

**Multi-Track
Magic, Part III**

MODERN RECORDING & MUSIC

ICD 08560
\$1.95

VOL. 6 NO. 11
AUGUST 1981

Mick Fleetwood On Location

Studio Notebook #2

LAB REPORTS:

Audio Control
'Richter Scale'

Hall ATS-401

Audio Test Set

UREI Model 6500

Power Amplifier

HANDS-ON REPORT:

Loft Model 402

Electronic Crossover

NOTES:

More On Tube-type

M.I. Amps

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For the name of your closest Studiomixer dealer, or for descriptive literature and specifications on our products, please write to Craig Bullington, National Sales Manager, Amerimex Co., Inc., PO Box 55, Atwood, California, 92601.

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Series

Subject:
Multiple Function
vs. Single Function
Delay Systems

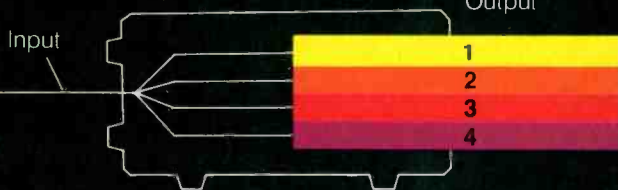
RE-501



You'll find a lot of digital delays in the same price range as the RE-501. But because a system is digital does not necessarily mean it's better.

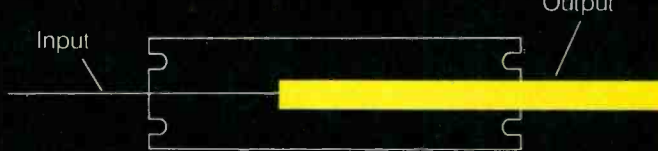
Most digital systems have a serious drawback. While they can produce different types of delay functions, they can do only one effect at a time. The multi-function RE-501 produces up to four different delay effects—simultaneously. Compare:

Roland RE-501



Single or
Multiple Effect
Output

Digital Delays



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Effect
Output

1/Echo

The RE-501's compander-type noise reduction circuit provides a signal-to-noise ratio that rivals the digitals, while retaining the warm sound of the Roland tape echo.

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4/Sound On Sound

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MODERN RECORDING & MUSIC

AUGUST 1981

VOL. 6 NO. 11

THE FEATURES

MULTI-TRACK MAGIC: CREATIVE MULTI-TRACK RECORDING, PART III

By Craig Anderton

36

Strategy for the 4-track recordist! All those clever layering techniques you learned in Parts I and II will require new attitudes and procedures in production. Craig leads the way and sums it all up in this final installment.

MICK FLEETWOOD ON LOCATION

By Jeff Tamarkin

40

Deepest, darkest Africa is not the place you would expect to find one of rock's super-drummers auditioning native musicians. Nor are the 120° temperatures in Ghana ideally suited to modern recording equipment. But despite physical and political barriers that would discourage others, "Mr. Mick" realized a dream and brought *The Visitor* back to our jungles!

STUDIO NOTEBOOK, #2

By James F. Rupert

52

Picking up where he left off in the June '81 issue, Rupe explains the role of capitalism in the small studio biz or, are you in this for love or money?

COMING NEXT ISSUE!

A Session With Teddy Pendergrass

Profile: Producer Ron Malo

Construction Project: Mic Cable Tester

Cover Photo: Courtesy of RCA Records
Mick Fleetwood Photos: Courtesy of RCA Records

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THE STAPLES

LETTERS TO THE EDITOR

5

TALKBACK

The technical Q & A scene.

14

THE PRODUCT SCENE

By Norman Eisenberg

The notable and the new, with a comment on the new wave of loudspeaker hype.

28

MUSICAL NEWSICALS

By Fred Ridder

New products for the musician.

32

NOTES

By Brian Roth

More on tube-type M.I. amps, plus a word of warning on a potentially hazardous ground switch.

56

AMBIENT SOUND

By Len Feldman

Equalization has become respectable: An examination of the latest tools and methods for acoustic testing.

60

LAB REPORTS

By Norman Eisenberg

and Len Feldman

Audio Control "The Richter Scale"
Hall ATS-401 Acoustic Test Set
UREI Model 6500 Power Amplifier

64

HANDS-ON REPORT

By Jim Ford and John Murphy

Loft Model 402 Electronic Crossover

74

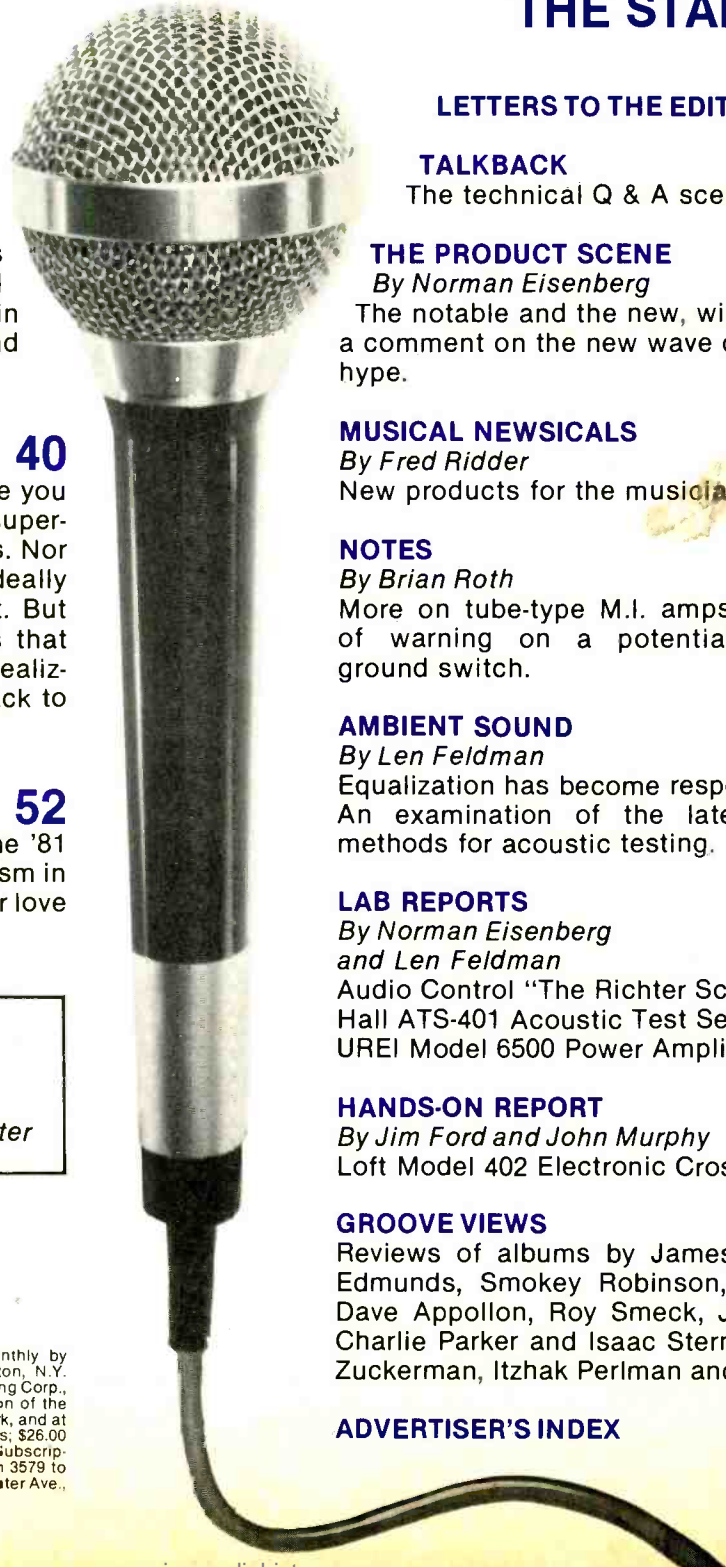
GROOVE VIEWS

Reviews of albums by James Taylor, Dave Edmunds, Smokey Robinson, Max Morath, Dave Appollon, Roy Smeck, Johnny Griffin, Charlie Parker and Isaac Stern with Pinchas Zuckerman, Itzhak Perlman and Zubin Mehta.

78

ADVERTISER'S INDEX

86



Touch the sound.

Carmine Appice
Rod Stewart

Wringing wet, you're pummeling your kit like a human cyclotron. You're into this intense, high-energy, extended rolling thing with multiple crescendos. And maybe 20,000 applauding, screaming people are into how you're putting out the pulse. Right then, the heavy crash accents are so thick you can reach out and touch each shockwave.

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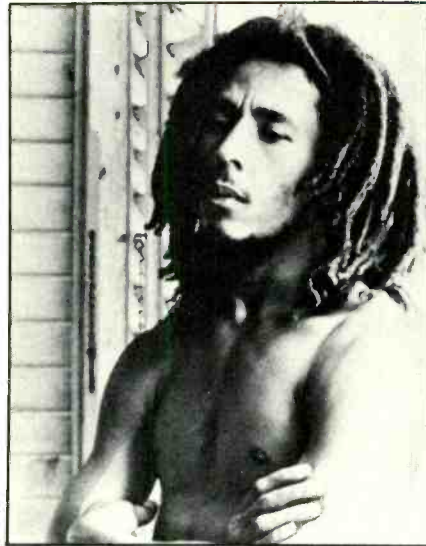
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LETTERS TO THE EDITOR

BOB MARLEY
February 6, 1945-
May 11, 1981



Word from the Castle

The following is a letter we received from Ben Cahill of Castle Instruments regarding Craig Anderton's review of Castle's Phaser III.

Many thanks to Craig Anderton and *Modern Recording & Music* for writing and publishing a very thoughtful and indeed flattering article on our product, the Phaser III. Craig seems to have well garnered our intent of very high quality at a very attractive cost-effective price.

In keeping with this attitude, we have made extensive design changes over the past few months which eliminate the very few performance reservations Craig expressed. Specifically, the gain structure of the noise reduction circuitry has been completely revamped to eliminate the high-frequency response problem for high level signals. The changes have also brought the noise level way below the already "dead quiet" level which Craig reported, making it quite transparent even for low level instruments such as a Rhodes piano.

These improvements have encouraged us also to retain the effect by pass

path through the electronics. The FET switching system requires this, and the constant low impedance output offers the user the advantages of a "line driver" function or, with the newly available Balanced Output Option, offers him the economy of a built-in "direct box."

Craig is quite correct in analyzing the Phaser III as "not a particularly creative unit." We shy away from the "gimmick box" approach because we believe the creativity should come from the musician, not the box. Instead, we try to afford the musician with a maximum of control versatility over the basic functions. We believe this is ultimately much more satisfying and time/taste flexible for the musician than would be a whole slew of "gimmick boxes."

Craig's comments on some extra control features, such as envelope follower and sample/hold modulation, as well as programmability, are well taken. We are considering future products which would incorporate some or all of these features, either as an add-on for use with the Phaser III's Control Voltage Input (or any other

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voltage controlled device), or as an integrated phase shifting package. Perhaps the readers of *Modern Recording & Music* would have some comments on these ideas, or some new ideas of their own. Either way, or if they would merely like further information on the Phaser III line of Pedal and Rack Mount Phase Shifters, I sincerely invite them to write or call me. User input always has been, and will continue to be, a mainstay of the success of Castle Instruments. Thank you again.

—Benjamin M. Cahill III
Owner, Castle Instruments
Madison, NJ

Support

I have not yet seen commentary concerning the "Hot Springs" reverb kit which Craig Anderton brought to us on your pages, and would like to offer my observations.

Since I have a capability of panned reverb send on my board, I built two identical units, so that I can have the reverb on the same side, opposite side, or mono send. The unit is excellent; far better than any spring reverb I have ever had the opportunity to work with, and that includes some high-priced units. It really sounds a bit more like natural reverb than a plate, which I consider desirable. You can feed it very hot without distortion with a certain amount of caution.

Unlike a plate or live chamber, you can't feed the unit very much that has tall transients, such as drum, mallet percussion or the like. You can make it twang if you are that cruel. Also, if your lounge refrigerator is on the same line with your studio, when the 'fridge comes on or goes off, it can put a little twang on it. The power supply must be remote from the spring unit or well shielded or you will get hum. It is best if the spring unit can be isolated from the blast of control room monitors and shouting mixers. The two sides of my unit are so identical that a mono send yields a seemingly mono return, whereas a mono send to a plate yields a pseudo-stereo return.

There is a bonus with this unit, for there is a built-in delay before

reverb begins, which further enhances the spacious feeling it offers. It is not very long, but nevertheless is there. Another bonus for me: this is the first kit I ever put together which worked the first time!

Several readers have asked about a good, economical reverb chamber; this is it, unless you want to get into building your own plate unit.

—Burton E. Hardin
Charleston, IL

What Course of Action?

I'm presently working as a camera/audio salesperson for a major department store, but have no desire to remain there ad infinitum. Several years ago, I took a series of R.I.A.A. courses through a local studio. My curiosity and interest were aroused by this view into the sacred domain of the recording studio and I decided, as soon as my cash flow allowed, to further my education by enrolling in the R.I.A.A.'s advanced level courses at this studio.

Well, before you could say "pan pot" (wasn't he a Cambodian official?), the courses were dropped. I didn't pursue the "WHY" of the matter at that time. Now I discover that our wonderful state legislature (God bless 'em!) has passed a law requiring organizations like the R.I.A.A. to be licensed as trade schools before they can operate!

Consequently, no studio in Tucson (reasoning that they would lack "authority") wishes to offer any independent courses, and can't offer accredited courses. The irony is that the studio I studied in before now belongs to the state of Arizona. (Because the University of Arizona bought out the previous owner, ostensibly to use the studio as production facilities for their broadcasting station, KUAT. In reality the place is being used by the music school profs to mix jingles.)

The University of Arizona declines to offer classes at the studio, though they could make a bundle if they did. The other studios don't want people hanging around (who can blame them?), so

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AT8501

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audio-technica.

it's an all-around bad show for interested parties like myself.

My question, therefore, is this: other than reading your fine publication, how should I go about acquiring knowledge of studio techniques (esp. mits on)? Please, practicality counts, though any advice would be treated as a god-send.

Yours and all,

—Scott Barker
Tucson, AZ

We recommend going to a university library near you, perhaps even the

University of Arizona library if you're not too disenchanted, or a public library for that matter, and looking through catalogues of various universities and colleges to see who offers what courses. Sometimes books on recording techniques or engineering will include listings of schools offering accredited programs. Speaking to people already in the field might help, in that they may have knowledge of the merits of one program over another. We are reluctant to print lists of schools ourselves in that we are bound to neglect some, and we are not actually

in a position to make judgements of merit. This column really is not a forum for that sort of "sale" of schools. So we recommend scanning the catalogues. Go to it!

The Young FX

In your October 1980 issue, page 30, there was a reference to FX Labs, Inc. in your Musical Newsicals column. Could you supply a mailing address for them? Thanks.

—Cliff Christian
Matrix Audio Productions
Middletown, RI

In the Letters to the Editor column of our May 1981 issue we printed a letter from James West, who had the same question you do. We'll print that address again: FX Labs, Inc., P.O. Box 406, Fort Montgomery, N.Y. 10922. Their phone number is: (914) 466-5454. They have been in existence for about two and a half years.

No One's in the Kitchen with Dyna

I would like to know if *Modern Recording and Music* has ever done a review of Van Alstine's or Audio Dimension's Dyna ST-70 and Dyna PAS modifications. If so, please let me know how I can obtain a copy of the review.

—Mark S. Rauber
Bethel, Alaska

I'm afraid the answer is no, we have no reviews of the pieces you mention. Sorry. Look for reviews of those pieces in future issues, though.

Left Out Outputs

In the July 1981 Talkback column there appeared a letter entitled "Bass-ically Direct Advice," to which Alphonso Johnson wrote a response. In the fifth paragraph of his response, second sentence, we left out the word "outputs." The sentence should have read, "Both units have an hi-impedance input and two outputs." That was the only word that was left out.

The Phantom Question Strikes Again

I am presently trying to wire a phantom power supply into my Teac Tascam 5A 8 channel mixer. It has been brought to

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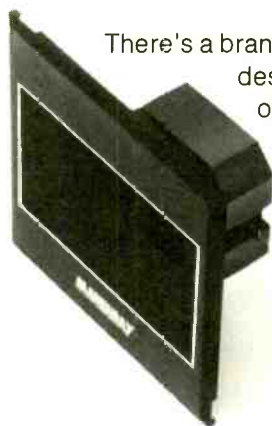
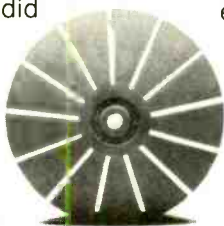
Announcing the new Altec Lansing 9813 high-accuracy recording monitor.



Loudspeaker accuracy. It's a highly controversial subject. And for good reason. The most prized result of a recording session is an accurate sonic illustration of what is going on in the heads of the producer, musicians, arrangers, and composers. Recording is a process of fusion, and the monitor is responsible for an accurate painting of the completed sonic picture.

Enter our new 9813. We developed it to play its highly critical part in the fusion process with great accuracy. We did it by putting nearly half a century of audio alchemy into it.

The 9813 has an all new high-frequency compression driver that uses our famous Tangerine® radial phase plug.



There's a brand new network design the patent office is already looking at, and the smooth, accurate highs are controlled by an asymmetrical Manta-ray® horn.

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The new 9813 does everything

a great monitor should: It sounds super (accuracy need not be unpleasant), handles power extremely well, mids and highs adjust through very wide amplitude ranges, and its great-looking hand-rubbed oak cabinet is small enough for even mobile recording vans (25½ H x 15½ W x 13½ D).

Next time you're visiting your favorite pro audio dealer, ask to hear the new 9813. What you'll hear will be the honest truth.



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my attention that in one of your issues, about one year ago, you had an article covering the above project. Could you please tell me what issue that was?

—Robert Sweigard
Grand Prairie, Canada

The article you may be referring to is a Talkback question which appeared in the October 1980 issue of MR&M. It was entitled "Phantom Powering a Fantasy No More." In fact two methods are included, one written by Dan Dugan, and one written by Carl Sandler. In the latter's letter is includ-

ed a schematic for the power supply, which might be of some assistance to you. These letters were sent in response to a request by Ed Perrone in his letter to Talkback which appeared in the June 1980 issue of MR&M.

You also might look at the article entitled, "Building a Power Supply" by Peter Weiss, which appeared in the October 1978 issue of MR&M. You'll have to check individual mic specs, as most phantom mics need 48 V. But check the mic specs, and find out, because some are designed to power op amp-based devices, such as pre-amp and line amps.

Enclosure

We received the following letter in response to the Talkback piece, "Speaker Design Dilemma," contributed by John Meyer which appeared in the October 1980 issue (see pages 22-23). For more on Meyer Sound Labs, we suggest you pick up a copy of the February 1981 issue of MR&M which featured the Grateful Dead "Live" at Radio City Music Hall on the cover. Meyer's technology was instrumental in creating the phenomenal sound reinforcement system that the Dead now utilizes.
—Ed.

John Meyer is essentially correct in stating that "placing two speakers in a box has the same effect as placing one speaker in a box with ½ the volume," almost. There are some higher order effects that would cause subtle differences to manifest themselves. Diffraction, coupling, and resonances, etc., would alter the net output of the same driver in the different boxes beyond simply the effects attributable to the small volume.

John is in error however, in stating that the smaller volume of the box raises the resonance of the speaker—in actual fact, the resonance of the SYSTEM is raised because of the mechanical interaction of the system components (box and driver) and their attendant parameters. This may seem like nit-picking, but most people I've spoken to seem either confused or misinformed about loudspeaker system tuning and Thiele-Small parameter use.

A vented loudspeaker enclosure should be thought of as a bottle—that's what a Helmholtz Resonator is. A bottle that has a larger volume will make a lower note and a bottle with a smaller volume will make a higher note—when you blow into the neck. Further, two bottles of the same internal volume can give two different notes when the dimensions of the bottlenecks are different, the longer neck will produce a lower note, and the shorter neck, a higher note. Likewise, two bottles with equal volume and necks of the same length can have two different notes if the necks are a different diameter (area). The neck with the smaller area will produce a lower note, and the neck with the larger area, a higher note. These are the three criteria governing the relationships between box size and vent size. In other words, the box tuning frequency

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0.04% RMS

(NAB weighted), 0.07% RMS (NAB unweighted).

Frequency Response* Record/Reproduce
0 dB referenced to 1 kHz: 40Hz-22kHz \pm 3dB
at OVU, 35Hz-25kHz at -10 VU.

Signal to Noise Ratio* at a reference of 1 kHz,
at 10 dB above OVU, 585
nWb/m: 61dB A weighted
(NAB), 56dB unweighted.

The 22-4 is a hard-working, no-frills machine. Which makes it perfect for the System 20, Tascam's hard-working, no-frills manual mixer.

See them both at your Tascam dealer. For the one nearest you, plus more information, just write to us at the address below.

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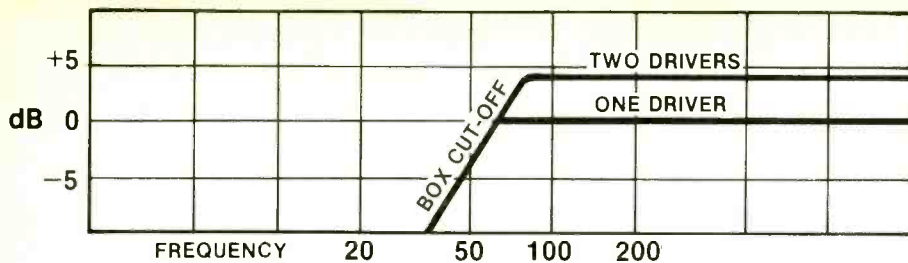


Figure 1

(f_b) depends on the RATIO of box volume (V_B) to vent dimensions (the vent dimensions define the MASS of air in the vent). The vent or port air mass is called M_{ap} , after the acoustic mass of the port.

Placing two drivers in the same box actually REDUCES bass output while increasing midband output—making comparatively much *less* bass! To get more bass, double the box size for every doubling of n drivers.

John is also in error in stating that the effect is one of rolling off the low frequencies sooner (at a higher frequency). Though it may seem like this is what happens, it is only a psychoacoustic comparison phenomenon. The laws of

physics don't change and the box will resonate at whatever frequency it is tuned to.

One thing to keep in mind is that when two drivers are placed in the box, the power handling capability doubles,

so if we were to apply double the power to the system, the net bass output would come back up to what it was before (with one driver) because the bass output is somewhat a function of the box, while the midband output would increase by 6 dB! Three for the extra driver, and three for the extra power.

John is also correct in stating that Neville Thiele's work defines loudspeaker operation in vented boxes, but I strongly suggest that readers interested in design of loudspeaker systems avoid this level of material unless they have a strong background in calculus and physics. A better place to start off might be David B. Weems' book on the subject published by Tab Books (Tab

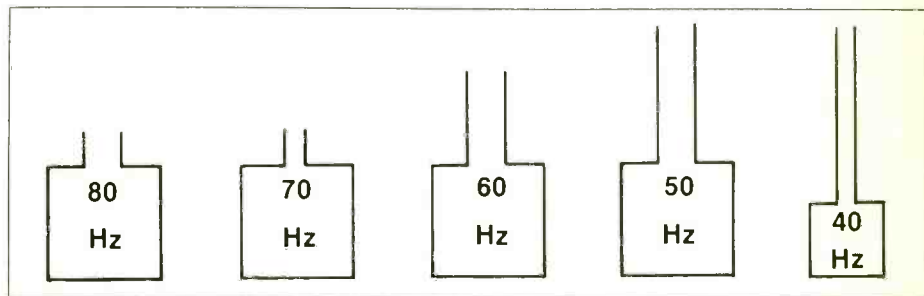


Figure 2

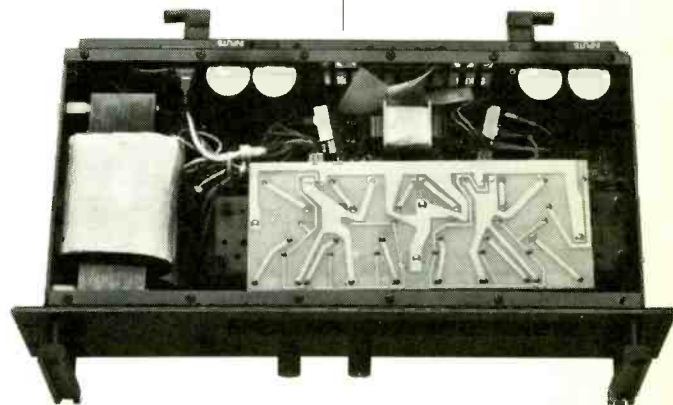
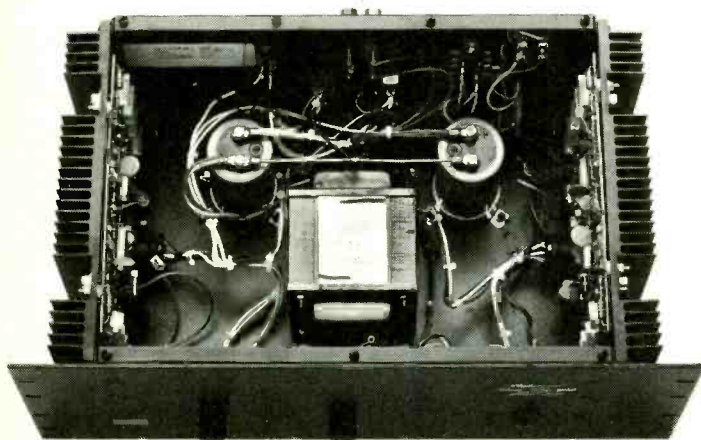
THE WEAK LINKS.

A power amp is only as strong as its mechanical integrity.

Here, the power transformer is bolted directly to the chassis. Every time the chassis takes a knock, so does the transformer.

Also, there are no detachable cords, no flexibility. Check for handles, too.

DITTO.



PHASE LINEAR TAKES THE

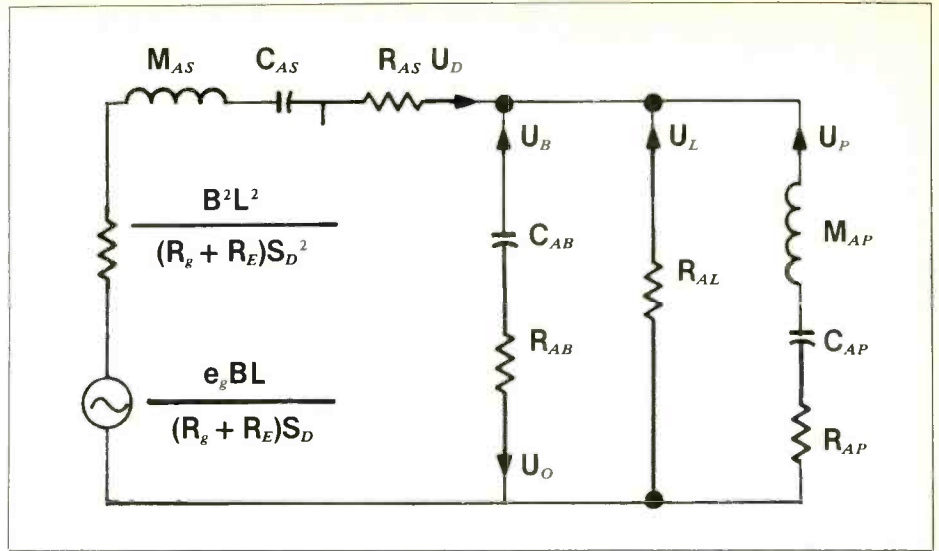
You can see the advantages of the new Phase Linear A60 and A30 pro amps. Now listen to them. For the name of your nearest

#1064) entitled *How to Design, Build and Test Loudspeaker Systems or High Performance Loudspeakers* by Martin Colloms, a Halsted Press book published by Wiley. Tab books are available at electronic parts stores and the Colloms book should be available at a technical bookstore or college.

I have included a couple of illustrations to aid clarity.

Five Helmholtz Resonators are seen in the accompanying diagram with decreasing tuning f_B . NOTE: the smallest box can be tuned lower using a long narrow port, but the acoustic output is a function of how much air will be moving so a driver placed in a small box and tuned low will make the port "whistle," indicating losses are reducing the potential efficiency of the driver. Placing the same driver in a bigger box (with a bigger port) will reduce losses, and increase acoustic output up to the point where the driver becomes underdamped—where the box is too big, and the air inside will no longer control the motion of the driver's cone near the resonance frequency.

The diagram suggests that the seemingly simple act of putting a speaker in-



Electrical analog circuit of generalized direct-radiator loudspeaker system.

to a box is really opening a can of worms if one attempts to properly design the system using Thiele-Small parameter methods rather than ear-balling or the tried and true seat-of-the-pants method, a method that is sure to make noise but...

I hope all this semi-scientific mumbo-jumbo hasn't served to confuse you

more than enlighten you. Hopefully, if we are all enlightened then manufacturers will have to be on their toes to improve their products and not just add bells and whistles.

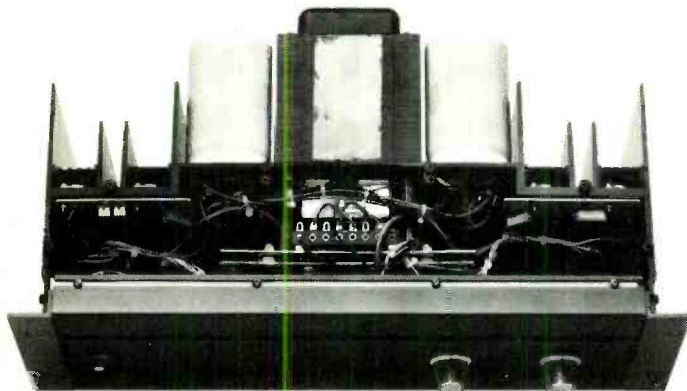
—Drew Daniels
Applications Engineer
TEAC Corporation of America
Montebello, CA

DITTO.

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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 & Music reader's technical forum.

A Permanent Detachment

Soon I will be engaged in building a snake for the band I mix. In your September 1980 issue, Steve Griffiths of Tasco, in response to reader Rick Odea's request, gave a very good description of how to build a snake (see "Do-It-Yourself Sound," page 18). However, for convenience and ease in packing up, I would like to use multipin connectors so the stage box can be disconnected from the cable instead of being permanently attached as Mr. Griffiths suggested.

My question is this: Do I need a connector with a pin for every conductor including the ground (shield drain wire) or can one pin be used for the ground? If you can use one pin, can the ground for the balanced sends use the same pin? Also, could you recommend a good connector for a 19- or 27-pair cable for such a purpose?

—Steven W. Summers
Athens, Tenn.

Building a stage-box using multipin connectors is a good idea in that the finished product is stronger and quicker to hook up. However, with regard to the question about grounding, it is definitely better from both physical and electrical aspects to use

separate shields for each line (as provided with Belden multicore cable). Some problems minimized by using this method are crosstalk between line and mic level lines, RF pickup, ground loops and interaction between balanced and unbalanced lines.

At Tasco, our favorite multipin connector is the ITT Cannon 90-pin DPD series (the DPD-90-33S-2B female line connector and the DPD-90-34P-2B male chassis connector and the matching shell housing). Most of the information required to attach the cable to the connectors has been printed in the September 1980 issue of *MR&M*. However, there are some additional steps to be taken as follows: *Do not forget to put the shell housing on the cable!* Also slide a two-foot length of heavy vinyl tubing on before starting. Strip the main sleeve back six inches and then cut two inches from each cable pair except numbers 4 (black paired with blue), 11 (red paired with yellow) and 27 (brown paired with orange). These pairs have to stretch from end to end of the connector and the additional length acts as a strain relief. Now prepare the ends as described in the previous article. An additional piece of $\frac{1}{8}$ " heat-shrink $\frac{1}{2}$ " long is required to insulate each individual solder joint. Having completed the assembly, slide the vinyl tubing to the edge of the main sleeve, slide the shell housing over the tubing to the end and screw to the connector. Tighten the clamp screws, brush some common, garden-variety nail polish over the screws and the job is finished and ready to be checked.

And, as always, if you have any difficulties or further questions about what we've set down here, please do not hesitate to call me at Tasco (804-499-1966).

—Steve Griffiths
Chief Technician
Tasco Sound Ltd.
Newbury Park, Ca.

Information and Inspiration

I recently purchased a Teac A3440 4-track recorder, a 2A mixer and meter bridge. Along with this equipment I received a manual from Teac that has proved inadequate in explaining the hook-up and mixing procedures for this equipment. Is there any material available that explains, in layman's terms, the basic operation of this 4-track setup?

Also, I would like some recommendations on possible accessories such as echo, reverbs, filters, filter units, etc. for use with the Teac units. I'm a musician trying to do my own demo tapes and feel that my final product could be of less effort and better quality with some simple guidelines for home recording. Teac has proved unable to be of any greater assistance with this problem. Any information you might provide me with would be gratefully appreciated.

—Greg Kessel
Marion, Ill.

It seems to be a truism that what you get out of something rarely exceeds what you put into it. This is especially true with art, and as with any new art you endeavor to learn, there is a learning curve you will follow to the point of either satisfaction or adequacy. Some people go beyond that and become creative and are sought out as trend setters. Others merely struggle along grudgingly doing only what is necessary to get by.

Just because the equipment you bought has RCA jacks on it like your stereo, don't assume that the process of learning to make good sounding commercial quality recordings will be as easy as hooking up your hi-fi.

We at Teac feel that the literature for the Model 2A mixer and MB-20 meter bridge give very clear and solid *guidelines* for their use and hookup. We also offer a booklet on multitrack and recording techniques for those on a

budget, by Dick Rosmini, a veteran of over 200 commercially successful record albums, and a home recordist to boot. It's called the *Multitrack Primer*, and is available by writing or calling Teac directly (213-726-0303).

Don't be impatient with yourself on this new art you are getting into. True, it serves to complicate life, but the result of the complication can be a lot of valuable studio time saved and the money it would have cost, and also the time to rehearse, record, polish, and really perfect your musical art without the pressure of the clock ticking away those dollars in a commercial studio, and without the feeling of strangers listening over your shoulder while you compose your very personal music. I, too, only wanted to play music once, so I understand the special kind of resentment musicians feel toward all those wires and knobs, but having needed to know how to get my sound to my audience has brought me so far along musically, that all the time taken by learning all that technical and engineering discipline has proved very worthwhile, indeed.

—Drew Daniels
Applications Engineer
TEAC/Tascam Professional
Products Group
Montebello, Ca.

A Finer Finish

I have a Teac 3440, a Tascam Model 5B board, two dbx Model 128's, an Akai ¼-track GX-630 with built-in Dolby B, a Furman RV-1 reverb, Beyer, Sennheiser and Shure microphones. I'm monitoring with a Luxman LRS 5M21 and a pair of Altec-Lansing Model 14's. My cassette deck is a Pioneer CTF-7272. I also have the Luxman LRS 5C50 stereo preamp, a Denon DP-1800 turntable and an old Fisher 395 receiver that I use as another headphone amp or, of course, to listen to jingles on AM/FM.

As of this point in time all my work is on tape, nothing having been pressed onto disc so far. The bands I record want cassette demos or 8-track cartridges to play at home or on the road from gig to gig.

I have been mixing down on the 7½ ips Akai and then dubbing off that onto cassettes. The sound quality is okay, but I know that it could be improved. From the information I have provided, can you tell me which would improve

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the sound of my finished product to a greater degree, a 1/2-track master recorder or a better cassette deck?

—Steve Ahrendt
Take One Studios
South Sioux City, Neb.

First and foremost, I suggest that you have both your cassette and reel-to-reel machines aligned and biased. Try working with the same brand of tape for all your work so that you won't have to adjust bias for each project. After that, let your ear be the judge as to whether both machines are reproducing a clean playback. If either has any noticeable noise problems, replace that particular unit. I would suggest that you invest in a good quality 2-track master recorder. It will allow the greatest flexibility for growth and assure a good quality master tape. Your clients will appreciate a master which can be used for acetate masters or multiple tape copies.

—Tom Boylan
Producer
Prairie Sun Recording
Cotati, Ca.

Wired for Sound

I am doing all the wiring in my recording studio myself. Instead of using multi-cable, I plan on using Belden cable #8451. I want to run approximately thirty feet of this cable from

an Auditrionics 110A (18 in x 4 out) console to the equipment rack. As you probably know, this console has nylon connectors on the back and on the patch bay.

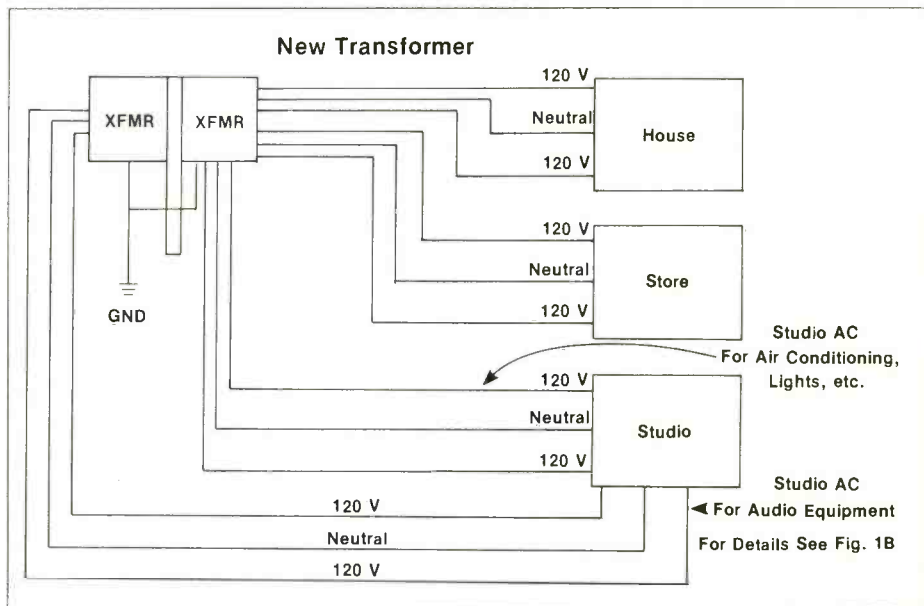


Figure 1A

THE STATE-OF-THE-NEED



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Shipping Address _____

City _____ State _____ Zip _____

Please send additional information.
 CIRCLE 142 ON READER SERVICE CARD

I need to know how I dress-up the ends of the cable at the connectors and how to harness 30 ft. of cable.

I also am a bit confused as to the grounding of equipment in the rack. My idea of grounding is to disconnect the ground wire on the A.C., find a screw on the chassis, hook up a wire

and ground it. Am I right with this procedure?

Also, I'd like to know if I can put the power supply unit for my board in the equipment rack with the limiters, EQ's, etc.?

—Louis Tousana, Jr.
 Chicago, Ill.

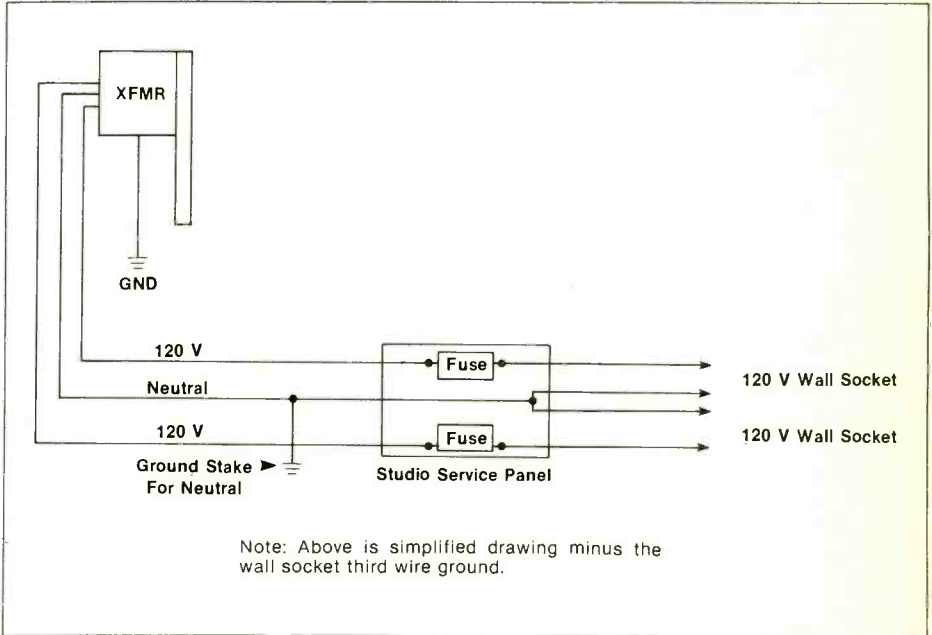


Figure 1B

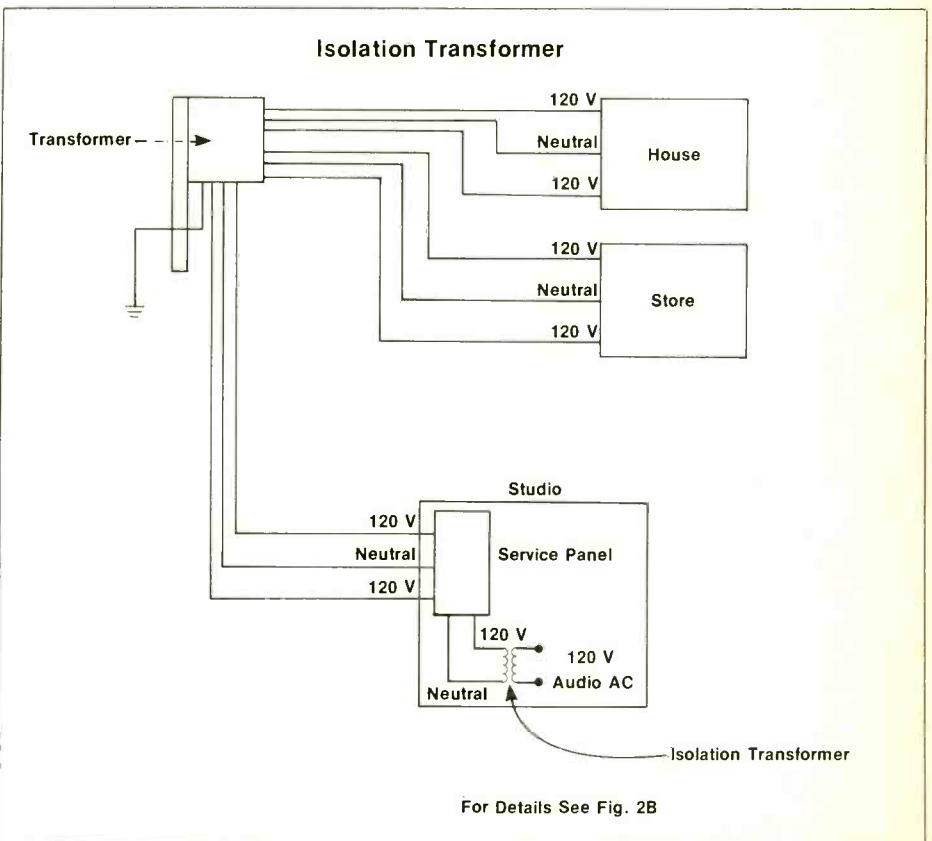
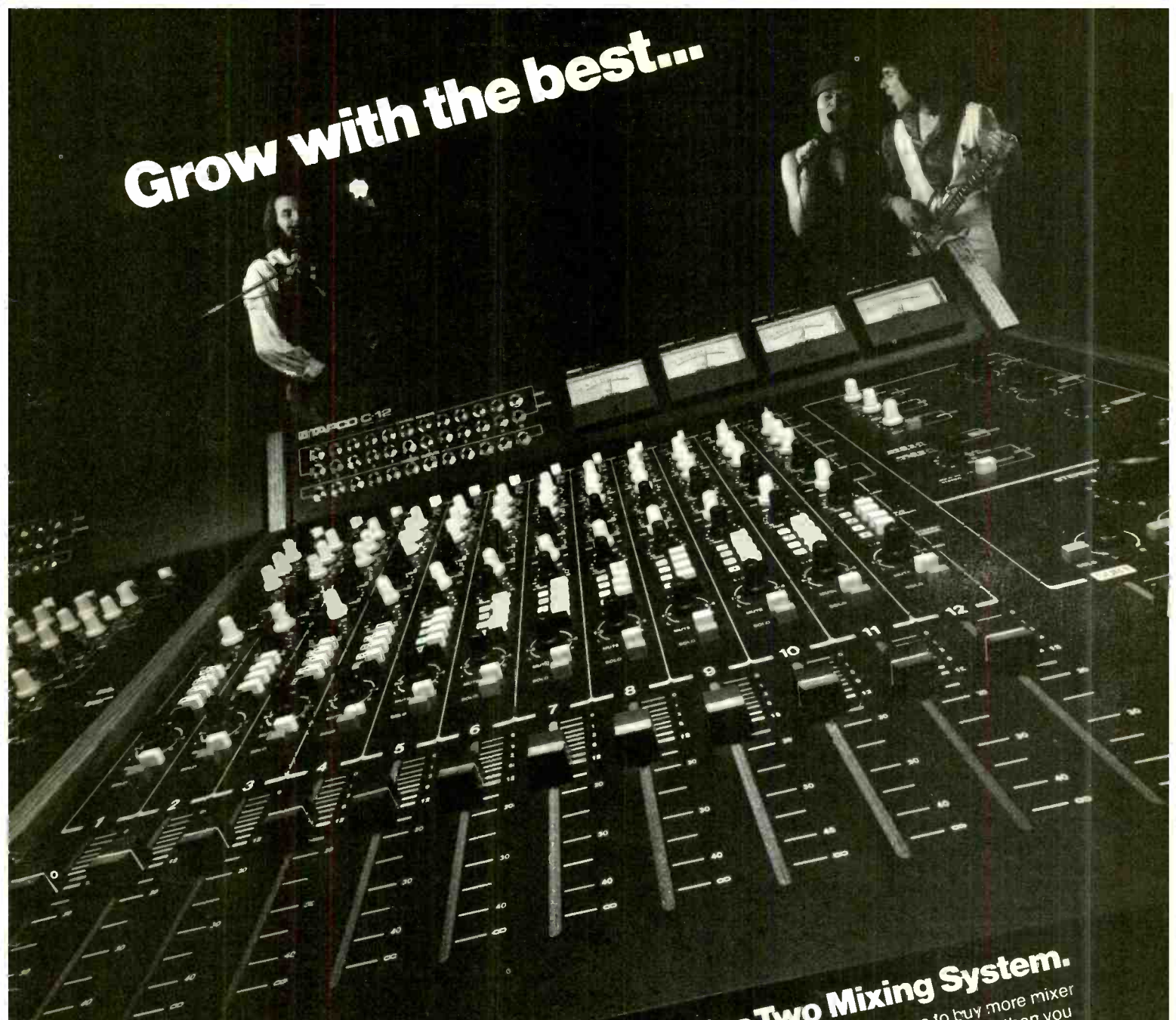


Figure 2A

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or as separate monitor sends, and still use the main outputs to feed your sound reinforcement system. It also has versatile features such as sweepable midrange EQ, a convenient patch bay, and transformer-balanced inputs. Plus, the C-12 has 48 VDC regulated power available, giving you the capability of using any phantom powered condenser mike currently on the market.

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You no longer have to buy more mixer than you need or less mixer than you require. The C-12/ Series Two mixing system will take you as far as you want to go. Grow with the best. Auditor: the C-12/ Series Two at your EV/TAPCO dealer.



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2-10 Yotsuya, Sh. juku-ku
Tokyo, Japan 163

Your console and patch bay are terminated in molex type connectors. Most modern consoles have adopted this system as the most cost efficient. An investment you should seriously consider is that of a high quality (\$100 or so) molex crimping tool as this would certainly enhance your memories of the installation as well as the maintenance and growth of your studio. Bundling and harnessing these wires is somewhat of an acquired art but the general idea is to use lots of tie-wraps and provide extra strain relief inventively close to the patchbay and console terminations on the bundles. Another excellent idea is to number every wire with stick-on labels and keep a master diagram of the interface. Anticipate future needs and run a few extra numbered wires. Belden #8451 is acceptable for all these lines. Try to place your power supplies at least three feet removed from any audio equipment.

Louis, your confusion about grounding is not unusual. Grounding is one of

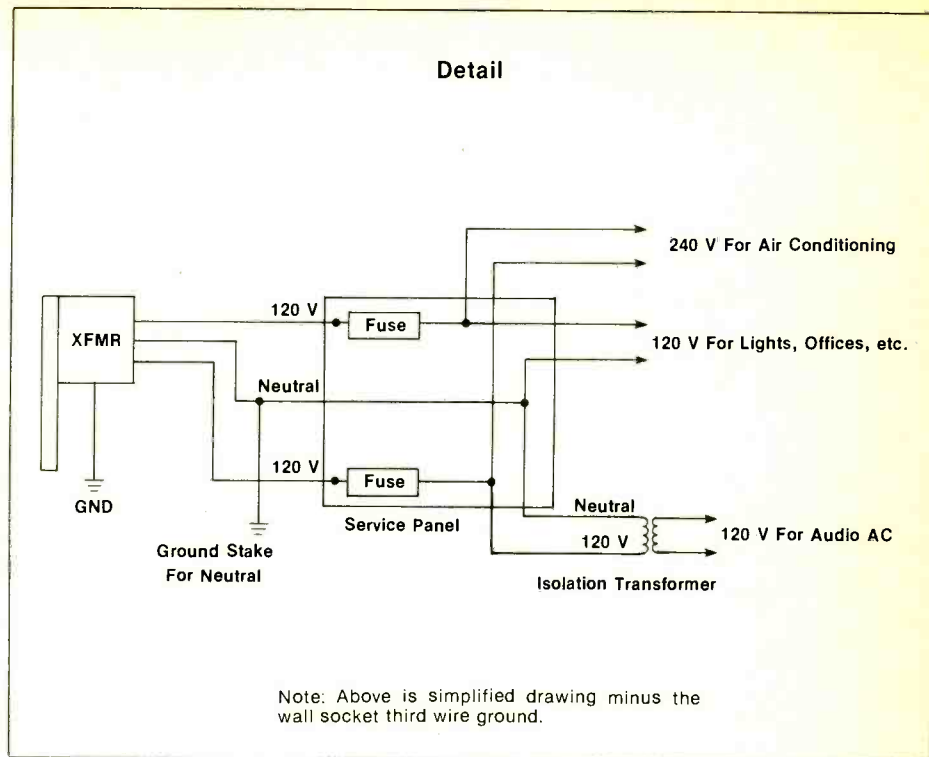


Figure 2B

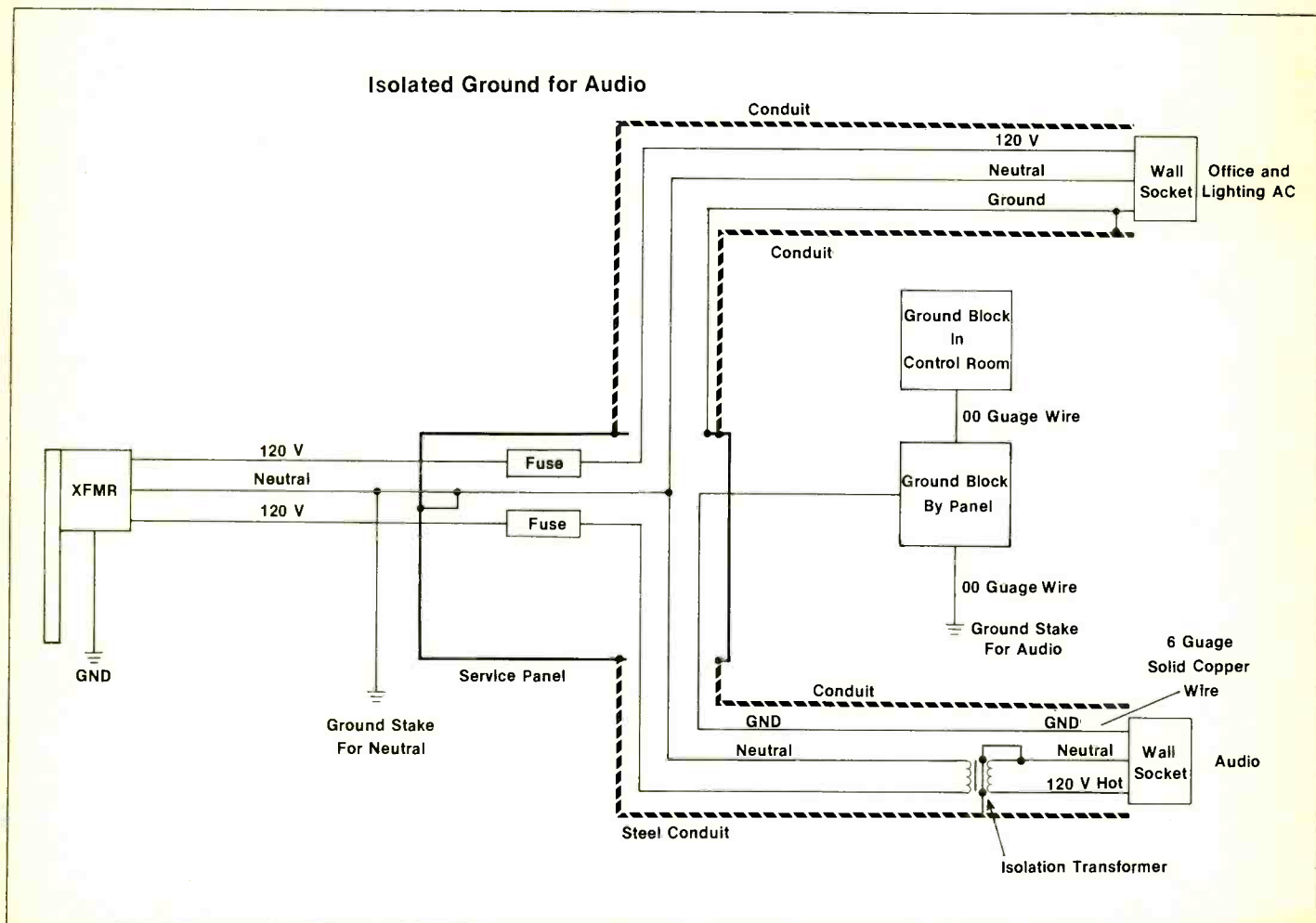
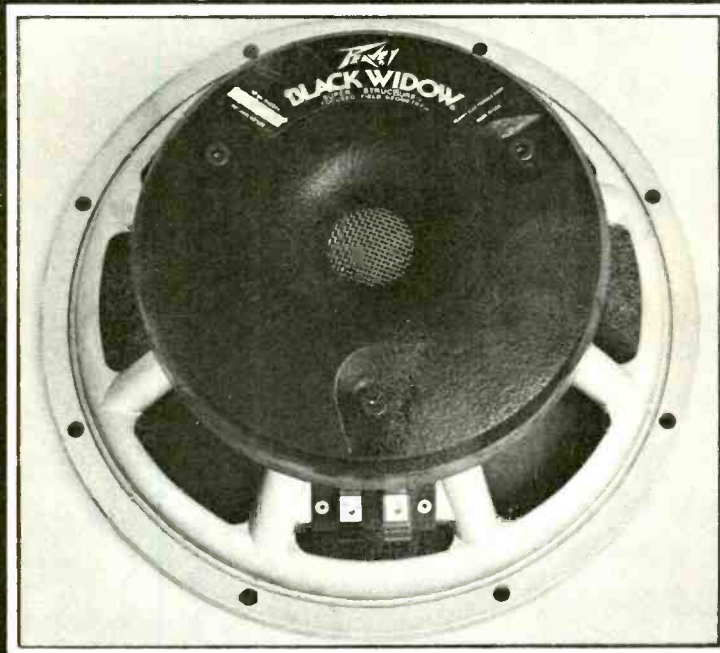
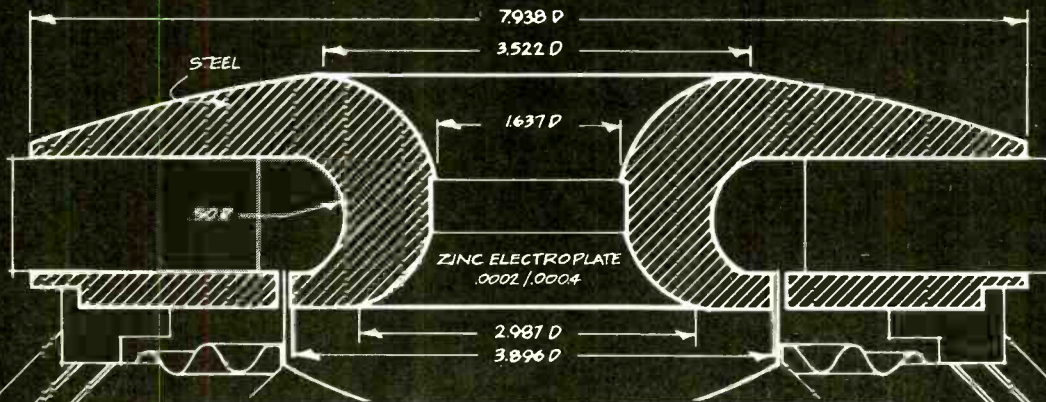


Figure 3

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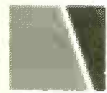
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High-Frequency Noise	A15LP Low Pass Filter—reduces objectionable high-frequency noises.
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Matching/Bridging/Isolating	A15BT Bridging Transformer—matches balanced or unbalanced devices of different impedances.
Trouble-shooting	A15TG Tone Generator—700 Hz signal helps check levels, connections, mixer inputs, and cables.
Microphone Impedance Matching	A95 and A97 Series Line Transformers—make it possible to connect low-impedance lines to mid- and high-impedance inputs (or vice-versa.)



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 microphones, sound systems and
 related circuitry.

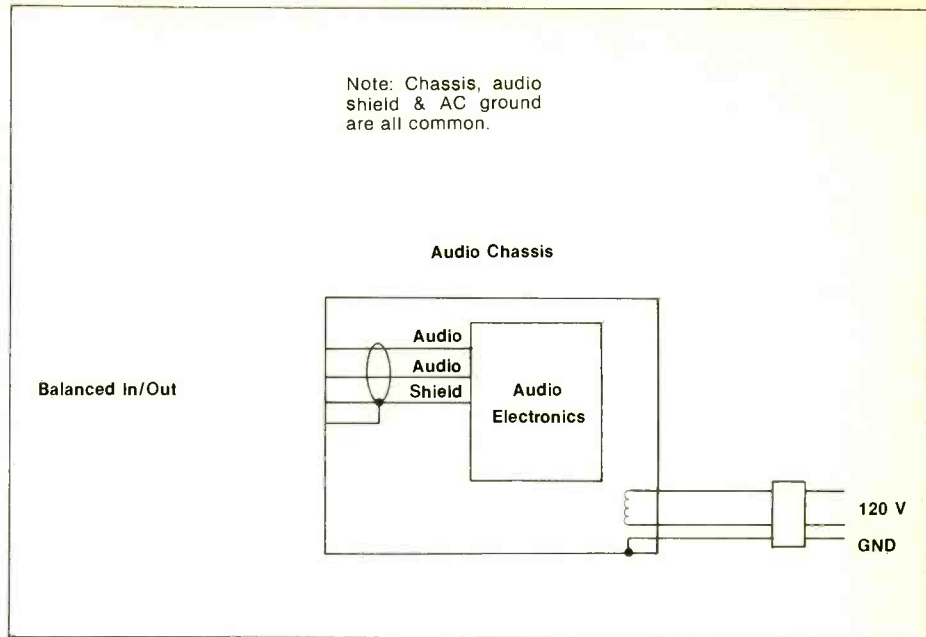


Figure 4

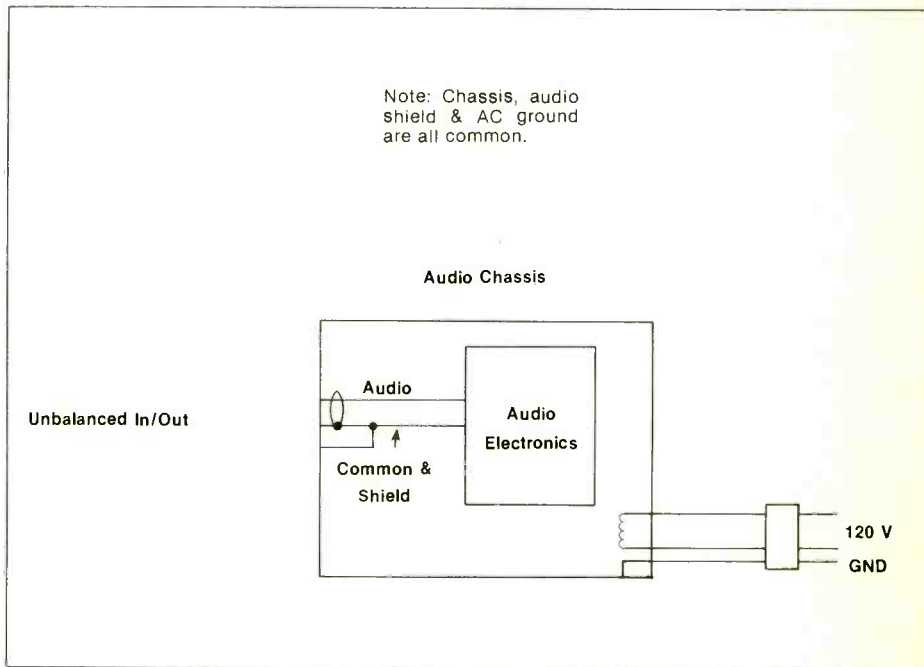


Figure 5

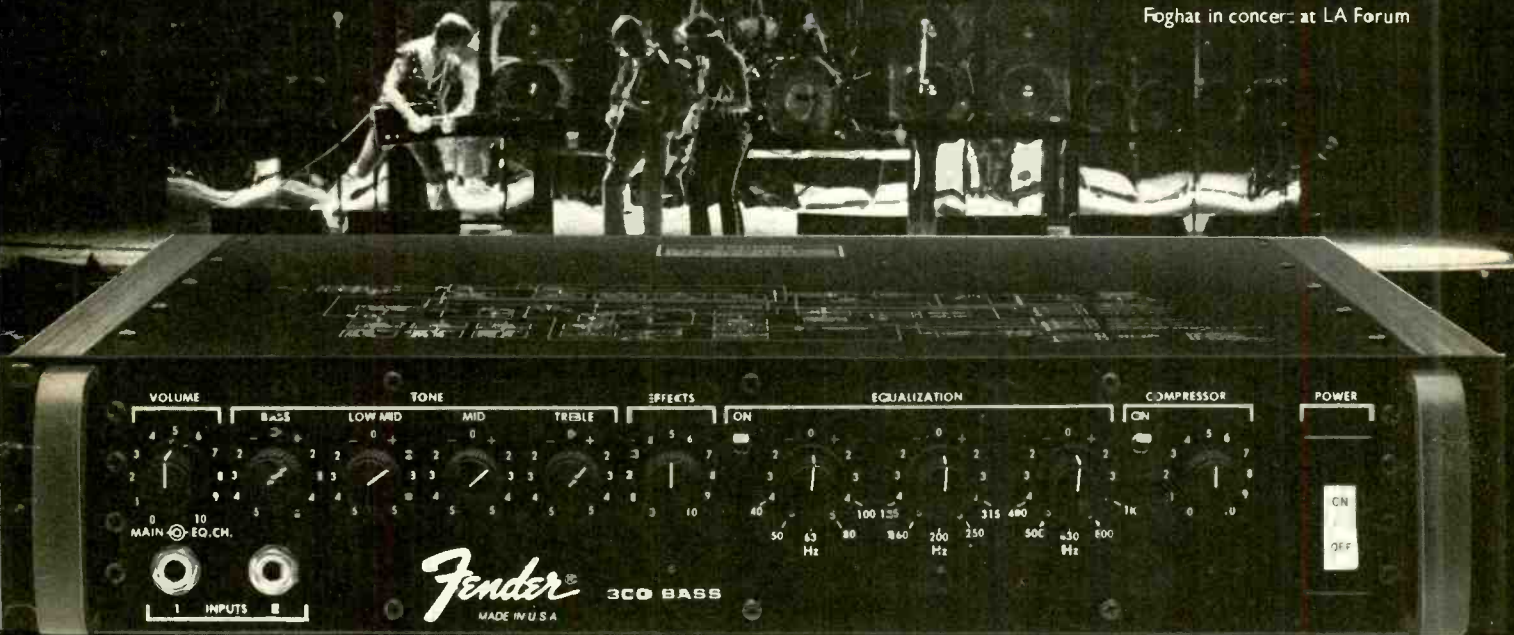
the most commonly heard yet misunderstood words in the audio field. People have been led to believe that anything related to grounding is black magic. I feel that most of the grounding information available is too complex for studio owners to understand. From our own experiences in recording studio construction, we have found that most studios work well and safely if several simple key grounding rules are followed. (Studios following these simple guidelines that still have a ground problem should bring in an

outside technical consultant.)

Proper grounding starts with having a proper AC system (120 V wall system, not air conditioning). So go outside your building and take a look at where your AC wires come from. They probably come from a telephone pole with a transformer. You should first check how many other businesses or homes are on the same transformer. You just need to look where the wires from the transformer are going. If there is a commercial business that uses machinery or an excessive

Fender's new 300 Bass Slimline Amplifier.

Foghat in concert at LA Forum



The state-of-the-art bass amp

Today's bass player is making more complex demands on his music than ever before. He's virtually playing lead lines instead of simply one and five tonic notes. But there's never been an amplifier to totally match his music—until now. The Fender® 300 Slimline, an entirely fresh concept in bass amplification. The bass amp for the 80's!

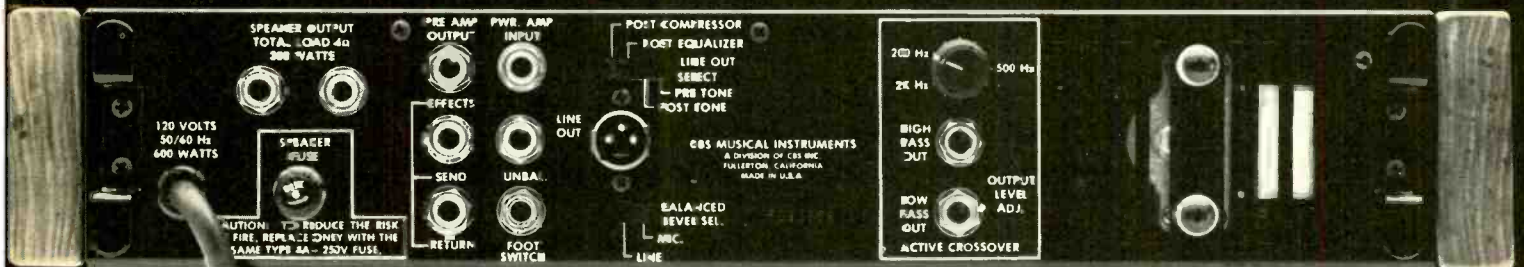
Incredible new tonal flexibility and control. The Fender 300 Slimline offers 300 watts of incredibly versatile solid-state power in a lightweight, 19" rack-mountable package.

Four bands of conventional equalization and three

Effects input/output jacks gain control provide for effects looping with high or low impedance accessories. The 300 Bass is bi-amp ready with a built-in electronic crossover. Adjustable Hi Pass/Lo Pass bi-amp output level controls offer easy auxiliary amplifier matching.

Take it everywhere. Every time. Fender designed all these tremendous advantages into one very small package. The 300 Bass Slimline weighs only 33 pounds. Yet its protected circuitry, special cooling capabilities and rugged construction make it as reliable as it is innovative.

Check the specs, check the sound at your authorized Fender dealer and major band stands. Because no matter how far your playing's taken you,



separate parametric controls let the player create any sound he wants to hear on stage. And, with a selectable line level output, the sound man can have a flat signal he can mix for the house sound. That's versatility you need today!

The built-in internal limiter/compressor with variable threshold control and on/off switch allows high-volume playing without distortion.

you haven't gone all the way 'till you've matched the state of your art with the state-of-the-art Fender 300 Bass Slimline Amplifier.

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for the state-of-the-art
bass player.

Fender®
MADE IN U.S.A.

number of homes on your transformer, you should talk the power company into installing a separate transformer for your studio audio AC feeds. Electrical machinery or several air conditioners

running at the same time could cause severe voltage variations and noise on the AC lines. Before you can evaluate any grounding scheme, you must start with a *clean* AC system. If the power

company will not install a new transformer, the next best solution if you do not have severe voltage variations but have excessive electrical noise, is to use isolation transformers between your service box and the wall outlets used for audio equipment.

Now that you have a clean AC service, let's talk about the grounds. A single point ground system is the most common. Start by installing a good ground stake outside your building. Attach a ground strap to the stake and bolt on about a 00 size copper cable. Run this cable to a grounding block mounted near the AC service panel being careful not to touch any electrical conduit or the chassis of the service panel. This block shall be your single main ground point.

You now have a clean AC system with a solid and safe audio ground. Check with your local electrical codes department to see if this grounding scheme is allowed by local standards. Communicating with these people about the special requirements of audio is usually a *big* hassle.

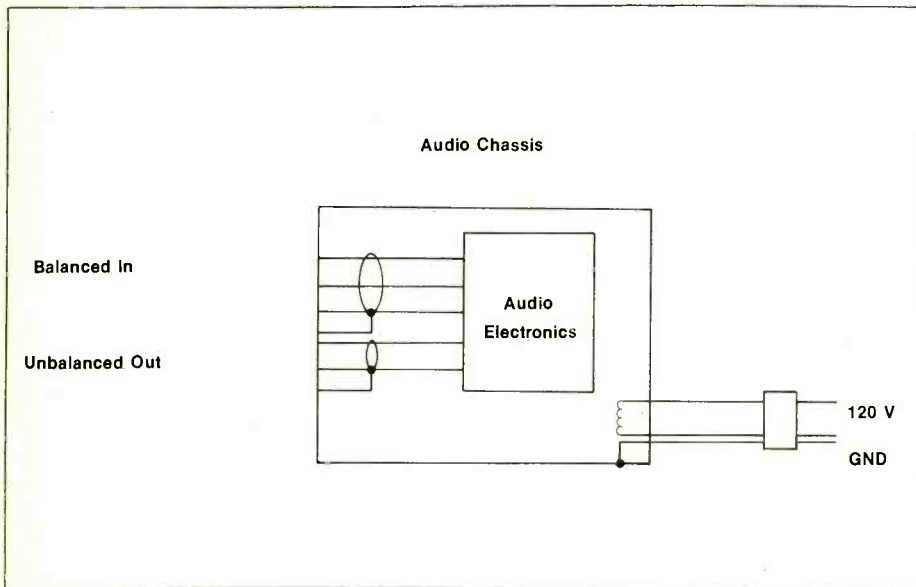


Figure 6

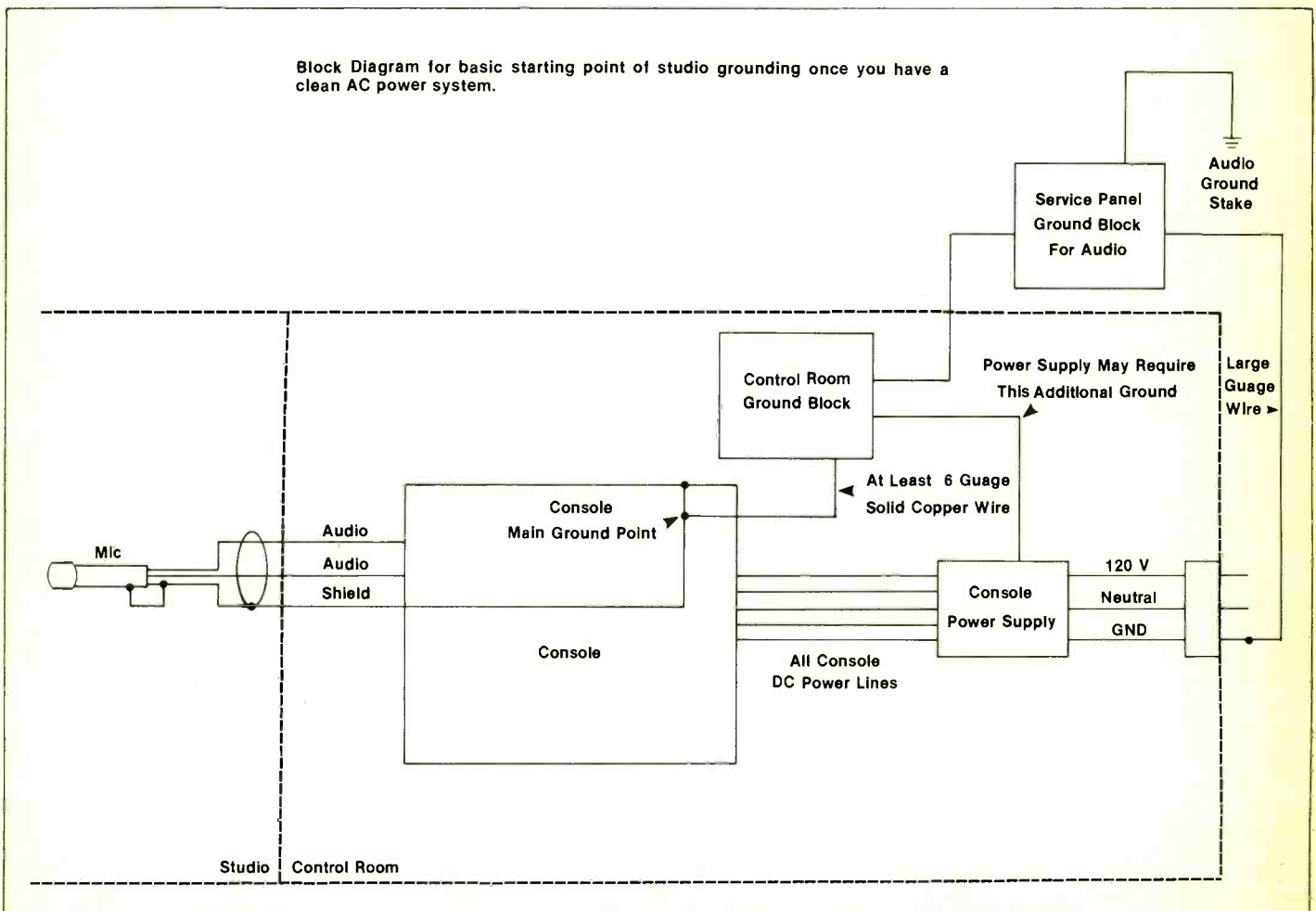


Figure 7

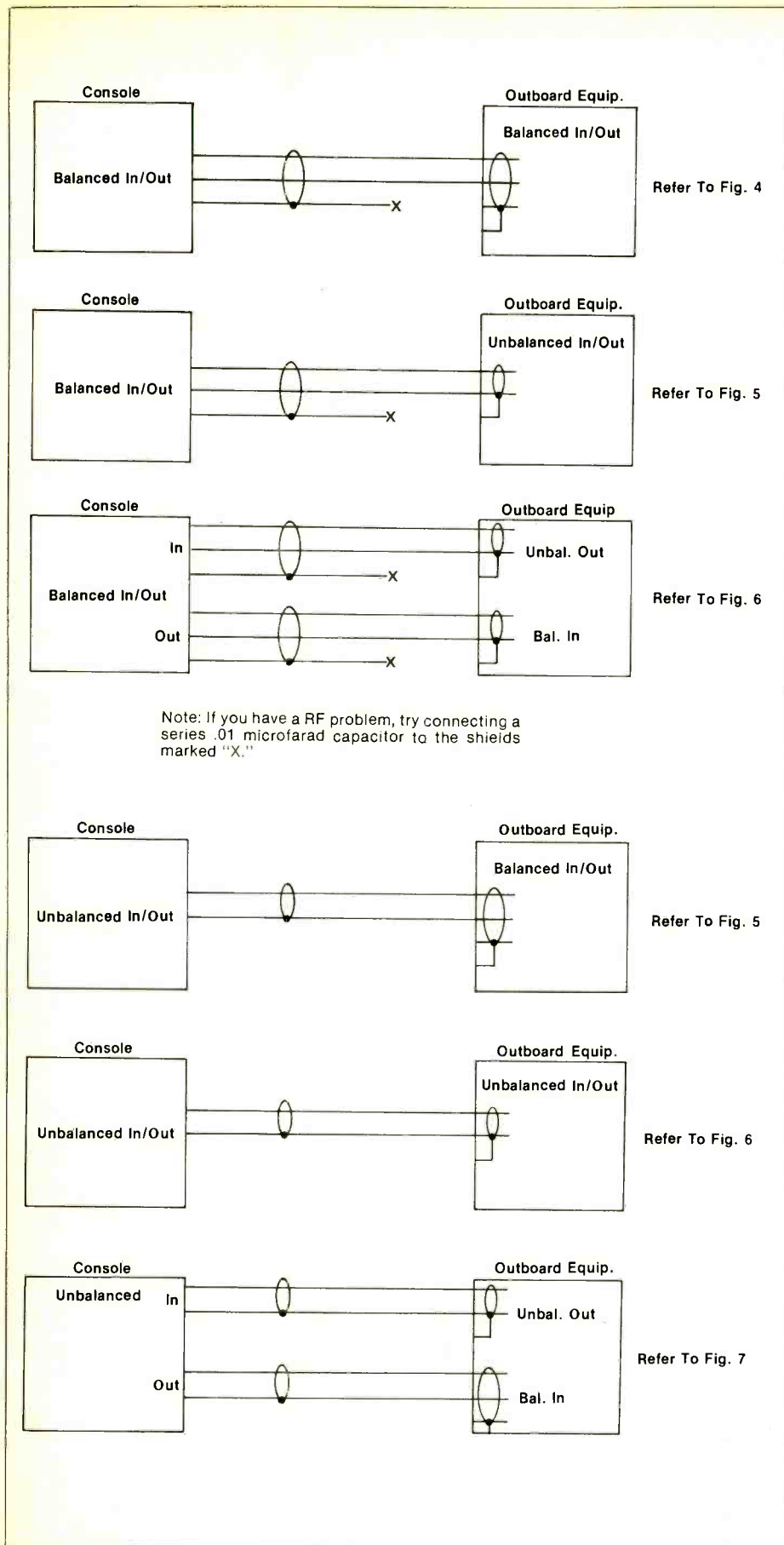


Figure 8

All of this work is necessary before you plug in a single piece of audio equipment. A solid grounding scheme must start at this point.

Use special wall boxes that float the ground from the wall box. The wall box ground is obtained by the conduit through the wall box. The audio obtains its ground through the third pin of the AC outlet. Each wall box should run independent AC and ground wires back to the panel box. If boxes are spread around the studio, run independent #6 ground wires from each outlet back to the ground block.

Most audio equipment has a three-pin AC plug: hot, neutral, and ground. Do not cut the ground pin. Start by plugging all three plugs directly into the socket. Equipment varies in the manner in which the AC ground interacts with the audio ground. Several common wiring techniques are shown in the following diagrams.

Figure 7 is the basic studio grounding system. The great difficulty and questions arise in connecting equipment to the console via the patch bay. Audio equipment is usually wired internally in one of the techniques shown in Figures 4, 5, and 6. The situation gets very complicated because the console itself has balanced and unbalanced points in and out. The console can be connected in the combinations shown in Figure 8.

The next problem you will encounter is the mounting of all your outboard equipment into a rack. My first recommendation is to build a custom wooden rack and space the equipment a short distance apart so that the chassis are not touching. If you already have a metal rack, you might try using plastic screws and spacers to float the chassis from the rack. Each piece of equipment is getting its AC safety ground through the wall plug and its audio ground from the console or from the AC plug depending on the equipment.

We hope these brief paragraphs will answer all your questions and solve all your problems, but we doubt it. Installing an air conditioning system, AC wiring installation, recording studio installation, and haircuts are some things better left in the hands of professionals.

—Allen Rumbaugh
George Juodenas
Audio Architects, Inc.
Nashville, Tenn.

THE **PRODUCT** SCENE

By Norman Eisenberg

LIMITER/COMPRESSOR

From Furman Sound comes word of the new model LC-2 limiter/compressor. Featured are input and output level controls; plus attack, release and compression-ratio controls. Gain over a 20-dB range is displayed on an LED-style meter, while LEDs also show overload and power indication. Front-panel push buttons select between normal compression and de-essing or side-chain modes. Furman ex-



plains that the latter options allow for the gain reduction signal to be processed through either an internal high-pass filter or an external equalizer (or other device), respectively. The side-chain input also may be used to allow a completely unrelated signal to control the gain as, for instance, in voice-over mixing where the level of background material needs to be compressed to allow the announcer's voice to "ride over."

CIRCLE 1 ON READER SERVICE CARD

TAPE SPLICE KIT

For editing and repairing cassette tapes and micro-cassette tapes (including the Philips format), Osawa has introduced the Model PC-507 kit which contains everything needed in one self-storing packet. The plastic top section contains cutting jigs for each of the three tape formats, positioning sections and recesses for screws, etc. The lower section holds tools and parts which includes a razor/cutter, mini-scissors, slot and Philips-type screwdrivers, marking pin, tweezers, an assortment of Philips-head screws, pressure pads, splicing tape sheets, a roll of leader tape and one cassette hub. Detailed instructions come with the kit.

CIRCLE 2 ON READER SERVICE CARD

SHURE PRO SYSTEM

A new monophonic sound system for professional sound reinforcement applications is the Pro Master from Shure Brothers. It consists of a model 706 power console and two model 709 speaker systems. The model 706 includes a 200-watt amplifier; a 10-band combining-type graphic equalizer; an exclusive Feedback Finder^(TM) that uses LEDs located over the graphic equalizer to indicate frequencies causing feedback; and a Patch Block^(TM) panel that is a combination block diagram of the internal console circuitry together with eight patching jacks located at appropriate points right on the block diagram. On the front of the console are eight inputs (six high and/or balanced low-Z mic, and two auxiliary). The low-Z inputs are transformer-coupled, and have a built-in 24-volt simplex power supply for professional condenser microphones. Outputs are provided for loudspeakers, effects devices, tape monitors and headphones, plus a low-Z balanced mic-level output that allows the console to feed a house system for maximum gain without feedback. Also included is a separate, complete monitor mixer for either stage monitoring or separate broadcast feed. The 709 speaker system uses a 15-inch woofer and three piezo-electric horns. System price is \$1930.



CIRCLE 3 ON READER SERVICE CARD

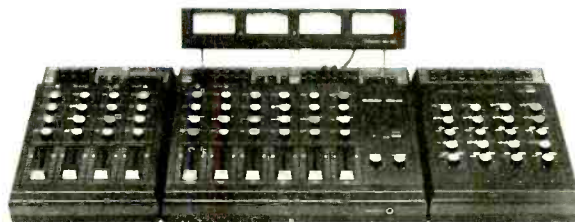
CROWN SPLITS PRO AND CONSUMER LINES

In a move to offer its products in terms of the different uses to which professional and home buyers put them, Crown has divided its equipment offerings into two lines. The pro line now includes a new active crossover, the MX-4; two completely new amps, the PS-200 and PS-400; two restyled amps, the DC-300A Series II and the D-150A Series II. Continuing in the pro line will be the M-600 mono amplifier and its larger twin the M-2000, the pancake D-75 amps, the VFX-2 crossover, several versions of the PSA-2 amplifier, the RTA-2 Real Time Analyzer, the redesigned BDP-2 Audio Microcomputer and some accessories. Also available through most Crown pro sound dealers will be the PZM microphones. Among the pro-aimed features of the new power amps (PS-200 and PS-400) are back panels that provide a full complement of choices for connecting the amplifiers to sound systems, including quick conversion to mono service; front-panel displays; options for transformer input and balanced active input; optional 70-volt transformers mountable on the heat-sinks; fan package capable of cooling three amps when stacked in rack-mount or cabinet.



CIRCLE 4 ON READER SERVICE CARD

TASCAM MODULAR MIXER



System 20, a new modular mixing system recently added to Tascam's Creative Series product line, operates with no switches—much like an electric patchbay. The operator has access to all signals at all relevant points along the signal path. Basic unit in the System 20 is the Master Module MM-20 (\$395). It offers six inputs (two transformer isolated mic inputs), six output busses (stereo line, monitor and cue) and provisions for four-track monitoring.

Four channels of parametric-like EQ are provided by the PE-20 module (\$350). Additional transformer-isolated inputs are available in groups of four with the EX-20 unit (\$350), while the meter unit MU-20 (\$150) completes the system.

CIRCLE 5 ON READER SERVICE CARD

PORTABLE 8-TRACK RECORDER

Rated for response of 30 Hz to 25 kHz ± 1 dB at a speed of 30 ips is the model 811D-103A open-reel eight-track recorder offered by Stephens Electronics Inc. of Burbank, Ca. The deck has the capability of operating from a 24-volt battery and is packaged in a carrying case. A built-in 60-Hz resolver aids in video or film sync. Completely transformerless, the new deck runs without the use of capstans or pinch-rollers. Transport controls come in a separate remote unit. Operating speeds are 15, 30 or 60 ips. Each channel can be assigned to automatically mute, switch to source and record. All channels can be set to sync which gives the user playback from the record head. Head R/P headroom of over 40 dB at 1 kHz is claimed to handle the heavy overloads of such applications. The model 103A accepts reels up to 10½ inch diameter; the model 104A, up to 14-inch reels. Total weight is 40 pounds. Prices are \$17,580 and \$17,830, respectively.

CIRCLE 6 ON READER SERVICE CARD

SOUND SYSTEM PROTECTOR

Described as a power line conditioning unit is the PS-1 from Linear & Digital Systems, Inc. of Centerville, Ohio. The new device, which is designed primarily for sound reinforcement systems, can be utilized to protect sound and other



electronic gear (including laboratory or industrial instrumentation) from power-line high-voltage transients. It also filters radio frequency interference (reducing noise from radio transmitters such as CBs and reducing buzz from nightclub light dimmers); monitors power-line wiring polarity; and provides circuit-breaking for overloads. It mounts in a standard 19-inch rack and supplies six grounded outlets with an 8-foot heavy-duty power cord. Price is \$129.

CIRCLE 7 ON READER SERVICE CARD

EXTENSIVE LINE FROM BIAMP SYSTEMS

Mixing consoles, equalizers, compressor/limiters, reverberation devices, electronic crossovers, power amplifiers and accessories make up the broad professional product offering from Biamp Systems, Inc. of Portland, Oregon. The mixing consoles comprise a variety of sizes and capabilities and include setups for recording, fixed installation, on-the-road P.A., broadcast and production applications. Graphic EQs are available for mono or stereo, and both use gyrator simulated-inductor circuitry in place of conventional coils. There also is a one-third octave equalizer with 26 bands on standard $\frac{1}{3}$ -octave ISO centers. The reverb units come in either mono or stereo versions. The "quad limiter" operates on four independent channels. The electronic crossovers are available for a mono 2-way setup, or for a stereo 2-way/mono 3-way setup. Power amps include the TC/60 (60 watts mono stereo or 200 watts mono); the TC/120 (120 watts stereo or 400 watts mono); and the 2500 (250 watts stereo or 860 watts mono).

CIRCLE 8 ON READER SERVICE CARD

COMPUTER AIDS POST PRODUCTION WORK

From Neve Electronics comes word of the NECAM II, an updated version of its computer-assisted system for use in recording, providing facilities for dubbing, sweetening and effects cueing in video or film post production work. Up to 999 mixes and cues for up to 64 sources can be stored, modified and repeated by the computer to individual frame accuracy using the standard SMPTE/EBU code. Neve also reminds us of its Series 542 consoles which include units with 8, 12 and 16-input capability.

CIRCLE 9 ON READER SERVICE CARD

ULTRA SMALL MICROPHONE

Claimed to be the smallest broadcast-quality clip-on microphone available is the MCE-5 offered by Beyer. It is less than one inch in length and it weighs 6.5 grams. Response is rated from 20 Hz to 20 kHz, with a signal-to-noise ratio of 62 dB. The MCE-5 may be powered either by a 9-18 volt battery (1.3 to 5 ma current) or via a 12-volt or 48-volt phantom power supply. For outdoor use a detachable mesh windscreen is included. Impedance is 700 ohms balanced (minimum of 2500 ohms input is recommended). Sensitivity is -47.5 dBm (-141 dBm EIA). Maximum input level is 116 dB/SPL. Generally similar to the MCE-5 is the MCE-5.1, slightly more sensitive and incorporating a 5.6-volt battery in the connector. Both mics include a 1-meter balanced-line cable. Prices are \$160 and \$189 for the MCE-5 and the MCE-5.1, respectively.

CIRCLE 10 ON READER SERVICE CARD

16-8 MIXING CONSOLE

The model MX1606 professional mixing console from Carvin Manufacturing Co. of Escondido, California is a sixteen-in and eight-out model whose special features include eight fully assignable outputs, three send busses, 3-band active equalization and a separate 8-track to 2-track mixdown system with independent level and pan controls for each main output. Also included are large 90-mm faders, phantom power supply, channel solo and mute switches and mic-line switching with direct channel outputs for channel patching. Price is \$2495.

CIRCLE 11 ON READER SERVICE CARD

NEW PIONEER CASSETTE SERIES

Timer-assisted record/play capability, record mute, one-touch recording and LED level meters are features shared by six new cassette decks in Pioneer's new "CT" series. Also found on all these decks is a switchable Dolby-C option in addition to the more familiar Dolby-B. Top of the line is the CT-9R with three heads, three motors, quartz direct drive, automatic reverse in playback and numerous other features. Specs indicate S/N ratios as high as 80 dB with both Dolby options switched on. Response with metal tape is listed as 20 Hz to 22 kHz. Prices were not announced at press time.



CIRCLE 12 ON READER SERVICE CARD

NEW LOUDSPEAKER HYPE

A new kind of hype about speaker systems is in the making, to judge from some promotional literature received here. It concerns "newly developed" or "special" or "breakthrough" technology that results in loudspeakers which can at last cope with the playback demands of digital recordings. The

main thrust of this material—aside from the usual claims of improved response, definition, clarity and so on—has to do with the enhanced dynamic range (on the order of 90 dB) of digital master tapes.

The implication in this presentation is that the 90 dB range is maintained all through the recording process, down to the commercial release you buy and play. With the exception of the dbx-coding process, I know of no method that can hold even close to 90 dB of dynamic range once the signal is taken from the master tape. Further, we must not confuse the dynamic range of a signal source with the loudness level perceived by listeners from loudspeakers working into the acoustic conditions of a given room. The sensitivity specification for a loudspeaker, which is apparently the only quantifiably tangible item on which a claim for dynamic range can be based, is normally measured at 1 meter from the speaker. Who listens like that? And what about the ambient noise level in even a very quiet room? Whatever it happens to be, you would have to add 90 dB to it in order to be able to say that a particular speaker is indeed reproducing the full dynamic range of the digital master. According to standard engineering data, the ambient noise level of a studio averages 25 dB; of a quiet country home, 30 dB; of an average residence, 40 dB. So we are talking about total playback dynamic ranges of 90 dB plus those figures. To give you an idea of what is involved, for a speaker to be able to furnish 130 dB/SPL in an average residence, it should have a sensitivity of say 97 dB/SPL out for an input of 1 watt, and be capable of handling up to 2000 watts from the driving amplifier.

It is obvious that this kind of performance is not what is being claimed by these new "digitally capable" speaker systems. What I make of them, really, is just a renewed emphasis on what many speaker designers have long stated—that efficiency is a very desirable attribute of a speaker system—which is to say, the more clean sound a speaker can produce for a given wattage input, the better, all other things being equal. Which explains, of course, the renewed interest in vented systems and in the larger sealed-box systems, the best of which do offer greater efficiency along with the other virtues of good sound—and which are not the exclusive achievement of the recent "breakthroughs" in speaker design.



MUSICAL

NEWSIGALS

MUSICAL INSTRUMENTS

The Korg LP-10 Electronic Piano was recently introduced by Unicord. The LP-10 is a compact, five-octave instrument which is said to have one of the most authentic reproductions of an acoustic piano sound. Korg has paid particular attention to simulate the complex attack and envelope characteristics of acoustic pianos in the design of the LP-10, including a varying decay rate for high notes in relation to lower notes. For versatility the unit has a variable decay control to vary the envelope's initial fall-off characteristics. The LP-10 has three different voices which may be mixed; in addition to the acoustic piano voice there is an electric piano voice which can also duplicate a vibes sound, and a clav voice for bright, percussive voicings. A three-position sustain mode switch selects sustaining or percussive characteristics with or without damping. The unit also features a built-in six-band equalizer with ± 12 dB of control at six frequencies from 100 Hz to 3.2 kHz on octave centers, and a variable speed chorus effect. Perhaps the most unique feature of the LP-10 is its thirteen position transpose switch which accomplishes electronically what a capo does for a guitarist, namely transposing to any key instantly over a full octave range.

CIRCLE 13 ON READER SERVICE CARD



A new model which represents something of a price breakthrough in quality, handmade guitars are announced recently by Taylor Guitars. The Taylor model 510 features scalloped soundboard bracing, a feature usually found in over \$1000 guitars, in a \$700 instrument. Scalloped bracing refers to a technique



in which certain soundboard braces are carved in a scalloped shape to improve the balance and resonance of a guitar. Taylor's model 510 is a dreadnaught shape with a solid Sitka spruce top, stained mahogany back and sides and a rosewood fingerboard over its thin, V-shaped neck, which of course has an adjustable truss rod. Taylor guitars are handmade in southern California and carry a limited lifetime warranty.

CIRCLE 14 ON READER SERVICE CARD

MUSICAL INSTRUMENT AMPLIFIERS

Legend Musical Instruments has become well-known recently as the manufacturer of the Legend Rock 'n' Roll 50 amplifier, one of the new generation of contemporary design tube amplifiers. The Rock 'n' Roll 50 features a combination of classic design features such as "English" bass/mid/treble/presence equalization, Celestion speaker and rounded-corner cabinet with cane grille. Also included are contemporary niceties such as preamp level, master volume, foot-switchable gain/color controls, preamp out/power amp in patch points and detented tone controls. Legend has now expanded its line with a new model, the Legend 50 Deluxe, which adds even more modern features to the basic sound and performance of the Rock 'n' Roll 50. Besides the familiar bass, mid, treble, presence, preamp volume and master volume, the 50 Deluxe has a Colour/Gain control, and a dual concentric control for lead level and rhythm drive which are switchable via a push switch on the panel or an optional foot switch; an LED is located above the control knobs for readout of this switching function. The 50 Deluxe also has a trans-conductance compressor circuit built in to an additional preamp stage; the compressor has a

dual concentric control to set compression level and sustain, plus a push switch and LED indicator. A final touch is reverb with a dual concentric control for control of reverb tone as well as level; the reverb has the same push switch/LED arrangement as the compressor, and both of these functions and the rhythm/lead switching may be controlled with an optional foot-switch box. The 50 Deluxe is available in single or twin 12-inch combo versions (Celestion speakers, of course), or as a head only for use with satellite speaker cabinets such as Legend's own lineup of 1x12" or 2x12" open-back or sealed-back cabinets or straight or slanted front 4x12" cabinets.

CIRCLE 15 ON READER SERVICE CARD

Four new models were recently added to the line of Leslie rotating speakers from Electro Music, Accutronics, Inc. These four new models supplement the Leslie 760 which is the current, solid-state, portable version of the classic Leslie rotating speaker system. At the top of the new line-up are the models 815 and HL-722 which have virtually identical specifications; the 815 is the portable version with plastic laminate finish, carrying handles and casters, while the HL-722, which was designed specifically for use with the Hammond B-3000, has a wood finish and lacks handles and casters. Both models are complete two-channel, two-way systems with both a stationary and a rotary channel. Each channel has its own low-level, active crossover to divide the audio spectrum and feed the signal to the appropriate one of the four built-in power amps. Frequencies below 220 Hz in the stationary channel (plus frequencies below 100 Hz from the rotary channel) are fed through a 70-watt amplifier to a 15-inch woofer in a bass-reflex enclosure, while frequencies above 220 Hz in the stationary channel are delivered to three 6" x 9" speakers mounted in the front and two sides of the cabinet by a 65-watt amplifier. In the rotary channel, frequencies from 100 to 450 Hz are amplified by a 45-watt amp and fed to a 6" x 9" speaker within a newly designed Rotosonic drum, while frequencies above 450 Hz are fed through a 35-watt amp to a compression driver and rotary horn. A dual Treble Response Control is provided to set the desired

tonal balance. The Leslie 315 is a similar, two-channel, two-way system using somewhat lower powered amplifiers and smaller drivers to yield an overall size over one-third smaller than the 815. The 315 is covered in Pionex plastic laminate and has carrying handles as standard equipment and casters as an option. The stationary channel uses a 50-watt amp to drive a 12-inch woofer in an aperiodic, ducted port, bass reflex enclosure for low frequencies and a 30-watt amp driving a front-aimed 6" x 9" speaker and a pair of side-aimed 2½-inch speakers. The rotary channel drives a 6" x 9" Rotosonic driver with a 30-watt amp and uses another 30-watt amp to drive the compression driver/rotary horn. The fourth new model is the 215A which is a small, unpowered satellite speaker designed to add rotating sound to single or two channel organs with or without their own Leslie speaker. The 215A uses a 6" x 9" Rotosonic speaker which is driven from the organ's own amplifier, and comes complete with a remote control box for convenient selection of fast, slow or off for the rotary speaker.

CIRCLE 16 ON READER SERVICE CARD

St. Louis Music Supply recently made two announcements concerning their Crate Line of amplifiers. The first announcement was the introduction of a new model, the Crate CR-60 Condor series. The CR-60 has two complete channels, each with its own preamp gain and master volume controls, and special patented Sequential Cascading Gain (SCG) circuitry for a very wide spectrum of tone colorations. EQ circuitry includes active bass and treble controls plus "parametric" midrange, and there are pull switches integrated with the pots for midrange boost (called a "Fat" switch), treble boost ("bright") and gain modification which boost the master gain for a louder output without increased distortion. The amp uses a high efficiency 12-inch Magnum Projector speaker designed by SLM Electronics for loud sound output without breakup. Other features of the CR-60 include a Hammond Accutronics spring reverb tank and both low impedance balanced and buffered high impedance line outputs on the back panel—very useful for recording use. Cosmetically the Crate Condor amp is available in midnight black or cork brown tolex coverings with a distinctive cork finish, or in a

solid oak and walnut Eldorado version. The other news from St. Louis music is a special promotion on their CR-TT 60-watt twin 12 amplifier stack. This package includes a Crate CR-IIRH 60-watt reverb amp head with gain and master volume controls, active bass and treble EQ and a "parametric" midrange, bright boost switch and line level send and return for effects device insertion. For speakers the CR-TT uses two CR-EX speaker cabinets, each housing a single 12-inch Magnum Projector speaker.

CIRCLE 17 ON READER SERVICE CARD

SOUND REINFORCEMENT EQUIPMENT

Electro-Voice sends word of a new passive crossover/equalizer specifically designed to match E-V's low-frequency enclosures and their patented HR and RC constant directivity horns for uniform frequency response. In more general terms, the new crossover, which is designated the XEQ-804, matches a 4-ohm woofer system, such as the E-V LF-215, to any single or dual



horn/driver combination requiring an 800 Hz crossover. The unit has front panel patching terminals for proper equalization of E-V's constant directivity horn systems. Input and output connectors on the unit are convenient ¼-inch jacks, and the unit may be flush mounted in an appropriate recess, or surface mounted. Power handling rating is 400 watts continuous.

CIRCLE 18 ON READER SERVICE CARD

Pro-Line Products, Inc. has announced a line of pre-fabricated risers for stage use. The units are very rugged, using exterior plywood, structural aluminum channels, steel legs and nylon outdoor carpeting or optional hardwood surfacing. The standard size unit is 6'x7' (or two 3½'x6' half-sections) which may be connected side to side or end to end for larger areas (other sizes are also available by order). Standard height is adjustable from 14 inches to 2½ feet using various inner legs, or by changing leg units the same riser will expand upward to 2½ feet to 4 feet with 2 inch increments. Accessories include lockable wheels, a drummer tie-down kit, dollies and leveling feet.

CIRCLE 19 ON READER SERVICE CARD

MICROPHONES AND ACCESSORIES

Crown International, who is the primary licensee for the manufacture of the Pressure Zone Microphone or PZM, recently announced the introduction of a new PZM version known as the PZM 31S. The new model is similar to the company's familiar PZM 30GP model in that both are mounted on 6"×5" plates, but the new version has a somewhat different frequency response contour than the general purpose 30GP model. The low frequency response of the 31S is rather more extended than the 30GP and the high frequency range of the new model is warmer and smoother than the older 30GP which is often characterized as bright or crisp. Since the 31S uses the same Pressure Recording Process™ design principles pioneered by E. M. Long Associates, in which a pressure calibrated mic capsule is mounted very close to a boundary plane defined by the mic mounting plate and the surface on which it is mounted, the PZM 31S retains all the same qualities of clarity, spaciousness and uniform tone quality throughout its hemispherical pickup pattern.

CIRCLE 20 ON READER SERVICE CARD

A most unusual accessory product is the Humid-A-Mike™ from Voice-Saver Products. This new product is a self-contained, localized humidifier designed to attach to a performer's vocal mic via a foam block and velcro strap to provide an adjustable spray of soothing moisture to protect their throat. The Humid-A-Mike is powered by a

pressurized CO₂ cylinder which can provide up to four hours of operation with a full load of distilled water. When fully loaded, the unit weighs only 10 ounces and measures only 6¾" long and 1" in diameter.

CIRCLE 21 ON READER SERVICE CARD

For the well-heeled and fashion-conscious performer, Audio-Technica has introduced the Microphone Wardrobe™, an array of seven colored microphones and matching or com-



plementing colored mic cables in a foam-lined, metal travel case. The mic used in the Microphone Wardrobe is Audio-Technica's most popular vocal model, one of which has actually been gold-plated for inclusion in this assortment. In addition to the colorful mics and cables, the Wardrobe includes two contrasting grill screens for even more visual versatility.

CIRCLE 22 ON READER SERVICE CARD

MUSICAL INSTRUMENT ACCESSORIES

Several years ago, a line of compact, plug-in sound modifiers bearing the Dan Armstrong line appeared on the American market; but when their manufacturer went out of the electronics business, the products disappeared from the market. The good news now is that these little boxes are available again from Beigel Sound Labs. The line comprises six color-coded boxes which may be used individually or cascaded for more complex effects. The units are designed to plug directly into the guitar or other instrument and have miniature toggle switches alongside the output jack for fingertip control over the effect. The boxes have colorful names such as the Orange Squeezer (a natural-sounding

compressor) and the Blue Clipper (a fuzz-tone), and includes a bass and treble booster, a sub-octave/ring modulator effect and equalizer modules designed specifically to improve the sound of a guitar or an electric bass. All units are battery-powered and have low impedance outputs.

CIRCLE 23 ON READER SERVICE CARD

Artists X-Ponent Engineering, also known as AXE, recently introduced three new electronic accessories which may be described as "interfaces." The first of these is the AXE Buffer Pre-Amp which is a plug-in unit giving the advantages of an inboard preamp without the hassles of building it into the instrument. Floorbox preamps only do part of a preamp's job because the cable from guitar to preamp is still subject to losses and noise pickup. The AXE unit plugs directly into the instrument to buffer the output at all times to remove the possibility of loading problems as well as providing variably boosted gain at the flip of a switch.

The second new product from AXE is the SP-100, a belt-pack headphone amplifier. This battery-powered unit has a very high input impedance and sufficient gain to allow use with mic or line level signals making it useful for tuning instruments, setting up piano



pickups or wireless mics or as part of a listen-only intercom system. The third product is the Klic-Trac, a metronome designed to be heard through headphones for use even in high noise or high volume performance situations. AXE's Klic-Trac also has an auxiliary input jack to allow an SP-100 to be plugged in for simultaneous monitoring of instrument plus clicks through the same headset.

CIRCLE 24 ON READER SERVICE CARD

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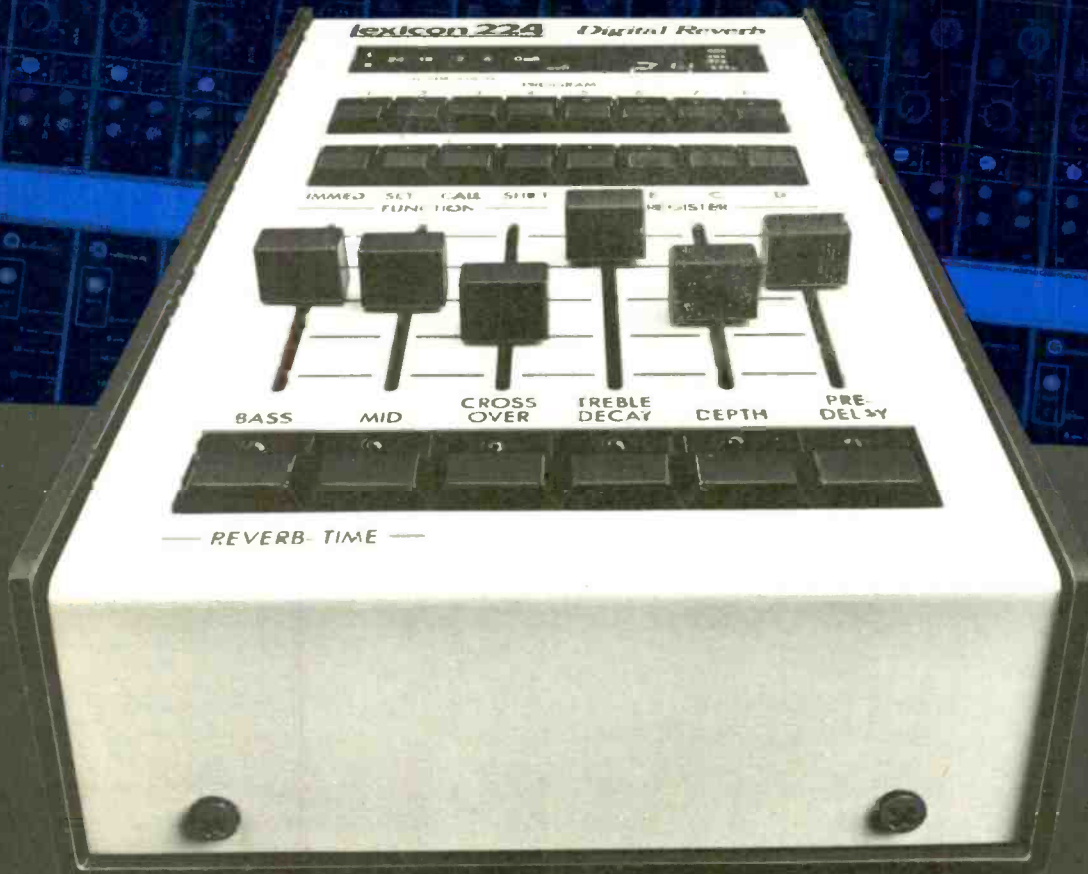
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MULTI-TRACK

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PART

3

By Craig Anderton



So far, in parts I and II we have talked about four-track layering and second machine techniques from an engineering point of view. Now, it's time to realize that the games we've been playing (layering, hand syncing rhythm tracks, etc.) drastically affect the production of a piece.

In traditional production, the rhythm instruments are recorded first, the lead instruments next and the sweetening tracks (massed sounds, such as strings, horns or extra percussion) usually go on last. But with our extensive layering techniques, sometimes the exact reverse must occur. This means that track strategies need to be carefully laid out in advance.

Track Strategy Basics

The producer and engineer should sit down with the musicians before a session to determine just how many parts need to go down on the tape, whether any pre-mixing will be involved and so on. This prevents any embarrassing problems that could happen later, such as needing four tracks to record a bunch of instruments and having only one track available.

While each situation is different, I

have found certain procedures to be true in most cases. Here are some of the most common ones.

(1) PUT on SWEETENING FIRST WHEN BOUNCING WITHIN a MACHINE: I know, this is the reverse of what we've been taught, but there's a very good reason for this. The more tracks you have available, the easier it is to layer parts without destroying the fidelity. For example, let's suppose that you have a piece with a four part horn section, rhythm guitar, keyboard, bass, vocals and drums, and you need to fit all these on a four track—and to make life even more complicated, you happen to be playing all the parts yourself, so you can't lay down more than one instrument at a time.

A suitable strategy would be as follows. Record a click track on track 3, and three of the horn parts on tracks 1, 2 and 4. Premix all three horns, plus a "live" part to complete the four part section, onto track 3. This leaves three tracks to work with. Next, record guitar on track 1, keyboard on track 2 and premix these (in the sync mode) along with bass onto track 4. (If you have any questions on how to best do this bounc-

ing, refer to Parts 1 and 2 of this series [May and July 1981 issues, respectively].) We now have tracks 1 and 2 open, into which the voice and drums will fit nicely.

Note that we've put the rhythm instruments on closer to the end of the recording process than the beginning—the mirror image of the usual, and generally preferred, process. However, we've also managed to cram a lot of tracks on to our four track, so there are some compensations.

(2) PLAN to RECORD THOSE INSTRUMENTS REQUIRING HIGHEST FIDELITY LAST: Repeated bouncing, whether within one machine or by recording back and forth between two machines, affects the sonic quality of a signal to the point where the build-up in noise and distortion can be quite noticeable. However, as you get towards the end of recording a particular piece you will have fewer and fewer free tracks available, which means that there will be fewer possibilities for bouncing. Thus, the last few instruments you record will have no bouncing whatsoever. These instruments will have the highest fidelity of anything on the tape.

Which instruments are most important in terms of fidelity? In my experience, I would have to say bass, drums and vocals, each for different reasons.

With respect to bass, most tape recorders have a peak in the bass region, say a couple of dB or so. This isn't too serious by itself, but by the time you've done several bounces, those couple of dB add up until you've got a significant bass boost on your hands. This tends to give bass instruments a boomy, less defined quality.

Drums have a wide dynamic range and require good high-frequency response in order to sound life-like and crisp. These are excellent reasons why drums should be recorded last when track space is limited.

Vocals are a special case. Again, they have a wide dynamic range; but perhaps more importantly, the voice is the part that does the communicating with most songs. Bouncing voices too many times lends a fuzzy, indistinct quality that can detract from the impact of the song. On the other hand, there may be times when this effect is useful; for example, when doubling vocals, a bounce or two may blend the vocals together a little

more seamlessly than you would have if each vocal was standing naked on a separate track. Understand that while we're not talking about drastic changes in sound, these types of differences are noticeable and should, if at all possible, be taken into account.

(3) COMPOSITION VS. IMPROVISATION: Unfortunately, these kinds of layering techniques really only work if you have a definite idea of where the song is heading. In other words, the song has to be composed down to the very last bar. There may be room for improvisation on an individual track or two, but overall, the song generally will not be able to deviate from a very specific structure.

This can cause problems with bands that write in the studio rather than working out their material "live." As a producer, you need to be sympathetic to the needs of the musicians, but still get across the fact that when budgets and track space are tight, a song must be well-rehearsed. If it is not, premixing becomes much more difficult because you can't alter the levels or equalization of premixed parts, except within very narrow limits.

One solution is to cut a "composing tape," one that does not include extensive layering or production techniques. In fact, you don't even have to worry whether the mix sounds good or not. Instead, the idea of a composition tape is to test out the *arrangement itself* on one piece of tape. As soon as the piece is arranged, and you've found out what works and what doesn't work, stop work on that tape, plan a track strategy and start work on the "reel" thing. Incidentally, the composition tape should not be agonized over; if a part doesn't work, move along.

(4) EFFECTS: ADD DURING RECORDING, or ADD DURING MIX-DOWN? In most studios, tracks are recorded as dry as possible, with effects being added later. While there are some engineers who disagree with this approach, it seems that they are in the minority. As we've shown, though, four-track production tends to bend the rules a bit—adding effects is no exception.

For example, most people don't like to put reverb on a drum set's bass drum. This is fine if you have a 24-track machine where the bass drum has its own track, but what if the drums have been pre-mixed along with guitar and

bass onto a single track? In a case like that, you're better off adding reverb as you record the drums in the first place, and avoid putting any on the bass drum. The most important point to remember is that with a premix, adding one effect to the premixed track affects every instrument on the track. So, if any part of the premix needs its own processing, that should be done as the part is being recorded.

Another production technique I've used many times is to add a small amount of reverb to each part while recording instead of adding reverb during mixdown. By making subtle changes in the reverb sound for each instrument, the overall sound can be much fuller. This type of approach works particularly well with the "Hot Springs" reverb (see the *October 1980 MR&M*), since this particular reverb unit doesn't muddy the sound as much as some other spring types.

(5) EQUALIZATION for BOUNCING: The more you bounce, the more the sound deteriorates. This is especially true if you bounce in the sync mode; not only will the noise be higher than when you bounce off the playback head, but you'll lose a fair amount of treble as well.

Therefore, if you're recording tracks that will be bounced several times, boost the treble on the way into the tape machine, and use as hot a level as possible short of saturation. On playback, the sync mode treble loss will offset the equalized treble boost, while the hot level will keep your signal above the noise.

(6) THE VIRTUES of NOISE REDUCTION: Noise reduction really helps when bouncing tracks, which is a statement I'm sure you will have no trouble accepting! But not all noise reduction is alike, and any errors introduced by these units will be magnified when bouncing. Sometimes the best kind of noise reduction is the boost-treble-when-recording, cut-treble-when-playing-back approach. This has no breathing or pumping effects, but on the other hand is not suitable for instruments with great amounts of treble (since instruments with lots of treble tend to mask noise anyway, so this may not be a problem).

(7) STEREO EFFECTS with 4 TRACKS: When you have lots of

premixes residing in these various tracks, it becomes more difficult to get a convincing stereo spread. Why? Say you have doubled vocals in one track, doubled leads in another, the rhythm track premixed onto the third track and the fourth track for string synthesizer and other sweetening. The rhythm track is naturally going to be placed in the center, as are the vocals... which leaves you with only the leads and string synthesizer to create the stereo effect, and that may sound a bit unusual. However, there are enhancements you can add during mixdown to create a pseudo-stereo spread.

Delay Lines—One way to create instant stereo spread is to take the tape channel output and patch it into both channel 1 of your mixer and a delay unit (see *Figure 1*). Then patch the output of the delay line to mixer channel 2. Pan channel 1 left of center, and channel 2 right of center. Note that if the delay is very short, cancellation may occur between the two channels when the track is played back in mono; and if the delay is longer than a few milliseconds, you'll hear a slapback echo effect. However, there are places in the 10 to 20 ms. region where there is negligible cancellation or echo—this is what gives the best sound.

Pitch Transposing Devices—The same technique mentioned above can work with pitch transposing and harmonizing devices as well. For best results, offset the pitch a very slight amount from the fundamental pitch of the track being processed.

Equalization Changes—Another way to create a pseudo-stereo image out of a mono track is with equalization. Split a signal as shown in *Figure 2* so that it goes through two independent channels of equalization. Notching one channel's frequency while boosting the other channel at the same frequency can give some good effects, as can more drastic equalization changes

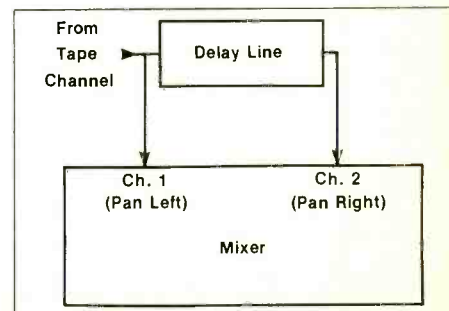


Figure 1

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CIRCLE 61 ON READER SERVICE CARD

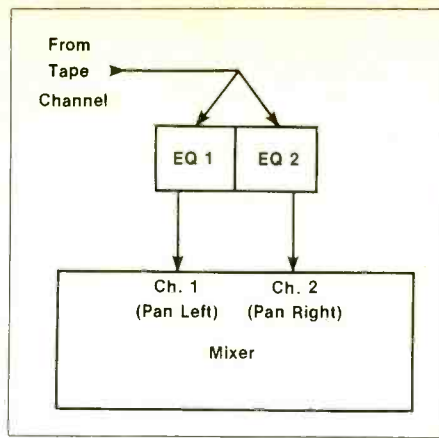


Figure 2

(higher frequencies in one channel, lower frequencies in the other).

Stereo Reverb—Stereo reverb sounds great, and can be easily generated with a stereo chorus unit (such as the DOD 690 reviewed in a previous "Notes" column [December 1980], the MXR Stereo Chorus and others). Patch the reverb to the chorus as shown in Figure 3; panning the chorus stereo outputs to opposite channels produces a stereo reverb effect. One disadvantage of this system is that playing the signal back over a mono system will remove the chorus effect, however, adding slight differences in equalization between the two channels can help to minimize this problem.

When recording, it is more difficult to produce for stereo on a 4-track machine than on an 8-track (or greater) machine. As a result, it's often a good idea to reorient your thinking so that you add the stereo effects during mix-down rather than while recording.

Final Comments on 4-Track Production

The most important aspect of 4-track production is to *plan ahead*. Premeditate every move—from where the tracks are going to be assigned to how the reverb is going to work its way into the final mix. This will not only make the session go faster (saving time and money, as well), but will also allow you to get the most out of your 4 track. If it's time to do a pre-mix and you don't know how it's going to fit into the rest of the song, you're in trouble... and if that pre-mix turns out to be usable in the end, chances are that's due more to luck than anything else.

Sometimes it's hard to make a group of musicians who are new to recording understand that these elaborate track

strategies and plannings are necessary, and not just the whim of a nasty producer or engineer. Do your best to explain what's happening; this will lead to one of two possible results. Either the people you're talking to will understand what you're talking about, in which case you'll impress them with your production savvy, or they won't even vaguely understand what you're talking about, in which case they'll probably be intimidated and leave you alone. Either way, all that counts is results. If those results are good, you'll look like a genius and they'll love you for it.

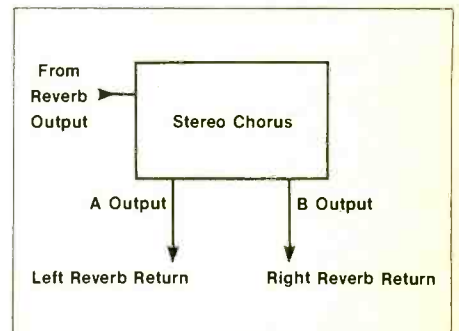
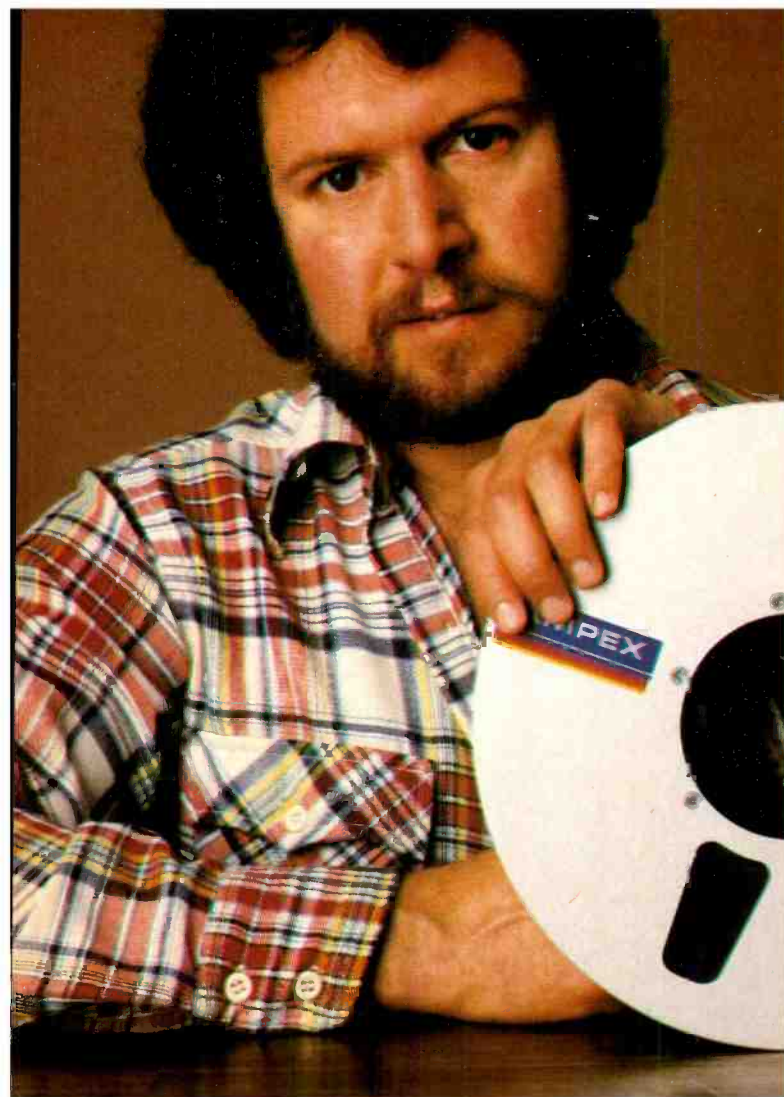


Figure 3

You may also encounter another type of problem with extensive layering, namely that your tapes will start off sounding pretty weird if you record the sweetening first and the rhythm section last. All I can say is that it's impossible to really gauge a tape until you've laid down all the tracks and prepared for mix-down. If the first couple of tracks sound out of place, even if the parts are technically good, don't worry about it. I've recorded lots of pieces where nothing really jelled until the very last track was overdubbed, and then, as if by magic, everything fell into place.

Finally, I'd like to emphasize that all of the techniques mentioned in this three-part series are *proven* techniques that I use in my own recording projects. Some of these ideas may sound off-the-wall and perhaps even impossible to accomplish (particularly the hand-syncing techniques described in part II), but have faith—given practice and determination, you can produce tapes on a 4-track recorder that might even make jaded professional engineers turn to you in shock and say, "How did you do that?!"

That wraps up our series on advanced 4-track techniques. Now go out there and create a masterpiece!



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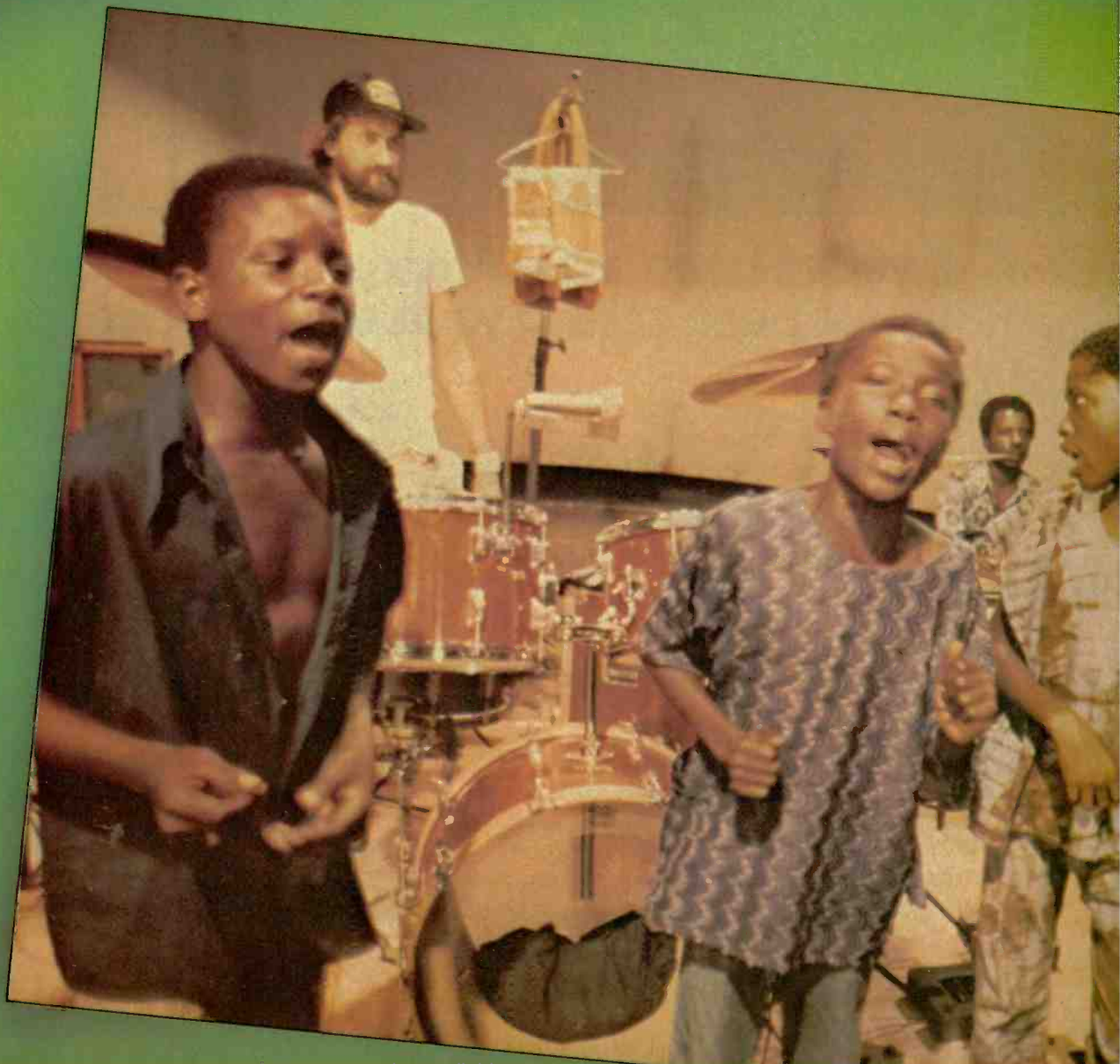
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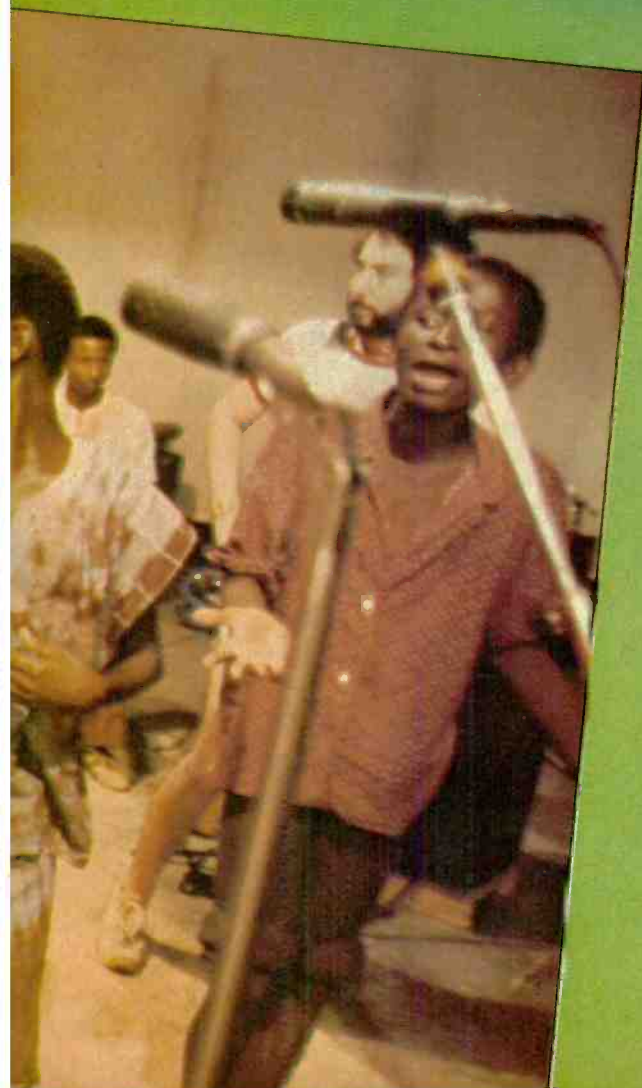
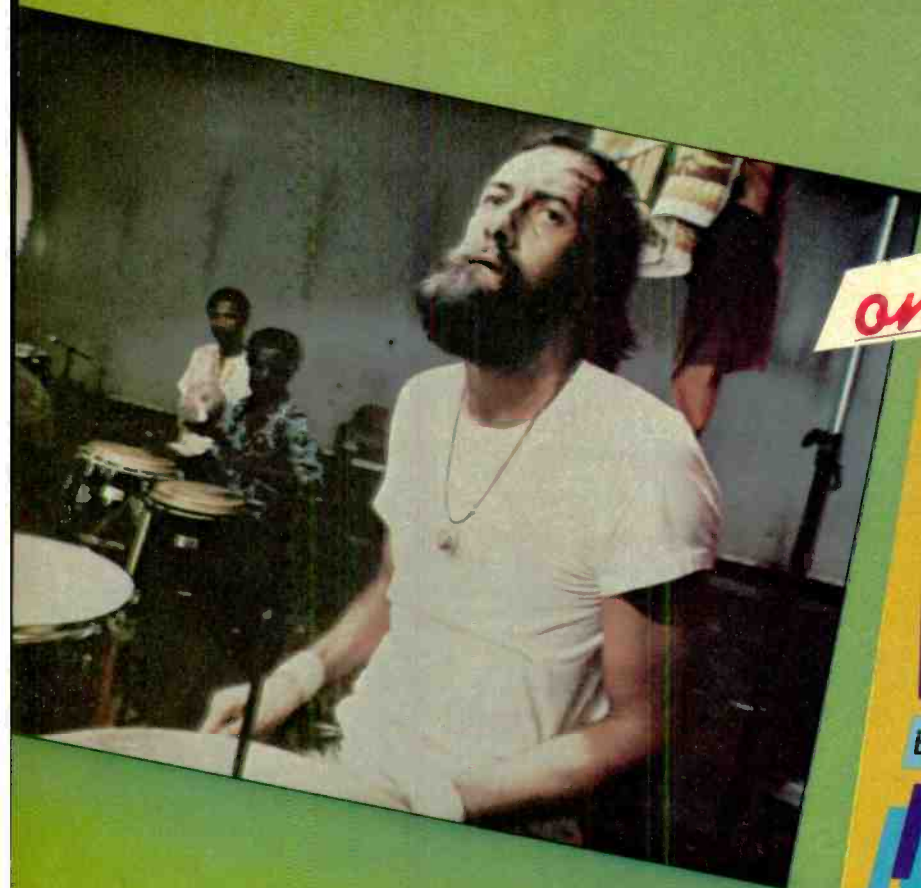
MICK FLEETWOOD

By JEFF TAMARKIN

Mick Fleetwood does not believe in taking ordinary vacations. While most rock musicians might choose to rest on some tropical island, Fleetwood decided to head to Ghana, West Africa, to record his first solo album. *The Visitor* is the result of that journey.

Fleetwood had long expressed a desire to go to Africa and record its native drummers, but the project turned out to be much more involved than he'd ever anticipated. For example, recording studios are not exactly an everyday commodity in Ghana. Neither, in fact, is the telephone! So Fleetwood's crew—including co-producer Richard Dashut and two musicians, guitarist Todd Sharpe and bassist George Hawkins, to provide the non-African backing—joined the Fleetwood Mac drummer on his safari through the jungles. Eventually, after obstacles not encountered in the making of your average Fleetwood Mac album, the African musicians were recorded, Fleetwood and his musicians were recorded and the whole thing became a reality—an RCA product delivered to the American record buying public in the jungles from Manhattan to Santa Barbara.

In recent conversations (they are already hard at work in Europe on the next Mac LP), Fleetwood and Dashut recounted the unprecedented recording session in Africa.





Modern Recording & Music: Before we talk about your new solo album, let's discuss Fleetwood Mac's history and current status. What are your strongest memories of the early years of the band, when you worked with people like Peter Green and Jeremy Spencer?

Mick Fleetwood: There are obviously some strong musical memories that still mean a lot to me. I still have a tremendous amount of respect for a lot of the early Fleetwood Mac stuff in terms of what it did for me—the schooling and the way I look at music in general. If there's a simple way to do something, and you can attain that, then certainly that's the best way to do it. As far as anything emotionally, that's a hard question to answer. You have to remember that (now) is the first time we've ever stopped since Fleetwood Mac began. This is the first time we've had eight months off without having to think about Fleetwood Mac or touring or recording. So I've never been in the position to be that aware of any one particular thing, although I know that to an outsider there must be hundreds of different facets (of the early Mac) that are interesting to look at. To me it's all part and parcel of something that I've been living out.

MR&M: How did Fleetwood Mac manage to stay together and thrive through so many personnel changes? Most groups would have folded or at least become less potent after so many changes and so much pressure.

MF: I think that's probably true. I think a lot of the reason is that, through coincidence or luck, the band has always had a solid rhythm section [Fleetwood on drums; John McVie on bass]. I'm not taking credit for it, but I think that's a pretty obvious assess-

ment. The fact that the two of us have always been in the band has meant that there's never been a lack of a platform to start off from. For better or for worse, the new people that have come into Fleetwood Mac have always been confronted by two people who have played together for a donkey's years. When musicians leave a group, they're often prone to say, "I'm starting a band," whereas being a drummer and a bass player, you're always part of a band.

MR&M: Hasn't the band managed to keep fresh by adding musicians who have distinct individual styles?

MF: Oh yeah, sure. We've never looked at a replacement as having to be a carbon copy of what came before. A lot of bands that I know have paid a lot of attention to trying to save something that they've already attained. The fact that they've all been very different as songwriters—Bob Welch's writing couldn't be more different than Lindsey Buckingham's—has certainly kept the band together. It's more revitalizing to add new outlooks than to employ session musicians to recreate what you're already doing. We made absolutely sure that that would never happen.

MR&M: How did the success of the *Fleetwood Mac* and *Rumours* albums affect the band. After playing as a mildly successful cult band you suddenly began selling millions of albums. What did that do to Fleetwood Mac?

MF: Well, it was a tremendously positive thing to realize that you've been part of something for so long and without any huge master plan you've attained something which people definitely appreciated.

MR&M: Do you think the musician-ship was unappreciated because people were paying more attention to the pop

structure of the songs?

MF: I don't even think like that. I'm not a musical snob. I'm not craving to be anything other than a person who loves what he does.

MR&M: There have been rumors that the group is disbanding. Is there any truth to that?

MF: No, we're not breaking up, not till the end of time. We're actually all living in the same house!

• • •

MR&M: Let's talk about your solo album, *The Visitor*. Why go to Ghana to make a record?

MF: It's an idea that goes back about 10 years or so, when I was in Zambia. I was there on my own, not on a musical venture but just wandering around aimlessly. And I always remembered what a great time I had and the amount of music that I was able to listen to.

When Fleetwood Mac came off the road after continually working for five years (including a one year tour), which, in anyone's language, is hard work, I said, well, stuff this, I don't want to sit around and do nothing. So I ended up doing something which I had wanted to do for many years: going to Africa to play with African musicians. The fact that I went to Ghana came from doing some fairly detailed research and talking to people who knew more about African music than I ever will or would want to know. They quite simply said that if I wanted to be involved fundamentally with drum music, which I did, that Ghana was the place to go to get a concentrated amount of the music. It was not an easy task; it took months to organize. It's not as if you can walk into a studio in Ghana and press buttons and start recording. We took all of our own equipment down there, which in itself is an exercise.

MR&M: How did you know where to look for the musicians you wanted to use once you got to Africa?

MF: We had an American guy (who's a drummer himself) who's down there studying musicology or something for a professorship. He was a great help in opening a few doors. At that point we got together more socially than anything else; we went to some of the clubs and rehearsal rooms they have there. Basically, these bands would audition for us. Some of them were horrific, but that in itself was an experience. All of the musicians we used we had seen at



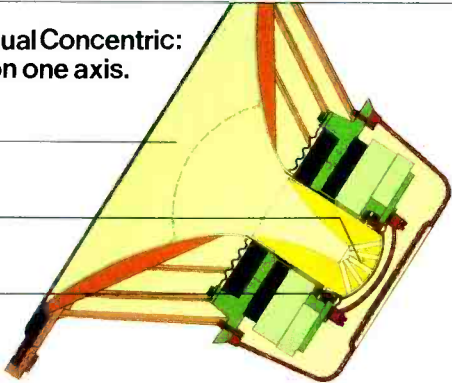
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In our 750 series, we use a heavy-duty rear-mounted two-speed industrial fan to move large volumes of air in from the back, over the internal circuitry and up through exhaust ports.

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

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

strength, rigidity and RFI immunity.

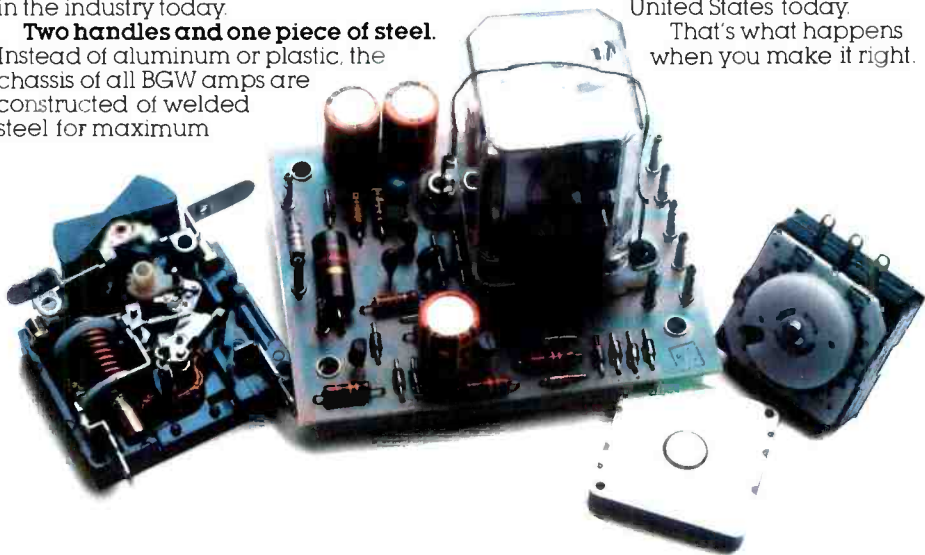
Two large, convenient front panel mounted handles make moving easy. (By the way, because of our unusually strict standards, we are forced to make most of our metal parts ourselves. And that's fine with us.)

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

It's a tradeoff we'll gladly make.

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

That's what happens when you make it right.



Look at the Numbers:

TANNOY

MODEL	DRIVE UNIT	MAXIMUM OUTPUT LEVEL (PEAK)	SENSITIVITY 1 WATT 1 METER ANECHOIC 4TT STERADIANS	FREQUENCY (1) RESPONSE	DISPERSION INCLUDED ANGLE @ -6dB POINT @ 10 KHZ	RECOMMENDED AMPLIFIER POWER @ 8 OHMS	CROSSOVER FREQUENCY	ENCLOSURE DIMENSIONS H X W X D	ENCLOSURE INTERNAL VOLUME
SRM 10B	10" Dual Concentric	109dB SPL (115dB)	90dB	55Hz-20kHz	90 degrees conical	50 Watts	1.2 kHz	20.6 X 13.8 X 10.4"	35 Liters. 1.2 Cubic Feet
SRM 12B	12" Dual Concentric	112dB SPL (117dB)	92dB	55Hz-20kHz	90 degrees conical	100 Watts	1.2 kHz	23 X 15.7 X 10.8"	46.5 Liters. 1.6 Cubic Feet
M 1000	15" High Sensitivity Dual Concentric	114dB	94dB	50Hz-20kHz	90 degrees conical	200 Watts	1.0 kHz	40.5 X 28.4 X 17"	230 Liters. 8 Cubic Feet
M 3000	15" Wide Bandwidth Dual Concentric	112dB SPL (119dB)	92dB	40Hz-20kHz	90 degrees conical	150-200 Watts	1 kHz	40.5 X 28.4 X 17"	230 Liters. 8 Cubic Feet
DREAD NOUGHT	1 15" Special Dual Concentric 2 15" Woofers	121dB SPL (126)	96dB	30Hz-20kHz ±3dB	90 degrees conical	750 Watts Low Frequency 500 Watts Mid Frequency 250 Watts High Frequency	250Hz 2.0 kHz	35 X 52.4 X 23.2, 14.2 15° Baffle Slope	400 Liters (15 Cubic Feet) 40 Liters (1.5 Cubic Feet) Sealed Cavity

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

BGW

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

*TOTAL POWER OUTPUT

The total power output is the actual power output as measured during our final test at the factory. Test conditions: mono operation 8 ohm load 1 kHz @ 0.1% Total Harmonic Distortion. Line voltage maintained at 120 volts RMS 60Hz. This power is equivalent to the sum of both channels when driving 4 ohm loads in the stereo mode.

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their homes or at the little club dates they'd put on. That's how it started and from there it was word of mouth, and people would turn up at the studio. Not every Ghanaian walking around is a good drummer; some were terrible, just like anywhere.

MR&M: I understand there were bureaucratic hassles getting the project off the ground. Can you talk about those?

MF: Yeah, there were [problems], and that's why this project means more to me than I could ever explain to anyone. Several times the whole thing was going to fall apart. I spent three months just getting into doing this thing and I was very loath to just say, well, we won't go. But on the other hand, I had seven other people, with a lot of equipment that didn't belong to me, and a lot of responsibility. You have to remember that at this point no one other than me [no other rock musician] had ever been there before. But I have to say that all of the problems were caused by miscommunications. We got them sorted out, and once we got there, the atmosphere was nothing but really positive. It is a strange thing for people to be confronted with. And you have to remember that you can't phone Ghana or call out of Ghana; it was all done with telegrams. I had decided that if I had to I was going to go down there myself with an 8 track; I was a desperate man. But once we got there, all of the misconceptions disappeared.

MR&M: Did you have any problems with the climate that might have affected the recording? Or perhaps the lack of electricity and modern roads might have severely hampered your efforts.

MF: We didn't have any problems. We were originally going to take what we had, two 24-track machines, which were very portable. The initial idea was to be very portable. I went to Ghana for eight days before Christmas (1980), and I realized the transportation problems in Ghana are so horrendous that it would have been a stupid idea to go out into the villages with a generator, which we could have done. Once you get out of the cities, the roads are really dangerous, and doing 50 miles is a

real shakeup. I didn't want to take the chance of bringing all that equipment, which is not cheap. I made the decision to stay in Accra (in Ghana). We found an unused film lot. We had some outdoor facilities, because I wanted to record some of the drums in the natural acoustics.

MR&M: Was it a problem getting all of the musicians in one place at one time?

MF: Yes, it was. A musician would be told to turn up tomorrow, but in Ghana time that means three days later is quite fine. We just got used to that. After a few weeks, we learned to slow down, which was wonderful, really.

MR&M: How did they perceive you? Was it a welcomed relief to not be treated as a star? How did they relate to recording equipment?

"A lot of effort went into getting the absolute correct miking; where the sound was going to come from was not the EQ but the source sound itself."

MF: To them I was just a gangly person they called "Mr. Mick." In Ghana, music is a big part of the lifestyle: "live" music and cassettes. They don't have records there, but some people have cassette players. You go to get a cassette made and you pay for that—it's the ultimate nightmare of any record company. Some of the bands had recorded in Nigeria, where they have multi-track equipment. All of the musicians were amazed. I'm really pleased with what we recorded, and there's a lot left over that we didn't use on the album. I don't think that much "ethnic" music has been recorded that well. It's usually a matter of going in with a Uher tape recorder and doing it that way. To record a whole drum ensemble with vocalists—50 or 60 people—and to record them well, was amazing. It blew them away when they heard it back. They couldn't believe it.

MR&M: Were there any rehearsals prior to recording or did you just turn on the machines and let the tapes roll?

MF: There were never any rehearsals.

MR&M: What was the producer's [Richard Dashut] role in this project? He wasn't really shaping the music per se, so what did he do?

MF: We didn't have a sophisticated

board, but in my opinion the drum sound turned out better than recordings we've done in the past. Richard concentrated on making sure we were covered in terms of microphones. We recorded 16 tracks, which is more punchy than 24, and then we transferred it back to 24 with the overdubs. When we mixed down, we linked up the 24 and the 16 tracks, so we retained the original dynamics of the drums. A lot of effort went into getting down the absolute correct miking. Where the sound was going to come from was not the EQ, but the mic and the source sound itself.

• • •

MR&M: What is the ratio of African music to rock music on the record? You completed the album with Todd Sharp on guitar and George Hawkins on bass. How much of what we hear will be their music and how much will be what was recorded in Ghana?

MF: There were also other people playing on the album: [original Fleetwood Mac guitarist] Peter Green was one of them. George Hawkins did a substantial amount of the singing.

MR&M: Who do you perceive as the audience for this record? Do you think Fleetwood Mac fans will buy it?

MF: I don't really know. I hope it will appeal to a lot of people, because I didn't go down there to do something too weird and wonderful. If I did, it would never get played on the radio and the whole point of making music is to have people hear it. I wanted this to be heard, so I took some songs I didn't write, like "Not Fade Away," and "Walk A Thin Line," a song by Lindsey Buckingham from the *Tusk* album. I took those songs out of personal choice. The main reason for that is because I wanted this to work both ways. I didn't just want to take stuff out of there. I wanted them to be confronted with music that we wanted to play and vice versa. Before people hear it they think it's gonna be real strange. But I think it works, even though it's a strange combination. There are some songs that have very little percussion, and one on which I don't think listeners will be aware that there's any percussion at all. We just cut a track there as three musicians, without a lot of Ghanaian musicians participating on it. Yet there

are tracks that involve 60 or 70 players, plus us.

MR&M: Why did Warner Brothers [Fleetwood Mac's label] reject the album and how did RCA end up with it?

MF: Without any strange feelings over it, I think Warners decided not to take the project because they thought it was going to be some drummer's extravaganza. I was, admittedly, a bit surprised. They thought it was going to be some crazed lunatic person living out his fantasies. I failed to tell them that that was not what I intended to do. So quite simply, after Warners decided not to take the album, we went to RCA, who gave it a huge amount of support. The fact that I represent something that has had a certain amount of success is reason for a record company to sign it.

What's more interesting to me is that the president of RCA, without having me explain very much, was quick to catch on to what I was trying to do. From that point on, it's been nothing but a good relationship.

MR&M: What is the relationship between the record album and the film made while you were in Ghana? Is there to be a separate soundtrack?

MF: We recorded the film soundtrack on our multi-tracks and we should have good sound quality on that. That will all be put together in the not too distant future.

MR&M: Were there other complexities involving the filming that added to the problems you already were experiencing from making the record?

MF: We tried to keep the filming as separate as possible. The main reason for being down there was not to make a film. We made the film secondary to the recording, and that being the case, it didn't create any huge problems. There were technical problems, because the film crew was Ghanaian, and there were moments, with things falling out of cameras, and so on. The film was academic, just documenting us working with African musicians and traveling around. Hopefully, it will capture the environment of us working there.

MR&M: You also gave a benefit concert while you were there. Was that also recorded?

MF: It was filmed and recorded. That's also in a holding pattern. I just thought it would be a shame not to record a "live" concert situation since we had all that equipment down there. The night before the concert I went down to

the site and looked at the stage and I wouldn't have put more than ten people on it. I don't know how they did it, but they fixed it up and it was a great success. There were only 2,000 people there, but the Vice President of Ghana was there and it was a very lively session.

MR&M: Did you bring a regular drum kit with you or did you play African drums?


MF: I brought my kit; I didn't want to go down there to turn around my whole musical career. I wanted to just play the way I play. That's the way I approached the whole thing with Richard: to put two different things together and confront each other. It wasn't hard at all. There were hardships, but they weren't musical. It was more a question of trying to get people to understand what we were trying to do.

MR&M: How will this experience be carried back to Fleetwood Mac?

MF: I think that everything each one of us in Fleetwood Mac is doing on his own is bound to affect the next album. I have no idea what it will be, but I think we'll all have more confidence. Stevie [Nicks] has done an album; Christine [McVie] has produced an album; and Lindsey [Buckingham] is going to be doing an album. I'm sure we'll all be more involved in certain ways. I think it will be a healthy stimulus for us to have done our own little projects.

MR&M: Do you have a desire to do another solo album?

MF: Yeah, I have nothing but good memories from this. It was not a nightmare at all.

 **Richard Dashut, in France during this interview, co-producer of Mick Fleetwood's album, spoke about his involvement in the project.**

MR&M: How did you originally become involved with production, and how did you come to work with Fleetwood Mac and now Mick's solo album?

Richard Dashut: All those parts came together at the same time, actual-

ly. I was living with Stevie [Nicks] and Lindsey [Buckingham] about three years before they even met Fleetwood Mac. When they met the rest of the band, they did the *Fleetwood Mac* album—the one before *Rumours*. Keith Olsen produced that one, and he was the person I learned from for two or three years. After that album, when the band went on the road they asked me to do their "live" sound. So I did that for a year. Then when it was time to do *Rumours*, I guess I was in the right place at the right time. I lucked out. I co-produced it with Ken Caillat. I'd been doing my own sessions as engineer before that, but that was my first production work.

MR&M: How would you compare working on a Fleetwood Mac album to

"I didn't just want to take stuff out of Ghana; I wanted them to be confronted with music we wanted to play & vice-versa."

working on *The Visitor*?

RD: It's a whole different thing, really. With Fleetwood Mac, you have the five members of the band, and then Ken and myself, and we all make decisions in a very democratic way. That's real nice, because you get a well-rounded point of view and the responsibility is shared with everybody. In Africa, with Mick, we were on our own; there was nobody to turn to. We had the responsibility of making it work. Here, RCA was kind enough to give us all this money to do it and trusted us. We had to take the ball and run with it. We hadn't actually planned out what songs we'd do or whom to use; we didn't do any of that until after we signed the deal and went to Africa. We stopped in Australia for two weeks and we found one song there in a bar. Some of the songs were written by George Hawkins and Todd Sharpe once we got down there [to Africa] and others were written by the African musicians. We had no idea what they'd be like until we got there.

MR&M: Backing up a bit, what was your first reaction when Mick suggested going to Africa to make a record?

RD: After thinking that he was out



of his mind, I was excited about it, mostly for Mick. It was something that he had been talking about for years. My first thought was, "How the hell are we gonna do that? How are we gonna bring all the recording equipment and organize the thing?"

MR&M: How did you prepare for it? It must have been quite an ordeal to set up recording equipment in that environment, under those circumstances.

RD: The basic preparations were made by Mickey Shapiro, our executive producer, who's Mick's attorney. He got in touch with the right people. Then Mick, I and a professor at UCLA who's from Ghana and specializes in music, sat down and Mickey told us where he thought we should go.

One reason for going to Ghana is that it is very rich in music. Nobody ever goes there to record. They go to Nigeria or Kenya—the typical places. To my knowledge, nobody had recorded the music of Ghana, certainly not with a 24 track. The only other project done there was a thing called *Soul To Soul* [recorded in 1971 and released on Atlantic Records], and the Ghanaians were very bitter about that because these people came down there and made a movie and a record and, to my knowledge, not one dime of it went back to the musicians of Ghana. We had to overcome that feeling that we were a bunch of white people coming down to take their music. We set up a deal where we paid the musicians in advance; we got all the financial stuff straightened out.

MR&M: How would you describe your role as producer? It obviously wasn't a typical situation. What did you actually do?

RD: I was more directly involved in the selection of songs and musicians.

The main thing was which way to take the album. Most people in the U.S. thought we were going over there to bring back a bunch of crazy drummers. So the biggest problem for me was to find a way to make it both commercial and cultural. We definitely wanted to expose people to African music, but if you just put out strict drum rhythms and the cultural stuff, nobody's going to listen to it. So the first problem was how to combine what we consider hit music with what the Africans do.

MR&M: How did you go about that? How did you instruct a group of African drummers that they were going to play a song called "Not Fade Away?"

RD: Well, in that case, what we did was lay down a basic track with Mick, George and Todd. Then we brought in percussionists and background singers and we played the music back through studio speakers real loud, and just got them to get into it because they'd never heard it before. After playing it four or five times, we turned them loose on it. We either liked it or we didn't, and if we didn't, we'd bring in another bunch of people—until we got something we liked.

MR&M: Did it ever work the other way around, where they'd play something you liked and then you'd go ahead and record something based on what they'd played?

RD: Absolutely. On "Super Brains" and "Amele," and "The Visitor;" those tracks were done exactly like that. The band, or cultural group, would go out and we'd record them, in the strictest sense, just like they'd play it, and then we'd take the tracks later and overdub it. So we had a two-fold thing; one on which we'd do the songs and they'd overdub over our stuff, and secondly,

where they'd do the songs and we'd overdub over theirs.

The interesting thing was when we first left we thought that the best and the only thing we could do was make every song a blend between the two. But how it turned out was that some were strictly African and some were Western. We found that by putting all these tracks on the same album, we had a blend.

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MR&M: What were some of the difficulties getting the equipment to where it had to go, and getting the actual studio set up?

RD: Getting the equipment there was the most monstrous problem we had. We're talking about a country where if you own an icebox, you are on top of the heap. There're no telephones, no place to call for parts, nothing. My first thought was, "What if something breaks down, what are we going to do?" I definitely wanted to record 16 track because I think it sounds better than 24. So we brought two 16 tracks, portables, so that if we needed a part we had a whole other machine, rather than try to bring parts. Then we brought our own board and mics.

When Mick and I first conceived the project, we were thinking about a mobile; I had no idea how to do it. Then I met Randy Ezratty, who had just finished putting together a whole mobile recording system. He had it all completely portable. So our original thought was we'd ship all the gear down there, shove it in the back of a Land Rover, and off we'd go, into the bush. But it's not quite the way it worked out. What happened was that in Accra, the British had left an old movie studio, a huge, 40-foot high, monstrous building. We decided to use it; rather than bringing the equipment there, we'd bring the musicians to us. But it cost about \$200,000 just to get the gear and personnel to Africa. The scary part was that I kept feeling I'd forgotten something.

MR&M: Did you encounter problems with the heat?

RD: At times it was up to 120° and the speed started wavering on the machines. We couldn't figure out why, and the gentleman who went with us, Bill Youdelman, figured out that it must've been the heat. So we ended up finding an air conditioning unit—again, very rare there—just for the control room. Finally, we got it cool

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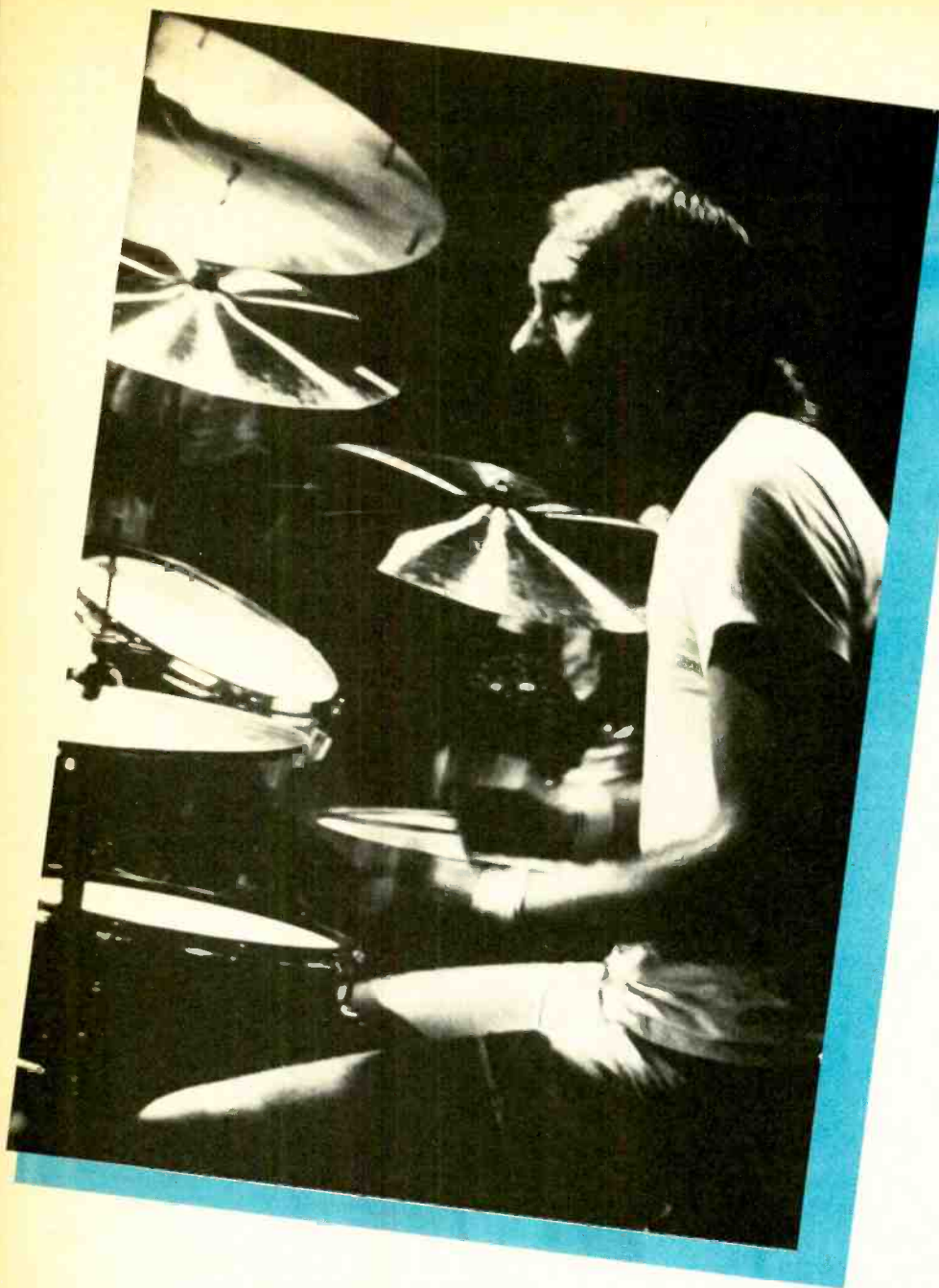
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enough to run at normal speed. Also, for one of the songs, "The Visitor," we recorded outside, and we had to run extra long mic cables and luckily everything held up. We lost one or two mics.

MR&M: What did you do with all 16 tracks? Wasn't there very little overdubbing if you recorded the musicians "live?"

RD: Actually, there was a lot of overdubbing. But the 16th track was for my syncing, so that when I continued overdubbing I could lock a 24 track in. Our basic track went down on 12 to 14 of the tracks. When it came time for mixing, I was able to sync the 16 and 24 tracks together so I would get first generation on both.

MR&M: Can you run through some of the equipment you used?

RD: The important thing is that it was not a mobile truck; it was all brought over in cases; We ended up using four RSL (Rogers Sound Lab) speakers. Our mainstay of mics were Schoeps-AKG 451s. Also, there were some Neumann mics. We found that the Schoeps were the best mics to hold up in the heat. Also, we chose three MK 250s because 250s seemed to do the best with humidity. And we went 30 ips non-Dolby. There was no Dolby used in any stage of the operation. Also, a first for me was I ended up mixing on UREI Time-Aligned™ monitors, the 813s, which I love.

When we mastered it, we used absolutely no equalization from the board. The way I did it was to patch straight from the machine to the cutter head and bypass the board, except for the master faders. That definitely gave us a cleaner sound; I can't stress that enough. People think that if you go through a board and don't add EQ it's gonna sound the same. But it's not true. It sounds much better if you bypass the electronics altogether. Also, we ended up mastering it on an Ampex ½-inch 2-track.

MR&M: What instruments were used on the recording?

RD: Well, the Africans had different sized drums. My personal favorite was a huge square drum which they'd sit on and hold their feet against. By raising and lowering their feet, they could raise the pitch of the drums. Then they'd have various conga drums, from eight feet tall down to a few inches. They used talking drums, with strings. You can put them between your arms and your chest and by squeezing it you could change the pitch. There were a lot of shakers—gourds with beads around them. And there was one African xylophone. As far as the other stuff, it's pretty much the basic Rogers drums, a Fender bass and Todd played an old Gretsch White Falcon.

MR&M: How was everything miked? Were there problems?

RD: The first thing we realized was that we couldn't close-mic everything. The thing I most wanted to do was to capture the natural sound of the whole thing, to try to really get the ambience of it, rather than getting my interpretation of it by mixing. So, the important drums we'd mic separately. For the background singers we'd put four or five mics about seven feet apart, back about six feet. So we had a blend between the drums, which sounded real tight, and the African ambience. As far as Mick's drums went, I miked those in a normal way. There were no baffles in the studio, so it was all completely open. It was all tied in—the bass was right next to the drums, and if there were one or two conga players I'd set them next to each other. If there were big background vocals or a big rhythm section, they'd be set apart.

MR&M: Would you want to go back to Ghana to do this again?

RD: Yeah, Mick and I are already talking about the next one. I don't know where it's gonna be, but it'll be something crazy, I can assure you.

Studio Notebook #2

By James F. Rupert

SCENE 1

Spanky: Hey gang! Why don't we put on a show!

Alfalfa: Gee Spanky, do you think we could?

Spanky: Sure we could! Darla could sing, and we could use Porky's barn and we could get two cents from every kid in the neighborhood who wants to come!

Alfalfa: Gosh, Spanky, do you think we can raise enough money to get Stymie's goat out of the goat pound?

Spanky: I'm just sure we will, gang!

Butch: Aw, you guys don't know nothin' about puttin' on no show!

Spanky: Shucks Butch, if you don't want to be in our show you can just leave!

SCENE 2

Rocky: Hey guys! What do you say we open up a studio!

Louie: Gee Rocky, do you think we could?

Rocky: Sure we could! Big Fred could be our engineer; we could use Ralph's basement and then we could get twenty dollars an hour from every band in town!

Louie: Wow, Rock, do you think we'll make enough for new gear for the band?

Rocky: Hey, no sweat, man!

Harvey: Wait a minute, what do we know about running a recording studio?

Rocky: Well, up yours, Harv! Are you gonna be in or out?

Sound familiar? It should. Basement recording studios in the 80s have replaced the basement bands of the 60s as the instant status symbol available for a pitiful few thousand dollars. Home studios have become as common as horsehair in a mattress factory. Some of these domestic empires are lucky enough to make a few bucks profit. Fewer yet eke out enough screaming eagles to expand and diversify the recording services they offer. A smaller number establish themselves as premier recording centers for their area. Tinier numbers luck into releasing a record, jingle or special project that perhaps begins to bring them into more of a national perspective. Hack from that a meeker ratio that build themselves into a nationally-known studio, with full schedules and plenty of business, cash and opportunities.

But let us slide back down six rungs on that ladder, gentle reader, and return to those ever-proliferating basement audio dynasties spoken of previously. You all know the type. It's the do-or-die business run by enterprising young people by merit of their courage and sticktoitvity. They face each and every obstacle with a stiff upper lip, supported by their basic belief in capitalistic free enterprise and the democracy that allows all of us the opportunity to grab for our own

slice of the pie, regardless of race, creed or color. You know who I mean. It's the guy down the block who wants an exciting side business that he doesn't plan on declaring a dime's worth for taxes. It's the rock band who thinks every other studio in the area is ripping people off with their high rates and their refusal to understand the mind of the artiste. It's the audio enthusiast who thinks that anybody with half a brain could work a job like that (confusing, of course, recording with politics).

Small studios have an expendability rate as high as Ben-Gay in an old folks home. United States Small Business Administration figures indicate that one of the major causes of business failures in this country is that the prospective businessperson didn't really know what he or she was doing when he/she started. There was not enough cash preparedness, the market was not studied for demand and pricing information, the competition was not accurately evaluated, permits and licenses were not applied for, and on and on. The ideas and principles of the people involved may have been sound, perhaps even previously successful in other situations or for other people. But the fact remains that the business failed. It is small compensation to someone who's work has

just gone down the Himalayan Hopper to think that maybe they almost made it. Or they would have made it if only...

In business, as in life, one of the most useless statements that can be made is the lament, "I should have done this," or "I should have done that." The key is working yourself into an ability to say, "I did this, I did it right and I made it work." The best way to get into the habit of doing things right is to get into the habit from the word go. Doing it right frequently involves a lot more initial hassle than taking a short-cut and worrying about it later. But going into business for yourself is no time to simultaneously join the Procrastinators Club of the World. The hassle today could turn into a lawsuit in three months. Forewarned is forearmed.

So where do you start? Well, let's try beginning with honest appraisal. We've talked in the past about your own personality. ("Small Studics—The Lighter Side of Business," February 1980 MR&M), now let's talk about your bankbook.

We'll go right down the list and see if there is anything you might have overlooked in your money budgeting (see chart). The chart, you will notice, is divided into two separate sections. The first section (A) are expenses you will only have to pay once—at least getting started, anyhow. Down the road you might incur additional expenses for more remodeling, expansion and additional equipment, but these are things that should be justified and paid for from profits of operation. An allowance for advertising is included in this section, but please note that is only for your grand opening.

At first examination there are two category headings that might be confusing. If you've already spotted them, you might be wondering what is meant by "receivables" and "cash." Receivables is short for "accounts receivable," meaning the money owed to you by your credit customers. If you're dealing with an advertising agency, a school system or any large company, you might be chagrined to learn that they work under a 30-, 60- or even 90-day billing period. That means you do the work for them in a hot flash because they need it in a hurry, but they pay their bills at the end of 30, 60 or 90 days following the invoice (billing) date. The first thought leaping into your minds might be, "What a bite!" but that's just the way it is sometimes. There's nothing illegal or even unethical about it. Some companies are so large that it takes them one to three months to take care of all the paperwork that goes with paying their debts. Consequently, when your studio is first starting you might run out of tape and supplies at the end of a month or two and no one has paid you a cent so you can sprint out and buy more. The Receivables category is your estimate of how much money you might need to buy more stock for your inventory so that you are able to stay in business until those credit customers pay up. (Take

heart, campers. The customers that have the longest credit terms seem to be the larger companies who potentially give you the most work. It doesn't necessarily always work out like this, but often enough to make it worth your while to be patient with them.)

Perhaps you might also work out special payment terms regarding length of time before you do the work so that there is no misunderstanding afterwards. Either way, the time to realize the potential problem is before you are neck deep in it.

The term "cash" means just what it implies. What would happen a month after you open if you found a mixdown deck worth \$2000 that someone is sacrificing for \$500? It's just what you're looking for and it's not being sold out of the trunk of a '55 Chevy, either. Are you going to be able to reach into the studio emergency fund, fan out five portraits of Benjamin Franklin and say, "I'll take it!" Or will you be asking if the seller is interested in taking an autographed picture of Desi Arnaz in trade? The term "cash" denotes the amount of money that should be set aside for unexpected purchases, losses or special expenses. Suppose a basement pipe springs a leak, soaks down

STARTING COSTS to BE PAID ONLY ONCE

Fixtures and Equipment	_____
Remodeling	_____
Installation Fees, Costs	_____
Starting Inventory	_____
Utilities Deposits	_____
Legal, Professional Fees	_____
Licenses, Permits	_____
Advertising, Promotion for Grand Opening	_____
Receivables	_____
Cash	_____
Other	_____
	total

ESTIMATED MONTHLY EXPENSES

Salary of Manager/Owner	_____	2x
All Other Salaries/Wages	_____	3x
Rent	_____	3x
Advertising	_____	3x
Delivery Costs	_____	3x
Supplies	_____	3x
Telephone	_____	3x
Other Utilities	_____	3x
Insurance	_____	*
Maintenance/Repairs	_____	3x
Legal/Professional Fees	_____	3x
Miscellaneous/Other	_____	3x
Taxes/Social Security	_____	4x
Interest	_____	3x

TOTAL ESTIMATED INITIAL CAPITAL REQUIREMENTS

your tape supply and ruins it. Do you have the bread to replace it? A recording studio with no tape is only a very expensively furnished room, and very uncomfortable furniture at that.

Don't let "Fixtures and Equipment" fool you, either. You can't just list all the recording gear you'll need and let it slide at that. This category also includes tape and equipment storage shelves, cabinets, studio furniture (chairs, couch), special lighting, maybe even an outside sign. If you plan on doing mobile recording work, don't forget about a van or truck in which to haul your potential hernia makers.

For "License and Permits," take a hike down to your local city hall and find out what's necessary and/or mandatory for your locality. Ditto for "Utilities Deposits."

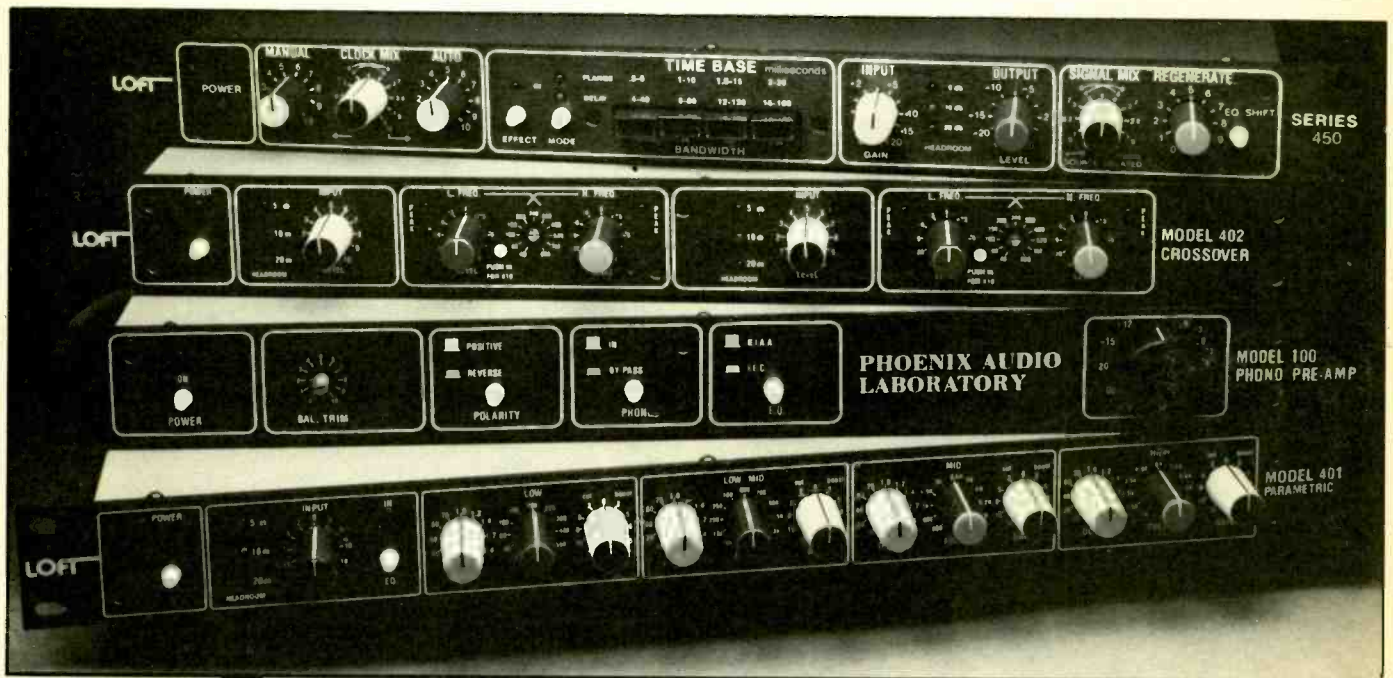
If you are cheating and looking ahead at the entire list, you've probably figured out that some of the information you need to fill out the form is known and some has to be estimated. Especially in the second section of monthly expenses—a category such as "Supplies" (inventory) will depend on how much business will be done in that period. Nothing could be truer. Right now fill out the form using a rough estimate for the figures you feel you would be doing monthly in your first year.

In upcoming articles we will be looking closely at specific charts designed to help you determine your estimated earnings up to three years in the future. You might be surprised how your original figures will change on this form in a few months time. You might want to draw up a master copy of the chart and make several photocopies of it for future figuring and reference. Chance has it that you might be revising it several times before we're through. It's a dirty job, I know, but somebody's got to do it.

In filling out the second section of the chart, remember that you need to jot down figures of monthly expenses. These numbers should be placed on the lines immediately next to the category headings.

Next month we'll be discussing how to compute the figures to go on the second series of lines and what those strange little numbers right next to the second column of spaces mean. For now I won't be tricked into telling it, because it's a secret. But here's a hint: They're real important! World peace depends on those guys, and I don't even know if the planet Earth will survive until the next issue comes out and the secret is told! I mean, I'm talking holocaust here! But I'm almost out of room, so, in the meantime, don't worry about it.

See you next time.



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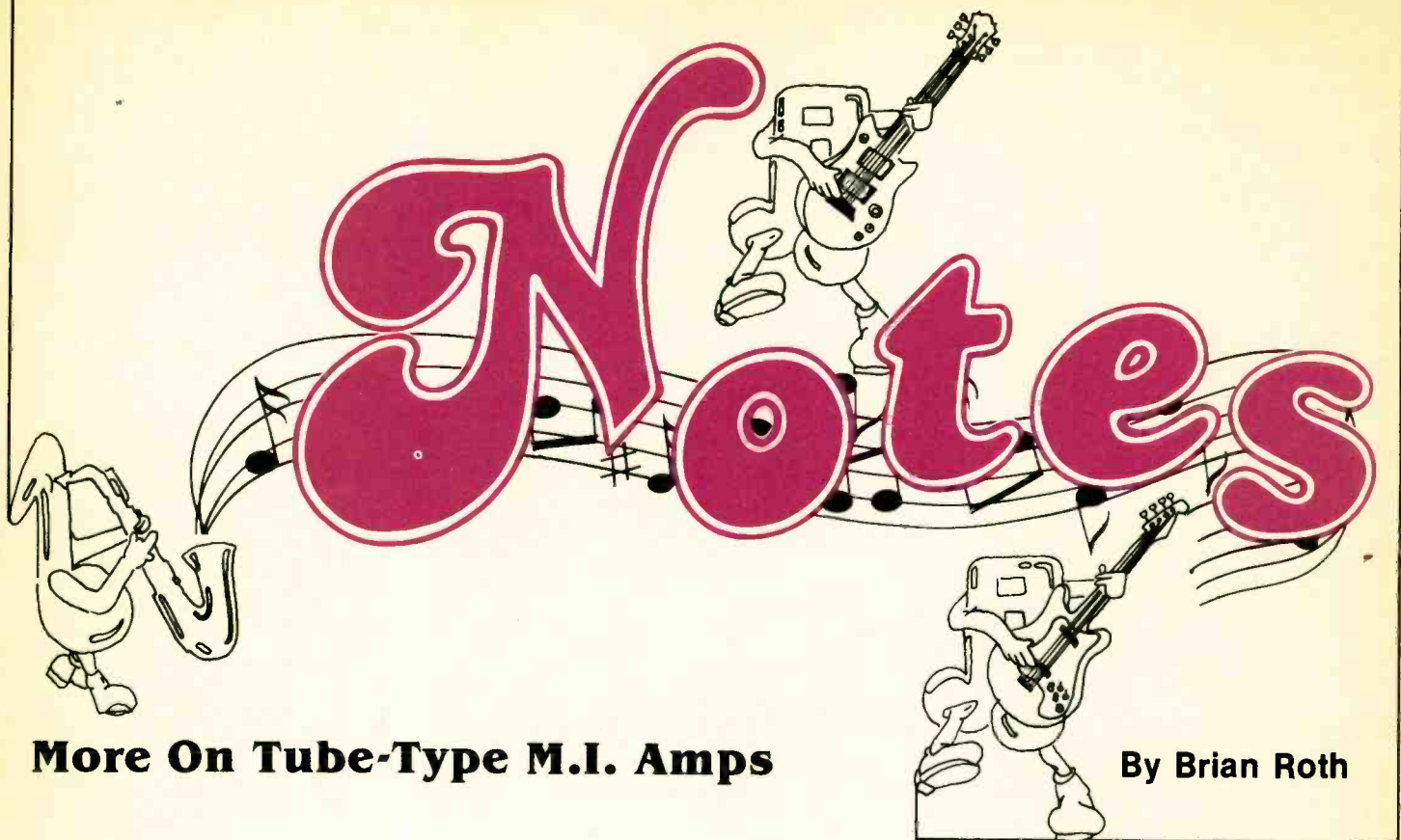
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More On Tube-Type M.I. Amps

By Brian Roth

Before continuing with the troubleshooting procedures we began in the June 1981 issue, I am going to take a moment to stand on my soapbox and talk about a potentially dangerous design found in almost all instrument amplifiers.

The "ground" switch appears innocent enough. If a hum or buzz is heard from the loudspeaker, a flip of the ground switch will often eliminate the noise; this is a useful feature. However, the method used to make the ground switch operate is potentially lethal!

Refer to *Figure 1*. You will see the two wires bringing 120 volt "house current" into the amplifier's chassis (this would be 240 volts for amplifiers used overseas). The voltage is used to energize the power transformer and hence the entire amp.

Now look how the ground switch is wired to the AC power line. Depending upon which way the switch is flipped, either the "hot" or the neutral power line is connected to one end of a capacitor. The other side of this capacitor is wired to the amplifier's metal chassis.

This is done to allow a small "leakage" current to flow into the chassis. Hopefully, this will "buck" any hum induced into the chassis by the power transformer or the AC power wiring.

This is great in theory, but what happens if the capacitor fails and becomes shorted? In this event, one or the other AC power wires (depending upon the position of the ground switch) is hooked to the amp's chassis! This will make the entire chassis one great big "live" wire, and a great danger of electrocution exists!

Fortunately, the grounding capacitor doesn't short too often; but I have seen several instances where the capacitor has developed a low internal resistance (these particular amps were brought to me because they were causing a nasty "zing" when touched by the musicians). Lucky for them they weren't also touching a grounded object—such as the metal case of a microphone plugged into a well-grounded P.A. system—when they got jolted by the amp!

The older the capacitor, the more likely it is to fail. Age takes its toll with all electronic components, and capacitors are no exception.

To make matters worse, most amplifiers more than a few years old are fitted with a two-wire (non-grounding) type power cord and plug. Newer models have a three-prong plug that hooks a grounded wire to the amp's chassis and prevents shocks. [Refer to "Practical Electrical," Part I, March 1981 issue, for a further discussion of three-wire grounded systems].



Now I can hear gasps of panic coming from studios and clubs all around the country. "We're too young to die!" I hear you saying. "What should we do?"

First, don't panic. The odds are that the capacitor in your particular amp is not leaky. It's a good idea to eyeball it, though. On a Fender amp, it is a cylindrical device attached directly from a terminal on the ground switch to the chassis. Its value should be .047 mfd at 600 volts. If the capacitor

shows any visible signs of wear and tear (deformed shape, ooze coming out from one of the end caps), it should be replaced. Fender uses a UL (Underwriter's Laboratory) type approved capacitor that is safe (we hope!) to use in this type of application.

Newer models of Fender amps are supplied with a three-wire (grounding) power cord which will prevent shocking experiences, *if* the third, rounded pin is not snipped off and *if* the wall outlet is properly grounded.

A new power cord can be installed on amps that were made with only a two-wire power cable. This should be done by a qualified technician since an improperly wired power cord can cause equipment damage, fires and electric shocks. This month's "Technician's Corner" section will briefly discuss the wiring configuration.

I should mention that a grounded power cord can put a fly in the ointment if a DI (direct box) is used in conjunction with the instrument and amp. A ground loop, which causes hum, can be created if the amp and P.A. are connected to separate ground points. This can be avoided by using one central power and grounding source for all the stage equipment. Transformer coupled DI boxes tend to minimize ground loop hum better than "active" type direct boxes.

Another trick I have seen is to wire all of the amplifier's chassis to the P.A. amp rack with a heavy gauge (#12) wire. This method usually works to prevent ground loop hum in cases where the amps do not have a third grounding pin. Some sound companies take this a step further and also tie all the shields (pin 1) of the stage mics to this central grounding point. Then all of the shields are disconnected at the console to prevent ground loops.

To sum all of this up, always beware of an amplifier if you feel a tingle while touching it or your instrument. If your pinkies detect juice, get that amp to the doctor *immediately*. Also, you might try brushing the loose end of one of your guitar strings against the exposed metal surface of any microphone you'll be utilizing. If any potential difference exists between your amp and the P.A. system, you'll see sparks and hear crackling through the equipment.

So much for that. I'll step down from my soap box and continue with more mundane topics.



The preamplifier/tone control stages of tube-type amps tend to be pretty reliable. The most common maladies involve crackling and similar noises, and these almost always can be traced to faulty preamp tubes. The bogus bottle can often be isolated by finger thumping on the small tubes. Be sure to have the volume controls turned up part way so you can "hear" the tubes that are prior to the volume pots.

Because many amps live in smoke-filled clubs, it is common for tar and nicotine to coat the tube pins as well as the socket contacts. This can be spotted by gently rocking the tubes in their sockets (careful—they do get a bit warm) with the amp turned on. If static is heard while the tube is rocked, then the socket needs a blast of contact cleaner. I use Jif made by GC Chemicals (available at many electronic supply houses), but there are other brands that will work. Just be sure that they do not contain anything beside a solvent and possibly a silicon lubricant. Avoid brands that leave behind a pile of goo.

While on the subject of a contact cleaner, Jif is useful for

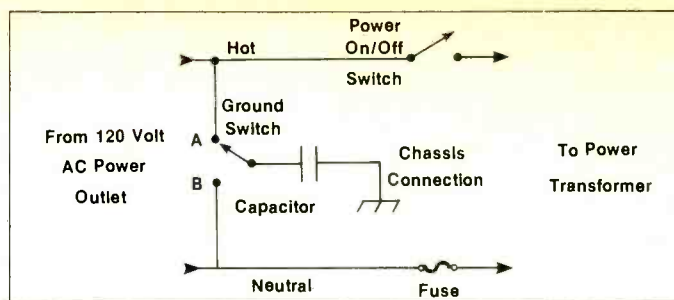


Fig. 1: Schematic of ground switch commonly found in most amplifiers.

cleaning the volume and tone controls also. You will need to remove the chassis from the cabinet to gain access to the potentiometers. The cleaner should be squirted into the small slot adjacent to the three electrical terminals on the rear of the control. Then rock the knob back and forth through its range about ten times to thoroughly scrub the contacts. Incidentally, only a quick shot of cleaner is required.

In advanced cases of wear, cleaner will not help matters. Replacement of the scratchy pot is the only solution. This is also true if the audio signal "cuts out" as the particular control is adjusted.

Be sure to make a drawing of which wire goes to which terminal before you remove the pot. The volume pots are typically 1 megohm resistance, and the bass or treble controls are 250 kilohms on Fender amps. These values can be verified by placing the probes of a VOM (volt-ohmmeter) on the outer two terminals. This test should be done with the pot out of the circuit. When replacing a control, be sure to specify the resistance and audio taper. This last characteristic assures that the tone or volume control will have the same range of useful operation rather than having the "action" bunched up at one end of its mechanical rotation.

A common cause of reverb malfunction can be traced to faulty or disconnected reverb cables. A pair of these run from the amp chassis to the reverb tank which is installed onto the bottom of the amp's cabinet. RCA phono plugs are soldered to each end of these cables, and we all know how reliable those are! Substitution of a known good set of phono patch cords is the best way to determine if the wiring is defunct. To ensure proper operation, don't interchange the input and output lines; replace them one at a time to avoid confusion.

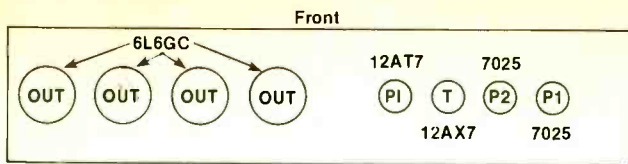
A funky reverb footswitch or cable can also kill the effect. Fortunately, merely unplugging the footswitch from the rear of the amp will bring the reverb back to life if the footswitch/cable assembly is at fault. Most Fender dealers stock replacement footswitches.

Technician's Corner

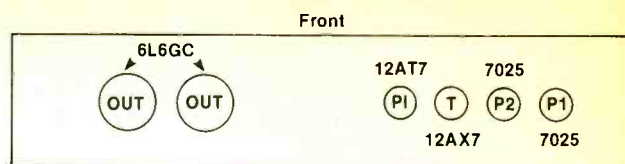
As mentioned earlier, I will describe how to replace a two-wire power cord with a three-wire grounding type.

Step One is to remove the chassis from the cabinet. Then you will be able to see the wiring configuration. On most Fenders, the two wires are soldered to the accessory AC outlet. Note the color coding and desolder the AC lines. Next, remove the strain relief (a pair of small automotive type ignition pliers works well) and the old power cord.

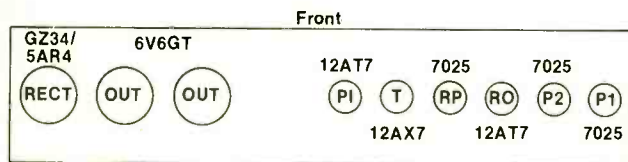
If you can find a new three-wire cable with the same



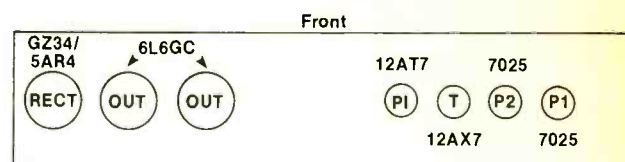
Fender Twin Reverb (mod. AB763)



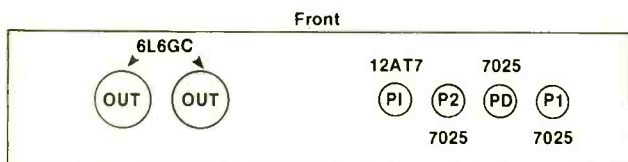
Bandmaster Amp (mod. AB763)



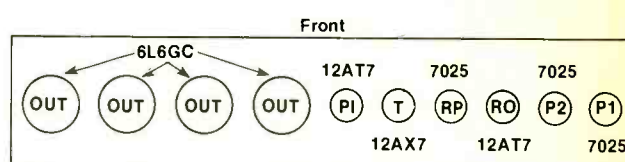
Deluxe Reverb Amp (mod. AB763)



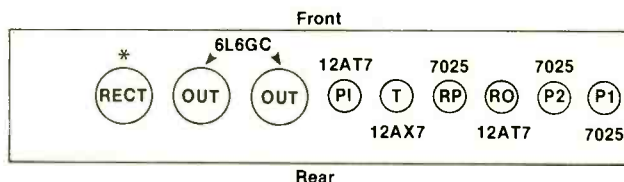
Pro Amp (mod. AB763)



Bassman Amp (mod. AA270)



**Showman Amp
Dual Showman Amp (mod. AB763)**



- *5AR4/GZ34 on Super Reverb model AB763
- *5U4GB on Super Reverb model AB568
- *5AR4/GZ34 on Pro Reverb model AA165
- *5AR4/GZ34 on Vibrolux Reverb model AA964

diameter as the original cord, your job will be much easier since you will be able to use the existing strain relief.

The white and black wires of the new cord connect to the accessory outlet, and the green grounding wire should be securely soldered to a chassis terminal. That completes the modification.



Before getting into preamp servicing, I will pass on a few output stage tricks I have picked up over the years. The first of these involves output tube matching.

Matched tube sets are available for common power output applications (6L6, 6CA7/EL34, 6V6, 6550), but they are becoming more difficult to find. Also, some "matched" sets are only marginal matches at best.

So, here's a little scheme that works pretty well. Install two or four new output tubes as required. Fire the amp up, and allow about ten minutes for the tubes to stabilize. Adjust the output tube bias to the manufacturer's spec. For Fenders with 6L6 output bottles, this should be around 50 volts (negative with respect to chassis) although some technicians set the bias for a slightly lower voltage (-46 to -48) which reportedly gives a "ballsier" sound. Pin 1 on the

output tube socket is a convenient measuring point to check the bias. Use a high-impedance voltmeter to avoid loading the bias circuitry voltage.

Some amps do not have a bias adjustment control, so if the voltage needs tweaking, you'll need to change resistor values in the bias supply circuit. The manufacturer's service data is probably required to know which resistor to change.

With the outputs warm and the bias set, measure the voltage drop across the 470-ohm resistor (on Fenders) soldered from pin 4 to pin 6 of the 6L6 output tubes. The positive meter lead goes to the screen grid voltage source (pin 6, usually) and the negative lead goes to pin 4. The voltage drop will be several volts, so use a 5- or 10-volt DC range. Be careful not to allow either lead to contact the chassis, because these points on the tube sockets are over 400 volts from the chassis potential (and don't you touch these points either!).

If the tubes are well matched, the voltage drops across each of the 470-ohm resistors will be matched within 10 to 20 percent. If this isn't the case, keep trying different tubes until you come up with a set that has about the same drop across each screen grid resistor. Admittedly, this method of matching is not the most ideal, but it does seem to work well. It is common to measure about 10 percent or more output

Key to Tube Functions

- PD = Predriver (feeds preamp signals to phase inverter).
RECT = Power supply rectifier.
OUT = Audio power output.
P1 = Channel one preamplifier.
P2 = Channel two preamplifier.
PI = Phase inverter/output tube driver.
T = Tremolo effect oscillator/driver.
RO = Reverb spring driver (feeds spring input).
RP = Reverb preamplifier (receives signal from spring output).

Miscellaneous Notes

- 1) Most manufacturers of tubes currently sell a 12AX7A/7025 tube rather than stocking each kind. This tube can be used in a position for a 12AX7 or a 7025 without problems.
- 2) 5AR4 is the American version of the GZ34.

power after installing a matched set as compared to a random set.

Now on to the preamp section. The best method of tracking down a missing signal in this part of the amp is to insert a 1 kHz sine wave signal into the input (use about 50 mV to avoid overloading the front end) and start tracing the audio with an oscilloscope. Again, the manufacturer's service data is an invaluable help.

In Fender and Marshall amps, the various resistors and capacitors are mounted on an insulated card which is mounted to the chassis. It is not unusual to find that some of the connections at the terminals or eyelets have become flaky. This will cause intermittent operation of a particular function. I ran into this recently on an old Fender Twin that would "lose power." On the bench, the critter worked fine, but when installed back into its cabinet and cranked up with a guitar input, drastic volume changes were heard. The problem was a loose connection at one end of a resistor in the phase inverter circuit. A quick blast with the tip of my Weller soldering gun cured the problem.

This month I am including tube layouts for a variety of Fender amps. Although these charts are usually pasted inside of the cabinets, the paper often ages and falls off. So, try to match up the model of the amp with the charts, and you'll be able to determine "which one goes in which hole." If I hear enough requests, I'll try to include layouts for other models and brands in future columns.

Until next time, keep those cards and letters coming in, folks!



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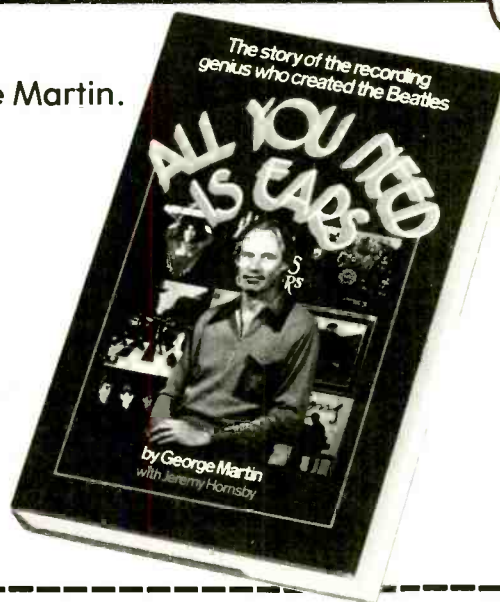
Now, in ALL YOU NEED IS EARS, Martin details his amazing career in the vanguard of modern recording. . . from the early days when wax was the medium, 78 was the speed, and an echo chamber was a small tiled room. . . to the advent of revolutionary digital reproduction. His vast experience makes him an expert commentator on fascinating backroom details like acoustics, arrangement, orchestration, microphone techniques, and more.

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Ambient Sound

BY LEN FELDMAN

Suddenly, They're Equalizing

I suppose the professional segment of the audio industry deserves the credit, but all of a sudden we seem to be bombarded by a huge variety of devices designed to help us set up our studios, sound rooms, concert halls and even home listening rooms for properly "flat" audio response. Equalization has become respectable—and if you aren't into using a fancy equalizer you are just not up to date in audio. But, as you can see just by examining two of the equipment reports which appear in this issue of *MR&M*, there are many ways of setting up an equalizer and, as you might suspect, the manufacturer who espouses one method is quick to criticize all other methods. The fact that two instruments dealing with equalization and equalization analysis passed through our lab in one month prompted me to set down a few thoughts (and a few basics) regarding this interesting and often controversial subject.

Two Approaches to Acoustic Testing

In all acoustic testing and adjustment, the general approach is to supply an appropriate test signal to the audio system being tested and then to measure sound levels produced. In order to translate the measurements into a meaningful frequency response plot, two basic methods are generally used. The first involves frequency analysis, using a wide-band signal that embraces all of the frequencies of interest simultaneously, while the second involves the generation and measurement of specific frequencies or narrow bands of frequencies and their analysis or measurement, one at a time.

Elements of Overall Frequency Analysis Testing

The basic elements used in the overall frequency analysis method of acoustic testing and adjustment are shown in *Fig. 1A*. Usually, a broad-band pink noise generator provides the signal that is used as an input to the audio system which is under test. A microphone picks up the sound waves produced by the loudspeaker(s) of the system and converts these sound waves back into an electrical signal which forms the input to a spectrum analyzer, or real-time analyzer (RTA).

The analyzer separates the various frequency bands and displays their relative intensities in some form (e.g., on a CRT, in banks of LED indicators, etc.).

Spectrum analyzers are generally quite expensive, though their cost is directly related to their frequency resolution capability. Thus, a spectrum analyzer able to resolve down to one octave will be less expensive than another RTA able to resolve down to $\frac{1}{3}$ -octave.

Specific Frequency Band Measurement

The basic elements used in this method of acoustic testing are shown in the block diagram of *Fig. 1B*. Here, just as before, the signal produced by a variable frequency signal generator is applied to the audio system, but measurements of sound intensity are made by means of a sound level meter which is placed in the approximate listening position. To obtain a complete response plot, the frequency (or frequency bands) of the generator is changed or stepped across the entire audio band in discrete increments, and readings of the sound level meter are plotted, either automatically or manually, on a suitable graph. The sound level meter, in this instance, includes a calibrated microphone and if the sound level meter's calibration curve is known, correction factors can be added or subtracted from readings to obtain maximum accuracy of the final response graph.

Regardless of whether you elect the generally more expensive overall frequency analysis (spectrum analysis) method of acoustic testing or the less expensive (but usually more tedious) specific frequency band method of measurement, it was long ago discovered that sine-wave signals, while suitable for testing the electronic portions of an audio system, are highly inappropriate as signal sources for use in actual acoustic measurements in a listening environment. The problem inherent in using sine-wave signal sources is that in a room of finite dimensions, at certain audio frequencies, the sound wavelength of the test signal just fits a dimension of the room an integral number of times. A phenomenon known as a standing wave is produced. Standing waves are similar to the vibration of a string of a musical instrument under tension. Another term used to describe such effects is "room resonances." In

three-dimensional space a large number of resonances can occur, and each can produce either an increase or a decrease in the response of an audio system at particular frequencies, depending upon the relative locations of the listener and the source. Often, if sine wave signals are used and points are plotted at, say every third of an octave, the resultant curve may appear as though it needs extensive equalization at specific frequency bands when, in fact, the "dips" or "peaks" in the response curve may be very narrow in bandwidth and might not even be perceived by a listener in that particular listening room. Acousticians maintain that dips and peaks in response which are considerably narrower than one-third of an octave will not be perceived by most listeners as irregularities in the overall frequency response of a given audio system.

Using Random Noise Signals for Acoustic Testing

The whole point behind using random test signals such as "white noise," "pink noise" or "finite bandwidth pink and white noise" in acoustic testing is based upon the concept that such random-noise signals never produce one frequency long enough for a standing wave pattern to develop and be maintained. While several types of random noise signals are used in acoustic testing, certain types lend themselves more towards spectrum analysis type of testing while other types work best when testing with the aid of a sound level meter.

Specifically, broad band pink noise is a random noise signal that contains *all* audio frequencies distributed in such a way that there is *equal energy* in a given frequency band compared with any other band (such as an octave, a third-octave, etc.). Thus, if you were to ex-

amine the output of a pink-noise signal source over a logarithmically plotted frequency response curve (in which the horizontal distance from one octave to the next is constant across the spectrum), you would see a 3-dB-per-octave downward slope of the pink-noise output signal.

Since broad-band pink noise contains *all* audio frequencies randomly produced, it is an ideal test signal for use with a spectrum analyzer. The filters within the analyzer divide up the signal into appropriate octave, third-octave or even finer increments and amplitude of each "band" thus divided is displayed on the analyzer's display format, whether it be a cathode ray tube, a series of LEDs or whatever.

When acoustic measurements are to be made with the aid of a more simple sound level meter/microphone combination, wideband pink noise is obviously inappropriate. What is required in this case is a pink noise signal of limited bandwidth. The bandwidth of the finite-band pink noise should correspond to that of the equalizer which will be used in correcting any problems in the response of the system under test. If the equalizer in the system is an octave-by-octave equalizer, then the pink noise generator should deliver pink noise test signals which are one octave wide and whose center frequencies are at or near the center frequencies of the equalizer's band controls. If a one-third octave equalizer is used, the pink noise bandwidth should be one-third of an octave for each test signal.

Pitfalls in Acoustic Testing

I recently talked with several of my colleagues who had been given the opportunity to evaluate an equalizer/analyzer that I had previously tested in my own lab. I was curious to find out if they had the same suc-

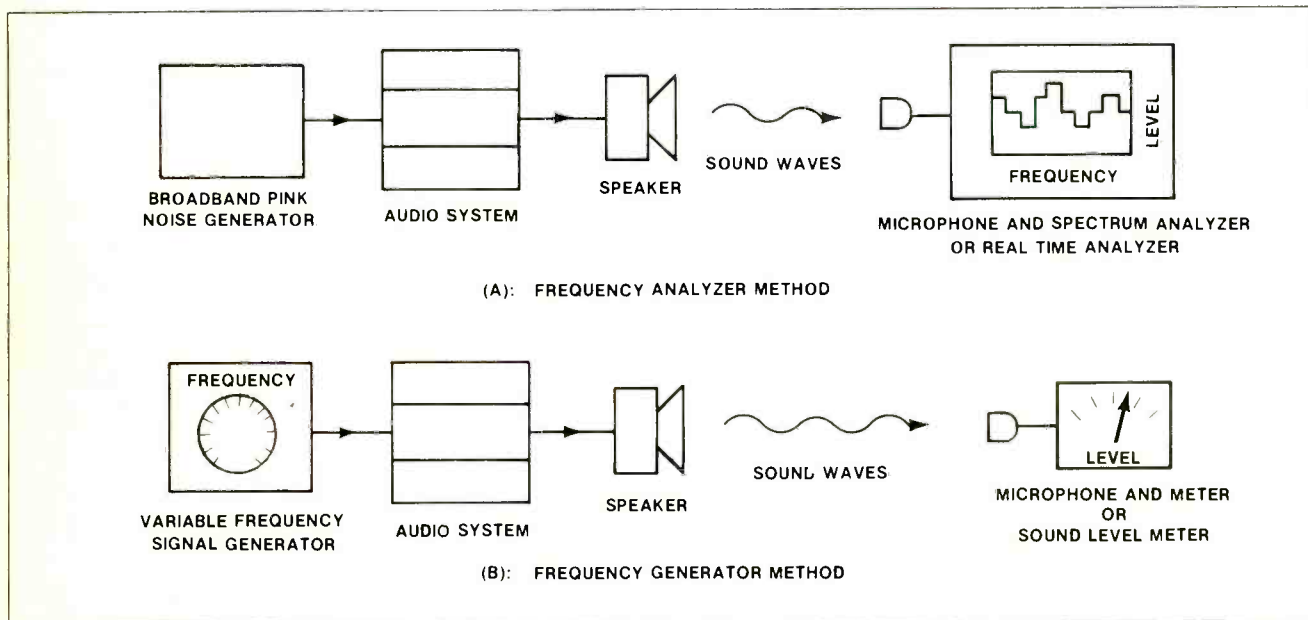
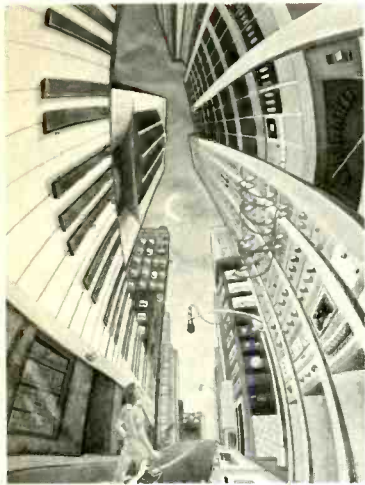


Fig. 1: Elements used in acoustic testing and equalizer adjustment. (A): Frequency Analyzer Method; (B): Narrow Band Frequency Generator Method.

unbalanced? balanced? fader type? meters? sensitivity? input impedance?
 outputs? **CONFUSED?** metal tape?
 parametric? bandwidth? pad? frequency response? bypass? load protection?
 graphic? balance control?



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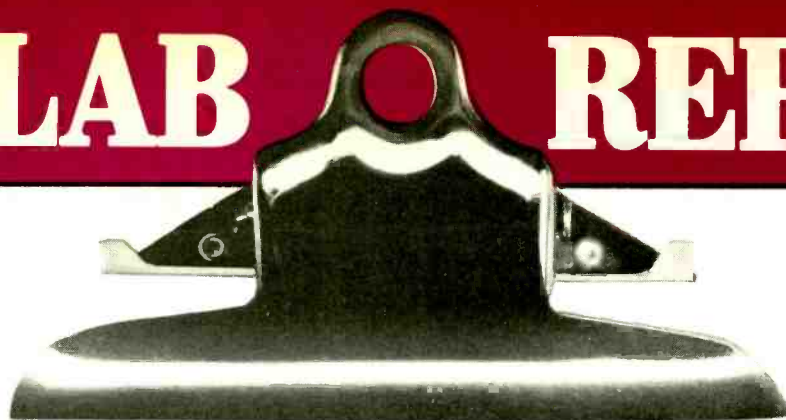
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NORMAN EISENBERG AND LEN FELDMAN

Audio Control "The Richter Scale"TM



General Description: The device from Audio Control known as "The Richter Scale"TM (apparently it has no model number as such) is described as a half-octave bass equalizer with asymmetrical electronic crossover. It also contains a bass frequency analyzer, complete with warble tone generator, a small dB meter and a supplied measurement microphone. Also incorporated in the device are a subsonic filter, a low-frequency summing circuit for mono bass mix and a deep bass boost circuit.

Half-octave bass equalization is accomplished by five sliders with nominal center frequencies of 31.5, 45, 63, 90 and 125 Hz. These controls go through a range marked from +12 to -12, with detents at the zero settings. The analyzer portion of the panel, to the right, contains the warble-tone level meter, a frequency selector which is continuously variable but which has frequency markings that correspond to the five frequencies of the sliders and the analyzer "on" button. When this button is left in out position, the equalizer and

bass boost functions remain operative.

Also on the panel (from the left) are: a tape monitor/source selector; the subsonic filter switch (18 dB/octave from 20 Hz); a button to activate or defeat equalization; the low-frequency summation button (also called a rumble reducer); the ultra-low boost button (+15 dB at 34 Hz); the electronic crossover selector (18 dB/octave with selectable frequency of 100 Hz or 800 Hz); and the low-frequency output level control (-20 to +20 dB with a detent at 0 dB). The panel is black matte with white lettering. A version that permits rack-mounting is available.

Signal connections at the rear, made via hi-fi pin-jacks, are provided for left and right channel high-frequency and low-frequency output from the electronic crossover; left and right channel output of the warble tone generator; single input for the microphone; left and right inputs from, and inputs to, a tape recorder; left and right inputs from, and inputs to, the tape monitor loop of a receiver or amplifier.

The stated purpose of the device is to provide an effective means of improving bass response since, in the words of the manufacturer, "even the finest speakers suffer from peaks and dips in the last octave or two." The half-octave setup is designed to permit fine-tuning of speaker bass response. The ultra-low bass boost circuit is designed to restore 15 dB of low-frequency signal which is said to be lost during disc processing. The subsonic filter is designed to remove the subsonic spurious signal products resulting from a speaker that has been equalized to flatness at 32 Hz. The crossover permits bi-amplifying (via external amplifiers and subwoofer, of course).

Test Results: The features and most of the specifications of the "Richter Scale" were confirmed in our tests. *Figure 1* (A, B, C, D and E) shows five individual dual frequency plots taken of the Richter Scale using our Sound Technology 1500A Test Set. These plots show maximum cut and boost for each of the half-octave controls found on the device. The printouts show the frequency of the electronic "cursor" setting, and the plus and minus dB level achieved with each slide control. In those instances where the cursor setting does not correspond to the center frequency listed by Audio Control, that is simply because the cursor on our test instrument moves in discrete increments and we chose the reading nearest to the nominal center frequency given by Audio Control—e.g., 130 Hz in *Fig. 2* (E) instead of 125 Hz. In any event, boost and cut ranges were, in all cases, close enough to the plus and minus 12 dB claimed, so there is no need to quibble.

In *Fig. 2* we plotted the response at the high-frequency and low-frequency output terminals of the device's electronic crossover section. As may be seen, actual crossover occurs at 175 Hz rather than at 100 Hz, and at 1450 Hz instead of 800 Hz for the two available crossover settings provided. We suspect that, in our test sample, the filters were not perfectly tuned (note the slight rise in response for the low-frequency sections in each case, just before roll-off), and that if they had been optimally tuned, the measured crossovers would have been closer to the nominal frequencies stated in the specifications. It is possible, by the way, to alter the crossover frequencies to suit one's particular speaker system, although that means, of course, getting inside the unit.

General Info: Dimensions are 14½ inches wide; 5⅞ inches deep; 2½ inches high. Weight is 5 pounds. Price: \$229.

Individual Comment by L.F.: Six separate bass-improving innovations are what Audio Control claims

to have incorporated in this neat little audio accessory. They do not exaggerate. I suppose you want to know what (as we did) the significance is of the instrument's name "The Richter Scale." Well, follow this: Audio Control is located in Lynnwood, Washington, which is not far from Mount St. Helens. And, of course, the bass rumblings of volcanoes and earthquakes are measured using—you guessed it...

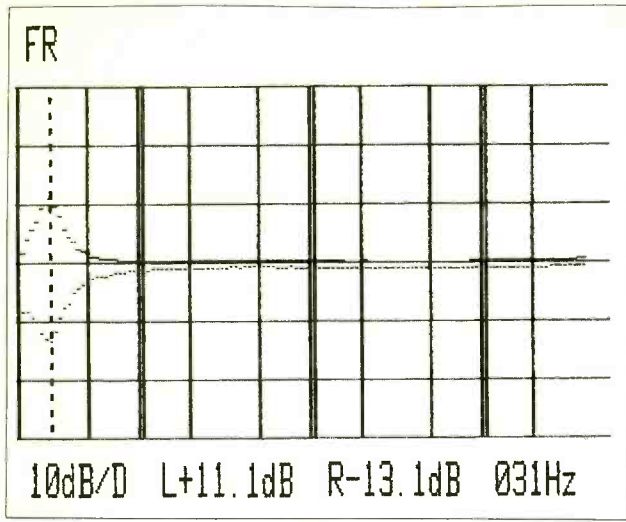
I like an audio company with a sense of humor, so long as that sense of humor doesn't get in the way of a good product. In the case of The Richter Scale we have a good product that would have won my approval even without the funny name (or statements on the descriptive brochure to the effect that it was "Printed on Mars" and that "All specs and Steve Satra's pliers are subject to change without notice").

What Audio Control's model C-101 is to the entire audio spectrum, (we reviewed that innovative piece of equipment in October 1979), The Richter Scale is to the bass region of the spectrum—and then some. The phase-accurate electronic crossover can be used in conjunction with the half-octave bass equalizer. The warble tone is a good type of test signal with which to equalize bass in a real-world listening environment if you are going to use a meter such as the one built into this multi-purpose unit. The rumble filter and the mono-mix rumble reducer (operative below 200 Hz, where stereo directionality is practically non-existent) are essential elements of this bass-improving component and, in my judgement, the unit would not have been nearly as useful had these extra features been omitted.

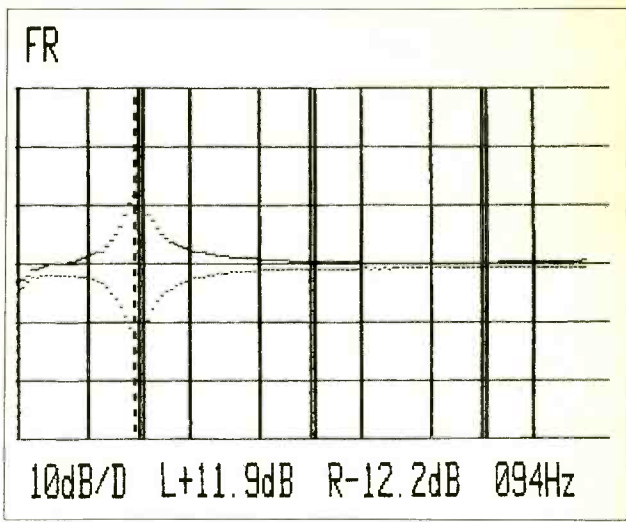
What worries me just a little is the possibility that unsuspecting audio neophytes may try to use The Richter Scale as a cure-all for all their bass ills, regardless of their source. The device can boost bass frequencies (centered at 125, 90, 63, 45 and 31.5 Hz, or combinations thereof) by as much as 12 dB, but if such corrective action is taken for a system in which amplifiers are going to overload and speakers are going to be overdriven when an attempt is made to "flatten" bass response, the end results may be worse than if you hadn't bothered in the first place.

In my own experiments at bass equalization, I was also reminded of another real-world fact. Ambient bass levels in most listening rooms—though subjectively inaudible—are amazingly high in SPL terms (air conditioners, outside traffic, even vibrations from the building itself are all culprits), so unless you do your bass equalization at high enough listening levels to override the ambient noise levels, you will *think* you want to attenuate the bass controls on The Richter Scale's lowest half-octaves when in fact they may need boosting.

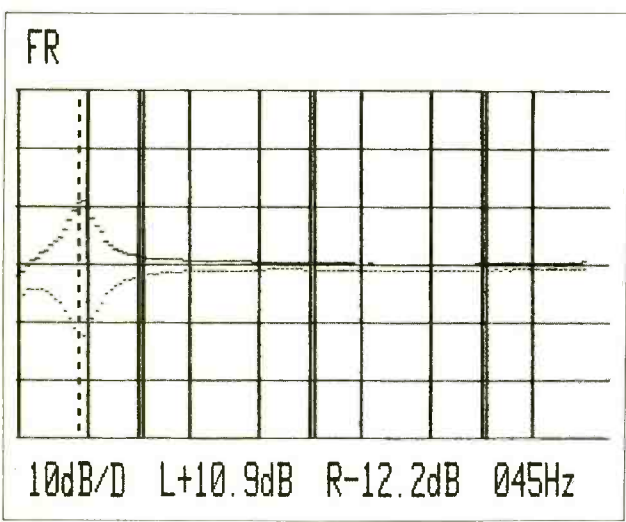
What is perhaps most amazing about this instru-



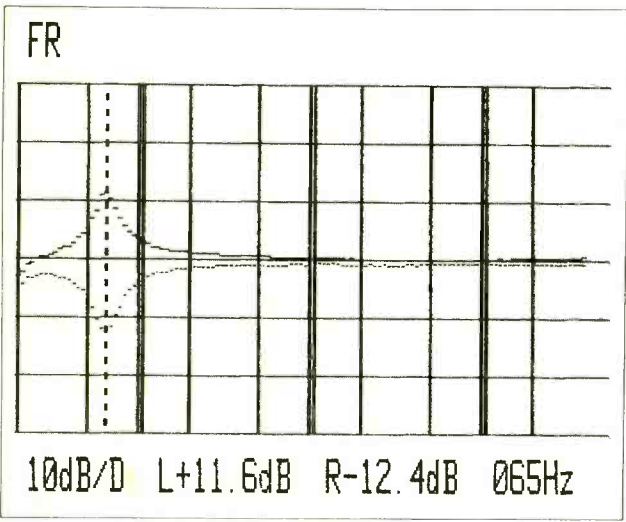
1(A)



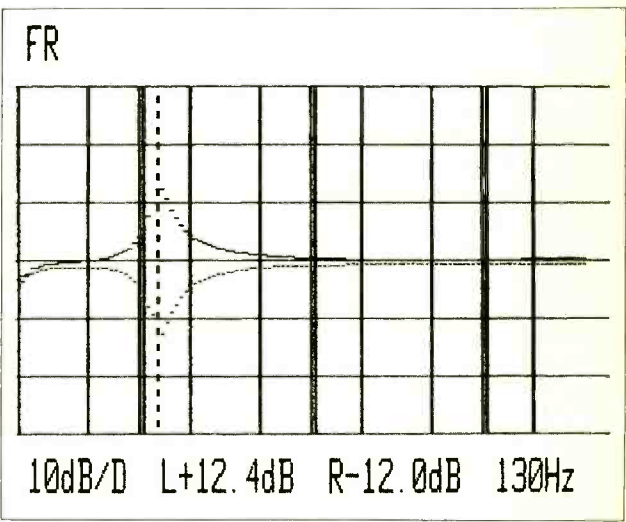
1(D)



1(B)

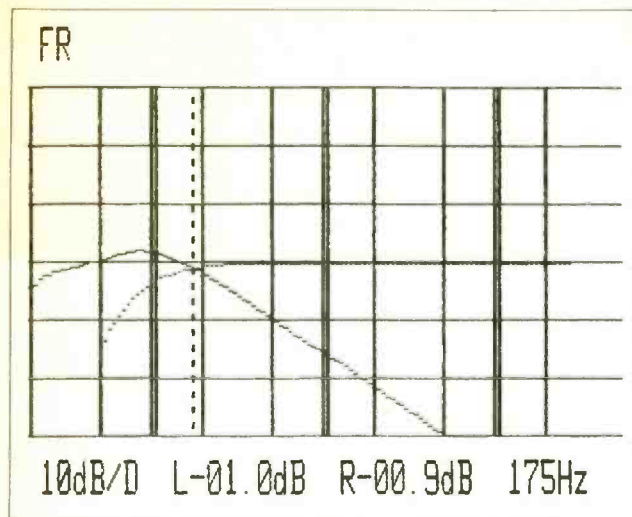


1(C)

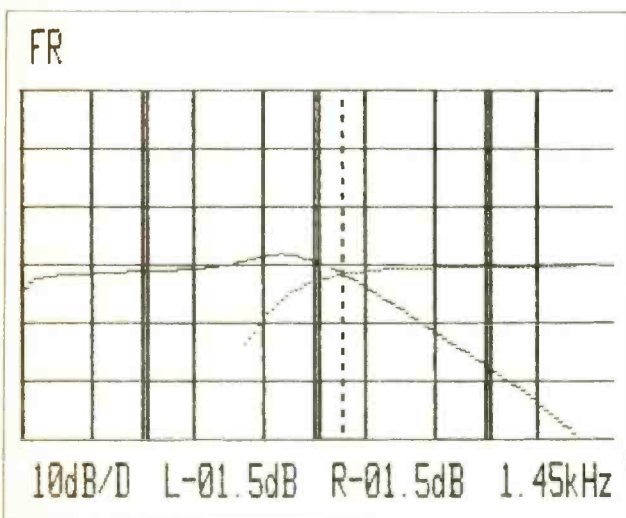


1(E)

Fig. 1 (A-E): Audio Control "Richter Scale": Calibrated plots of boost and cut range for each of the half-octave controls. In each display, the dotted line cursor has been set as close as possible to nominal frequency of the control being measured. (Actual center frequencies are: (A) 31.5 Hz; (B) 45 Hz; (C) 63 Hz; (D) 90 Hz; (E) 125 Hz.)



(A)



(B)

Fig. 2: Audio Control "Richter Scale": Response characteristics of the electronic crossover sections of the unit. (A): 100 Hz crossover; (B) 800 Hz crossover.

ment (and that seems to be true of other Audio Control products I have seen so far) is its unbelievably low price. I really don't know how Audio Control can deliver such products at the prices they charge and still make money. I hope they are making some money out there in Rainforest country, because I'd hate to lose a company with such a great sense of humor (they were offering volcanic ash with their products for a while), and such a great array of feature-laden products.

Individual Comment by N.E.: Apparently what Audio Control has done here is to take various techniques for improving bass response and combine them into one compact device that offers several options for cleaning up and/or augmenting low-frequency playback response. I find that it is most effective on bass transients (such as abound in pop and rock music) and less dramatic on classical music except for sudden deep drum beats or sustaining low-string pizzicatos. It also proved good at finding and subduing a resonance in my listening room that I have previously noted (using other analyzers) at about 90 Hz.

These and other applications of the device raise the question, though, of whether such acoustic improvements can be, or should be, accomplished by more specialized devices. That's a tough one to answer. Maybe the question should be not what the device can do, but rather who will want to use it. It is primarily a playback accessory, and its "personality" (including its signal connectors and its rather small meter) suggest it is aimed more at the fussy home stereo enthusiast than at the working sound pro. I doubt that a studio technician or a sound-reinforcement man will desert his full-size graphic and/or parametric equalizer or real-time analyzer for The Richter Scale. This is not to deny the versatility of this device or the clever engineering that has gone into it, but rather to suggest that it does have definite limits as an "audio tool." For instance, it equalizes both channels at once and by the same amounts even needs correction at a given frequency. And its very compactness does crowd the many options available on the panel.

AUDIO CONTROL "THE RICHTER SCALE": Vital Statistics

PERFORMANCE CHARACTERISTIC	MANUFACTURER'S SPEC	LAB MEASUREMENT
Meter range	- 20 dB to + 3 dB	Confirmed
Distortion	0.015%	0.013% at 1 kHz, 1 V out
Frequency response	± 1 dB, 3 Hz to 100 kHz	Confirmed
Input impedance	100 K ohms	Confirmed
Output impedance	150 ohms	Confirmed
Subsonic filter	18 dB/octave at 20 Hz	Confirmed
Low frequency summer	200 Hz, 12 dB/octave	Confirmed
Electronic crossover	18 dB/octave, 100 or 900 Hz	175 and 1.4 K Hz
Warble output	100 mV	120 mV
Signal-to-noise	90 dB	95 dB ("A" wtd)

CIRCLE 25 ON READER SERVICE CARD

Hall ATS-401 Acoustic Test Set

General Description: The ATS-401 Complete Test Set from Hall Engineering consists of the Hall model ATG-301 acoustic test signal generator together with the Hall model SLM-201 calibrated sound level meter. Both devices are available packaged, together with detailed instructions (actually, three separate manuals, one each for the generator and the meter, and a third containing a detailed explanation of acoustic testing of audio systems), in a sturdy Samsonite attache case whose interior is carefully padded and compartmentalized to safely and conveniently hold the test gear.

The generator itself (model ATG-301) can be switched to furnish white noise, pink noise and finite bandwidth pink noise with variable frequency and bandwidth. The noise-selector or "mode" switch is located at the top left corner of the front panel. Below it is a similarly styled switch for selecting the frequency range in steps of low, mid and high. A third switch at the bottom selects bandwidth in steps of 1/20, 1/10, 1/5, 1/3, 1/2 or full octave.

The large dial and knob in the center of the panel selects frequencies from below 20 Hz to beyond 22 kHz. The control here is continuously variable so that sweeps are feasible. The dial is divided concentrically into three bands of frequency decades, with overlap at the extreme ends of each band's range. Output level is adjusted by the knob at the right; its specified range is from 0 dBm (relative to 600 ohms) to below -40 dBm. Above this knob is the device's AC power off/on switch and indicator; below it is a pair of output terminals, marked for polarity, which accept twin banana plugs with standard spacing. The generator's power cord emerges from the right side and is fitted with a three-prong (grounding plug).

The sound-level meter (model SLM-201) is a handheld unit with the microphone at the end of a tube that extends about nine inches up from the top of the unit. The face of the device contains the range switch, a button to select "A" weighting or flat response, a slow-fast damping switch and the dB/SPL scale. The range switch has positions for off, "batt" (this tests the condition of the internal battery which is shown on the meter scale) and then the dB/SPL reference levels of 120, 110, 100, 90, 80 and 70. Since these levels refer to "0" on the meter which itself runs from -10 to +6, the total range handled is from 60 to 126 dB/SPL. The battery that powers the meter, a 9-volt cell, fits into a small compartment on the underside.

Suggested applications of the Hall test set include equalizing with either graphic or parametric equalizers;



speaker placement and level control adjustments; speaker phasing; testing custom-made speakers; adjusting tone and balance controls.

Test Results: Since there is not much we could measure concerning these instruments, which are themselves measuring devices, there is no table of "Vital Statistics" with this report. We did, however, put the system through its paces and we did make some interesting photos of its various signal outputs.

A spectrum analysis (20 Hz to 20 kHz, logarithmic sweep) of the generator's wide-band white noise output is shown in Fig. 1. Note the uniformity of amplitude of the random noise across the entire audio spectrum. A similar analysis of the generator's pink noise output is shown in Fig. 2. Here, the requisite slope of 3 dB per octave (downward with increasing frequency) is clearly

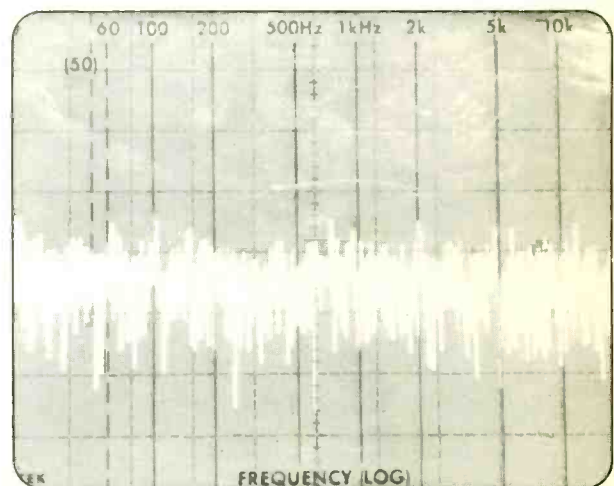


Fig. 1: Hall ATS-401: White noise spectrum produced by the ATG-301 generator.

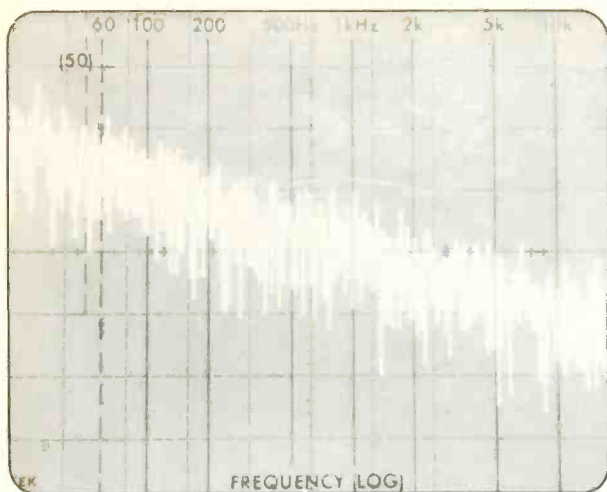


Fig. 2: Hall ATS-401: Pink noise spectrum produced by the ATG-301 signal generator.

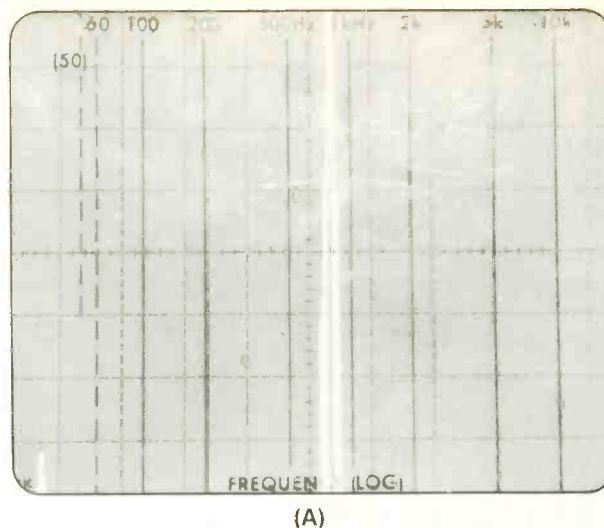
evident. This amplitude slope results in equal noise energy per octave.

Switching over to the generator's fractional-octave pink noise mode, *Fig. 3* shows various fractions of an octave, from the extremely narrow 1/20-octave display of *Fig. 3A* (which almost resembles a single tone in the spectrum analyzer photo), through the medium 1/3-octave mode (*Fig. 3B*), to the wide one-octave mode (*Fig. 3C*). All of these displays were centered about a nominal 1 kHz frequency. However, it is important to realize that the same results can be obtained for any of the device's continuously variable center frequencies.

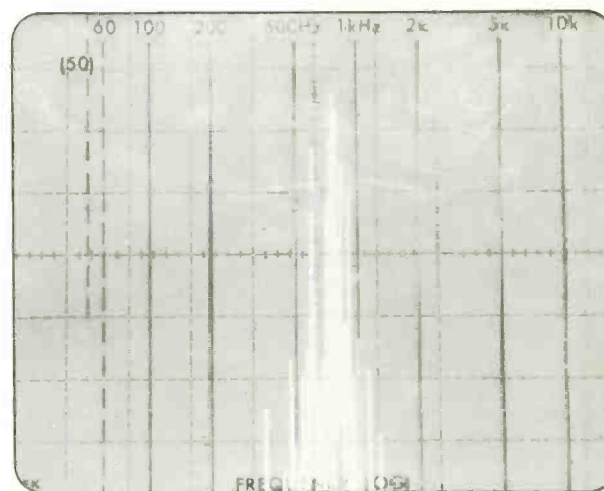
General Info: Generator dimensions are 9 inches wide; 7 inches high; 3¼ inches deep (including knobs and feet). Weight is 2.25 lbs. Meter is 6 inches high (plus 9½ inches for extended microphone); 2½ inches wide; 1¼ inches deep. Weight is 11 ounces. Attache case dimensions are 19½ inches wide; 14 inches high; 5½ inches deep. Weight completely packed is 9 lbs. Price: \$449; less the attache case, \$399. Units individually: generator \$299; meter, \$169; attache case, \$50.

Individual Comment by L.F.: I agree with Hall Engineering that the combination of these two instruments offers a fairly inexpensive means of adjusting system response effectively and intelligently. The generator is an extremely useful device thanks to its flexibility and its variety of output signals which are far more useful and reliable than the 1/3-octave pink noise test records sometimes supplied with graphic equalizers. With the ATG-301 we were able to set center frequencies exactly to the center frequencies of the equalizer with which we experimented in our tests (as an aside, we note that often the "nominal" center frequencies of some equalizers are not the actual filter center frequencies).

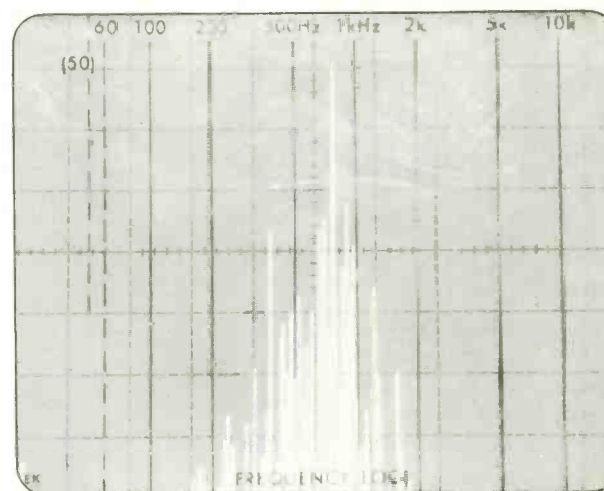
To be sure, working with these two instruments in attempting to "voice" a sound reinforcement system, or



(A)



(B)



(C)

Fig. 3: Hall ATS-401: Fractional octave noise output produced by ATG-301. (A) 1/20 octave; (B) 1/3 octave; (C) 1 octave.

using the set to equalize the play-back system in a recording studio control room, or even in a home audio system, requires more time and patience than would be needed if you used a real-time analyzer. But then, how many real-time analyzers are there that can give you 1/20th octave resolution (or 1/9, or 1/3, etc.) and cost less than \$400?

Incidentally, an important advantage when you purchase the complete test set, rather than the meter or the generator separately, is that Hall Engineering will calibrate the frequency dial of the generator with the frequency response correction factors of the individual meter (and its microphone) included in the set.

Individual Comment by N.E.: There are times when a reliable signal generator, especially one that can sweep through an extended band of frequencies as well as hover around a given frequency, can prove invaluable. There is no need to restate the list of possible uses of

such a device, but I find such a generator especially handy for checking speaker performance in a general way, and in a more specific way—such as going after a particular resonance effect, or studying the response behavior at a crossover point, and so on.

I like the way the ATG-301 handles, and I like the options it provides for output test signals. Styling also is on the plus side, with a very legible front panel and no need to hunt around for the right control when it is needed.

The SLM-201 is obviously an improved version of a former sound meter design, and, as far as I can tell, it operates accurately. The fact that it has been calibrated with respect to the frequency readout on the generator is also appreciated.

All told, the two devices, known as the ATS-401 and packaged in that neat Samsonite case, make one very useful tool for the audio-minded.

CIRCLE 26 ON READER SERVICE CARD



UREI Model 6500 Power Amplifier

General Description: The model 6500 from UREI (United Recording Electronics Industries) is a heavy-duty, professional-grade power amplifier suited for stereo or mono applications. It actually consists of two mono amplifiers sharing one chassis and one power cord (although each amplifier has its own power supply). The unit features four kinds of protection circuitry, including temperature and overload sensing and shutdown, a time-delay after power turn-on and a DC sensor in the output signal for protecting speakers. In addition, the amplifier contains cooling fans that come on automatically if needed.

Each channel has a gain control plus a green LED that indicates normal operation, and a red LED that shows clipping level. Two sets of inputs are provided—there are ¼-inch phone jacks that may be used balanced or unbalanced, plus XLR sockets (balanced). Outputs are 5-way binding posts. The mono-bridge mode is selectable by a switch.

An unusual feature of the model 6500 is an extra cable from a BNC terminal on the rear for connecting to each speaker (in addition to the normal speaker

leads). This added cable is designed to counteract the effects of cable resistance, inductive reactance and capacitive reactance in the normal speaker leads. This "conductor compensation," as it is called, is credited with dramatically improving damping factor and transient response regardless of speaker lead lengths. As a consequence, however, of this innovation, connections to the speakers must be made with correct polarity if amplifier stability is to be maintained.

Test Results: In our tests, the UREI 6500 easily met or exceeded all of its specifications, and generally shaped up as among the best power amplifiers yet encountered. The data for operation into both 8-ohm and 4-ohm loads are listed in our table of "Vital Statistics" and, as may readily be seen, power was higher and distortion was lower than the manufacturer claims. In our tests we deliberately drove the amplifier to the point at which the fans had to come on. Even running at full speed, the fans proved to be extremely quiet. As for the claim of the high damping factor via that special cable, we found that it increased by many

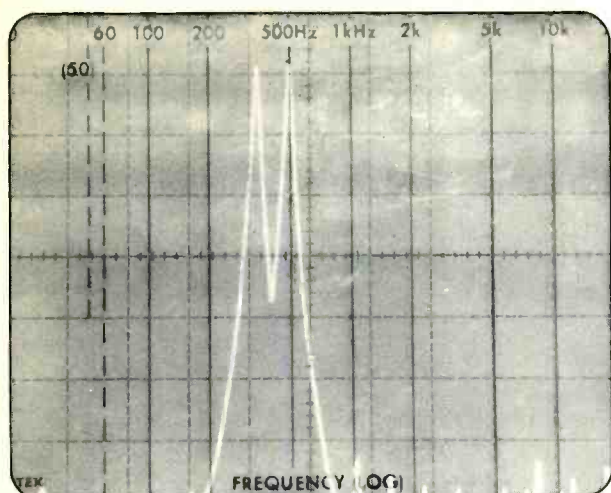


Fig. 1: UREI 6500: 9 kHz and 10 kHz twin tones used to measure IHF-IM are plotted in this spectrum analyzer sweep, which also displays low-amplitude, higher frequency IM components to the right of the desired twin tones.

times—it became so high, in fact, as compared to the DF without that connection, that our test setup was not adequate for measuring it.

A point of interest may be studied in the accompanying 'scope photo which shows a twin-tone measurement being analyzed by our spectrum analyzer to obtain the IHF-IM figure. In this display, the sweep was *linear* from 20 Hz to 20 kHz (notwithstanding the frequency notations at the top of the 'scope face which are used for log sweeps). The twin tones used (worst case is shown) were at 9 kHz and at 10 kHz, and the vertical

sensitivity here is 10 dB per division. As can be seen, the few IM products shown to the right of the twin tones are extremely attenuated, and calculate out to the 0.057 percent figure listed in the table of "Vital Statistics."

General Info: Dimensions are 19 inches wide, 7 inches high, 15 inches deep. Weight is 90 pounds. Price: \$1995.

Joint Comment by L.F. and N.E.: What impressed us both about the UREI 6500 was not so much its ruggedness or durability (we would expect that at its price level), but the fact that designing an amplifier for really heavy and continuous duty in pro applications does not preclude also designing in ultra-low distortion, good transient response and smooth, clear sound reproduction.

At that, some readers may puzzle over the fact that one high-powered amplifier can be lifted and held in one hand, while another of generally similar output wattage requires two men to raise it off the floor. The difference is in the fact that the heavyweight version can deliver its claimed power for rated distortion day in and day out, even when some unattentive sound mixer insists on sending the amp into clipping and overload for much of its duty cycle. Moreover, the heavyweight will usually take, more readily, the kind of abuse that electronic equipment is subject to on the road. Finally, it is just about impossible to make the heavy amplifier blow up, unless there's a random failure in an output stage that is unrelated to the way in which the unit was used.

Of course, for that kind of performance and reliability you do pay—in terms of muscle power and cash outlay.

UREI 6500 POWER AMPLIFIER: Vital Statistics

PERFORMANCE CHARACTERISTIC	MANUFACTURER'S SPECIFICATION	LAB MEASUREMENT
Continuous power for rated THD		
8 ohms, 1 kHz	275 watts	322 watts
4 ohms, 1 kHz	450 watts	506 watts
FTC rated power (20 Hz to 20 kHz)	275 watts	318 watts
THD at rated output		
1 kHz, 8 ohms	0.1%	0.017%
1 kHz, 4 ohms	0.1%	0.037%
20 Hz, 8 ohms	0.1%	0.030%
20 kHz, 8 ohms	0.1%	0.130%
IM distortion, rated output		
SMPTE	0.05%	0.025%
CCIF	NA	0.006%
IHF	NA	0.057%
Frequency response at 1 watt, -1 dB	NA	19 Hz to 42 kHz
S/N ratio re: 1 watt, "A" wtd, IHF	NA	86 dB
S/N ratio re: rated output, "A" wtd	NA	102 dB
Dynamic headroom, IHF	NA	1.58 dB
Damping factor at 50 Hz	500	greater than 200 (see text)
Input sensitivity, IHF	NA	0.060 V
re: rated output	NA	1 V
Power consumption, idling; maximum	NA; NA	400; 2000 watts

CIRCLE 27 ON READER SERVICE CARD



Loft Model 402 Electronic Crossover

By John Murphy and Jim Ford

The subject of our report this month is the Loft Model 402 Electronic Crossover from Phoenix Audio Laboratory, Inc. This is a two-way, two-channel crossover with a full complement of front panel indicators and controls. The active filters used in the Loft crossover are third-order Butterworth (18 dB/octave) types and are therefore capable of providing an accurate frequency (amplitude) response when the hi and low outputs are recombined. The unit is packaged in a standard rack mounting package (single width) and has an approximate retail price of \$495.

General Description: The front panel of the Loft crossover has a black anodize finish with fine white graphics and neatly arranged groups of controls. At the far left there is a push-button power on/off switch with a red LED pilot light above. The power on/off switch also activates an output muting circuit with a delayed turn on/instant off characteristic. This feature is to protect the associated speakers from normal on/off transients or accidental power interruption. The remainder of the front panel is occupied by two identical sets of controls and indicators—one set for each channel.

At the left of each control group is a signal headroom indicator consisting of three LEDs arranged vertically



Because the input level control is arranged as an attenuator, unity gain occurs at the maximum level setting. In the event that additional gain is needed, there is 9 dB of boost available on each of the high- and low-frequency output level controls. These are located to the right of the input level control on either side of the crossover frequency controls and are calibrated in dBs with the 12 o'clock setting corresponding to 0 dB (unity gain). Above each of the output level controls are LED peak indicators which illuminate whenever that output signal level is near clipping.



which illuminate to indicate 20, 10 and 5 dB of headroom remaining with respect to the unit's nominal maximum output level of ± 18 dBv. Immediately to the right of the headroom indicator is the input level control which has its settings labeled simply from 0 to 10. This control, like the output level controls, has twenty-one discrete positions which make it possible to accurately reproduce control settings. The indications in the panel graphics for both the input and output level controls align with the control settings with unusually good precision. These characteristics lend a genuine feeling of excellence to the unit!

Because the crossover frequency controls are recessed in the front panel, access to them is somewhat restricted. This is a very good feature of the crossover since it will tend to prevent any casual [incorrect] adjustment of these critical controls. Like the level controls, the frequency control is a rotary type with twenty-one discrete settings which are precisely aligned with the front panel graphics. A screwdriver is required to adjust the frequency control since it consists of a slotted shaft recessed behind the surface of the front panel with a small indicator dot for reading the setting. The graphics identify eleven frequency settings from 40 Hz to 800 Hz



so there is one setting between each of the indicated frequencies (twenty-one settings). To allow selection of frequencies above 800 Hz, there is a push-button switch next to the frequency control. This switch, when depressed, shifts the frequency control range upward by a factor of 10 so that the control range then spans from 400 Hz to 8000 Hz. When not depressed, the top of this button is flush with the front panel so that an implement such as a screwdriver or pencil is required to actuate it. Again, this restricted access to the frequency controls is an especially nice feature of the unit.

All signal connections to the Model 402 are made at the rear panel by way of ¼-inch phone plugs. Each input is an active, balanced type which accepts single-sided inputs as well. Balanced input connections would be by way of three-conductor (ring, tip, sleeve) phone plugs, whereas single-sided signals would be input by way of standard two-conductor phone plugs. The unit's outputs are single sided and will drive 600-ohm loads. The only other item on the rear panel is an AC line fuse.

Listening Test: Just as a good window pane will allow outside scenery to be viewed without distortions or colorations, so should an audio component be "transparent" to the audio program. And, as an ideal window pane should appear invisible, an ideal audio component should be inaudible (of course we are not talking about those components that are intended to modify the sound of the program, i.e., equalizers, compressors, etc.). Specifically, with the type of A/B listening comparisons that we routinely perform on products

we review, the best the product can do is to be totally inaudible when it is switched into the listening chain. Even if the program sounds somehow "better" when listening through the unit under test, the fact that any difference was heard is a mark against the transparency of the unit. Indeed, neutrality is a difficult quality to appreciate!

In order to verify the sonic transparency of the Loft crossover, we summed the high and low output signals through a precision summing amplifier and interfaced the unit with our reference monitoring system. We were quite careful to set up the crossover for unity gain since even a slight change in signal level on passing through the crossover would mask any subtle sonic problems. On alternately switching the unit in and out of the listening chain while listening to a high-quality direct-to-disc album, we observed no audible changes in any characteristic of the music. This is exactly as things should be and confirms that the Loft crossover is highly transparent to audio information.

On employing the crossover for a couple of weeks in a high performance two-way loudspeaker system (used in a home listening room) we observed that all the controls and features perform as indicated with the possible exception of the output muting feature. When the unit was powered on/off there were slight but none-the-less audible "pops" transmitted to the speakers.

We also noted that the audio was heard instantly

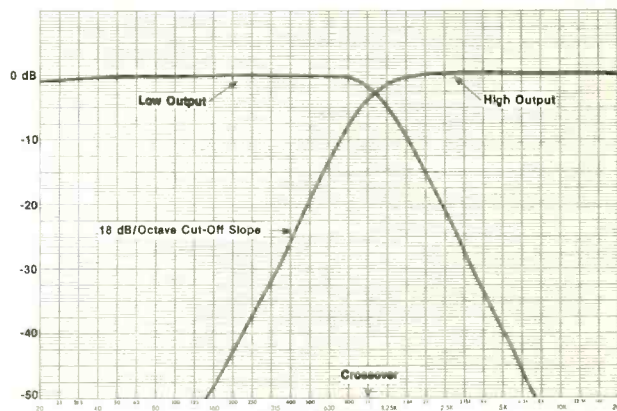


Fig. 1: Loft 402: High and low output frequency response curves.

d lingered a bit after turn-off rather than the "delayed-on/instant off" feature would rate, the pops and thumps from the unit are, less severe than similar units without and are unlikely to cause any problems in is good practice to not turn on the power amplifiers in a system until all other components are turned on and stabilized.

As of the time the crossover was received for review the owner's manual had not been printed, so we have no comment on owner's documentation.

Lab Test: The detailed results of our lab test on the Loft crossover are provided in the "Lab Test Summary" below.

Because the differential input stage provides 6 dB of signal attenuation, the input will accept signals about 6

dB hotter than the unit's maximum output level. The maximum output level of about +20 dBv into either high impedance or 600-ohm loads is more than adequate for any likely application of the crossover. At about -86 dBv, the output noise levels were very low and unlikely to ever be bothersome. The total harmonic distortion (THD) was extremely low, being below .003% at frequencies below 2 kHz and rising slowly with increasing frequency to about .009% at 20 kHz. This very low distortion at 20 kHz is made possible, no doubt, by the unit's high slew rate of ± 11 volts per microsecond. Considering that the output clips at about 11.5 volts peak the normalized slew rate limit (slew rate divided by peak voltage swing) is 0.96 volts per microsecond per volt which is well in excess of the minimum of 0.5 (Jung criteria) recommended for freedom from slewing induced distortion.

Comment: An Exciting Crossover Development

In previous reports¹ we have discussed the relative advantages and disadvantages of the various types of filters used as loudspeaker crossovers. One of the most appealing filter types that we discussed was the "derived" crossover, where the low pass signal (in this example) was derived by electronically subtracting the high pass signal (18 dB/octave Butterworth) from the input signal. The unique advantage of such derived crossovers is the fact that the high and low output signals will recombine to reproduce the input signal with a very high degree of precision. There is no summing error with respect to either the amplitude or phase response of the audio signal. The net result is accurate reproduction of the input waveform; even square waves can be accurately reproduced. Conventional crossovers are incapable of accurately reproducing waveforms because of the phase response error they introduce.

As attractive as derived type crossovers are, they have one serious drawback: steep cutoff slopes cannot be obtained in both filter bands so there is an excessive amount of overlap in the frequency response curves of the filter pair. This is undesirable since it implies that the loudspeaker drivers that the derived crossover is used with must have a correspondingly generous degree of overlap in their response range for optimum performance. This shortcoming of the derived type crossovers has led us to ultimately recommend 18 dB/octave Butterworth filter pairs with their steep slopes and minimal overlap as the preferred crossover

filters for most applications. But there's a new development on the horizon.

At the Audio Engineering Society's 69th convention held recently in Los Angeles we heard a technical paper² given which holds the promise of a significant advance in loudspeaker crossover technology. In this report the authors describe a family of high-slope, phase accurate crossovers where the high-pass signal is derived from the input signal and the low-pass signal through the use of a short time delay. The high-pass filter which can be derived from an 18 dB/octave Butterworth low-pass filter, for example, is actually an improvement over the standard 18 dB/octave Butterworth high-pass response since there is about one-half octave less overlap between the delay derived filters. This reduced overlap combined with the accurate amplitude and phase response of these time delay derived crossovers makes them very attractive prospects for future crossovers. Until the time that these delay derived crossovers become commercially available, however, the 18 dB/octave Butterworth filter pair will remain the crossover of choice for general purpose use.

References

1. John Murphy and Jim Ford, "An Overview of Crossovers, Parts I and II," *Modern Recording & Music*, V (August 1980), 68-72 and V (September 1980), 75-77.
2. Stanley P. Lipshitz and John Vanderkooy, "A Family of Linear-Phase Crossover Networks of High Slope Derived by Time Delay," paper presented at the 69th Convention of the Audio Engineering Society, Los Angeles, May 12-15, 1981. [Preprint No. 1801 (1-5).]

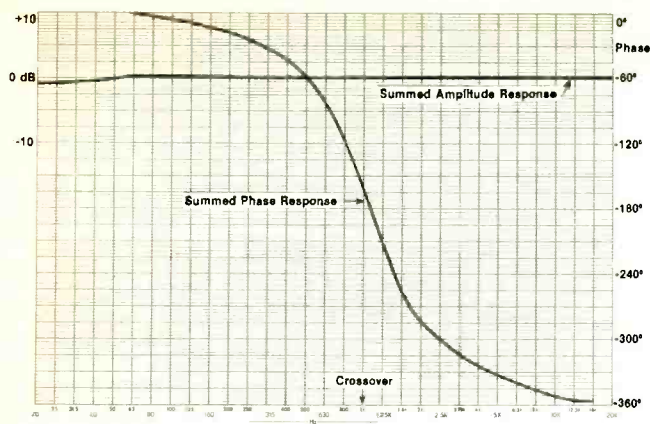


Fig. 2: Loft 402: Amplitude and phase response when the high and low outputs are summed (no polarity reversal).

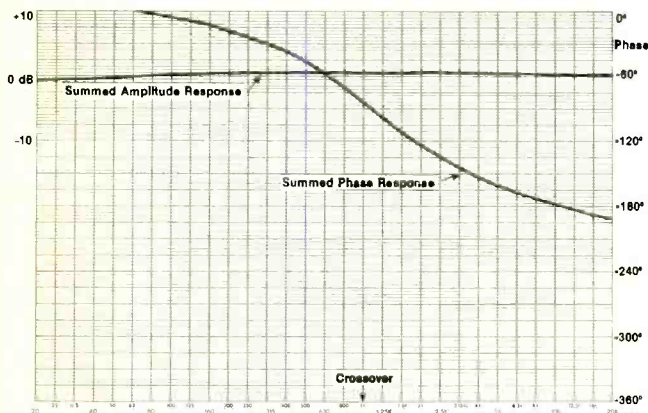


Fig. 3: Loft 402: Amplitude and phase when the high and low outputs are summed (with external polarity reversal).

The frequency (amplitude) response curves for the individual high and low outputs of the crossover are shown in *Figure 1* for the case of a 1 kHz crossover (per the frequency control setting). When the high and low output signals are electronically summed, the frequency response (amplitude and phase) is as shown in *Figure 2*. The flat amplitude response and 360° total phase shift are precisely the results expected for a properly designed 18 dB/octave Butterworth filter pair. Inverting the polarity of one output signal before the signals are summed results in the frequency response shown in *Figure 3*. Again, the results are exactly as expected for this type of filter pair. Note that in either case the summed amplitude response is very flat, being within about $\pm \frac{1}{2}$ dB across the audio spectrum. Because the total phase shift is halved by reversing the polarity of one output signal, we would recommend configuring the crossover and speaker system with the polarity reversal. (The time delay distortion associated with the slope of the phase response curve is similarly reduced!) This polarity reversal can be accomplished in the field simply by inverting the polarity of the signal connections to either the high- or low-frequency loudspeaker driver.

Conclusion: The Loft Model 402 electronic crossover from Phoenix Audio Laboratory, Inc. has been carefully evaluated and was found to perform well in our standard laboratory tests, as well as exhibit a high degree of sonic transparency in our listening test. The audio muting for the "delayed-on/instant off" feature did not seem to work quite like we expected, but the power on/off pops and thumps are not as severe as some of the other units we've reviewed. By employing 18 dB/octave Butterworth filter pairs, accurate amplitude summing has been assured for any combination of signal polarities. We especially like the restricted access to the front panel crossover controls and the coordination between the rotary control detents and the panel graphics. This full featured crossover deserves serious consideration for use with any high-quality multi-amplified loudspeaker system.

LAB TEST SUMMARY

(Note: 0 dBv is referenced to .775 Vrms)

Input/Output Levels

Maximum input level before clipping	+ 27.1 dBv
Maximum output level before clipping:	
20 K ohm load:	+ 20.1 dBv
600 ohm load:	+ 19.8 dBv

Noise Performance

(Note: 20 kHz filter, unweighted, output level controls set for unity gain)

Noise at "Hi" output (Ch 1):	- 85.3 dBv
Noise at "Low" output (Ch 1):	- 86.5 dBv
Noise at "Hi" output (Ch 2):	- 85.6 dBv
Noise at "Low" output (Ch 2):	- 87.2 dBv

Distortion Performance

(+ 10 dBv output level)

Frequency	THD plus Noise
100 Hz	.0028%
500 Hz	.0028%
2 kHz	.0024%
10 kHz	.0055%
20 kHz	.0089%

Small Signal Bandwidth (- 3 dB points):

4 Hz to 190 kHz

Power Bandwidth: 152 kHz

Slew Rate Limit: ± 11.0 volts per microsecond

Normalized Slew Rate Limit: 0.96 volts per microsecond per volt

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GROOVE VIEWS

Reviewed By:

NAT HENTOFF

JOE KLEE

KAREN SCHLOSBERG

STAN SOOCHER

NORMAN WEINSTEIN

POPULAR

JAMES TAYLOR: *Dad Loves His Work*.

[Peter Asher, producer; Val Garay, engineer; recorded at Record One, Los Angeles, Ca.] Columbia TC 37009.

Performance: **Over easy**

Recording: **Well-hidden elbow grease**

For most of his musical career, James Taylor has played the role of the sad-eyed country bumpkin, a pitchfork in one hand and a guitar in the other. He has sung soft and slow about a broken heart or an injustice that he didn't quite understand, all the while amusing himself with a wry sense of humor. James Taylor may seem to have developed his world-weary style from too many hot afternoons of working under a tranquilizing summer sun. But the truth of the matter is that Taylor's music is slick, smooth and, yes, sophisticated.

Dad Loves His Work offers no new surprises to the Taylor catalogue, but it does contain some fine songs. The melodies sound familiar but also comfortable because of it. "Her Town Too," for example, sounds suspiciously like an Eagles outing. Co-writer J.D. Souther did after all co-write that band's "New Kid In Town." But that makes little difference because the song turns out to be a gentle, finely-crafted pop gem. Likewise, "Sugar Trade," co-written with Jimmy Buffett, recalls *Flag's* blue collar tribute "Millworker." "Believe It Or Not" would have worked well on Taylor works as early as *Sweet Baby James* or *Mud Slide Slim*. It is cynical about to-

day but unquestionably idealistic about tomorrow and a favorite Taylor theme.

Taylor's tunes are based on a half-time rock beat. He performs them as if he is straining to break free of the albatross beat around his neck which he is forever doomed to pull down the, er, middle of the road. The result is an underlying tension in the music that is sometimes mesmerizing.

Personal manager Peter Asher has no doubt kept a watchful eye over the stability of Taylor's sound through the production of seven of Taylor's eleven albums. *James Taylor* and *One Man Dog* from the late '60s and early '70s were both busy and primitive (but never complacent). *Dad Loves His Work* is practically flawless production-wise with a full, rich recording quality that is characteristic of Taylor's recent work. The nasalness of Taylor's vocals never become thin in the mix and his acoustic guitar, whatever instruments or vocals it is surrounded by, always maintains a

distinct presence.

James Taylor has carefully etched out a durable slot for himself as a modern-day crooner which *Dad Loves His Work* aptly reinforces. With this kind of attention paid to his work it seems unlikely that Daddy James will ever have to worry about finding himself in the unemployment line. S.S.

PRINCE NICO MBARGA & ROCAFIL

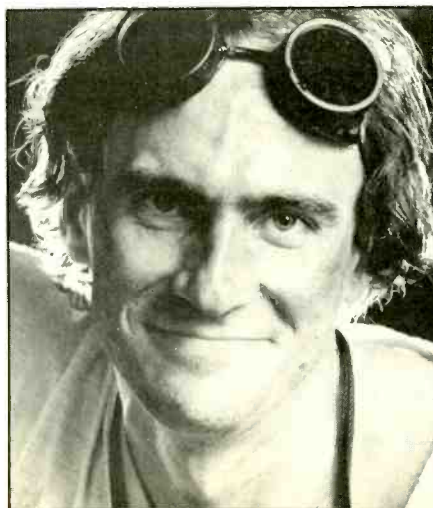
JAZZ: *Sweet Mother*. [Rogers All Stars Nig., Ltd., producer; no engineer listed; no recording site given.] Rounder Records 5007.

Performance: **More driving energy than a speeding locomotive**

Recording: **Primitive**

What makes a *great* dance record? Imagine if you had to list the ingredients of the *ultimate* record to shake your tail off to? I don't know about you, gentle readers, but the best dance stuff I've ever heard has never been pressed on vinyl. I can still remember the sounds I heard as a kid from various street corners in South Philadelphia of various black musicians using nothing but their unamplified voices and an overturned trash barrel for a drum. Talk about infectious rhythms, unstoppable swing, furious funk. Those unknown street corner singers could wipe the floor with Bo Diddley, reduce Elvis to a whining simp. Their sound was raw, crude, driving and bouncy. I've waited years to hear dance music with that unpolished force on record. At last I've heard it.

That it takes the form of a Nigerian



JAMES TAYLOR: **Slick.**

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The sound on my copy was tinny, dense, swampy—just the kind of muck new wave/punksters love to artificially create in studio settings capable of sonic transparency. I would love to see these guys record their next album in a decent studio with a sympathetic and knowing producer. Meantime, this group has eight more albums that have only been released in Africa. I hope that Rounder has the good sense to issue more (one is entitled *Polygamy*—that should go over big in California and New York). In the meantime, get *Sweet Mother* and dance your troubles away. N.W.

DAVE EDMUNDS: *Twangin...* [Dave Edmunds, producer; Aldo Bocca, engineer; recorded at Eden Studios, London, except for "Baby Let's Play House," recorded at Rockfield Studio, Wales, in 1968.] Swan Song SS16034.

Performance: **Energetic, skillful, classy and witty**
Recording: **Clean, punchy and full—traditional Edmunds**

The wonderful thing about Dave Edmunds is his ability to keep moving while basically staying in the same place. One can't say that *Twangin...*, Edmunds' fourth album for Swan Song, is the same as the past three, but then again, it's not that much different. With any Edmunds' record a listener generally knows what to expect: great sounding songs, in terms of production, execution, and material. Though Edmunds is not a songwriter he's got an almost flawless ear for good songs and he's able to make them sound distinctively his.

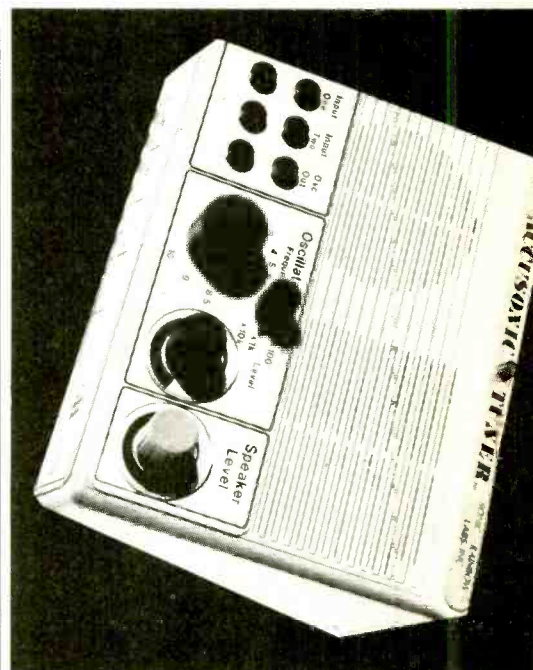
Twangin..., which seems to refer to Edmunds' nasal but expressive voice as well as the overall guitar sound, will not offer any surprises to fans, though it's not likely to disappoint. Songs on the first side run the gamut of crystal clear pop ("It's Been So Long"); the old-fashioned starkness of "(I'm Gonna Start) Living Again If It Kills Me," that recalls in Edmunds' sweet harmonies the Everly Brothers at their best (although with a modern perverse twist in the lyrics); a wonderfully syncopated, Squeeze-ish sounding cover of John Hiatt's "Something Happens"; and two no-frill basic rock and rollers: "Singin' The Blues" and John Foger-

rock band (that insists for unknown reasons on calling itself a "jazz" band) shouldn't take me by total surprise. Academic authorities for years have been writing about the African tribal music roots of American rock. No one shows the connection better than Prince Nico and his seven-piece band.

The cross fertilization of African and American musics is evident in the instrumentation. Rocafil Jazz consists of three electric guitarists (one lead, one rhythm, one bass), a drummer, a congarist. Three vocalists weave in and out of each other with a thunderous energy (if not always perfect pitch). The African identity of the music is maintained by the drummers who create dazzling polyrhythmic tapestries which liberally borrow from old tribal drum works. If you don't start dancing five minutes into the first song, check your pulse to ascertain whether you're still alive. The other charming African quality can be found in the lyrics. When was the last time you heard a rock singer singing an anthem of praise to his "sweet mother?" Not to mention the trauma of buying a wife only to have her stolen by the man who sold her to you. Sorry. There's no cosmic imagery, no ontological quest in these song lyrics. Has great ass-shaking music ever addressed these issues in lyrics? Not to the best of my knowledge.

Sweet Mother consists of four long songs. After repeated listenings, they tend to blend into one another. The overall impact of the record is one of rhythmic energy climaxing numerous times within a little more than a half hour of recorded time. The fancy guitar work—when you can stop tapping your feet to pay attention to it—is stunning and works brilliantly with the frenzied percussion. It's no wonder that this group sold eight million copies of *Sweet Mother* in Africa. Yet, in America, it took a little progressive company like Rounder to take the commercial risk of introducing this group to our shore. Rounder has provided excellent liner notes and has even enclosed a lyric sheet translating Prince Nico's broken English into good English.

I have only one bitch about this record and it's related to recording quality. Maybe this was recorded in Nigeria's finest studio facility. If it was, I hope that better recording facilities are built in the near future.



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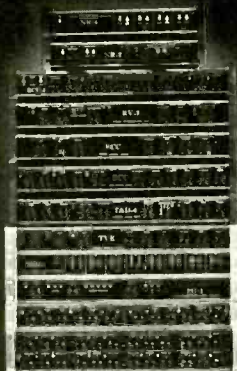
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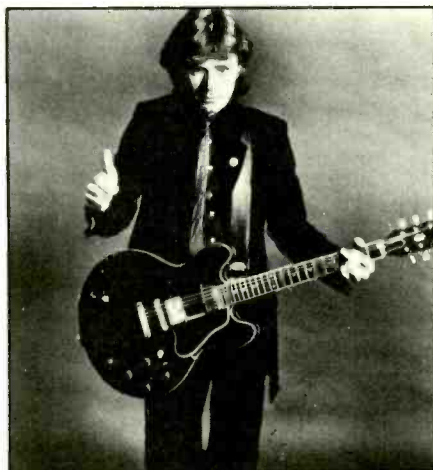


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ty's "Almost Saturday Night" (which, although there's nothing wrong with it, sounds uninspired; Edmunds' use of echo here only serves to make his voice sound strained. Fogerty's original is still the best).

Side two doesn't really get off the ground until the third song, Mickey ("Switchboard Susan") Jupp's "You'll Never Get Me Up (In One Of Those)," which opens with a punch and keeps kicking throughout, powered by Terry Williams' smashing drums and Edmunds' growling vocals. Hardly anyone can top Edmunds at getting a pure rock and roll sound, when given the right material. The last three songs reflect Edmunds' constant and ever-growing love for rockabilly and country music. Both "I'm Only Human" and "The Race Is On" (the latter recorded with England's rockabilly raves the Stray Cats during a break in Edmunds' production of their very successful debut album) have an immediate sound, no filler, featuring especially strong, playful vocals and guitar work on "I'm Only Human" and an engagingly corny American accent and country yodel-type vocal break in "The Race Is On." The last song, "Baby Let's Play House," is a gem from Edmunds' vaults. Recorded in 1968, when he was a lad of 25 and still experimenting in the studio (he also recorded "My Baby Left Me" at the same time and put that at the end of his first classic Swan Song LP *Get It*), it's an affectionate tribute to Elvis Presley, a wonderful cover of the King's Sun Session's tune. While it features painstaking, and strikingly similar, recreations of the slap-bass, guitar solos and the echoed, breathless urgency of Presley's vocals, Edmunds



DAVE EDMUNDS: Superlative.

manages to avoid being just another Elvis imitator because of his obvious enthusiasm and respect for the original.

Twangin... is an immediately comfortable album, though it's not as immediately catchy as his last solo effort, *Repeat When Necessary*. *Twangin...*'s strengths become evident after a few listenings—as does its basic weakness, which is a lack of risk-taking. Edmunds relies on the same techniques he has perfected over the years and have served him so well in the past. But it's hard to argue with something that sounds as good, and is as much fun to listen to as *Twangin...* In a sense, Edmunds is almost above criticism: either you like his style or you don't. And even the unspectacular material on *Twangin...* (and there's not much of it) sounds great. Edmunds could probably produce superlative rock and roll in his sleep. K.S.

SMOKEY ROBINSON: *Being With You*.

[George Tobin, Mike Piccirillo, Smokey Robinson and Michael Lizzio, producers; Howard Lee Wolen and Mark Wolfson, engineers; recorded and mixed at Studio Sound Recorders, N. Hollywood, Ca. and Motown/Hitsville U.S.A. Recording Studios, Hollywood, Ca.] Tamla T8-375M1.

Performance: **Ooh, Smokey, Smokey**
Recording: **State of the art soul**

I had a dream last night. I was a teenager again and had been striking out on a series of dates. Then Smokey Robinson agreed to accompany me, sit in the front seat of my car and sing while my girl and I sat in the back. You can guess what happened during the rest of my dream.

Since the Miracles first hit with "Bad Girl" in 1959 and through a solo career that began in the '70s, Smokey has been the premier romantic soul balladeer of our time. *Being With You*, while not Smokey's best solo work, is a shining example of the durability of his vocal style, a soft, breathy, yet emotive falsetto.

Smokey started the Miracles when he was 13 and he has written over 500 songs. Yet half of the songs on *Being With You* weren't written by Smokey. Of these, "Who's Sad," written by Gary Goetzman and album co-producer Mike Piccirillo, most closely evokes the em-

bracing melodies and gentle lyrics of classic Robinson songs like "Ooh Baby Baby" and "More Love." "Can't Fight Love," on the other hand, is an uptempo dance tune derived directly from the style of Michael Jackson.

"If You Wanna Make Love (Come 'Round Here)," which was written by Smokey, is a gospel-based ballad that reaches back to the early Miracles hit "You've Really Got A Hold On Me" for inspiration. Its claim to the contemporary scene lies in an introduction that is a take-off on Robert John's "Sad Eyes." The real centerpiece of the album, though, is "Being With You." Interspersed with a ripping sax part straight out of Gerry Rafferty's "Baker Street," "Being With You" is sung by Smokey with that same romantic abandon he displayed on "I Second That Emotion." The lover isn't right for him, but he is going to pursue her anyways.

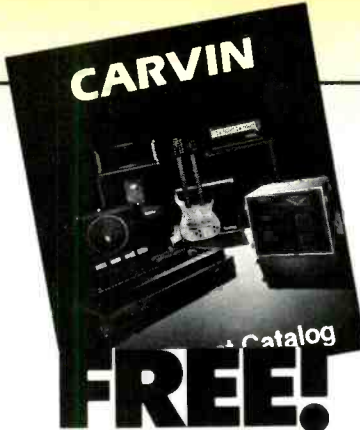
Ever since Motown's move from Detroit to Los Angeles in 1971, its music has been less funky and more homogenized for a pop rather than a soul audience. While the quality of the great Motown 45s of the '60s sounded overly distorted on a home turntable (due largely to a mastering process that catered to the needs of the radio stations over the consumers), its Los Angeles product is clean and polished. *Being With You* utilizes flair but not flash in its recording techniques. Nothing grinds or grates against the ear. Given Smokey Robinson's velvety vocal style, this works in his favor where it might have diluted the boisterous impact of a Four Tops or Junior Walker.

Is Smokey a singer for the ages? Well, years from now, when my children are going out on dates, I have the feeling that they, too, will be listening to his songs—and dreaming him into the front seat of a space shuttle. S.S.

JAZZ

MAX MORATH: *Max Morath and His Ragtime Stompers.* [Maynard Solomon, producer; Tom Lazarus, engineer; recorded at Vanguard Studios, New York, N.Y., 1980.] Vanguard 79440.

Performance: **A double-barrel of fun**



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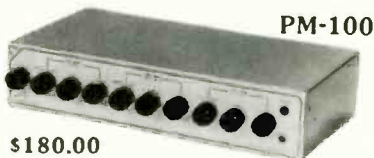
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Recording: Generally excellent, but I could've used a few more guys on kazoo

Max Morath has always been one of Ragtime's most enjoyable practitioners. Regardless of whether you like Max's piano playing or his singing or not, you will have to admit this man puts on one whale of a show and he does it every time out. This LP—and it must have been one heck of a party in the studio—teams Max on piano and doubling on hot kazoo with a mostly folksy bunch of country players like bluegrass banjo virtuoso, Bill Keith and Eric Weissberg who can play anything with strings on it, except maybe a tennis racket. Some of the other musicians are from backgrounds a bit closer to jazz. Ron Traxler has been one of the busiest New York jazz drummers for years and his father, Gene Traxler, was well known as bass player with Tommy Dorsey's big swing band of yore. Tubaist Dave Barger on has spent a few years in the brass section of a band known as Blood Sweat and Tears. If Ken Kosek on fiddle and Don Brooks on harmonica are less well known, they too have been around backing up this singer or that one for a few years.

What is most important about this recording is that it contains some of the marvelous tunes that Max and the Stompers have recorded that you don't get to hear very often. Sure, there are well known standards like "I'm Looking Over A Four Leaf Clover" and "I Wish I Was In Peoria" but it's not too often you get to hear W.H. Krell's "Mississippi Rag" or Clarence Wiley's "Carbalick Acid." It's that kind of an

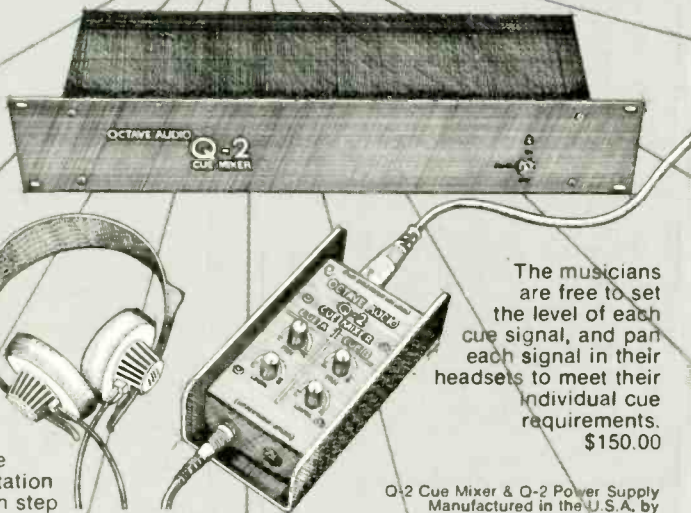
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MAX MORATH: Good time music!

LP—full of charming and fascinating discoveries.

The sound is certainly good and serviceable but it seems as though they weren't properly able to mic Max's kazoo playing. It sounds almost buried at times. Now some would say that buried is how a kazoo should sound, but those of us who are loyal to the comb and tissue paper—or to the gold plated number I carry around in my pocket always in search of a good jam session—take great offense to the dishonor done our instrument by Vanguard's technical staff. It's a noble instrument, guys, don't bury it under the tuba and washboard. Let us hear that kazoo next time! J.K.

DAVE APOLLON: *Mandolin Virtuoso.*
[David Grisman and Nick Perls, producers; no engineer listed; recorded between 1932 and 1956, various locations.] Yazoo 1066.

ROY SMECK: *Wizard of the Strings.*
[Roy Smeck and Nick Perls, producers; no engineer listed; recorded at Blue Goose Studio, New York, N.Y.] Blue Goose BG 2027.

Performances: **String artistry**
Recording: **Better the more recent it gets**

Nick Perls is still putting out fantastic recordings of exciting string music, as well as ragtime, blues and vo-do-de-oh-do nostalgia music on his two labels, Yazoo for reissues, Blue Goose for the new stuff. He never lists the engineers on the liner notes but, knowing Nick as well as I do, I can charge that up to modesty because Nick Perls never trusts anyone else to engineer his recordings.

Actually, recording for Nick Perls is just about all Smeck and Apollon have in common. While Smeck played just about all the stringed instruments (he plays uke, banjo, steel guitar and Spanish guitar on these sides) he is best known for his ukelele playing. This, despite the fact that he played steel guitar on a King Oliver recording of "Everybody Does It In Hawaii" in 1929 and that he played Spanish guitar with Sonny Clapp's band, Sunshine, when they recorded "Come Easy Go Easy Love" in 1931 (rumored to be not just another Bix Beiderbecke item but the last recording Bix ever made before

he died). Despite his association with King Oliver's band in the recording studio and his presence on a record which may or may not be Bix at his last outing, Roy Smeck never was a jazz musician. He was, if any category can be applied to him, a vaudeville performer whose technical forays on the stringed instruments were intended to amaze. He was not a genuine improvising jazz musician. His well worked out versions of old standards like "Ain't She Sweet" and "Five Foot Two" are interspersed with such Smeck originals

as "Raggin' the Uke" and "Steel Guitar Hop." My favorite cuts from this album are his guitar solos on "Saint Louis Blues" and "Sorrento." Fully extending the scope of the guitar as a solo instrument, I find these interpretations a good bit less trendy and with a lot more meat on their bones than the rest of Smeck's performances here.

Dave Apollon was another entertainer and vaudevillian. I remember seeing him in the '40s when the late Ed Wynn brought him to Chicago as a

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EXPLOSIVE HORNS: JOHNNY GRIFFIN AND BIRD

By Nat Hentoff

There are some players who ought to do all their recordings "live" because the warmth of audience response keeps building up the improvisers' own fire. Johnny Griffin is one such jazzman, as is exuberantly evident in *NYC Underground* (Galaxy), taped at New York's Village Vanguard, the oldest continuing jazz club in the nation. The room is small, "live" (but not too "live"); and although the constant presence of owner Max Gordon doesn't affect the acoustics, it certainly does help shape the room's welcoming ambience. That's why jazzmen like to work at the Vanguard, and why Johnny Griffin insisted on recording there.

With his big, bursting tone and sizzling beat, the tenor saxophonist ranges from Frank Lehar's "Yours Is My Heart Alone" to Duke Ellington's "Sophisticated Lady" and Thelonious Monk's "Rhythm-a-ming." His attentively enthusiastic colleagues are pianist Ron Mathews, bassist Ray Drummond, and drummer Idris Muhammad. Both on ballads and walloping swingers, Griffin is in masterful control of the horn—cleanly executing complex streams of ideas and making them sound unerringly uncluttered.

At one point on the record, Griffin says to his producer, "I hate studios. You see cold walls, and you're supposed to play something inspiring." In this place of warmth, Griffin had no difficulty finding, and holding onto, inspiration.

The recorded sound is big and clear, with the interrelationship of the players crisply defined.

Although Charlie Parker too often sounded more fierily relaxed in a "live" setting, Bird could also be at his most startlingly authoritative in

a studio, his concentrated intensity transcending the "cold walls." Two such dates make up *Swedish Schnapps* on Verve (now marketed by London/Polygram). On one, Bird is joined by Red Rodney, John Lewis, Ray Brown, and Kenny Clarke while his associates on the second session are Miles Davis, Max Roach, Walter Bishop, Jr., and Teddy Kotick.

Making the set even more illuminating are alternate takes on "Swedish Schnapps," "Back Home Blues," "Au Privave," and "She Rote." Throughout, Bird has that magisterial presence which, starting with note one of every chorus, proclaims the unforced originality to come—the ideas flowing like a force of nature.

This set, by the way, heralds the re-release of many of the original Verves, long unavailable and now imported from Japan on first-class pressings. Fortunately, there has been no attempt to fake the original mono into a semblance of stereo. The sound here is clear and spacious. And by contrast with many of the amateur-made "live" recordings of Bird, you can hear him *fully* in these studio recordings. Again, what particularly comes through here is the naturalness of Bird's music—the way it all so totally cohered as it burst out of his horn.

JOHNNY GRIFFIN: *NYC Underground*. [Orrin Keepnews, producer, Tom Arrison, engineer.] Galaxy Records GXY-5132.

CHARLIE PARKER: *Swedish Schnapps*. [Norman Granz, producer; no information on the engineer.] Verve UVM 2030.

part of his show "Boys And Girls Together." He was also an improvising jazz musician. As technically profound as his versions of "Russian Rag," "Czardas" and Sarasate's "Gypsy Airs" may be, he was equally adept at jamming his way through "Who" ignoring the wrong changes his band plays. The changes to that tune are tough and the bands which backed Apollon periodically were longer on entertainment value than they were on musical sophistication. Even Apollon himself was not that sophisticated a player but what he could do with a good melody like Hoagy Carmichael's "Star Dust" needs to be heard to be appreciated.

So here are two masters of the strings...masters of two different kinds. Both of them virtuosi yet Smeck the dazzling technical wizard and Apollon the hot improviser. Fortunately, thanks to Nick Perls' two record labels, it's a both/and situation...not an either/or. J.K.

JOE SULLIVAN: *At the Piano.* [Bosey White, reissue producer; originally recorded at various locations during 1944 and 1950.] Shoestring SS 104.

JOE SULLIVAN: *And the All-Stars.* [Bosey White, reissue producer; originally recorded in New York, N.Y., 1950.] Shoestring SS 114.

Performances: From the golden days of the traditional jazz revival

Recordings: 1944—the horrors of war-time; 1950—much better

It is not easy for me to say anything about Joe Sullivan. He was always, and always will be, one of my favorite jazz pianists. His career was continually plagued by ill health and when he died in October of 1971 the general reaction of jazz fans was "I thought he died years ago."

Of all the things that have impressed me about Joe Sullivan, paramount is that he never apologized for what he was or what he played. He was an out and out barrelhouse stride piano player. He never made any attempt to disguise the fact. He never tried to smooth out the rough edges. He never tried, like his inspiration Fats Waller, to superimpose comic touches over his playing and while a run from Art

Tatum shows up here and there, his style and forcefulness is of a type in which Tatum indulged only in guarded, off-the-record, after hours sessions.

Most of the tracks on *At the Piano* are from 1944 recordings for the Armed Forces Radio Service and the fidelity is just terrible. Some of this is due to the lack of fidelity of most 40's recordings. Some of this is due to the fact that I'm sure the military had more important worries on their mind in '44 than high fidelity recording. Most of the problem, I suspect, is that the recordings from which this LP were made probably saw

a lot of wear and tear during WW2 and may even have been a bit too close to the bombing. Yet there are moments here (particularly "Time On My Hands") which make up for any loss in Fi.

Less painful are the recordings from 1950 (the last three tracks of SS 104 and all of SS 114) which were recorded at an open air concert in New York during the summer of 1950 by the Voice of America. By 1950, tape was in common use and the standard of the industry was somewhat elevated from what it had been before the advent of tape.

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R.S. #	Page #
68 . . . Abadon Sun	85
144 . . . Altec Lansing	9
84 . . . Ashly Audio	15
102 . . . Audio Technica	7
142 . . . Auratone	18
44 . . . Carvin	81
112 . . . Cetec Gauss	5
61 . . . Countryman	38
88 . . . Dallas Music Industries .	50
92 . . . dbx	15
82 . . . Electro-Voice	10
56 . . . Fender	25
47 . . . Ford Audio	82
87 . . . Gold Line	84
150 . . . Institute of Audio/ Video Engineering	80
122 . . . Lexicon	35
No # . . . LT Sound	80
No # . . . LT Sound	83
79 . . . Maxell	17
No # . . . MXR	Cover 4
64 . . . Omni Craft	82
156 . . . Otari	Cover 3
89 . . . Peavey	23
153 . . . Phase Linear	12,13
63 . . . Phoenix Audio Laboratory, Inc.	54
126 . . . Polyline	81
179 . . . Pulsar Laboratories	81
71 . . . RolandCorp US	2
124 . . . Sam Ash	83
116 . . . Sescom	82
118 . . . Shure	24
No # . . . Sonic Rainbow Labs . . .	79
59 . . . Soundbox	84
130 . . . Soundcraftsmen	8
83 . . . Studiomixer	1
171 . . . Tama	16
77 . . . Tapco	19
123 . . . Teac	11
No # . . . 3M	39
99 . . . Yamaha	Cover 2

These recordings show it in their general sound improvement, yet there are mistakes of the sort that can only be charged to poor planning. Soloists start out playing into dead mics. Volume level goes up and down during solos. Worst of all are the late starts that mean the loss of the beginnings of such performances as "Body and Soul," "Jazz Me Blues" and most brutal of all, "High Society." The All Star band referred to on SS 114 is just that. Wild Bill Davison (when he was still playing dixieland jazz) and Bobby Hackett are on cornet, Vic Dickenson is on trombone, Edmund Hall is on clarinet and George Wettling is on drums. That's it, no bass, no guitar, just a two man rhythm section. Maybe that's why Wettling feels called on to play four beats to the bar rather than the customary dixieland two-beat. There is also one cut from another session that includes drummer Eddie Phyfe and a band that comes in for just a short coda at the end. Otherwise "Honeysuckle Rose" is all Joe Sullivan on piano. Compare this with his "Honeysuckle Rose" from 1944 on SS 104 and if you have his earlier "Honeysuckle Rose" from 1933 on Columbia, UHCA, Parlophone or on a Prestige LP, you more or less have a history of Joe Sullivan playing one of his favorite tunes.

I hope that when the history of jazz is finally written, a chapter is included on Joe Sullivan. One listen to the music on these two LPs will demonstrate my reasons why...but that would be true of any Joe Sullivan recordings for he was there on the very first important Chicago jazz recordings for Okeh by McKenzie and Condon's Chicagoans in 1927. From then until he made his last recordings, probably sometime in the sixties, he never played a bad chorus, he never failed to back a band or a singer to the hilt and he never let his listeners down. J.K.

CLASSICAL

BACH: *The Six Partitas*. Joao Carlos Martins, piano. [Heiner Stadler, producer; Mitchell Tanenbaum, engineer; recorded at the Little Bridges Auditorium at Pomona College, Claremont, Ca., in the autumn of 1980.] Arabesque Digital 6501-3.

Performance: **Muscular, athletic, exciting**

Recording: **Digitally excellent, but a bit too brittle for my taste**

To begin with, this release is the first installment in what Arabesque is calling the Bach Tri-Centennial Project. The plan is that by 1985 (the 300th anniversary of Bach's birthday) Arabesque will have issued, in digital recordings by Joao Carlos Martins and other performers, the lion's share of Bach's keyboard music. It's an ambitious project. It's a worthwhile project and if this first release is any indication, it augurs well for artistic success.

There are probably more ways to interpret Bach than any other composer. While the adherents of any one particular style may feel that their way is correct and everyone else is misinterpreting Bach, that is an oversimplification of the facts. Bach's music is universal enough to respond to a romantic treatment, a classic treatment, a virtuoso treatment, even a synthesizer treatment as well as the Baroque traditions under which the music was originally heard. The question of authenticity versus interpretation is skirted by Arabesque by including a quote from Paul Hindemith implying that Bach would have delighted in the big orchestra and the modern Steinway piano if they had been available to him. I find the quote rather presumptuous but the results are agreeable enough if, perhaps at first, a bit startling. To put on the first of these LPs is to be confronted immediately by a most foreign sound. Genuine players of the muscular, athletic, virtuoso category tend to display their fireworks on the piano music of Liszt or Busoni and yet here is a player whose playing is about what one might expect from a piano virtuoso whose career had to be interrupted by an injury received in a soccer game playing the music of J.S. Bach. It is a sound which is enhanced by the magic of the Soundstream Digital process. The sound accentuates the muscularity, the aggressiveness, the percussiveness, of the playing to the point where the piano approaches the brittle sound of the harpsichord. It takes a few minutes of getting used to, but once your ears have accommodated the sound and the style, go back to the beginning for a new view of music that you thought you knew. Joao Carlos Martins' Bach is a vibrant, alive Bach. It is neither clinical

nor pedantic. It approaches the music on an emotional basis and brings a virtuoso technique to bear on music which is so often sloughed off in a scholarly manner which says more about the performer's acquaintance with past practices than it does about any present feelings the performer may have about the music.

I seriously question the advisability of taking these six partitas out of order...Martins' begins with No. 4, goes back to Nos. 1 and 2, skips to No. 5, goes back and picks up No. 3 and finishes—as did Bach—with No. 6. I guess that it is the performer's privilege to not perform these works chronologically if he so desires and in a concert I'd probably accept it as that and let it be, but on a recording, especially one intended as part of a larger project, I think a certain amount of perspective is lost by not hearing the works in sequence. Of course one can, if one wishes, dart back and forth between discs and arrange them for chronological listening but I don't really understand what, if anything, was gained by the rearrangement of the order of this music.

What is most important is that here is another interpretation of some important Bach keyboard music and music which has been rather neglected on LP. When one looks at the many recorded editions of the French Suites, for example, it seems totally inexcusable that this is only the third complete version of the Partitas listed in the current Schwann catalog. J.K.

ISAAC STERN, PINCHAS ZUKERMAN, ITZHAK PERLMAN: *From Lincoln Center.* The New York Philharmonic Orchestra, Zubin Mehta, cond. [Andrew Kazdin, producer; Bud Graham and Ray Moore, engineers; recorded Sept. 24, 1980 at Avery Fisher Hall, Lincoln Center, New York, N.Y.] CBS Mastersound IM 36692.

Performance: **Emotionally charged**
Recording: **Quiet surfaces, wonderful sound**

It is difficult to think of Isaac Stern as being 60 years old. I would have thought him to be much older. It seems that he's been around for almost ever and a day but looking back into the bio we find that Isaac Stern was indeed

born in 1920 in Kriminiesz, Russia. What makes it seem as though he's older is that Isaac has been playing in public since 1932. In other words, when I heard him play the Beethoven Concerto with the Chicago Symphony as a teenager, he was little more than a teenager himself. So he's been playing this music, or music like it, for the better part of 50 of his 60 years and as Schuyler Chapin pointed out during the intermission of this Birthday telecast he had remarked to Chapin after a performance of the Brahms Violin Concerto some years earlier, "another Brahms." Yet instead of the music getting stale as Stern approaches his second half-century as a performer he seems to have taken on a more emotional approach as he's gotten older. His playing on September 24, 1980 was impassioned, which is a word that I would never have thought of applying to Stern's playing some thirty or forty years ago. True he is in the company of the most emotionally charged violinist since the days of Fritz Kreisler in Itzhak Perlman but balancing things is the highly technical and somewhat cool playing of Pinchas Zukerman who plays both violin and viola on this recording. Also present and accounted for are Zubin Mehta and the New York Philharmonic. There seems to be little agreement on Mehta's highly stylized conducting yet certainly he was at his best on this occasion.

I'm not going to try to tell you that there have been no better recordings of Bach's *Concerto for Two Violins*, Vivaldi's *Concerto for Three Violins* or Mozart's *Sinfonia Concertante for Violin and Viola*. What I will tell you is that this was an evening to remember, a meeting of four master musicians in a program of music for violins and viola with orchestra. It was an evening of music made with love—not just a love for music but a love for one of the great musicians, still with us. This is a recording that will bring pleasure and enjoyment to any music fan.

The engineering is digital, well balanced and so well separated that for once we have a recording of a "live" concert performance without the annoying intrusion of coughers and program rustlers. This points out the advantage of increased control over extraneous noises which can be added to those plusses of digital recording of which we were already aware. J.K.

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