended over the band for a more direct music pick up, and the other in the audience to gain the concert goers perception. To set up, position and check out the heads takes Manfred about four or five hours. When the show was recorded in Germany, the remote unit from Dierks Studios was used; the engineer was Heiner Friez. It was decided that of



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the twenty-four tracks available, four would be used for the outputs of the two heads, and the remaining twenty tracks would be used to record in the standard multi-track format. This allows for the remix and overdubbing to be done in the studio if all concerned wish to try to eliminate any problems that the heads may have encountered in picking up unwanted noise (they do make good targets for audience-thrown cans). Thanks to Manfred's remix layout, this is no problem. A spatial effect can be maintained in the remix of the individual instrumental and vocal tracks.

Beyond Binaural

So with all of the extra tracks available and the studio binaural remixing, some may ask if this procedure is strictly binaural. Well, if the definition of binaural is a recording made using only the head, then Manfred's project is perhaps one step beyond binaural. His procedure will ensure a binaural interfacing with overdubbing and maintain a binaural effect. However, a true binaural recording using *only* Man-

fred's heads can be heard on the King Biscuit syndicated radio show which recorded Lou at the Bottom Line Club in New York City. To add some icing, the interview at the club with Lou was recorded binaurally, which may make for the first binaural rock interview with such national air play.

If the excitement so evident in the control room is any indication of things to come, this project may become a milestone in recording technology. Those involved were so impressed with Manfred's procedures that, according to engineer O'Brian, Record Plant, New York may become more involved in this new type of recording in an attempt to make it more available to the recording public.

Listening Advantages

So when you get the record, and settle down to listen, you will most likely hear a mix that will feel so much like the actual concert, you'll wonder where the "smoke searching" ushers with flashlights are. You won't hear the typical stereo separation with, for example, drum rolls panning right to

left. What you will hear will be the concert, happening right in front of you. The bass and all low frequencies will be in mono, just as they are in a concert hall, with, as stated before, the real directional perception happening when listening to the higher frequency instruments. You'll hear the drums, guitar, saxophone, keyboards, etc., sounding and coming at you just as you would see them set up on stage.

The real advantage to this method is that Manfred perhaps has done for binaural what the multi-track tape system did for recording; he has made it possible to recreate the concert in the studio. Rod and Lou have a great amount of respect for this man's ideas and are very happy with the outcome. Speculation has it that this is only the beginning for this idea. Binaural isn't all that new. The first tests were done in the fifties. But with Manfred's research and developments, you will surely be hearing more about this idea.

Acknowledgments:

Horst Ankermann, Uwe Sattler
Sennheiser Electronics, N.Y., N.Y.



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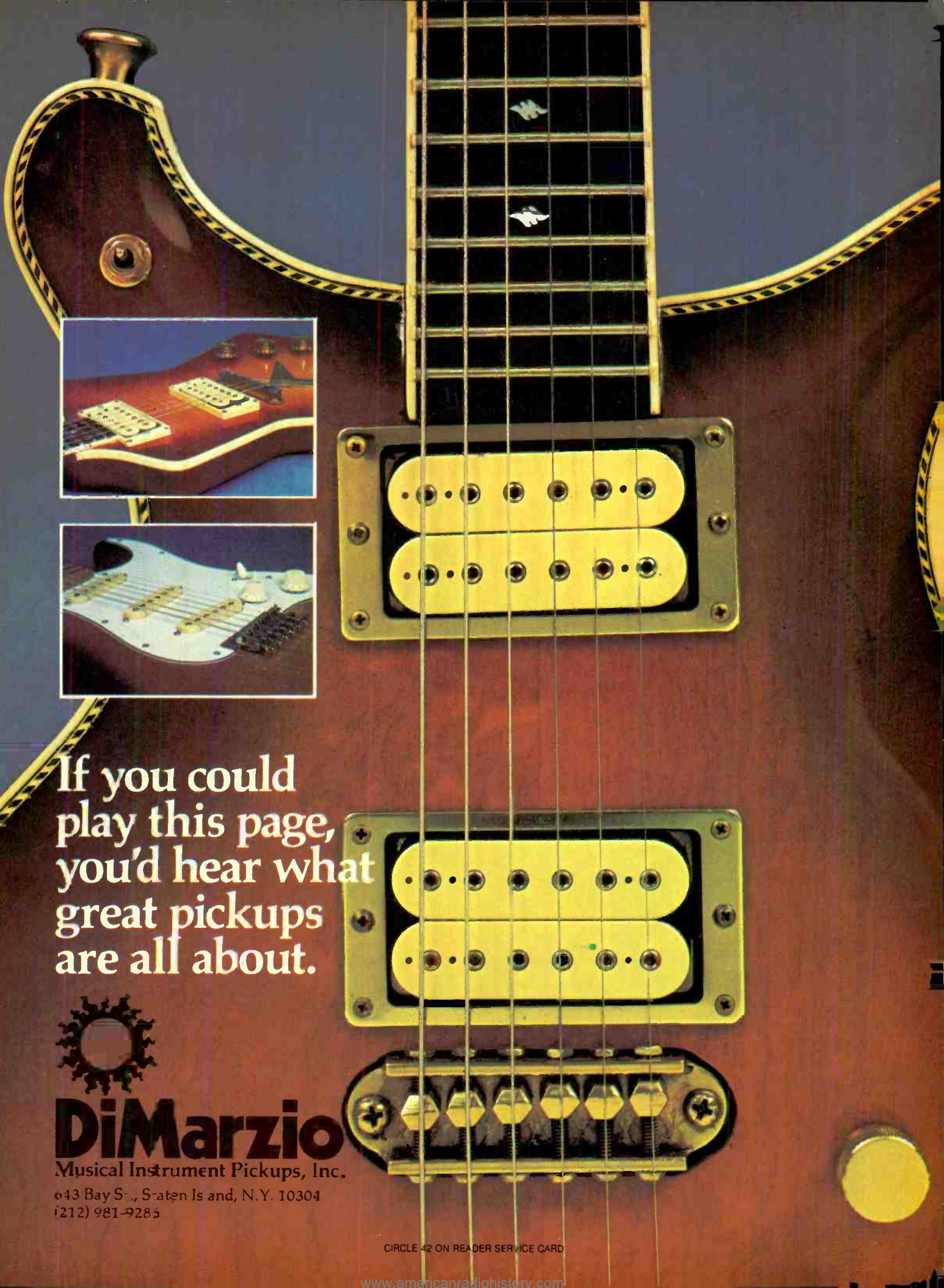
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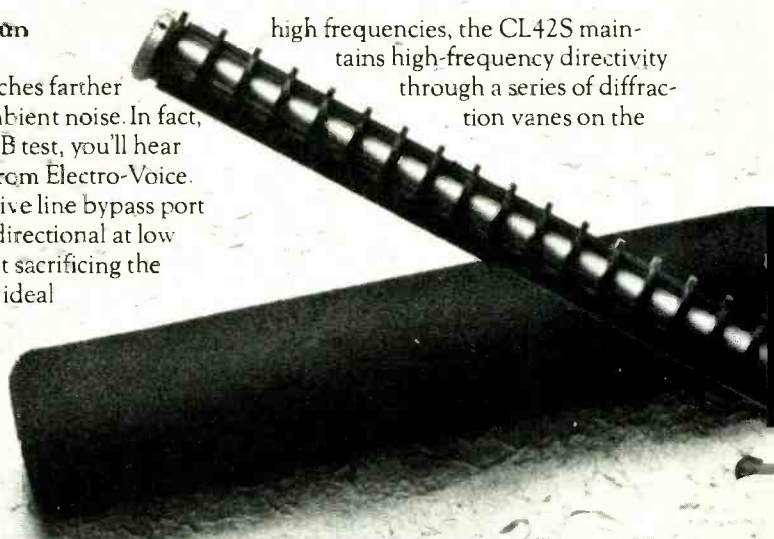
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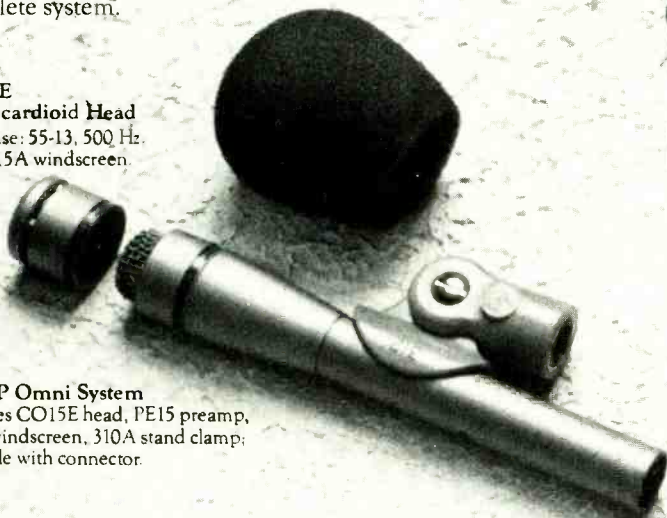
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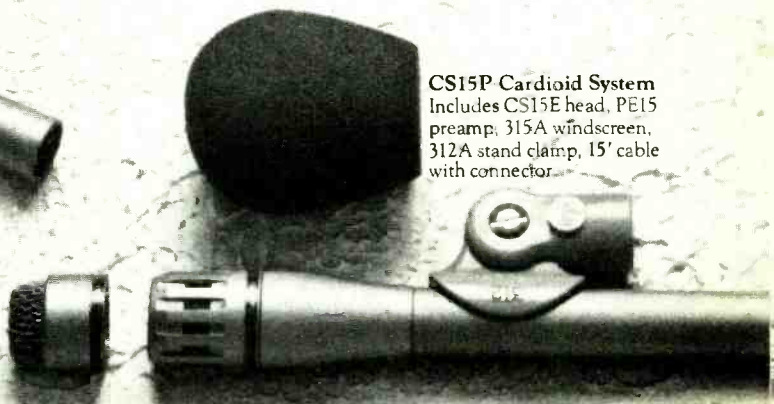
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Response: 20-20,000 Hz.
With 315A windscreen.

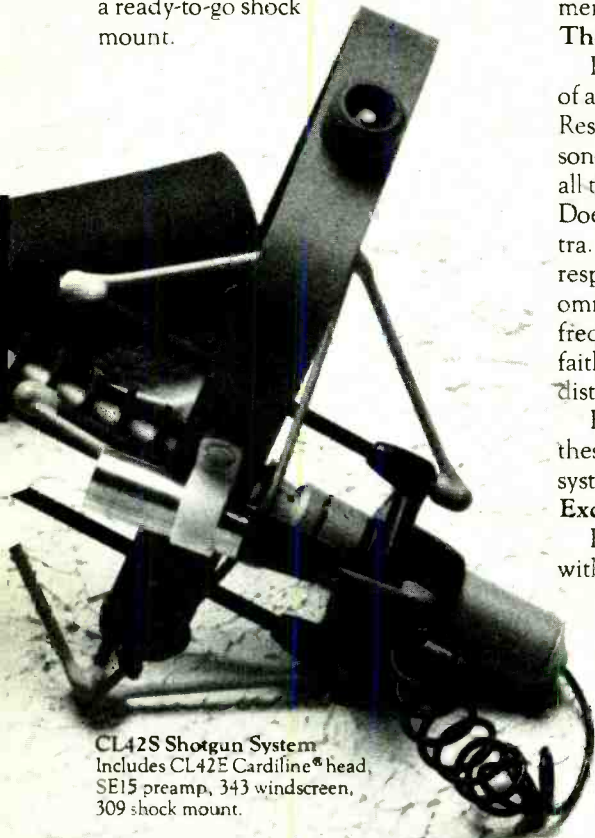


CS15P Cardioid System
Includes CS15E head, PE15 preamp, 315A windscreen, 312A stand clamp, 15' cable with connector.

line tube. Maintains sibilance if the "talent" gets a bit off-mike.

The CH15S Hypercardioid System.

It's two extreme nulls—in excess of 35dB at 120° off axis—create a tighter frontal pickup pattern than conventional directional microphones. We're actually more directional than a "mini" shotgun mike, in a package half the size. And our element and preamp were designed together for boom and fishpole use. Lightweight. Under 4 inches long. Compatible with phantom and AB power. And all with a ready-to-go shock mount.



CL42S Shotgun System
Includes CL42E Cardiline® head, SE15 preamp, 343 windscreen, 309 shock mount.

The CS15S Single-D Cardioid System.

It loves the stage, has the best gain-before-feedback in the business, and puts sex appeal in any singer's voice with its bass-boosting proximity effect. And the shaped high-frequency response makes the CS15S equally at home in the recording studio. The phantom powerable preamp has wide-band response and high sound pressure level capabilities (140dB SPL for 1% THD at 1kHz)—ideal for the most demanding close-up vocal and instrument miking applications.

The CO15S Omni System.

It extends response to the very limits of audibility—20 to 20,000 Hz. Response that registers the deepest sonorities of a great pipe organ, mirrors all the subtlety of solo instruments. Does full justice to a symphony orchestra. And unlike even the most highly respected omni's the CO15S is truly omnidirectional at the very highest frequencies. Provides a spectral balance faithful in both close-up miking and distant pickups.

Electro-Voice includes all four of these high-performance, packaged systems in its...

Exclusive Warranty System.

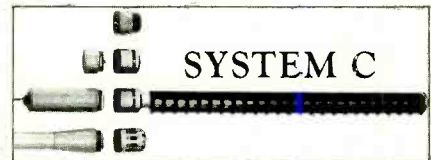
Electro-Voice backs up its System C with the only unconditional warranty

in the business: for two years, we will repair or replace your System C microphones at no charge—no matter what caused the damage!

We can do it because System C, with its structural integrity through turned-steel cases, and positive mechanical nesting of internal components, more than meets the E-V standards for ruggedness. You'll experience less downtime, and prompt service if anything does do wrong. Prompt because we don't have to send things back to Europe for repair. Prompt because our modular design simplifies repair. Prompt, because we care.

We don't think the professional should accept anything less.

For complete information including an in-depth technical paper on Electro-Voice System C, just write to: Electro-Voice, Inc., 600 Cecil Street, Buchanan, Michigan, 49107



EV Electro-Voice®
a gulton company
600 Cecil St., Buchanan, Michigan 49107



BS9
Remote battery power supply.



SE15 Preamplifier
For boom or fishpole use.



CA10 Attenuator



PE15 Preamplifier
For stand or hand-help use.

All were optimistic and cheery last summer when Modern Recording observed Lynyrd Skynyrd. Street Survivors their new album, was being born; all concerned were laudatory. General consensus was that it would be the best album Skynyrd had yet issued.

The beginning of a late October week brought the new platter to this writer's doorstep; immediately, the optimism of group leader Ronnie Van Zant and others was extremely justified. Songs that we previously had heard in embryonic form during our time in Atlanta's Studio One had blossomed to full adulthood. We felt that the group was approaching full realization of their vast technical abilities, and had succeeded in transferring their "live" energy to vinyl with a purity seldom exceeded in contemporary rock.

A couple of days later, a motel room radio brought the news of the tragedy which claimed the lives of Van Zant, guitarist Steve Gaines and his sister, vocalist Cassie Gaines. For the writer, who had known all three, the loss is personal as well as artistic.

While most of Skynyrd survives, the band will never be the same. Therefore, this feature glimpse of LS in the studio, a manuscript written in a happier time, becomes in retrospect a parting glimpse. —R.S.

The more raucous side of Lynyrd Skynyrd — fights, drunken brawls, alleged orgies—has been described and exaggerated in the fan press, so we need not tell any war tales here. However, if popular impressions were to be believed, a Skynyrd recording date would have been punctuated by whiskey-chugging "pier six" knock-down-dragouts, orgies, etc.

Not so. Oh, there were intoxicants around at the recording of Skynyrd's new LP, *Street Survivors*, yet those cerebral lubricants came from the beer store down the street. As we really should have expected, the platter was recorded in a light, informal, yet totally business-like atmosphere. They may not be choirboys, but the six southern rockers are consummate, dedicated recording professionals.

This Atlanta-based journalist didn't have to travel very far to observe Ronnie Van Zant and company in action. The sound factory utilized was Studio

One, fifteen miles up the expressway in suburban Doraville, Georgia. Set in an industrial park near one of the freeway exits, the plant has recently undergone an extensive expansion and modernization, at the crux of which was the installation of the 24-track mixing board.

No neophyte to the manufacture of chart toppers, Studio One boasts an extensive history of regional prominence. Opened at the turn of this decade by song publishing magnate, Bill Lowery and Atlanta Rhythm Section manager/producer Buddy Buie, the location has churned out all seven ARS albums (including the platinum *Rock and Roll Alternative*); several top-forty hits by futuristic Starbuck; a well-received platter by that revered Dixie tunesmith, Joe South; as well as other longplayers and singles by regional acts on the way to significant national recognition.



Mean and Hungry

In 1972, Lynyrd Skynyrd fit the above description. They were young, green, mean and hungry. And if those terms sound like cliches, rest assured they apply here. Plying their trade in Atlanta rock and roll bars, at the point where they were still dogged by plebian musical abilities, they were herded into Studio One that year to record their initial LP which bears the group's name.

As lead singer and group director Ronnie Van Zant describes it, "Everything really good we've ever done has been here, so I really don't know how we were enticed away from this place. On our second album, we recorded *Sweet Home Alabama* here, yet when our producer, Al Kooper, moved from Atlanta to the West Coast, he convinced us at the time to record out there."

for this year's *Street Survivors* sessions. Saw the album in the *Monday Night Special* which was done at Atlanta's West TV Studios, house operation of the city's fabulously successful (Eric, Paul Davis, others) Bang Records (*One for the Back My Bullets*, was recorded) at Capricorn Studios in Macon, Ga., and last year's "live" double set, *One More From The Road*, was taped over three days in Atlanta's Fox Theatre. So although they are booked by a New York agency, managed by Rolling Stones guiding force Peter Dudge, and seldom appear on bills with other so-called "southern rock" acts, Lynyrd Skynyrd has, except for a brief fling in Tinseltown, never left the South.

Coming Home

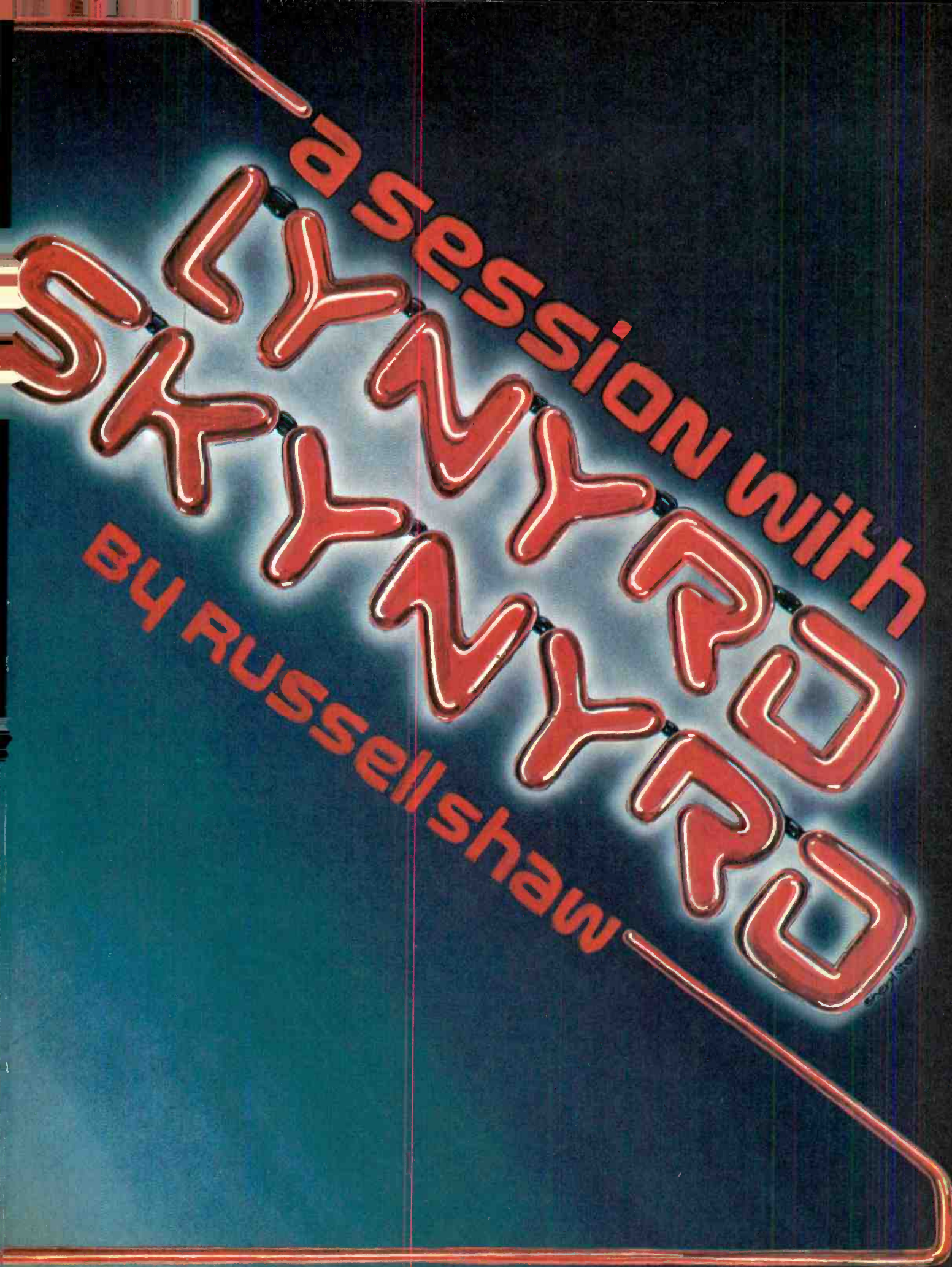
"By returning to Studio One, we feel we've come home." Testifying is Ronnie Van Zant, the enigmatic figure who makes the sextet go. His forceful vocals, true-to-life lyrics, and unsavory reputation are quite at odds with the individual we meet in the wee hours of the morning, taking time from a mix to chat. He's cordial, perceptive, and quite lucid as he states his case.

"We are the type of band that really depends on the room. When a guitar player hears a note, he wants to have it come out the same way on the phonograph in someone's home. We have been in situations where we have gotten mad because a studio wasn't coping what you were putting out.

"Yes, this is our first complete album here in five years. They have much better equipment and are far better organized, but in the same length of time, we are far more together, too.

"Why do we like this place? On recording, we depend a whole lot on what we call 'room noise' which is the closest thing to a 'live' sound that you can get in the studio. According to those requirements, this is the best place we have ever recorded. The thing about it is that Studio One has not got a truly big name yet, but I can truthfully say they have both the facilities and the people to work with. If you are a band like us, if you like hard shit, you'll realize that to capture that in a studio is very, very hard to do."

Van Zant reinforces his plaudit with a more technical description. "The



Silly Session with
Russel Shaw
BY RUSSELL SHAW

studio was built almost acoustically perfect for what we call 'balls.' It has got a tile floor and it is a very 'live' room, yet one without leakage. We've been in rooms that were 'live' like this, but we had bad leakage problems. There are six people in Lynyrd Skynyrd, three guitars, and they do not believe in turning down."

For a while, it seemed that Skynyrd would not record here. They experimented a bit at Criteria in Miami, Florida. While Van Zant is hesitant to describe the maneuvers that led to the site switch, the general impression was that they yearned for the old days.

"Everything we have ever done which we felt good about was recorded here. When you are successful at one place, why mess with it?"

While it was generally inferred that Criteria was the first choice of producer Tom Dowd, he later accepted the decision to go to Atlanta. "At first, he was a bit hesitant," revealed Van Zant. "When he came here to look at this place, they were in the middle of switching from sixteen to twenty-four tracks, and he wasn't sure that they would be ready on time. As we all know, they were and are."

Good Ole Boy

That last comment was tossed specifically at the appreciative ear lobes of Rodney Mills. Now chief engineer at Studio One, Mills is that rare combination of the creative and practical. The artistic and scientific. His days as a touring musician for several area ensembles now at least a decade behind him, Mills spends his time (mostly nights) dealing in the multifold technical intricacies that involve record production. It was and is his combination of fraternal, "good ole boy" artist camaraderie, no-nonsense, almost puritanical work ethic, and perceptive tonal antennae (disguised as regular human ears) that prompted Van Zant to comment on the inside jacket of *Nuthin' Fancy* that "the entire album was recorded at Web IV Studios, Atlanta, Georgia with the exception of "Saturday Night Special" which was knocked off in one night at good ole Studio One, Doraville, Georgia with good ole Rodney Mills at the controls."

Contrasting with Ronnie Van Zant's folksy, often rambling jargon, Mills' observations are much more precise. "I built this studio on sheer instinct

and not on anything I was sure of. We started out with the idea that we would build it too 'loud,' and if it needed deadening, we would go from there. Now, we have a quality called ambience. When Ronnie sings, he can hear his voice come off the walls around him. Some studios, your voice can be completely buried, but there's nothing to absorb the sound here but the back wall."

"I feel like I'm singing 'live,' I can hear that bounce," chimes Van Zant. Resumes Mills, "The walls are made of ¼-inch plywood; they do absorb sound, like those bass frequencies that can cause you a lot of trouble."

Ronnie also reveals that, "We like to go 'live' rather than do a whole lot of overdubbing and punching. Most of this record, well, we've been doing it [the material] in concert so we know the tunes and haven't required a great deal of rehearsal time. We would arrange it one night, and the next night come in and cut it."

With a sly grin, Mills then confesses that, "We didn't have need for all twenty-four of our tracks. Even so, this new console is fantastic. You can do anything in the world with it. It's a Harrison 3232, with an Allison 65K

Programmer. The Allison will memorize your levels for you. That's one good thing about having twenty-four track capability, you have enough room for storing six different mixes. I remember on our old board (now sold to a smaller studio in the area) that we couldn't bounce things from one track to another, say to combine tracks one and three on track two. Now, of course, we can do it."

Modern consoles are, of course, not ends in themselves; knowledge weaned from lengthy experience must be a catalyst. Here, Mills' countless hours behind boards, both old and new, come into play as he discusses studio location settings, products, and technical specifications.

Mics and Locations

"As far as the location settings are concerned, the drums went where we have been putting them for years—in the corner of the room. Some of the guitar amps were on one side, some on the other. This room is V-shaped and that was the best configuration. We keep the bass and guitar side by side, and the drums out of the booth. The

Engineer Rodney Mills (right) and equipment manager Kevin Elson (left).





Steve Gaines, Artimus Pyle and Ronnie Van Zant (left to right).

keyboards are rear left, and this poses no problem . . . except if the drums are very loud and the acoustic piano is very soft. Then, we can either go direct pickup, or redo the piano."

Of course, all the positioning strategy in the world is academic without the "best" mics, a subject which brings out more of Mills' perceptive judgments.

"I believe in trying to have as many different mics as I can. There are mics [which are] more versatile than others, but each one sounds different.

"For drums, we came across this AKG mic that Skynyrd's road crew had. To my knowledge, it is not even imported in this country. For kick it was just great. It's got good low end; we went with it all the way. On the snare, we used either a Sennheiser 421 or Shure SM 56. Tried a lot of different mics on snare. One premise we knew already as fact is that condensers are not meant for a snare drum if someone is beating hard on it.

"With the toms, we worked with Shure SM 56s and 57s because of the sound. You hit something close to it, and the whole end builds up, making the drums sound bigger than what they are. Only problem with them is

that they don't have extended low end. Overhead, it is AKG C 451s; I like the brightness, and transparency they have on the top end.

"I like the Sennheiser 421 on guitars. We put them in real close. They have a nice boost and an upper midrange that helps them cut thru. We use the Electro-Voice RE20 on the bass, and for the acoustic piano, the AKG 451 again—six to eight inches above the hammers. Incidentally, I'm not into cutting stereo piano that much. I believe in mono piano because that's what most people will hear. No one notices the stereo effect except other piano players who might happen to listen to the album."

Ronnie Van Zant has a set-up of his own. "We booth him, and use the Beyer 500. It gets a real natural sound," muses Mills. "Some tunes, we used an AKG 414, which does not sound like him but has such a crisp top end and such a nice low end. On the basic tracks, we used the Beyer, because he felt most comfortable with that mic. We did no double tracking of vocals. On early Skynyrd things, we did it a good deal, but Ronnie's voice is so strong, it really doesn't call for doubling." Not available at the time of

recording, but since installed, is a noise gate-vocal stresser, which "automatically cuts off the vocal mic when the singer has stopped. There has to be a certain level before it switches back on."

Playback

From time to time, Van Zant, as well as his enthusiastic cohorts, dart back into the control room to audit the blossoming fruit of their labors. For such tasks, Mills has mandated "JBL 4350s, which are the biggest they've got. The way that you satisfy some people is with volume, so we got tired of having smaller speakers cranked all the way up and someone coming back in, all pissed off, saying that it wasn't their sound. Those smaller things would be straining for volume, but these things can be played at less than half the capacity and still blow you away. We also have smaller JBL 4311s in the recording room, but they are used strictly as convenience speakers for talkback purposes."

For virtually intravenous auditory absorption, Mills prefers "Koss K6LCS headphones, because they have level controls. The head room and the sound pressure are great. That is a really vital aspect."

What of the recording material? Mills is emphatic in reply to this question. "We work with Ampex 456 G master tape. It is the best available in this part of the country. Our tape speed is 30 ips with no Dolby. Skynyrd doesn't like to work with noise reduction—they feel it alters the sound."

Mastering

Once all the material is mixed to absolute perfection, mastering becomes the next priority. Catching up with Mills a few weeks later, we find him just returned from a trip to Capitol Mastering Labs in Los Angeles.

"We did a lot of stuff out there, changing the sequences three times so that the sides would be balanced as to length. Each side is approximately eighteen minutes, an ideal length. Me and Tom Dowd used Ken Perry."

Perry is a gentleman of considerable repute whose latest efforts have included *Rumours* (Fleetwood Mac), plus recent works by Bob Seger, Steve Miller and Paul McCartney, among many others. Not a bad track record.



Guitarist Steve Gaines (left) and lead singer Ronnie Van Zant (right).

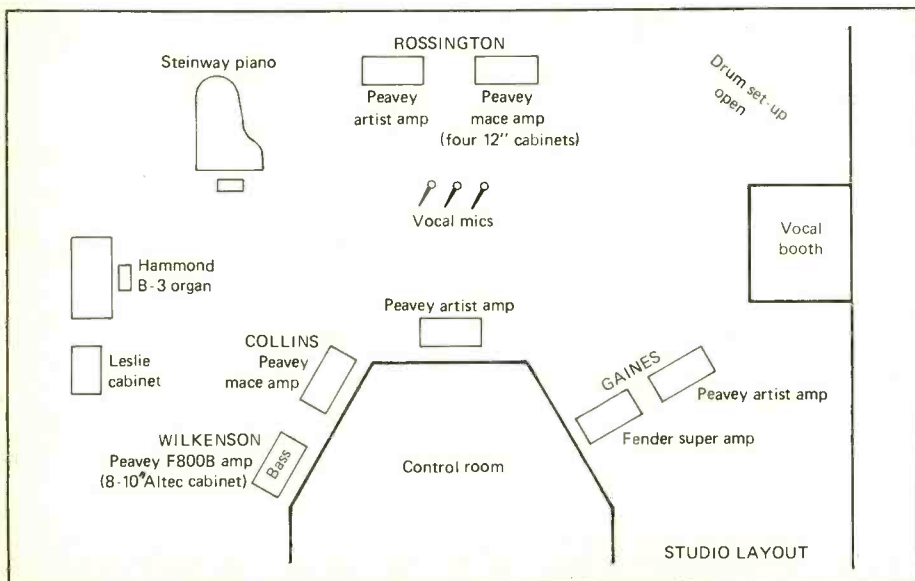
Constant Demand

Speaking of impressive resumes, producer Dowd definitely fits that criterion (no pun intended). Constantly in demand by the likes of Rod Stewart, for instance, he is virtually revered by Lynyrd Skynyrd. Capsulizing, Van Zant beams, "Tommy is a genius. He can show people stuff you wouldn't

believe. He's like a father to me, the best man I've ever worked with. He gives us complete freedom, but he always is there with his part. He has even written some of our best material. He is also one of the best arrangers around.

"More went into *Street Survivors* than any other album we have ever done. Maybe there's not a big hit

single like 'Sweet Home Alabama' on it, but it is the best we have ever done. Studio One, Tom Dowd, Rodney Mills and all the people here are greatly responsible for that."



MIC SELECTION

VOCALS: Neumann U-87
AKG 414
Beyer M500

GUITARS (electric): Shure 53
Sennheiser 421 & 451

GUITARS (acoustic): AKG 414

BASS: E-V RE20 & direct

ORGAN: RE20 (bottom)
AKG 451 (top)

PIANO: AKG 451 (low strings)
AKG 414 (high strings)

DRUMS: Sennheiser 421 (snare)
AKG D-14 (bass drum)
Sennheiser 406 (hi-hat)
Shure SM56 (tom-toms)
Neumann U-87 (floor tom)
AKG 451 (overheads)

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MODERN RECORDING

THE STUDIO GAME

By Bob Berliner

TOOL ROAD

TOTAL

Possible Total 17

My total _____

Do you know the difference between flanging and phasing?

Yes—1 pt.

No—0 pts.

How many types of audio delay methods can you think of?

1/2 pt. ea.
up to 2 pts.

RULES

The object of the game is to see how you and your studio rate in terms of maintenance potential and capabilities, experience and flexibility. In short, the object is to find out whether or not you and the studio are operating at maximum efficiency and if not, how you can get that efficiency.

Follow the arrows along the road board answering each question as you go along. Answer each question (honestly) and then total your points at the end of each section. If you don't understand a question, suffer the consequences and deduct the points or simply don't give yourself credit for it—whichever is most applicable.

When you reach the end of the road, go back and total the points of each section to get your grand total. Then refer to the scoring table to get your rating. There's no time limit and you are allowed to look up references as you go along.



START

EDUCATION ALLEY

I have some idea of how it works but can't fix it.

1 pt.

I know how it works and I can connect it all together.

2 pts.

I understand *some* electronics theory

3 pts.

I have some technical schooling in electronics.

4 pts.

Do You Really:
Have a tool kit?

Yes—2 pts.
Sort of—1 pt.
No—0 pts.

Have a working
flashlight?

Yes—1 pt. No—0 pts.
Have a soldering iron,
solder and solder wick?
Yes—2 pts. No—0 pts.

Have a long nose,
cutters and strippers?

Yes—2 pts. No—0 pts.

Have a nut driver set?

Yes—1 pt. No—0 pts.

Have a flat head & Phi lips
screwdriver?

Yes—3 pts. No—0 pts.

Have an Allen wrench set?

Yes—2 pts. No—0 pts.

Have contact spray?

Yes—1/2 pt. No—0 pts.

Have Q-tips, alcohol &
audio cleanser?

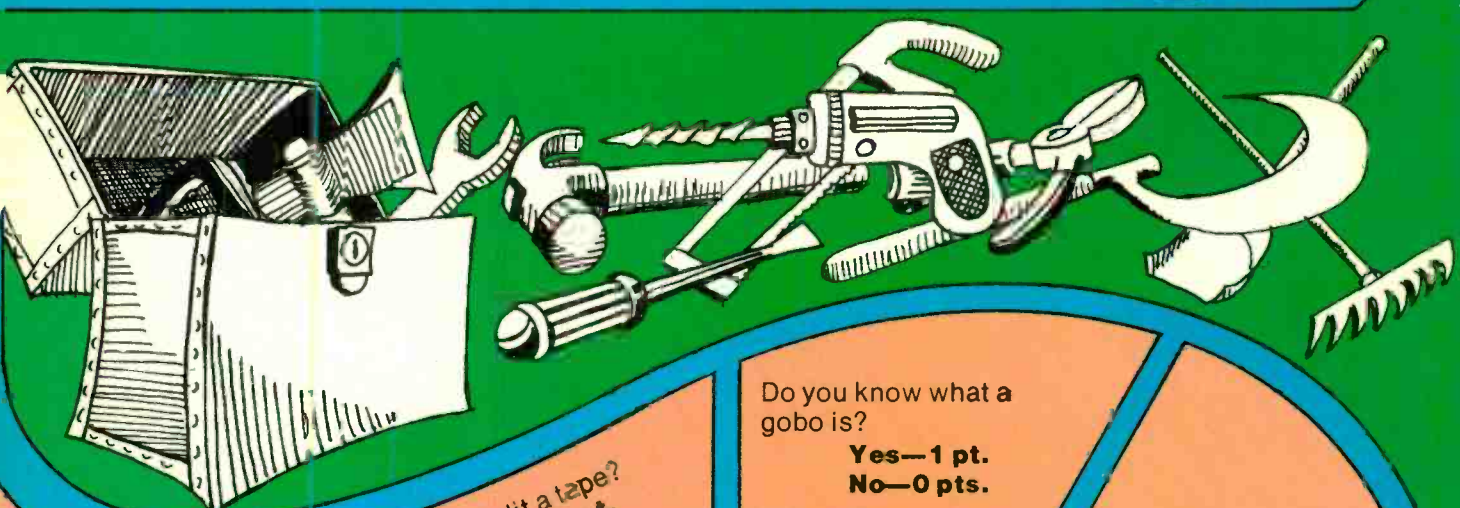
Yes—1/2 pt. No—0 pts.

TOTAL

Possible Total 14

My Total _____

*(continued
or next
page)*



Do you know how to
measure head room?

Yes—1 pt.
No—0 pts.

Can you edit a tape?
Yes—1 pt.
No—0 pts.

Can you set a cue mix?
Yes—2 pts.
No—0 pts.

Do you know what a
gobo is?

Yes—1 pt.
No—0 pts.

Do you know what a
snake is?

Yes—1 pt.
No—0 pts.

Several years using and
fixing audio equipment
3 pts

Very experienced with studio
equipment and crazy
musicians

5 pts

Do you know what pre- or post-
means?

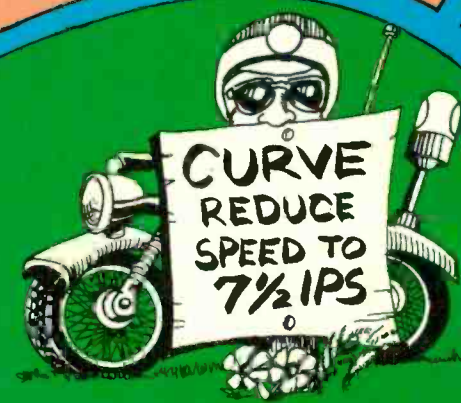
Yes—1 pt.
No—0 pts.

No audio experience,
just an interested
beginner

1 pt

Some studio experience
(have mixed, will travel)

2 pts.



I understand the circuits
and how they
interconnect.

5 pts.

I completely understand
the system philosophy
and can also redesign it.

6 pts.

Do you know Chris Law
and how to use it?

Yes — 2 pts.
No — 0 pts.

TOTAL

Possible Total 14

My Total _____

**EXPERIENCE
STREET**

**TEST
EQUIPMENT
BLVD.**

Do you have a
Multimeter?
**Yes—2 pts.
No—0 pts.**

Does the R x 1 scale
work?
**Yes—2 pts.
Not sure—0 pts.**

Do you know how to check
voltages with your
multimeter?
**Yes—2 pts.
No—0 pts.**

Do you have alignment tapes for
your tape machines?
**Yes—for all speeds and tape
widths—4 pts.
Yes—for most speeds and
widths—2 pts.
Yes—have a few but high end is
down—1 pt.
No—0 pts.**

Do you know how to
test diodes and tran-
sistors with your
Multimeter?
**Yes—3 pts.
Not sure—0 pts.**

Do you own a head
demagnetizer and know
how to use it?
**Yes—2 pts.
No—0 pts.**

Do You Own:

An audio oscillator?
Yes—2 pts. No—0 pts.

A set of clip leads and assorted test
cables?
Yes—2 pts. No—0 pts.

An AC VTVM?
Yes—3 pts. No—0 pts.

Resistor/capacitor
assortments?
**Yes—1 pt.
No—0 pts.**

A spare I/O module for
console?
2 pts.

A spare set of
electronic cards for
tape machine?
**Yes—2 pts.
No—0 pts.**

Do You Have:

Audio hook-up cables?
1 pt.

Mic cables?
2 pts.

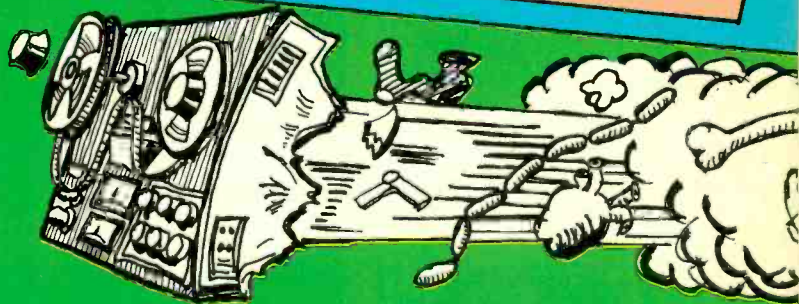
Speaker wire?
1 pt.

A spare Dolby Cat 22 or dbx
module?
**Yes—2 pts.
No—0 pts.**

Spare headphone
transducers?
**Yes—1 pt.
No—0 pts.**

**WIRE
ROAD
EXIT**

55 mph



TOTAL

Possible Total 23

My Total _____

**TECHNICAL
SUPPORT
JUNCTION**

Do you:

Work with & buy from a
few good audio dealers
or shop for price?
**Good dealer (yea)—
3 pts.
Price shop (nay)—
1 pt.**

Know who to call for
technical assistance
on each piece of
studio gear?
**Yes—2 pts.
Not all—1 pt.
None—0 pts.**

Have a complete set of
tech manuals on your
studio equipment?
Yes—2 pts. No—0 pts.

Return warranty exchange
parts promptly to your
dealer or manufacturer?
Yes—1 pt. No—0 pts.



Do You Own a:

Distortion analyzer?
Yes—3 pts. No—0 pts.

Oscilloscope?
Yes—3 pts. No—0 pts.

Flutter meter?
Yes—2 pts. No—0 pts.

Do you have:

Test extender cards for console and tape machines?
Yes—2 pts. No—0 pts.

TOTAL

Possible Total 40

My Total _____

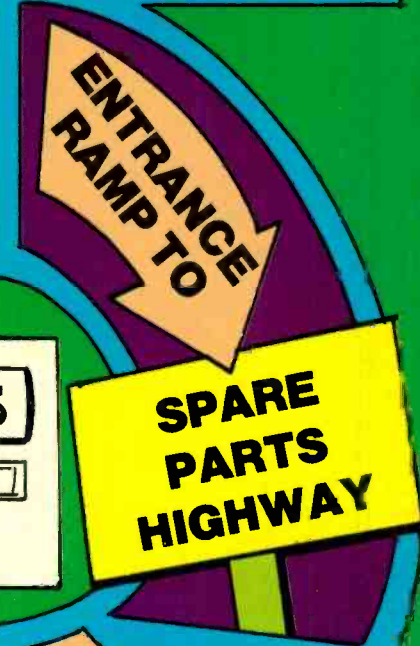
Do You Own a:

Real-time analyzer?
Yes—3 pts. No—0 pts.

Digital voltmeter?
Yes—2 pts. No—0 pts.

Colby cat 35 tester (if you have Colby)?
Yes—1 pt. No—0 pts.

Do you prefer pink noise or white noise?
White—1/2 pt. Pink—2 pts.



A spare pressure roller for tape machines?
Yes—2 pts. No—0 pts.

A complete set of transistors and diodes for major equipment?
Yes—3 pts. No—0 pts.

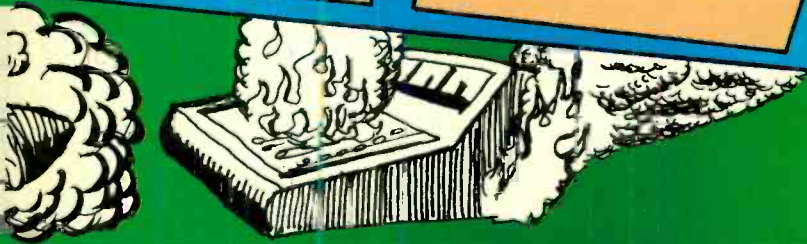
A set of bulbs of each type (always need bulbs!)
Yes—2 pts. No—0 pts.

Belts for tape machine (if used)?
Yes—1 pt. No—0 pts.

Do you Have:

Spare fuses for all your equipment?
Yes—1 pt. No—0 pts.

At least two of each relay tape used in the studio?
Yes—2 pts. No—0 pts.

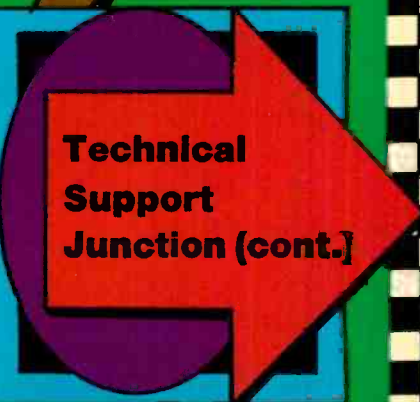


Try to find out if any service bulletins are out on your equipment?
Yes—1 pt. No—0 pts.

Install these service bulletin updates on your equipment?
Yes—1 pt. No—0 pts.

Have you been to an audio show lately?
Yes—2 pts. No—1 pt.

Do you subscribe to Modern Recording?
Yes—2 pts. No—1 pt.



When outside tech help comes in, do you schedule service time?

**Yes—2 pts.
No—0 pts.**

Do you schedule maintenance for your studio . . .

**once a week?—4 pts.
once a month?—2 pts.
never—1 pt.
we fix problems as they come up.**

When you use outside service help, do you pay the bill promptly?

**Yes—2 pts.
As soon as we can—1 pt.
Let him wait—1 pt.**

Do you keep everything running, rarely need outside help?

Yes—7 pts.

ECHO CANYON



Do you locate problem and repair it from service stock?

Yes—5 pts.

Do you pin problem areas down, but need outside help to fix?

Yes—2 pts.

Do you check fuses and cables but then are at a loss to fix?

Yes—1/2 pt.

Choose only *one* of boxes A, B, C or D

(D)

(C)

(B)

(A)



TRANSIENT PEAK



DRY SIGNAL GULCH

**Tech. Junc.
continued**

Do You:
Own a set of transistor/diode substitution books?

**Yes—1 pt.
No—0 pts.**

Complete & return all warranty cards?

**Yes—1 pt.
No—0 pts.**

Do you have to rush around looking for a mic?

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twice/yr—1 pt.
more than twice—0 pts.**

Is 600 ohms a British housing project?

**Yes— -1 pt.
No— +1 pt.**

Do you like what you are doing in the audio business?

Yes—5 pts.

I don't know—3 pts.

If no, why did you bother playing this game??

TOTAL

Possible Total 20

My Total _____

FINISH

**DANGER
FALLING
SPECS ZONE**

**TROUBLE
SHOOTERS
COURT**

TOTAL

Possible Total 22

My Total _____

What size speaker wire do you use?

22 ga.—1/2 pt.

18 ga.—1 pt.

10-12 ga.—2 pts.

RATE YOURSELF

SCORING

- Below 25** — Welcome to audio. Start by reading the articles in Modern Recording. Learn how to use a multimeter. Build up a good tool kit, and a few spare parts. Have fun learning.
- 25-50** — You know how to connect equipment but have recently had equipment failures during sessions. Buy some tools, at least a multimeter and learn how to use it. It would not hurt to obtain the maintenance manuals for your equipment and learn at least some routine service procedures.
- 50-80** — You have been in the recording business for a while, and only call for outside service help on the hard problems. It would not hurt to have an audio oscillator, and new alignment tapes. Start thinking spares and build up a small stock of transistors and diodes. Make sure you have a complete set of technical books on your equipment. Start working with one or two good suppliers so that you only have a few places to call when problems come up or you need something in a hurry.
- 80-110** — You have a good start on test equipment and spare parts. Most of the routine service and test measurements in the studio are within your present capability. What is needed is some of the extras such as extender test cards for the console, tape machines or Dolby. A real-time response analyzer might be in the cards. We suggest you find out from manufacturers of your equipment what service bulletins might be available and begin updating your equipment as time permits. Review your spare parts. It might be a good idea to have some extra caps or power supply components. Try to get your employer to let you attend some of the training schools run by the equipment manufacturers.
- 110-140** — You have a well-equipped shop, excellent technical background and probably work the hell out of the studio without much down time.
- 140-150** — You rarely have technical problems you can not handle in-house. If your employer were smart he would give you an immediate raise.

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Ambient Sound

BY LEN FELDMAN

Recording Revolution Ahead?

I have just returned from my semi-annual visit to Japan. The visit was timed to correspond with the annual high-fidelity show which takes place at the Harumi convention center in Tokyo. If you can visualize a combination of an AES Convention, a CE Show and a consumer-type high fidelity show all rolled into one you will get some idea of the scope of this mammoth event.

Awareness of good sound and dedication to high-technology in consumer and professional audio products is more evident in Japan than perhaps anywhere else in the world, including the United States. These days, if you want to know what's just over the horizon, the best way to find out is to learn, first hand, what Japanese audio manufacturers are up to in their own domestic market. The products and audio techniques on display at the Japan audio fair are usually the ones you will see here six months or even a year from now.

Even a quick walk-through of the show (language barrier notwithstanding) proved to me that the recording industry may well be on the verge of a major upheaval—both at the recording studio level and at the software level. As many of you may have already guessed, I am talking about PCM recording. For the uninitiated, PCM stands for Pulse Code Modulation. Nearly half-a-dozen companies exhibited various forms of tape recorders which employ this new recording technique.

In a PCM recorder, analog audio signals are first converted to a series of pulses of varying width. These pulses are all of uniform amplitude (unlike analog audio signals which, in a conventional tape recorder, must be faithfully stored as continuously varying degrees of tape magnetization). As in any audio-to-digital conversion system, the number of pulses per second recorded onto the tape must be many times the highest audio frequency to be translated. That means

that the tape recording system must be capable of wide-band response approaching the bandwidth capability of a video tape recorder. Obviously, these days that is no longer a major problem, as evidenced by the number of commercially available video cassette and other video tape systems, such as the well known Beta-Max system manufactured by Sony and now available for home use.

But once the problem of bandwidth is solved, the benefits derived from PCM audio recording are many. For one thing, since in a PCM system audio information is stored in the form of fixed amplitude pulses, residual tape noise is always far below the level of the recorded pulses and therefore does not figure in the reproduction process as the pulses are "read" by the tape playback head. This, in turn, results in a much improved signal-to-noise or dynamic range capability. Typically, PCM tape recorders are boasting dynamic ranges of as high as 85 dB. Even the very best conventional analog tape decks now in use in professional applications are capable of no more than about 65 dB of dynamic range, measured from tape saturation level down to residual tape noise level. Signal-processing devices such as Dolby and/or dbx are often used in professional studio applications to improve this 65 dB figure somewhat, but, in the course of dubbing individual tracks in creating the final master or mixed-down tape, some of this added dynamic range is sacrificed, since each successive dubbing adds a few dB of noise to the finished product. Not so with a PCM tape which can be copied repeatedly with no degradation in signal-to-noise. With an 85 dB (or more) dynamic range capability, there is hardly ever a need to employ peak limiters or compressors when recording a "live" performance, since 85 dB of dynamic range is about the amount needed to record such "live" performances.

Another advantage of the PCM recording system has to do with its low order harmonic distortion. Traditionally, head-room in a conventional analog tape

recording has been defined as the recording level which results in 3% total harmonic distortion during playback. In the case of a PCM recorder, pulse amplitudes can be kept well below that tape saturation point and the new PCM tape decks are boasting harmonic distortion levels as low as 0.03%!

Finally, thanks to the PCM recording techniques, wow-and-flutter can be reduced to totally inaudible levels. Thus, it would seem that all the ills of conventional tape recording can be solved with PCM recording. Unfortunately, that is not quite true just yet. For one thing, the PCM recording technique, to date, stops at the master tape. The final product sold to consumers—namely the phonograph record itself—is still very much an “analog” product with the usual groove wiggles and modulations used to convey audio information via the cartridge stylus. Thus, the best that can be said for discs that are pressed from PCM tape masters is that they should approach the fidelity and signal-to-noise capability of some of the newer direct-to-disc recordings which have been showing up in increasing numbers lately and which by-pass the tape-recorder completely. These discs, as most readers probably know, are pressed from master lacquers which are cut at the time of the musical performance itself.

The inherent disadvantage of direct-to-disc records is, of course, the fact that there can be no “multiple takes” or multi-track mix-downs—the mainstays of modern popular recording technique. The performance must be perfect the first time, and all of the musicians and vocalists must play together as they would in a “live” concert. As of now, the same thing applies to the PCM tape recorders. Eight or sixteen-track PCM recording capability is still off in the future, simply because of high cost and because PCM tape deck manufacturers have not seen fit to offer such machines as yet. No doubt that limitation will be overcome as costs come down and the PCM technology improves with time. In any case, we were informed that several recording studios both in Japan and in this country and abroad have already expressed extreme interest in the new tape mastering technique and some have even placed orders for first-generation PCM professional tape decks for use in their studios.

The Ultimate Recording Revolution

One exhibit which we saw at the Tokyo hi-fi show suggested that the PCM recording idea may one day even be extended to home software. Teac Corporation showed a working model of a PCM disc player. The system shown was reminiscent of the video disc system developed jointly by Philips and MCA and which is soon to be marketed by those companies via

Philips-owned Magnavox. In this system, a thin plastic disc contains pulse-encoded information which is visually traced or tracked by a laser beam pickup system. In the case of the video disc, rotation is at many hundreds of rpm in order to provide for the 4.5 MHz bandwidth necessary to encompass the video information. In the case of an audio PCM disc with its lower bandwidth requirements, rotation of the PCM disc can be done at more moderate speeds. Again, because of the language barrier, we were unable to learn the actual rpm of this prototype disc but would estimate that it was not very different from the usual 33½ rpm to which we are all accustomed.

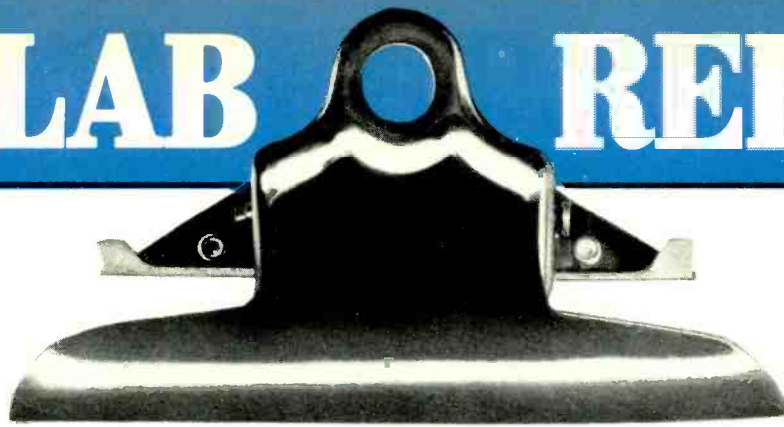
To be sure, the transition from conventional vinyl mechanically-tracked phonograph records to laser-beam traced PCM discs is not something that is going to take place overnight. A multi-billion dollar industry is not going to give up and just fade away. But just consider what benefits might be had from such discs in the future. The full dynamic range (85 dB or more) of the PCM master tape could be “transcribed” intact to such discs, since both would employ the same pulse code modulation principle. Since there is no physical contact of a stylus when playing such a disc, the disc might be expected to last indefinitely, with no signs of wear or audio degradation whatever. The ultra-minute grooves which contain the PCM information would make it possible to produce discs with much more playing time than even present day LP discs and the discs themselves would be extremely inexpensive to mass produce. Cost of the playing mechanism, of course, would far exceed the cost of a conventional record player at first but such costs might be expected to decrease rapidly once such a system gains universal acceptance.

Such painstakingly achieved signal-processing techniques as Dolby, dbx as well as all manner of peak limiters and compressors would become a thing of the past, since they would no longer be needed to “contain” the full dynamic range of recorded audio programming. Furthermore, millions and millions of dollars worth of professional recording equipment, not to mention the billions of dollars worth of home record playing equipment would become antiquated.

How Soon Will It All Happen?

No one can guess how soon the conventional vinyl LP record will become a relic, but the economic realities of the new PCM recording technique suggest that such a major revolution is still quite a ways off. In other words, don't discard your record collection just yet. If nothing else, they may become valuable as audio antiques some day.





NORMAN EISENBERG AND LEN FELDMAN

JBL 6233 Power Amplifier



General Description: The model 6233 from JBL is a stereo power amplifier intended for professional and commercial applications. It is rated for continuous output power per channel of 200 watts into 8-ohm loads, or 300 watts into 4-ohm loads. Inputs at the rear are XLR connectors; speaker outputs are standard binding posts. The rear panel also contains a grounding terminal, an operating line-voltage selector (100-120 V AC and 200-240 V AC), a 15-ampere fuse-holder and the unit's AC power cord which terminates in a three-prong (grounding) plug. The rear is partly covered with a screen behind which are the output transistors and their heatsinks. This area actually lines up with a vented section on the front panel and between them is a cooling fan whose operation varies depending on power drawn and the amplifier's internal thermal conditions.

Input level controls for each channel are on the front

panel together with the power off/on switch and illuminated indicators showing power output levels.

Test Results: Tests conducted by *MR* on the JBL 6233 amplifier confirmed or exceeded manufacturer's published specifications. The amplifier thus offers very high power at very low distortion, plus the kind of ruggedness and reliability of concern to the professional user. There is also a temptation to think of this amplifier as a super hi-fi model for use in an all-out home stereo system except for the high power it can draw from the line, plus the fact of its cooling fan which does get a little noisy when it runs at full speed (which happens intermittently, depending on power drawn and thermal levels inside the amplifier). In normal use, the fan operates at a slow speed and the noise produced is barely audible. At top speed, however, we

measured an SPL level of nearly 70 dB when standing within 1 meter's distance of the amplifier. While this probably would be unacceptable for home hi-fi use, it probably would "pass muster" in professional applications where an amplifier typically is somewhat removed from the rest of the sound system (and from the audience).

This point aside, MR could not help being impressed with the performance of the JBL 6233. Its power output was higher, its distortion was lower, and its fre-

General Info: Dimensions are 19 inches wide (rack-mountable), 5¼ inches high, 17½ inches deep behind front panel. Price is \$1500.

Individual Comment by N.E.: One wag who was present in the studio during tests of this amplifier said something to the effect that all you have to do these days to offer a professional amplifier is to put XLR



JBL 6233: Front panel view.

quency coverage was wider than JBL claims. S/N was excellent at the rated 100 dB down level. Input sensitivity was below 1 volt for full rated output.

The professionalism of this amplifier does not stop at the XLR sockets. Examination of the 6233's insides revealed very rugged and careful construction, with an extraordinarily high amount of internal shielding

connectors on its outside, and add a noisy fan to its inside. He changed his tune, however, as we got more into this amplifier and he soon agreed that while he would not use it for his home stereo setup, he certainly would have no hesitation in recommending it for use in a studio or in sound-reinforcement and PA applications where very high and very clean power plus relia-

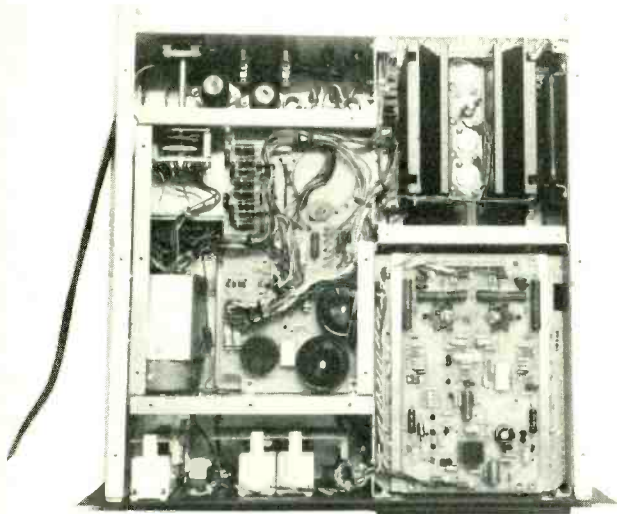


JBL 6233: Rear panel view.

throughout the chassis. The interior photo gives some idea of the unit's superior organization and parts layout, although not all of the shielding is evident since we removed some of the covers in order to provide a closer look at the circuitry itself.

bility are required. I'll go along with that. The performance measurements detailed elsewhere in this report speak for themselves, but two points ought to be made for underscoring that data. One: while an amplifier of this class normally does not have to com-

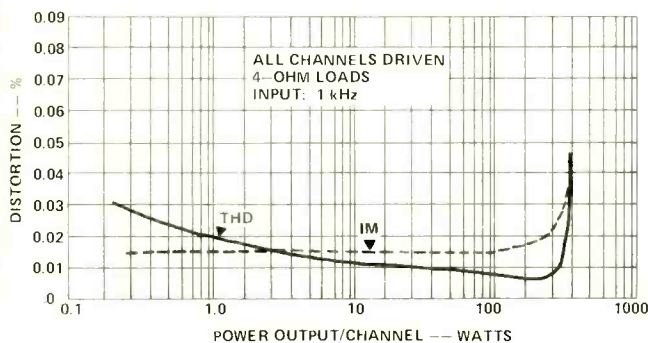
ply with FTC power-disclosure rules, it is to JBL's credit that this one actually can do so. The power rated is available all across the 20 Hz to 20 kHz band, and



JBL 6233: Internal view.

rated distortion was never exceeded across that band for full rated output. Even the preconditioning test (running the amplifier for an hour at one-third its rated output into 4 ohms), a rigorous test applied to "consumer" amplifiers, posed no problems with this unit, although under actual use conditions such continuous internal "dissipation" probably would never occur.

The other point relates to the unit's power draw which can be considerable—850 watts at 15 amps from the line is the rating-legend on the rear. Aside from the obvious caution about turning this amp on from a

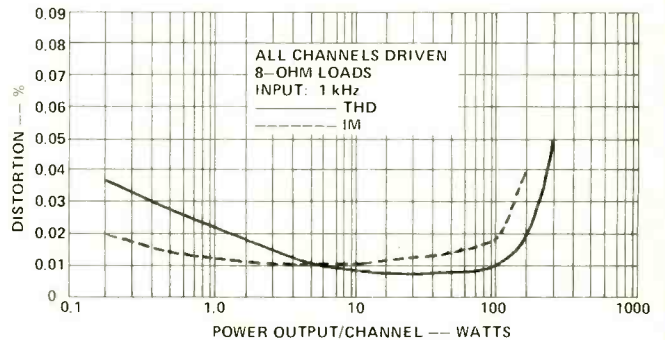


JBL 6233: Harmonic and intermodulation distortion characteristics.

preamp-control unit, one should re-check all power-draw ratings in the total system in which this amp may be used.

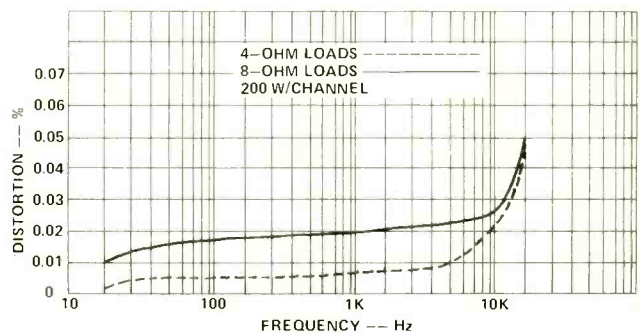
Individual Comment by L.F.: This amplifier serves to illustrate the difference that still exists be-

tween home-use "professional" power amplifiers and those which are intended for true professional use, sans the quotation marks. The JBL 6233 definitely falls in the latter category, which is evident from its input sockets to its output in terms of construction and of performance measurements. The fan is noisy at



JBL 6233: Harmonic and intermodulation distortion characteristics.

times but in most professional setups it would not normally be within earshot, and it does assure you that the amplifier is being kept comfortably cool regardless of power generated and dissipated during operation. The front-panel power monitors are, in my view, superior to the use of VU meters or even so-called "peak-reading" mechanical meters since these indicator lights do respond instantly to peak signals and thus will alert the operator to the imminence of rising distortion. And they do so *just before* clipping level is reached and thereby can alert you to the need to keep things below clipping level. In any event, the professional user doubtless will be using more conventional VU meters elsewhere in a system.



JBL 6233: Distortion vs. frequency.

It is worth noting that the unit's frequency response has been extended far enough to satisfy the "wide band" school of audiophile without imposing unnecessary cost on an amplifier that will probably be used in many sound-reinforcement and studio-monitoring applications where one seldom hears discussions concerning the merits of amplifiers whose response extends to "channel 5."

In all, it seems obvious that JBL is eminently capable of building the kind of amplifier their loyal following is looking for. If your only familiarity with

JBL is in terms of their speaker line, you would do well to take a look at (and give a listen to) the model 6233 amplifier.

JBL 6233 AMPLIFIER: Vital Statistics

PERFORMANCE CHARACTERISTIC

Continuous power/channel at 1 kHz

Continuous power/channel,
20 Hz to 20 kHz

Power bandwidth

Frequency response

Damping factor

Rated THD

Rated IM

Residual hum & noise (- dB)

Input sensitivity

Input impedance

MANUFACTURER'S SPECIFICATION

300 watts into 4 ohms;
200 watts into 8 ohms

300 watts into 4 ohms;
200 watts into 8 ohms

20 Hz to 20 kHz

± 0.5 dB, 20 Hz to 20 kHz

40

0.05%

0.05%

100

0.77 V

20 K ohms

LAB MEASUREMENT

380 watts into 4 ohms;
300 watts into 8 ohms

confirmed
confirmed

10 Hz to 20 kHz

± 1 dB, 10 Hz to 20 kHz

40

0.006% (4 ohms)

0.017% (4 ohms)

100

0.70 V

confirmed

CIRCLE 1 ON READER SERVICE CARD

White 4100 Stereo Equalizer



General Description: The model 4100 from White Instruments, Inc. is a stereo equalizer offering ten bands on one octave per channel. I.S.O. centers are 31.5, 63, 125, 250, 500, 1 K, 4 K, 8 K and 16 kHz. The control range for each band is ±10 dB. In addition to this EQ facility, the model 4100 includes a low-cut filter on each channel plus the option of being used as an electronic crossover for driving a bi-amplified reproducing system

A relatively compact unit, the model 4100 uses rotary controls instead of sliders for handling the EQ adjustments. The front panel contains identical rows of twelve knobs for each channel: ten for the EQ bands, one for the low-cut option and one more for channel

level. The low-cut knobs are marked from 20 Hz to 160 Hz. The channel level knobs are marked from -20 to 0 dB. In addition each channel has an overload LED indicator. Finally, there are the switches for bypass (EQ in/out) and for power off/on.

At the rear are the signal input and output jacks (standard hi-fi pin jacks) which are marked for normal (EQ) use and for use in bi-amp hookups. The rear also contains a grounding terminal, a fuse-holder, the device's AC power cord fitted with a three-prong (grounding) plug, a voltage selector switch (115 or 230 V AC) and a special eleven-pin socket to accommodate a White network for use in the electronic crossover application. When used as an equalizer, this socket may

be ignored (it comes properly strapped for EQ use).

The White 4100 is supplied with two pair of stereo signal cables, an AC plug adapter for two-prong sockets and a "security cover" that may be fitted over the front-panel controls once proper EQ adjustments have been made for a given situation (a chart inside the cover may be used to note the control settings). The black metal housing of the model 4100 is set off by walnut side panels. For rack mounting, additional hardware may be ordered.

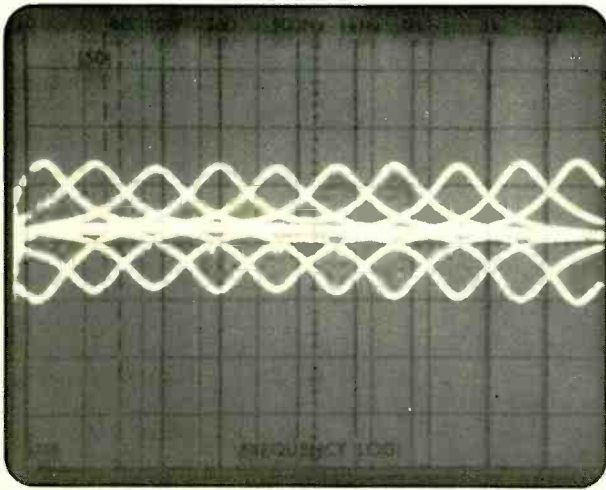


Fig. 1: White Instruments 4100: Octave by octave response range.

Test Results: The White 4100 is supplied with a fairly comprehensive list of specs, which, save for a small difference here and there, were confirmed or bettered in *MR*'s tests. The latter kind of test result was especially noteworthy in the case of the centering of the EQ frequencies. White claims they are within ± 6 percent; we found them to be more accurately centered than that—within ± 4 percent. What is more, the boost and cut range of each control was uniform, and precisely 10 dB. An oscilloscope photo made in our lab (Fig. 1) shows the range of the ten octave-controls.

The action of the variable low-frequency filter controls, which provide selectable rolloff of response on either channel from about 160 Hz down to 20 Hz is graphically shown in the other 'scope photo (Fig. 2). *MR* considers this feature a worthwhile addition to an equalizer since without it, even if the lowest band (usually 20 Hz or, in this device, 31.5 Hz center frequency) is set for attenuation, the response usually rises again below the lowest center frequency, and so the last lowest band control is relatively ineffective in reducing high amounts of turntable rumble or vibration, when such reduction is needed.

Another useful option of the model 4100 is its rear-panel provision for the insertion of an external network (White model 4101 for 12 dB/octave slopes, or model 4102 for 18 dB/octave slopes) which enables the unit to function as an electronic crossover device.

Suggested uses of the 4100 include, in addition to EQ for reproducing systems, and bi-amping, applications in small sound-reinforcement systems where full one-third octave EQ may not be needed. It also can be used to pre-equalize material just prior to mixing in a multichannel mixdown board or recording setup.

General Info: Unit is 18½ inches wide (including wood side panels); 3½ inches high; 6¾ inches deep. Weight is 7.5 pounds. Advertised price is \$599.

Individual Comment by L.F.: Not all equalizers are alike, obviously, and in the case of the White model 4100 it is the differences that particularly impressed me. The unit has rotary knobs instead of sliders. Behind these knobs are rotary potentiometers that are high-quality sealed MIL-Spec types not likely to become noisy with repeated use. Calibration is linear and is provided for every dB of boost or cut on each knob. The extra controls—level adjustments and variable low-frequency filters—are very useful and accurate additions to the control panel. I also liked the facility for converting the 4100 to use as an electronic crossover, if desired. The instruction manual supplied with the device is very good. It describes the complete equalization procedure, and the manufacturer is not afraid to suggest that the process be performed by a qualified technician equipped with a pink-noise source

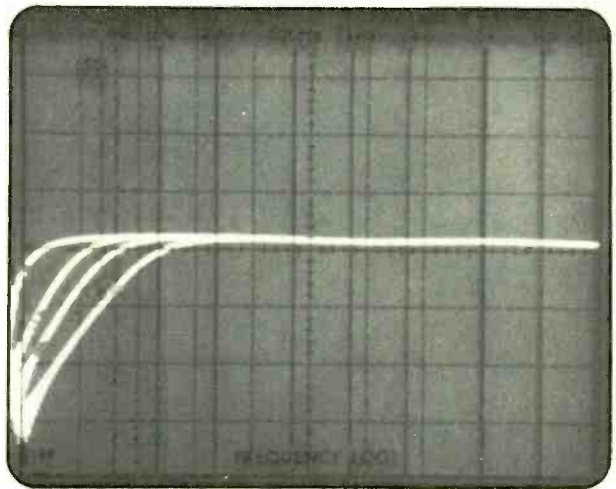


Fig. 2: White Instruments 4100: Examples of low-cut filter response obtained with various settings of the continuously variable high-pass filter.

and a real-time analyzer. Their own dealers are evidently encouraged to perform this service (for an additional charge, of course), and I heartily agree that a layman attempting to perform system EQ "by ear" is more apt to come up with poorer sound balance than if he or she left well enough alone and did not bother with an EQ device in the first place. I have always felt that an equalizer is not a "sound effects toy" and that

anyone serious enough about a sound system to consider buying this kind of device should be advised, and helped, to integrate it correctly into the system.

The slide-on "security cover" (which may be fitted over the front panel after controls have been adjusted) is a further reminder to the user about leaving well enough alone and will discourage future tampering.

Compared to what is available these days, the 4100 may be a little high-priced (it has no bandwidth adjustment and no shifting of center frequencies). Notwithstanding that, the device is very well engineered. It uses, incidentally, regular LRC filters incorporated in the negative feedback loop of IC op-amps, which to me demonstrates that when a designer knows what he is doing he can use good old-fashioned coils and capacitors in an equalizer and still come up with a unit that boasts very low distortion and very high signal-to-noise ratio.

Individual Comment by N.E.: The White 4100 conveys an impression of very careful design and superior engineering, but I am not sure to whom this device is being addressed. The owner's manual starts in a manner to which the music system owner would be accustomed, but then it shifts its emphasis to more advanced levels, going into the use of a pink-noise generator, standard microphone and real-time analyzer—devices that are not likely to be part of the normal collection of goodies owned by even the most avid of home audiophiles. In my view, the manual ought to be revised so that it clearly indicates procedures for using the device, albeit in a limited way, that the home system owner could manage, and then goes into increasingly complex (and accurate) methods of equalizing. The manual also does not make it quite clear that when the 4100 is used as an electronic crossover for bi-amping, it still can function as an equalizer.

WHITE INSTRUMENTS, INC. MODEL 4100 STEREO EQUALIZER: Vital Statistics

| <u>PERFORMANCE CHARACTERISTIC</u> | <u>MANUFACTURER'S SPECIFICATION</u> | <u>LAB MEASUREMENT</u> | |
|--|--|-----------------------------------|--------|
| Operating range (frequency): Control range (frequency): | 20 Hz (−3 dB) 20 kHz (−1 dB) Ten bands (each channel) on one octave I.S.O. centers from 31.5 Hz to 16 kHz | 20 Hz (−1.0 dB) to 20 kHz (−1 dB) | |
| Control range (amplitude): Low-cut control: | −10 dB to +10 dB 12 dB/octave active high-pass filter, continuously variable from 20 Hz to 160 Hz | Confirmed Confirmed | |
| Gain: | Unity gain with all controls in flat position. Calibrated attenuator at input of each channel for level setting. | Confirmed (see Fig. 2) | |
| Operating level (input): | 0 dBm (approximately 0.8 Vrms) recommended | Confirmed | |
| Maximum output: | +18 dBm with all controls in flat position | Used as reference input for tests | |
| Overload detector: | Peak level detector set approximately 2 dB below maximum peak output. LED indicators | +19.5 dBm | |
| Distortion (THD): | Less than .08% at 0 dBm, worst case control settings; less than 0.1% at +18 dBm | LED lights at +16.5 dBm | |
| (IM): | Less and .004% (SMPTE) | *See table below | |
| Noise: | Better than −92 dBm (19 microvolts) over 20 kHz bandwidth | 0.01% | |
| Dynamic range: | 110 dB | −92 dBm | |
| Input impedance: | Greater than 40 kilohms, single ended, AC coupled | 111.5 dB | |
| Output impedance: | Approximately 100 ohms | Confirmed | |
| Output load: | 600 ohms or greater | Confirmed | |
| Frequency tolerance: | ±6% of center frequency | — | |
| | | ±4% (worst case) | |
| *THD MEASUREMENTS | | | |
| | 20 Hz | 1 kHz | 20 kHz |
| All controls max., 0 dBm output | 0.1% | 0.01% | 0.1% |
| All controls centered, 0 dBm input | 0.05% | 0.03% | 0.1% |
| All controls min., 0 dBm output | 0.07% | 0.025% | 0.06% |
| All controls max., +18 dBm output | | 0.075% | |

CIRCLE 6 ON READER SERVICE CARD

Allen & Heath Mini Limiter



General Description: The Allen & Heath Mini Limiter is a compact single-channel limiter designed for use in a PA or "live"-recording system. Inputs are provided for line and for low-Z balanced mic.

Front-panel controls include five pushbuttons, a slider and the power switch. Two pushbuttons are white: one selects line or mic; the other is for limiting or not. The other buttons, colored red, include one for attack (slow or fast) and two for release—one is slow or fast; the other, slow or medium. Pressing both the last

Furnished in a neat black metal housing, the Mini Limiter has four small "feet" on its underside.

Test Results: Most of the manufacturer's specs for the Mini Limiter were confirmed in *MR*'s tests, and the general conclusion was that this relatively tiny device has a surprising amount of versatility. Its limiting action was judged to be very good, with strong effect but without encroaching on frequency response,



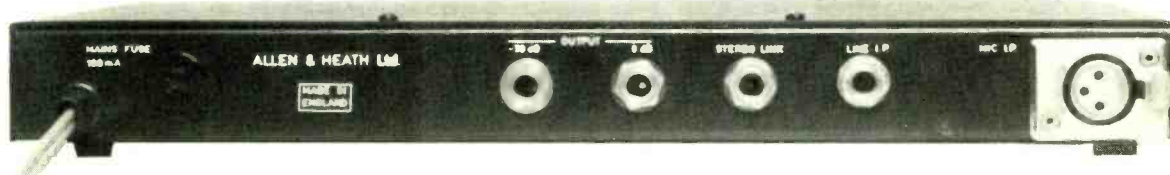
Allen & Heath Mini Limiter: Front panel view.

two buttons together introduces an automatic release. To the right of these buttons is an LED that comes on when 3 dB of limiting occurs. To its right is the horizontally-mounted slider for input level. Farther to the right is the LED for power on and the power switch.

The mic input at the rear is an XLR connector. Other

and with keeping harmonic distortion well within acceptable limits.

As for "breathing" or "pumping" effects, *MR* found that they can be overcome by experimenting with the two degrees of attack time, and the two degrees of release (decay) time, provided. We never did quite settle on how to use the "auto" release option; under most



Allen & Heath Mini Limiter: Rear panel view.

signal jacks are standard ¼-inch phone jacks and include the line input, a stereo link connection, an output for zero dB and an output for -30 dB. The unit's AC power cord and a fuse-holder complete the rear panel.

program material conditions the decay time was too slow when the "auto" position was activated. The available slow and fast release times, however, did provide enough permutations for most of the test pro-

gram material (vocals, using a mic; and previously-recorded tapes with signal expansion, etc.) to satisfy

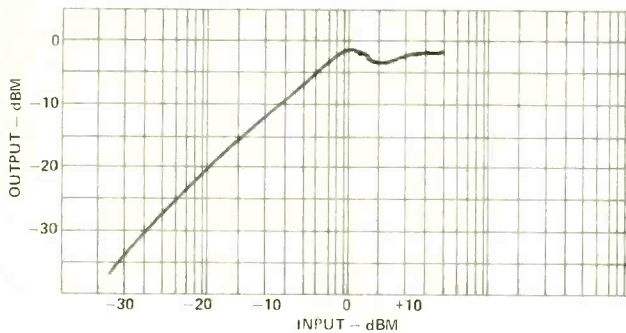


Fig. 1: Allen & Heath Mini Limiter: Output vs. input characteristics with threshold set for approximately 0 dBm.

limiting needs, at least on an experimental basis.

In static sine-wave tests, it became clear that the Mini Limiter—properly calibrated in terms of threshold—gets to work promptly and almost totally. No “rounded edges” were discernible on the input-versus-output signal curve (see Fig. 1).

General Info: Mini Limiter is 12¼ inches wide; 1½ inches high; 4½ inches deep. Price: \$130.

Individual Comment by L.F.: Anyone who needs a single-channel limiter might consider this handy petite device. Other than the “auto” option, I found it did its intended job remarkably well. I wonder, however, why the unit includes a microphone

input channel (at what was no doubt some increase in cost) unless the manufacturer envisioned users purchasing one Mini Limiter for each mic channel in use. Myself, I would simply continue to use a good mic mixer for each of my stereo channels, and would insert a pair of Mini Limiters (one per stereo channel) at line level, farther down the audio-signal line. I suppose, of course, there are some PA applications (a single lecture speaker mic, for instance) where only one mic is involved. In such a setup, a limiter such as this one—installed between the mic output and the PA amplifier’s line input—would be all the PA system operator needed. On the other hand, in such a minimal installation most operators probably would be insufficiently versed in the application to even bother with a limiter. Be that as it may, if space is at a premium in your setup and you have been looking for a small limiter that does not skimp on circuitry and that does its job as well as any limiter can be expected to do, this device may be just what you want.

Individual Comment by N.E.: The compactness of the Mini Limiter, plus its mic-input option, may be counted on by the manufacturer to appeal to some sound-system operators who otherwise might not bother with any limiter, although for more sophisticated setups and users, its mic channel would be superfluous. However, it is precisely for the former kind of user that some explicit instructions would be needed, and no real instructions were supplied with either of the two test samples we received at MR. Instead, a rather poorly reproduced set of specifications accompanied the units which could be interpreted only by someone with previous technical knowhow in terms of this particular class of equipment.

ALLEN & HEATH MINI LIMITER: Vital Statistics

PERFORMANCE CHARACTERISTIC

Sensitivity at threshold for 0 dBm out, fader at max.

Mic
Line Input

Unweighted noise, max. gain

Mic
Line

Available limit range

Attack times

fast
slow

Decay times

slow
fast
auto

Distortion during limiting

Distortion at +10 dBm out

Max. output (m limit out)

Frequency response, any condition

Power consumption

MANUFACTURER'S SPECIFICATION

-70 dBm
-25 dBm

-52 dBm
-70 dBm

> 20 dB

c. 100 usec.
c. 5 msec.

100 msec.
c. 4 usec.

between 50 msec. and 2 sec.

< 0.25%
< 0.10%

+17 dBm

± 1 dB, 20 Hz to 20 kHz

11 watts

LAB MEASUREMENT

-70 dBm
-23 dBm

-54 dBm
-72 dBm

19 dB

confirmed
confirmed

confirmed
confirmed

60 msec. to 1.8 sec.

0.19%
0.09%

+18 dBm

± 1 dB, 10 Hz to 50 kHz

11 watts

CIRCLE 3 ON READER SERVICE CARD



TEAC/TASCAM 40-4

Four-channel Tape Recorder

By Brian Roth and Jim Ford

General Description: The announcement of the 40-4 four-channel tape recorder raised our curiosity since we were very familiar with the world famous TEAC 3340 models. We were quite interested in seeing TEAC's new generation of multi-track recorders.

Very similar in design and operation to the Tascam 80-8 eight-track model, the 40-4 records and plays back four channels of material on quarter-inch tape. This stout machine, weighing in at about seventy-five pounds, includes sophisticated sync playback and monitoring circuitry that makes "track building" very straightforward.

The unit operates at 7½ or 15 inches per second tape speed (selectable by a front panel switch) and accepts up to 10½-inch reels (large or small hub sizes are accommodated by a front panel tension selection switch).



Front panel controls include the usual tape motion buttons as well as a tape lifter override switch to allow editing or cueing. The four digit tape counter (which is not calibrated for actual running time) is tied in with a memory switch that will automatically stop the tape motion during rewind when the machine's counter has returned to zero.

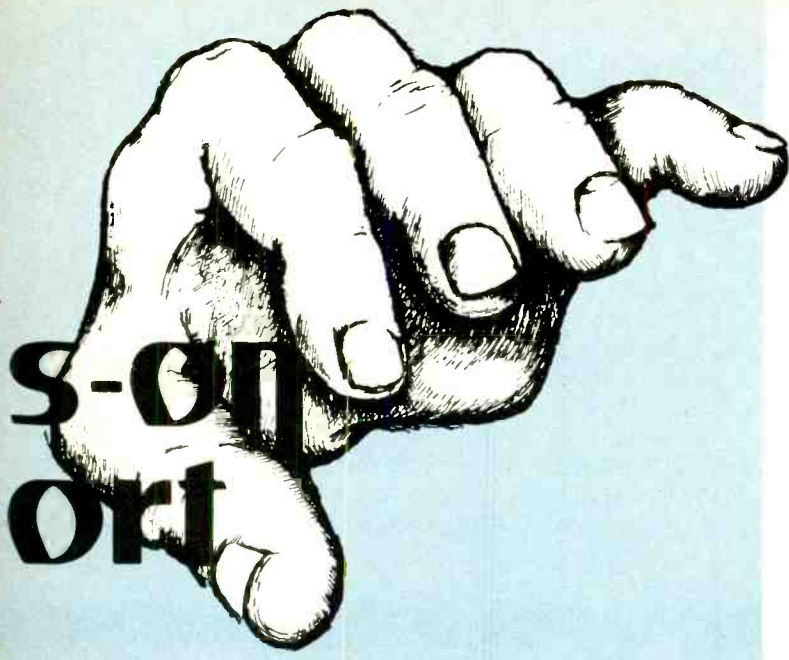
Four "function select" switches allow recording on



one or more tracks; these operate in conjunction with three "output select" switches. When the "input" switch is activated, the recorder is in "source" status with the meters indicating input line level and the recorder outputs producing the line input signal. The "norm" switch activates sync playback from the record head if none of the four "function select" switches are pressed. When a function select switch is engaged, that track changes to an "input" or "source" mode.

The "norm" mode of operation allows easy punches so that mistakes on an otherwise good take can be corrected. It is possible to rewind to a spot on the tape before the mistake, and begin playing the tape in sync mode. The machine is activated into a record stand-by mode by pressing the "record" and "play" buttons. Actual recording will not take place until a "function select" switch is activated. As the tape runs, the musician will hear sync playback from the recorder's output. When the part of the tape arrives with the mistake to be recorded over, the "function select" switch for the particular track is pushed and recording is initiated. In addition, the recorder's line output (and metering) for that track automatically transfers from sync playback to "input." Consequently, the musician will hear the material originally recorded right up to the time of punch-in, then he will hear what he is recording over the mistake. When the punch-in is completed, the "function select" switch for that track is deactivated. This terminates recording and reverts the line output and metering back to sync playback.

A third "output select" switch labeled "monitor" connects the playback head into the output circuits to allow monitoring off the tape. This function is used mainly during mixdown or for alignment of the record circuit internal adjustments. In this status, the playback head signals are routed to the line outputs



and meters regardless of the setting of the "function select" switches.

Four volume pots below the VU meters control the level of the line input signals. Output volume levels are internally adjusted. The VU meters feature peak overload indicators.

On the tape transport itself, TEAC has wisely chosen to use a roller coupled with a flywheel in the tape path to the left of the head assembly. This inertia roller will help isolate tape fluctuations caused by the supply reel, and should be superior to the fixed (non-rotating) guide more commonly used.

The head assembly of the 40-4 features a hinged head cover to allow easy access to the heads for cleaning or adjustment.

The rear panel provides the necessary line inputs and outputs for the four channels as well as a remote control socket and an interconnect socket for the optional dbx noise reduction unit.

The recorder under test was supplied with the dbx accessory which mounts at the bottom of the recorder. Our sample was a pre-production prototype and had a single "in-out" switch for the dbx. Production models will feature individual in-out switching for each track.

Field Test: We connected the 40-4 into a Soundcraft console and ran a recording session. First, we checked the fidelity of the machine by dubbing some high quality records and comparing the input signal with the playback off the tape. Overall, the sound quality of the 40-4 was very good with little deterioration of the input signal noted, even when in the sync playback mode. There appeared to be some sound character change at the higher frequency region, but it was not major. Without the dbx switched in, the recorder

sounded somewhat hissy. Naturally, the dbx completely removed all tape hiss.

Due to the fact that the 40-4's dbx unit cannot encode a signal and decode it simultaneously, the user cannot listen to signals from the tape as he is recording. Instead, the dbx routes the input signal right back to the line output jacks. Thus, we could not do a direct A-B comparison of input signal and dbx encoded/decoded signal from the tape. However, it appeared that the dbx did not introduce much additional coloration to the signal (which it shouldn't if the recorder is properly aligned).

We would have preferred having level matching controls for the dbx's input because the particular console used had a +4 dBm line output level. This would cause the recorder's line output level to be much higher during recording than during playback due to the fact that the recorder's input signal was routed directly to the output jacks while recording. During playback, the decoded tape level was at its nominal -10 dB level and thus much lower. This problem will not appear in installations utilizing mixers with lower level outputs.

Our next step was "track building." The automatic punch-in monitoring was a great feature. We would have preferred a slightly different logic arrangement in the "norm" status so that sync playback could be monitored regardless of the function select switch's position until recording was actually initiated, at which point the monitored output signal would transfer from sync to input. This arrangement is used on many large multi-track studio machines and simplifies punching in several tracks at once. Nevertheless, the automatic monitoring function was quite effective.

Punch-ins were practically silent except for situations where new material was dropped in right on top of old material. Under this condition, a pop was heard when recording was introduced and an odd distortion was recorded when punching out. The use of the dbx accentuated these noises. Thus, we suggest that all punch-ins and punch-outs be done at a "hole" in the program where no music is recorded; under this condition, punch-ins should be silent.

We noticed that as the monitor circuitry switched from sync to input there was a momentary absence of signal at the recorder line output. Although this wasn't recorded on tape, it was disconcerting to the musicians.

Tape handling was excellent under most all conditions. When using partially full reels of tape we noted that the 40-4 would drop some slack tape on the take-up side and cause the end of the tape arm to drop when the machine was stopped during rewind. This problem was not observed with full reels of tape.

The machine features full transport logic so that it was impossible to damage the tape regardless of the sequence in which the tape motion buttons were pushed.

After recording three tracks, we decided to see if we could "ping-pong" those tracks onto the fourth using the sync playback mode on the recorded tracks. Since

both playback and record functions are happening at the same time within the record head, it is often found that an oscillation (squeal) occurs due to the record signal feeding back into the tracks of the head used for playback. However, no such problems were noted if the previously laid tracks were at a normal level (not recorded at too low of a level).

Since the sync playback response of the record head is so good, this means that "ping-ponging" in the sync mode is possible. There are many occasions when this will be necessary on a four-track machine, since it may be desired to transfer two tracks onto a third while maintaining sync with the fourth track. The combination of high quality sync response (rivaling that of high dollar studio recorders) and sufficient track to track isolation in the record head make this technique a possibility if care is taken to maintain high levels on the tape. We suggest that ping-ponging done in the sync mode be transferred to one of the outer tracks so that the track being recorded on is not between two tracks being played back. Otherwise, potential feedback problems will come to life.

We were quite satisfied with the recorded results obtained. The well thought out logic functions made normal multi-track recording very easy. The sync playback sound quality was astonishingly excellent, and the overall sound was very good with the exception of the somewhat high levels of hiss noticed when the dbx was not utilized. We feel that the noise reduction accessory would be a good idea.

Lab Test: Our first check was playback frequency response both through the record/sync head and through the playback head. The response for either head was virtually identical being within ± 1.5 dB up to 15 kHz at 15 ips, the highest tone on an Ampex alignment tape. Track to track relative phase was almost perfect with only a small amount of "jiggle" of the relative phase between the two outer tracks.

Overall record/playback response at 15 ips was ± 1.5 dB from about 60 Hz to 20 kHz on the worst case track (#3); other tracks were slightly better. Response was down -3 dB at 45 Hz and 24 kHz typically. There was only a negligible difference between the overall response of the playback head and the sync head, quite an accomplishment! Response through the sync head was -3 dB at 21 kHz typically with only a slight variation from channel to channel. All tests were made with Ampex 456 tape.

Playback at $7\frac{1}{2}$ ips was flat within ± 2 dB up to 15 kHz and overall response was down -3 dB at 16 kHz through the playback head and 14 kHz through the sync head. The low end response at $7\frac{1}{2}$ ips was typically -3 dB at 30 Hz.

Next, we checked the unweighted noise level from the tape after having recorded a period of silence on Ampex 456 tape and noted the noise floor to be -54 dB below 0 VU or -60 dB below +6 VU which TEAC uses as a reference in their specs. The noise was caused by the recording process since the noise level of

playback of virgin tape was about 10 dB better than the noise of biased tape.

The dbx reduced the noise level by about 35 dB to -90 dB below 0 VU. This is dead silence for all practical purposes.

Distortion at 0 VU at 1 kHz (15 ips) was masked by the noise level. The measurement was .4% THD, quite good. Distortion at +10 VU at 1 kHz was still a respectable 2%. Visible overload at 1 kHz did not occur until about +13 VU. The dbx increased the overload point to +22 VU.

Wow and flutter was .04% NAB weighted at 15 ips and .07% NAB weighted at $7\frac{1}{2}$ ips. Crosstalk between channels during playback was -55 dB at 1 kHz. Crosstalk through the sync head (one channel recording and one channel playing back) was -35 dB at 1 kHz decreasing to -15 dB at 15 kHz, sufficient to prevent head feedback if the signal to be played back is recorded at 0 VU nominal.

The construction of the unit was very good. The record/playback electronics for each channel are on individual plug-in circuit boards located behind the hinged front panel that holds the VU meters and input volume controls. Access to the audio electronics is very easily accomplished by removing two screws from the front panel and swinging the front down. Nearly all audio adjustment pots (equalization, bias, etc.) are mounted along the front edge of the circuit cards. The normal mode playback (sync) level pot and meter calibration pot on the sample were not the upright mounted type and could not be adjusted without a circuit board extender card. However, the owner's manual shows these are upright-type pots so that is probably particular to the prototype nature of the test unit.

Since there are separate level and equalization controls for both the sync and playback heads, there is a large quantity of adjustments to be checked during set-up, more per track than on many studio models. However, this isn't too bad since the adjustments allow individual optimization of both sync and regular playback modes.

The owner's manual contains a complete set of logical instructions on machine alignment. However due to the complexity of the machine, the novice had best leave alignment to a qualified technician, *especially* if test equipment is not available. For the brave, the owner's manual gives the necessary info.

Conclusions: Overall, it appears that TEAC has designed a great machine both in terms of functionality and sound quality. Noise performance could be improved, but the dbx eliminates the problem (just be sure the recorder's equalization is set for flattest response or else the dbx will exaggerate the response errors). We were able to make first class recordings with the 40-4, and even punch-ins were a breeze. The 40-4 should be right at home in a budget conscious studio that still expects high-quality results.



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GROOVE VIEWS

Reviewed by:
SEDGWICK CLARK
NAT HENTOFF
JOE KLEE
GIL PODOLINSKY
RUSSELL SHAW

POPULAR

LITTLE FEAT: *Time Loves A Hero*.
[Ted Templeman, producer; Donn Landee, engineer; recorded at Sunset Sound Studios, Hollywood; Warner Bros. Recording Studios, North Hollywood; Western Recorders, Hollywood; and the Record Plant, Sausalito, Ca.] Warner Bros. BS 3015.

Performance: **Mechanically functional**
Recording: **Adequate**

Little Feat has its definite strengths. As a jamming band, they can really cook; the rhythm section is especially skillful. Yet, though possessed of a

certain drive and propulsive sense rare to the rock idiom, these capable musicians often fall back on comfortable jazz-rock clichés.

“Day At The Dog Races” is a case in point. Ritchie Hayward’s drums and Sam Clayton’s percussive backing give the piece a sense of movement; yet the frankly cheap shot guitar and keyboard feedback and space effects only serve to diminish the piece.

As guitarists, Lowell George and Paul Barrere contribute very little. “Old Folks Boogie” is punctuated by hackneyed slide guitar phrasings which sound no different than those produced by an average southern bar band. The acoustic, country-flavored “Missin’ You” falls far short of eloquence, sounding like a Jerry Jeff Walker reject.

Give credit, however, to the producer

and engineers, who have attained an intangibly rich sound. Perhaps it is no fluke that Little Feat’s most ardent fans seem to own the biggest component sets. There is a good deal of clarity, not to mention the technical proficiency evident in the precise, bell-clear tones; but all the mixing boards and sophisticated systems in the world cannot mask ordinary lyrics, and clinical, yet exacting, musicianship. R.S.

ROBIN TROWER: *In City Dreams*.
[Don Davis, producer; Don Gehman, Alex Sadkin, engineers; recorded at Criteria Studios, Miami.] Chrysalis CHR 1148.

Performance: **Slight change of direction**
Recording: **Flowing**



LITTLE FEAT: Exacting yet clinical

In comparing this to Trower's first LP, *Twice Removed From Yesterday*, we notice various changes in both the musical and recording directions. First of all, Trower was then a blues trio and drawing heavily from Jimi Hendrix. Now bassist/vocalist Jimmy Dewar only sings,



ROBIN TROWER: Ineffectual changes

and added bassist Rustee Alan has brought some funk rhythms with him. The first album, produced by fellow former Procol Harum member Mathew Fisher relied heavily upon reverb for guitar, echo for vocals and upper frequency panning on cymbals, as well as some tape reversals. The guitar, the main reason why we came, was allowed to get as dirty as possible. *In City Dreams*, produced by Davis, still features Dewar's bluesy voice with slight echo treatment, the use of panning for effect, but there's more evidence of guitar overdubs and experimentation with the mix than before. Also, the guitar doesn't come through as raw in comparison, with reverb still having a place on this effort.

The material is not as Hendrix-blues-sounding either. Working basically with 4/4 stuff, Davis tries to add to songs like "Sweet Wine of Love" by occasionally putting echoed claps and finger snaps in sync with the downbeat played on the snare. However, they are nearly lost due to their irregularity and placement in the mix. In similar situations Fisher added Hammond organ placed back in the mix with little volume to get a great haunting effect.

Davis' ineffective use of the tambourine on "Falling Star" adds nothing to

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percussive effectively used here and it adds nothing for this tune either. While the material is fine and the addition of Alan's funk inclinations on bass should interest new listeners, it's the little production things that went flat. Why the "live"-in-the-studio approach to "Farther Up The Road?" "Live" is fine, but to attempt to alter that by backing off the guitar through the use of a limiter/compressor distracts from the intent. I think that when dealing with a trio/with vocal situation, the gimmickry adds nothing, or at least nothing was gained by what Davis' imagination led him to attempt. That being the case, I prefer the results Mathew Fisher obtained. G.P.



ROY HARPER: Deserves recognition

ROY HARPER: *One Of Those Days In England.* [Roy Harper, John Leckie, Peter Jenner, producers; John Leckie, Mark Vigers, engineers; studio unlisted.] Chrysalis CHR 1138.

Performance: **Jolly good**
Recording: **Flawlessly clever**

A persistent occupant of the British best seller charts, Roy Harper is still

almost an anonymous figure in the United States. Perhaps because his lyrics deal in subjects so English that only a subject of the Queen can truly comprehend them, Americans have missed out on this fine craftsman for too long.

One Of Those Days ranks among Harper's best. His lyrics are probingly poetic, forsaking simple rhythm schemes for highly complex meter. Fortunately, the intricate harmonic and compositional sense present in Harper allows for a perfect fit of words and melody.

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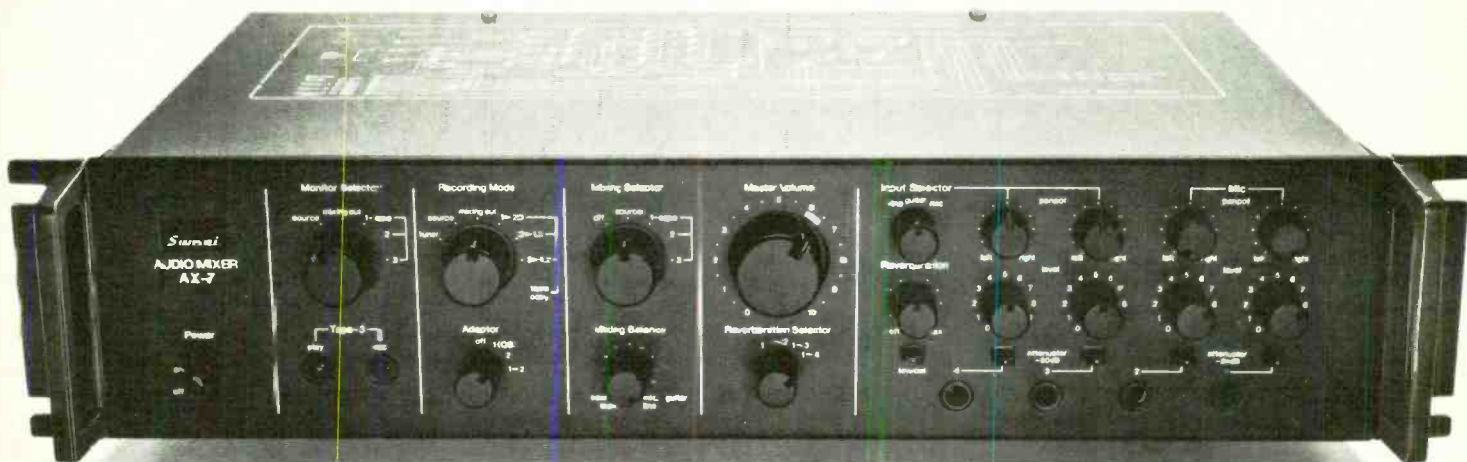
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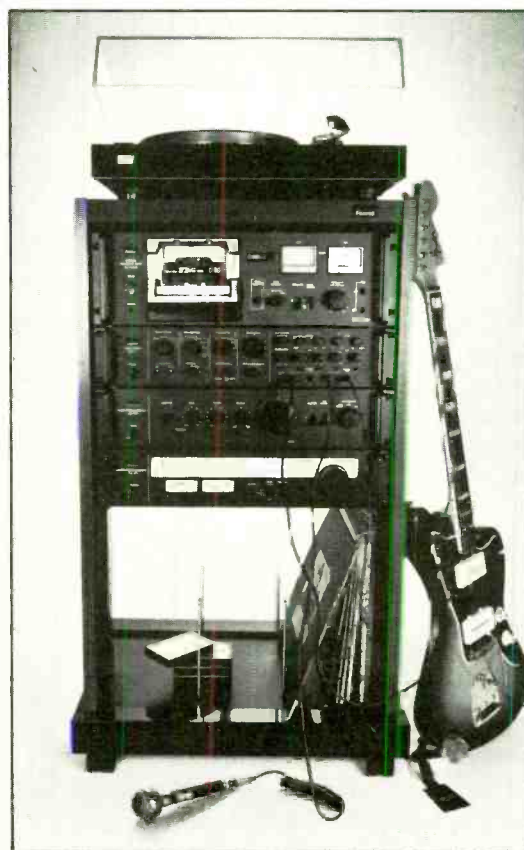
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CIRCLE 61 ON READER SERVICE CARD

the
thunderstorm
and the
spring breeze

By Nat Hentoff

What has drawn me to Cecil Taylor for more than a quarter of a century—I first heard him in Boston when he was a student there—is his hurricane-like emotional force. No pianist in jazz history has demanded more of himself, his colleagues, and his listeners. And that demand is primarily emotive, despite his corollary continuing explorations in forms, timbres, and rhythms.

As Taylor has said, "To feel is perhaps the most terrifying thing in this society." And I am convinced that much of the resistance to his work until fairly recently has been due to his almost ravenous emotional energies. They can indeed be frightening. But he is finally finding an ever larger audience which now should be ready for one of his most challenging recordings—*The Great Concert of Cecil Taylor* (Prestige). Performed in Paris in 1969, this is its first American release. And as Gary Giddins writes in his exemplary notes, it fills a significant gap in Taylor's recorded canon because these three LPs are "the truest representation of Cecil Taylor's music as experienced in concert." That is, Taylor requires extended space and time to fully plumb his feelings and his ideas, and this is his longest continuous recording.

With drummer Andrew Cyrille, alto saxophonist Jimmy Lyons, and soprano-tenor Sam Rivers, Taylor creates a stunning, sometimes lyrical, sometimes demonic series of whirlpools within whirlwinds that you ought to just plunge into. This is not music for celebration. As Taylor has said, "In part, my music is about magic, and capturing spirits."

I can't say that the recording engineer fully captured the looming immediacy of Cecil's sound-presence and his slicing

interplay with the other musicians. But so central is this album to an understanding of Taylor's immense musical importance that the audio deficiencies are not vital—no more, say, than those of the Louis Armstrong Hot Five recordings.

Keith Jarrett is more immediately accessible than Cecil Taylor, and while not nearly so overwhelmingly original, is capable—as in *Byablue* (ABC)—of rivetingly sustained performances that fuse reflective lyricism with blues-colored urgency. This new set is one of Jarrett's most deeply satisfying so far because of the strength of his associates—Charlie Haden and Paul Motian in the rhythm section and Dewey Redman on tenor and musette.

The themes, most of them by Paul Motian, are melodically inviting, intriguingly structured, and allow each player ample space for introspection within the collective whole. In a way, this music has elements of modern ballet—diverse solitudes converging in a common, if transient, discovery that there are answering voices out there. If the music lacks Cecil Taylor's thunderstorms of energy, it nonetheless has its own introspective force. Poignancy, too, has power.

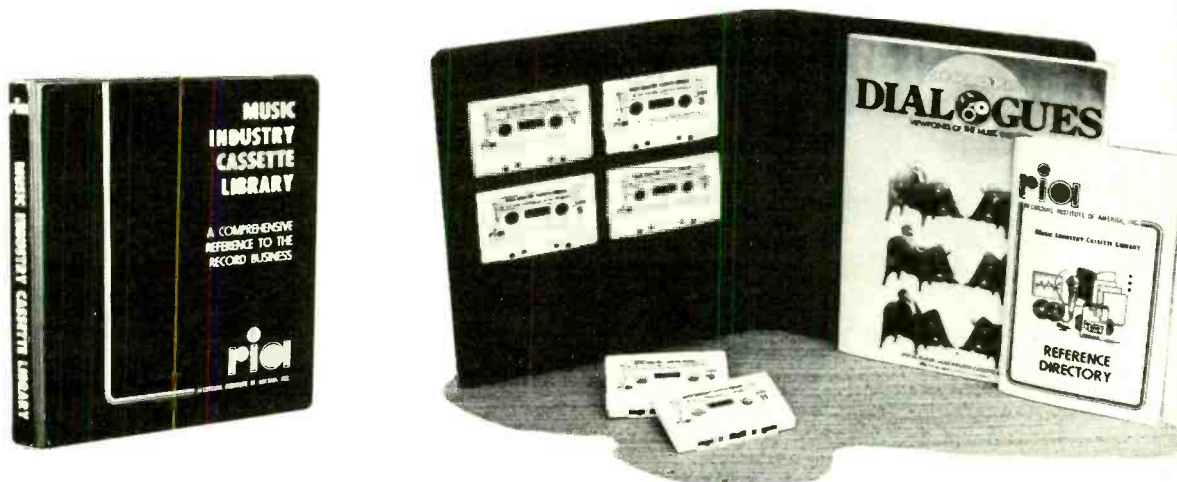
The recorded sound is excellent, having an incisiveness that this kind of romanticism requires lest it project too softly.

CECIL TAYLOR: *The Great Concert of Cecil Taylor*. [Producer not named; Claude Jauvert, engineer.] Prestige P-34003.

KEITH JARRETT: *Byablue*. [Esmond Edwards, producer; Tony May, engineer]. ABC/Impulse AS-9331.

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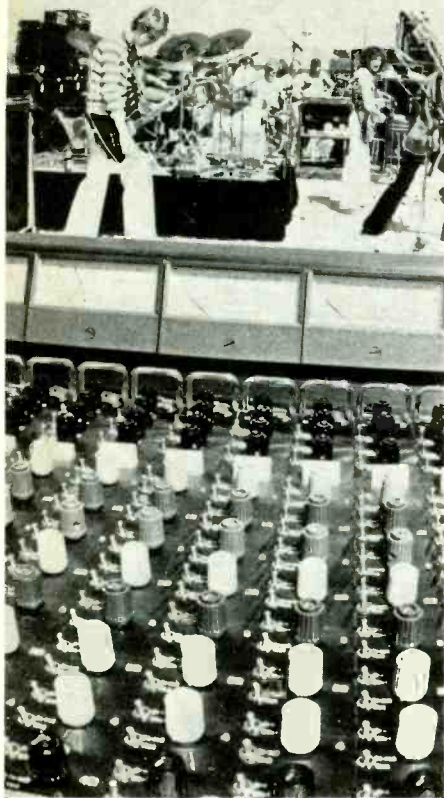
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A Harper album does not offer gargantuan feats of musical virtuosity, yet the playing is quite adequate. The morose, apathetic sarcasm of "One Of Those Days In England, Part 1" is underscored by a grudge-bearing John Halsey drum track; similarly, the sentimentality of "Cherishing the Lonesome" is orchestrated with a solitary acoustic guitar.

Parts two through ten of the title track take up all of side two, giving the particular piece epic identity. A cornucopia of personal, wry thoughts, this album benefits greatly from clever production, which integrates the musically onomatopoeic elements into the complex, flowing text.

R.S.

STOMU YAMASHTA: *Go Too*. [Dennis McKay, Stomu Yamashta, producers; no engineer credited; recorded at Camp Columby, New City, N.Y.] Arista AB 4138.

Performance: **High energy**
Recording: **More input needed**

While this is percussionist/composer Stomu Yamashta's second release under the group name Go, he has released several albums prior to these available only on import and primarily featuring oriental instruments and experimental music. Here, he follows a cue from Alan Parsons in selecting known and unknown musicians alike for a basic session album approach to a concept. The Yamashta variation includes using the same personnel from song to song, no conceptual web holding the whole thing together, and no involvement in the actual engineering. As a result, and from a strict technical/engineering standpoint, this album is good, but does not compare with the Parsons Project's two albums.

While still employing Michael Quartermain's lyrics, Yamashta has turned the arrangement aspect of the album over to Paul Buckmaster. With synthesizers, vocals and the Martin Ford Orchestra being the main impetus, the mix is primarily a basic one with everything centered, then adding and subtracting instruments depending upon the parts. While the music is more difficult for the average listener to grasp than Parsons', it is almost commercial compared to what Stomu was doing three or four albums back.

I find the lyrics and interpretation weaker on this outing than last, and maybe he bit off more than he could chew in terms of the size of the project and the number of people involved.



STOMU YAMASHTA: Hard to grasp

Featured vocalist Linda Lewis' unique voice is hard to take, either because the music is not geared to her high-pitched squeak, or because we're asked to listen to it for too long. While Buckmaster's contributions all seem to work, Quartermain/Yamashta's unfortunately do not.

G.P.

RY COODER: *Show Time*. [Ry Cooder, producer; Lee Herschberg, Ray Thompson, engineers; recorded at Great American Music Hall, San Francisco, Ca.] Warner Bros. BS 3059.

Performance: **Stunningly versatile**
Recording: **Highest quality**

This is just about a perfect album. The material is superior, the recording is of a fealty not frequently found on "live" issues; and the playing ranges from merely sufficient to absolutely consummate.

The central figure, Ry Cooder, is a walking amalgam of American music styles—country, blues, folk, rock, you

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name it and he's touched on it. In the space of one disc, he ranges over more of the musical spectrum than many performers do in their whole career.

In the early sixties, a soul band named Gary U.S. Bonds hit the top of the charts with "School Is Out." As the title indicates, the tune should be played in a party atmosphere. That's what Ry and crew do. Cooder, deftly playing an electric guitar, is backed up vocally by the tight harmonies of Eldridge King, Terry Evans and Bobby King. The stomping of drummer Isaac Garcia reinforces the festive atmosphere.

The aforementioned vocal trio contributes other worthy moments; the acappella intro of the classic r&b ballad "Dark End Of The Street" is another bright moment. These three gentlemen are a force to be reckoned with.

Despite the flowing guitar playing of Cooder (whose brilliant mandolin work is not represented here), the prime plaudits must go to Chicano accordionist Flaco Jimenez. Somewhat a legend in his own right, Jimenez authors two tuneful rides on "Viva Seguin" and "Volver, Volver."

The technical area is well taken care of. There is simply no fault to be found with the mix; editing is done with respect for the artists, and most important of all, the listener is left with an impression that the presentation was staged in his own living room. The cozy, folksy

JAZZ

EARL HINES: *Live At The New School.*

[Hank O'Neal, producer; Fred Miller, recording engineer; recorded at the New School for Social Research on March 27, 1973.] Chiaroscuro CR-157.

Performance: **Hines at his highest**
Recording: "Live" in concert

Hank O'Neal's Jazz Ramble concert series at the New School has always served a double function. It has brought the best jazz artists to an excellent auditorium in a scholarly atmosphere where one may expect an enlightened and appreciative audience. It also serves as a working laboratory for O'Neal's course on sound recording offered at the school. Thus far, recordings issued from these concerts include a program by the Ruby Braff/George Barnes Quartet, a program by Wild Bill Davison, Eddie Condon, Gene Krupa, Kenny Davern and Dick Wellstood and this, the first of two solo recitals by Earl "Fatha" Hines.

The best thing about a solo Hines recital is the way his left hand plays the role of the rhythm section. Interestingly enough, when Earl has a bassist and a drummer to make things easier for him



RY COODER: Musical amalgam

nature of the room obviously is responsible for some of this, but nonetheless, engineering and like personnel should take a well deserved bow.

R.S.
he relaxes his left hand rhythm section and things are far less swinging than they would have been if Earl had just done them solo. An example of the

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EARL HINES: Keeps it swinging

Hines drive is the opening selection on this LP, "I've Got The World On A String." Before playing this medium tempo tune at a sane medium tempo the way most players do, Earl Hines turns it into a tour de force that scampers madly over the keyboard—and that's only the beginning. Unfortunately, a lot of the tunes, like "Satin Doll" and Earl's arrangement of "Boogie Woogie On the St. Louis Blues," have been overdone but some such as "Talk Of The Town" and "Along The Santa Fe Trail" haven't.

The sound is very much what you would have heard in the auditorium that evening. It's a somewhat dry sound yet with a nice piano presence and just enough audience applause to get you into the spirit of things. J.K.

PAUL KNOPF: *Outcat Comes Back.* [William E. Dern, producer; no engineer listed; recorded at RCA and the Bob Kubbage Studio in New York City, Sept. and Nov. 1976.] Outcat OP 126.

Performance: **Out indeed, but not too far out**

Recording: **Good enough, but it could be better**

Although he calls himself the Outcat, Paul Knopf's music is not "out" music

in the jumbled sense that Miles Davis' music is "out" music. To be sure, these are not tunes you'll be walking down the street whistling (unless you're a very sophisticated whistler) yet there are some nice tunes on this album and they are, in several cases, tunes. I point this out to separate them from Paul Knopf's more ambitious concert pieces such as "Stontium 90." Yet even *that* track swings along nicely after an introduction of total outness. Particularly fetching are Knopf's experiments with the jazz waltzes "Collage" and "Waltz For Clare" and his allusion to the ragtime roots of jazz, "You Can't Always Lead A Horse To Water But You Sure Can Drive Him To Drink," as well as his "Blues On A Wet Thursday." Of course if you want to apply the classic definitions of ragtime and blues, none of these compositions would qualify. However, if you are willing to consider this as the way Paul Knopf, in 1977, looks at the music of the '20s and '30s and reacts to vintage stimuli in a modern medium, they work as well as anything Scott Joplin or W.C. Handy ever wrote.

The recording is a bit bothersome. All the notes come through clearly, but there is a lack of presence that makes me a bit uncomfortable. The piano sound is particularly distant, somewhat like it was in the next room. The bass and

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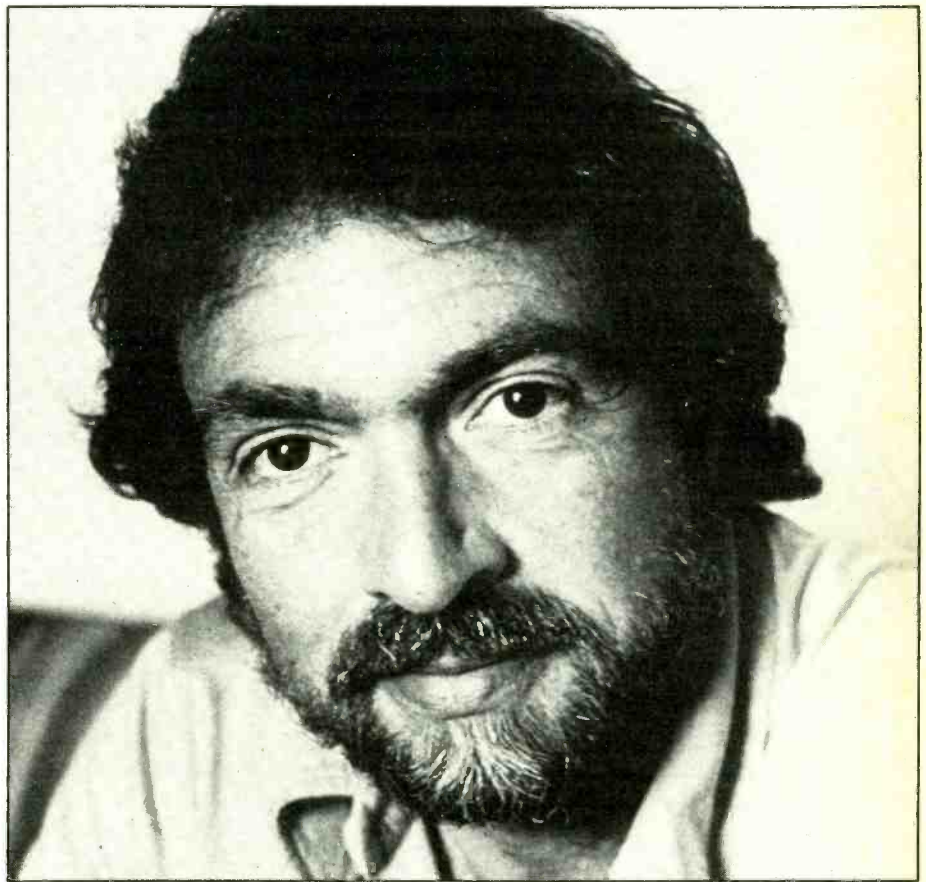
drums seem to fare better, but then it's not their record and if any player should be up front and present, it should be the pianist.

Paul Knopf is not a jazz interpreter in the same sense that Dave Brubeck or Teddy Wilson are jazz interpreters. Paul Knopf is a composer and this, in a way, is a demonstration of his music. Some day a Dave Brubeck or a Teddy Wilson may choose to improvise on one or another of Knopf's compositions. At that time, we will have something to compare with Knopf's original intentions—and that's all to the listener's good. J.K.

PAUL HORN: Inside The Great Pyramid. [Paul Horn, David Greene, producers; David Greene, engineer; recorded

ing for sure if the Egyptian government would allow him to record inside the pyramids when he planned the project, it's fortunate for us that he was granted two three-hour sessions. Working with an eight-second decay rate, Horn approached the recording as an improvisation, playing off the echo as though it were another musician. Recording in three different chambers, the sizes of which varied from the Queen's Chamber (127' long X 18' square X 20'5" high) to the King's (34' X 17' X 19') and comprised of polished red granite or limestone, Horn's suspended notes would often come back as chords; or the natural, ever-changing acoustics in the room would emphasize various notes at will.

The record begins with Horn tuning his flute to the room by striking the



PAUL HORN: Hearing is believing

"live" in the Great Pyramids of Gizeh, Egypt.] Mushroom Records MRS 5507.

Performance: **Spontaneous**
Recording: **Natural**

This double album (with a second record to be released later) was conceived as the natural follow-up to Horn's "live" recording in the Taj Mahal. Not know-

stone coffer, which emits an "A" at 438 vibrations per second. The overtones are amazing, and cliches like "must be heard to be believed" were originally coined for quality performances such as this. Add to that his chanting/singing and the spectrum of tones is fascinating. For those of you who will now give up the shower stall in favor of Grant's Tomb or a missile



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silo somewhere in North Dakota, let me inform you that this recording was made on a Stereo Nagra tape deck with a Studor Stereo Microphone and Ampex 407 tape. Good hunting. G.P.

BOBBY HACKETT: At The Roosevelt Grill. [Hank O'Neal, producer and recording engineer; recorded April-May 1970 at the Roosevelt Grill, New York City.] Chiaroscuro 161.

Performance: "The guys played well" or better

Recording: "The sound came out OK" or better

There are so many stars on this record that it gets a bit hard to sort them out. First there's the late Bobby Hackett, one of the few players who could be spoken of the way we speak of Louis Armstrong and Bix Beiderbecke without fear of seeming ridiculous in the comparison. There's Vic Dickenson, one of the best trombonists around then—and now. There's pianist Dave McKenna, one of Hackett's favorite players and with good reason. There's Jack Lessberg, a fine bassist from the Eddie Condon days and a man who keeps dropping in and out of the New York jazz scene when least expected. There's drummer Cliff Leeman, a swing band veteran of the orchestras of Charlie Barnet, Woody Herman, Artie Shaw, etc. There's Hank O'Neal who produces and makes records and writes fascinating liner notes. In his liner notes for this album, after giving us a lot of technical data about the recording equipment used on this remote job, he states "It was primitive but the guys played well and the sound came out OK." That's the understatement of the year. From such well-known and oft repeated classics as "Tin Roof Blues" and "Fidgety Feet" to such seldomly recorded material as Hoagy Carmichael's "New Orleans" and Jelly Roll Morton's "Wolverine Blues" the music is only superlative. And that delightful little quote that comes out of Vic and Hackett in the last chorus of "Sweet Georgia Brown" is from Duke Ellington's "Cottontail," just in case the source slipped your memory.

So it's just one more piece of recorded evidence to the fact that Bobby Hackett and Vic Dickenson could really play when they wanted to—and thank goodness they wanted to on the nights Hank O'Neal was there with his tape machine.

J.K.

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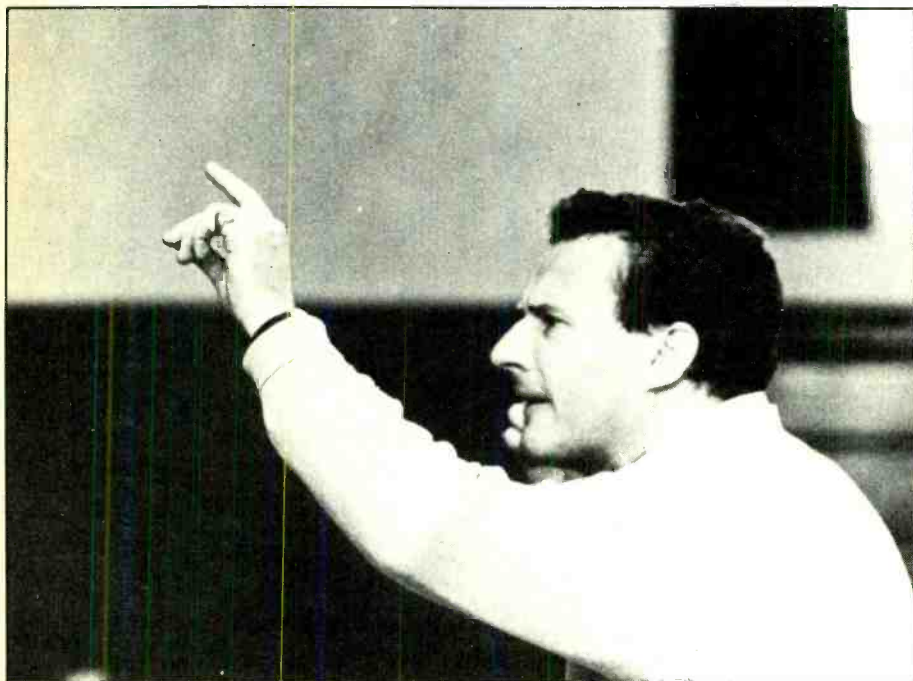
CIRCLE 36 ON READER SERVICE CARD

CLASSICAL

HAYDN: *Symphony Nos. 88 and 99.* Concertgebouw Orchestra, Amsterdam, Colin Davis cond. [Vittorio Negri, producer; recorded in the Concertgebouw in Amsterdam, Holland.] Philips 9500.138.

Performances: **Sparkling**
Recording: **Crisp and detailed**

Colin Davis' many Mozart recordings have received well-deserved praise, but



COLIN DAVIS: Sparkling performance

oddly this is his first disc of Haydn symphonies on Philips. Not surprisingly, Davis' virile, forthright style of music-making produces sparkling performances, notable for wit and structure and the extraordinarily precise Concertgebouw playing. Repeats are taken, trios in the minuets are in tempo, and the heavy ritards that so frequently disfigure Bernstein's Haydn are avoided.

The only questionable point is a rather fast *largo* tempo for the 88th: although sensitively phrased, the pizzicato accompaniment early on lends an inappropriate sense of jog-trotting to the music. The superb recorded sound is very close and detailed, yet with ample depth and warm reverberation; cutting level is high, but with no resulting distortion; surfaces are excellent. Let's have more Haydn from these artists, Philips! S.C.

BAX: *Symphony No. 7.* London Philharmonic Orchestra, Raymond Leppard cond. [Robert C. Ludwig, mastering.] HNH 4010.

MOERAN: *Symphony in G minor.* New Philharmonia Orchestra, Sir Adrian Boult cond. [Robert C. Ludwig, mastering.] HNH 4014.

Performances: **Dedicated**
Recordings: **Transparent sound, excellently mastered**

MAHLER: *Symphony No. 5*; PETERSSON: *Eight "Barefoot Songs."* Erik Saeden, soloist; Stockholm Philharmonic Orchestra, Antal Dorati cond. [James

Mallinson, producer; Hakan Sjogren, engineer; Robert C. Ludwig, mastering.] HNH 4003/4 (two discs).

Performances: **Mahler, a bit stolid; Pettersson, ravishing**
Recordings: **Concert-hall depth**

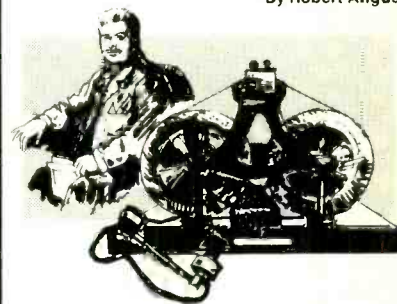
Once in a while, someone decides to do it right. In this case, the vernacular applies to Harvey N. Hunt, a record importer who for some years has been bringing many high-quality Scandinavian and English labels to these shores. Last year, Mr. Hunt started his own domestic label, citing inflated costs and sporadic product availability as reasons for his decision.

The results are a model of how records should be manufactured. Disc surfaces are among the best in the world, and the

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mastering has maintained the quality of (and in some cases improved upon) the original issues. The packaging is quiet, with excellent design and choice of artwork, and the records come in polyethylene-lined sleeves.

Of the records listed above, the first two are previously imported 1975 releases from the English Lyrita catalogue and the third has been available since the early '70s on a Swedish label. The sound on this latter two-disc set has extraordinary depth; although occasional details may not come through as clearly as one some more obviously multi-miked recordings, the realistic, concert-hall perspective provides ample reward.

The Mahler Fifth performance will not be to everyone's taste, as Dorati keeps a tight rein on emotional matters. Only his stolid view of the second movement fails to register, and the third movement *scherzo* is especially well-done. The fourth side of the set offers a welcome bonus in Dorati's orchestrations of eight "Barefoot Songs" by Swedish composer Allan Pettersson. Strongly reminiscent of Mahler, the songs belong to a series of twenty-four composed in 1943-45 when Pettersson was in his early 30's. Performances seem fine.

The Bax and Moeran symphonies are rewarding examples of the secondary echelon of twentieth century British composers. The music is frequently derivative (Delius, Vaughan Williams, Walton and Sibelius in the Bax; Walton and Holst in the Moeran), but retains a distinctive personality—Bax in his atmospheric tone-painting and Moeran in his use of folk music. Anyone who has enjoyed these composers' works in more concise forms should hear these discs.

The most interesting point about these records for readers of *MR*, however, involves the mastering. The Lyrita versions were produced in England by Decca—no slouch when it comes to sound. But when the master tape was delivered to Robert C. Ludwig for HNH mastering, he discovered that Decca had compressed the dynamic range. A/B comparison clearly reveals more impact and brassy presence at climaxes on the new HNH discs.

There is no underestimating such insistence on quality. HNH waited until it had control over all aspects of production—and only then introduced one of the classiest lines of records in the world. Further releases will be anticipated with extreme interest.

S.C.

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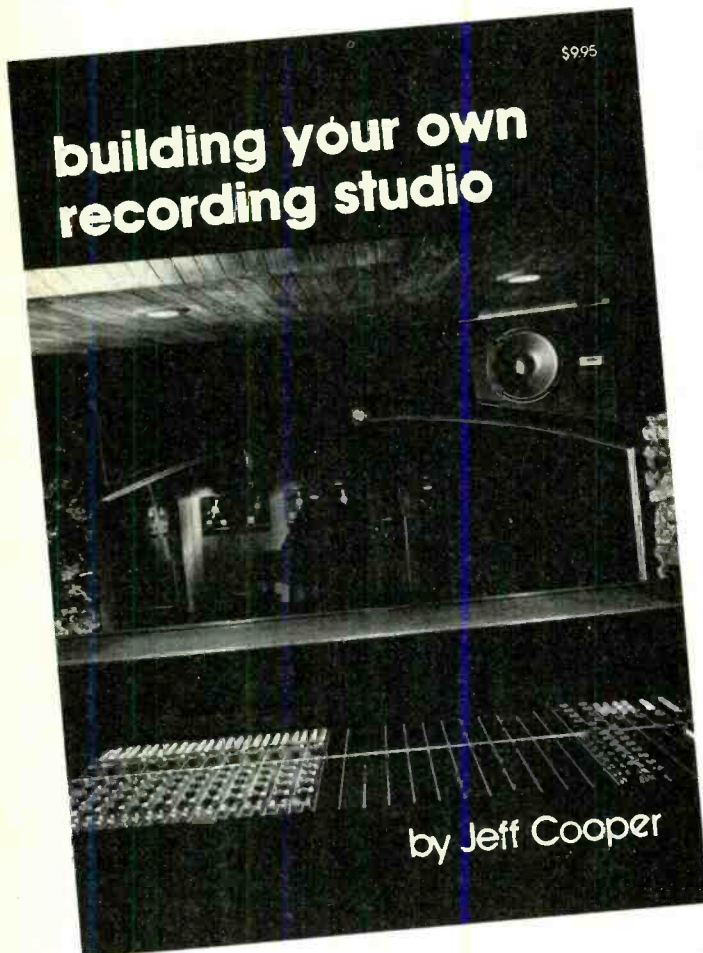
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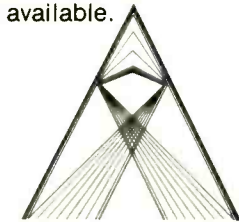
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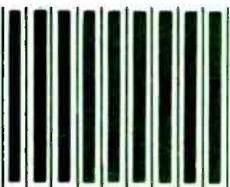
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