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Maynard
Ferguson

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MODERN RECORDING

SERVING TODAY'S MUSIC / RECORDING-CONSCIOUS SOCIETY

VOL. 5 NO. 2
NOVEMBER 1979

TRAVELS
WITH
YES

BUILD A DUAL LIMITER

Lab Reports:

- AB Systems
730a Triamp
- Orban 672A EQ
- Revox B-77
Recorder

HANDS-ON REPORT:

- dbx Model 168
Comp/Limiter

NEW PRODUCTS WORD REVIEW



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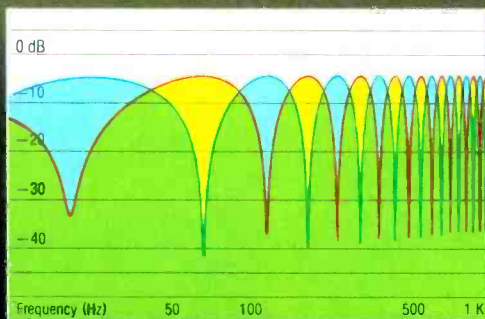
More than a chorus.



The new MXR Stereo Chorus stands alone among conventional chorus devices. Its unique design and sound almost defy description.

The Stereo Chorus utilizes advanced time delay circuitry providing a doubling effect for voices and instruments; one voice will sound like two singing in unison, two like four. As in nature, the voices can vary subtly in pitch. What you get is a natural choral effect. It can be used to thicken the sound, so that six-string guitars sound like twelve-strings. Through the introduction of extreme pitch bending, the Stereo Chorus will produce an intense vibrato, normally unattainable.

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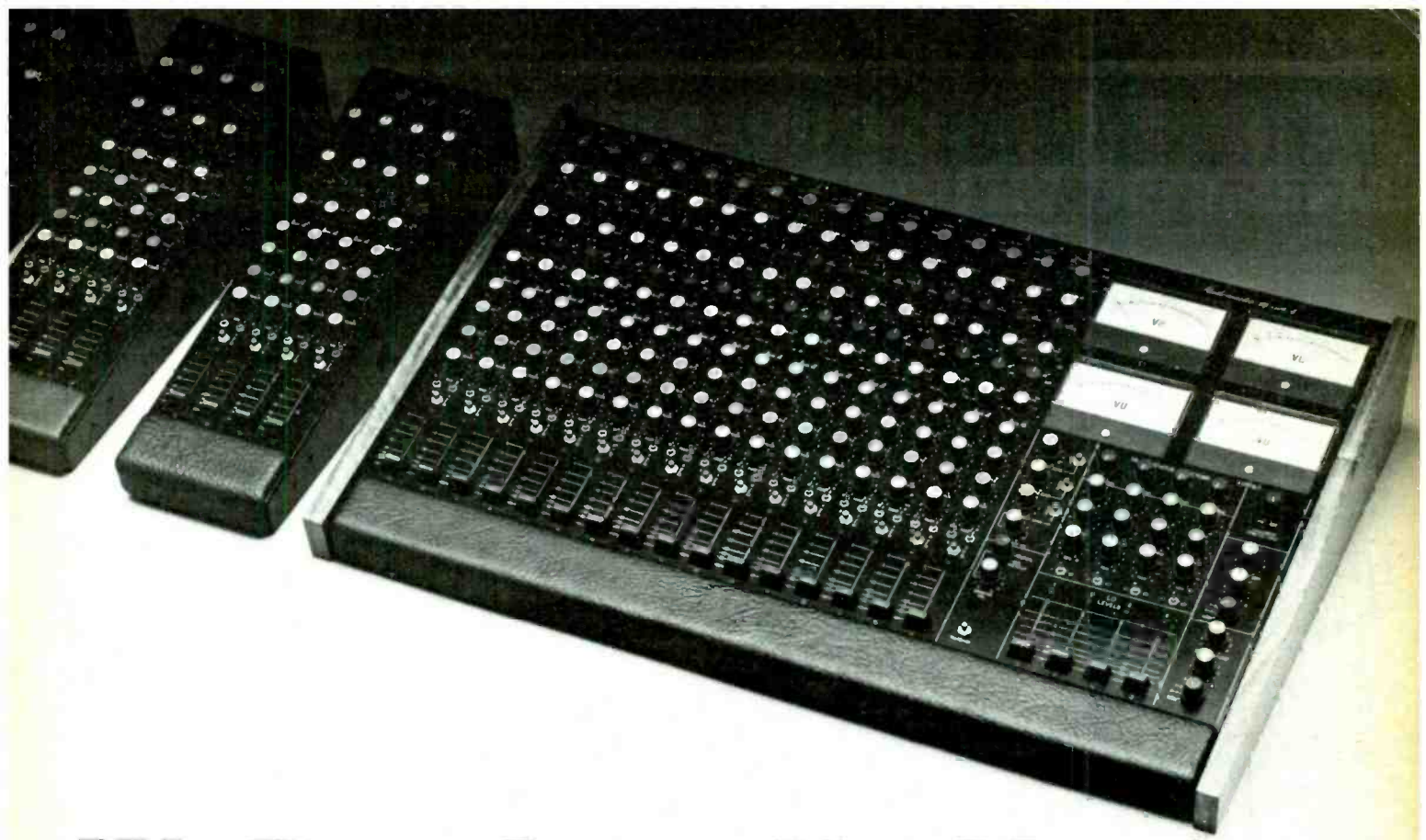
The MXR Stereo Chorus is AC powered, ruggedly constructed to withstand the rigors of professional use, and is backed by MXR's reputation and commitment to the music industry. But reading about a product that has no equal is not enough. To appreciate what your music has been missing, see your MXR dealer.

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Music has come a long way in the past few decades. But with amplifiers, it's been pretty much the same old thing—an amp in the top of a wooden box with some speakers mounted in the bottom. The only real change has been from amp manufacturers who have designed *their* own sound into their amps. But now, Roland has designed a system of amplification that designs *your* sound. We call it The Roland Rack.

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The SIP-300 performs well with any quality power amp. Of course, if you don't want to settle for just any power amp, try Roland's SPA 120 or SPA 240 Stereo Power Amps. And for bass guitar, there's the SIP 301 Bass Pre-Amplifier. The Roland Rack System also includes a Stereo Flanger, Vocoder,

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MODERN RECORDING

SERVING TODAY'S MUSIC/RECORDING-CONSCIOUS SOCIETY

NOVEMBER 1979

VOL. 5 NO. 2

THE FEATURES

BUILD A DUAL LIMITER

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The most sophisticated piece of gear that we have presented to our readers in a construction article. It should be a snap if you pay close attention to reading requirements. Let us know how you feel about articles of this nature.

TRAVELS WITH YES

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YES has always been one of the most advanced music acts to work the rock element. In this article the *MR* reader gets the opportunity to look inside the inner workings of the group.

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By Sheryl Roberts

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Mr. Ferguson has been in the business of music for some time now, but his ability to try the new and different has enabled him to sustain a high level of energy. He passes along some of that energy to us in this interview on the run.

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George Benson On the Road

The Electric Primer

—Part III

The New Radio City Music Hall

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West Coast
Advertising Representative

MYLES GROSSMAN
Advertising Director

VINCENT P. TESTA
Publisher

Editorial and Executive Offices
Modern Recording
14 Vanderventer Ave.
Port Washington, N.Y. 11050
516-883-5705

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Editorial contributions should be addressed to
The Editor, Modern Recording, 14 Vanderventer
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LETTERS TO THE EDITOR

Qualitative Contemplation

First let me say I discovered your magazine last fall and was instantly hooked. Unlike other recording oriented magazines, you can relate information to the novice and to the professional recordist as well, with equal clarity.

In past issues, I have read articles on sound reproduction for concert situations and was very interested. But there is one thing that puzzles me, not so much on the technical end of it but on the creative aspect. A short time ago, I had the pleasure of attending a concert featuring a certain rock group, no heavy metal. I will admit it was quite a show, staging was inventive, lighting was superb, but when it came to sound, I was embarrassed to call myself an engineer. It seems that the sound has to be so loud as to completely mask the music. Now, I'm not one who constantly wears cotton in his ears. I've played bass guitar for years and love to blast away as any other rock 'n' roller does. But I'm also very serious when it comes to sound quality. There comes a point when the ear cannot or will not take sound levels that are too loud.

The recent concert I mentioned is not the only one I've been to where the PA was so loud that it blended everything into mush. With all the equipment that an engineer has at his disposal to help him "tune" his system to the hall, why must it be so loud that separate instruments and voices become one source of noise? I am well aware that the PA must be loud enough to reach the ears of those who listen and also to add that spice you get from a good mix, but haven't sound men gone a bit too far where power is concerned?

I am very interested to hear what people in the business have to say about this problem. Thank you for giving me the opportunity to present this question; I hope there is an answer.

—Vic Marsh
Madison, Wisc.

Multi-Tracks on Disco

I am responding to your offer ("Letters," Sept. '79) to voice our feelings about that disease called Disco. Let me start the ball rolling with these comments:

Any fool can sit around all day and write disco tunes. All he needs is two chords and some words like "baby oh baby, oh, oh, ooh." Then he can play that over and over as long as he wants five, ten, twenty minutes. Disco music is extremely repetitious. All songs have the same beat, listening to it is almost like listening to a metronome. Notice I said listening, dancing to it is another story.

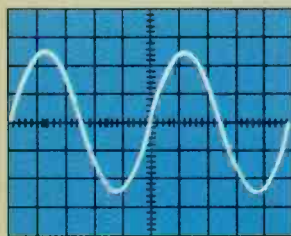
In Ken Rapoza's letter to you he says "it's the biggest thing happening in music and cannot be ignored!" But its not music, it's more of a noise. I am not trying to be nasty, it's just not something I can sit down and listen to. Ken also says that the people are saying that disco won't last, it's just a fad and that people were saying the same thing about Rock and Roll 25 years ago. I hate to tell Ken this but the people of 25 years ago were 100% right! Rock and Roll died many years ago. To prove it just listen to Bill Hailey's "Rock Around the Clock" and then listen to the latest Rock tune. Did you notice the difference?

This is what I am hoping will happen to disco, 25 years from now there will be music called Disco but it will be nothing like

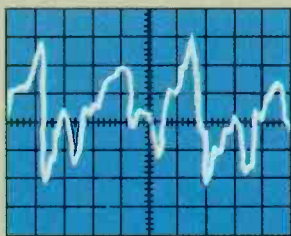
Many amps can deliver pure sound. The Sansui AU-919 delivers pure music.



Today's audio engineering has reached the point where you can select among a number of affordable high-power amplifiers that have virtually no "total harmonic distortion." That's good. But THD measurements only indicate an amplifier's response to a pure, continuously repeating, steady-state test signal (below, left). They don't tell you how the amp responds to the never-repeating, rapidly-changing transient waveforms of real music (below, right). And only an amplifier designed to reproduce the demanding dynamics of music signals can satisfy the critical audiophile. An amp like the Sansui AU-919.



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The Sansui AU-919 sounds better than conventional amps because Sansui developed a unique (patent pending) circuit that is capable of achieving both low THD and low TIM simultaneously.

Our DD/DC (Diamond Differential/DC)* circuitry provides the extremely high drive current necessary to use proper amounts of negative feedback to reduce conventionally-measured THD (no more than 0.008%, 5Hz-20,000Hz into 8 ohms at 110 watts, min. RMS) without compromising our extraordinary 200V/ μ Sec slew rate, ensuring vanishingly low TIM, as well. The power amplifier frequency response extends from zero Hz to 500,000Hz.

Since ultimate tonal quality depends on more than the power amplifier alone, Sansui also uses its DD/DC* circuitry in the phonic equalizer section — where current demands are also particularly high — to prevent TIM. ICL (input capacitorless) FET circuits are used throughout the AU-919, and a "jump switch" is provided that will let you run pure DC from the Aux. input to the output.

Visit your authorized Sansui dealer today, and he'll show you a lot more that the AU-919 has to offer. Like twin-detector protection circuitry and our Penta-Power Supply system. Two-deck monitoring/recording/dubbing facilities. And a high-performance ICL/FET pre-preamp for moving-coil cartridges.

Then listen to the AU-919 with the most demanding music you can find. You'll hear the way the music should sound. Like music. Not just like sound.

*The Diamond Differential/DC, Sansui's (patent pending) totally symmetrical double ended circuitry with eight transistors, is named for its Diamond-shaped schematic representation.

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what you hear today, so much so it will be a whole new style of music. After all, about fifteen years ago there was a sound called Discotheque; let your ears taste that and then compare that to Donna and the Bee Gees.

Keep up the good work.

— Alan Wolf
Ellicott City, Md.

Disco is finally headed in the direction I feel it should go. Disco has certainly provided many, many people with a lot of enjoyment, which is, I feel, the purpose of writing, playing, producing and recording *any* music. Disco has provided an arena for new change, and with it, boon for some and bane for many others.

Personally, I began playing guitar back in the days of the original Ventures, so I've seen (heard) a lot of music come and go. As I see it, Disco began to evolve during the waning 60's. In 1969, in Tallahassee, Florida, there were a number of Florida State University fraternities that hired bands for weekend parties. This was a time when there was basically a great amount of freedom given to the groups to play what they wanted. (The Allman Brothers were popular, as were Steppenwolf, Cream, The Beatles, Canned Heat, Jimi Hendrix, The Vanilla Fudge, Deep Purple and in the early 70's, Grand Funk Railroad.) The groups featured heavy guitar work which became very popular with the fraternity members. So much so that they were willing to forego a good dance beat; to sit on the floor to just listen and watch.

This continued through '71, and around '72, they began to tire of the ten-minute guitar solos and the high cost of hiring groups that did not really play the kind of music that they began to want, that is, a more top 40 format. During this time, I was both working in a group as a guitarist, playing a lighter variety of rock, and working in a Tallahassee music store. The store began renting P.A. systems to one frat in particular and we wondered what was going on. We finally realized that they were playing eight-track tapes through the system and foregoing the band costs, saving from \$200 to \$300 per weekend. As the recession of '73 began, many of the other fraternities began renting systems and we noticed a fall-off in band bookings, and thus a fall-off in purchases. Some enterprising people dropped out of bands and hired-out as DJ's, with large sound systems. This, of course, is a situation of seeing change come about and making the most of it,



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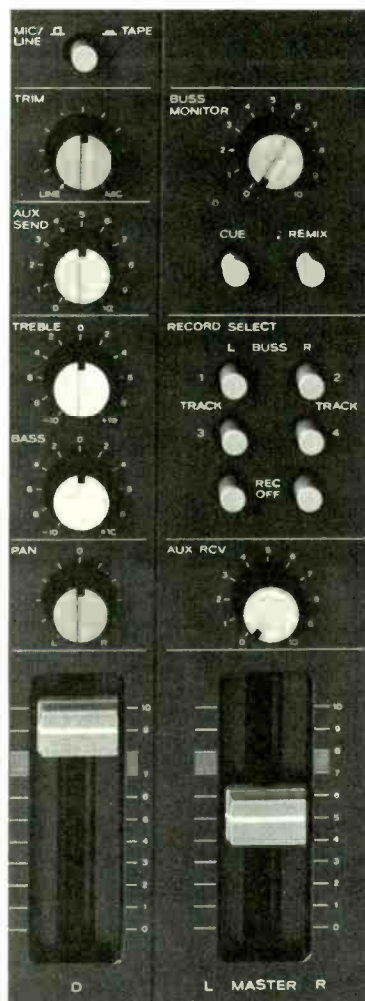
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Now you can have the essential functions and flexibility of multitrack recording in one compact, self-contained unit. It's called the Model 144 Porta-Studio™ and it lets you record basic tracks, overdub in sync and remix to stereo. On standard cassette tape.

TEAC engineers created a totally unique format for Porta-Studio. Four tracks in sync on cassette tape at 3-3/4 ips. It's fast, simple, reliable and economical. Rehearse on it. Learn on it. Create on it. Just plug in a microphone or instrument and go to work on it.

Porta-Studio's versatile 4 x 2 mixer section gives you mic/line/tape switching, trim control, high and low EQ, fader, pan and Aux Send for each input. The failsafe group switching matrix lets you record on up to two tracks at the same time. And there's a master fader that gives you overall level control during recording and mixdown.

The full-logic cue system in Porta-Studio lets you hear everything you're doing all the time.



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Porta-Studio's drive system is built specifically for the rugged needs of multitrack recording. Transport controls are all solenoid-operated for faster, easier switching. And you get a built-in variable speed control that lets you add special effects, fix a flat note or solve timing and cueing problems.

You can work with Porta-Studio using nothing more than headphones. Or send the output through your home audio system. You'll also find the patch points and controls that let you use Porta-Studio

with equipment like echo or delay units, equalizers and additional mixers.



So see your dealer for a demonstration of the very affordable Porta-Studio. Nothing else in the world puts so much multitrack function into so small a package.

TASCAM SERIES
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rather than fighting it.

Perhaps this localized situation is the kind of thing that happened across the country. At any rate, while in the early and mid-seventies, as Disco was becoming more popular, I was also involved as an engineer with Sweetbay Recording Studios, a professionally equipped, sixteen-track facility in Tallahassee. Thus, I was affected by the surge in Disco popularity in three ways: 1) as a part-time musician it was and still is hard to get steady weekend work without playing a lot of Disco tunes, and *even then* it's tough; 2) as a sales clerk in the best stocked music store in the area, I saw a booming business dwindle to nothing (the recession of '73-'74 was a factor, but when Disco is the "in thing" and musicians aren't working, they aren't buying); 3) as a studio engineer - once again, when musicians aren't working, they aren't able to speculate in the form of recording and producing their own albums, singles or even demo tapes, and perhaps of the three, this is most important.

Today, the sophistication of modern electronics—both for studio and live performance—has created better equipment and higher costs. The money that

groups, musicians and singers *do* earn has to go toward their equipment, leaving little for the pure speculation of recording in order to improve their following, grab that recording contract everyone wants, or just to get better paying jobs through demo tapes.

These things constitute the local predicament. On the national level, when you *do* send a tape to a label, the reply is, "It's not the kind of material we're looking for." That's because the rock labels have room for only 60-65% on BILLBOARD'S TOP 100, and they have, in the past several years, been unwilling to speculate on any material that is unique. They have to go with what they feel is a positive "hit" to keep Disco from gaining more of the market. For this reason, we have not seen the emergence of a super group playing real music such as The Beatles did, in this decade.

To me, real music is that which is written, produced, recorded and marketed because a group believes its sound and songs are really good and they want others to enjoy it with them (remuneration, which is welcomed of course, is secondary). If the best groups in this approach were discovered (un-

covered) and developed, we would have better rock music to listen to, and dance to, both on AM and FM formats.

Most music (both rock and Disco) in the last eight years or so has been manufactured: a formula is followed with slick writing, great producing, recording and marketing. Even the groups are occasionally manufactured, such as Kiss and Alice Cooper. And of course, Disco for the most part, is especially manufactured.

But people *are* tiring of the same heavy beat and repetitious lyric lines of Disco. When the 50,000 watt AM station, WAPE, in Jacksonville, Florida, promos emphatically, "no disco after 7 P.M.", things are definitely changing. Additionally, the success of the first Dire Straits album and single release swells my heart with hope. Although they may not become a super group, someone did speculate heavily that a two-guitar, bass and drums band with zilch overdubbing could make it big on the strength of great guitar playing and a unique sound.

Yes, these things are small indeed compared to the overall scope of today's music scene. However, I believe that Disco is being nudged in the direc-

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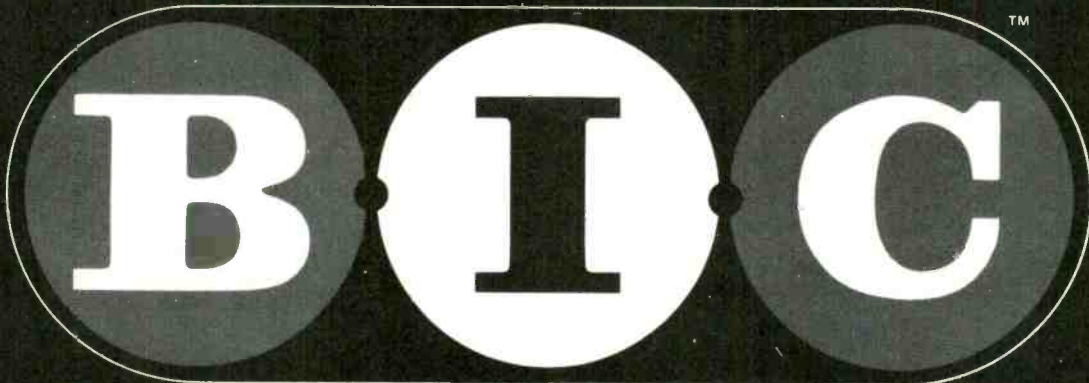
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CIRCLE 131 ON READER SERVICE CARD

tion I think it should go: almost totally segregated from the rock and roll scene, in much the same fashion as "soul" music seemed to become segregated after "Dock of The Bay." That's not to say that it won't exist or that it shouldn't. To the contrary, it should survive and will, but it will not continue to be the raging "in thing." Two or three Disco songs may continue to keep Disco alive on BILLBOARD'S TOP 100, but it will go its own way with more attention paid to it through its own Disco charts.

Disco is great for the people who make money with it and for those who have fun with it. But for the grass roots musicians, all the industries associated with them, and even more, for the listeners, it is time to write, play, produce, record and market *real* music, because the demand is there and growing all the time.

—Kenneth L. Norton
Audio-Visual Producer
Jacksonville, Fl.

Regarding my feelings about Disco: Personally, I hate it, And Punk Rock, New Wave and de-evolution, for that

matter, but don't let that bum you out. To me, music always will be an expressive *art*, musicians letting their creativity flow, presenting their interpretations of life to the world.

But I do fail to understand how this has sidetracked into simple punk melodies and redundant Disco beats. I'm still longing to hear inspirations and soul of rock 'n' roll: Why should it be smothered by Disco and New Wave? Do I smell a commercial buck to be earned with no dues to be paid? (And yes, I am aware that the hottest Disco albums contain the hottest studio cats playing their paycheck-fulfilling roles.)

This subscription *won't* be discontinued after reading a Disco write-up; there's always something to be learned.

—J.L. Kulslad
Arlington, Va.

Rather than join the deluge of readers who will reply to Ken Rapoza's letter with the mass mailings of "DISCO SUCKS" bumper stickers, banners etc., I would like to point out that the thousands of people who help make up the record ratings are also the same ones who spend their hard earned

dollars for pet rocks, Skylab Repellant and other such useless items. There are a few "Disco" songs that I enjoy, but it seems to me that after awhile most of the current crop seem to sound alike. I have also been told by several musician friends who have performed everything from Jazz to Acid Rock that the Disco variety of music is by far the most boring to perform. But regardless of whether I like disco or not the main objection I have with Rapoza is that I personally feel that all the modern electronic wizardry of the recording industry should be used to enable us to faithfully reproduce the artists' performance as they intended it—not to waste a perfectly good, well recorded, 24 track master.

But, to each his own... "I will survive..."

—Tim McDonough
Senior Electronics Technician
Media Productions
Sangamon State University
Springfield, Ill.

In reply to the letter, "Dirty Word-Disco" from Ken Rapoza in *MR* Sept '79 issue, when asked how I feel about

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CIRCLE 141 ON READER SERVICE CARD

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Disco, I say, "Sisco Ducks!"

—Sincerely, a Rock 'n' Roll Patriot.
Columbus, Ohio

P.S. Good mag!

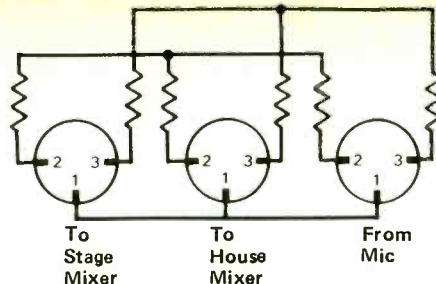
Illustrious

One of the things I like the most about *Modern Recording* is the amount of illustrations, which truly helps in the description of different situations. Keep them as simple as you do and as clear as you do—you're doing a great job, it's appreciated!

—Edgar A. East
Panama City, Panama

Poor Man's Mic Splitter

I provide sound reinforcement for a number of local rock bands and clubs in the San Francisco area that are on a low budget. My forte is bridging the gap between the poor quality sound systems many newer acts are forced to use and the Mega-buck per night systems the big boys use. It occurred to me that many of your readers would be interested in an economical way to build a mic splitter.



All resistors 24 ohms

I will be the first to admit that an active splitter (as designed and described in a past *MR* issue) is the optimum way to go, but excellent results can be achieved by placing a 24 ohm resistor in series with each leg of the mic line (except the ground leg). I built a 16 in 32 out resistive splitter in a 16x20x4-inch metal box using 16 A3F switchcraft receptacles and 32 A3M receptacles with three 24 ohm resistors in a "Y" configuration between all of the hot pins. The cost of the entire project was \$115. Multi-pin connectors could be substituted for individuals at extra cost.

—Joe Bajza
Matrix Sound
San Francisco, Ca.

We would like to add that Joe's design has not been tested or evaluated in any way by the MR staff, although we do not doubt it is not without merit. We publish alternate methods of doing the same job as a service to our readers. Thank you, Joe, for this "poor man's mic splitter."

Choosing a Mixer

My inquiry has two parts. As a broadcast major at the University of Nebraska, I am trying to find a mixer that would be flexible enough to meet my diverse needs.

I have numerous friends who are musicians and would like to be able to record them with a good quality mixer. As a broadcast major, I would like a mixer with cue capability for two turntables and two tape decks with voice-over for any production work.

I am interested in a stereo mixer that could be expanded to four channels as one of my tape decks is a Pioneer RT-2022 to which I have already added the four-track head and will eventually add the extra amplifier.

I would like the mixer to be for studio

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long-life advantage of ferrite without static build-up or heat degradation, we use Revox's exclusive Revodur heads, made of metal to dispel heat and static, and vacuum-coated with permalloy for durability.

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CIRCLE 91 ON READER SERVICE CARD

or portable recording. Not knowing what my mic cable run length would be, I imagine that LoZ inputs would be preferred. Number of inputs would be flexible as long as the mixer could handle the two turntables, two tape decks, and the talk-over mic. A second talk-over mic wouldn't hurt for interview-type situations.

I am prepared to spend \$1500 to \$2000, but if an obviously superior mixer would be priced \$2500, I could also consider it.

The second part of my inquiry is related to the first... If I find that combining a recording mixer and a broadcast mixer is unrealistic then I would be interested in a low-cost broadcast mixer, or disco mixer.

Your magazine featured one such possibility in the August 1978 issue, in the Product Scene section. The piece of equipment I refer to is the Numark Studio Master (DM 1500W). Of course, the Reader Service card has expired, and I have so far been unable to locate

an address for the Numark firm either in your magazine or through audio dealers locally. What is their address?

Please send me any recommendations for mixers that you feel would fulfill my needs as expressed in either part one or two. Your help will be much appreciated.

Keep up the fine publication as I look forward to receiving each issue.

—Larry W. Sheffield
Lincoln, Neb.

Larry, Larry, Larry, we're in no position to offer you complicated advice such as you're asking. Do the legwork and writing necessary (the Numark Electronics Corp. is located at 503 Raritan Center, Edison, NJ 08817) to obtain specs and catalog sheets on a selection of mixers within your price range. The best people to advise you would be your instructors and/or personnel selling this type of equipment (a good salesperson wants to sell you what you want to buy). In this space, we simply cannot endorse products.

Some Serious Skipping

I'm not sure what good this letter will do other than vent off a fit of frustration. I didn't even know who I would send this letter to except to *Modern Recording* because it is a good magazine read by many.

Recently I received over a dozen brand new albums via my membership in NARAS. Great! I start playing them and to my dismay, not one, not two, but about eight of them either seriously skip or have some variety of clicks, pops, and surface noises. I go, "Say What!" Immediately I set to rebalancing my turntable's tonearm. I'd like to add at this point that I use a most respectable disc-cleaner and some very nice stereo equipment and I was a disc-jockey for eight years (so I should know how to handle records). My collection is always kept in great shape.

After rechecking the equipment, I find that the "annoyances" are still there. One album of a top-selling vocal group had only two playable cuts on the entire LP and they were the first on each side. This has happened time and time again whenever I get a new disc from any store or as a gift. The music industry which is now a major contributor to our country's overall economy, has evolved much like the nuclear industry; technically faster than it has the means to maintain its

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CIRCLE 129 ON READER SERVICE CARD

They said we couldn't do it!



For years Peavey (and everyone else) depended on the same two or three companies to supply high efficiency, high quality loudspeaker products for use in our equipment. These few companies have been around for years and are, for the most part, producing their loudspeakers in the same way and from the same materials they always have. As the market demanded better performance, Peavey and other manufacturers increased the electronic sophistication of their products far in excess of the capabilities of the available high efficiency transducers. We attempted to explain to the "speaker geniuses" the problems and shortcomings encountered with their "beloved" products. We tried to explain why paper voice coils were inadequate. We tried to explain the power handling requirements necessary with the new generation of power amps. We tried to explain the need for

better cooling, for stronger and lighter cones and diaphragms. But they wouldn't listen. They said, "We are the experts and we know that most equipment manufacturers and soundmen don't understand our 'precision' transducers and how to use them."

In desperation, we agonized over what we might do to satisfy our customers and to match the increasing sophistication of our electronics. After examining all the alternatives, we decided that we must apply an old adage....**"If you want it done right, then do it yourself."**

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Over five years of research and development, millions of dollars, and many thousands of hours of engineering time have gone into what we believe is the finest series of transducers available,.... at any price.

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The "established manufacturers" of high efficiency loudspeakers have been very critical of our efforts and continue to emphasize the various features on which they have depended so long, while branding us and our products as "upstarts" and extolling the virtues of alnico and other venerable materials and techniques. Meanwhile, they have been **frantically** redesigning their dated products and you will soon see that their "fantastic new generation of loudspeakers," which will be introduced with great **hullabaloo**, will closely resemble our innovative Black Widow series. We would ask that you remember **where** you saw these features initially and also ask that you consider the amount of care and dedication we at Peavey are putting into offering you what we believe to be the finest series of loudspeakers ever introduced for sound reinforcement,...**First!**



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CIRCLE 34 ON READER SERVICE CARD

quality levels for pressing records.

I've now been a recording engineer for four years and know the blood sweat and tears that go into some projects, not to mention the money. I also relate to the prospects and joy this hard work can bring not only to those who are creating it, but the public that will receive it. However, all is for naught once it reaches the pressing plant. It makes me want to forget records and stick to tape.

With an energy crisis as well as the inflationary rise on the price of producing and purchasing records, how can this waste be justified? People don't want to throw — what is it now — \$8.00? away for (expletive deleted)! If the record companies are so concerned about maintaining their profit margins in the face of spiraling costs, then they should be keeping an ear on the facilities they use.

Perhaps *Modern Recording* could take this up as a cause to look into. Excuse me, I have to go. My record is skip... skip... skip...

— Tom Roberts
Staff Engineer
Sound Ideas Studios
New York, N.Y.

Harmonized

I'm hung up about Todd Rundgren, and really too. I like his guitar sound very much and have heard that he uses a Harmonizer, an Eventide Harmonizer.

Can you tell me what this device does; what kind of effect does he get from it? Also, what is the address of the company that makes these?

Thank you for a good magazine and can I ask you for more stuff with Mr. Rundgren?

I certainly have the issue of *MR* with Mr. Rundgren from August 1977.

— Henry Thompson
Oslo, Norway

Eventide's Harmonizer has "unexplored potential for both investigating and creating a myriad of possibilities," as stated by Len Feldman and Norman Eisenberg in their report on the Model H-910 that we published way back in our December '76/January '77 issue. It is designed for a great variety of applications in sound reinforcement, recording, performance and ordinary playback.

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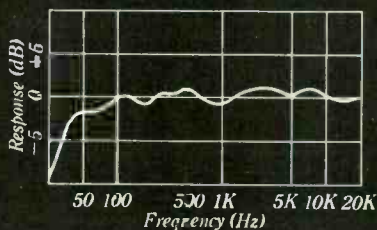
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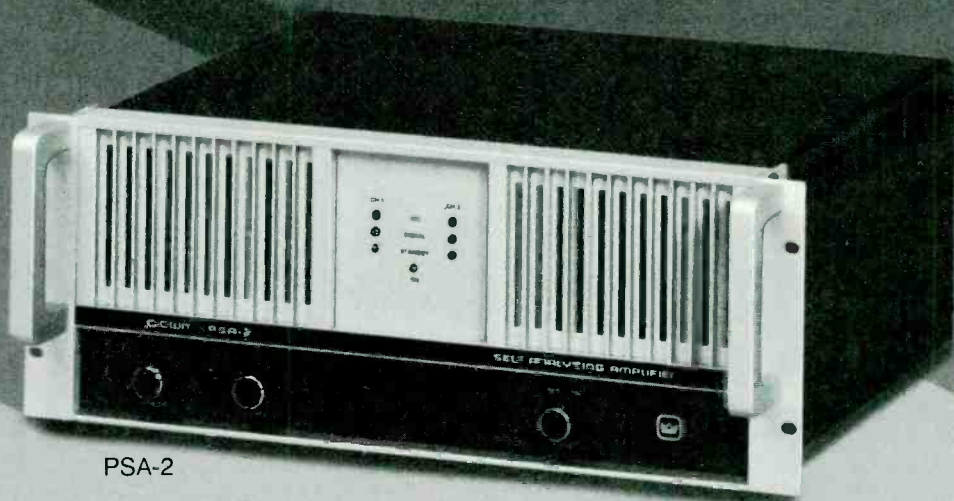


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CIRCLE 104 ON READER SERVICE CARD

TALK BACK

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

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

A Slew of Information on Amplifier ABC's

I have two questions concerning amplifiers and I hope you can help me with them.

What is the slew rate of an amplifier and how important is it to consider when buying an amp?

I am lost when it comes to the letter classifications of amplifiers. I am totally confused by the A's, B's, D's, etc. — what do they mean?

—Mac Dent
Charlottesville, Va.

The slew rate of an amplifier is another way of describing how "fast" the amplifier is. If you apply a sharply rising, steep waveform to the input of an amplifier, it will take some finite time for the voltage at the output terminals to go from "zero volts" to the desired maximum voltage. In effect, the electrons moving through the semi-conductors used in the amplifier cannot do so in "zero time," but must take some small amount of time to create the necessary steep-rising voltage at the output of the amplifier. Engineers generally measure slew rate by applying a square wave to

the input of the amplifier. If the square wave were truly square, and if the amplifier had an infinite slew rate, the appearance of the wave at the output terminals of the amp should be perfectly square, with an absolutely vertical rising front to the wave and an equally vertical decreasing wavefront on the downgoing side of the applied square wave signal.

Since this is never the case, the output is displayed on an oscilloscope, which had been calibrated with respect to its vertical axis (so many volts per division) and with respect to its horizontal axis (so many microseconds per horizontal division). By observing the slope of the rising (or falling) part of the square waveform, it is easy to calculate the number of volts per microsecond that the given amplifier can handle. Thus, if the waveform has a linear slope of 50 volts rise, in 5 microseconds of 'scope sweep, then the slew rate is 10 volts per microsecond (50/5).

As for the importance of slew rate in an amplifier, there are still conflicting views. Certainly, the amp must be fast enough to handle *any* sort of musical waveform which is likely to be presented to it from any modern program source (tape, disc, radio, microphones, etc.). If you take the position that 20,000 Hz is the highest instantaneous frequency that any amplifier ever needs to be able to handle, the required slew rate, even for high-powered amps, becomes surprisingly small. For example, suppose we had a 100-watt amp. At full output that means it must have a voltage output of 28.28 volts across 8-ohm loads. But that's an RMS value. The peak-to-peak value of that voltage is approximately 2.828 times as much, or around 80 volts (from a maximum - 40 to a maximum + 40). The amplifier must be able to 'swing over that extreme of voltage in one half of a cycle. Now, one cycle of one 20,000 Hz tone takes 1/20,000 of a second, or 50 mic-

roseconds. Half of that is 25 microseconds, so the voltage must be able to swing 80 volts in 25 microseconds. That works out to be a required slew-rate of only 3.2 volts per microsecond!

If you take the position that complex waveforms contain frequencies much higher than the so-called theoretical limits of human hearing, and that it is important to reproduce these components along with the fundamentals that we do hear as discrete tones (and there is much evidence to support this theory), then an amplifier should have a much higher slew rate than in the example just given. I tend to lean in that direction myself, based upon my own listening experiences with modern amps, but I believe that, like all newly publicized specs, some amp makers may be going a bit overboard in the amount of slew-rate capability they are designing into their latest amps. Of course, it this does not involve a cost penalty, there is certainly no harm done in having those incredibly high slew rates, such as 100 or more volts per microsecond.

[Your second question, regarding the various classes of amplifiers and their significance to you as a potential buyer, has already been explored in depth in Len Feldman's Ambient Sound column. (If you happen to have it on hand, refer back to the February 1978 issue, pages 68-69.) Since we felt he had already had the last word on this topic, we reprint it here for your edification. —Ed.]

A review of the differences of the various classes of amplification, and definitions of same, is particularly relevant now because in the last few years, after living contentedly with three basic classes of amplifiers for many decades (Class A, B and C) there have recently been a rash of "new class" amplifier introductions which are unfamiliar to audio professionals and hobby-

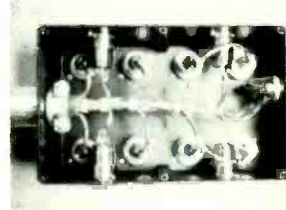
ists alike. So let's begin at the beginning, with Class A amplifiers.

A Class A amplifier, whether it be a tube or transistor type, is generally biased so that maximum current flows through the amplifying device regardless of whether or not an audio signal is applied to the amplifier. When an audio signal is applied (to the grid, in the case of a tube amplifier, or to the base circuit of a transistor), its amplitude must be kept small enough so that the amplifier device is neither "cut off" nor driven into saturation. Since the amplifying device conducts during the entire signal waveform (positive and negative halves of each cycle), Class A amplifiers can operate with only one active amplifying device (tube or transistor) in the circuit. A Class A amplifier, carefully designed for linear operation, exhibits very low orders of distortion and higher orders of distortion are reached only if and when the amplitude of the input signal is too great to be handled within the linear operating range of the tube or transistor used. The disadvantages of Class A operation have to do with the low efficiency of this amplifier class. Even with no signal applied, the Class A output stage draws maximum current. So, power dissipation or total power consumed by a Class A amp is constant (and relatively high) under all signal conditions. With no signal applied, the power consumed has to be dissipated within the amplifier itself, giving rise to large heat sink requirements even for relatively low power output amplifiers. In a Class A design, some of the power consumed is transferred to the load when signals are amplified, so that at maximum output, such amplifiers actually dissipate less power internally than at no-signal conditions. Overall efficiency of Class A amplifiers (output power divided by input power, expressed as a percentage) runs around 20%.

In a Class B amplifier, two output signal amplifying devices (or pairs of devices in parallel) are generally used in what is popularly called a "push-pull" circuit. Each device (or each half of the stage) handles only half of the signal waveform being amplified. With no signal applied, the amplifying devices are biased almost to cut-off. When a signal is applied, the positive half of the waveform causes conduction and amplification by one half of the circuit, while the negative-going waveform is handled by the other half. With no signal applied, therefore, power consumption of

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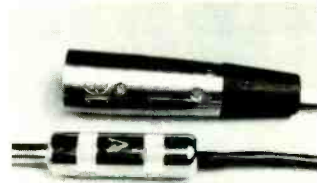


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a Class B amplifier can be made very small or almost negligible. This arrangement reduces overall dissipation within the amplifier and thereby reduces heat sink requirements (in the case of transistorized equipment) and increases overall amplifier efficiency. Efficiency of Class B amplifiers can reach a figure of 60% or even a bit higher. Most solid-state amplifiers sold these days generally employ Class B, or Class AB design. In a Class AB design, the push-pull idea is still employed, but each amplifying device is biased somewhat more into its conductive region, so that there is some overlap of signal waveform handling, with both devices conducting in and around the "crossover" region, or the region where the signal waveform crosses the zero-amplitude axis in its positive and negative going swings. Class AB design is one method used to overcome the chief disadvantage of pure Class B design—crossover or notch distortion. This type of distortion occurs at the zero-crossover point if the amplifying devices exhibit non-linear characteristics at or near their cut-off points, creating a discontinuity "notch" or "glitch" as the amplified signal alter-

nated through the zero-axis during each alternation. Notch distortion, unlike clipping or overload distortion, becomes even more bothersome at low power output or low listening levels, since the discontinuity of waveform is fixed and becomes a greater percentage of the total signal output as the volume control is turned *down* to lower percentages of the rated output of the given amplifier.

Class C amplifiers are those in which conduction of the output stage takes place for only a small fraction of the duration of a single alternation or waveform. Since such an amplifier cannot possibly accurately reproduce an audio signal, this type of amplifier is only used in fixed-frequency RF amplifying circuits, where tuned circuits (consisting of inductances and capacitances, or their equivalents) provide the necessary "flywheel" effect to fill in the "missing" section of the waveform. On the positive side, a Class C amplifier may have an efficiency as great as 80%.

So-called Class D amplifiers are more properly described as "switching" amplifiers, or even pulse-width modulation amplifiers. In such amplifiers, a very

high, super-audible frequency is generated within the amplifier, creating a series of short-duration pulses. The frequency of these pulses may be of the order of 500 kHz or even higher. The incoming audio signal voltage is used to modulate these pulses, varying either in their width (in the case of a pulse-width modulation amplifier) or their amplitude. The output stage is therefore called upon to amplify a series of short-duration pulses rather than a continuous signal waveform. Passive, integrating circuits following the power amplifier stage are then used to convert the varying amplitude or varying width pulses back into a filtered, smooth audio waveform which is an amplified replica of the input signal.

The advantage of the Class D idea, as you might have guessed, is very high efficiency, ranging above 90%. Because of other inherent problems associated with switching amplifiers, such as RF radiation and the difficulty in designing high-powered switching devices that can operate at the high frequencies required, only two manufacturers have offered consumer versions of the Class D or switching amplifier, to date. These manufacturers are Infinity Systems,

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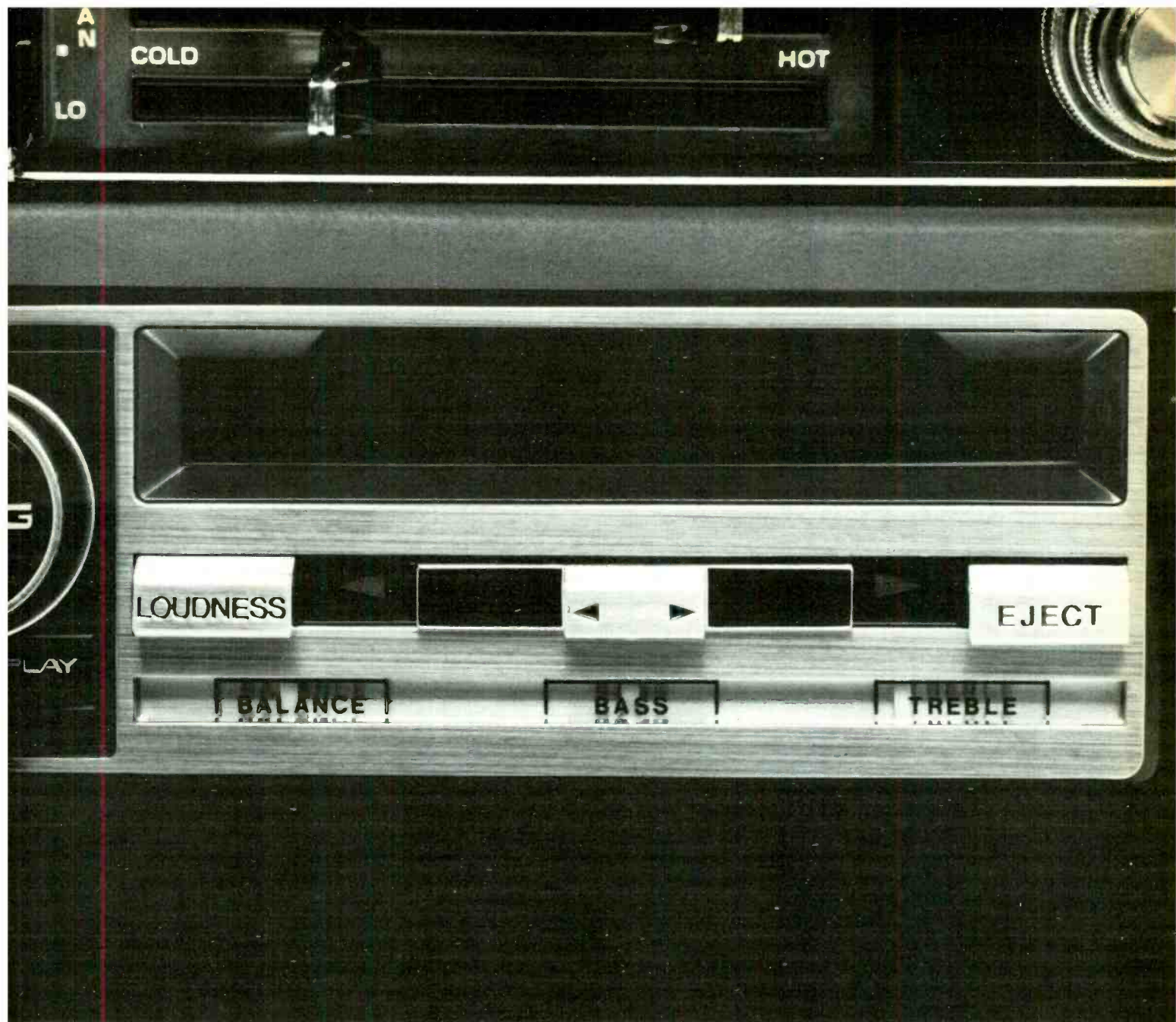


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Inc., and Sony Corporation. The latter company expects to market their version of a switching amplifier very shortly.

Classes E and F seem to have been used up in fields other than audio, which brings us to Hitachi's highly touted "Class G" amplifying system.

In the Class G amplifier, each half of the classical Class B circuit is replaced by two amplifying devices wired in a sort of series arrangement and powered by two different supply voltage sources. At low signal levels, the waveform is amplified by the lower-powered transistor (for each half cycle)

while the upper, higher voltage transistor remains non-conducting. When the signal input voltage exceeds a predetermined amplitude, the lower-voltage transistor is turned off and the higher-voltage, higher-powered transistor takes over the job of amplifying the peaks or crests of the waveform during each alternation. The idea here is that each pair of transistors is operating more often at its most efficient operating point and the efficiency of the Class G amplifier exceeds that of a Class B circuit not only when the amplifier is delivering its full rated

power but at lower levels as well.

Not to be outdone, the folks at Soundcraftsmen, Inc. have come up with what they call a vari-portional amplifier system that some audio people have dubbed the "Class H" circuit. In this scheme, only one pair of output amplifying devices is used, much as in the case of a Class B or a Class AB power stage. However, these output devices may be powered from either of two voltage supplies, one supply being higher than the other. A sophisticated logic or monitoring circuit measures the amplitude of the incoming signal. At low signal levels, the lower voltage supply powers the output transistors. When the logic circuits detect a rising waveform that is likely to exceed clipping levels of the amplifier, the higher-voltage power supply is "turned on," extending the operating range of the output devices so that they can now handle those higher voltage swings. The higher voltage supply is always turned "on" before it is actually needed so that there are no discontinuities in the amplified waveform or switching transients. Furthermore, the speed of turn-on is great enough so that even when a high-amplitude high-frequency transient is to be amplified, the higher voltage supply is available sooner than it is needed. Again, the advantage claimed for the Class H amplifier is its increased efficiency, lower internal dissipation over more of its operating range and therefore, decreased heat sink or heat dissipation requirements. The inventors of this idea also maintain that because only one set of transistors is used (as opposed to having to switch from one pair to another in the Class G approach) there is less of a problem with switching distortion or discontinuities in the reproduced waveform.

Whether inspired by the energy crisis or for other reasons, more engineers and audio companies seem to be turning their attention to developing more and more classes of more efficiently operating audio amplifiers. Normally, we would conclude by saying that we have covered the operation of all existing classes of audio amplifiers, but since we generally prepare this column a few weeks before it is published, that might be a foolhardy statement to make. For, by the time you read this, perhaps some obscure lab here or abroad may have already announced another breakthrough in amplifier classes—perhaps "Class I" or "Class J" or who knows what. It's at least comfort-


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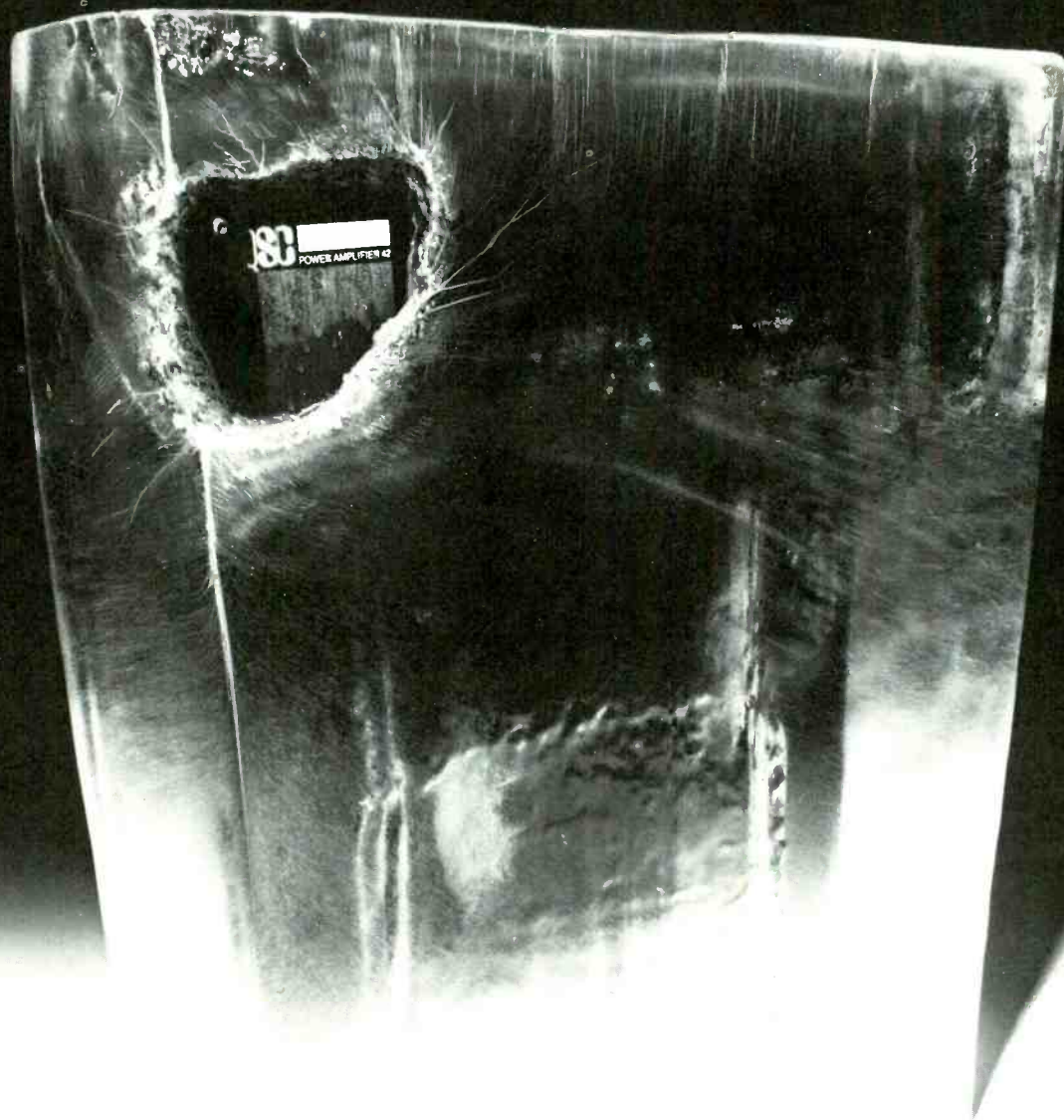
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ing to know that, with twenty-six letters in the alphabet available to us, innovators need not be concerned about running out of designations just yet.

—Leonard Feldman
Technical Editor
Modern Recording

The Facts About Fixing It in the Mix

I'm not sure if I read this in some magazine or if some sound salesman is BSing me, but I heard somewhere that most studios try to keep the basic tracks flat, and equalize during mixdown or mastering. Now, if this is so, and assuming the guitar tracks I put down are good enough, maybe I'm wasting my time searching for perfect sound and tone when I can accomplish this with an equalizer during mixdown. If an equalizer was to be used in this way, which type is preferable—a graphic or a parametric? Which type do professional studios prefer and why?

If I were to mix three tracks down to a fourth, where would the equalizer fit in, before the mixer or after the 'line in' on the deck? I should mention that I would also like to use this equalizer for

bringing out "buried" guitar parts on records. Would I be able to use one type (graphic or parametric) for both purposes I have outlined or will I have to align my priorities since I can't afford two?

—John D. Myke
Ottawa, Ontario

There are no set rules for what is called recording "flat." Originally, recording flat meant to record without echo and/or equalization. But it must be remembered that, at that time, we were recording direct to mono, stereo, or 4-track. If you wanted echo on the final record, then it had to be done immediately. There was no re-mix to fall back on. Everything was on one track. About all that you could do was try to correct it in mastering, and that was really a challenge. When more tracks became available, it was possible to separate the instruments and delay the decisions about how much echo or equalization to use. It was then that the term recording "flat" came into use.

Because there are many ways to do a recording, I can only relate how I would do the original tracking session. Over the years, a standard mic setup has

evolved that I use for doing rhythm tracks. Well before the session begins, a discussion with the producer or artist determines the type of "sound" we will be going after. If there is a record that has the sound we are looking for, we will listen to it, and make a copy that can be delayed back at the studio during the session. This way, we can hear the sound on the studio monitors we will be using. We will then have a standard to base our sound on. If we are confident that the monitor speakers are correct, we will record the tracks with whatever equalization is necessary to produce the desired sound. The tracks would still be referred to as being cut flat, or without echo.

Now, let's get to your basic question: to record with equalization or to do it at mixdown time. I will usually equalize as much as is needed to give the "sound" I want on the final record. There are two reasons for doing it on the multi-track master: First, the sound heard is close to the final mix sound, and other instruments can be equalized to produce a balanced mix and, two, equalizing on the mixdown will usually add noise if large corrections have to be made.

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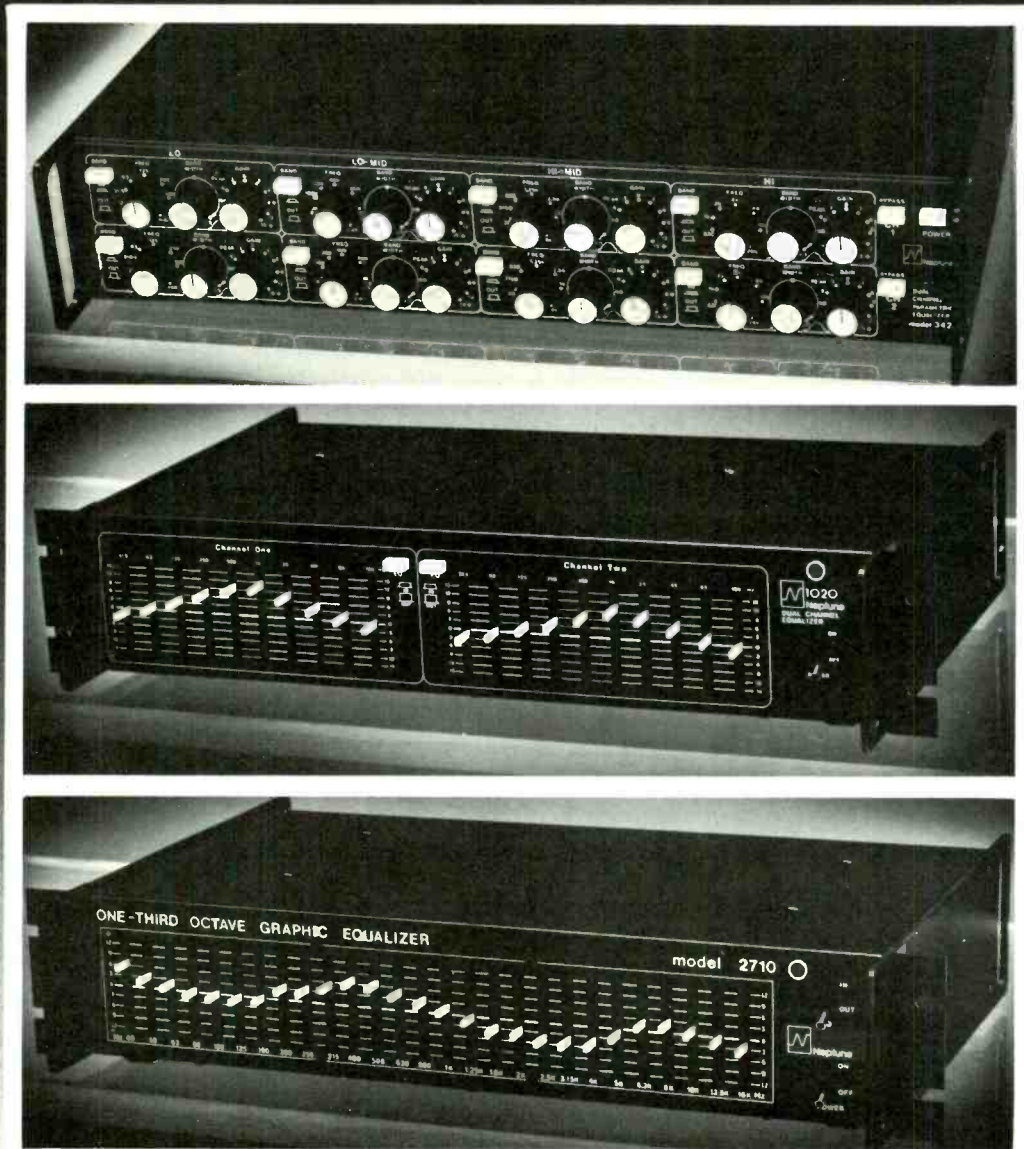
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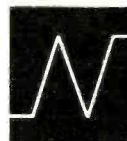
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session be able to hear the mix as close to the final sound as possible. This way each musician can relate to the tune, and play with the proper feeling. If you can't hear it, you can't correct it. Don't say, "I can fix it later;" make it sound right *now*. You may not be able to correct it later.

Equalization in the remix is used to correct for apparent loudness, or to bring out a sound that needs help due to overdubs that were done later, or you may even want to change your original concept of what the record should sound like.

You must understand that a perfect sound starts in the studio; all the equalization in the world can't help later. Try to get the sound right when you first record it. Don't fall into the trap of trying to fix it in the mix. Getting it right on the session is always easier. Only then can the musician make the corrections that will help you get a great sound.

Here are some hints for recording guitars. I have found that recording an electric guitar usually doesn't require any equalization. The tone controls on the instrument and amplifier can usually give more correction than any equalizer. I usually use a Shure 545 series or an Electro-Voice DS 35 on electric guitars with no equalization. If it doesn't sound right, I'll work with the musician till we get it right.

Acoustic guitars usually pose a different problem. Leakage from other instruments in the studio will determine how close you have to be and what will be the best sound you can get with them. For rhythm acoustic, I will use the same type of microphone as on the electric guitar. Because the mic is in so close, proximity effect will boost the bass end, so the microphone doesn't need great bass response. If the microphone has a bass rolloff, use it. It's much easier to overdub an acoustic guitar—you can get back and get a better pickup of the sound. Use a bright microphone and try different positions till it sounds right.

What kind of equalizer to use? This is probably the hardest question to answer. Books could be written about which is the "best" equalizer. There are many good equalizers made for guitars. MXR makes a small graphic that should work in a Hi/Z system. With two equalizers you could patch them around. Then, on the final mix, they could be put in the output of your console, and equalize the overall sound. Just

remember that more is not always better—use as little as possible.

When mixing down, it would be best to have the equalizers before the mixer on each track that needed equalization. If everything needs the same equalization, then a good place to put them is the outputs of the mixer before the line inputs of the tape machine.

Will one equalizer do everything? No. But any corrective equalization, when it is needed, will help. Even with all the equalization available in a modern recording studio, you can't make a perfect sound out of something that was recorded badly in the first place. You can only try to make it sound better.

Graphic or parametric? A graphic equalizer will give you changes only at set frequency bands. The number of bands that can be equalized will depend on how large the equalizer is. With a parametric equalizer the frequency bands are adjustable to different points in the audio spectrum. This allows more control of the equalization. The number of bands and their range of control will increase directly with price.

A parametric equalizer would be the best to "dig out buried guitar parts," but it'll cost you to get a unit that affords you that much control.

The basic things to remember about equalization are:

Use as little as possible, it's easier to have the musician correct his sound.

Make the sound right the first time—because you *can't* always fix it in the mix.

Equalization is a good tool, but too much of a good thing *is not* good.

—Ron Malo

The Total Concept Sound
 Burbank, Ca.

Echoes of the Past

Could you outline the method or methods of achieving tape slap-back echo? I know it can be done without using two tape recorders because I had a very controllable slap-back in an earlier TEAC setup. My new setup includes a Speck 800B console and an 8-track Otari. I've tried hooking my equipment up in the same way my TEAC was and routing and rerouting lines, but the only echo I have found is out-of-sync when using a mic, and it is impossible to sing or play and hear it. If I turn the monitor, cue, or anything else down, away goes the echo completely.

Is it possible to add echo to an already

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recorded signal by bouncing tracks or jacking with the patch bay? Yes, I have a good delay system, but it doesn't touch the old "Sun Echo" of the 1950s.

One final question, must my dbx be bypassed or is there a way to prevent the bizarre sounds it causes when slap-back is achieved?

—Joey Guinn
Guinn Sound Stage
Houston, Tex.

While it is true that most pro and semi-pro studios make use of discrete accessory devices (digital/analog delay lines, tape loops, and other tape recorders) for the production of echo-type effects, satisfactory results can be obtained using the primary recording unit itself to produce the desired "slap-back" echo. Although this method has its limitations, it can be of value to the home or semi-pro recordist.

Basically, slap-back echo can be produced by recording a signal on two separate tracks of a multi-track recorder and then feeding back one of these channels (as played off the reproduce head) to the other recording channel. Due to the distance between the record and the reproduce heads, and in proportion with

the speed of the tape, the original signal will be delayed by a specific amount of time. By mixing this delayed signal with the original, an echoing effect is yielded.

The following is a generalized recipe for attaining the above effect:

Send the signal to be recorded through a mixer's input strip (say, track number 1) and assign matrix to two tracks of a multi-track recorder (for instance, tracks 1 and 2).

Monitor the input of track 1 and the tape out (off the repro head) of track 2.

Route the output of track 2 (monitoring of the repro head) to line in of another input strip (for example, track number 2) and assign the output of that strip through the matrix to track 1 of the multi-track recorder.

Adjust the level of strip number 2 to vary the amount of echo.

This arrangement yields one track of the original signal plus echo (track 1) and one track of echo only (track 2). This track can be reused.

To achieve the same effect in a situation where the information to be echoed has already been recorded, it is necessary to bounce the original track, along with the echo of that track to another track. A possible system for producing

this effect would read as follows:

Route the signal (off the repro head) of the track to be echoed (say, track 1) to the line in of an appropriate input strip and assign through the matrix to two tracks of the multi-track machine (perhaps tracks 2 and 3).

Monitor track 2 off the sync (record) head and track 3 off the repro head.

Bring the tape out (repro head) of track 3 to an input strip and assign through the matrix to track 2 of the multi-track machine.

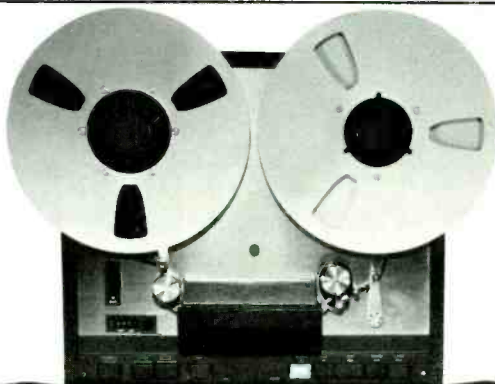
This arrangement will yield one track of original signal plus echo (track 2), one track of echo only (track 3), and, of course, the original track (track 1). Needless to say, tracks 1 and 3 can be reused. However, let me point out that if these tracks need not be reused, it would be an advantage to mix down tracks 1 and 3 as original plus echo, thus eliminating the objections to second generation recording which occurs on track 2.

I think a word should be said at this point about the use of noise reduction devices and how they would affect the above procedures. Generally speaking, if the noise reduction device has simultaneous encode/decode capabilities, they

SE-500 PROFESSIONAL TAPE ECHO.

The no-compromise choice for the best sounding tape echo, featuring:

- Built-in Noise Reduction System;
- Canon XLR Connectors;
- Selectable Input/Output Sensitivity;
- Sound-on-Sound;
- 7-head system (5 separate playback heads with individual pushbutton selection);
- Remote Control Tape Speed, Feedback, and Echo;
- Brushless Direct Drive Servo Motor.



SE-300 PROFESSIONAL TAPE ECHO WITH REVERB.

A lower-cost, quality-oriented tape echo offering many of the features of the SE-500 plus the added flexibility of a professional quality spring reverb. The SE-300 features:

- Sophisticated circuitry maintaining wide frequency response without sacrificing signal-to-noise ratio (Competitive units cut high frequencies to reduce noise);
- Echo/Reverb and Direct/Effect Balance Controls;
- VU Meter and Peak Level Indicator;
- Automatic Input and Selectable Output Attenuation;
- Pushbutton Head Selector;
- Brushless Direct Drive Servo Motor.

The professional way to judge echoes.

You're trying to decide which echo is right for you. And what do you hear? Confusion.

"Tape vs. Digital." "Tape vs. Analog." "Features, gizmos, and gimmicks..."

When the only thing you should be listening for is *sound quality*... the reason you're buying an echo in the first place.

The best way to judge sound quality is the professional's way. Lay down a track or two on tape through a KORG Echo or plug the KORG into a quality sound reinforcement system. And listen.

Listen for the accuracy of KORG's extended frequency response and the dynamics of KORG's higher signal-to-noise ratio. Hear the broader range of effects available with KORG from "Slap-back" to the longest delay around.

KORG started out to build the best sounding tape echo money can buy. It just may have turned out that they built the best echo. Period.

KORG

CIRCLE 73 ON READER SERVICE CARD

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can be left in line without any problems. However, if your noise reduction devices must be switched between record and play modes, then they must be bypassed.

—Bill Hudak
Chief Engineer
Reel Dreams Recording Studios
Bloomfield, Ct.

Simple As It Sounds?

I am assembling a portable sound reinforcement system for use in small- to medium-sized clubs. For quick set up and portability of the speaker amp section of this system, I would like to use an Altec 1224A electronic bi-amplifier (60 watts RMS—Lo, 30 watts RMS—High) built into a JBL three-way main speaker system (in a 4560 bin). What should I know about where in the cabinet this unit should be installed (preferably in the upper rear baffle), so as not to interfere with low speaker backwave? Is there any disadvantage in using this built-in system, as compared to using separate components?

Would there be any problem in powering the JBL 2461 and 2405 compression drivers and 3106 8K passive crossover network (in 4663 cabinets)

with the high-frequency power amp of the Altec 1224A and how would these units be wired? Also, which crossover frequency would be best suited—800 Hz or 1500 Hz?

—George A. Watkins
New York, N.Y.

An electronic bi-amplifier unit such as the one you describe can be mounted directly in the cabinet cut-out where the passive crossover network would normally go. The opening would have to be modified to fit the new shape, and a gasket used to maintain the acoustic integrity of the enclosure. The power levels of 60 watts for the woofer and 30 watts for the high frequency section are directly compatible with the components of a JBL 4663 system and should provide a balanced sound. The output of the high frequency amplifier section should be wired to the input of the 3106 passive crossover network and the network outputs connected to the 2461 compression driver and 2405 ring-radiator tweeter, maintaining proper phasing as marked on the units. The electronic crossover frequency should be set at 800 Hz for best compatibility with the characteristics of the 4560

bass bin and 2345/2461 horn-compression driver combination.

As a general opinion, while the components you suggest are electrically compatible, the practical aspects of having the amplifiers mounted within the speaker enclosures may not be as convenient as first thought. Both line level signal input and A.C. power lines must be run to each speaker enclosure, increasing the possibility of hum pickup, and in the event of any component failure it will be much more difficult to change to a different configuration or to effect field repairs. Some of the major sound contractors have tried modular systems with combined amplifier/speaker packages, and most all have gone back to separate amplifiers and speakers for more versatility and less wiring problems. As with any audio system, the decision as to the best set-up will depend on your particular method of operation and performance requirements.

—Mark R. Gander
Transducer Engineer
JBL Sound, Inc.
Northridge, Ca.



CALZONE ... WHEN "STANDARD" ISN'T GOOD ENOUGH!



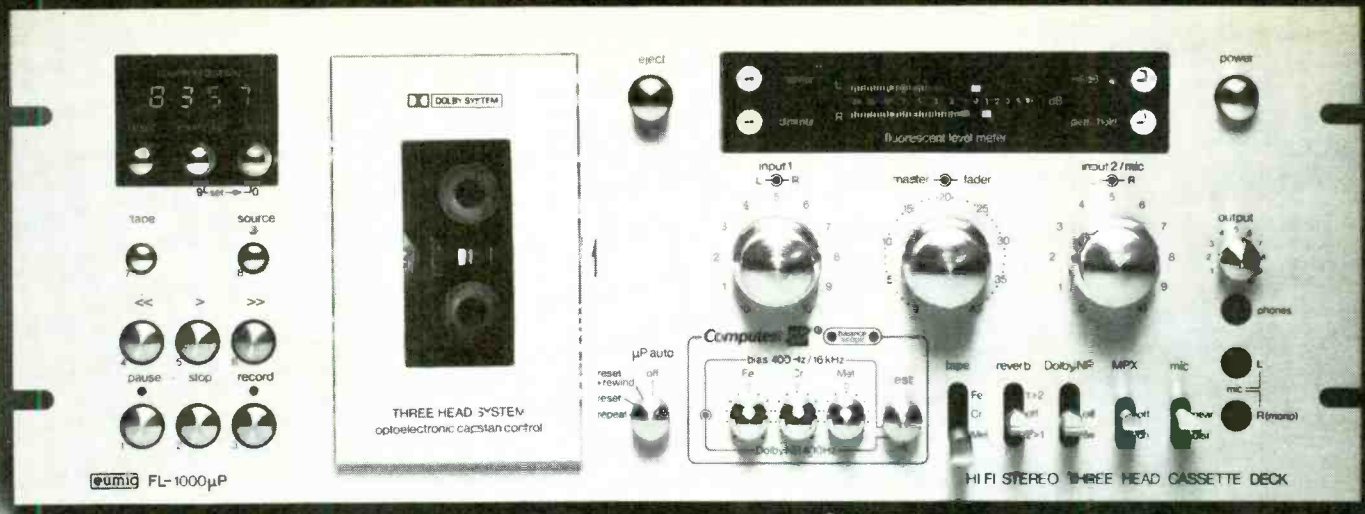
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- 1956 STRAT
- 1966 J-200
- 1960 LES PAUL
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CIRCLE 132 ON READER SERVICE CARD



Calling the FL-1000 a cassette deck is like calling a Ferrari transportation.

The owner of a Ferrari knows his car is much more than transportation. It'll get you there, but with a difference. A difference that comes from years of dedication to building precision machinery with an emphasis on performance and pleasure.

Similarly, anyone who uses the new Eumig FL-1000 immediately recognizes how much better it is—and how much more it does—than any other cassette deck. Much like the Ferrari, it is built for total satisfaction, to give top performance and instant response, where the competition just... works.

The FL-1000 has the most sophisticated microprocessor ever used in a cassette deck. It's so sophisticated, in fact, that it can be directly interconnected with most popular minicomputers through its standard IEEE buss for data storage and retrieval or automated music programming. The microprocessor provides logic-perfect tape transport supervision, plus automatic programmable stop and repeat. There's even an automatic searching mode to select any programmed point on the tape just by punching digits on the keyboard. The tape counter is purely electronic, with digital readouts, and the motor automatically slows when it approaches your selection and stops at the perfect point so you hear only what you programmed.

Our Computest automated test system and 400Hz and 14kHz test oscillators help you set optimum bias, equalization and Dolby™ levels for any tape, including the newest pure metal formulations. And our superb switchable limiter circuit—absolutely

undetectable in operation—assures distortion-free recordings with any tape or sound source.

Instead of clunking solenoids, the FL-1000 uses two electronically controlled motors for mechanical functions and to move the tape. The capstan motor incorporates Eumig's unique optoelectronic control. Instead of heavy flywheels and cumbersome belts, we use a low-mass disc with 2500 precisely photo-etched lines that are read by an optical sensor at the rate of 15,000 pulses per second. Speed correction is instantaneous, and wow and flutter are kept to an insignificant 0.035%.

Naturally the Eumig FL-1000 has three heads and double Dolby for true monitoring. And added flexibility is provided by two mixable stereo inputs with a cross fader, reverb without patch cords, fixed and variable outputs, fluorescent level meters with peak hold, and even a read-out that says "END" when the tape is finished.

If you want to understand and appreciate a fine car, a test drive is best. It's much the same with the FL-1000; so visit your Eumig dealer to audition the FL-1000 and the companion tuner, preamp and power amp. To set the right mood, make the trip in a Ferrari.

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CIRCLE 149 ON READER SERVICE CARD



THE **PRODUCT** SCENE

By Norman Eisenberg

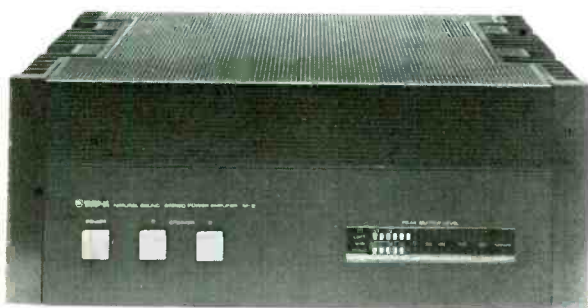
EMPIRE REVEALS EMI TAPE LINE

Empire Scientific Corp., for years known as a manufacturer of phono pickups, turntables and speaker systems, has entered the recording tape field with cassette and open-reel tapes made by EMI of England. In cassette tapes, they are offering three grades of ferric-oxide (normal bias; 120 msec EQ) known as Standard, Super, and High Fidelity. In each grade there are three sizes (C-60, C-90 and C-120). In open-reel tapes there are reel sizes from 5-inch to 10½-inch, including—for 7-inch and 10½-inch sizes—formulations said to be suited for professional and semi-pro use.

CIRCLE 12 ON READER SERVICE CARD

NEW YAMAHA AMP

Yamaha's model M-2 is a DC stereo power amplifier rated at 240 watts per channel RMS (8 ohms) with a THD of 0.005 percent. Into 4-ohm loads, the power rating at 1 kHz is 350 watts per channel. The amp sports a high-speed peak level meter system using green LEDs reading from -50 dB to -5 dB in steps of 5 dB, and from -3 dB to +3 dB in steps of 1 dB. Red LEDs light up to indicate excessively high inputs or overload, as well as clipping, when distortion hits 1 percent. Price is \$1200.



CIRCLE 13 ON READER SERVICE CARD

NEPTUNE ELECTRONIC CROSSOVER

Stereo biamp or mono triamp capability is offered in the model 321 electronic crossover from Neptune Electronics of Portland, Oregon. Featured are 18 dB/octave slopes, maximally flat Butterworth filters, single-knob frequency controls, a high-frequency phase-reversal switch, level controls for all outputs, balanced or unbalanced operation, LED peak indicators, mic and phone jack connectors.



CIRCLE 14 ON READER SERVICE CARD

TDK SHOWS NEW TAPE CARE PRODUCTS

In the wake of its professional-grade series of special cassette test-tapes, TDK continues its appeal to serious recordists with a head maintenance kit and a storage module. The head care kit, Model HC-05, is housed in a cassette box, and it includes a mirror, brushes, pads and cleaning fluid. The CP-15 storage unit holds up to fifteen cassettes—in or out of their cases—and has a hinged door. Units are stackable.

CIRCLE 15 ON READER SERVICE CARD

DUAL CASSETTE DECKS



All four of Dual's new cassette recorders have metal tape capability. They also feature what Dual calls "direct load and lock"—instead of a door over the cassette area, this section is always open and a head protector swivels away from the heads when the unit is switched on. The cassette then is slipped into position where it is automatically locked into alignment. The cassette can be grasped and removed at any time, even while tape is in motion—stop switches on each side halt the tape a split second before it is removed. All four decks use DC servo motors, equalized peak-reading level indicators (which read the complete signal reaching the record head and tape, including the high-frequency boost).

The top-of-the-line model 839 uses two motors and two capstans in a closed-loop system. It also features automatic reverse in both record and playback, electronic fade/editing, variable speed, wireless remote-control capability, logic controls, switchable limiter, and more. Price is \$850.

CIRCLE 16 ON READER SERVICE CARD

3M MARKETS DIGITAL MACHINES

The word from 3M is that it will soon be offering its digital recorders—originally available only on a leasing basis—for sale. According to 3M, the leasing plan "had served its original purpose, to share the responsibility for the integration of the first digital systems with the pioneering studios."

Delivery of the machines, which will be sold directly by 3M, was stated to begin in September of this year. The complete system will cost approximately \$150,000. That system includes the 32-track recorder (\$115,000) and the 4-track unit (\$35,000). Also available will be a disc lathe preview unit at approximately \$4,800.

CIRCLE 17 ON READER SERVICE CARD

OPTONICA SHOWS NEW CASSETTE DECKS

Four new cassette recorders from Optonica feature this firm's "Opto" peak-level display; three are metal-tape compatible, and one also is microprocessor-controlled.

The last-mentioned unit is the RT-6502/6, a step-up version of the RT-6501. The new version handles metal tape and boasts improved performance specs. With five memory functions, this deck can be directed to find the start and automatically play any segment of a recorded tape in either forward or reverse. It also can be programmed to turn itself on or off, and to play a specific segment of a tape repeatedly. It also has rewind and tape-counter memories. It includes a quartz digital clock with LCD display; electronic tape and elapsed time displays; peak-level display and hold; mic/line mixing, 4-position bias and EQ selection; and much more. Retail price is \$520.

CIRCLE 18 ON READER SERVICE CARD

TAMON STEREO EQUALIZER

The EB-1000 is a new stereo graphic equalizer from a Japanese company, Tamon International. Designed for equalizing program sources as well as tape playback signals, the device has ten sliders per channel with nominal center frequencies an octave apart from 32 Hz to 16 kHz. Range for each slider is ± 12 dB. THD is listed as 0.03 percent. Price was not available at presstime.

CIRCLE 19 ON READER SERVICE CARD

NEW MXR EQUALIZERS

Fifteen bands spaced 2/3-octave apart, on two stereo channels, highlight MXR's "Stereo Fifteen" graphic equalizer. The device includes a tape-monitor switch, walnut side panels (rack-mounting hardware is included) and an EQ in/out switch.

MXR also is showing a one-third octave equalizer offering thirty-one discrete frequency bands on one channel. In addition to the EQ sliders, the unit has a broadband level control and an EQ in/out switch. Side panels and mounting hardware are the same as for the Stereo Fifteen.

CIRCLE 20 ON READER SERVICE CARD

PROTECH PC CARD AMPLIFIERS

Three new PC Card Amplifiers, from ProTech Audio of Lake Ronkonkoma, N.Y., all feature built-in high level output transformers designed to deliver up to +28 dBm into 600-ohm balanced loads. Model 725 AM/T is a low-noise microphone preamp featuring a 150-200 ohm transformer isolated input, adjustable gain up to 63 dB and provision for powering 48-volt-DC condenser microphones. Model 725 ABL/T serves as a balanced input line amplifier with a transformer-isolated input designed to bridge a 600-ohm source impedance. Its gain is adjustable up to 40 dB. Model 725 LAU/T is an unbalanced input line/summing amplifier featuring access to both non-inverting (+), and inverting (-) inputs of the IC-Opamp input stage. The user may select the desired function of this card by simple external connections. Gain is adjustable on a built-in trim pot.

CIRCLE 21 ON READER SERVICE CARD

PARASOUND OFFERS SYNTOVOX UNITS

Parasound, Inc. of San Francisco, is now distributing products made by Synton Electronics of Holland. Highlights in the line are the Syntovox 221 and 222 Vocoders, formerly available only in Europe. The model 221 is a 20-channel analyzer, synthesizer, and control system which allows the user to create a wide range of vocal effects for recording, theatre use, film sound, commercials,



and so on. The analyzer accepts an input signal and breaks it down by means of twenty bandpass filters. The levels at each filter frequency are converted to control voltages which impose the speech characteristics onto an input signal, either an internal pulse generator or an external source (any instrument with ample harmonics such as a synthesizer, organ or guitar. The model 222 is a simplified version of the device.

CIRCLE 22 ON READER SERVICE CARD

THORENS OFFERS CASSETTE DECK

Claimed to emphasize "professionalism rather than gimmickry" is the new model PC 650 three-head cassette recorder from Thorens. In announcing the recorder, the company stresses its past experience in belt-drive technology in turntables, and states that the new unit "will set new industry standards



for smooth cassette operation." The PC 650 uses two motors. Its "double Dolby" system includes a built-in test oscillator with front-panel calibration. Transport controls are full-logic types. The deck also has a separate headphone/monitor amplifier. Priced at \$1075, the PC 650 is said to be easily converted to all standards of metal tape.

CIRCLE 23 ON READER SERVICE CARD

SPECK STUDIO CONSOLE

Speck Electronics (North Hollywood, Ca.) has announced its model 800-D, described as a 16-input, 8/16 output studio mixing console. Totally modular, the unit has 16 input modules, a master module and a complete communications module housed in a sturdy mainframe that features ten large illuminated VU meters. Each input has eight panable assigns, 3-band parametric EQ, three sends, pan, stereo solo, a long-throw slide fader, and—what Speck terms as "most important"—a second line input with an independent slide fader, a 2-band equalizer and pan. The console is said to be well suited for 16- or 24-track studio operations. The stereo program bus is independent of the 8-track assign section which allows the console to feed a full complement of half-track, quarter-track and cassette recorders simultaneously during mixdown. Price of this mixing console is \$9,800.

CIRCLE 24 ON READER SERVICE CARD

NEW TEAC TASCAM UNITS

Reportedly now available in TEAC's Tascam series is the model 85-16 open-reel system. Operating at 15 inches-per-second and handling 10½-inch reels, the new recorder/reproducer is a 16-track model offering 16 full channels of dbx. The transport uses three servo motors. Included is a zero search function and a four-digit display that indicates tape position and velocity in percentage. The cue lever has a built-in tape lift defeat. Depressing the stop button during the stop mode converts the transport to the editing mode. Depressing either the fast-forward or rewind buttons twice slows tape speed as an added convenience for editing. The 85-16 allows tandem operation of two transports. Sync between transport and VTR, or film recorder, or another machine, is possible. Most functions have remote control capability. Price is about \$10,500.

The model 5B mixing console is an eight-in, four-out unit with color-coded controls. Circuitry features new ICs said to provide a slew rate four times faster than present ICs. The unit can be expanded to a 20-in, 4-out mixer, or be converted to eight-bus operation with the addition of the Tascam Model 1 mixer, the MB-20 meter bridge and the PB-64 patch bay. Price of the Model 5B is \$1,900; the add-ons mentioned list for about \$500.



CIRCLE 25 ON READER SERVICE CARD

READING—HEAVY AND LIGHT

Every now and then the audio industry comes up with items of literature that are, in their own way, as interesting as the equipment itself. For instance, there's a paper received from DuPont that carries the sobering title of "High Coercivity and High Output Chromium Dioxide" but which contains what could prove to be a bombshell for the tape industry. That is, simply, the development of "Crolyn" II, an improved version of CrO₂ tape which is expected to become "a highly cost-effective competitor for improved versions of both video and audio recorders as well as for new systems with higher information storage density." According to DuPont, Crolyn II is nothing more or less than "the best performing cassette tape now available."

CIRCLE 26 ON READER SERVICE CARD

Less jolting, but challenging in its own way is a technical bulletin published by the British speaker company KEF titled "High Efficiency with Small Enclosures?" The question is answered, with a good deal of explanation and theory—including graphs and some math—but not before covering some widely-held beliefs about such popular speaker system designs as vented enclosures, passive radiators, and labyrinths.

CIRCLE 27 ON READER SERVICE CARD

For some time, Nortronics—the tape head manufacturer—has been teasing audio editors and writers with a series of little folders touching lightly on tape-recorder care. Now comes the major piece: a 32-page booklet on the subject that explains track configurations for all tape formats, and covers subjects such as bias, azimuth adjustment, equalization, erasing and head losses. In addition it explains the use of accessories for inspecting, cleaning, degaussing, bulk erasing, splicing and lubrication. A good portion of the booklet is given over, naturally, to Nortronics products developed for these various applications.

CIRCLE 28 ON READER SERVICE CARD

Heath has come out with two catalogs. Along with its familiar general "dream book" listing all manner of electronic gear for do-it-yourselfers there's a special Heath/Schlumberger Instruments catalog describing assembled and tested oscilloscopes, lab-grade Strip and X-Y recorders, power supplies, signal and function generators, counters, multimeters and several computers and peripherals. Both catalogs are free.

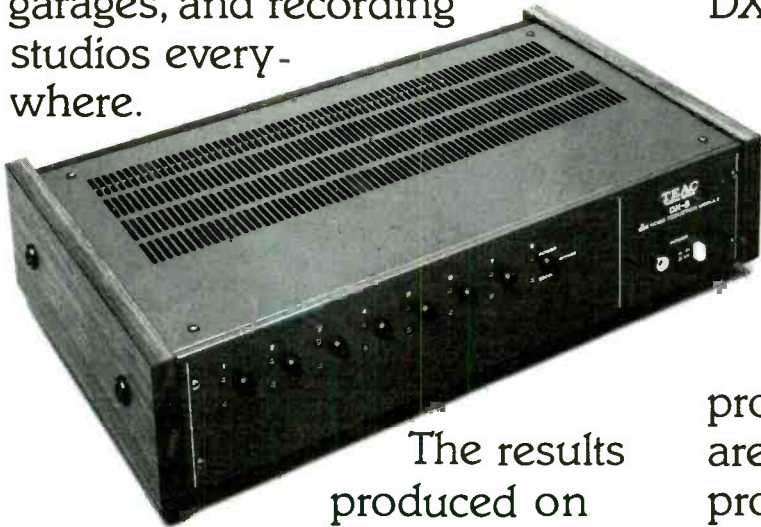
CIRCLE 29 ON READER SERVICE CARD



THE MACHINE THAT HOLDS THE WORLD TRACK RECORD.



The Tascam Series 80-8 has become the most popular 8-track multichannel recorder in the world. Its reliability has been proven in basements, garages, and recording studios everywhere.



The results produced on the 80-8 are a matter of record. Sometimes gold.

The 80-8 proved a new standard was needed. Eight tracks on half-inch tape. 15 ips only. This new format allowed us to create a combined record/reproduce head, with full frequency response in the sync mode.

The 80-8 proved multichannel recorders could be relatively easy to operate. Our Function Select buttons determine the record, monitoring and dbx* status. One button for each track.

The 80-8 proved that performance and versatility could be affordable. Signal-to-noise is better than 95 dB (weighted) with our integral dbx unit (Model DX-8). Once installed, it's totally automatic. And our new Variable Speed Control** lets you adjust 15 ips $\pm 20\%$ to solve tough cueing and timing problems or add creative effects.

The 80-8 is proving that in professional recording, results are all that count. Because to us, pro means results. On demand. For payment.

If you agree, see your Tascam Series dealer for the machine



that can prove it. Because it makes sense to do business with the people who have the track record.

*Registered trade mark of dbx, Inc.

**Installation required; a new DC servo-controlled motor is included.

TASCAM SERIES
TEAC Professional Products

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CIRCLE 113 ON READER SERVICE CARD

NEWSICALS

MODULAR AMPLIFICATION SYSTEMS

Over the last few years there has been a trend in both the hi-fi and professional audio markets toward separate, rack-mounted components, each performing a specific function, rather than the more familiar receiver or combo-type instrument amplifier. There are several obvious advantages to this approach, including the ability to tailor a system to individual requirements, to upgrade any portion of the system without having to replace the whole thing and the ease with which modular units may be interchanged. Until recently, however, the user had to pick and choose between several manufacturers' equipment to assemble his system since few if any manufacturers approached the design of their units with a system design philosophy. Some companies are now realizing the advantages of offering a line of coordinated components that together form an efficient, versatile system with maximum flexibility and a minimum of overlapping or redundant functions.

Intersound, Inc. now offers the components for a high-quality instrument amplification system based on their very versatile IVP Instrument Voicing Preamp. The IVP preamp combines two preamp channels, each with a high/low sensitivity switch, with con-

ventional bass and treble tone controls and a four-band parametric equalizer for total control of tonal balance. In addition, the IVP has an exclusive "tube voice" distortion circuit, effects patch points before and after the tube voice circuit and a low impedance "direct" output, making it an ideal control center for a sophisticated modular system. Intersound's new PRV-1 is a professional quality solid-state mechanical reverb unit. This new unit differs from most conventional

the SP-300 high resolution power amplifier, a professional quality unit which delivers 150 watts RMS into a 4-ohm load, or 200 watts into a 2-ohm load. The unit is ruggedly built and features six protection circuits and/or indicators to keep it running reliably under a variety of conditions.

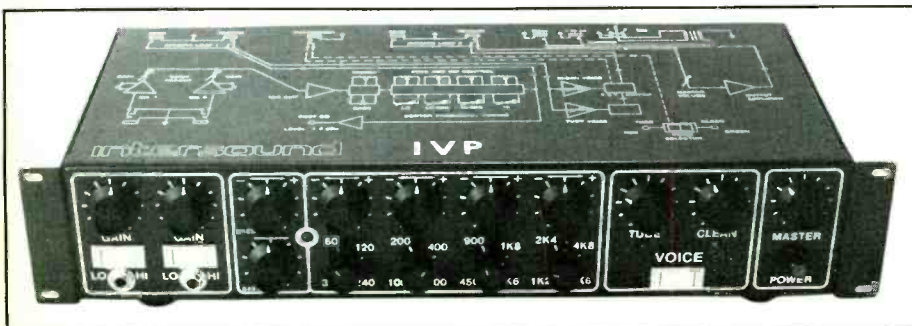
CIRCLE 1 ON READER SERVICE CARD

Roland Corp US recently introduced the Roland Rack concept, which carries the basic modular concept a step



reverb units in that it includes a two-band parametric equalizer which may be switched to control the tone of either the reverb signal or the dry, line signal or both, and a low-cut filter on the reverb signal only to combat mechanical feedback through the mechanical delay line. For versatility, the PRV-1 features input and output gain controls, plus level controls for the reverb and dry signals to allow any proportion of the two signals to be mixed together. To complete the system, Intersound recently introduced

farther by offering a variety of special effects units in addition to the basic preamp/equalizer/power amp setup. The basic preamp in the Roland Rack system is the SIP-300 guitar preamp. This unit features high and low gain inputs, an overdrive circuit with sensitivity and level controls, three-band, wide-range equalization with a choice of two frequencies for each EQ band, hi-cut and lo-cut filters, and master volume control plus the effects patching loop and balanced, low impedance "direct" output. Bass players would probably wish to use the SIP-301 preamp rather than the SIP-300 guitar preamp. The bass version uses different frequencies for its filters and substitutes a compressor circuit for the overdrive of the SIP-300, but is otherwise the same as the guitar version. For power, Roland recommends either of their new power amps, the SPA-240 and the SPA-120 which boast 120 or 60 watts RMS respectively into an 8-ohm load. Beyond these basic



units, the Roland Rack system includes a number of innovative, sophisticated signal processors and effects devices including the SBF-325 Stereo Flanger, which boasts three flanging modes plus chorus and doubling effects; the SDE-388 two channel Digital Delay Line with eight user-programmable delay modes including two flanger modes, two chorus modes and four delay modes with delay times up to 640 ms; and the SDD-320 Dimension Decoder which is described as a specially-designed chorus effect which produces four different spatial effects. And the truly sophisticated musician will find use for the SVC-350 Vocoder and the SPV-355 Pitch-to-Voltage Synthesizer which is basically a self-contained guitar synthesizer. All of these Roland Rack units are standard rack-mount dimensions of 3.5"x19" and will mount in Roland's own equipment racks, the SRR-102 which accommodates single units or the SRR-114 which holds up to seven Roland Rack units in its 24.5 inches of rack space.

CIRCLE 2 ON READER SERVICE CARD

MUSICAL INSTRUMENTS

The NovaLine Piano Company has introduced a new, portable electronic piano, the Roughrider, which is available in 64- and 88-note versions. The Roughrider piano features "Concertouch" dynamics and the acoustic sound quality found in other NovaLine models but houses them in a road case cabinet style for improved roadworthiness. The cabinet is a dust-tight, ABS-laminate road case complete with aluminum edging and steel bumper corners. For additional protection, the keyboard manual and electronics are shock-mounted within the case for vibration isolation. Legs and sustain pedal for the instrument store inside the case's cover section for a self-contained package weighing in at 63 or 75 pounds for the 64- or 88-note models, respectively.

CIRCLE 3 ON READER SERVICE CARD

GUITARS

The newest offerings from Ibanez are the two six-string electric and two electric bass guitars which comprise the Roadster Series. These new models combine familiar styling with the latest hardware, electronics and construction methods to make them some of the most advanced high perfor-



mance guitars available today. A weak spot of many guitars of this type is the neck/body joint. All Roadster models use the Ibanez Quadra-Lock mounting system which uses four machine bolts to mate with threaded inserts embedded in the neck for greatly improved strength. Additionally, the Roadster bass models feature the TR tuned response neck which uses individual tuning techniques involving tuned steel rods embedded in the neck to eliminate the dead notes which plague many basses. All models feature the new Ibanez Accu-Cast bridge-tailpiece units; the guitar model has a unitized sustain block and through-the-body stringing, while the Accu-Cast 8 bass model has slotted string retainers. For pickups, the Roadster guitars use Super 6 or Super-Tap 6 single coil pickups which use twice as many windings as conventional single-coil pickups plus a new magnet structure and non-inductive copper tape shielding for awesome output with excellent clarity, fullness and bite. The Super-Tap 6 also features a switch to only use part of the winding to reduce the output level to more conventional levels. The RS-900 bass guitar features a specially designed active filter network for very versatile tonal control.

CIRCLE 4 ON READER SERVICE CARD

GRD Instruments offers a very interesting line of acoustic, acoustic/electric and electric guitar models designed and crafted by Charles Fox and Associates. Several variations are available within the company's line of hollow body acoustic/electric guitars: six string models with 660 mm scale

length and twelve string guitars with 630 mm scale are available in full body style or single cutaway designs, and shallow body styles with 645 mm scale are available in single or double cutaway models. Standard construction for these models includes solid rosewood back, sides and trim details, spruce soundboard, and solid brass fingerboard nut and saddle; options include cedar soundboard and interchangeable saddles of bone, phenolic or epoxy-graphite. All GRD steel-string hollow body models are equipped with a built-in transducer pickup/tone control system which does not require a preamp. The two transducers are mounted beneath the bridge and in the neck beneath the fretboard for two different tonal characteristics without interfering with the playing or acoustic quality of the instrument in any way. Three controls (volume, tone and balance between pickups) are discreetly mounted on the bass-side shoulder of the instrument (or on the face of the double-cutaway thin body model) and the output jack is flush-mounted.

On the solid-body electric side GRD offers a variety of shapes in six-string models plus a four-string bass; standard construction is Honduras mahogany with a thick rosewood overlay, brass cover plates and all solid brass hardware including a 1/4-inch wide nut, 1-inch deep separate bridge blocks with height and intonation adjustments, and a large brass tailpiece. Electronically, the GRD instruments are unique, featuring two humbucking pickups plus a transducer embedded in the neck under the fingerboard for an "acoustic" sound, plus two-channel active equalization of a very sophisticated design. Power for the active electronics is handled in a very convenient and intelligent way: a three conductor cable carrying audio and DC runs between the guitar and a small power supply box. In the event that the power supply cannot be used for some reason, a rechargeable Nicad battery inside the guitar (which is kept charged whenever the power supply is connected to the guitar) provides the power. The guitars all have two independent channels of equalization and two types of equalizer are available: either a wide-range parametric filter or a six-band graphic equalizer. Each parametric channel has a mode switch to select hi-pass, lo-pass, band-pass or owner preset configurations

and a dual concentric control for filter frequency on the lower half of the control and "Q" on the top half to control the amount of effect. The graphic equalizer has six controls on octave centers with a ± 18 dB range on each control. Each electronics channel is normally connected to one of the magnetic pickups, but a switch is furnished to route the transducer signal through one of the channels. The outputs of the two channels are blended in any proportion via a slide-type control which is conveniently mounted along with the master volume knob alongside the bridge for fingertip sound control.

CIRCLE 5 ON READER SERVICE CARD

SYNTHESIZER EQUIPMENT

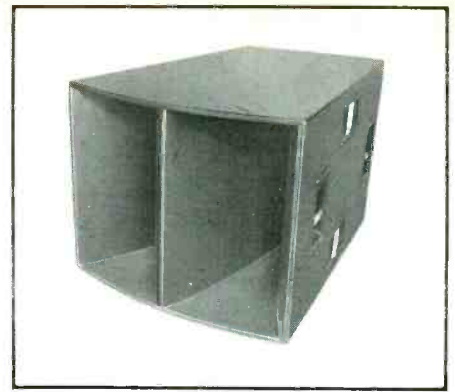
Oberheim Electronics has announced the availability of a kind of super-system based on their Synthesizer Expander Modules. The new system is the Dual Manual Eight Voice Polyphonic Synthesizer with Programmer which comprises eight Expander Modules mounted in one case and a dual keyboard, keyboard controllers and an eight-voice programmer in a second case. Each of the two keyboards has its own control electronics, a four-voice configuration for the upper keyboard and an eight-voice configuration for the lower keyboard; the lower keyboard's electronics act as the master control for pitch bend and overall filter control. The lower manual is a 5-octave unit while the upper is a 4-octave keyboard. Several modes of operation are designed into the system, including four voices each on upper and lower keyboards, two voices on the upper and six on the lower keyboard or all eight voices on

the lower keyboard. Since the two keyboards' electronics function virtually independently, the user can play with unison voices on one keyboard and fully polyphonically on the other keyboard simultaneously.

CIRCLE 6 ON READER SERVICE CARD

SOUND REINFORCEMENT EQUIPMENT

Eastern Acoustic Works has an interesting new design bass horn, the B-212CT. The design of the new horn uses a novel means of coupling the drivers to the throat of the horn and maintains the theoretically correct exponential flare rate through the full length of the horn. The design is said to minimize irregularities in the air-loading, and to avoid the well-known performance compromises of typical folded horns since it is a non-folded type. The construction of the horn uses sophisticated techniques and materials to achieve the relatively complex shape required for the throat design without the strength, rigidity and resonance problems so often found in conventional wood and fiberglass enclosures. Various woods, high-density foams and special damping compounds are used for the horn itself, and the outer enclosure is made of 15 mm laminated Baltic Birch finished with semi-gloss catalyzed polyurethane paint. Standard hardware includes recessed handles and an input connector panel which includes dual $\frac{1}{4}$ -inch phone jacks, dual twist-locks and banana connectors; wheels and edge trim are available as options. The unit uses two 12-inch drivers (ATC drivers are supplied as standard equipment) for better transient response and lower distortion than a single 15-inch design.



The horn flare rate is 62 Hz resulting in frequency response to 70 Hz for a single cabinet, but when a multiple cabinet array is used (as intended by the designer) the low frequency limit is extended to 42 Hz with four cabinets. System impedance is 4 ohms and power handling is 300 watts RMS.

CIRCLE 7 ON READER SERVICE CARD

PICKUPS

Schecter Guitar Research has become well-known for their upgraded hardware items for various popular guitars. The latest from Schecter is their Z Plus pickup series for Gibson Les Paul guitars. Three styles of the Z Plus pickup are now available: the Standard model directly replaces standard size humbuckers while the Deluxe replaces the small size humbuckers, and the Superrock is an all-out super high output model. The pickups are available separately with instructions describing installation using the standard Les Paul wiring, or as the Z Plus Assembly which includes a pair of Z Plus pickups and a fully wired electronics assembly on a brass grounding plate. The new Z Plus wiring assembly includes four Allen-Bradley Omni-pots which combine a low-noise pot for the volume or tone control function with a push-pull switch to give twenty-one different combinations of pickup interconnections without the usual jumble of miniature toggle switches. Two of the push-pull switches are used to select single coil or humbucking modes for each pickup, the third is basically a series/parallel switch and the fourth is a phase reverse/coil select switch. Also new from Schecter is the Kros-Lok brass replacement bridge for Les Pauls. The design features rounded contours for comfort and appearance plus individual adjustment and locking screws for each string's saddle.

CIRCLE 8 ON READER SERVICE CARD



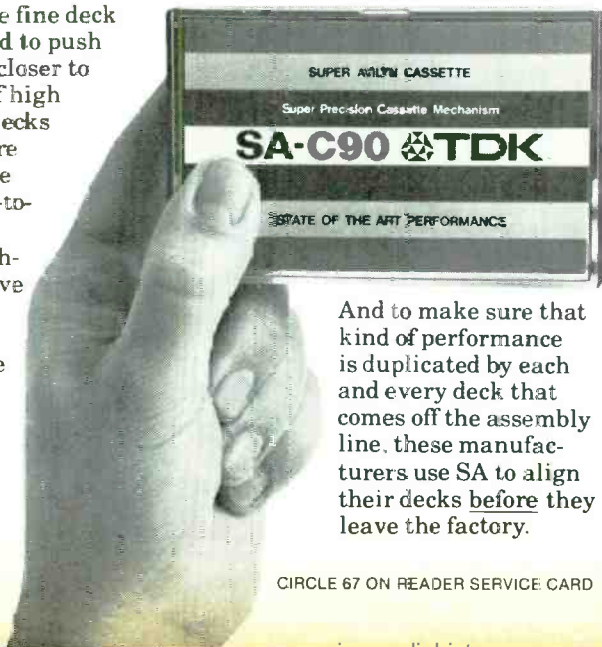
The standard bearers.



The high bias standard.

In the past few years, these fine deck manufacturers have helped to push the cassette medium ever closer to the ultimate boundaries of high fidelity. Today, their best decks can produce results that are virtually indistinguishable from those of the best reel-to-reel machines.

Through all of their technical breakthroughs, they've had one thing in common. They all use TDK SA as their reference tape for the high bias position. These manufacturers wanted a tape that could extract every last drop of performance from their decks and they chose SA.



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Which makes SA the logical choice for home use; the best way to be sure you get all the sound you've paid for.

But sound isn't the only reason SA is the high bias standard. Its super-precision mechanism is the most advanced and reliable TDK has ever made—and we've been backing our cassettes with a full lifetime warranty* longer than anyone else in hi fi—more than 10 years.

So if you would like to raise your own recording standards, simply switch to the tape that's become a recording legend—TDK SA. TDK Electronics Corp., Garden City, NY 11530.

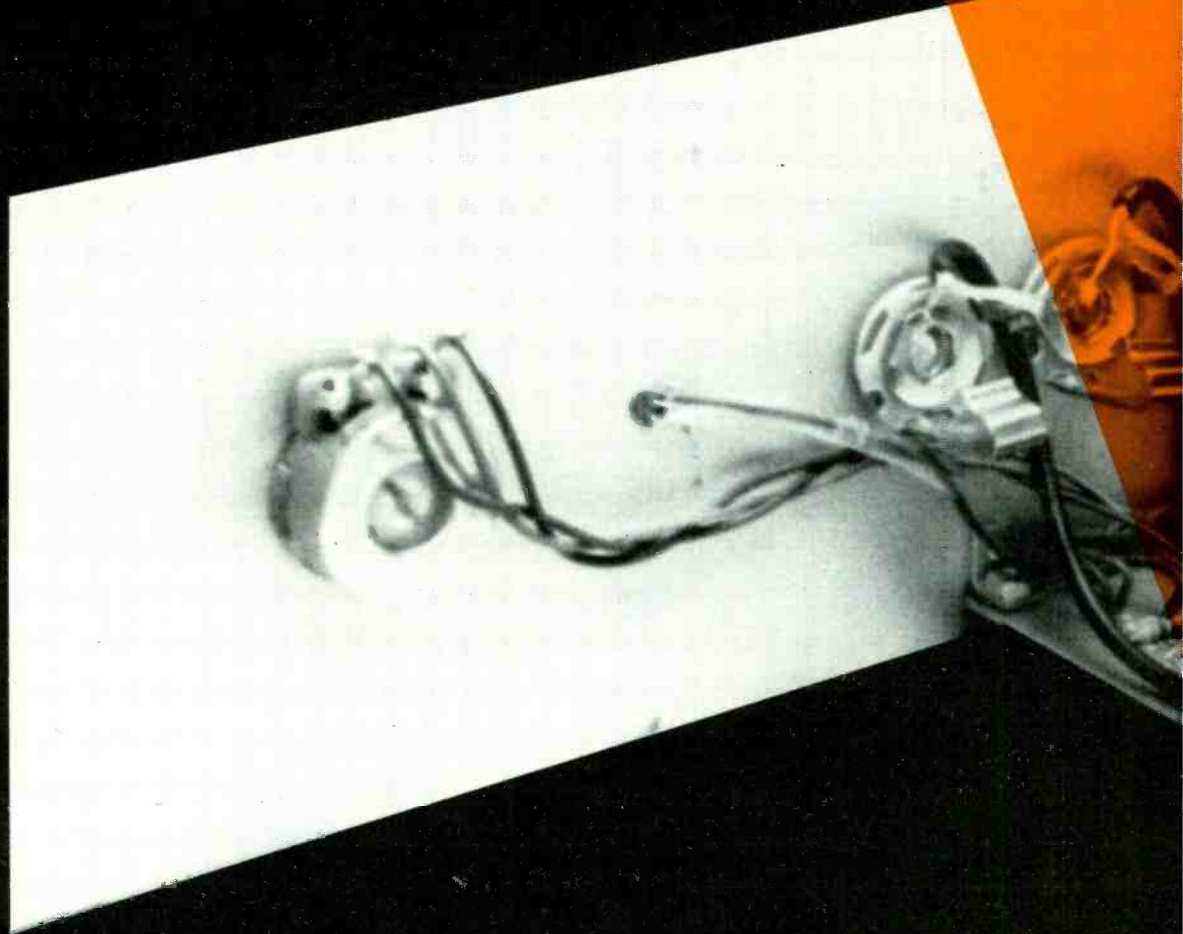
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The machine for your machine.

CIRCLE 67 ON READER SERVICE CARD

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

a Dual Limite

Building



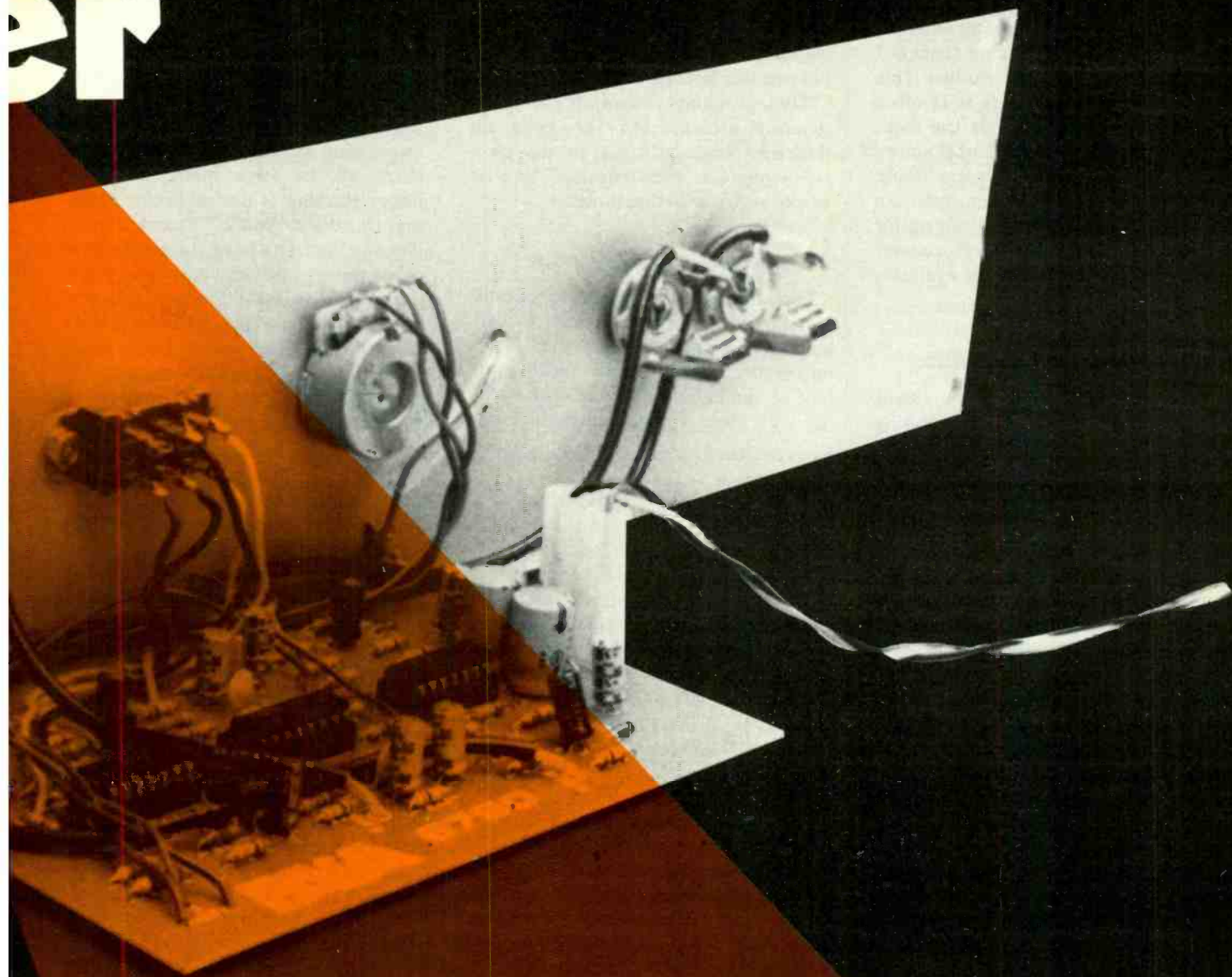
By Craig Anderton

You're recording a singer . . . you've run through the tune a couple of times, and have set the levels perfectly. You're psyched up for the next take, and so is the singer. You roll the tape, and everything's great—the vocal sound is superb, the rendition flawless. Inspired by the moment, the singer

gets into the emotional crescendo of the song . . . but unfortunately, the level of the vocal also hits a crescendo that far exceeds any level attained during the run-through. Sadly, you watch the VU meter pointer pin against the right hand meter post . . . you rush to turn the fader down, but it's too late. You rewind the tape, and your worst fears are confirmed: at that one spot, the vocal sound is badly distorted. So, it's back to square one; you cross your fingers, hoping that the magic of the moment isn't gone.

Or, you're recording a synthesizer

er



player who likes to use a lot of filter resonance. This playing style means that although most notes have a level around -15 dB, occasionally the filter frequency will coincide with the frequency of one of the notes played by the synthesist and the level shoots up to $+8$ dB. Your choice is to either set the recording level to accommodate the biggest peaks, which means the softer notes end up in the mud; or, you can try to keep the record level up and ride the gain whenever a peak comes up—neither of which represents a very satisfactory approach.

Then, there are the situations where you're trying to explain to a player that it just isn't possible to use extreme dynamics when playing in the studio, since the headroom of the tape just can't cope with a large dynamic range. The player, who is probably mistrustful of technology in the first place, tries to be accommodating and restricts the dynamics of his or her playing in order to please the machine; but then you note that there just isn't as much feel to the performance. It seems that the performer has become self-conscious about the actual

mechanics of playing instead of concentrating on the flow of the music.

As you've probably figured out by now, the solution to the above-mentioned problems, as well as to many others that crop up with regularity while recording, is to *limit* the dynamic range of a signal. This article describes how to build a device called a *limiter* which does just that—quietly, accurately and inexpensively. Purists may object to the sound of limiting, and I'd be the first to agree that limiters can give unnatural "squeezed" sounds if used incorrectly. Then again, when

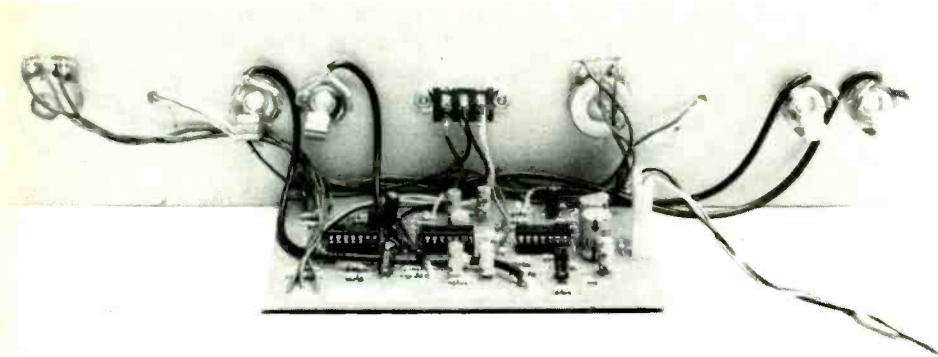
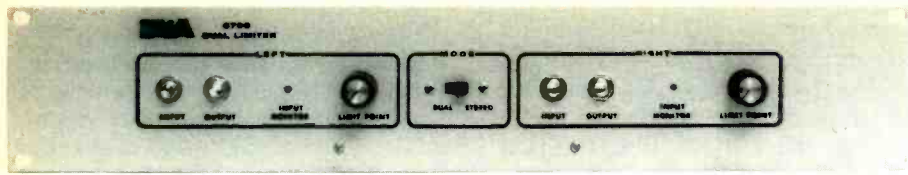


Fig. 3. Photos of the completed kit.

something in your studio capable of providing $\pm 15V$, PAIA offers a suitable supply (#4771) as does Bill Godbout Electronics (PO Box 2355, Oakland Airport, Ca. 94614)—specify #HK-116. As of this writing, the 4771 costs \$29.95 in kit form and the HK-116 costs \$10 in kit form. The HK-116 does not include a case or line cord; the 4771 includes a couple of added features (such as adjustable bias sources) that are not required by the limiter but which you may find useful in other applications.

Whichever power supply you use, connect the +15 lead from the supply to the + connection on the board, the -15 lead from the supply to the (-) connection on the board, and the ground lead from the supply to the ground connection on the board. You must also connect the supply ground to a ground point on the rack panel; you can do this by running a lead from

supply ground to the ground lug on one of the input jacks, or by attaching a solder lug to the panel and running the ground wire to that. As long as the ground point on the board and the rack panel ground point eventually terminate at the power supply ground, you'll have your grounding scene together for this project.

How It Works

The heart of this limiter is the NE570 IC made by Signetics. Signetics also manufactures a very similar IC called the NE571; for our application either one may be used, although the performance of the NE570 is just a shade better (I doubt if your ears would hear any difference, though) than the NE571.

The NE570 is called a "Companer IC," and is designed to be configured so that half of the IC is a 2:1 compres-

or and the other half is a 1:2 expander. If you think that this makes the chip an ideal candidate for noise reduction, you're right; and perhaps someday we'll investigate a noise reduction unit based on this chip. But for now, we can use each half of the IC as the basis of a limiting circuit.

Referring to the schematic for the right channel, the input signal couples into the limiter via C3 and R25, while IC2B senses when the input exceeds a nominal 0 dB point. When this occurs, LED D3 lights up. The circuit built around IC2B is called a "Comparator," because it compares two voltages (in this case, the input voltage is compared to a voltage reference comprising D1 and R13).

IC1A contains a circuit similar to a VCA along with an output buffer and a circuit that drives the VCA—all taking up only half of the chip (IC1B takes up the other half, and includes the same building blocks). We could spend a couple of pages explaining how we turn all this into a limiter, but I'll avoid the temptation . . . let's just say that the output of the limiter couples through R3 and C9 to the output jack, and also couples into IC3B through C5; IC3B is another comparator—this time, it compares the output of the limiter to a variable voltage dialed in by R9. R9 sets the limit point or threshold, so, when the signal exceeds this threshold, the gain of the limiter is reduced by having Q1 charge up C11 to maintain a constant output signal. Further increases in the signal result in more gain reduction, thereby continuing to keep the output signal constant. IC3A and IC3B combine to sense both positive peaks and negative peaks of the output signal. Therefore, if you have an asymmetrical waveform, limiting will still occur at the selected point.

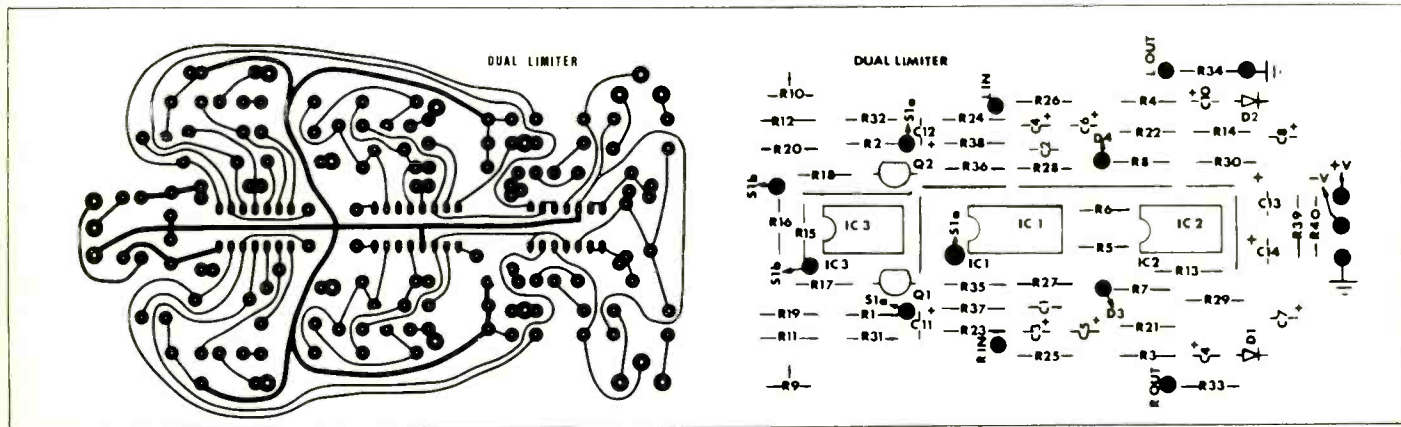


Fig. 4. Circuit board foil-side artwork and corresponding component layout.

BOTH OF THESE DIGITAL DELAY LINES HAVE GREAT SPECS. ONE COSTS \$200* LESS.

| Specification | New Mu-tron Digital Delay | MXR Digital Delay |
|-------------------------------------|------------------------------|----------------------|
| Bandwidth @ 160 ms delay: | 10KHz | 5KHz |
| Dynamic Range: | 85dB | 80dB |
| Total Harmonic Distortion (T.H.D.): | <0.2% 40Hz - 7KHz | <0.5% 40Hz - 7KHz |
| Maximum Output Level: | +20dBm | +18dBm |
| Gain Range: | -∞ to +30dB | 0dB |
| CMRR (Common Mode Rejection Ratio): | 40dB Typical | 36dB Typical |
| Variable Delay Range: | 4:1 | 4:1 |
| Regeneration Range: | 0-100% | 0-100% |
| Input Connectors: | 1/4" & XLR | 1/4" |
| Outputs: | (1) Mix, (1) Dry | (1) Mix |
| Manufacturers' Suggested List Price | \$795 | \$995 |

*Prices and specifications are based upon those published by manufacturers, and are subject to change without notice.



In addition to great specs, the new Mu-tron Digital Delay offers live performance extras that make it an unbeatable value. Like a "natural decay" bypass footswitch, a front panel "freeze" control with LED indicator and optional footswitch, an external control voltage jack for synthesizer interface, low noise circuitry, silent range switching and power-up for quiet stage operation, and high-visibility wink-indicator switches for delay selection.

A look inside reveals a rugged single circuit board construction for high reliability, plus a built-in FET preamplifier allowing direct instrument input. The heavy steel chassis is solidly built in the Mu-tron tradition. And it takes up less rack space!

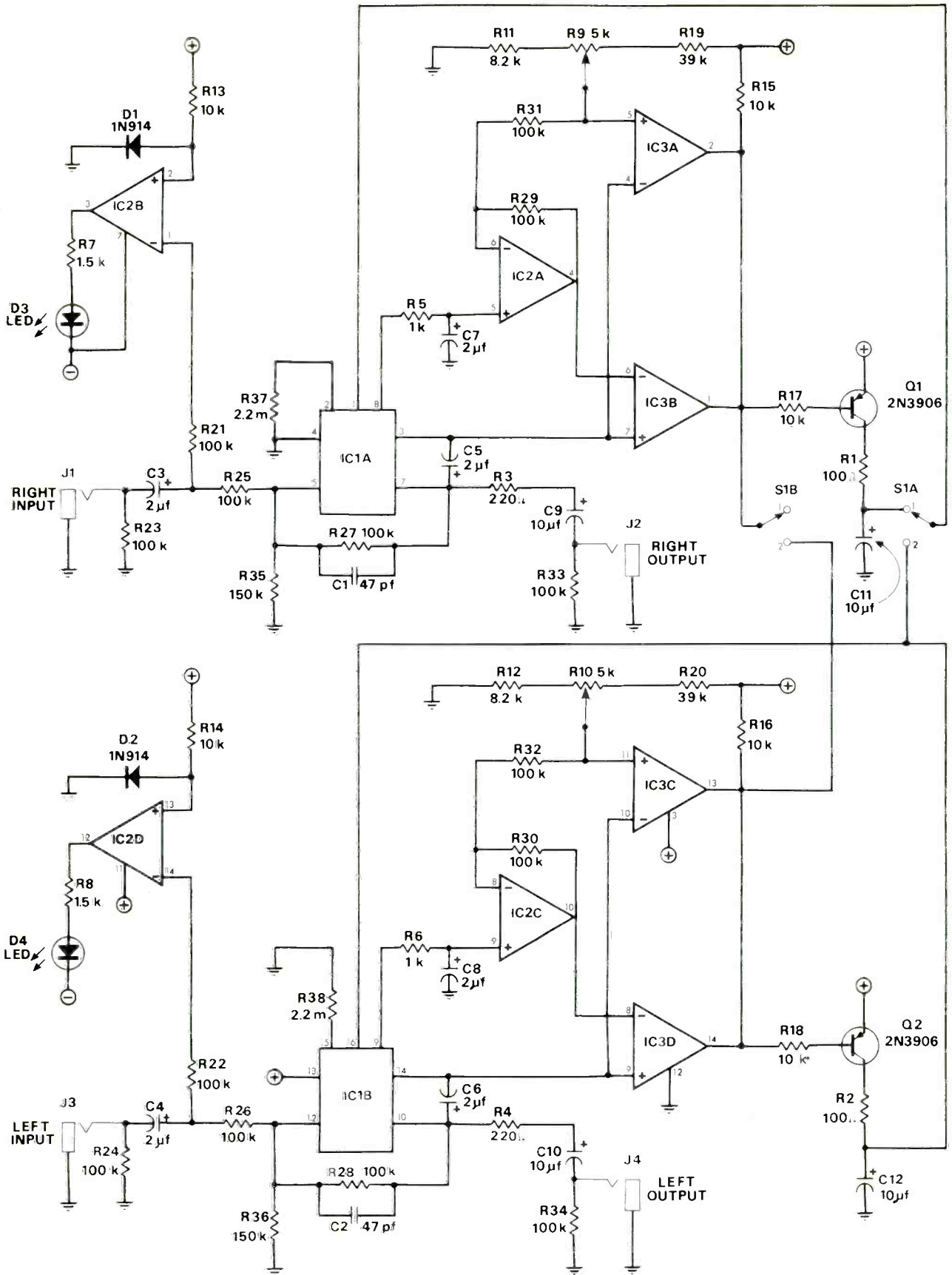
See your Authorized Mu-tron Dealer and compare.

The new Mu-tron Digital Delay. Another hard-working effect for hard-working professionals.

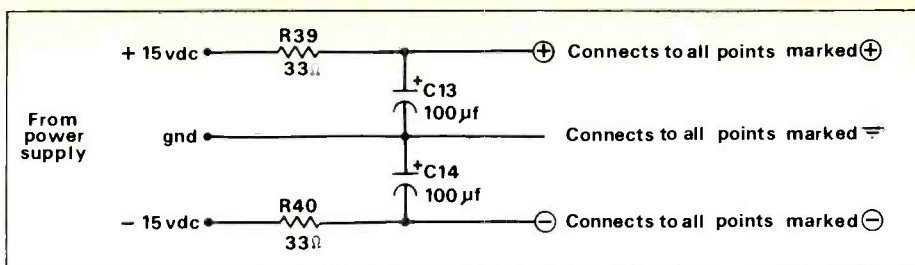


45 Hartwell Avenue, Lexington, Massachusetts 02173.
CIRCLE 143 ON READER SERVICE CARD

**NEW FROM
MU-TRON!**



Schematic diagram of the dual limiter.



Schematic of the power supply connections.

The left channel limiter built around IC1B operates in an identical fashion to the right channel limiter.

This circuit is based on a circuit presented in the *Signetics Compander Mini-Manual*, published by Signetics to promote the NE570. This manual explains the operation of the NE570/571 and offers advice on applying the chip. If you need more information on this companding IC, refer to this book or similar data sheets published by Signetics. Rest assured, though, that you do not need to know exactly how the limiter works in order to use it effectively.

Testing and Using

Testing the limiter is pretty simple. Feed your input into J1, and patch J2 into a tape input or mixer input. Apply power to the unit, and wait a few seconds for the circuit to stabilize. [If you see any smoking, sparking, or feel any of the components getting hot (warm is OK, but hot is not), immediately shut down the power and check through your circuit to locate the source of the problem.] Next, hit the input of the limiter with a strong signal, and adjust the limit point control for the desired limiting point (typically 0 dB). That's all there is to it; you may now stop worrying about whether the input is going to go over 0 dB, because it won't. Meanwhile, you can refer to the input monitor LED to see how often the input signal is exceeding the 0 dB point. If it's flashing a lot, that means you're limiting the signal most of the time; this can lead to an unnatural sound. In such a case, reduce the input going to the limiter somewhat via a channel fader, output control on your instrument, or other means of adjustment.

In Conclusion

This dual limiter is simple, inexpensive and not hard to build. It would have been nice to go into more of a

step-by-step type of construction approach, but that just isn't practical in a magazine format where space is at a premium. Nonetheless, if you're even moderately proficient in electronics, you shouldn't have any trouble putting this project together. And if you're not proficient in electronics,

you can probably arrange to get some help from a local "expert."

This limiter has been an invaluable addition to my studio; it has taken a lot of the worry (and gain-riding) out of setting levels. I hope you find it equally useful in your setup.

Since MR hasn't previously published do-it-yourself projects with this level of complexity, please inform us of your experiences—both positive and negative—with building this circuit. Not enough detail? Write in. Too much detail that you maybe found boring? Write us about that, too. The purpose of an article like this is to appeal to you, the reader and user of musical electronics . . . let us know if we're doing our job right.

LIMITER PARTS LIST

(All resistors are 1/4 watt, 10% tolerance unless noted. 5% tolerance resistors are preferred.)

Resistors

| | |
|----------|--------------------------------|
| R1, R2 | 100 Ohm |
| R3, R4 | 220 Ohm |
| R5, R6 | 1 k |
| R7, R8 | 1.5 k |
| R9, R10 | 5 k linear taper potentiometer |
| R11, R12 | 8.2 k |
| R13-R18 | 10 k |
| R19, R20 | 39 k |
| R21-R34 | 100 k |
| R35-R36 | 150 k |
| R37, R38 | 2.2 M |
| R39, R40 | 33 Ohm |

Capacitors

(All capacitors must be rated at 15 or more working Volts)

| | |
|---------|-----------------------------------|
| C1, C2 | 47 pF disc ceramic or polystyrene |
| C3-C8 | 2 μF electrolytic or tantalum |
| C9-C12 | 10 μF electrolytic or tantalum |
| C13-C14 | 100 μF electrolytic or tantalum |

Semiconductors

| | |
|--------|------------------------------------------------|
| D1, D2 | 1N914 or 1N4001 silicon diode |
| D3, D4 | red LED |
| IC1 | NE570 or NE571 (Signetics) |
| IC2 | RC4136 (Raytheon) or XR4136 (Exar) quad op amp |
| IC3 | LM339 (National) quad comparator |

Other parts

| | |
|-------|-----------------------------------------------------------------------------------------|
| J1-J4 | Open circuit 1/4" phone jack |
| S1 | DPDT slide or toggle switch |
| Misc. | 1-16 pin socket, 2-14 pin sockets, circuit board, knobs, rack panel, wire, solder, etc. |

(Note: a parts kit containing the above mentioned items is available from PAIA Electronics for \$49.95; specify #6790-K. The circuit board is available for \$7.95; specify #6790-PC. Both are postpaid in the US.)

LIMITER SPECIFICATIONS

Limit threshold range: approximately -10 to +3 dB
 Current consumption: +25 mA, -8 mA
 Maximum input before clipping: greater than +20 dB*
 Frequency response (for any input signal level at any limit threshold setting): ±1 dB, 20 Hz-20 kHz
 Input impedance: greater than 40 k ohms
 Output impedance: less than 400 ohms
 Attack time: less than 1 millisecond
 Signal-to-noise ratio (referenced to a 0 dB output signal): greater than -65 dB
 Phase: output inverted compared to input
 ICs used: NE570, LM339, RC4136

*maximum output of signal generator used for testing

TRAVELS WITH

SPICES

By Murray M. Silver, Jr.



An essay concerned with the technical achievements of a Yes show should be prefaced by a few brief observations on the band itself and its history.

When at last in 1968 Jon Anderson met Chris Squire in a Soho drinking club, it seemed unlikely then that the pair would father a genre of such singularity that it should qualify as *suigeneris*. Anderson, performing on the road since 1956, had whiled away a singing career in a regionally popular group known as the Warriors. Chris Squire, a bassist of urbane disposi-

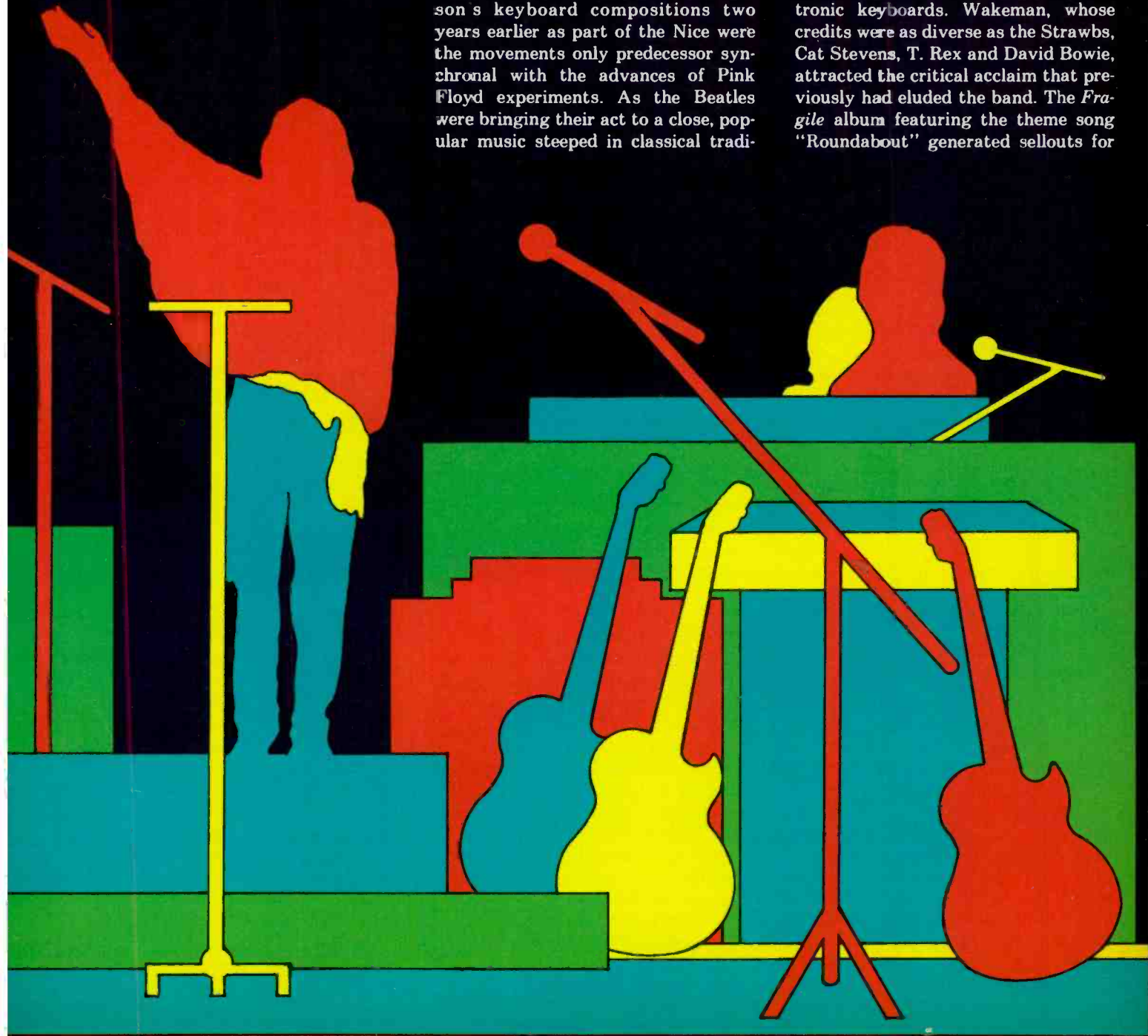
tions, had heretofore briefly been part of the Syn. At the time, Anderson was 24 and Squire was four years his junior, which meant, as far as musicians go, that both should have already begun their ascent. Now, more than ten years later, we look upon a vocalist at 35 and marvel at a voice of matchless dimension which fails to succumb to mounting years of strain, and a bass guitarist who transcends the normal limits of that mode of instrumental expression.

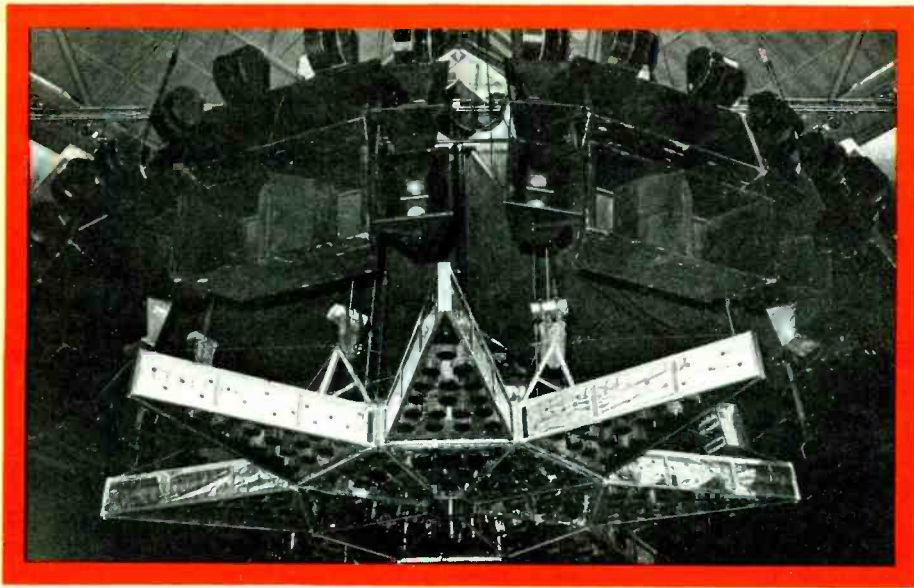
It is interesting to note that in 1969 when Yes released its first album that the "techno-rock" movement was being born. Perhaps only Keith Emerson's keyboard compositions two years earlier as part of the Nice were the movements only predecessor synchronous with the advances of Pink Floyd experiments. As the Beatles were bringing their act to a close, popular music steeped in classical tradi-

tions was on the upswing.

The Yes debut album received much more attention than the fledgling project by Genesis in that same year, but both were overshadowed by the epic *Court of the Crimson King* by King Crimson. Yes seemed to choose to play it safe by covering material by the Beatles, Byrds, Richie Havens and Stephen Stills on their first two LPs while the others took added chances on popularizing their lyrical significance.

Instrumentally, Yes did not mature until as late as 1971 when guitarist Steve Howe replaced Peter Banks and Rick Wakeman arrived and soon after invented a new style in playing electronic keyboards. Wakeman, whose credits were as diverse as the Strawbs, Cat Stevens, T. Rex and David Bowie, attracted the critical acclaim that previously had eluded the band. The *Fragile* album featuring the theme song "Roundabout" generated sellouts for





The unique sound and lighting system completely assembled and suspended.

the first Yes tour. Yes as we now know them became complete when in the next year drummer Bill Bruford, having departed for King Crimson, was replaced by Alan White, a veteran of sessions with George Harrison, the Plastic Ono Band, Joe Cocker and Alan Price, among others.

In 1973 Yes entered the first of two blue periods when Rick Wakeman, having had enough of too much pretty, decided to go it alone. By 1975, Yes had nothing better to do than release a compilation, *Yesterdays*, and divide so that each member might record a solo album, none of which garnered much attention or acclaim.

For whatever reasons Wakeman decided to reunite with Yes, it is for sure that he did not do so for love or money. As one key member of the entourage explained, "This band stopped talking to each other a year ago." And Wakeman, who at last count was director of more than eleven companies (including one which manufactures instruments) does not need the work. We then suppose that when on his own, Wakeman tends towards self-indulgence, as exhibited with *Myths and Legends of King Arthur*, recorded while part of Yes.

The members of Yes choose to rarely see each other off stage which normally results in travelling in separate limosines, dining along and marathon sound checks. Steve Howe is locked away in his own dressing room where his array of guitars has previously been meticulously assembled and neatly laid out for tuning. Chris Squire is also deep-sixed with his collection of

basses and will step out onstage to play odd scales and exercises for an hour, all the while punching [foot] pedals. Alan White is content to leave whatever work there is to be done to his drum roadie to handle as are Wakeman and Squire.

On the Road

The design, staging and staffing of a Yes show is a fine science which has been nearly perfected by Clair Brothers Audio, Inc. during an association spanning over eight years. Clair Brothers has handled audio matters for Yes since its first tour and Roy Clair still travels on the road in his supervisory capacity. G. Michael Roth has spent eight of his nine years with Clair Brothers in the capacity of engineering stage sound for Yes.

The man we've come to Atlanta to see is sound engineer Nigel Luby, a mild-mannered individual who prefaces most answers to questions with a quiet smile. We are predisposed to believe that the Yes engineer must be an incredibly strong man—he has a band of volatile prodigies to pacify and a staff of mad dogs and Englishmen to cohabitate with. Above all, he must be endowed with a marvelous ability to maneuver sophisticated custom-designed equipment and to mix a highly complex signal.

And now for the surprise: this man Luby, this signal processor, has a list of credits as long as your little finger. Excuse us, but there must be some

mistake. His credits include one album and an assist on another. He has never mixed sound before in his life.

"Actually, I'm an illustrator," begins Luby. "Went to art school. The same as Bill Bruford, although we did not meet then. Seven years ago I began working with Yes primarily out of a friendship with Chris Squire. I was his personal road manager—looked after his instruments, etc. About three years ago I felt the need to progress into engineering to fulfill a creative urge and a desire to move ahead. My first job was assisting on *Going For The One* where I did little more than watch and acquaint myself with the equipment."

Perhaps we are a bit hasty then to judge the merits of a decision to employ an art student as an engineer. A cursory investigation of the educational history of English popular musicians reveals more than a few illuminati who once pushed pencils and twiddled with paint brushes. John Lennon, David Bowie, Jeff Beck, Eric Clapton (Stained Glass Design, Kensington School) Ian Anderson, Jimmy Page, Keith Richard, and the original Genesis and 10CC members were all art students. We may then deduce that an English artist may be, in some cases, twice blessed.

Luby, who still reflects more of the pensive nature of an artist rather than the hyper department of most engineers, relates what it is about sound engineering that he finds gratifying: "The immediacy of mixing sound in concert is exciting, much more than studio work of course. The changes in venues each with their particular problems is an exciting element. The repetition in performing the same job with the same music needn't be boring. The creative aspect involves getting sound which pleases the band and the crowd."

"Surprisingly, very few bands have discovered the advantages or have been able to take advantage of the benefits in taking their studio engineer on the road. The band is much more comfortable with the same engineer and no one else could be more familiar with the music," says Luby.

Nigel Luby will not tell you that he is the genius he is attributed to be. He is just interested in the learning process of mixing sound and finding a stage for his creative talents. He insists that the only true technical wizard is Steve Dove, a little man who can repair anything in moments. Less

than one hour before showtime, a UREI 1176 LN Limiting Amplifier is causing a very strange buzzing crackle over the system's speakers. In comes Dove who pops the top off the limiter and with clock-like and deliberate precision rights-wrongs-case-closed-locker-up-go-home.

Steve Dove, by profession, designs and commissions radio stations in Britain and finds himself in his present employment quite by accident. "I once designed a mixer for Jethro Tull," Dove relates. "Within a few days after delivery they called to tell me that no one could figure out how it worked and would I please come to Australia with them the next week for a tour."

Lastly in this cast of characters is Trip Califf, a Clair Brothers employee who administers to the mixing board alongside Nigel and is in charge of bad jokes and also has the responsibilities of after hours social director.

Reading for Showtime

Luby points to the semi truck loads of equipment pouring into the Omni and claims that on a good day by getting a start at 10 a.m., the Yes show will be assembled and ready for a sound check by 4 p.m. In a rush, four hours at the very minimum.

In the very center of the floor, the sides of twenty large rolling cases drop to reveal housings for tools and cables to assemble the stage and sound system. Later, when the stage is set and speakers hoisted, these same cases will surround the circular stage and act as a barrier between band and crowd. Construction of the show is happening in four places simultaneously. Luby is uncrating the mixing console while the crew is erecting the stage out of a network of fitted steel beams on wheels which roll easily into place. Another crew is setting up instruments on stage while Michael Roth sets up his stage monitor mixing board underneath the stage.

In the center of the room, two crews are connecting a circle of speaker stacks around an eight-point star of stage lights. Thirty-two Phase Linear 700s grouped in stacks of four are bolted behind the stack they service. The entire production moves into place effortlessly once everything is unloaded and assembled.

[Those readers tuned into *Modern Recording* back in December 1978 will recall our cover story on Bruce Spring-

steen and the notes on the Clair Brothers mixing console, but similarities between the shows generally end here.]

The Clair Brothers 32 x 6 mixing console is a marvelous design which is one of only four in use. The other units have served other prominent touring acts such as Elton John and Fleetwood Mac, so take note: Each input module contains its own 15 dB pad, preamp gain control, submix selector, echo send bus selectors and pan. Each parametric equalizer provides each section—highs, low and midrange—with frequency selection, dB cut/boost, curve-shaping control and a push button EQ in/out switch.

The stereo output of each module can be assigned to any one of six stereo submix buses and each channel is manipulated by dual faders. Each module contains a 100 segment neon glow bar graph wherein average levels and peaks are displayed over a 50 dB range simultaneously, the average level readings being brighter than the peaks. A flat, multi-conductor ribbon cable provides internal cabling, but lacking a shield, cannot then be used to connect the console to the stage. Therefore, Clair Brothers custom orders a 40-pair shielded cable with a connector that has required periodic replacement.



Technical wizard Steve Dove working on a Urei limiting amplifier before the show.

Five of the six submix channels are assigned from the main console. The drums, spanning inputs 3 through 13, comprise the first submix (inputs 1 and 2 are reserved for cue tapes). The second submix contains Chris Squire's bass on inputs 14, 15 and 16, Steve Howe's guitars on 17, 18 and 19 and Jon Anderson at 20. The third submix is for the vocals by Jon, Chris, Steve and Alan. Submix four devotes inputs 25 through 32 to Rick Wakeman's keyboards. The fifth submix oversees everything including special effects.

Luby also uses a 16-channel board solely for the odds and ends sparsely used in submix six. Assigned here are

Brothers Audio electronic crossovers. Luby's use of limiters is sparing.

"I refrain from using limiters and compressors because I don't like what happens acoustically," he says. "I will use them only on something like a bright guitar passage where I do not mind losing some of the brightness.

"Frequency crossover is something Clair Brothers would rather not discuss. Where this system crosses over tends to make sense only when referring to this particular system. It wouldn't make much sense as part of another system."

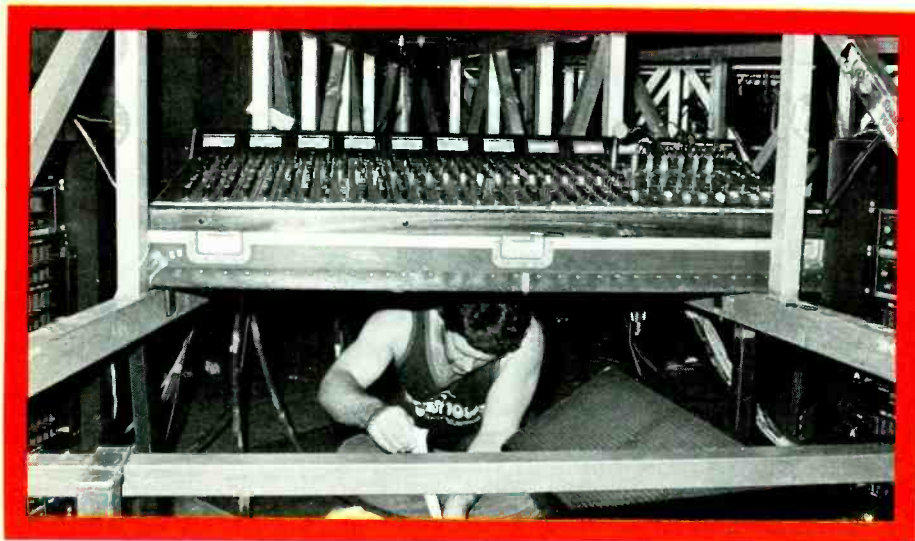
The second rack contains the White Instruments model 140 Sound Analy-

Speed is controlled by the DeArmond volume pedal which also pans back and forth. A second pedal interlocks the speed of the oscillators into the panning device and phases them back and forth. The effect is akin to a sonic tidal wave washing from one side of the room to the other.

Set-up Continues

Talk then turns to the suspended sound system that has been hoisted into place by eight two-ton hoists. "The suspension of the system has three basic advantages, aside from [simply keeping the system out of the] line of sight," says Luby. "Suspension allows [the sound] much better travel over a distance and reduces reverb times. Also, the low frequencies tend to become omni-directional."

The speakers are constructed in eight small sections, each [section] powered by four Phase Linear 700s. Included in each stack are two large "W" boxes which house two 18-inch speakers each. On each side of these are two "Roy" (Clair) boxes which hold two 12-inch speakers. Above these units are four JBL horn boxes utilizing the 2482 2-inch driver, the 2440 60-watt driver and the 2405 ultra-hi driver. All speakers are made by JBL.



G. Michael Roth of Clair Brothers installing the Midas console under the stage.

special effects such as the drum synthesizer, electronic gong and Wakeman's Keytar (a guitar shaped keyboard worn like a guitar).

At the console, Luby uses an Electro-Voice RE 16 dynamic cardioid mic and an AKG C 451 EB during his sound check. Headphones put to use are Koss Pro/4AAA and Beyer Dynamic DT 109S.

Now that Luby has his system erected, he shoots in white noise to "voice" the system and then plays a 1-inch reel-to-reel tape with a lot of dynamics, vocals and bass on one of two professional tape machines.

"I choose to mix in stereo," says Luby, "primarily because certain effects in dynamics can be enlisted."

From Luby's command post, he oversees three racks of auxiliary signal processing equipment. In a rack furthest from the console, there are four White Instruments Series 4000 equalizers, five dbx 162 Stereo Compressor/Limiters and two Clair

zner and four UREI 1176 LN Limiting Amplifiers. Effects such as the dbx 160 Compressor/Limiter, Marshall Time Modulator model 5002A1, and the Eventide digital delay 1745M are housed here along with an SAE 2200 solid-state stereo power amplifier.

The third cabinet has the goodies which will set the Yes show apart from whatever else is currently touring concert halls. Aside from the Eventide Clockworks H910 [the Harmonizer™], a Technics M85 cassette player, the SAE 2700B stereo half-octave equalizer and the Lexicon Prime Time digital delay, are the panning and flanging devices. Clair Brothers has developed a very interesting technique in areas of flanging and panning. The B.E.L. electronic flanger BF-20 and the Survival Projects stereo panner are used in conjunction with two foot pedals. All oscillators can be linked enabling Luby to add flanging while panning from left to right by flicking a switch and locking the panning unit.

The stage can be best likened to a carousel. Unobstructed by cabinets, the stage revolves one complete revolution in one minute so that everyone gets a good look at each member of the band. Jon Anderson stands on a riser at the very center and because of its small radius, he must constantly turn counter to the stage's movement to avoid dizziness. His Beyer Dynamic M88 [cardioid] microphone is suspended from above and hangs at his eye level.

Rick Wakeman's keyboard fortress faces toward the center of the stage and therefore most of the concert presents an adequate view of the back of his head. He has, after all, eleven instruments to manipulate, including two Mini-moogs, two Yamaha string synthesizers, a six-foot baby grand piano and an RMI Computer keyboard. The Keytar attracts the most attention although used only briefly in comparison with Wakeman's dependency on the Moogs and Polymoogs. All of the keyboards are taken direct and the Leslie is miked with a [Senn-



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Louie's a great drummer, and you've been playing together for years, so he must be good. But in all the time you've known him, he's never been on time for practice. So you've always had to wait for him to arrive before you can start to play; and now that you're in the studio that's even more of a problem, because as we all know—nothing can happen without the rhythm track.

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heiser MD] 441.

In the course of an evening, Steve Howe will play seven guitars. His Fender Telecaster and Gibson Les Paul are used most often. Harp-like tones are coaxed out of either his Rickenbacker 12-string, Martin acoustic or Gibson Stereo. For more mystical effects, Howe plays a Portuguese Vacalia and a Gibson mandolin. Chris Squire plays 4 and 8-string basses by Rickenbacker and Ranney. Both guitarists sing into Beyer 88s.

Trapper Alan White is hidden among the forest of percussive instruments springing up around his Ludwig kit. He has a list of assorted devices to color his rhythms including a drum synthesizer and a tympani. The toms are miked closely by Sennheiser 421s and the snare is picked up by an AKG 451 condenser mic. Condensers are also used overhead for hi-hats and a lone 88 is used on the bass drum.

The monitoring of these complex signals is handled by Michael Roth from his sub-stage perch located almost directly under Alan White. He can make eye contact with band members through an orchestra leader's vent in the stage floor. For eight years Roth has manned the Midas 24 x 8 console for Yes and operates extremely effectively for a man who has a difficult time hearing what he is mixing.

Roth uses the eight mixes accordingly: Anderson on 1 and 7, Chris Squire on 2 and 3, Howe on 4, White on 5, instruments on 6 and Squire's keyboard mix is on 8. At module inputs 8, 12 and 13, Roth receives effects from Luby's board. The effects that Roth will administer include the Eventide Harmonizer™ H910, six dbx 160 Limiters and a Multivox Multi-Echo. dbx [limiting] is primarily used on the basses, keyboards, drum synthesizer and Anderson's vocals.

Roth's equipment is powered by four SAE 2600 amps and utilizes nine Clair two-way crossovers and eight SAE 2700B equalizers. Roth hears sound via a monitor which he practically sits on. His remedy for feedback is either to lessen volume or cut it out with EQ.

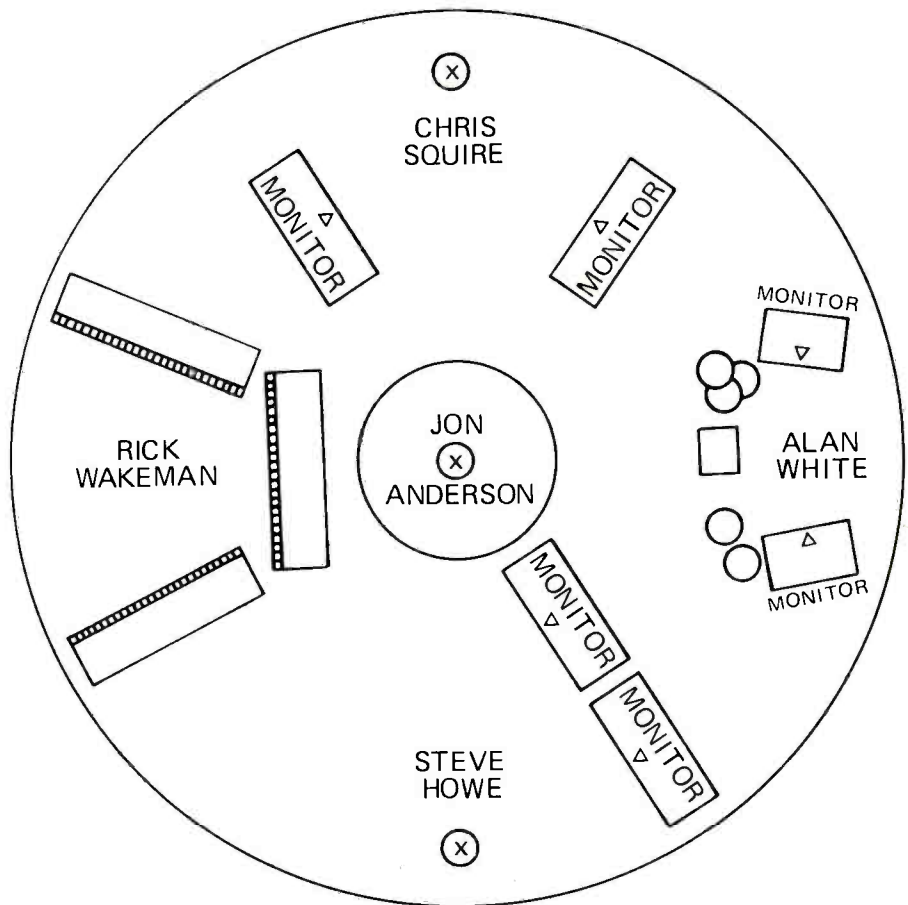
Roth and Luby have a list of special effects on stage to deal with. Jon Anderson's vocals alone will require use of a plate reverb, double-tracking delay, Lexicon, Eventide Harmonizer™ and one technique which will involve Harmonizing and flanging off the same mix. Steve Howe's guitars will be siphoned through an Echoplex

or phaser. Chris Squire will employ a reverb, fuzz and Harmonizer on his bass guitar.

Clair Brothers engineers its own stage monitors using JBL components in arrangements which, like its crossovers, it considers to be trade secrets. Gene Clair relates that a standard favorite is two 12-inch speakers with a two-way crossover or two 15-inch speakers with horns. Variations of this

says Luby, "so they ended up rehearsing before recording. It required only about three weeks to mix the album and the work was made easier because many of the special effects were added 'live' in the studio rather than leaving those additions for the mix.

"On songs such as 'Freedom,' 'Future Times' and 'UFO,' we were using a Harmonizer™ on the bass 'live.' When taking a direct feed at cer-



plan may involve using two 18-inch speakers or smaller units of one 10-inch or one 15-inch speaker.

The Recorded Animal

Yes has recorded many of the earlier concerts of this recent tour for an anticipated "live" album. Whenever taping was desired, Luby simply split the inputs, one into the board and one into an MCI 24-track recorder. No changes are made in miking.

A Yes studio LP is a different animal. The recent release *Tormato* was completed in four months, somewhat shorter than for most state-of-the-art performers. "The only reason it took that long was that the band came into the studio not knowing the material,"

tain times, Chris had to be limited, which sometimes resulted in him having to stop using his [in the studio] and I would add on [a Harmonizer™ in the control room]. One special effect I am particularly fond of was the use of a reverse echo that comes in before the vocal arrives."

When the Yes World Tour of 1979 closes, the members of the band will be looking forward to a vacation. Clair Brothers will be returning home to the drawing board to overcome problems encountered on this tour and begin preparations for the staging of the next tour. Nigel Luby is headed for Montreux, Switzerland, where he hopes to begin other involvements and hopes to spend his vacation in the studio working on a new project.

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script. He was in studio A for two hours punching the bag, and that was really hard, and I was in the booth recording Stallone. The next day he was back in the mixing studio because we wanted to mix the single and get it out. He was in there with me for six more hours because he had just fallen in love with the whole idea. Nick Lane did the arrangements and the orchestration. We worked very quickly. My job, along with Don Hahn, who was the engineer, was to mix in the sound effects, voices and punching bag.

MR: How long did it take you to make this record?

MF: We worked for two weeks, but a lot of that included mixing the new album *Hot* too. I was in the studio from 10 in the morning until 2 in the morning most days. This was also my so-called "vacation." But if you're really going to produce, you should produce without worrying about the time factor.

MR: How expensive was it to spend all that time in the studio? Did Columbia give you free reign?

MF: Columbia has expressed a lot of confidence in me ever since the *Rocky* thing and even before that too. I never had a loser album in terms of losing money, and so that instills confidence to the point where if I want to be outrageous, money-wise, they let me.



MR: Your schedule appears to be quite heavy. What is the one thing that keeps you inspired to keep going?

MF: Basically it's the music and the personnel. The current band we have right now is lots of fun. There are lots of good attitudes and lots of creativity within the band. I may be the Admiral or the head of the ship, but I also know how to throw it open to the creativity of the musicians in the band. I want to encourage them to express their ideas . . . to get their input. Sometimes I will pull something out because it doesn't please me, but on the other hand, there would be things that I would never have heard if it wasn't for their input. That encourages them to know that musically they can be creative with my band and also enjoy themselves.

MR: You have been associated with big bands throughout your entire career. What is the fascination?

MF: I am fascinated by the fact that I have the option to be a small group whenever I want to be and yet I can



Sound engineer Bruce Galloway marks in channel assignments before tour date.

create all that other excitement that a big band can create. No longer does a big band have to feel like everyone has to play. Whatever you do with the small group you can develop into a large group.

MR: And this gives you more leeway to produce the sound that you want?

MF: When you have a large band that includes electronics, you are a producer every night. I am going to produce the show that we are going to play in about an hour and a half. I'll choose the soloists, put it together, and run down the fact that because it is a festival, we can't play as much music as we'd like.

MR: So this requires a certain sense of spontaneity. Is that part of being a good producer?

MF: My band knows me well enough to expect that even if I discuss a certain set after we get off the bus, I might double-cross them at least one or two times while we're playing. If a certain song all of a sudden feels good to play and I hadn't planned on doing it, I'll do it anyway.

The bus had reached the backstage area of the Newport Jazz Festival.

The weather conditions that night tried the patience and wits of all the stage crew people there. Heavy bouts of rain threatened to ruin the electrical equipment that lay under the thin protection of canvas rooftops. Maynard's four stage crew members worked very hard protecting the band's equipment

so it would be ready for their performance. Although Maynard and the band were a little late getting on stage around 12:00, everything functioned properly throughout the set. That's the type of service Maynard expects from his stage crew men, regardless of the performing conditions.

After the show, Harry Netti, the stage manager, Bruce Galloway, the sound engineer, Larry Robbins, the lighting director and Carl Clemmons, the truck driver, were up until the wee hours of the morning packing up and preparing everything for the next night's performance at the Music Circus in Cohasset, Massachusetts. On the bus ride to their next destination, despite having had only a few hours sleep, Harry and Bruce spoke with me about the particular equipment that Maynard's band uses and their functions as stage crew people.

Modern Recording: Let's start out with who you are and who you previously have worked with.

Harry Netti: I'm the stage manager for Maynard Ferguson and I've had no previous on-the-road experience. I did work for a local rock 'n' roll band in Ohio; I ran the lights. When I came on this tour that's what I was originally doing. About a year ago, I had become frustrated working in the local bars, and I just made it known to the head of the lighting company I was working for that I wasn't happy. Through the grapevine he made contacts and got

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me on with Maynard.

Bruce Galloway: I'm Maynard's "live" engineer. As far as other gigs or tours, this is my first steady tour. I worked for a sound company and we did certain acts for a few nights in a row. I started with Maynard as the truck driver and I worked my way up. I really like working for a band rather than a company because of the personal contact. When you work with a company, you set up the equipment and then the band people come in. To me, that was not my thing.

MR: You use a Shure sound system. What makes it work for you?

BG: The thing about the Shure system is it's very simple; it's not a complex set-up. It's very roadable. It's a system that will work every night at a consistent level. There's no intricate circuitry as you have in a lot of other components. It's simple and basic equipment that we found worked well under touring [conditions]. For this band it's suitable.

MR: What kind of monitors do you use? What is your mixing console configuration?

BG: We run 24 channels in the front console, which is three Shure 101 boards linked together. We use Shure power, and we use Shure monitors. As far as monitors go, Maynard has used every different monitor in the world. Like last night there were different type monitors. He'd rather have his Shure monitors because to him it's a

good sound.

MF: The Shure System people actually took care of this band when this band really needed a hundred dollars. They have supported us in good times and bad.

Never in the history of show business, though, has there ever been a sound system that will not break down. The sound people's gig is really "fun" because we'll play in the rain, like last night, and I'm the type of leader who will not leave the stage until I'm through. I still expect that the sound sounds right. In the same sense, they expect me to play good.

MR: What kind of mics do you use?

BG: We use a variety of all the Shure microphones. There are two front mics—one is Maynard's mic and the other is the soloist mic. Both are SM58s. We also use the SM58 on all our trumpets and saxophones.

MR: Why do you use the SM58 on these instruments?

BG: The SM58 gives a very "rounded" type of sound. It's not a bright mic nor a dull mic. It's in between, so it can go either way, up very high or down very low. On the trombones I use the SM59. I just found that I have had very good luck with all the Shure mics as far as roadability.

MR: How many mics do you use?

BG: A total of twenty-four. Each player has his own mic. The drumset has six. I use the SM58s on all the tom toms and I use the 56 on the kick

drum. One of the main jobs of an engineer is to know the capabilities and limitations of the equipment he has. Sometimes you ideally can't put them where you want. Do I need this 58 more on the trumpet or the kick drum? I'd rather have them on the kick drum because it's a ball mic. A lot of people think that certain components can only work with one particular instrument, but I don't think that way. It's an experimental procedure.

HN: All the equipment we use might work best in one situation, but out on the road everything is so subjective. It all depends on the personality of the stage you're on. Whereas you might use one type of microphone on one type of stage for a particular horn one night, you may have to use a different mic on the same horn the next night. In a "live" situation, you don't have time to sit down and ask what are my possibilities; you have to make it work as quickly as you can, as best you can. The band really appreciates our efforts. Like last night at Newport, we were hampered by the rain and there were a million people running around with their heads cut off, so it took a little extra time to get set up. The crowd was getting restless . . . but once Maynard walked out, it was all there—the lights, the sound, the equipment. We built the stage just so, and it was all worth it. And the crowd loved Maynard. The major function of Bruce and myself is to see to it that everyone is happy with the performance.

MR: What mics do you use for the rhythm section?

BG: I run the bass guitar, guitar and keyboards direct.

MR: Is there any particular word that you could think of to describe the sound Maynard likes to have?

BG: What I strive for is to have the system sound clean. It should be clean and have no distortion. The thing that is great about mixing for this band is they put out so much sound without a system. With a lot of rock acts, it's the P.A. and the P.A. versus the stage. Can you get the P.A. to sound louder than the guys playing on stage? We do what a system is supposed to do, just amplify the sound. It don't like to fight with the stage volume. All of Maynard's musicians are very easy to work with. All of them respect us and our opinions.

HN: A lot of sound men, and I'm not knocking any other acts at all, have a difficult time making the sound of



Ferguson, surrounded by his band, hits a resounding note—and a striking pose.



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their band dynamic. A lot of bands don't have that natural sound.

MR: How difficult is it to adapt your sound system to other house systems?

BG: There's definitely a transition to be made, but when I go in and there's a different system, I just do my best to adapt to it. Just like when Harry goes in and is working with a 150 foot stage, he has to adapt too. We do any type of show from a junior high school to Carnegie Hall.

We much rather do our own show. We much rather use our sound system, our lighting, etc., than go in and work with foreign [unfamiliar] equipment.

HN: One of the reasons I love this particular gig is because the crew is allowed to make the show a part of their personality just as much as the band is allowed to do the same. We're all like a family.

MR: Are there any particular instruments that present more sound problems than others?

BG: The horn section does [presents more problems] because it is putting out the same sound every night. It doesn't vary as an amplifier can. There's more mixing to be done with the horns than anywhere else. [However,] As far as the engineering aspect [mic placement, setting levels, etc.] of it, the rhythm section is much more involved than the horn section. You're dealing with acoustics in the system because of the signals being put out. When I do a sound check I do the rhythm section first. I start with the drum kit, then I do the bass, then the guitar and then the keyboards.

MR: What kind of on-stage amplification do you use?

HN: The horns go through the P.A. system. Lou Carfa, the bass player, uses an Acoustic 370 amplifier with two speaker cabinets with 15-inch speakers in them. Tom Rizzo, the guitar player, uses a [Norlin] Lab Series amplifier, and a Polytone amplifier, small, yet it produces a good sound. The drummer uses Slingerland drums and the keyboard player uses a Fender Rhodes speaker bottom and a Fender Rhodes 88 piano.

BG: For our monitors, we use slant monitors and floor spots.

HN: Whoever needs to hear the sound, we put a small monitor near so they can hear, rather than projecting the whole sound over the stage.

MR: Do any of the special effects that the band uses pose any sound problems?

HN: The type of equipment our rhythm section uses is very advantageous since Maynard has a multi-fusion band. The piano player has a Polymoog and a Micromoog synthesizer.

BG: We also have a special effect—a Multivox analog delay—on the front system.

MR: When you go into the studio to record, what are your functions?

HN: The last album we recorded in New York; I went in as equipment manager. My function was to make sure that the equipment got there and was set up in the studio when it should be. When they go into the studio they record in sections. The rhythm section goes first. So my function was to have all their equipment set up for the time allotted to them when their tracks were happening.

BG: My function was just to be in the studio when the song was recorded. That gave me much more insight into the song when I had to reproduce the sound again, "live." It takes me deep into the tune. I hear it from its raw form, I hear the drum tracks, I hear the tune being constructed. By the time they go on the road and do that tune, I know it well.

[The following evening] Harry, Bruce, Larry and Carl had their work cut out for them at the Music Circus. It was theatre-in-the-round, so the band had to be set up in a circle, on a small stage. Maynard's microphone and the soloist microphone were placed in the center of the circle. Because the Music Circus is located in a residential area, all the sound monitors were directed downward instead of outward, so as to cut down on the area of dispersion. Because of this situation, the band's volume sounded compact as compared to their usual magnitude of projection. However, with the combination of efforts from Bruce at the mixing board, Larry at the lighting console, and all the musicians, the show zapped the audience with its dynamism.

On the bus ride back to the motel, Maynard and I resumed our interview. It was now the witching hour and the end of a working-man's day. Maynard looked fresh and lively—and so did most of the members of the band. Their zany, loud antics served as the backdrop to our final talk.

MR: Who are the guys in the band and what are their backgrounds?

MF: Allan Johnson is our brand new trumpet player. He came from Indiana University and has also played with

Count Basie. Stan Mark gave me a lead on Al. Stan Mark has been with me longer than any other member of the band. He's been with me for six years now. He's a great lead trumpet player. Stan came out of the U.S. Navy band. Dan Barber, another fantastic trumpet player came out of the Army Band, and Joe Mosello, who plays trumpet and percussion, was from the Eastman School of Music, but he was also from the U.S. Marine Band. We seem to have all the armed forces represented here. *[He laughs.]* That's why they are all such macho trumpet players.

Now on trombone is one of the most talented guys in the band, Nick Lane. He's from the Berklee School of Music. He's spent a lot of time with me in the studio and has learned a lot in the last three months. Then there is Phil Gray, who is a wonderful young trombone player from Toronto. We feature him as a soloist on "Stella By Starlight" and "Dayride" on the new album.

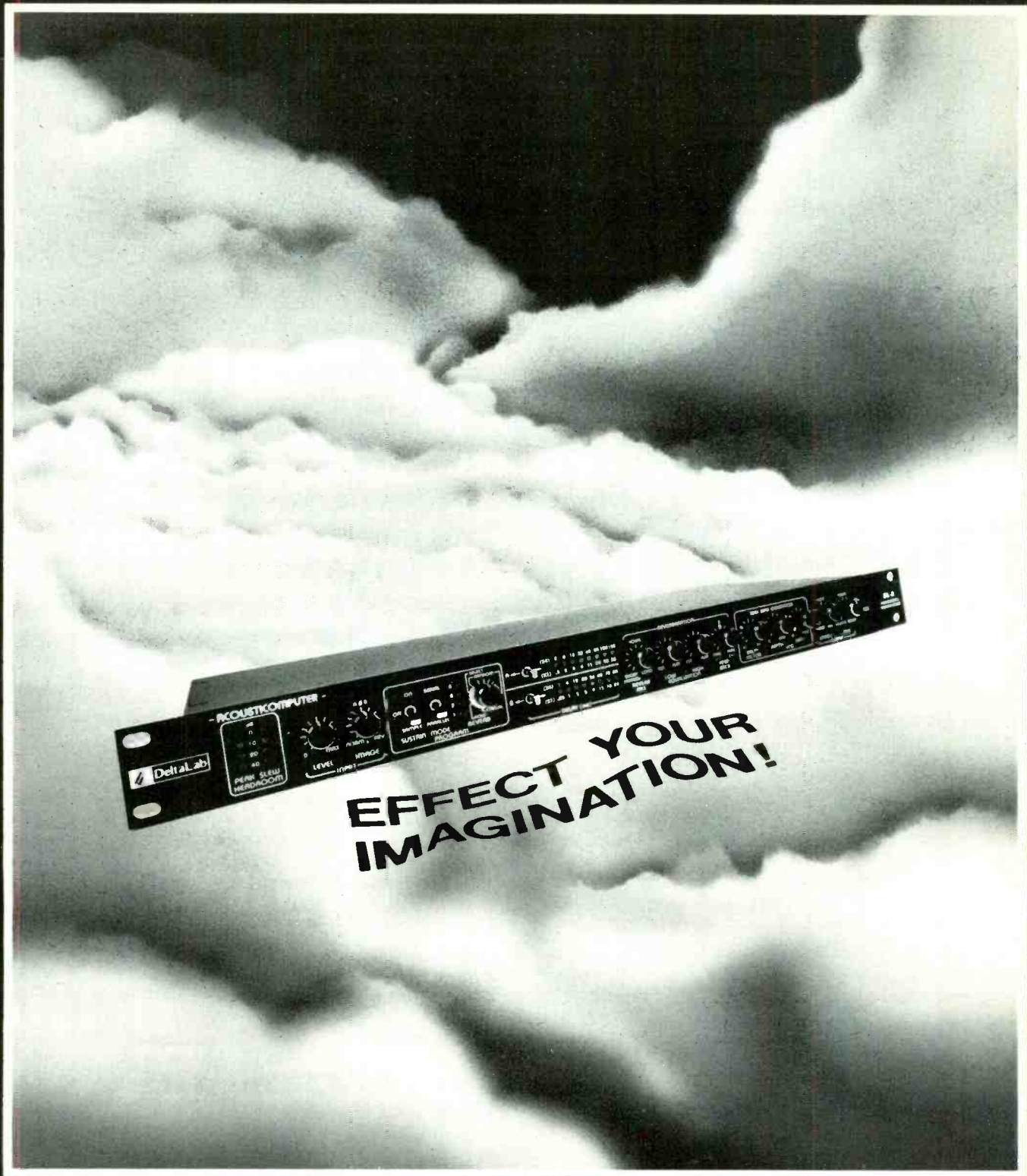
And then we could move to the saxophone section, which is a heavy section. I only use three saxophones. I take care of ego problems by having only one alto player, one tenor and one baritone player. The baritone player is Ed Maina who is from the University of Miami. He is also a great piccolo player and flute player. On alto flute and tenor sax is Eric Traub who is also from the University of Miami. Then there is Mike Migliore who is the alto saxophonist and soprano saxophonist. His mother used to take him to listen to me when he was young, in Canada.

We have Jeff Pittson, who is a very fine keyboard player from San Francisco. Jeff is also a very fine classical player. Then there is Lou Carfa from Buffalo, who is a great bass player and Tom Rizzo from Rochester, New York, who is a talented guitar player. They were both taught by Lou's father. The drummer is from Ohio State University and he was my pick. No one ever heard about him. But I heard about him and heard him: this is Jim Rupp.

MR: What qualities do you look for in picking your musicians?

MF: They have to have a lot of talent and a lot of stamina. They have to play in tune and they have to have a lot of stamina. Then they have to be good readers and have a lot of stamina, and then they have to be good improvisers . . . and have a lot of stamina.

MR: Do you think that the band members have a special chemistry



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CIRCLE 99 ON READER SERVICE CARD

flowing between them?

MF: It's the best band I ever had for that. They are all concerned about how they can make the other guy sound better, rather than saying "I wonder how I can make that bummer sound passable." We don't have any passable players. If somebody in this band sounds passable, then we're playing wrong behind him.

MR: What are the instruments that you use and that you've designed?

MF: I design my instruments for myself. There are two kinds of MF Horns. The first one has a huge bore and it takes a lot of air to fill it, but the reward is there if you do fill it. On the other hand there are times when I don't want to play with that velocity. I want to play more delicately, and move quicker. I use my other MF Horn that I just recently came up with and that has a smaller bore. The other two designs that are my pets and are totally contemporary are the Superbone and the Firebird. The Superbone is a combination of a valve and slide trombone. I played it tonight and so did Nick Lane. The Firebird is a slide and valve trumpet. Larry Ramirez is a brilliant young guy who works for Hol-

ton LeBlanc [the horn manufacturer] who helps me make my instruments. He's a great brass worker and a very innovative guy.

MR: What instruments do your trumpeters use?

MF: They use anything they want to use. I don't pose anything on them. Two of the trumpeters were using my instruments. I never try to sell the guys on the instruments I design.

MR: What mouthpieces do you use?

MF: Once again, I design them for myself. I use Jet Tone. Bill Ratzenberger, who designs mouthpieces for all kinds of great brass players around the world recreates them and then distributes them for me.

MR: What in particular do you look for in a mouthpiece?

MF: Mine are very unique. They are a V cup as opposed to a bowl with a hole in the bottom of it. The V cup was used by Bix Beiderbecke, Buddy Bolden and Jack Teagarden.



MR: Do you have your own studio at your home in Ojai, California?

MF: I just spent 6,000 dollars

designing one. That is something I'm into right now. I don't want this to replace a major studio or do all my recording at home, but I would like to record my creative thoughts there. I want to be able to choose a level and afford something that is great but is basic. Sometimes some of my best writing seems to come when I'm relaxed between tours. That's when I did "Conquistador" and that's when I've done my best things with Nick Lane and Biff Hammon.

MR: When do you expect your studio to be finished?

MF: I'm on the road so much that I really don't know. George Benson told me to forget it because six months after you have the hippest equipment, something new comes along. It's not uncommon to spend a half million dollars on a board right now, and at that point it starts getting a little silly.

MR: What were the factors that led you to produce your own records?

MF: It became clear to me that I would enjoy my albums more if I produced them. I wanted to start paying attention to becoming a great producer, not only of this kind of music, but also of getting this music where it

belongs. It should be in films and television. I enjoy being a producer and presenting people. I've always presented what I thought were great young musicians and now I'm interested in getting them to make their own albums, soundtracks, whatever.

MR: Are you concerned more with the artistic side of producing [rather than the technical]?

MF: I get involved with both the artistic side and the technical side. One of the first things a producer has to learn is to respect the engineer and allow him to do his own thing. An engineer knows more about engineering than I do and that's how we establish a mutual gamesmanship.

[For example,] I tease Mike Migliore by saying that he knows I play soprano sax much better than he does. Now, I don't play the soprano sax better than Mike by any stretch of the imagination . . . but the point is, I do play the soprano sax. At the same time, I should know the board, but I do not have to know all about the board and the engineer does not have to know all about the band.

MR: What were some of the production techniques that you used on your

new album, *Hot*?

MF: We did a song called "Om Sai Ram" which is a south Indian musical piece and is a tribute to Satya Fai Baba, who is one of the great spiritual leaders of India. Besides my band being in the studio, there were eighteen great Indian singers, most of them ladies in their beautiful saris, and I sat with them in the Lotus position around the microphones. We sang a Bhajan, which we call Gunga Jatori. Om Sai Ram is one of the great sayings of Satya Fai Baba. I'm very interested in the music of other countries without trying to become like them. I'm more interested in fusing the music of east and west.

MR: So it seems that your new album is a combination of all different types of music?

MF: Yes, very much so. We also did "Naima" which is a tribute to the late John Coltrane and was written for his first wife, who died very young. I wrote a piece with Biff Hannon called "Topa, Topa Woman" and that's more in the American Indian fashion.

MR: How long did it take you to make the album? I know you were first in New York at Media Sound and then

in Los Angeles at A&M.

MF: I wanted to make it a great album so I really did not pay attention to the hours or the budget. But I also made sure that I wasn't wasting money, and I don't feel that I did waste any with this album.

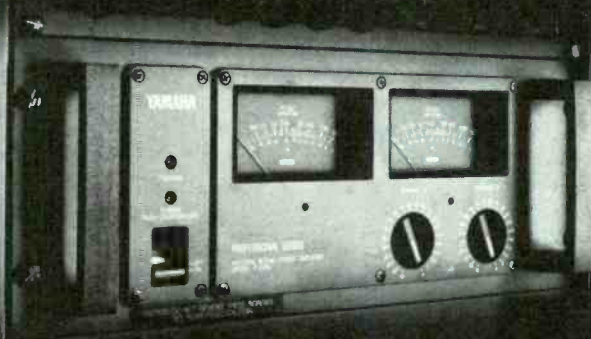
MR: How do you feel about playing your music? Do you still find that there is mystery to it?

MF: Of course there is. It's totally unexplainable. The guy that talks about the tremendous use I had at the D minor seventh and all its alternates during the third bar of letter D is really a bore. That's why you'll catch musicians of a very high caliber come into my dressing room or me go into theirs and say something really intellectual like, "Hey baby, you really burned tonight." That's far more artistically important.

MR: If destiny had pushed you in a different direction, Maynard, where do you think you'd be?

MF: Even if I had become the world's greatest classical trumpet player I would never have been a serious musician. I still would have had a good time playing with any symphony orchestra.

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CIRCLE 81 ON READER SERVICE CARD

Ambient Sound

BY LEN FELDMAN

The Digital Hype Begins!

I have just finished reading a news item in one of our most respected audio trade journals, and that item caused me to give some serious thinking to the problems relating to misinformation to which all of us are subjected, from time to time. Mind you, this article was not an advertisement; it was a *news* item, ostensibly written by a responsible reporter who, I am certain, was simply trying to do his or her job. The headline for the article read:

NO NOISE IS GOOD NEWS ON DIGITAL FM SHOW

My curiosity was immediately aroused, because, thinking that I had kept up with technological developments as well as most of us, I had been led to believe that there was *no way* that any FM station in this country (or in any other country I know of) could transmit music *digitally*. Furthermore, even if digital transmission of audio signals over FM were possible (and I'll explain why it isn't in a moment), as far as I

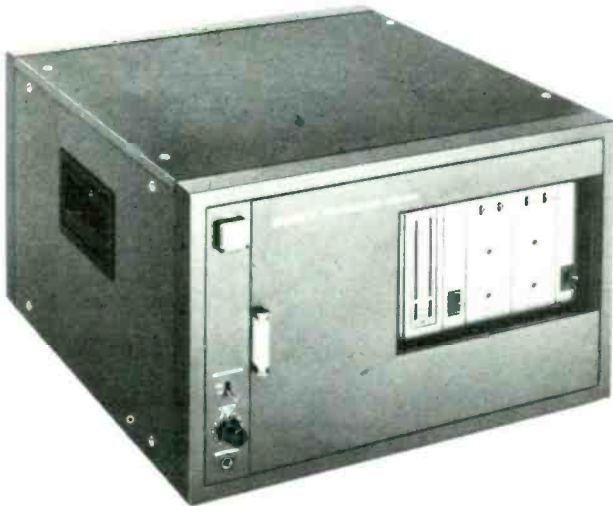
knew, there was not a receiver or FM tuner in the world that could receive such transmissions and convert them back into analog audio signals.

As I read further, things began to come clear. What the station had in fact done was to use the Sony PCM-1600 (a digital audio processor, which, used in combination with a Betamax VCR, can record and play back audio signals which have been converted to true PCM or digital form) to play some digitally recorded master tapes over the air *after converting them back to conventional audio signals*. That, however, is hardly what the unsuspecting reader would have gathered from reading the headline, or even from the details that followed later on in the news article.

Most readers probably realize what was happening here, but for those who don't, here's a brief explanation of *why* true digital transmission of audio is not possible over FM, as we now know it.

Most of the digital tape mastering systems use 13-bit, 14-bit or 16-bit (for professional recording applications) encoding systems. That means that each binary code number used to describe an instantaneous amplitude of an analog audio signal contains that many "1's" or "0's" (positive pulses or absences of pulses). To obtain audio response out to 20,000 Hz, you have to sample the audio waveform around 50,000 times per second (45 kHz-plus has been proposed as a standard for consumer digital recording equipment). Multiply 13 "bit" by 50,000 and you come up with 650,000 pulses (or "0's" and "1's") per second. The bandwidth of any system capable of storing or transmitting that number of pulses per second has to be at least that great, if not greater—possibly into the Megahertz in width. Now, I'll ask the well-intentioned reporter how in hell an FM station, with a bandwidth of 200 kHz and a maximum deviation of ± 75 kHz can *possibly* transmit a couple of Megahertz worth of bandwidth legally without effectively wiping out half the other FM stations in the area?

Obviously, what happened here is that the station in question simply *decoded* the digital tapes at its studio



Sony PCM-1600 Digital Mastering Unit.

and then played the resultant music signals over the air in the conventional way. There was nothing *digital* about the broadcast.

As I read further, I learned that the station manager and chief engineer were unanimous in their praise of the "absence of tape noise" and the "wider dynamic range" achieved during the experiment. While I didn't myself hear the broadcast in question, I would like to ask them a couple of questions. First, did the station engineer remove all limiting and compressing equipment from the line so that the newly achieved "wider dynamic range" was actually transmitted? If the answer is yes, then why isn't the station able to remove these devices from the line when playing *other* top quality tapes or discs, which are purely analog in nature but which also have far wider dynamic range than we ever enjoy when listening to FM? If the answer is no, how can these people claim that the dynamic range was better at the home of the listener?

Secondly, assuming that tape noise was indeed completely inaudible (as it probably was), did this in any way decrease the "noise floor" or background FM hiss heard by listeners to the program? We all know that the answer to that one is "no," so in fact, the noise-free nature of the audio signal being transmitted was really not enjoyed by the listener anyway. My own experience with FM has been that if a station keeps its records reasonably clean and free from damage and replaces them from time to time, disc surface noise is usually not the limiting problem with FM noise.

The same sort of misinformation is being foisted upon an unsuspecting public by many record producers and record companies. It's only a short jump from saying that a disc was "digitally mastered on tape" to saying that what's being offered is a "digital disc." Mind you, I have heard some digitally mastered discs which, when carefully pressed and strict quality procedures applied *do* offer increased dynamic range and lower surface noise than do conventionally pressed discs copied from analog master tapes which have been dubbed and re-dubbed Lord knows how many times. But even the best of them cannot provide the home listener with 80-plus dB of dynamic range (the theoretical capability of the digital mastering system) or a surface noise level that is as inaudible as the noise level on the master digital tape from which the records were made. The only way we're ever going to be able to equal the performance of a digitally produced tape on a disc is when we finally convert to *true* digital discs—the kind that have been demonstrated by at least half a dozen high-technology companies, either as unique products or as spin-offs from their video disc research and proposals. Since video discs must inherently have a high-bandwidth storage capability, it follows that video disc systems (regardless of format) lend themselves to true digital audio storage.

The Hype Goes On

The digital hype extends to other areas of our common interest, too. How about all those new "digital" cassette tape decks? I've seen tape decks where the only thing digital about them is the fact that the read-out of the tape counter has been converted from a mechanical type of counter to one which displays the tape count in brightly lit digital LEDs. Others, employing microprocessors for all sorts of timing and programming functions *other* than the recording process itself, also sport the "digital" buzzword.

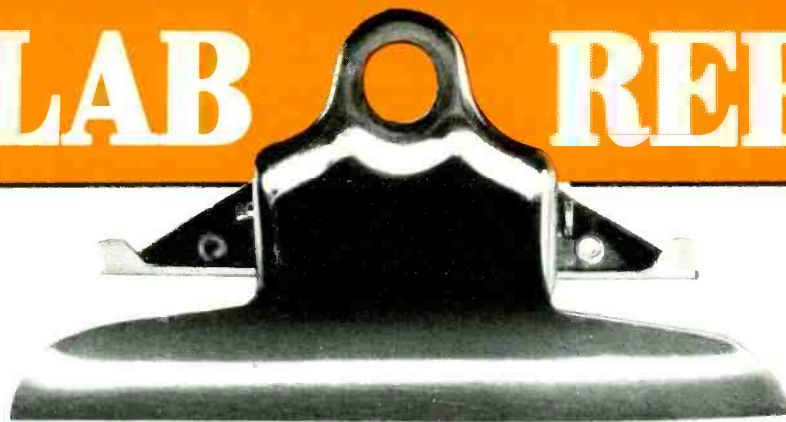
I suppose the problem arises because the word digital has too many meanings. Digital refers in a general way to anything using numbers, or digits, from 0 to 9. It also refers to fingers (as in the digits of your hand) which have about as much to do with digital recording and playback of audio as do the new "digital readout" tuners which have simply substituted those numeral-indicating LED displays for the screened frequency notations and the travelling dial pointer used on tuners of more conventional design.

Even the so called frequency-synthesizing tuners which have been proliferating of late should not properly be called "digital," since the only thing digital about them (aside from the LED frequency displays) is the counting circuitry which compares the incoming signal frequency with a quartz-referenced, internally generated signal for improved center-tuning. The RF, IF and audio stages responsible for recovering and reproducing the FM sound as audio are still very much "analog" and are likely to remain so for the foreseeable future.

Substituting the term PCM (Pulse Code Modulation) for the more widely accepted term "digital" when referring to binary encoded audio information and its playback (as used primarily by Japanese manufacturers of true digital equipment) might be a suitable solution to the problem, except that not all the systems used actually employ Pulse Code Modulation, which is just one approach to digital recording. The same holds true for Delta Modulation, another digital technique sometimes employed with digital time delay units, etc. In short, it appears as though the terms digital recording or digital audio will prevail.

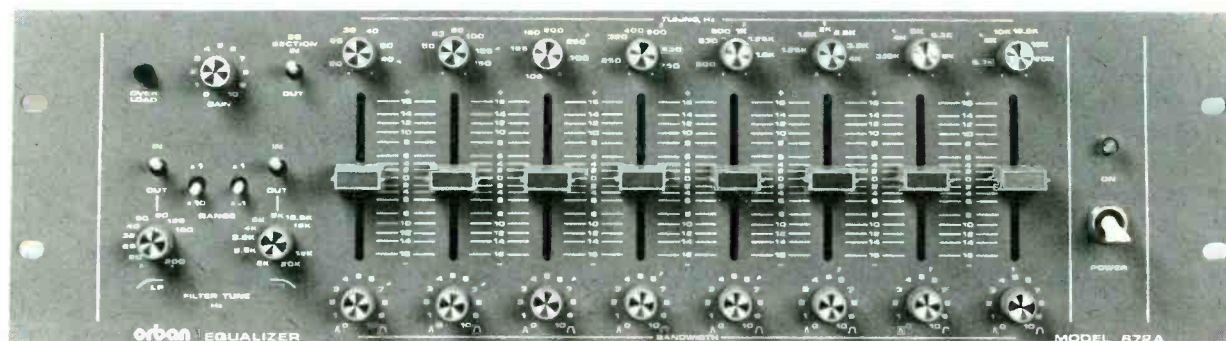
Getting back to the printed news item which prompted all this, I am concerned that if a trade publication that is supposed to be knowledgeable about such matters could mislead the reading public about "digital" audio matters, the general press, which loves to latch on to current buzz-words (its current favorite is "computerized," with "digital" not far behind) will confuse the average consumer even more. We, as more technically aware readers, have, I think, an obligation to our friends and business associates to set the record straight, and, for the moment at least, the *record* is still very much analog!





NORMAN EISENBERG AND LEN FELDMAN

Orban 672A Equalizer



General Description: Orban's model 672A is a single-channel (mono) parametric equalizer offering control over eight frequency bands across the audio range. It also contains two tunable filters, and it may be used as an electronic crossover.

The eight EQ sliders handle boost or cut. For the parametric function, associated with each slider are two knobs (one above, the other below each slider) for adjusting center frequency and for the Q (bandwidth) around it. Each center-frequency knob has numbered markings for six frequencies within its continuously variable range, and a small mark on each dial indicates the ISO preferred frequency for that range. The knobs for varying bandwidth are numbered from 0 to 10, with the 0 corresponding to a waveform symbol showing a very steep Q, and the 10 corresponding to a symbol showing a very broad Q. The number 7 on each dial has a small arrow indicating average Q position. The sliders themselves operate through a range from +16 to -16 dB, and there are detents at the 0 settings.

The eight sliders and their associated knobs occupy the largest portion of the light blue front panel. Lettering is in white and very legible. The device's power switch is at the right together with an off/on indicator.

The left portion of the panel contains an overload

LED, a gain control and the EQ defeat switch. Below them are the controls relating to the unit's filtering and crossover applications. There are two filter-tune knobs. One covers the high-pass filter over a continuous variable range from 20 Hz to 200 Hz, with specific frequencies indicated at 20, 25, 32, 40, 50, 80, 125, 160 and 200 Hz. This tunable filter has a range-multiplier switch that may be used to multiply its frequencies by 10. It also has its own in-out switch. The other knob covers the low-pass filter from just below 2.5 kHz to 20 kHz. Its markings are at 2.5, 3.2, 4, 5, 8, 12.5, 16, 18 and 20 kHz. This knob too has a range-multiplier switch that may be used to reduce the designated range in that it multiplies the indicated values by 0.1. The LP filter also has its own in-out switch.

The rear panel of the Orban 672A contains the unit's inputs and outputs plus a block diagram of its circuitry. One set of in and out connectors consists of twelve no. 5 screws on a barrier strip. The inputs and the lowpass and highpass outputs are wired in parallel to ¼-inch phone jacks above them. In addition, there are holes punched (behind a screw-on plate) for optional installation of XLR-type connectors. The unit's AC power cord is fitted with a three-prong grounding plug.

The Orban 672A may be used as a single-channel parametric equalizer with high- and low-pass filters, or as an equalizer cascaded ("in series") with an electronic crossover for bi-amplified speaker systems. In the latter application, no additional or external crossover is needed. Special precautions are recommended in the owner's manual when installing and connecting the device to avoid hum-causing ground loops. Suggested applications include its use in sound reinforcement, recording studios, motion picture sound, broadcasting, disco and electronic music.

Test Results: In MR's lab tests, the Orban 672A met or exceeded its published specifications handily. All EQ ranges, for boost and cut, for "Q" and for frequency tuning were readily confirmed. Distortion and noise were measured as less than claimed. Filtering action proved to be accurate as specified.

These "static" test measurements hardly tell the whole story of this remarkable and versatile instrument. An idea of its capability can be obtained from the series of spectrum analyzer sweep photos we took while putting the 672A through its paces. In Figs. 1a and 1b we set the "Q" (bandwidth) control for maximum width, and plotted the range of control of each slider set to maximum boost or cut, while the center-frequency controls were set for their minimum points (e.g., the 110-Hz to 310-Hz knob was set to 110 Hz and so on) for Fig. 1a, and for their highest dial settings for Fig. 1b. As the photos show, extremely gradual changes in response are possible with these settings.

For Figs. 2a and 2b we went to the other extreme of bandwidth settings. This time we were able to introduce sharp "notching" at any desired frequency, or sharp, narrow boosting of any frequency. Again, in Fig. 2a the center frequencies for each control were set to one extreme; in Fig. 2b they were rotated to the opposite extreme settings.

Next, to illustrate how much range of control could be obtained with only one of the frequency-band controls, we operated over the complete range of frequency, bandwidth and boost and cut of the 480-Hz to 1.9 kHz band. This produced the patterns shown in Fig. 3 which illustrate the center-frequency range as well as the bandwidth range of this control.

The low-pass and high-pass filters were found to have very wide range of adjustments as to cut-off points. A worthwhile feature of this extra filter circuitry is that the low-pass filter is in-line with one of the outputs of the equalizer, while the high-pass filter is in series with the alternate output. This arrangement makes it possible to obtain a customized electronic two-way crossover system for use with a biamp-

plified mono reproducer without the need for a separate crossover unit. Moreover, the equalizer itself continues to function even when you use the bi-amp option, with those frequency bands that are relevant to the bass power governing its overall response, and those frequency bands pertaining to the treble amplifier controlling its overall response curve. A few of the infinite variety of low and high pass filter settings (cut-off is continuously variable as to frequency) are plotted in the spectrum analyzer photo of Fig. 4.

To convey some idea of the enormous flexibility

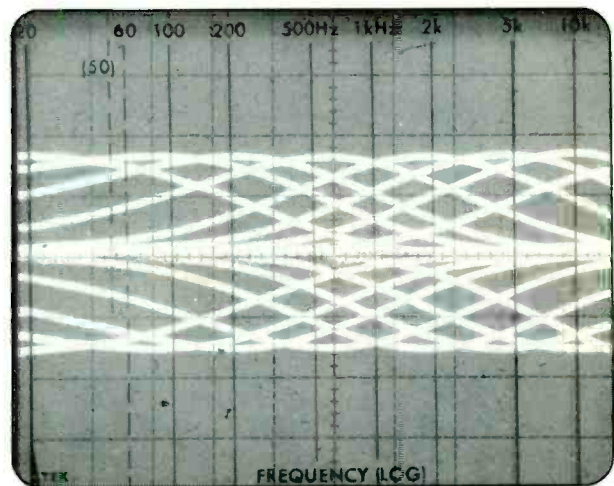


Fig. 1a

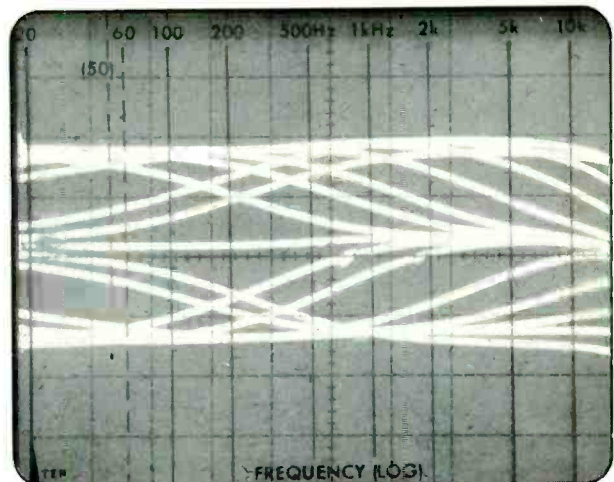


Fig. 1b

Fig. 1: Orban 672A: Boost and cut range of the eight band controls with bandwidth (Q) set for maximum. In 1a center frequencies are set at their low points, while in 1b they are set at maximum.

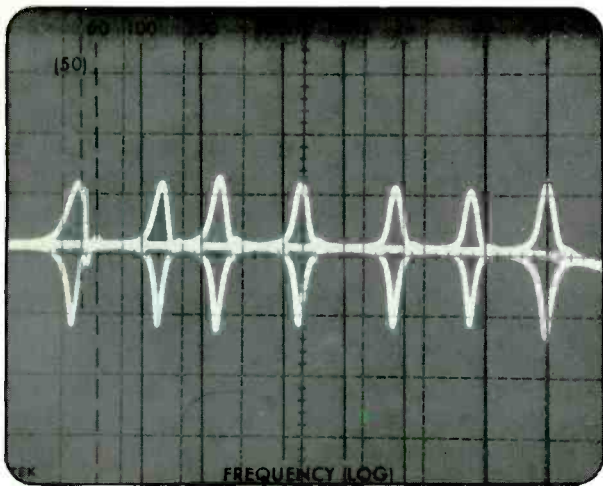


Fig. 2a

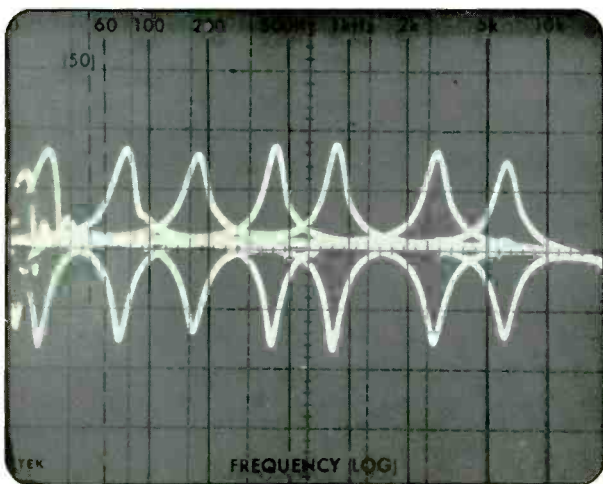


Fig. 2b

Fig. 2: Orban 672A: In figures 2a and 2b, bandwidth controls have been set for minimum "Q."

inherent in a combination graphic/parametric equalizer such as this model, we set up a "wild" curve that might never be needed in actuality but which does illustrate how the combined control of amplitude, bandwidth and center-frequency positioning can be used. The resultant curve, shown in Fig. 5a, was obtained with the controls set as shown in Fig. 5b.

With all this flexibility of response, we found that the Orban 672A introduced no noise or distortion into the sound, and exhibited no quirks of erratic behavior.

General Info: Dimensions are 19 inches wide (rack-mount); 5¼-inches high; 5¼-inches deep. Weight is 8 pounds. Price is \$499.

Individual Comment by L.F.: A quick look at the Orban 672A will show that it is both a graphic and a parametric equalizer. One could, for example, set the upper rotary controls to equally-spaced frequencies,

keep the lower rotary controls at some nominal bandwidth or value of "Q" (say, about 1 or 2), and thus have a perfectly fine 8-band graphic equalizer using the levers for boost and/or cut as would be done with any other graphic EQ.

This function would of course be using only a small portion of the control flexibility of which the Orban is capable. In addition to the enormous variations possible with the parametric controls of this unit, an entirely different aspect of it is found in its filter section. This took me a while to figure out since the owner's manual, though complete, could be written in slightly less vague fashion. Anyway, the filtering possibilities also are extremely versatile as shown on the accompanying graph photos.

The high degree of versatility of this device is, happily enough, available with excellent basic perform-

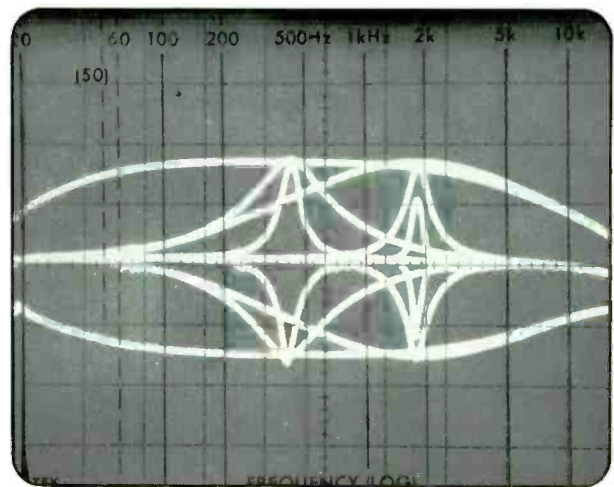


Fig. 3: Orban 672A: All of these curves were obtained using only one set of band controls (480 Hz to 1.9 kHz).

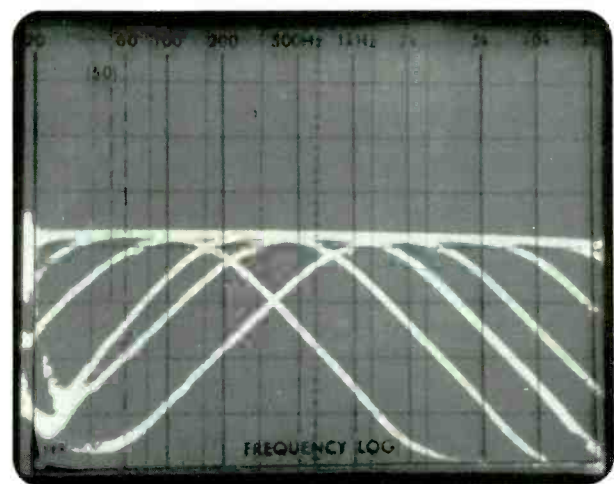


Fig. 4: Orban 672A: Low and high pass filters can be set over a wide range, creating electronic crossover for biamp applications.

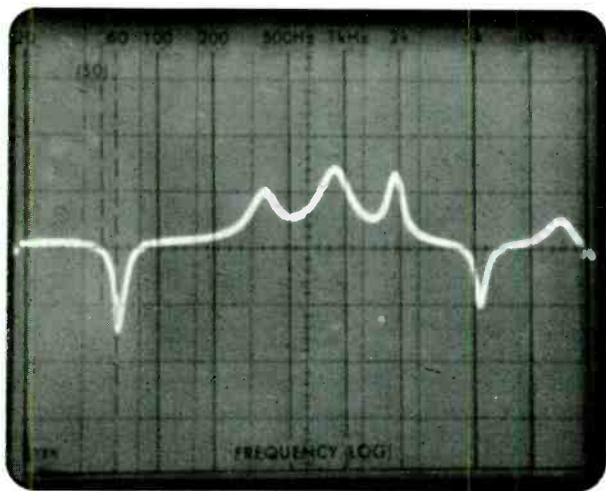


Fig. 5a

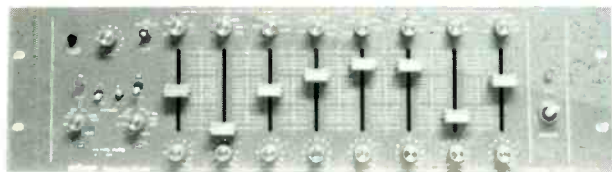


Fig. 5b

Fig. 5a: Orban 672A: Response curves obtained at output of unit with controls set as shown in fig. 5b.

ance characteristics in terms of distortion and noise. With the controls set for flat, but with the EQ switch "on," we could not distinguish between sounds heard with the unit in or out of the circuit. For simple EQ

jobs, a three-band parametric, or a ten-band graphic may well do the trick, but for the really tough situations that occur all too often in P.A. and in sound-reinforcement work, the Orban 672A would be a logical choice, in my view, particularly since its price is really quite attractive.

Individual Comment by N.E.: Eight bands of parametric option are quite impressive, and the sheer number and variety of response variations and tonal effects possible with the Orban 672A are truly "ear opening." You can get a whole assortment of response changes, from subtle variations to major tonal alterations. The filters too really do a job that has to be heard to be fully appreciated.

Handling the device is gratifying from the standpoint of control responsiveness; the knobs and sliders and switches all perform as if they were parts of a well-built machine, which, of course this unit is. It probably will take some getting used to in order to fully realize all its potential, and in this regard I feel that the owner's manual could be a little more explicit. For instance, a few typical system hookup diagrams wouldn't hurt here at all. The whole business of using a floating shield (grounded to one chassis only) might be gone into somewhat more tutorially, and pictures of these techniques and their associated connectors also would help. Maybe Orban feels that the level of technical expertise that would characterize the buyer of one of the units obviates the need for such explanation, but I am not so sure, judging from some chats and mail I've had with interested or would-be serious recording enthusiasts. Anyway, the Orban 672A certainly is one sweet piece of parametric equalizer. For stereo, of course, you would need two.

ORBAN 672A EQUALIZER: Vital Statistics

| PERFORMANCE CHARACTERISTIC | MANUFACTURER'S SPEC | LAB MEASUREMENT |
|----------------------------|---------------------------------------------------------------------------------------------------|------------------------------------------------------|
| Input impedance (driving) | 600 ohms or less, balanced or unbalanced | confirmed |
| Output load impedance | 600 ohms or more | confirmed |
| Nominal output level | + 4 dBm | confirmed |
| Maximum output level | + 19 dBm | + 24 dBm |
| Frequency response | 20 Hz to 20 kHz, ± 0.25 dB | 10 Hz to 40 kHz, ± 1 dB |
| Available gain | + 12 dB to "infinity" | confirmed |
| Total harmonic distortion | 0.05%, 20 Hz to 20 kHz | 0.012% @ 20 Hz 0.005% @ 1 kHz 0.0052% @ 20 kHz |
| SMPTE IM distortion | 0.05% | 0.02% |
| Noise at output | - 84 dBm | - 84.5 dBm |
| Equalization range | ± 16 dB | confirmed |
| Tuning ranges | 20 Hz-60 Hz, 40-150 Hz, 110-310 Hz, 230-750 Hz, 480-1.9 kHz, 1.1-4.5 kHz, 2.8-9.0 kHz, 5.9-21 kHz | confirmed |
| "Q" range | 0.5 to 10 | confirmed |
| Low pass range | 200 Hz-20 kHz, 12 dB/oct | confirmed |
| High pass range | 20 Hz to 2 kHz, 12 dB/octave | confirmed |
| Power requirements | 115/230 VAC, $\pm 10\%$, 50/60 Hz, 6W | confirmed |

CIRCLE 9 ON READER SERVICE CARD

Revox B-77 Tape Recorder



General Description: The model B-77 from the firm of Willi Studer (of Switzerland and Germany) is an open-reel tape recorder with 10½-inch (NAB size) reel capacity available in two speed configurations (15 and 7.5 ips, or 7.5 and 3.75 ips), and in different head configurations. The model chosen for this report runs at 15 and 7.5 ips, and uses a half-track head configuration (stereo in one direction, or mono in two directions). The mono mode also permits "parallel" recording of individual channels in the one direction. Three heads are used, separate for erase, record and play. Three motors are used in the transport.

The tape comes off the supply reel and runs past a tension arm, tape guide, an infrared "light gate" that controls automatic shutoff when tape runs out or breaks, the erase head, a tape lift pin, the record head, the play head, another tape lift pin, another tape guide, the capstan shaft and pinch roller, yet another guide and up onto the takeup reel. The head and guide assembly is protected under a cover which is removable for access to the parts for adjusting, cleaning, etc. Installed on the chassis plate, to the right of the head assembly, is a handy tape splicing block with built-in cutter. Just above the head assembly is a four-digit tape counter and reset button. To the left of the head assembly is a reel-size selector.

Below the head cover and toward the left is a sliding button "editor" which may be used to stop the transport with the tape still contacting the heads. This permits manual rocking of the reels to locate a given passage. This button is released when the regular "play" key of the transport is activated.

Under this general area is a slightly forward section

containing the bulk of the deck's controls and its meters. The left portion of this panel contains the speed selectors; the power off/on switch; the tape/source monitor switch; two stereo headphone output jacks offering identical signals; a dual-concentric output level control that handles channels individually for the headphone outputs; and a mode selector knob with settings for stereo, channel reverse, left only, right only and mono (left plus right on both outputs). *Note:* the line output level controls are at the rear.

The center portion of this panel contains separate recording-on switches for each channel, and associated indicator lights; separate knobs for input level on each channel; left and right microphone input jacks; and individual input selectors corresponding to the level controls for each channel. The selector knobs have settings for low-level microphones, high-level microphones, "radio" (this applies to inputs from a device fitted with a DIN output) and "AUX" which corresponds to what we normally call the line input (from such sources as tuners, preamp outputs, mixing consoles, etc.). In addition, the left record selector has a position "R-L" which transfers a signal from the right channel to the left channel, while the right record selector has an "L-R" position that does the opposite.

The two meters are at the top right portion of the panel. They show VU and are calibrated from -20 to +3. They also show modulation percentages, with 0 corresponding to -20; 50 corresponding to -6; and 100 percent corresponding to 0. In addition to the scales, there are peak LEDs.

Below the meters are the transport keys for pause, rewind, fast-forward, play, stop, and record. A "con-

trolled" sort of fast-buttoning is possible in that you can go from play into record directly by pressing the play and record buttons simultaneously. You also can go between the two fast winds directly. To go into play or into record from either fast mode, it still is not necessary to touch the "stop" button, but the machine itself will come to a full stop briefly, and then go into the mode selected.

A panel at the rear contains additional items. There is a voltage selector that permits operating the deck on different line voltage supplies, a fuse-holder, and the receptacle for attaching the machine's separate AC line cord. There also are three special sockets for use with optional accessories which include a device for varying capstan speed, a slide projector with sync options and a remote-control unit. Finally, the audio signal connectors: the DIN socket, the normal line in and out phone jacks, and screwdriver adjusted output level controls for left and right line-out.

The recorder is housed in a heavy plastic case that has a hinged carrying handle at the top. It may be installed vertically or horizontally, although the vertical attitude seems the preferred one for accessibility to front and rear controls and connectors.

The Revox B-77 is supplied with a head-cleaning kit (flat swabs, cotton-tipped sticks, fluid, mirror); an empty 10½-inch reel; two pairs of stereo signal cables; and a three-language instruction manual. It is aligned for Scotch 250 re: 0 dB. There are no user-available bias or EQ controls; this is in line with the manufacturer's avowed philosophy that such adjustments should be made only by qualified technicians or other "technically capable users" with competent test instruments as detailed in a Service Manual for the machine (which is priced at \$25).

Test Results: Coming in at or better than spec on most counts, the Revox B-77 proved in our tests to be an excellent deck offering performance of the highest order. This verdict is undeniable despite some personal comments on its features (see below).

Audio response at either speed was splendid, exceeding the manufacturer's spec and confirming the claim for smooth "no bump" low-end response which relates to the very good tape-to-head contact of the Revox. At both speeds, distortion was extremely low, and even at a signal level of +6 VU it remained well under 1 percent. Recording headroom was more than adequate, and it is doubtful that one would ever run into problems of tape saturation with this deck. Signal-to-noise, *unweighted*, was a very high 68 dB at 7.5 ips. The comparable figure with the "A" weighting normally employed would be 72. At 15 ips, it got a jot better, making 73. These figures are from a deck that has no noise-reduction system.

Figures 1 and 2 really tell the whole story as regards frequency response. Fig. 1 shows the response at 7.5 ips. The upper trace is playback of a sweep-frequency signal (20 Hz to 20 kHz) recorded at 0 dB level, which—for the Revox B77—corresponds to a magneti-

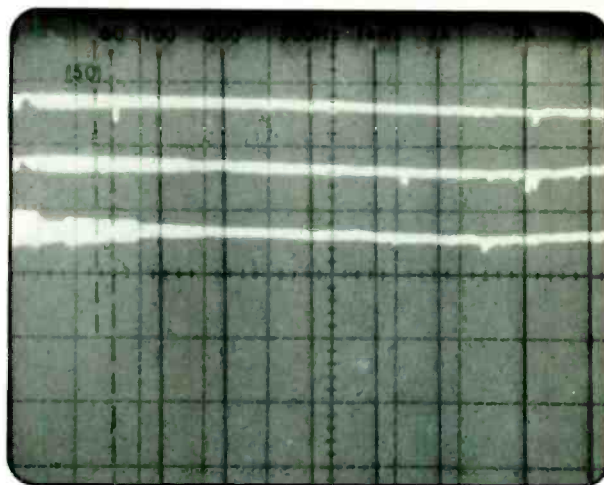


Fig. 1: Revox B-77: Record/play response from 20 Hz to 20 kHz, at 7½ ips speed, for record levels of 0 dB (upper trace); -10 dB (middle trace); -20 dB (lower trace).

zation or record level of 257 nWb/m. The middle trace is response at a record level of -10 dB from this reference. The lower trace resulted from recording at -20 dB record level. Even the upper trace (0 dB level) exhibits flat response to about 15 kHz. Of course, when you back off to the -20 dB level, which is what Revox specifies for record/play response, you can get response that goes well beyond 20 kHz, even at the slower 7.5 ips speed. Revox claims 20 kHz for the -3 dB point, and we measured 22 kHz.

At the higher speed of 15 ips (Fig. 2), the r/p curve at 0 dB record level is indistinguishable from the curves at -10 dB or -20 dB. No problems of tape saturation at this speed! In fact, at the -20 dB record level, response now extends flat to 24.5 kHz (for -3 dB), and S/N comes in at 73 dB "A" weighted.

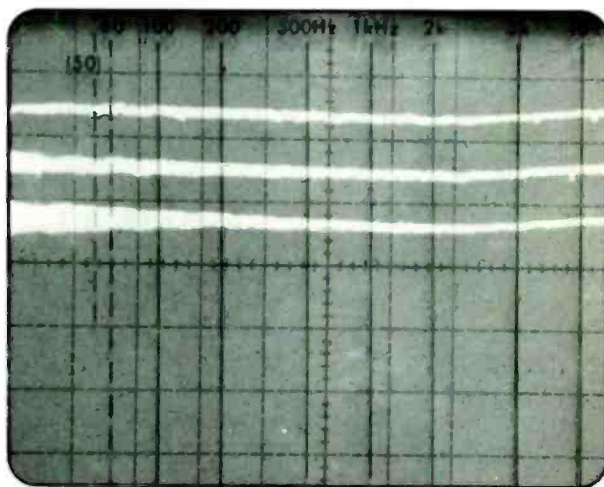


Fig. 2: Revox B-77: Record/play response from 20 Hz to 20 kHz, at 15 ips speed, for record levels of 0 dB (upper trace); -10 dB (middle trace); -20 dB (lower trace).

Complementing this superb electrical performance is the equally fine mechanical behavior of the Revox three-motor, logic-controlled transport system. Wow-and-flutter measurements were superb. Again, it should be remembered that the figures we tested against were DIN unweighted. Even so, our measurements bettered Revox's specs. But when you match these figures against the WRMS values normally given for other tape recorders, the true mettle of the Revox really stands out—with a wow-and-flutter measurement of 0.015 and 0.025 for 15 ips and 7.5 ips, respectively.

The deck includes built-in facilities for sound-with-sound recording (also known as "duo play"), simultaneous 2-channel recording with inherently synced-in added second track, sound-on-sound recording (also known as "multiplay" or over-dubbing) whereby material from one track is transferred to another track, including echo effects. To get sync in this application requires listening (usually with headphones) to the previously recorded material while making the track transfer.

General Info: Dimensions are 17.8 inches wide; 16.3 inches high; 8.14 inches deep. Clearance for 10.5-inch reels: maximum width, 21.2 inches; maximum height, 18.25 inches. Weight is 37 lbs., 7 oz. Price: \$1500.

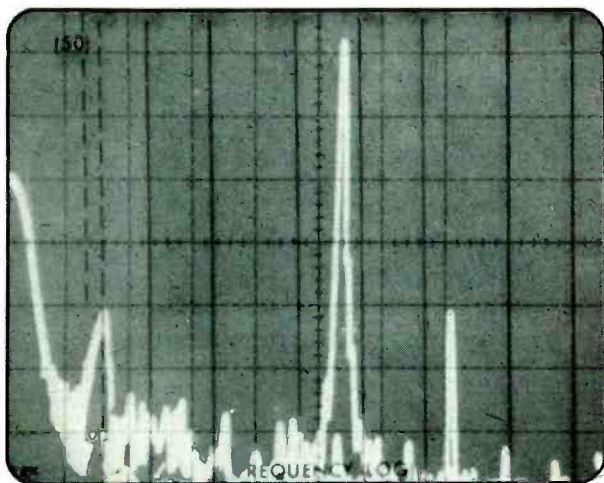


Fig. 3: Revox B-77: This display really consists of two separate spectrum analyzer sweeps, taken at two different sensitivity levels, 20 dB apart. The first display shows the desired 1 kHz signal and the third-order harmonic component, some 42 dB lower, for a distortion percentage of 0.79% at a record level of +6 dB, 15 ips. This is a bit better than the 0.85% measured with an audio distortion analyzer which, of course, includes noise components. The second sweep, at an increased sensitivity of 20 dB greater than the first, shows a small residual "pip" within the first 1 kHz tall reference spike. It is 63 dB below the reference level, to which must be added the extra 20 dB sensitivity of the analyzer, for a total erase-ratio of 83 dB—far better than the 75 dB claimed by Revox.

Individual Comment by L.F.: There are a few things that disturb me about this fairly expensive tape deck from the distinguished firm of Studer/Revox. Basic performance is not one of them. One look at the "Vital Statistics" tells you that this is as smooth-operating a deck as most pro machines. For instance, an *unweighted* signal-to-noise ratio of 68 dB at 7½ ips is nothing to sneer at. Try matching that on any of the new super-cassette decks that claim to perform as well as an open-reel machine! Remember, we're talking about a deck with no noise reduction system. Can you imagine what sort of signal-to-noise ratio you would be able to get with even a consumer-type outboard Dolby "B" noise reduction system coupled to this deck? Or a dbx linear noise reduction compander?

Other performance characteristics were similarly outstanding. So what's bothering me about the Revox B-77? Simply this: I can't make up my mind whether this machine is intended for amateur audiophile use or for "semi pro" use or what. If it is a consumer product (and I have to think that's what Studer/Revox meant it to be, considering the "radio" inputs, the dual-size reels it can handle and the general layout of the panel), then why were some of the basic control features—that are found on similarly priced or even lower-priced units—omitted? For example, you cannot mix microphone and line inputs. The output level controls are on the rear panel (near the input and output jacks) rather than on the front panel. Most peculiar of all, the front panel pause control, which I would have interpreted to be a touch-type switch that puts the transport into the pause mode when it is depressed and keeps it there until the pause button is touched once more, is nothing of the kind. It will only place the transport in the pause mode as long as you keep your finger on it. The only way you can get continuous pause and free your hands for other activities is to buy the optional, and-of-course-extra-costing, remote control TAPE DRIVE accessory box offered by Studer/Revox.

I sincerely believe that Studer/Revox, like many other European manufacturers of audio equipment sold here, really ought to study the U.S. recordist/audio enthusiast. Our needs and recording habits are, perhaps, just a bit different from those of the customers these companies cater to in other markets. It seems a pity that a machine that performs as well as this one should have missed the mark insofar as including a few essential features that many of us deem important. I would have to give Studer/Revox a high "A" grade for engineering excellence, but a somewhat lower mark for sales and marketing research.

Individual Comment by N.E.: As has been my experience with Revox products in the past, testing this unit and putting it through its paces proved to be a gratifying exercise in confirming (and then some) all the claims made for it, and having the pleasure of getting my "hands on" a wonderfully crafted, smooth-running, highly responsive piece of audio machinery.

This favorable view, however, does not deny the

obvious fact that the model B-77 has a "personality" that reflects its European origin and the design philosophy of its manufacturer, that may or may not appeal to American-oriented recordists. The inclusion, for instance, of a "radio" input and a corresponding marking on the recorder selector knob would, at first glance, seem to imply to low-grade machine for the non-critical mass market rather than for the serious audio person. However, in European audio jargon, "radio" refers to a specific signal level and impedance which apply to the DIN configuration and which in Europe is not a "dirty word" to audio purists.

There is, in any event, a certain intransigence evident in the design of the B-77. The absence of user-available adjustments for bias and EQ is deliberate, and you either accept Studer's philosophy on this point or not. Myself, I don't see the harm in making such adjustments easily accessible and dispelling some of the "mystery" surrounding them—as long as clear instructions for their proper use are spelled out for the owner, together with a cautionary note about how easy it is to misadjust them.

The lack of an input mix facility I can forgive on the grounds that a really serious recordist probably would use an outboard mixer—although, again, what's the harm in supplying this fillip for those who might want to experiment in this area for the first time, or whose recording needs are such that they do not need the more professional outboard mixer?

Certainly, in my view, the line output level controls should be on the front panel. On the other hand, there is that nice splicing block, right where you need it.



Front panel view of Revox B-77.

While all of these points can be argued, and —I am sure—will not deter Revox enthusiasts from buying and enjoying this deck, what really annoys me a good deal here is the owner's instruction manual. It is printed in three languages, and the text runs in three parallel columns throughout. As a result, it is impossible for the illustrated material always to show up conveniently spotted near the text to which it refers. You have to do a lot page turning and foldout manipulating to get through this manual. You certainly should go through it all—maybe more than once—to really understand the full operation of the deck.

REVOX B-77 TAPE RECORDER: Vital Statistics

| PERFORMANCE CHARACTERISTIC | MANUFACTURER'S SPEC | LAB MEASUREMENT |
|-----------------------------------------------|------------------------------|--------------------------------------------------------------------------------------------------------------|
| Tape speeds | 7.5; 15 ips | confirmed |
| Reel capacity | 10.5 inches | confirmed |
| Frequency response, 15 ips | + 2, - 3 dB, 30 Hz to 22 kHz | + 2, - 3 dB, 22 Hz to 24.5 kHz |
| Frequency response, 7.5 ips | + 2, - 3 dB, 30 Hz to 20 kHz | + 2, - 3 dB, 25 Hz to 22 kHz |
| Wow and flutter, 15 ips | 0.06% DIN | 0.04% DIN; 0.015 WRMS |
| Wow and flutter, 7.5 ips | 0.08% DIN | 0.08% DIN; 0.025 WRMS |
| THD at 0 VU, 7.5/15 ips | <0.6%/NA | 0.5%/0.4% |
| THD at + 3 VU, 7.5/15 ips | NA/NA | 0.6%/0.55% |
| THD at + 6 VU, 7.5/15 ips | <1.5%/NA | 0.75%/0.85% |
| Best S/N (standard tape) | 67 dB | 68 dB at 7.5 ips, unwt'd 69 dB at 15 ips, unwt'd 72 dB at 7.5 ips, "A" wtd 73 dB at 15 ips, "A" wtd |
| Record level for 3% THD, 1 kHz, 7.5/15 ips | NA/NA | + 11 VU/ + 15 VU |
| Rewind time, 3600-ft. reel | 135 seconds | 123 seconds |
| Mic input sensitivity, lo/hi | 0.15 mV/2.8 mV | 0.07 mV/1.13 mV |
| Line input sensitivity | 40 mV | 17 mV |
| Line output level | 1.55 V | 0.7 V |
| Headphone output level | 5.6 V (220 ohms) | 2.81 V |
| Bias frequency | NA | 160 kHz |
| Erase ratio, 7.5 ips | 75 dB | 83 dB |
| Speed accuracy, 7.5 ips | ± 0.2% | ± 0.1% |

CIRCLE 10 ON READER SERVICE CARD

AB Systems Model 730a Tri-Amp



General Description: The AB Systems model 730a is a single-channel (mono) "triamp" or three-band amplifier with built-in electronic crossover. The unit is intended to accept preamplified signals, split them three ways, provide power amplification for each frequency band, and feed the outputs to the high-, mid- and low-frequency sections of a loudspeaker.

The crossover frequencies (any two from 100 Hz to 16 kHz), and the rate of slope (6, 12 or 18 dB per octave, Bessel or Butterworth) may be chosen via plug-in card modules. The device is normally factory supplied with cards for frequency crossovers at 800 Hz and 7 kHz with 12 dB/octave Butterworth slopes. Regardless of frequency and slope, the low-frequency section of the model 730a is rated to supply 350 watts into 8 ohms (bridged) for the low-frequencies; 100 watts for the midrange; 50 watts for the highs. For 4-ohm bass operation (available on special order), the low-frequency power rating is 280 watts. Rated input sensitivity is 0.75 volt RMS.

The rack-mountable front panel contains a power off/on switch plus four knobs for individual level control of the entire system as well as for the low-, mid- and high-frequency ranges. Input and output signal connectors are at the rear. The input connector is a standard 1/4-inch phone jack. This is paralleled to another jack for supplying the complete original signal (before crossover) to another amplifier, if desired. There also is an octal socket for input transformer (balanced line) operation. The frequency-divided outputs are taken from three sets of five-way binding posts. In addition to these connectors, the rear also contains the unit's AC line cord fitted with a three-prong (grounding) plug, an AC convenience outlet and recessed input gain sets.

Test Results: In *MR's* lab tests, the AB Systems Tri-amp generally did better than specified, producing

higher power, lower distortion, wider response and less noise than claimed. It did, however, need a little more input signal for these results than the 0.75 volt specified. The difference here would be, in any event, hardly significant in actual use.

To measure the model 730a we approached it as three amplifiers (two of which—the high and mid sections—share a power supply, while the bass section has its own power supply). The tricky part about measuring the low-frequency amplifier has to do with the fact that it has a bridged output. That means you cannot have a ground reference for the load (8 ohms) or for any of the associated test equipment. This posed a problem with our Sound Technology 1700A when used with the Sound Tech 1200A test panel and related digital VTVM (which we use for accurately setting up equivalent voltage for power output measurements).

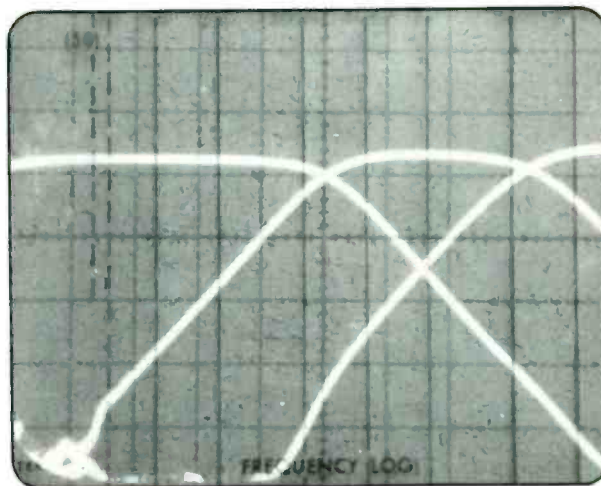
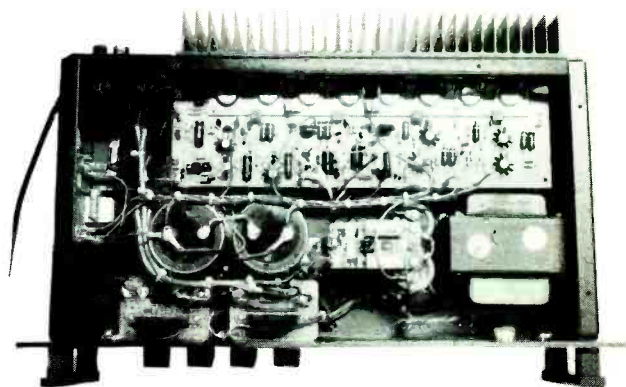


Fig 1: Combined response of the tri-amp's three sections shows accurate positioning of crossover points.

Accordingly, we ended up having to go directly into a separate isolated 8-ohm precision load and to depend on the VTVM contained in the Sound Tech unit, which is a mechanical meter movement and not as accurate as the separate "grounded" digital readout VTVM. Accordingly, what we can report about the low-frequency amplifier in the model 730a is that it delivered 360 watts before clipping. We cannot vouch for the distortion figures at 350 watts other than to state that they were at least so low as to be inaudible at that power level.

Measurement of the mid- and high-frequency sections was easier, and in both cases, THD was lower than claimed. The midband amplifier, with a 1-kHz test signal applied, offered an enormous amount of dynamic (IHF) headroom—nearly 2.5 dB. Signal-to-noise ratios of all three sections, measured separately, were much better than claimed.

We verified the action of the crossover circuitry by separately plotting and superimposing the outputs versus frequency of the three amp sections. The results are shown in the composite sweep-frequency



AB Systems 730a: Tri-amp system internal view.

display shown in Fig. 1. Filter slopes in the normally supplied networks were 12 dB/octave with a Butterworth configuration. These characteristics are determined by two plug-in p.c. boards which stand vertically and connect to a "mother board" inside the unit. The two boards may be removed readily, and other boards with alternate crossover frequencies and a Bes-

Power and Distortion: How Do You Measure?

As regards power and IM distortion measurements, some interesting problems came up during tests of the model 730a which are worth recounting for those readers who are "into numbers."

To begin with, in a brochure on the 730a, AB Systems states that the unit has "600 watt equivalent full band power." We weren't sure what that statement meant at first. We assumed AB Systems arrived at that figure by a "logical trap" we ourselves have fallen into at times when writing about the subject of tri-amping or bi-amping. The amplifier's individual sections (low, middle and high frequency) are rated at 350, 100 and 50 watts, respectively. If you figure the RMS voltage equivalents across 8-ohm loads for each of these wattages, you come up with voltages of approximately 52, 28 and 20, respectively.

An incorrect analysis would suggest that if you added these figures (the sum is 100 volts RMS), the tri-amp would provide the full-band power that a single amplifier could deliver if it produced 100 volts RMS into an 8-ohm load. But that would work out to 1,250 watts! So our assumption was simply that AB Systems had elected to state the equivalent of about half that power, or "600 watts." Even that, however, would not be quite accurate. The fact is, the varied frequency content of music waveforms do not add arithmetically, and the 350-watt section of the tri-amp would still be the limiting factor if you wanted to talk about "equivalent full-bandwidth power."

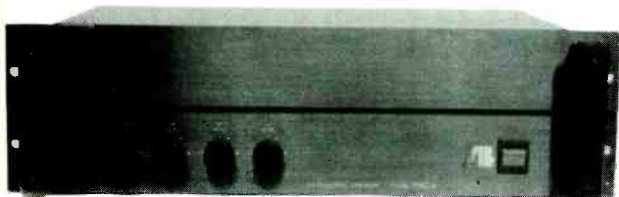
In response to the above, AB Systems contends—and rightly—that if you drove the bass section into clipping while a treble waveform was also

present in the signal, the latter would come through clearly and undistorted, while if you did the same thing with a wideband amplifier of the same 350-watt power rating, the highs would be all but obliterated. In that sense, tri-amping does offer added "equivalent power." Regardless, in any event, of the numbers, the principle involved is basically correct, and it is a clear advantage for a tri-amping approach.

As to distortion, it is indisputable that tri-amping produces far less IM distortion (of the SMPTE-measured type) than do single amps. Again, however, AB Systems quotes an IM distortion figure of less than 0.1 percent. We were curious as to how one would go about measuring SMPTE IM, with the 60-Hz component coming out of the low-frequency outputs, and the 7000-Hz component coming from one of the other sets of outputs. Clearly, we could not bridge the outputs of two of the amplifier sections and take a combined reading.

According to AB Systems, the way it arrived at its IM figure was to remove the crossover filter network from each section and then treat that section as a full-range amplifier. On that basis, we feel the company is doing itself an injustice to quote even 0.1 percent IM. While we could not measure IM in the lab because of the nature of the tri-amp, conventional SMPTE IM would, by definition, have to be unmeasurable and inaudible—another big advantage of tri-amping or even of bi-amping.

Because all this seems unusually intriguing and provocative, we would welcome reader comments on either or both subjects.



AB Systems 730a: Front panel view.

sel (instead of a Butterworth) slope, ordered from AB Systems, may be inserted in their place.

General Info: Dimensions are 19 inches wide (rack-mountable); 5¼ inches high; 10¾ inches deep. Weight is 28 pounds. Price is \$945.

Joint Comment by L.F. and N.E.: The "business" about power and distortion measurements aside

(see accompanying box), under actual use and listening tests, the "tri-amp" shaped up as extremely powerful, almost impossible to overdrive and surprisingly cool-running under high-level music signal amplification. We connected its outputs to two completely different speaker systems using varying tweeters, midrange and woofers in each. With each such system, the 730a performed as it should—loud and clear—and the facility for adjusting relative levels of the three frequency bands surely helped in achieving satisfactory balance in each experimental case.

The unit's relatively light weight would be a clear bonus for those who have to do a lot of transporting of sound gear. For the home hi-fi addict who wants to assemble a tri-amp system, the compactness and ruggedness of the model 730a are also in its favor (of course, two would be required for stereo). All told, an unusual, solid performing and attractive package.

AB SYSTEMS 730a TRI-AMP: Vital Statistics

| PERFORMANCE CHARACTERISTIC | MANUFACTURER'S SPEC | LAB MEASUREMENT |
|----------------------------------------------------|---------------------|-----------------|
| | LF/MF/HF | LF/MF/HF |
| Continuous power for rated THD, (W)(8-ohms) | 350/100/50 | 360/108/78 |
| Continuous power for rated THD, (W)(4-ohms, 1 kHz) | */NA/NA | */NA/NA |
| FTC rated power (20 Hz to 20 kHz) (W) | NA | NA |
| THD at rated output, 1 kHz (8 ohms)(%) | 0.1 | 0.08 |
| THD at rated output, 1 kHz (4 ohms)(%) | NA | NA |
| THD at rated output, 20 Hz (8 ohms) (%) | 0.1 | See Text |
| THD at rated output, 20 kHz (8 ohms) (%) | 0.1 | 0.09 |
| IM Distortion, rated output, SMPTE (%) | 0.1 | NA |
| IM Distortion, rated output, CCIF (%) | NA | 0.22 |
| IM Distortion, rated output, IHF (%) | NA | 1.41 |
| Frequency Response @ 1 W, Hz-kHz (for -1 db) | 20-20, 0.25 dB | 15-60 |
| S/N ratio, re: 1 W, "A" weighted, IHF (dB) | NA | 89/90/91.5 |
| S/N ratio, re: rated output, "A" weighted (dB) | 100 | 114/110/108 |
| Dynamic headroom, IHF (dB) (mid-band tested) | NA | 2.44 |
| Damping factor, @ 50 Hz | NA | 40 |
| IHF input sensitivity (volts) | NA/NA/NA | 0.12/0.11/0.14 |
| Input sensitivity re: rated output (volts) | 0.75/0.75/0.75 | 1.9/1.1/0.99 |
| Slew rate (volts/microsecond) | NA | 12.0 |
| Power consumption, idling (watts) | NA | 50 |
| Power consumption, maximum (watts) | NA | 900 |

*Standard unit not rated for 4 ohms. Optional unit available for 4-ohm bass amp section has rating (for LF amp) of 280 watts at 4 ohms.

CIRCLE 11 ON READER SERVICE CARD



If you want the condenser microphone sound on stage, Electro-Voice gives you that option.

The PL76 and PL77 condenser cardioid microphones are fast becoming the number one choices of vocalists who want to make the "studio-condenser" sound a part of their act. Both mikes give you condenser performance in a package that competes with dynamic microphone durability. Their gutsy, bass-boosting proximity effect adds presence to any voice. The PL75 is powered by a 4.5 volt battery. The PL77 is similar except that it is also phantom powerable. The "77's" output is 4 dB down from the "76's" to allow for more flexibility at the mixing board, and it has a recessed on/off switch that many sound men prefer.

For those desiring the more traditional dynamic sound, the PL91 and PL95 fit the bill perfectly. The PL91, with its mild bass-boost and clear highs is a joy to work with. The PL95, the "pro's choice" in a dynamic cardioid, offers the best gain-before-feedback of any



E-V's PL9 dynamic omni has one of the flattest frequency response curves in the business - from 40 to 18,000 Hz. And its small size lets you mike instruments you couldn't get near with other mikes offering this performance.

All E-V Pro-Line microphones come with super-tough Memraflex grille screens that resist denting. Designed to

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dynamic mike in the business - a test we invite you to make.

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The PL6, with its patented Variable-D construction gives you cardioid (directional) performance without up-close bass boost - perfect for miking brass, reeds, percussion or piano. The PL11, even though it's a directional mike, maintains its response curve off axis. "Leaked" sound from off-axis instruments are faithfully reproduced - not colored in any way.

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CIRCLE 82 ON READER SERVICE CARD

dbx 165 Compressor/Limiter

By John Murphy and Jim Ford

The dbx 165 is a single channel compressor/limiter with a soft threshold that provides what dbx refers to as "over easy" compression. According to dbx, this compression characteristic greatly reduces the audibility of the compressor action, even at high compression ratios. The threshold and compression ratio are continuously adjustable as are the attack and release rates and the output level. The meter can be switched to read either input level, output level or gain change. The nationally advertised value of the dbx 165 is \$550.

Compressors and Limiters

Before continuing with the report on the dbx 165, let's review some of the concepts important to an understanding of compressors and limiters.

A compressor is simply a line amplifier with an automatic volume control. When the signal input to the compressor is below a certain level (the "threshold" level) the compressor has no effect on the signal and the output signal level is the same as the input level. When the input signal level exceeds the threshold level then compression begins. For input signals above the threshold, any change in signal level is reduced so that the output signal level changes less than the input level. When properly used, a compressor can level off wide changes in amplitude and provide an output signal with well contained dynamics.

The amount by which the compressor reduces changes in signal level is determined by the compression ratio. The "compression ratio" is most succinctly defined as: "the ratio of change in input level (in dB) to change in output level."

A compressor that gives 1 dB of change in output for every 5 dB change in input is said to have a compression ratio of 5 to 1. If the compression ratio were increased to 20 to 1 (20 dB changes at the input compressed to 1 dB changes at the output) then the compressor would be considered to be "limiting" the signal. So a "limiter" is just a compressor with a high compression ratio (greater than about 10 or 20).

One of the best ways to understand the operation of





a compressor is to look at its input/output transfer curve. The input/output transfer curves for various compression ratios of a conventional type compressor are shown in Figure 1. The arrow near the center of the graph indicates the threshold point. Note that this point corresponds to 0 dB input level and 0 dB output level. It's easy to see from the graph that below the threshold the output level is the same as the input level. For input levels above the threshold the output level depends on the compression ratio. When the compression ratio is high (20 to 1 for example) the output level is pretty much "limited" to the threshold level. Indeed, for a compression ratio of infinity the output level is held *exactly* at the threshold for any input level above the threshold. These high compression ratios can provide really good guitar sustain effects!

In many applications a small amount of modest compression is all that is needed. For these applications a compression ratio of about 4 to 1 is usually satisfactory. Higher compression ratios tend to make the compressor's action audible and this is normally undesirable. The audibility of the compression can be minimized by keeping the compression ratio low and keeping the threshold relatively high so that the signal spends the least time above the threshold necessary to give the desired amount of leveling.

One of the most common applications for compressors is in processing vocals before they are recorded on tape. Here the intention is to contain the vocalists' loudest passages so that a reasonable record level can be used without fear of saturating the tape. In P.A. applications a compressor allows higher average signal levels before overdriving the sound system.

Be aware, however, that compressors are easily abused and may degrade rather than improve the audio quality of the signal processed through them. In fact, some audio purists are so offended by compressors that they refuse to use them ever! The point is this, compression has to be applied tastefully in order to not be offensive to critical listeners. Unless the compressor is deliberately used for a special effect (such as guitar sustain) a light touch is recommended.

General Description: The dbx 165 is distinguished from other types of compressors by its characteristic "over easy" compression curves. The input/output transfer curves of Figure 2 were provided by dbx and illustrate the action of the 165. In comparison with the conventional compressor of Figure 1, the obvious difference is the lack of a sharply defined threshold for the 165. Instead of changing from 1:1 (no compression) to the selected ratio at a distinct input level, the compression ratio of the 165 increases gradually from 1:1 to the selected ratio as the signal level increases through a threshold *region*. For high compression ratios the threshold region can span more than a 10 dB range of input signal level.

With the compression threshold spread over a 10 dB range, above threshold indication is no longer a simple matter. However, dbx has implemented a simple and highly functional solution to this problem. They have provided a group of three LEDs to indicate the input signal level with respect to the threshold. A green LED is illuminated when the signal is below the threshold and a yellow [amber] LED illuminates to indicate that the signal level is in the threshold region. When the signal level arises above the threshold region and the full compression ratio is reached, a red LED lights.

The front panel of the unit is attractive, with all of the controls clearly marked as to their function and calibration. The power on/off switch is a pushbutton to the far left of the front panel and has an LED indicator located just above it. Just to the right of the power switch is an identical pushbutton labeled, "Stereo Coupler." An LED above the switch is labeled "Slave." This feature is employed when two units are used together for stereo operation. The two are interconnected by means of a special cable which simply plugs into the rear of each unit. One of the compressors is then switched into the slave mode while the other becomes the master controller and provides for equal amounts of gain reduction in each channel in response to an above-threshold signal in either.

The threshold control is located to the right of the power and stereo coupler pushbuttons and is calibrated from -40 dB to $+10$ dB in 10 dB increments with the 12 o'clock position being -15 dB. The green, yellow and red LEDs which constitute the above/below threshold indicators are located directly above the threshold control. Continuing to the right across the front panel the next control is a large rotary knob for selecting the compression ratio. This control is continuously variable and is calibrated to indicate unity and infinity at the counter clockwise extremes, respectively. The 12 o'clock setting of this control provides a 4 to 1 compression ratio.

Near the center of the front panel are a group of controls for establishing the attack and release characteristics of the unit. To the left is a rotary control for setting the "Attack Rate," that is, the maximum speed with which the compressor reduces its gain when the input signal level is increasing. To the right is a similar control for determining the "Release Rate," or the speed with which the compressor recovers its gain when the input signal level is decreasing. Between the manual attack and release controls is a pushbutton labeled "Auto," which when depressed disengages the manual controls and places the unit in an automatic attack/release mode. An LED above the pushbutton indicates when the auto mode is selected. According to dbx when the auto attack/release mode is engaged the attack and release rates automatically vary to suit the input signal envelope. The auto mode is recommended for "natural" sounding compression whereas the manual mode, with its fixed attack and release characteristics, allows the user to experiment with compressor special effects.

Next to the attack/release controls is a series of three interlocking pushbutton switches for determining the function of the unit's meter. Either input signal level, output signal level or gain change can be monitored. There is another pushbutton to the right of the meter function switches which is labeled "System Bypass." When this button is depressed the input is connected directly to the output and the unit is entirely bypassed. Above this button is a rotary control for setting output gain. By means of this control the output can be boosted or cut up to 20 dB to compensate for gain reduction through the unit. The 12 o'clock position is labeled "0" and provides for unity gain through the 165 when there is no gain reduction.

The meter is located to the far right and reads levels from -20 dB to $+10$ dB. The 0 dB level is factory set to correspond to an input signal level of $+4$ dBV. However, the 0 dB level may be set to anywhere from -20 dBV to $+20$ dBV by adjusting the meter calibration trimmer which is accessible through a small hole in the rear panel of the compressor.

Input and output connections to the 165 are by way of rear panel mounted screw terminal strips. The unit can accommodate either balanced or unbalanced line formats. Next to the input/output terminal strip is a multi-pin connector for coupling two units together for

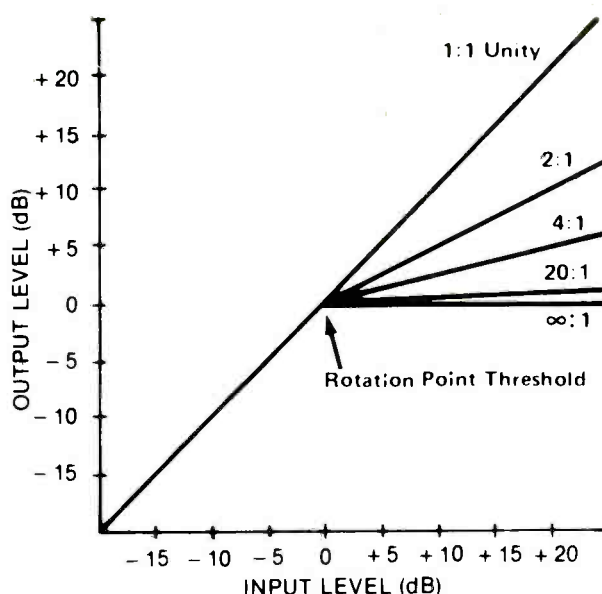


Fig. 1: dbx 165: A conventional compressor/limiter.

stereo operation. Other items on the rear panel are the meter calibration access and a line fuse holder.

Field Test Listening Test: We used the dbx 165 to compress the vocals when we engineered the audio for a locally produced country/western music TV show. The unit was interfaced with our console such that it processed only the vocal sub mix. We used a compression ratio of 4:1 and lowered the threshold just far enough to get about 5 or 10 dB of gain reduction with typical levels. The unit was used in the auto attack/release mode and after initially establishing input and output levels through it we left the metering in the gain change mode.

The 165 performed well and effectively controlled the dynamics of the vocals. The compression sounded quite natural and at no time was its action objectionable. It actually made our job of mixing the music a little easier by reducing the need for frequent vocal level adjustments. When you're mixing music "live" little conveniences like that really help!

Back at the shop we performed our usual listening test by inserting the 165 in one channel of our reference system. The first thing we did was to set the controls for a 1:1 ratio (no compression) and adjust the output level for no level change when the unit was alternately switched in and out of our system. Having done this we got our direct discs and tried to get into a critical listening mood. Under these conditions when we made A/B comparisons with the unit alternately in and out of the system we could detect no significant change in audio quality. It's quite clean!

Next we started playing with the knobs and listened through the 165 with many different compression settings. We are pleased to report that even with high compression ratios and relatively large amounts of gain reduction the 165 provided very "listenable" com-

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PERFORMANCE:

Overall Signal-to-Noise: 66 dB unweighted at 520 nWb/m (30 Hz to 18 kHz audio filter).

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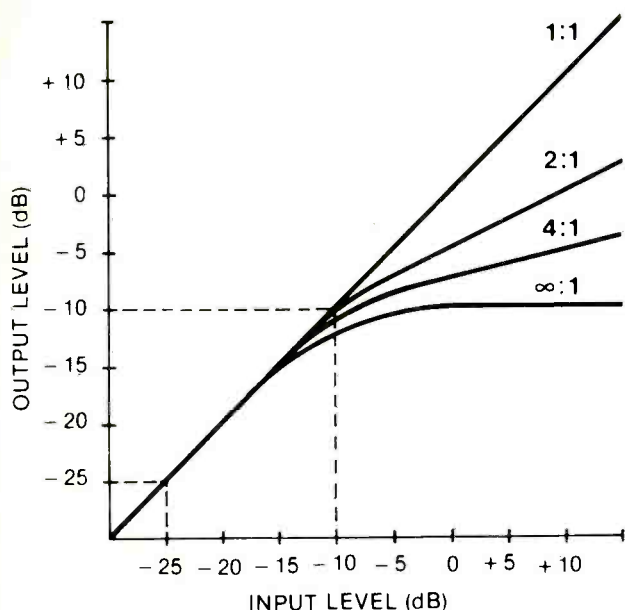


Fig. 2: dbx 165: The dbx 165 compressor/limiter.

pression. With more moderate amounts of compression the sound was better yet. The unit seems to do the job of compressing the signal while providing a minimum of the obnoxious side effects heard with some compressors on the market.

The discussion up to this point has concerned the unit in the auto attack/release mode only. When we switched the unit to the manual attack/release mode we heard a distinct change in the sound of it. The manual mode seems to introduce a harshness that is not audible in the auto mode, especially with extreme settings of the attack/release rate controls. In particular, using fast release rates especially adds audible distortion. Because of this we recommend that the unit be used in the auto mode *only*, except for special effects when the degradation can be tolerated. This is our only complaint about the sound of the 165 and it applies only to the manual attack/release mode, which is *not* the usual mode of operation.

Lab Test: We took the 165 to the lab and ran it through the usual series of tests. See the "Lab Test Summary" for the specific results of these tests.

The unit has more than sufficient headroom for normal studio or P.A. use. Its output is capable of driving a 600-ohm load to +24 dBV. The noise level at the output was -89 dBV or 93 dB below 0 VU with the output level control set for unity gain. The threshold and compression controls did not affect the noise level. Distortion was measured at 0 VU for 1:1, 4:1 and 20:1 compression ratios. The threshold was set for 10 dB of gain reduction for the 4:1 and 20:1 ratios. We made the measurements first with the unit in the auto mode and then repeated them for the manual attack/release mode. Distortion increases with higher compression ratios and at lower frequencies.

When we examined the slewing performance of the

165 we observed that it could not be made to slew. That is, we fed it a sine wave at a level just below clipping and observed the waveform as the frequency was increased. The high frequency bandwidth limit was encountered before the unit ran out of slew rate so the sine wave never took on the triangular shape indicative of slew limiting. Since the active devices could not be driven into slewing we could not observe the actual "slew rate limit" of the unit and therefore we can't discuss the "slew rate ratio" of the unit (ratio of slew rate limit to peak output voltage swing). However, the unit is pretty much "slew proof" since its bandwidth prevents it from being driven into slew limiting.

Conclusion: The dbx 165 performed well in our listening tests as well as in our lab tests. It is capable of providing high quality compression/limiting in either studio or P.A. applications. The continuously variable compression ratio makes it quite flexible and allows the use of "just enough" compression to do the job. We have reservations about using it in the manual attack/release mode, but other than that we consider it an excellent unit and a pleasure to use.

LAB TEST SUMMARY

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

Input Levels

Input level for 0 VU indication: +4.0 dBV
Maximum input level before clipping: +26 dBV

Output Levels

Output level for 0 VU indication: +4.0 dBV
Maximum output level into 600 ohms: +24 dBV

Noise

(20 kHz bandwidth)

With the output level control at "0" (12 o'clock) the noise level is: -89 dBV

Total harmonic distortion at +4 dBV (0 VU)

Auto Attack/Release Mode

| Compression ratio | 1:1 | 4:1 | 20:1 |
|-------------------|-------|-------|-------|
| Gain reduction | 0 dB | 10 dB | 10 dB |
| THD @ 10 kHz | .044% | .053% | .062% |
| THD @ 1 kHz | 0.11% | .127% | .145% |
| THD @ 100 Hz | .165% | .38% | .44% |

Manual Attack/Release Mode

| Compression ratio | 1:1 | 4:1 | 20:1 |
|-------------------|-------|-------|-------|
| Gain reduction | 0 dB | 10 dB | 10 dB |
| THD @ 10 kHz | .046% | .037% | .038% |
| THD @ 1 kHz | .109% | .187% | .212% |
| THD @ 100 Hz | .185% | 2.1% | 2.6% |

Frequency response (1:1 compression ratio): ±0.5 dB from 17 Hz to 17 kHz

Bandwidth (-3 dB points) 6 Hz to 40 kHz

CIRCLE 30 ON READER SERVICE CARD



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GROOVE VIEWS

Reviewed By:
STEVE CAPUTO
ROBERT HENSCHEN
NAT HENTOFF
JOE KLEE
STEVE ROW
JEFF TAMARKIN

POPULAR

LINDA COHEN: *Angel Alley*. [Craig Anderton, producer; Craig Anderton, Dan Alexander and Richard Van Dorn, engineers; recorded at Tewksbury Sound Recorders, Richmond, Ca.] Tomato TOM-7010.

Performance: **Splendid**
Recording: **Also splendid**

I had the extreme good fortune of finding two of Linda Cohen's earlier recordings on the Poppy label in the cutout bin several years ago. At 99 cents each they remain among the very best musical investments I have ever made, because here is a guitarist of the first rank, whose sense of music and whose taste and skill with the instrument are absolutely impeccable.

Much of the same crew that made those 1971 and 1973 Poppy albums so good is with Cohen on this later release, one of 1978's "little" albums that slipped through just about all the cracks available on the road to obscurity last year. The cover again has been designed by Milton Glaser; Craig Anderton is once again producing and assisting in the playing. In the years since those earlier albums, none of the crew has lost its touch. Particularly Cohen, whose work will remind some of John Fahey, others of Charlie Byrd, others of Leo Kottke. In fact, she combines elements of all of these players, without copying them so much as to sound like them.

The recording is simply great, too, with the guitar sounds dominating all

others. The arrangements are spare enough to avoid audio clutter, with only slight embellishment by Anderton's electronic instruments and percussion. And as in her earlier albums, Cohen keeps the listener awake by dropping in humorous little additions to the music, such as something that sounds like a steam pipe hiss to close the title track here. (The album *Leda* contained the use of white noise and other special sonic effects.)



LINDA COHEN: Fascinating magic

The tones coming from the recording are flexible, expansive and occasionally round. "Liaison," for example, is a piece that must be heard through headphones. Its initial blues development is pretty much straightforward, but when the meter quickens some strange things begin to happen! The introduction of a second melody signals some incredible movement by the guitar all around and through the ears of the listener, forward and backward, and the separation is quite good.

Two songs are instantly recognizable, and they are particularly well played: the traditional "Minstrel Boy" receives a fine reading on (presumably) Cohen's Lo Prinzi steel string guitar, with each verse gaining a little more percussive embellishment. "Susannah Variations" features a slow development of the main theme, and a second reading of almost classical delicacy, with a bass figure resembling a fugue. The song never takes on a rowdy air; instead, it builds in lushness and emotion.

I could find only a few flaws in the recording of the songs. The bass tones in "Midday Moon" tended to boom a bit, for example, and the guitar sound in "Dark Rain" was more percussive than restrained, although this might have been a planned effect.

But I also found some fascinating "magic," too. In "Meridian," tiny hisses provided a very subtle accompaniment to the melody line, alternating with the synthesized sounds. The effect was an intermittently moving "whoosh" through the song. The synthesizer warbled, too, during the opening of "Still the Bell," and this was an effective accompanying sound to the guitar.

The album's highlight likely will be for many Michael Kac's "Guitar Suite No. 2," which is the most classically-sounding piece on the album. With a duration of more than six minutes, the piece also is the longest cut and assumes a more modern setting before it closes.

Angel Alley is a thing of considerable beauty, and it certainly is nice to know that Cohen, who is something of a cult figure in the Philadelphia area, remains interested in bringing her music to the public. The album is recommended without reservation.

S.R.

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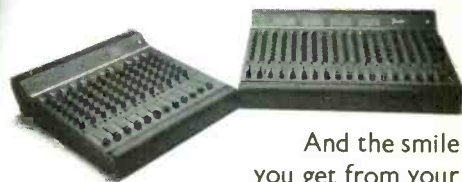


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CIRCLE 85 ON READER SERVICE CARD

MANFREDO FEST: *Manifestations*.

[Jerry Peters, producer; F. Byron Clark, Bob Higgins and Jim Stantetos, engineers; recorded at Total Experience Recording Studios, Hollywood, Ca., Sept. 1978.] Tabu JZ 35636.

Performance: **A disco delight**
Recording: **Clean and clear, if a bit overblown**

Remembering that my chosen field of specialization is jazz and that I'm not "supposed" to like disco recordings, I still check out just about everything that comes through my mailbox and give it at least a passing chance. Every now and then something far afield from jazz hits me the right way and to heck with categorical statements; I have to praise it to the skies. But then is this music so far from jazz? One of the arrangers is Bill Holman, formerly a saxophonist for Woody Herman and Stan Kenton. The band includes Victor Feldman, who used to play piano and vibes with Cannonball Adderly, and Buddy Collette who played saxophone and flute with Chico Hamilton's band. On reading Fest's bio, which the record company thoughtfully included with the record, one finds that he comes out of a background that involves both the classics and jazz and that he comes from Brazil and it all reeks of *deja vu*. It worked for Eumir Deodato whose credentials and background were much the same and I think it should work for Manfredo Fest.

The repertoire goes from the classics (Bach) through show music ("Slaughter On Tenth Avenue" and "Send In The Clowns") and some Brazilian influenced type pop material. Fest worked for some time with Sergio Mendes and Brasil '66 so that's part of his background, too. Frankly, what I don't understand is why it took ten years (Fest came to the U.S. in '67 and this record wasn't made til '78) for it to happen. It's pleasant, it's tuneful, it's danceable and, while the approach is not so novel, he does do some strange twists of concept such as on "Send In The Clowns." The high point for me, however, has got to be the Bach "Prelude & Fugue #2 Ala Disco."

This becomes all the more spectacular when one reads that Fest is blind (so was Art Tatum) and deaf in one ear (Beethoven was deaf in both). I put this last because Manfredo needs

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ROXY MUSIC: *Manifesto*. (Roxy Music, producers; Rhett Davis, Jimmy Douglass, Phill Brown, and Randy Mason, engineers; recorded at Ridge Farm and Basing Street, London.) Atco SD 38-114.

Performance: **Deceptively lightweight**
Recording: **Surprisingly deep**

Manifesto comes close to being the missing link between Bryan Ferry's quasi-pop/soul solo albums and his more experimental work with Roxy Music. Curiously, new bassist Alan Spenner is one key to this combination of progressive rock and regressive gospel. Cuts like "My Little Girl" have Kokomo soul harmonies stamped all over them—and Spenner previously led Kokomo, an all-English R&B unit that deserved a lot more attention than it actually received.

Roxy Music is not quite the avant garde powerhouse that it was in its formative years, when Brian Eno gave this group a heavier keyboard touch. But Phil Manzanera (guitar), Andy Mackay (sax), and Paul Thompson (drums) remain from the original group, and Ferry, of course, continues to be the vocal focal point. Joining on bass is Gary Tibbs (from the Vibrators) and keyboardist Paul Carrack.

The flirtation here with popular music is not totally unanticipated. At least three years ago, Roxy's last studio album *Siren* was hailed as the band's commercial breakthrough with cuts like "Both Ends Burning" and "Sentimental Fool." Going back even further, the group's unique brand of parody has pulled them magnetically toward every transient area of contemporary music—witness "Do The Strand" as early as 1973. On *Manifesto*, the stylistic commentary is made on "Angel Eyes," an Eddie Floyd sound-alike called "Cry, Cry, Cry," and another cut, titled "Ain't That So."

These and other cuts tamper, more or less creatively, with known rock clichés. "Stronger Than The Years," an excellent example of Roxy's deceptive depth, even dips into the late sixties

with a California instrumental break and psychedelic guitar howls. "Dance Away" is similarly successful at bridging the gap between the band's progressive instrumental abilities and the older, melody-conscious fifties. The cut is carried by catchy congas and castanets, with a Spanish Harlem sound yielding to near-disco on the chorus. Highly accessible.

All tunes on this album are originals, but "Manifesto" and "Spin Me Round," the opening and closing cuts, come closest to unveiling the *real* behind-the-scenes Roxy Music. The title track's slow beat builds dark and powerfully through a long bolero instrumental before Ferry delivers his vocal credo... the music grows stronger and the lyrics are awesome. "Spin Me Round" shows almost classical restraint and a serene approach to instrumental colors, but it too has a melody hook hidden in the dizzy, drifting chorus.

As usual, Ferry & Co. keep the listener guessing as to where the fun stops and the seriousness begins. The music here doesn't seem as important as in years past, but a closer look reveals covert strengths. It's part of the Roxy mystique to keep us off balance and on guard. As Ferry sings in the album's thematic centerpiece: "I am for a life around the corner/that takes you by surprise." That ideal is certainly upheld on *Manifesto*. R.H.

JOHNNY MATHIS: *The Best Days of My Life*. [Jack Gold, producer; Dick Bogert, Ray Gerhardt, and Larry Forkner, engineers; Recorded at A&M Studios, Hollywood, Ca.] Columbia JC35649.

Performance: **Routine**
Recording: **Adequate**

The Best Days of My Life has a pretty nice feeling about it. It's the kind of album you listen to on the first day of spring, with the windows open, and the robins chirping out in the trees. It's an up feeling. Even though some of the songs, like "How Can I Make it on My Own," and the title track are sad, they're still up, because that's the kind of performer Johnny Mathis is. Don't get me wrong, he's not a hyper kind of guy. In fact, when he tries to be, in the pseudo-disco "Gone, Gone, Gone," he goes nowhere. He is very personable through his singing, very friendly, and this is what has made him so popular

through the years. Johnny Mathis is an entertainer, and as entertainment, *The Best Days of My Life* may satisfy many people. With the success of his last album, Johnny has come up with the formula for pop music prosperity, and he applies it to this collection. It goes something like this: start with a couple of old tunes, one slow and heartfelt, ("As Time Goes By"), and one uptempo (a disco "Begin the Beguine"), add a nice Latin beat ("Would You Like to Spend the Night With Me"), another disco tune (the aforementioned fizzler, "Gone, Gone, Gone"), a handful of very nicely done love songs, and to top it off, another duet, with another lovely young songstress, ("The Last Time I Felt Like This," performed with Jane Olivor—they're more evenly matched than Neil Diamond and Barbra Streisand, and they sound twice as nice). But this album acts as a vehicle for Mathis' voice, rather than his voice acting as vehicle for the songs. They (the songs) somehow got lost in the shuffle. There is no sign of expansion of the artist's talents. Where there should be some always maturing Johnny Mathis feeling emanating from the words of his songs, there is, instead, the same old, true blue, Johnny Mathis voice.

The musicians on the album are skillful, but the balance of sound is awkward. Producer Jack Gold has held the Mathis vocals a bit too far above the music, and any sort of blend is lost. When they do begin to blend, it is to stress the disco rhythm and that ridiculous sounding synthesizer in "Gone, Gone, Gone." Besides his duet with Ms. Olivor, I think that "We're in Love," with its soft upbeat sound, best captures the Johnny Mathis tradition. But, because none of the vocals on the album are punchy enough, some of the tunes tend to bleed together, leaving us with a Johnny Mathis sound, rather than what could be some very fine Johnny Mathis songs. S.C.

BOB DYLAN: *Bob At Budokan*. Don DeVito, producer; Tom Suzuki, Teppei Kasai, Tetsuro Tomita, G.H. Sukegawa, engineers; recorded at Nippon Budokan in Tokyo, February 28 and March 1, 1978.] Columbia PC2 36067.

Performance: **Already dated**
Recording: **Cleaning up Dylan's act**

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credit for this recording—Toshiyuki Sugano, Hiroshi Kanai, and their troupe of technicians. Dylan's "live" sound on recent tours has frequently been out of hand, and this Japanese tapping is to be commended for making some sense of it all. Imagine "It's Alright, Ma (I'm Only Bleeding)" as an acid rocker, or "Don't Think Twice, It's All Right" a la reggae... complete with flashy female chorus, heavy metal guitarist, pop-jazz saxophonist, and five others as part of the backup crew. Atop this you've got to hear Dylan's scratchy, nasal voice draw out some of the most complicated lyrics in rock poetry.

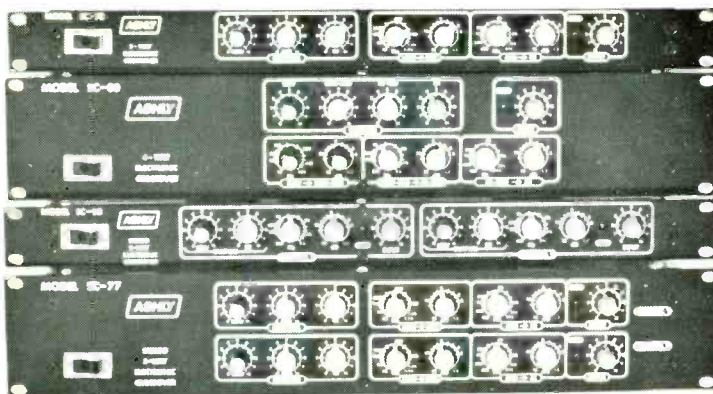
And yet, it could have been a much tougher proposition. At Budokan in early '78, Dylan had *begun* to rearrange his older tunes a bit, but that was *nothing* compared to what would evolve over the coming months. By the time this entourage hit the U.S. for a fall-winter tour, tunes like "Mr. Tambourine Man" and "All I Really Want To Do" had ballooned into smoldering rockers, "Like A Rolling Stone" had been drastically altered, and half of the songs on this LP had been replaced by equally hefty—but much more unrecognizable—oldies from the Dylan repertoire. More tunes from *Street-Legal* would soon enter the playbook, and everything would be radically bigger, more bizarre.

At Budokan is from a transitional period when most of these tunes were in a state of creative flux, but still immediately identifiable. Enlarged cuts like "Going, Going, Gone," "Maggie's Farm" and "Ballad Of A Thin Man" are partially indicative of where Dylan was headed. "Is Your Love In Vain" is announced as "an unrecorded song," which it was until the release of *Street-Legal* shortly thereafter; it's done here almost identically. "Oh, Sister" has already become conga line material, but "Simple Twist Of Fate" is only slightly changed. If you don't think Bob Dylan is a master vocalist, check out the new, slowed-down version of "I Want You"—a gorgeous love song despite (maybe because of) its tiny imperfections.

The eleven musicians behind Dylan are flexible and proficient, a loose crew that lends itself easily to constant experimentation. Steven Soles (guitar) and David Mansfield (violin, mandolin, pedal steel) of the Alpha Band have been multi-talented Dylan sidekicks for years. Billy Cross adds fire and theatrics as lead guitarist, and Bobbye Hall contributes her cooking congas to

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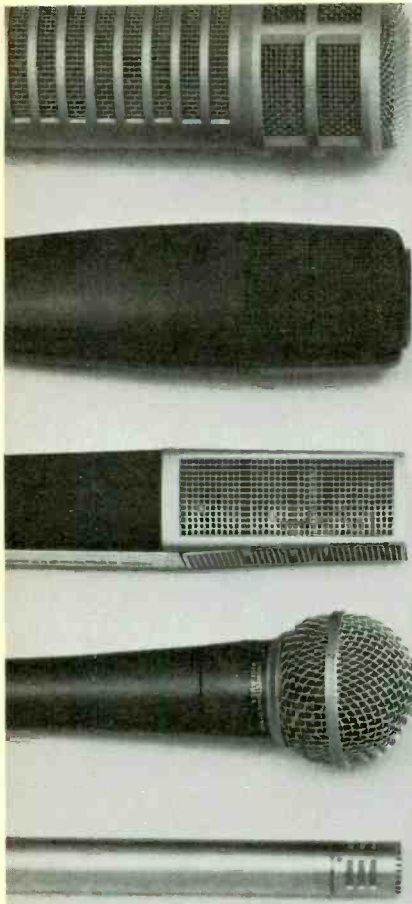


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the rhythm section. With these and other variables to work with, Dylan can mold and rework his music as he so desires. None of these originals needed reshaping, but "Tangled Up In Blue," "Girl From The North Country" and "Ramona," none of which appear here, were to achieve a different intensity at Dylan's whim. Although *Budokan* is a pretty fine album, it would have been even more amazing had it been recorded a bit later, when Zimmerman had gotten far enough out to reinsert an authentic solo folk version of "It Ain't Me, Babe" into the playlist. R.H.

GRAHAM PARKER and THE RUMOUR: *Squeezing Out Sparks.* [Jack Nitzsche, producer; Mark Howlett, engineer; recorded at Lansdowne Studios, London.] Artista AB 4223.

Performance: **Pre-Costello basics**
Recording: **The earthy side of Jack Nitzsche**

Graham Parker's back-to-basics rock approach has been well-documented for almost five years now, yet the man and the band have been pushed out of the limelight by stiff competition. He's not as pretty as Springsteen, or as quirky as Costello, but Parker's music is equally honest, moving, and real. Now on a larger label, it could be Parker's turn to grab a share of the musical market he most certainly deserves.

Unfortunately, Parker's vocal sound and ideological attitude on rockers like "Don't Get Excited" and "Nobody Hurts You" will invite renewed comparison to Elvis Costello, and the album's balladic climax "You Can't Be Too Strong" is as lyrically impassioned as Bruce Springsteen's best anthems of teen rebellion. But Parker is no copy; he had much to do with resurrecting the realities of rock & roll, lacing his music with hints of early rockabilly and R & B, as well.

Correspondingly, *The Rumour* could be *the* backup band in rock today, an awesome cross-referencing of diverse roots. Led by guitarist Brinsley Schwarz, *The Rumour* is a no-nonsense quintet that relies on solid rhythmic, small but appreciated harmonic innovations, and an equally important restraint. The instrumentation is strong and substantial at all times, but never approaches overkill.

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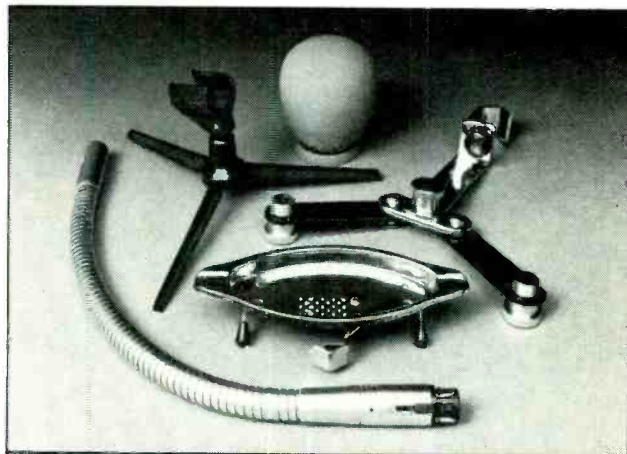
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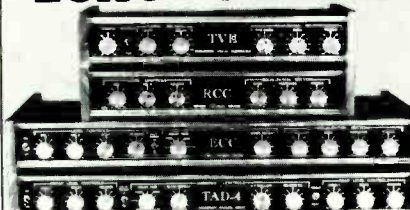
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recent Mink De Ville, producer Jack Nitzsche allows this music to survive on its own strengths, even on weaker cuts like "Protection." There are a couple of good-to-average tunes on *Squeezing Out Sparks* ("Saturday Nite Is Dead," "Local Girls"), but other tracks are total grabbers. If newcomers to Graham Parker find his music derivative, they better check out his three earlier discs on Mercury! This guy is not just another Elvis clone. R.H.

JACK TEMPCHIN: *Jack Tempchin.* [Pete Carr, producer; Pete Carr, engineer; recorded at Fame Studios, Muscle Shoals, Ala. MCI computerized mixing console at Muscle Shoals Sound Studios, Sheffield, Ala.] Arista AB 4193.

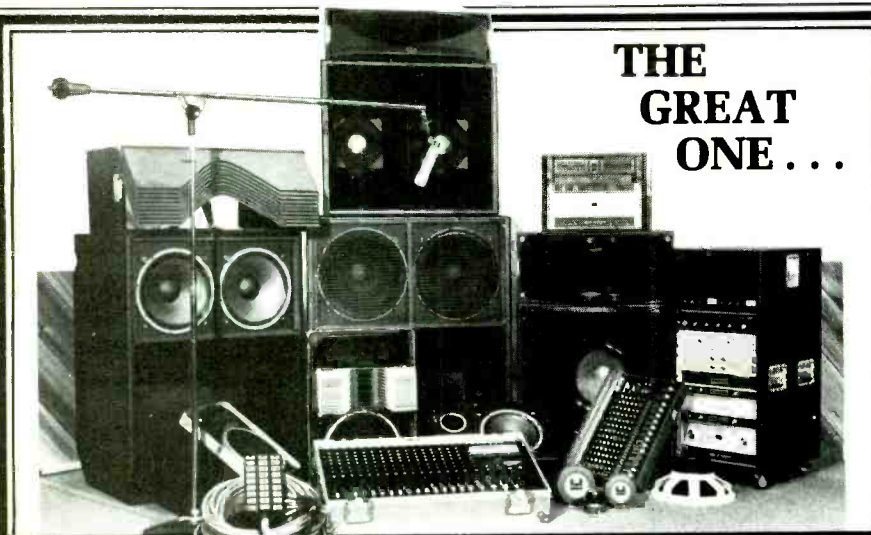
Performance: **Promising**
Recording: **Tasteful and well done**

Jack Tempchin is a long-standing member of the Los Angeles singer/songwriter clique which also includes Jackson Browne, the Eagles, and their like, though this is his first solo outing. If you were to go on first impressions, you might assume from the opening bars that Tempchin is cashing in on his association with famous friends, but it's not so. As a seasoned writer and half of the creative team behind the underrated band, the Funky Kings, Tempchin is as deserving of credit as those he hangs out with.

Tempchin applies taste to every move he makes. He could have gone the Browne route of sticking to sappy ballads, or he could have taken the Eagles' life-ain't-easy-in-the-big-city approach, but Tempchin has more than one horn to toot. And along with producer/engineer/backup musician Pete Carr, Tempchin captures each of his various moods with the most appropriate musical feel. His best-known composition, "Peaceful Easy Feeling," which the Eagles turned into a classic, is rendered here as a soft, acoustic ballad, fronted by Carr's lonesome mandolin and amended by Jennifer Warnes' sweet harmonies.

"Fifteen Days Under The Hood," however, follows, and immediately the tone lightens up. This rocker, previously recorded by the New Riders Of The Purple Sage, is a grease-monkey's lament about car troubles, and is given a revved-up treatment by Tempchin and crew, which this time includes both

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Browne and Eagle Glen Frey.

The key to the success of this record is Tempchin's careful approach. He takes pains to insure that his vocal inflections perfectly match the thoughts behind the material. Unlike someone like Browne, Tempchin is not afraid to put out some wind when he rocks, but on the other hand, he soothes on his softer numbers.

Credit must be given to Carr, however, as it is he who coaxes the right balance out of Tempchin and musicians. By adding his own guitars, dobro, and mandolin where needed, Carr puts the finishing touches on what might otherwise turn out to be a rather commonplace debut. On "Peaceful Easy Feeling," for example, Tempchin and Carr could easily have chosen to borrow the Eagles' interpretation of Tempchin's song, and might have brought the song back to hit status for a second run. But instead, they stick with Tempchin's original concept of the song, and in no way does it resemble the more familiar Eagles version.

Jack Tempchin is not a revelatory LP by any standards, but it is an impressive debut, especially within the tired mode of L.A. country-rock. Tempchin has come into his own with this record after having bubbled-under the L.A. scene for years, and by the next album or two there's no reason his name shouldn't be as familiar as those of Browne and Frey. J.T.

JAZZ

JOE PASS AND NIELS HENNING ORSTED PENDERSEN: *Chops*. [Norman Granz, producer; Robert Golding, engineer; recorded at Chappell Studios, London, England, on Nov. 19, 1978.] Pablo 2310 830.

Performance: **Passing fancy—Niels to no man**
Recording: **Typical Granz**

It's not too surprising that some recording studios have an instantly recognizable sound but what is surprising is that some producers do, as well. I'm not sure that's always to the good. When I can immediately recognize a Norman Granz record as a Norman Granz record, that says to me that the man has a tight formula down pat. I'm

not sure whether that's good or bad.

However, there are some surprises on this record. Joe Pass is well known as a chordal player who often does entire albums without bass support. One would have thought from just looking at the album that it would be more of Joe Pass playing another series of jazz tunes, standards and blues in his own recognizable style but this time with the bass of Niels Pedersen walking him along the way. That's not the case. Often they play parallel, converging, contrasting lines the way two horns would be expected to do. It's the kind of unpredictable excitement that makes this more than just another Joe Pass/Niels Pederson album. Listen to them, for example, on Dave Brubeck's lovely tune "In Your Own Sweet Way." It's a true duo album. There's no soloist, no accompanist: on this album, everybody does everything.

Another plus is the liner notes by Joe Pass, who discusses the music from a more technical point of view for all the other guitarists who hear the album and want to know how it's done. One thing Joe Pass doesn't tell you in the notes is that to play Joe Pass you have to be something of a genius—and then it takes practice and hard work. J.K.

JOAN MORRIS AND WILLIAM BOLCOM: *The Girl on the Magazine Cover*. [Sam Parkins, producer; Edward Graham and Stan Tonkel, engineers; recorded at CBS' 30th Street Studios, New York, N.Y., June 19, 21, 22 and 23, 1978.] RCA ARL 1-3089.

Performance: **A winning combination wins again**
Recording: **Another winning combination wins again**

RUSTY DEDRICK AND THE GENTLEMEN OF JAZZ: *Say It With Music*. [Bill Borden, producer; George Piros, engineer; recorded in New York, N.Y., circa 1969.] Monmouth Evergreen MES 7084-7085.

Performance: **Enjoyable but not earthshaking**
Recording: **Clean and clear—everything it needs to be**

In 1978 Irving Berlin celebrated, as much as one who is ninety years old would care to celebrate, his 90th birthday. Irving Berlin is 90 and although his

composing career went into hibernation if not hiatus with *Mister President* in 1962, as far as longevity goes, and as far as the quantity of quality songs goes, I don't think Irving's met his match yet. There are songs on both of these sets which you may well be hearing for the first time ("Mysterious Rag," "Pack Up Your Sins And Go To The Devil" and "Harlem On My Mind" are good examples). There are others which you would need to be deaf or a hermit to have avoided over the years ("Always," "White Christmas" and "Easter Parade" being the best examples in that category). Even these items (although "White Christmas" has become practically a cliché every December) still wear well and haven't lost much of their brilliance and sheen through repeated hearings. There's yet another category of songs on these albums—songs like "Let's Have Another Cup Of Coffee And Let's Have Another Piece Of Pie" and "The Song Is Ended But The Memory Lingers On" which I've known, it seems, all my conscious life, but which I didn't realize 'til now were Berlin songs.

These two recorded sets of Irving Berlin nostalgia are as different as the artists and producers who created them. The Monmouth Evergreen collection is a potpourri of Berlin highlights culled from their 80th birthday salute involving the Jack Manno singers, Annette Sanders and Steve Clayton and Rusty Detric's Gentlemen Of Jazz. The Gentlemen are a house band of studio musicians with tendencies toward traditional dixieland jazz. They include names like Lou McGarrity, Dick Hyman and Bob Wilber. They don't get too much chance to blow but that's not what the album's about. It's a nice studio band and singers doing often little more than one identifying chorus for one of Berlin's tunes and getting thirty-six songs onto two LPs. Were it not for the fact that some of the songs are done as medleys (two or more to one record band) the only song which lasts over four minutes is "How About Me." It's an album for party time when people want to listen to the music but not all that intently. The sound is clear and the words are understandable but at no time does the recorded performance command the listener's attention. This can be a plus or a minus depending on the time, the place and the purpose.

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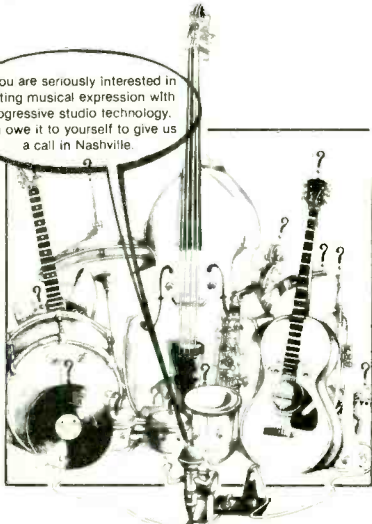
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A Jazz Woman and a Jazz Immortal

By Nat Hentoff

It is largely due to the Kansas City Women's Jazz Festival (three years old in 1980) that there has been an increasing focus on female horn players. With certain exceptions, women's place in jazz has largely been at the piano or as a singer. Otherwise, there has been a strong, though seldom explicitly stated, *macho* tradition in jazz. Women, it was widely held by men, just don't have the strength of "soul" to be taken seriously on the jazz horns.

This myth will eventually disintegrate as more and more women instrumentalists get exposure. For instance, soprano saxophonist Jane Ira Bloom is already well-respected by such major leaguers as George Coleman and Rashied Ali, with whom she has worked. She has also been part of the Women's Jazz Festival. Now, in her first album as leader, *We Are/Outline* (Outline Records, 200 West 16th St., #3E, New York, New York 10011), she should finally begin to get the national jazz attention she so unmistakably merits.

For one thing, Jane Ira Bloom has thoroughly mastered the often resistant soprano, an instrument on which there have been few virtuosi in jazz history. Her sound is strong, clear, and actually sings. Moreover, she is an unusually resourceful, cohesive melodist—creating what sound like "spontaneous compositions" (as she puts it). Rhythmically secure, she is resiliently complemented here by bassist Kent McLagan. The repertoire includes Bloom originals, and one song apiece by Miles Davis, Billy Strayhorn, and McLagan.

The sound is as clean and vivid as Jane Ira Bloom's playing. Like her, it's honest.

One musician who commanded the soprano saxophone early in his career (having been greatly influenced by Sidney Bechet who, in turn, much admired him) was Johnny Hodges. In the 1930's, Hodges largely abandoned

the instrument although his alto saxophone solos retained the soaring grace of the smaller horn.

A choice collection of Hodges' performances is newly available on Storyville, a Danish label now distributed in the United States by the Moss Music Group (Vox, etc.) Seven sides are 1962 performances by the Ellington orchestra and four are 1964 tracks by a Hodges-led small combo with trombonist Lawrence Brown, tenor saxophonist Paul Consalves, altoist Russell Procope, and trumpeter Cat Anderson. (The latter session includes such sempiternal Hodges classics as "Good Queen Bess" and "Jeep's Blues.")

When Hodges died in 1970, Ellington was desolated, not only because of the personal loss but because Hodges' serene sensuousness, easeful blues-laced power, and loping swing were central to the band. As you can hear in these numbers, Hodges was a compelling romanticist without sentimentality; and no one before or since has told such deeply, richly evocative stories on the alto saxophone. To use a favorite term of Duke's, Hodges was truly "beyond category."

Engineering on the two dates captured the natural, enliveningly variegated sounds of both the full orchestra and the Hodges' chamber group. These musicians had so much inherent presence that no tinkering with the dials to "enhance" them was at all necessary.

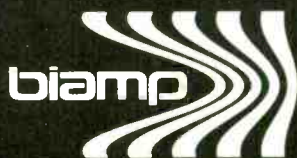
JANE IRA BLOOM: *We Are/Outline*. [Jane Ira Bloom, producer; Dean Roumanis, engineer]. Outline OTL-137.

JOHNNY HODGES/DUKE ELLINGTON: *Duke Ellington and Johnny Hodges*. [No information on producer or engineer]. Storyville SLP 4003.

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tory Eubie Blake album on Columbia some moons ago. At the time, I felt it was one of the best representations of Eubie's ability as tunesmith that had yet been recorded. The artists stuck to the composer's intentions rather than improvising all over Eubie's melodies and Noble Sissle's (for the most part) lyrics. It was a good "live" recording done in Parkins' favorite studio (mine too), Columbia's old renovated church on 30th Street. Sam loves this studio and when he has to use another studio because 30th Street isn't available he's invariably not as happy with the results. He knows this studio; so do engineers Graham and Tonkel. The results that the Parkins/Morris/Bolcom/Graham team got from 30th Street on the Eubie Blake album are confirmed here for Irving Berlin. The fact that neither Joan Morris nor Bill Bloom are jazz artists doesn't matter — in fact it helps them get to the heart of Mr. Berlin's songs without imposing their own interpretations.

This album has a character to it. Being only one LP it includes only a dozen of Berlin's best efforts. The only song I'd question is the Pollyanna optimistic "It's A Lovely Day Tomorrow" and that's only a difference of opinion. It's a short LP, timing out to only a little over 34 minutes playing time, the longest cut being the nearly four minute version of "The Girl On The Magazine Cover." In comparison to the Monmouth Evergreen, which times out something like 22 minutes per side, it would seem that the RCA album is not a bargain, but then works of art of this magnitude seldom are. It's not an either/or situation. The approaches are totally different as comparison of such material as the two sets have in common will quickly show. Each set of artists does its job marvelously well and Annette Sanders' peppy straightforward rendition of "Pack Up Your Sins And Go To The Devil" is as fine a piece of work of its own kind as is Joan Morris'. Morris, however, offers the song lyric, the patter lyric and, via overdubbing, shows how Berlin intended these two lyrics to jibe superimposed just as he had with his earlier "Play A Simple Melody" or as he was to with his later "You're Not Sick You're Just In Love." I will, however, admit a decided preference for Joan Morris' version of "All Alone." Maybe it's her classical training, but she has an uncanny ability to conjure up remembrances of the late Grace Moore who sang the song in the

1925 *Music Box Revue*.

These two different LPs show two different ways to treat the music of Irving Berlin and, as the many recordings by artists from Al Jolson to Elvis Presley will testify, these are only two among many. That's the genius of an Irving Berlin song. It responds well to the interpretations of as many different artists as care to interpret it. That's universality. That's Irving Berlin. J.K.

HEIKKE SARMANTO: *New Hope Jazz Mass*. [Recorded in a "live" concert at TempPELLIAUKIO Church, Helsinki, Finland, September 7, 1978.] Finlandia FA 201 LP2.

Performance: Definitive, the composer's concept
Recording: Balance a bit fuzzy at times, but it captures the music

In the late 1950s, when the idea of the jazz mass was first being tried on an experimental basis, I had a conversation with Canon Joseph Maza of St. James Episcopal Cathedral in Chicago on the subject. The problem, as he lamented it, was that the so-called jazz masses were neither very good masses nor very good jazz. It happens so often with cross breeding between elements of art that so many compromises need to be made that the distinguishing characteristics of neither participant emerges unscathed.

This is not only the first truly successful marriage of jazz and the Mass but it is, in my opinion, the finest piece



HEIKKE SARMANTO: Captured it all

of liturgical music since Benjamin Britten's *War Requiem*. From the opening dedication to "Duke and Trane" to the closing "Alleluja," it is swinging and moving with jazz spirit. If Heikke Sarmanto had to sacrifice the improvised spontaneity of jazz in writing parts for the Long Island Symphonic Choral Association, he also had the good fortune to call upon the services of Greg Smith, a choral conductor who can get a chorus of massed voices to swing. Smith, a concert music composer himself, may not be a (quote) jazzman (unquote) but he has sufficient feel for the idiom that he makes it happen. It may be more calculated, in fact I'm sure it is more calculated, than the instrumentalists jamming on the changes of the tune but if calculation is what it takes to achieve results, then Greg Smith is the man who can do it. With the addition of Heikke Sarmanto's quintet of fine Finnish jazz musicians and the incredible voice of Maija Hapuoja and Greg Smith's quartet of classically trained, but jazz oriented, vocal soloists including the remarkable alto voice of Fay Kittelson who phrases like a bebop saxophone player, it adds up to good jazz.

So how about the Mass? It's all there — the Gloria, the Credo, the Sanctus, the Agnus Dei — in texts taken, for the most part, from the newly revised Lutheran liturgy.

If the sound, particularly at the first entrance of the chorus, is unfocused it's lamentable but forgivable. This was a "live" performance taped by an engineer, as nearly as I can learn, without a control room producer being present. I can well imagine the problems he must have had adjusting balance in a work which includes full chorus, vocal quartet, vocal soloist and jazz quintet with no opportunity for retakes. The TempPELLIAUKIO Church in Helsinki is reverberant enough that no artificial echo or sweetening was needed. Maybe some day Heikke Sarmanto's *New Hope Jazz Mass* will be recorded in a studio under optimum conditions with the sound of these large forces in a more manageable situation. But even then it will not bear the authenticity of this recording unless these same forces are again recruited for the recording.

If there is a high point to this work of uniform excellence, the composer has wisely saved it for the grand finale wherein the chorus joins in an essay on the word "Alleluja"; that same word which served Johann Sebastian Bach,

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George Frederick Handel and Wolfgang Amadeus Mozart before him has not let Heikke Sarmanto down. The walls of the church—both the church in Finland and the one in the listener's mind—echo with the shouts of "Alleluja." The only appropriate response is "Alleluja - Amen." J.K.

THERESA BREWER AND EARL HINES: *We Love You Fats.* [Bob Thiele, producer; Bob Simpson, engineer; recorded at RCA Studios, New York, N.Y., July 24 and 25, 1978.] Doctor Jazz DJRX 60008.

Performance: **Typical Teresa, typical Earl, typical Fats**
 Recording: **Typical Thiele**

The word for this record is predictable. There are ten tunes composed by or associated with the late Fats Waller. If they're the same ones that show up on many other Fats Waller tributes that's predictable, too. There's a show, on Broadway called *Ain't Misbehavin'* and the tunes that are featured in the show are the ones everybody is going to put on their Fats tribute. That's how to get airplay and how to sell LPs and that's the name of the game. There's Teresa Brewer, as good a pop singer as ever graced the top ten, doing Fats' material. Sure she's a pop singer, and not really a jazz singer per se, but neither are Dinah Shore, Frank Sinatra and a lot of others who have sung Waller's tunes over the years. Take "I've Got A Feeling I'm Falling" for example. The original hit was by Gene Austin, and like all Austin's hits it was a giant. Gene Austin came from a lot of the same southern country roots as Teresa Brewer. Had Gene Austin lived long enough to be contemporary with Teresa Brewer's rock-a-billy music, he'd have been comfortable with it, if not in it. Earl Hines is probably the most distinctive piano stylist in jazz today. In these days when electronic keyboards are making so many pianists sound the same, it's good to find someone like Earl who not only possesses an identifiable style, but an identifiable sound. They're few and far between. To say that this record is predictable is in no way a put-down. These are dependable artists and their predictability is a part of that dependability. It was true of most of the giants. There was no way for Louis Armstrong to sound like anybody but Louis Armstrong or Pee

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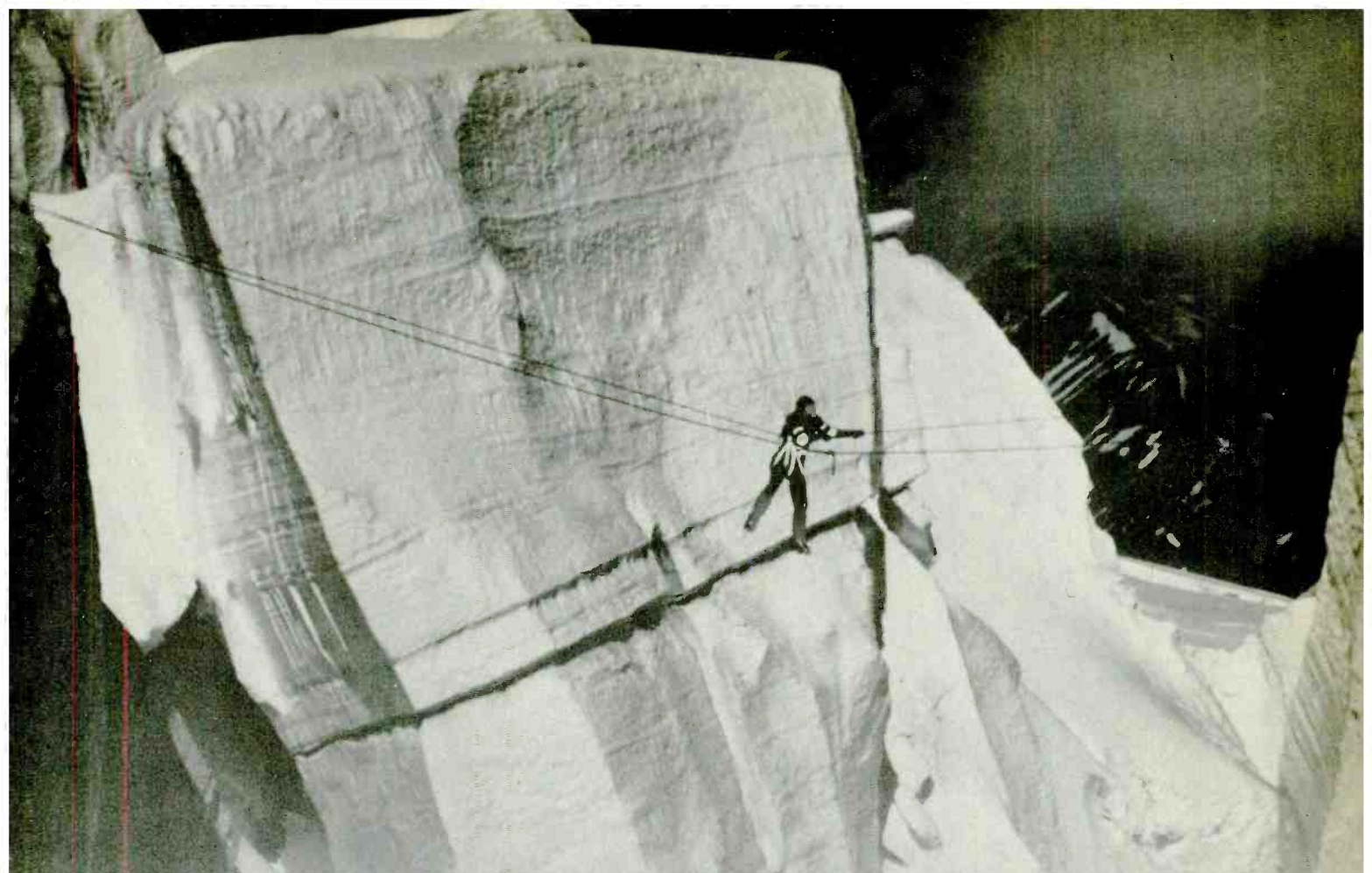
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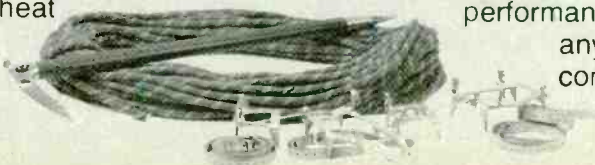


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Wee Russell to sound like anyone but Pee Wee Russell. Even the idea is predictable. In 1944, soon after Fats' death, Bob Thiele put out on Signature records two ten-inch 78 RPM records of Earl Hines and a rhythm section playing Fats' music and, would you believe it, only one of the tunes recorded in 1944 is not on this new album! Earl still sounds like Earl and I'm in favor of that. There are a couple of advantages to the new recordings. While the 1944 date had former Waller guitarist Al Casey and former Duke Ellington

bassman Oscar Pettiford, these two artists weren't nearly as well matched with Hines as the current rhythm section of Milt Hinton on bass and Grady Tate on drums. Casey, by 1944, was playing overamplified electric guitar even when playing rhythm and Pettiford, a major soloist, had difficulty staying out of the way of Earl's left hand. It ended up sounding as much like the Al Casey trio or the Oscar Pettiford band as Earl Hines with rhythm. Milt Hinton is a sensitive bassist who knows when *not* to play. There are whole

stretches on this LP where Milt lays out and lets Earl's left hand have its way. Milt is one of the few bassists who has ever been able to play with Earl and not inhibit his famous stride. Grady Tate sometimes gets a little too busy for my taste behind Earl but somehow Earl manages to overcome and the results work nicely. Teresa does her vocals and stays out of Earl's way during the instrumentals—unlike so many vocalists who feel the urge to interject encouraging comments just so the listener will realize they are still there.

The 1978 sound is better than the sound of 1944 if only because of stereo and such other advanced techniques which have evolved over the past three and almost a half decades. Yet the sound is unspectacular: comfortable and warm and clear but without much to distinguish it from a lot of other jobs that Bob Thiele has done in the RCA studios on similar occasions. That also is no put down. When you have a good working combination, there's no need to make changes just for the sake of conveying progress. J.K.

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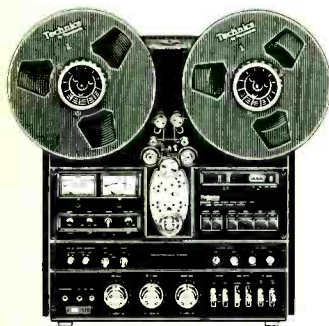
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CLASSICAL

MASCAGNI: *Cavalleria Rusticana*.

[Michael Woolcock, producer; Kenneth Wilkinson and Colin Moorfoot, engineers; recorded in Kingsway Hall, London, England, June, 1977.] London OSAD.

LEONCAVALLO: *Pagliacci*. [James Malison, producer; Kenneth Wilkinson and Colin Moorfoot, engineers; recorded in Kingsway Hall, London, England, March and April, 1977.] London OSAD 13125.

Performance: **A rave for Cav and a good try for Pag**
Recording: **London's usual flawless quality**

PUCCINI: *Tosca*. [James Malison, producer; Kenneth Wilkinson and Colin Moorfoot, engineers; recorded June 1978 in London, England, studio not listed.] London OSAD 12113.

Performance: **A Tosca to treasure**
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Much has been made, with the release of these records, of the fact that the only reason for London to record these works anew is the presence of their tenor of the day, Luciano Pavarotti. Many critics have attacked such a star system, wondering if we really need another version of these oft recorded warhorses. This is the third London *Pagliacci* in the catalogue, their fourth *Cavalleria* and their fourth *Tosca*. But why not? Luciano Pavarotti is hot right now. He is a star. And the reason he is a star has every bit as much to do with his beautiful voice and his sensitive interpretation of his various roles as it does with his charisma and his "press-exploitation."

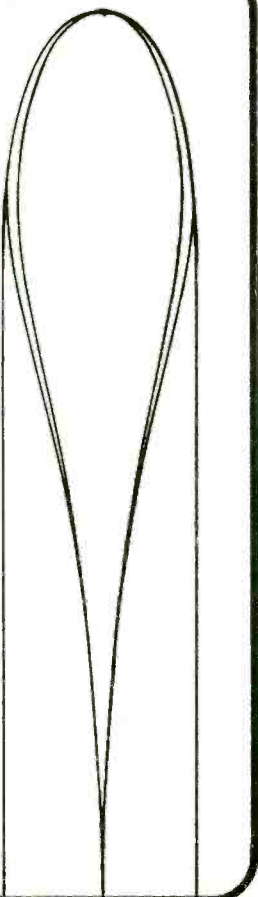
Whether these roles are his best vehicles is another question. To the best of my knowledge Pavarotti has never sung either *Cavalleria Rusticana* or *Pagliacci* on the operatic stage. To do a role in the recording studio that a singer has not done on stage is to court disaster. Problems of interpretation that iron themselves out during rehearsals for a stage production under a competent director have no resolution in a recording studio and the non-chronological piece-meal methods of modern operatic recording do not make for dramatic insights. That Pavarotti has pulled off this studio *Cavalleria Rusticana* is either a remarkable testimony to his acting ability or, I hope, a dead giveaway that he has been working on the role and we'll soon hear and see his Turridu at the Met. His *Pagliacci* is not as dramatically mature but not necessarily for any lack of work on the role. There are very few tenors with both the lyricism necessary to sing *Cavalleria* and the dramatic intensity necessary for *Pagliacci*. While Placido Domingo, for example, has sung both roles, his *Cavalleria* is markedly better than his *Pagliacci*. Another reason that *Cavalleria Rusticana* seems to work better than *Pagliacci* is the supporting cast which includes Julia Varady as Santuzza and Ida Bormida as Lucia. Mirella Freni is sadly miscast as Nedda in *Pagliacci* and Ingvar Wixell is not in the least impressive as Tonio. Freni's unsteadiness in the role, especially as far as intonation is concerned, makes it all the more difficult for everyone. Yet Pavarotti pulls off the mechanics of the role well. He can sing the role and if his interpretation still has some growing to do, there's time for that yet.

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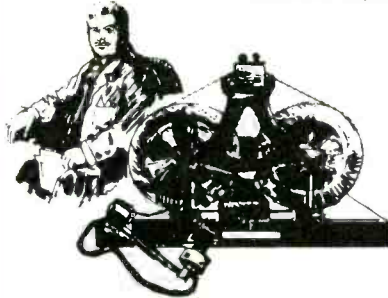
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would argue well for the premise that singers ought to do a role on stage before recording it. Luciano Pavarotti sang his first Cavaradossi in San Francisco in the 1977-78 season. He brought it to the Metropolitan Opera the following year and in between these two seasons recorded the role for London. Originally the rumor was that his Tosca would be his Tosca of the Met production, Shirley Verrett, but whether it was because of contractual problems or whether it was an artistic decision, Mirella Freni does remarkably well with a role that one would not expect her to sing. I don't believe she has sung it on stage so there goes my pet theory. The importance of the baritone role Scarpia is central to the success of any *Tosca*. While Sherrill Milnes does not erase the vivid memory of the magnificence of Tito Gobbi's Scarpia, he is superior to any of his current competitors that I've heard including Cornell MacNeil who sang it with Pavarotti at the Met.

The conductor for *Cavalleria Rusticana* is Gianandrea Gavazzeni, who's been a staple of the Italian opera conducting community for years. Giuseppe Patane, who is one of the rising young conductors of the Met is entrusted with *Pagliacci*. Nicola Rescigno, who conducts *Tosca*, is most famous for his interpretations of such works as Donizetti's *Don Pasquale*, which is a far cry from Puccini's romanticism with its multi-colored orchestration. Both Rescigno and Gavazzeni lead exemplary performances. So, in fact, does Patane, however, I find his choice of *tempi* tending to the quick side. But that only heightens the dramatic intensity of Leoncavallo's music.

The recording, as has been the case with London Records since their first LPs, leaves nothing to be desired. They are quiet, clean surfaces and they are not distorted. On *Tosca*, however, someone conceived of the idea of larger than life sound effects. Maybe they felt the sound of the window closing in Act II would compensate for the fact that you were only hearing the opera, not seeing it. But anyone who knows *Tosca* knows that the window is to be closed at that point and Puccini even includes musical evidence of the closing of the window in his score. It's a gimmick, and it's not needed, but it doesn't really do any harm to have it there.

I understand that there is a brief cut in *Cavalleria*, but on the other hand there is a restoration of some measures

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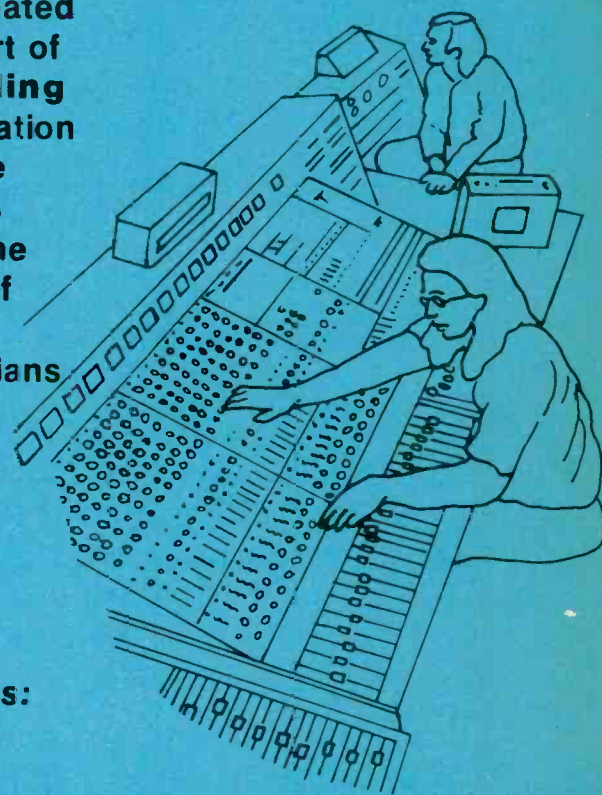
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in *Pagliacci* which are frequently omitted so you win some, you lose some.

It will be interesting to hear how Pavarotti's Canio finally emerges. He may well never attempt the role on stage but if he does I am sure he will grow with it. In fact I hope he records it again if and when he does perform *Pagliacci* "live." J.K.

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ORIGINAL CAST: *Sweeney Todd*. [Thomas Z. Shepard, producer; Anthony Salvatore, engineer; recorded March 12 and 13, RCA Studio A, New York, N.Y.] RCA CBL2-3379.

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You really can't argue with the winner of *eight* (count 'em) Tony awards. Especially if, after listening to the original cast recording which includes virtually the whole show, you are in complete agreement that the awards were justly deserved. There's nothing surprising in that Stephen Sondheim's remarkable score and Len Cariou's thrilling performance won awards. What is surprising is that the show is alive and well on Broadway. It shows signs of the maturity in the American theatregoer—the same public who rejected such previous attempts at operatic theatre as Frank Loesser's *The Most Happy Fella* and Leonard Bernstein's *Candide*. Even George Gershwin's pioneering *Porgy and Bess*, despite the work's current status, was less than an instantaneous hit.

We can trace the development of the Broadway musical from the reviews of Flo Ziegfeld and George White (song after song with little or no plot) through the book show like *Whoopie* and *Showboat* where the music was an integral part of the plot to the golden age of the musical (*Oklahoma*, *South Pacific* and *My Fair Lady*) up to the present where Sondheim, Hugh Wheeler and Harold Prince seem to have conspired to create what sounds from here like an American classic. The plot is a spine-tingling thriller, as blood curdling as any that Arrigo Boito or David Belasco

was able to furnish Verdi or Puccini. The craftsmanship of composer, librettist, director, singers and players is utterly faultless.

By definition, opera is a form of music-drama in which the vocal and instrumental music are predominant and indeed essential. *Sweeney Todd* fits this definition as well as any, however when it comes to spoken dialogue versus the sung recitative there can be a lot more argument about *Sweeney Todd*. Indeed, in Paris *Sweeney Todd* may well find itself, as was *Carmen* for many years, relegated to the Opera Comique Theatre rather than the main Opera House. But the American musicals, and not just *Porgy And Bess* but *Kiss Me Kate* and *West Side Story* as well, have been making inroads into the European opera houses and while the Metropolitan has not yet accepted the Broadway show as part of the operatic repertoire, that time may be coming. It is sincerely to be hoped for because music like *Sweeney Todd* is good enough to be performed anywhere.

The recording comes off well. Surprisingly, it was not done straight through from Overture to Epilogue. If the chorus had to be on hand on one day, they'd try to get everything down on that date so as not to have to bring them back the next day. Then it was cut and patched together by twentieth century technology. Generally, it's a dangerous practice and invites fragmentary performances, but when you're recording the cast who have done the show eight times a week from beginning to end, they can pull off the fragments with a full sense of direction and completeness. Of course with all the gimmicks that modern recording studios have available, it is possible to put in some larger than life effects. In a thriller like this, the temptation to amplify those razor blades and trap doors out of proportion was a bit too tempting for the producer and the technicians. It's certainly startling, but it's not what you'd hear in the theatre.

What you hear in the theatre is scarcely a bit more than is on these two LPs. Only a few snatches of dialogue had to be omitted for the sake of brevity and economy and to keep the flow of the simply auditory performance from slowing down under a long stretch of speech sans music. What you hear on these recordings is more than an ample sample of an award-winner on its way to becoming, in time, a classic. J.K.

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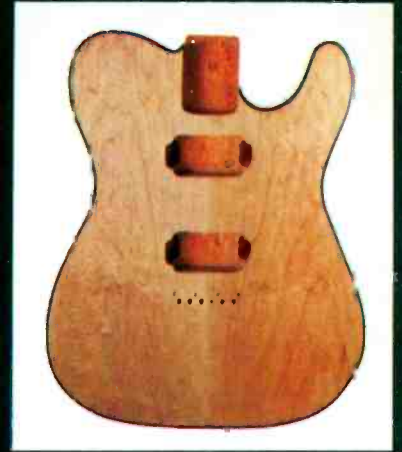
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