

Profile:
Dr. John & Producer
Tommy Lipuma

MODERN RECORDING

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SERVING TODAY'S MUSIC/RECORDING-CONSCIOUS SOCIETY

VOL. 5 NO. 5
FEBRUARY 1980

BEE GEES "LIVE I"

THE ELECTRIC
PRIMER
— Part IV

LAB REPORTS:

Apt 1 Power Amplifier

Neptune 2709

Real-Time Analyzer

Soundcraftsmen AE2420-R

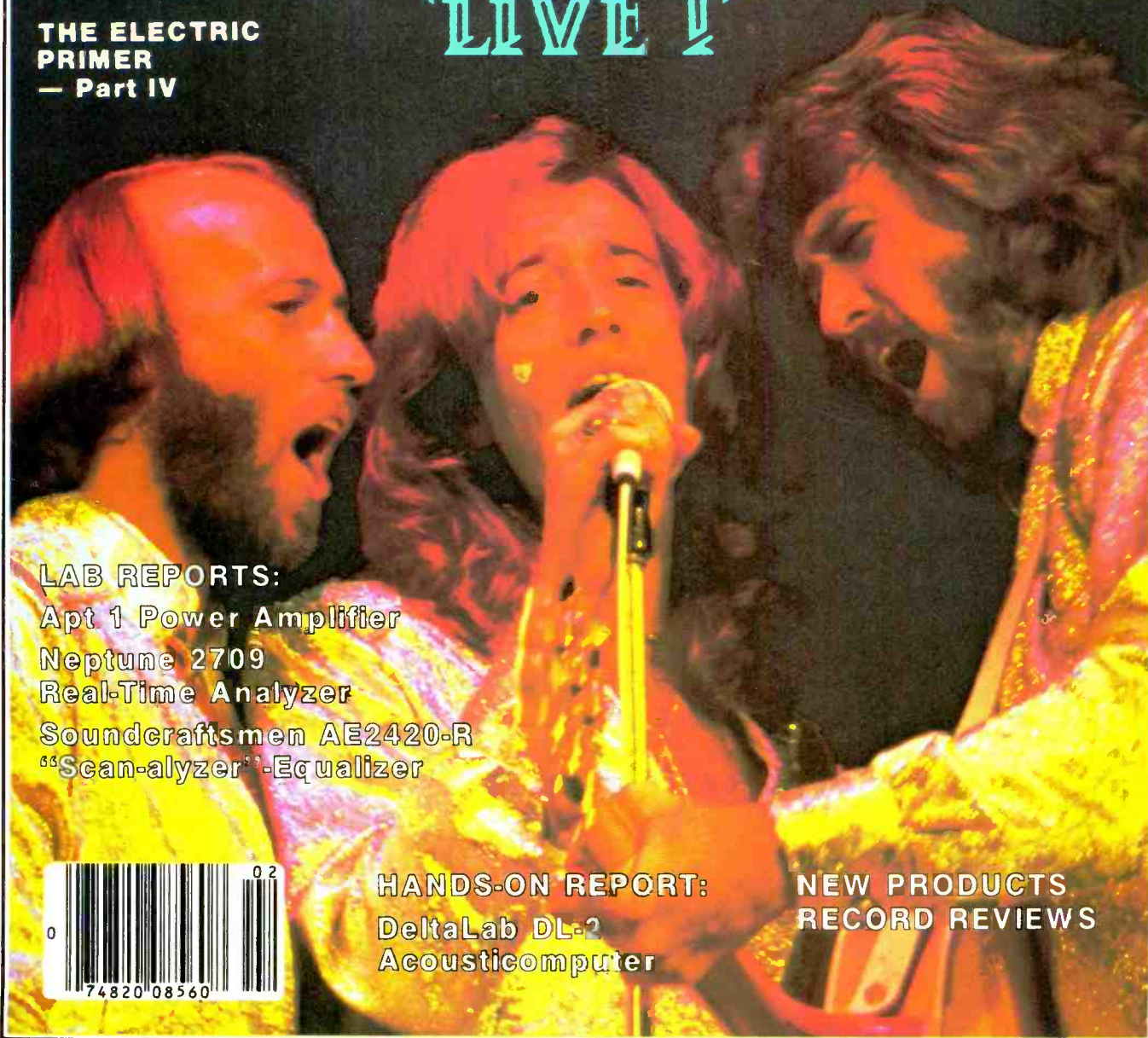
"Scan-analyzer"-Equalizer



HANDS-ON REPORT:

DeltaLab DL-2
Acousticcomputer

NEW PRODUCTS
RECORD REVIEWS



Expression through time delay.

Time delay has become increasingly important to musicians and engineers as a way to color musical sounds and create spatial illusions. MXR's Flanger/Doubler and Digital Delay have proven to be effective tools for the musically creative professional who requires a wide range of performance possibilities from a precise and cost effective time delay unit.

Both the MXR Flanger/Doubler and Digital Delay offer a flexible system of controls which provide ultimate freedom for creative expression. They feature frequency sweep and width controls, a mix control (between the dry and the delayed signals), a regeneration control for additional intensity and multiple repeats on doubling and echoes, and a delay bypass jack which enables the user to employ a footswitch to bypass the unit entirely for instantaneous cut-offs of time delay effects. Both units represent an expandable system, and can be easily ganged together or interfaced with other instruments and recording gear.

The MXR Flanger/Doubler provides a manual control over delay time, and rear panel connections offering full remote delay time adjustments and a VCA output suitable for stereo ganging of two units. The MXR Flanger/Doubler can switch easily between flanging and doubling modes, and two LED indicators are provided for easy visual monitoring of sweep speed and range.

The Flanger/Doubler is capable of producing infinite varieties of flanging, hard reverberation, vibrato, and numerous doubling effects including subtle chorus

sounds. It offers a time delay range of .25 to 5 milliseconds in the flanging mode and 17.5 to 70 milliseconds in the doubling mode.

The MXR Digital Delay offers a continuous range of delay times from .08 to 320 milliseconds. This range of delay times is expandable with three optional memory cards, in 320 millisecond increments to 1280 milliseconds, with full bandwidth (20-Hz to 20kHz) capability to 160 milliseconds. The Digital Delay features push button controls for varying delay ranges. A level control regulates the input signal to prevent overloading of the unit's circuitry, and LEDs monitor the input level and indicate whether the effect is in or out.

At fixed delay times the Digital Delay is perfectly suited for "traditional" delay applications such as "slap echo," discrete echoes, and synchronization of speakers in PA applications. By adjusting sweep frequency, mix, regeneration, and level controls, the Digital Delay offers additional effects which include doubling flanging, pitch alteration (vibrato, pitch bending), frequency modulating, and infinite (non-deteriorating) repeat hold.

The MXF Flanger/Doubler and Digital Delay are designed for use in the studio and on stage, with line or instrument levels. They're reliable, delivering a clear signal consistently, with a dynamic range exceeding 80 dB. And as with all MXR Pro Group products, optional road cases are available. For the serious artist, the MXR Flanger/Doubler and Digital Delay are the versatile tools which provide the key that will unlock his creative musical imagination.



Expression through equalization.

The MXR Dual-Fifteen Band and Thirty-One Band equalizers are cost effective electronic signal processors designed to meet the most exacting equalization requirements in a wide range of professional applications.

The MXR Dual-Fifteen Band equalizer can be used to tailor the frequency response of two sides of a stereo system, or it can act as two separate mono equalizers. In performance one channel can equalize the house system, while the other is used independently in the stage monitor line adjusting frequency response and minimizing the possibility of feedback. In the studio the Dual-Fifteen Band equalizer can be used to compensate for control room acoustics.

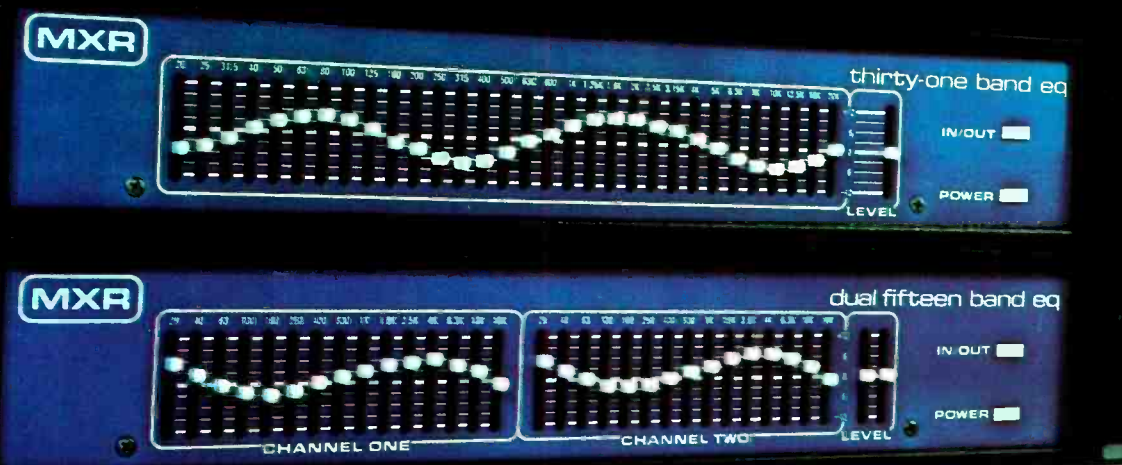
The MXR Thirty-One Band equalizer provides maximum detail in the most demanding equalization applications. It can be used in pairs for ultimate stereo control, or in live performance interfaced with PA systems and other instruments. The Thirty-One Band equalizer is also the perfect tool for conditioning film or video sound tracks, and in mastering applications.

The spacing of frequency bands on ISO centers (2/3 octave in the Dual-Fifteen Band; 1/3 octave in the

Thirty-One Band) and a flexible system of controls offer superior accuracy in frequency equalization. Each band can be boosted or cut over a range of ± 12 dB. Clear, readable markings alongside each level control allow for quick and accurate checks of equalization settings, and aid in resetting the sliders to predetermined positions. The tight mechanical action of the sliders prevents slips during indelicate handling.

The MXR Pro Group equalizers afford maximum control of frequencies while maintaining the highest level of sonic integrity. The Dual-Fifteen and Thirty-One Band equalizers both have a dynamic range exceeding 110 dB and, as all MXR Pro Group products, will drive low impedance lines. Audio signal, including transients, is reproduced faithfully due to a high slew rate and a wide bandwidth.

The MXR Dual-Fifteen and Thirty-One Band equalizers are designed to withstand the demands of a professional road and studio schedule. Their superior design and superb craftsmanship reflect MXR's continuing commitment to the manufacture of the highest quality electronic signal processors for today's creative artists.



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

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

New realms of expression from MXR.

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

The Pitch Transposer extends your musical boundaries by creating live instrumental and vocal harmonies. It has 4 presets which allow the artist to predetermine the intervals to be processed. Transposed intervals can be preset anywhere from an octave below to an octave above the original pitch. The chosen interval is activated by means of touch controls or a rugged footswitch. LED indicators display which of the four presets has been selected.

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

With many other pitch transposition devices a splicing noise, or glitch, is present. The MXR Pitch Transposer

renders these often offensive noises into a subtle vibrato which blends with the music, and is, in some cases, virtually inaudible. The result is a processed signal which is musical and usable.

We have been able to maintain a high level of sonic integrity in this most versatile signal processor. The frequency response of the processed signal is beyond 10 kHz, with a dynamic range exceeding 80 dB.

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

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

MXR Innovations, Inc., 247 N. Goodman Street,
Rochester, New York 14607, (716) 442-5320





Silence. The Step Beyond.

Even more important than what an effect adds to your performance is what it doesn't add. Noise—pops, clicks, and hiss can make a good effect virtually unusable in a performance. That's where BOSS effects are different, and it's a difference you'll notice from the moment you turn them on.

You see, all the different effects on the market share the same noisy problem—they all use the same kind of mechanical footswitch, and no matter who makes it, it still has the same problem—it makes an audible "click." That can be a pain in the studio where you have live mikes, but even worse is that a mechanical switch is prone to make popping noises in the signal when it's engaged, and that's a real problem no matter where you are.

BOSS effects have been designed differently. We incorporate what is called F.E.T. switching. This means that there are no mechanical contacts in the signal system, so it won't make an audible click—and it can't make a pop. The switching is done totally electronically and cleanly.

But that's only the beginning of the beauty of BOSS pedals. You'll find a host of other features the competition has yet to catch up with. Features like battery eliminator jacks on every pedal, skid pads that work, and a unique design that allows you to change the battery without exposing the circuit board. And, back on the subject of silence, you'll find BOSS pedals to be the quietest pedals on the market with signal to noise ratio consistently better than 80 dB.

You'll find a BOSS pedal to fit any need—from phasers to flangers, to equalizers to compressors to the new CE-2 Chorus Ensemble, a compact version of our legendary CE-1.

None of the BOSS pedals make noise. No clicks, no pops, no hiss. And that's pretty important. Cause if you're serious about your music you know that what you leave out is as important as what you put in.

BOSS products are designed and manufactured by Roland, 2401 Saybrook Ave., Los Angeles, CA 90040. (213) 685-5141.

 **BOSS**

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MODERN RECORDING

FEBRUARY 1980

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SERVING TODAY'S MUSIC/RECORDING-CONSCIOUS SOCIETY

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By James F. Rupert

Although Mr. Rupert has come to be known as a "fun guy" in these pages of *MR*, we should always remember that he has serious things to say. Here he attacks the problems of business—how to get it and keep it—in the small studio.

THE ELECTRIC PRIMER —Part IV 48

By Peter Weiss

For three issues, author Weiss has been instructing us on the fundamentals of electricity as they apply to recording. This month we again delve into capacitance and resistance, and march on into magnetism.

THE BEE GEES "LIVE!" 54

By Peter Weiss

Balladeers, rock 'n' rollers, discoers—the Bee Gees have been called all of these. But, what is more important is that they have been hugely successful in practically all their musical endeavors. *MR* covered their most recent U.S. tour and was astounded by the sheer effort involved.

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(courtesy Howard Bloom Organization)

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GREAT GUITAR ISSUE!
A Session with Al DiMeola
Profile: Rick Derringer
Special AES Wrap-up
The Electric Primer — Part V

MODERN RECORDING

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LETTERS TO THE EDITOR

Mush Note

I agree wholeheartedly with Vic Marsh ("Letters," November) that many concerts are so loud that the sound is mush. I would like to point out, however, that responsibility for the situation must ultimately rest with the band. This is a point he nearly hit on when he mentioned that his puzzlement is not on the technical end, but with the creative aspect. The music begins at the creative end of the cables—on stage. In spite of all the sophisticated gear, the sound technician is unable to reduce stage volume before it gets into the P.A. (If he insists on lower stage volume he'll most likely be accused of tampering with the creative process.)

Faced with a couple of Marshall stacks and given the job of keeping the drums and vocals audible forces the sound man to use his watts. I maintain that few of the "too loud" concerts Vic has attended were a case of a good mix simply turned up too loud.

We have to assume that the band is responsible for the quality of the sound at any show. Even if it can be proven that the bad sound is the contractor's fault, it's still the band's fault—they should find a better contractor. The band should have things like proper sound check time allotments in their contract and refuse to take the stage unless they're satisfied with the arrangements.

At a concert I did last summer I learned the hard way that the sound company has to please the band first. I was handling the technical end, mixing under the suggestion of the group's manager. She knew the group's desired sound, and we had it by the end of the second song. The promoter began to insist on a different mix. (The band preferred the Rhodes and guitar right up with the vocals, which were not overly strong. The promoter "wanted to hear the words.") As soon as we lost the group's groove, their set was destroyed. I decided then and there to never again try to satisfy anyone but the band. If a promoter or audience is not happy, their dissatisfaction will be with the creative presentation of the group and not with my technical contribution.

I'll still offer tactful suggestions and observations, especially when stage SPL's spell house mush, but the band has the last word. I would encourage concert-goers to address criticism to band members or employees.

—Rob Cook
Cook Christian Supplies
Alma, Mich.

Make It a Monster

I was truly amazed at the number of comments I found in your "Letters" section sent in by readers who I must assume to be experienced sound personnel concerning a music style labeled "Disco." It seems to me that these people are missing the point of what it is they're really doing.

Any professional should be able to deal with the medium of sound reproduction as an art form in itself and should concentrate on perfecting their expertise and not quite so much on biasing themselves towards or away from any particular current style.

I am neither defending the Disco style nor condemning it. I



Studiomaster is Expanding

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

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

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

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

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

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

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

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

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am merely stating that any professional working in our field has to deal with an infinity of totally different styles, performers, instrumentation, interpretations, producers and tastes. That's one of the things that keeps this business interesting. In a professional studio, an engineer may be called upon to work with anything from Gospel to Rock, Funk to Folk, Salsa to speech overlays. You may be working with the greatest fusion group one session and trying to make the trumpet trills work in some idiotic commercial the next.

We all have our musical preferences and our ideal situations, but if my engineer gets called in for a session and can't cut it because he dislikes the style of music being played, he had better re-evaluate his true level of competence and realize that a professional engineer should be able to deal with any situation and any style of music, regardless of his personal tastes.

Let's cut the bull about styles and concentrate more on the perfection of the art. If you have to deal with a Disco session, make it a monster! It should be no

problem, working in such a seemingly simplistic medium.

Styles will change with the wind, and repetitious, basic beat music will forever make up the majority of commercial product, but the art of sound recording and engineering will always require the talent and imagination to interpret and reproduce the music of the period.

—Joe Marchione
SBR Audio
Vineland, N.J.

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The D-250 is covered by a full one year parts and labor warranty.



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Voltage Fluctuations

An incorrect value slipped past our eyes in Part III of Peter Weiss' "The Electric Primer" (Dec. 1979) on page 40: Four lines below Figure 8 (in the center column), $V_1 = 10$ volts; not 1 volt, as printed.

Scouting Out Scott

In an earlier issue of *MR*, there was a Scott audio analyzer on which you did a test report. I'm interested in reaching Scott—could you provide me with their address? Keep up the good work, *I love your mag*. Thanks a bunches.

—Gonzalo Rangel
San Antonio, Tex.

We published the report on the Scott 830Z Audio Analyzer in our July 1979 issue. H.H. Scott Inc. is located at 20 Commerce Way, Woburn, Ma. 01801, phone (617) 933-8800.

Familiar Words

Re: Letter to the Editor on "That Dirty Word... Defended" published in the September 1979 issue of *MR*.

Local Disco clubs such as 1234 (in Montreal) drive their patrons out in 15-20 minutes because the DJs operate their consoles and banks of power amplifiers at full blast. This gives excessively loud and highly distorted music (not to mention the fact that the power amps are in for constant weekly replacement of output stages). According to the medical profession, these levels are very detrimental to hearing.

The background beat on the majority of 12" Disco discs is monotonous and boring. A standard 45 provides us with 3-4 minutes of this unvarying beat—which is plenty for the majority of our mobile Disco clientele.

Now take a look at the large increases in price for 12" singles coupled with a decrease in consumer buying of records in general, due mainly to excessive

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Normal bias tape taken to the optimum.



TDK's answer to the need for a normal bias reference standard.

Optimum Dynamic is the outcome of the same, sophisticated technology which set the high bias reference standard with TDK's SA cassette. Its tape formulation consists of Optima Ferric particles. A needle-shaped, pure iron oxide that has been ultra refined to cover the tape surface evenly and densely. The result is a cassette with a sensitivity and MOL audibly superior to any normal bias cassette available in the market today.

Well balanced sound.

Optimum Dynamic has all the sound characteristics you've been looking for. Super flat frequency response and sensitivity with a wide dynamic range. Lower noise and higher output at critical levels. For example, you'll now be able to capture the full dynamic complexity of a classical performance as well as the sustained higher output characteristic of contemporary music. In every way, Optimum Dynamic will deliver a well balanced, reference quality normal bias performance. And you'll hear it, unfailingly, for years to come.

Optimum Dynamic has the same Super Precision Mechanism as the SA cassette, protected by TDK's full lifetime warranty.*

Supplier to the U.S. Olympic Team



*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.

The test of success.

We believe we've been highly successful in fulfilling the need for a normal bias reference standard. But there's a simple test. Listen to an Optimum Dynamic just once. Compare it to anything else you've been using. From then on, you may want to use it as a reference.



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CIRCLE 67 ON READER SERVICE CARD

prices. (Here promo material is virtually non-existent and record pools are closed cliques that are next to impossible to penetrate.) Some promo managers don't even bother answering letters. They should not wonder why sales are down.

Keep up the tremendous work you do. Leave Disco to Disco magazines.

—Victor R. O'Brien
Owner & Manager
V-I-K Productions
Montreal, Quebec

Go Ask Alice

Some time ago in "The Product Scene," (May 1978, to be exact), Norman Eisenberg made reference to a "Stage Light Control," the "ALICE Model 1," from Automated Lighting Concepts. If you could please send me the address of this company right away, I would appreciate it very much. Also—do you have any additional information on the system itself?

Thanking you "in harmony,"

—Kevin J. Knight
Rancho Cordova, Ca.

Get in touch with Automated Lighting Concepts directly for more info on ALICE, which (who?) retails for \$799. The company is located at 1369 West Byers Pl., Unit C, Denver, Col. 80223. Their phone number is (303)722-4629.

Mobile Protection? Seat Belts Not Enough

I have subscribed to your magazine for quite some time now. Thanks for the good reading.

I've been search for some information on the protection of audio equipment in mobile situation. Not so much the protection against theft, but more regarding protection against climate, humidity, overnight storage, etc. I have not seen any coverage in your mag on this subject, but then again maybe I overlooked it. Nevertheless, I'd appreciate any information or leads on books to read or places to write to on this subject.

Thank you in advance for your time.
—Paul Andrew Smith
The Ear Music Co.
Oshawa, Ontario

You're looking for cases. Write to a few manufacturers, or pick up brochures and info at a creative audio retailer. We suggest you drop a line to such companies as Anvil Cases, Inc., 4128 Temple City Blvd., Rosemead, Ca. 91770; Calzone

Case Co., P.O. Box 862, Norwalk Ct. 06856; Star Case Mfg Co., 15525 S. 70th Ct., Orland Park, Ill. 60462; Bobadilla Cases, 2302 E. 38th St., Vernon, Ca. 90058.

Lamentations Called Off

Re: "Letters," Oct. 1979—"1994:"

Editors! Editors! I would like the chance to thank you for reviewing our first album and to let you and your readers know that the group 1994: is "indeed *not* defunct."

Furthermore, Steve Row need "lament" no longer, for we invite him, and everyone, for that matter, to review our latest A&M release, recorded in part digitally at Record Plant-L.A., and entitled *Please Stand By*. . . Thank you!

—Karen Lawrence
Member, 1994:
New York, N.Y.

Acoustic Simulation

I am looking for information on the PY-10 acoustic simulator from Polyfonic Sound Industries. Could you please furnish whatever information you have on this model, as well as the address and telephone number of the company so I can contact them directly concerning their machine.

—Jim Caldwell
Sound Department Supervisor
Southwest Film Laboratory, Inc.
Dallas, Tex.

You can write and phone Polyfonic Sound Industries at 104 Ridge Rd., No. Arlington, N.J. 07032, (201) 997-6666. PSI has stated that the PY-10 (and the stereo version, PY-5S) Acoustic Simulators carry a conceptual patent and the device "has been acclaimed as a breakthrough to a new dimension of fullness in sound, not just another effect." Their application can vary from correcting overly close microphone techniques in studio use, to creating an ambience effect on dry sounding tapes. In live applications, the units, it is claimed, can actually vary the apparent room environment acoustically to allow the user to adjust rooms according to taste.

Convinced and Persuasive

We would like to state that your magazine is published with a quality and consistency uncommon in today's market. It is always a pleasure and an education reading your material.

We have been actively performing Top 40 and Disco material for the last five years and are familiar with the playing of each. In regards to Ken Rapoza MR September '79, and following letters, MR November '79, please allow us to state the following:

Disco music is no less difficult to perform, when performed properly, than any other type of music. Those who doubt this statement should try recording themselves and compare their result with the original record. It is just as difficult to play Disco music "convincingly" as it is to play any other type of music "convincingly." Music lovers are entitled to their opinion and so are musicians, but musicians should be prepared to play any type of music, "convincingly."

—The Rudnick Brothers
Keyport, N.J.

Getting Rational

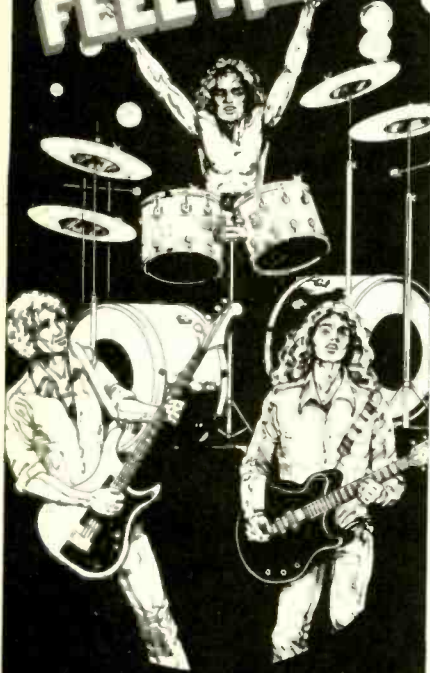
Many of you expressed delight at our latest construction article, "Build a Dual Limiter" (this by Craig Anderton in MR's November 1979 issue). But you self-sufficient types who opted to do up your own circuit board were dismayed to find a contradictory situation 'twixt pages 53 and 54: The text on page 53 states that Figure 4 (p. 54) depicts the circuit board foil side artwork along with the corresponding component layout in a 1:1 ratio (the author rightly felt this would facilitate making your own board). In the layout process, though, the artwork was reduced to fit our space so that the 1:1 statement is in error. It is suggested that readers who wish to use Figure 4 should have it enlarged photographically—Craig says that this should be scaled so that the distance between adjacent pins of any of the three ICs is exactly $\frac{1}{10}$ " (or 2.54 mm).

Craig also advises us that he's developing a number of do-it-yourself projects for future publication (all copyrights, by the way, on the Dual Limiter article, belong to Mr. Anderton), including a low-cost noise reduction system. Look for these in upcoming issues of Modern Recording.

Thinning Our Letter File: Starting, Schooling, Setting Up; Books and More

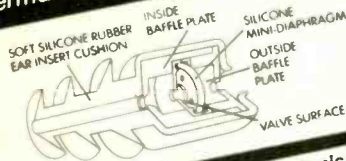
I am a student in college, majoring in Electrical Engineering. I am active in music and have experience playing the guitar and in amateur recording. I am an avid reader of *Modern Recording* and

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CIRCLE 69 ON READER SERVICE CARD

find that many of the articles in your magazine are very informative to me and help me in some problems. My desire is to become an Audio Engineer (either "live" performance or recording), but I don't have much more information on these subjects. Can you suggest just how I could get started as an engineer of this nature? Any information or advice you could give me would be greatly appreciated. Thank you.

—Alan W. Todd
Judsonia, Ark.

I have become very interested in Peter Weiss' series of articles called The Electric Primer. I feel that it is essential to understand not only the basics of recording, but also the actual physics that make the whole process functional.

As a potential recording engineer (I hope!), I am presently doing my own recording and mixing in my basement, using a 4-track open reel tape deck and an 8-channel mixer.

In his introduction, Mr. Weiss made allusion to "The introduction to one of the more popular recording studio handbooks..." That statement particularly hit me hard because I have been looking for some form of recording studio handbook for quite some time. The only information I can seem to acquire is from the public library, which is usually outdated, or from the various magazines, *Modern Recording* outstanding.

Up to this point, I've pretty well been in the dark except for my own experimentation and evaluations, so what I am requesting is information on how I could obtain a recording studio manual, or the equivalent.

I would also be interested in finding out which college or colleges in the United States offer a curriculum in the recording arts and sciences.

—Fred Fellows
Edmonton, Alberta

I'm glad to see your magazine helping a lot of people learn to produce a better sound. The educational material is very valuable to me. I'm working towards an engineering job at a growing firm in Wilmington, Delaware. I've completed a course in Modern Recording Techniques at a studio in Philadelphia. What else can I do to further my education and get more actual experience? Are there shows or seminars offered by studios or companies in New York or Philadelphia? Are trade shows of any value towards learning techniques and new equipment operation? If so, how do I find out when

and where to go? This education could land me a job and a future that I've been chasing for years.

—Jim Heffernan
Wilmington, Del.

I have a question regarding Craig Anderton's article, Build a Dual Limiter, in the Nov. '79 issue. He recommends his book, *Electronic Projects for Musicians* on page 53. Where can I get this book?

—Lisa Meeker
Boulder, Col.

I'm interested in a career in the recording arts. I'm presently working in a small 8-track (demo tape) studio, but it's only a start. Can you help me out?

—Holly Whiteside
Oberlin, Ohio

I am interested in learning recording techniques, theories and different approaches of recording to use in my small home studio. I would be very appreciative if you would be so kind as to list some books that may be helpful to me.

—Charles Maier
Saratoga Springs, N.Y.

I have recently taken an interest in stereo and hi-fi systems in general. I recently purchased a receiver, equalizer, turntable, cassette deck and a 12-band graphic equalizer. Also, I have just started reading your magazine, and find it very interesting and informative. I would like some information on setting up a recording studio on an amateur level. I read a magazine article once, which stated that one could purchase the basic equipment needed to do recording for about \$2,500, and that a lot of people were setting up studios in their garages and basements. I would like to know what equipment is needed and also how to go about setting up a small studio.

—Joe Paparo
Lancaster, Pa.

I am a Mexican recording engineer who studied R.I.A.'s "Modern Recording Techniques I" course in Toronto and now I'd like to learn more about schools, universities, courses, seminars, associations, etc., in the U.S. or in Europe. I am very interested in taking another course, so I would kindly appreciate it if you could supply complete and juicier information on the subject, please!

I was working in an 8-track studio and am trying to get into my country's only 24-track facility. So I'd like to find a good and complete course—with so many and

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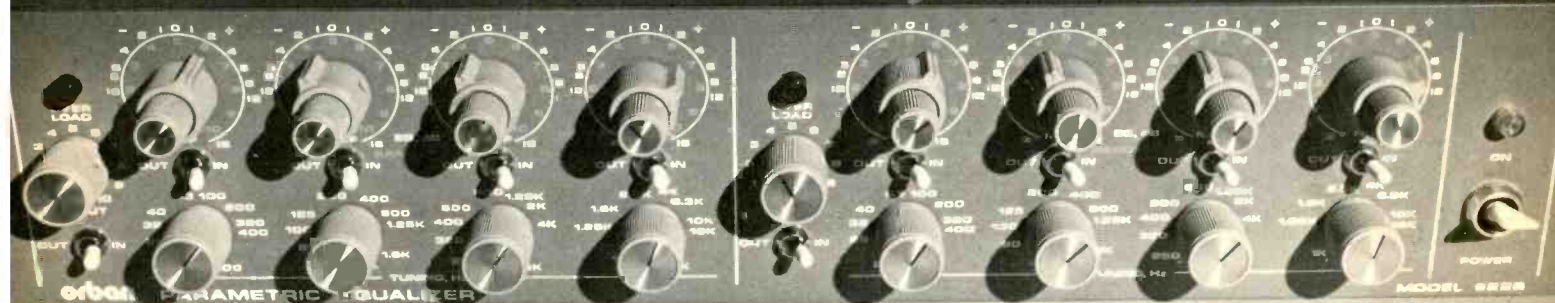
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CIRCLE 100 ON READER SERVICE CARD

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such sophisticated sound processing gear on the market and in studios, you've got to know about everything going on in the studio to be creative and to create a good quality and salable finished product (master tape).

Is there a book that lists all the studios in the world? I understand there is; where can I buy or send for it?

—Francisco Rosas
Mexico City, Mexico

For some time now, I have had a most enjoyable love affair with a most exciting mistress; contemporary music. Along with such a love, I have also acquired a keen interest with regard to how music is created and preserved, and it is because of this interest that I would like to become a recording engineer.

Although I have a somewhat extensive musical background—as performer, writer, listener—my experiences in recording are few. I am, therefore, trying to acquire enough information on what sort of curriculum to take and where to take it in order for me to begin my studies. I am trying to leave no stone unturned because, as I am sure you will agree, it is important to leave no aspect of the field out if one is to become profi-

cient in it.

I have reached a stumbling block, however, in obtaining such information, and I am now turning to you for help. Any assistance will be highly valuable and more than greatly appreciated. Thank you.

—Robert B. Payne
Topeka, Kan.

We had to single you out from the crowd, Robert, because it was your magnetic letter that spurred us to compile this latest update on schoolsnbooks for the clamoring multitude.

If you do happen to stray from your proclaimed love, feel confident in the one you do not mention, though obviously very close to you. You write real nice!

Thank you for publishing a thoroughly enjoyable magazine; I subscribed about a year ago, and have not been disappointed in the least.

Perhaps you can help me; I am currently enrolled in an electronic technician training program. It is becoming increasingly apparent to me that even after I finish the prescribed curriculum, I will not be prepared to work as a studio technician. Can you recommend any

book(s) that might be instructional in this specialized field? Also, are there any trade organizations? Thank you for your time and trouble.

—John Witthaus
St. Louis, Mo.

I have worked as an electronic technician for the past fifteen years. My work has been in the RF and digital fields. Over this period of time, I have worked strictly on a hobby basis in recording.

Everything I have done has been self-taught on a trial and error basis. About six months ago, though, I picked up a copy of *Modern Recording* and was thrilled with it. I subscribed immediately.

Now, as a novice in recording, I have run into a problem and need your help. That problem is terminology. Can you recommend a book or some other source a person can go to for that information?

I am lost by such terminology as: flanger, analog time processor, parametric equalizer, attack, delay, release, de-essing, stereo chorus, etc.

—Stephen R. McDonald
Logan, Utah

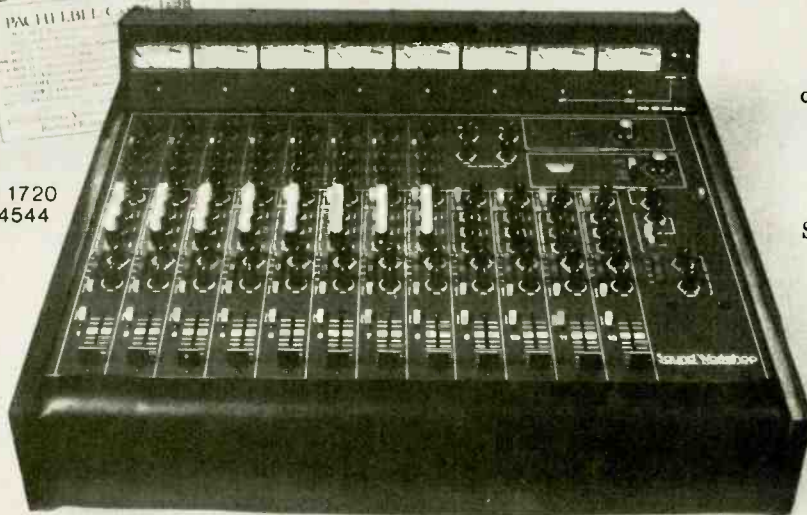
I'm a 23-year old avant garde experimental guitarist and keyboard player. I

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Columbia MX 34544

This album was recorded using a Sound Workshop 1280B recording console, Ampex ATR 100 tape machine with Dolby A, AKG 451E microphones.



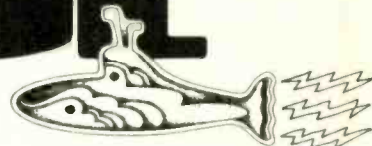
The Greatest Hits of 1720 has topped the Billboard classical charts for over six months. This superior recording clearly demonstrates the exceptional quality we build into all Sound Workshop products. Please write us for complete information on the 1280 series.

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Inside Tip:

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High current drive capability allows easy 2 Ohm performance. The Toroidal design also has no stray hum field, so you can put low-level stuff like preamps and digital delay lines right on top of the P50.

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If you're tired of an amplifier that sounds like a chicken being chased by a steam-roller, give the P50 a listen. . . soothes ravaged ears.

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300 Watts in Mono

High Pass Filter

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Inserting a 1/4" phone plug into this jack disconnects the left and right stereo inputs and automatically bridges the amp for mono operation. No switches. No jumpers. No headaches.

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study building advanced musical instruments and electronic systems as well as building non-electronic advanced instruments. I write to builders of all these fields of art and I have been doing this for about three years now. I'm also a member of Eckankar, the ancient science of soul travel (books are found in book stores and libraries) and the people in Eckankar deal in advance music and recording because they play very spiritually high energy music. My field of study is, as I mentioned, advanced avant garde recording with experimental recording and engineering equipment. Could you send me information on how to get in touch with top industry people of the field of study in which I am.

Also, I'd like to get information on how to go about building a studio. Did you do an interview with Tom Scholz of the group Boston on how he records and engineers his albums? Please answer.

—Craig Briscoe
Kansas City, Mo.

Our interview with Tom Scholz appeared in the July 1979 issue, which is available from the Back Issue Dept. To get in touch with the top industry people, your best bet is to write to the companies you have interest in—you'll find many addresses in our own Winter '80 Buyer's Guide (\$2.95), available through this address or on your newsstand. Read below for info on building a studio.

I enjoy reading your magazine and the articles that are in it. I have one large problem, though, that I think you could help me find a solution to.

I am very serious about making a career in the musical recording industry. I am confused, though, on how to get training in this profession.

I hope that *Modern Recording* might be able to lead me in the right direction. I am seeking the highest level of education offered in the field of recording.

—Michael W. L. Lemke
Worth, Ill.

I've been reading your so very informative magazine for quite a long time, and ever since, I determined to learn as much as possible of what it takes to become a recording engineer. My knowledge so far comes from books related to the recording business.

Since I will shortly be moving to Florida, I would be grateful if you could inform me of the names of schools there, where I can study all the aspects of a recording engineer's artistry on a pro-

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EQ should be used to improve the sound... not to fix the mike!

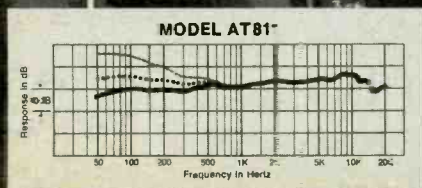
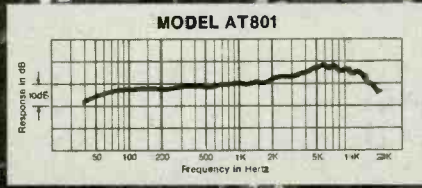
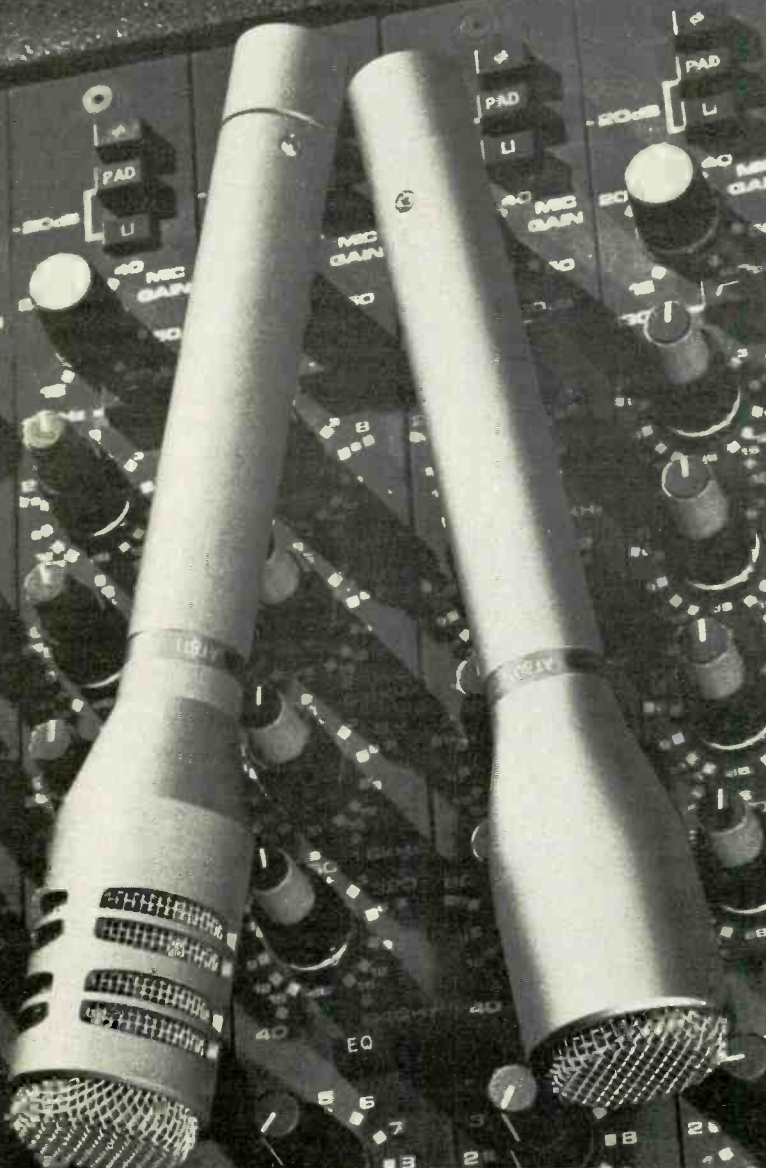
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fessional or pre-professional basis.

—Demetres Anagnostopoulos
Athens, Greece

We suggest that the starting point for any of these letter-writers would be with the Audio Engineering Society (AES), 60 East 42nd St., New York, N.Y. 10017, (212) 661-8528. The AES has its own Journal as well as important biannual exhibition/seminars—not to mention much in the way of information, including a Directory of Educational Institutions with programs in audio and music. Jim Heffernan, for one, might be at a point where membership in the

AES would be advisable. All of you looking for schools—contact the AES for its Directory, and also for copies of articles that appeared in the Journal, including one entitled "The Audio Engineer—circa 1977; What Does He (or She) Do?" Another group some of you might be interested in would be the Recording Industry Association of America (RIAA), at 1 East 57th St., New York, N.Y. 10022, (212) 688-3778. Veteran readers will recognize this information; bear with us while we spread the word to new recruits.

Now, for a list of books that should keep the lamps burning a while: "The

most comprehensive and authoritative reference volume on audio ever published" is Howard M Tremaine's Audio Cyclopaedia. Over 1700 pages long, this book should aid Stephan R. McDonald beyond his hopes. It is about \$40, and is published by Howard W. Sams & Co., Inc., 4300 W. 62nd St., Indianapolis, Ind. 46268. Sams also publishes Modern Recording Techniques (about \$10) by Robert E. Runstein, which is a text that covers equipment, controls and techniques in modern studio recording.

TAB Books, Blue Ridge Summit, Pa. 17214, publishes quite an array of paperbacks that our audience will find desirable. These include Microphones—How They Work & How To Use Them (about \$6) by Martin Clifford, Acoustic Techniques for Home & Studio (about \$9) and Handbook of Multichannel Recording (about \$8) by F. Alton Everest, and a new volume by Everest, the mention of which will surely rivet all your eyes and stamp many an envelope: How to Build a Small Budget Recording Studio From Scratch... with 12 tested designs (about \$9).

Electronic Projects for Musicians—with instructions on building about a score of electronic accessories—and Home Recording for Musicians are two books by Craig Anderton published by Guitar Player Books, P.O. Box 615, Saratoga, Ca. 95070. They are about \$8 and \$10, respectively.

Sagamore Publishing Co., Inc., 1120 Old Country Rd., Plainview, N.Y. 11803, is famous for The Recording Studio Handbook, \$35, by John M. Woram, as well as Lou Burroughs' Microphones: Design and Application.

Billboard Publications, Inc., 9000 Sunset Blvd., Los Angeles, Ca. 90069, publishes annually Billboard's International Recording Equipment and Studio Directory. This would be the volume Francisco Rosas is looking for, listing all the studios in the world.

A volume entitled Tape Editing (\$2) by Joel Tall, is published by Elpa Marketing Industries, Thorens & Atlantic Aves., New Hyde Park, N.Y. 11040.

Finally, you folks into P.A. will find Bob Heil's Practical Guide for Concert Sound (\$10) from Melco Publishing, P.O. Box 26, Marissa, Ill. 62257, a welcome library and flight case addition.

Two further suggestions: Write the above publishers for a list of all their titles. And keep in mind that bibliographies in published books and articles are valuable sources for additional reading matter.

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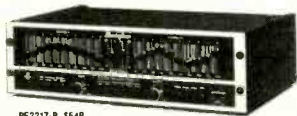


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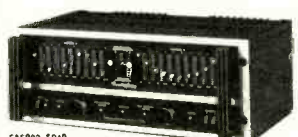


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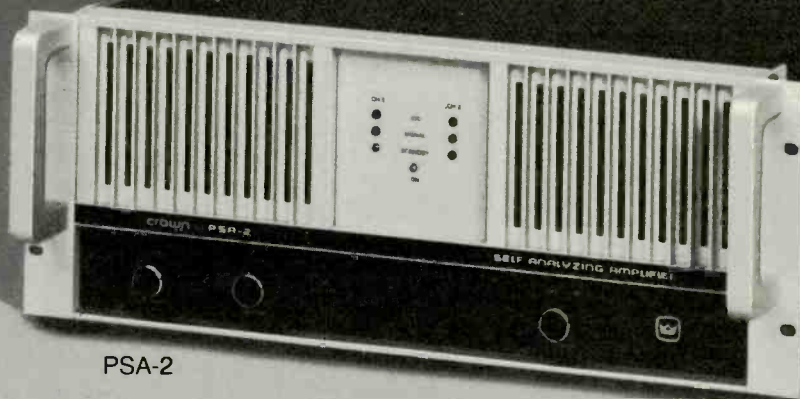
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PSA-2

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M-600



D 150A
IOC



D 75

OF PROFESSIONALLY AMPLIFIERS

	PSA-2 2-channel	DC 300A IOC 2-channel	D 150A IOC 2-channel	D 75 2-channel	M-600 mono
Power into 8 ohms	220w/ch	155w/ch	80w/ch	35w/ch	600w
Power into 4 ohms	350w/ch	250w/ch	125w/ch	45w/ch	1000w
Power into 8 ohms, mono*	700w	500w	250w	95w	600w
IMD into 8 ohms	<.01%, .25w-220w	<.01%, .25w-155w	<.01%, .25w-80w	<.01%, .25w-35w	<.05%, .01w-600w
Hum & Noise	-115 dB	-115 dB	-110 dB	-110 dB	-120 dB

* All two-channel Crown amps are rear-panel switchable to mono mode.



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CIRCLE 104 ON READER SERVICE CARD

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TALK BACK

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

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

Advice for Expanding a "Little Studio"

A few years ago (1977, to be exact), *Modern Recording* printed a Hands-On Report on the TEAC/Tascam 5 mixer. I had just purchased one shortly before your July issue appeared, and so found it very helpful.

Now, in the October 1978 issue, a

report on the Tascam 80-8 was printed. I have an 80-8 and the DX-8 unit. This is my "little studio." What I'm asking is: When recording with the 80-8, I have the D buttons pushed in on the Tascam 5 mixer, and I'm using the faders to control the volume into the 80-8—is this right? Next, where should the level controls be set on the 80-8? I've never read anything that said where they should be set, and if they should then be left alone.

Also, to mix down to a two-track recorder, "auxiliary out" paired with "line out" (1 through 4 on the back of the mixer) must be "Y"-ed as in the diagram below. Is this right?

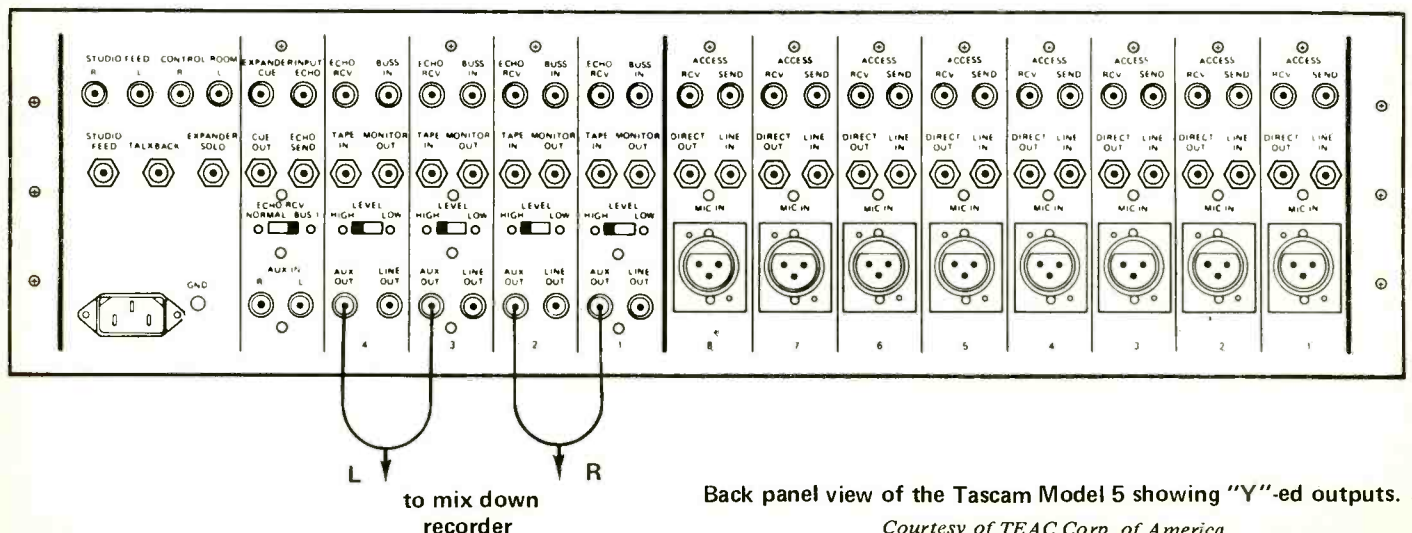
Thank you for your time with this.

—Larry Auman
Auman Recording Studios
Dover, Ohio

In setting up any kind of recording system, I always advise reading the instruction manuals for each component in use. The better the understanding you have of your equipment, the better able you will be to set it up. Using the owner's manual in conjunction with my

answer to your question should help design a system that will best suit your needs and situation.

There are several different ways to use the Model 5 as an eight buss board. As you already know, the Model 5 has only four buss outputs which limits its capabilities in eight buss operation. The method that you mention (using the direct out of each of the eight input channels) is one way to achieve eight buss operation. However, it has its limitations. First of all, you can only use one mic per channel. This is extremely inefficient when recording an instrument such as drums where you may use as many as eight mics, but only want the drums on two or three channels. Secondly, when using the direct out, you lose the usage of your echo receive, your buss in, etc. There's an alternative to using all of the direct outs. I recommend using the configuration that is described in the TEAC publication, "Eight Buss Operation With the Model 5." In short, four direct outputs and the four buss outputs are used together to give you a total of eight busses. This method also has minor drawbacks, but



not the ones as mentioned when using all direct outputs.

There's one major drawback to the use of either system. When using dbx, or other types of noise reduction systems, the signal must be viewed first, *before* it reaches the noise reduction system. This is because the signal that you will see on your 80-8 will be an *encoded* signal which is not to be used for level setting. Some type of meter bridge, such as the MB-20, will have to be added to your system before you can use the dbx noise reduction.

This brings us to your second question: level setting. This procedure is commonly referred to as calibration. For use here, calibration merely means making sure all the "O VU" references in the system are the same. Begin this procedure by turning on the test tone oscillator on the master module. Place the input switch on the number 8 input into the middle position. Depress all four buss assignment buttons, turn the pan pot to the center position. Place the input channel submaster and master faders in the shaded position, then turn up the trim pot of the number 8 input channel until "O VU" is obtained on all four VU meters. Note that you may have to readjust the submaster faders to obtain "O VU" on the four VU meters.

Now apply the reference signal from the buss output directly into channels 1 through 4 on your 80-8. Place the output select switch into the input position and adjust the input control to obtain "O VU." Place the buss outputs into channels 5 through 8 on the 80-8 and perform the same procedure. This setting should place the input controls at approximately the number 6 or number 7 position. If not, your high/low switches are in the wrong positions (switches should be in the *low* position).

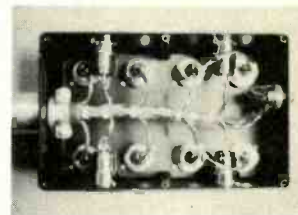
After performing the calibration procedure, place your dbx unit into the circuit. (Please keep in mind that you must have some kind of meter bridge, such as the MB-20, before you can use the direct outputs into your dbx unit.)

As for your last question, as a general rule of thumb, never "Y" together two or more outputs. You're asking for trouble. In your case, there is no need to "Y" the outputs: the mixer will do all of it. Read your owner's manual, it will help you to understand the flexibility of your board better.

— Dale Dalke
Technical Correspondent
TEAC Corp. of America
Montebello, Ca.

CAVEAT EMPTOR. Let the buyer beware.

All multi-cable connectors are not created equal. Some of them may look alike on the surface, but a closer examination of the design and components will show a marked difference. A professional will know the difference; if not now, then in time to come. The Whirlwind Medusa will hold up under abusive day in and day out treatment.



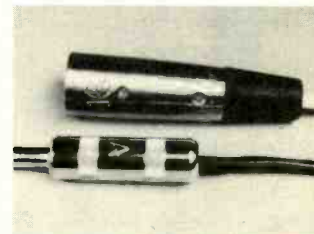
Medusa systems are available in five basic configurations, or with many custom options depending on your specific needs. Multi-pin connectors at either end permit quick connect and disconnect. Impedance matching line transformers can be included for greater line flexibility. Storage options include the Medusa Wheel and two different road cases.



We feel it's important to take a close look at the Medusa and at the competition. Look inside the junction box. How were the connections made? Do they look like they will withstand the kind of torture you will put them through? And what about the strain-relief? Our heavy duty wire mesh strain-reliefs are double reinforced and are at both ends. Check to see if the cables are color coded (by subgroup) on the sends and returns.

This could save you time and aggravation. Only Whirlwind uses cable custom made to our specifications by Belden for increased life and versatility. We individually hand stamp the plug ends for easy identification; We don't use wrapping which can come off. We've designed our Medusas with independent grounds to eliminate ground loops.

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Rochester, New York 14603

Shown above is the standard Medusa 15 with 100' cable, 12 mikes in, and 3 sends.

CIRCLE 110 ON READER SERVICE CARD

Scully Circuits Explained

I am a small studio operator (I use an Akai CS-34D recorder) who subscribes to the technique of using as few mics as possible and I make good, *uncompressed* tapes.

In the July 1979 issue there was an interview with Tom Scholz (Profile, page 72). In it, Tom described a Scully 12-track he had worked with as having linearity circuits that "predistort" the signal to get more output. He said it used Germanium transistors which are no longer available.

I would like to learn all there is to know about these circuits (how they work and on what principle), and perhaps see a representative circuit, or learn where I could get a copy of one. This would help me immensely.

Also, being a small studio operator, I have trouble getting the large studios to notice what talents I have—any suggestions as to how to get their attention?

—Robert Pettus
Louisville, Ky.

Regarding your question about linearity circuits, I found it best to quote directly from the Scully Technical Manual's section on linearity control:

"In a properly adjusted tape recorder, nearly all the harmonic and intermodulation distortion is caused by the approach to saturation of the magnetic tape used. The Scully 280 uses a linearity extending circuit which permits recordings to

be made at normal levels with greatly reduced distortion, or at somewhat higher levels without exceeding the usual amount of distortion. (See schematic of linearity circuit below.)

The record amplifier card contains two diodes, CR801 and CR802, whose forward conductance increases with signal level so as to minimize the drooping tendency of the overall transfer characteristics. This can be called "predistortion," which is complementary to that which is inherent in the tape. It has the effect of cancelling out the distortion which would otherwise be caused by the non-linear relationship of remanent flux on the tape to the audio-frequency driving current.

As the voltage sensed by the diodes CR801 and CR802 increases above threshold in either direction, the diode conductance increases, cutting down on the amount of inverse feedback provided by emitter degeneration if Q802, and boosting the signal by the amount required for linearity. Now the shape of the compensation required is quite constant with changes in recording head characteristics, oxide formulation, etc. However, the threshold point will be shifted by a change in recording head sensitivity (new head of different inductance) or a major change of tape characteristic, e.g., low noise to high output tape. Therefore, the linearity adjusting pot, R618, is provided so that the current level which corresponds to the

"knee" of the transfer characteristic can be matched to the threshold voltage of CR801, 802 where the diode conductivity starts increasing."

—Ed Zdobinski
Customer Service Manager
Ampro-Scully, Inc.
Newton, Pa.

The consensus of opinion in these parts is that if you want those larger studios to notice you fast, go into competition with them! Offering a good service at a reasonable price and "stealing" away a job or two from a major studio in your area is a sure way to make them take a second look at your prowess.

—Ed

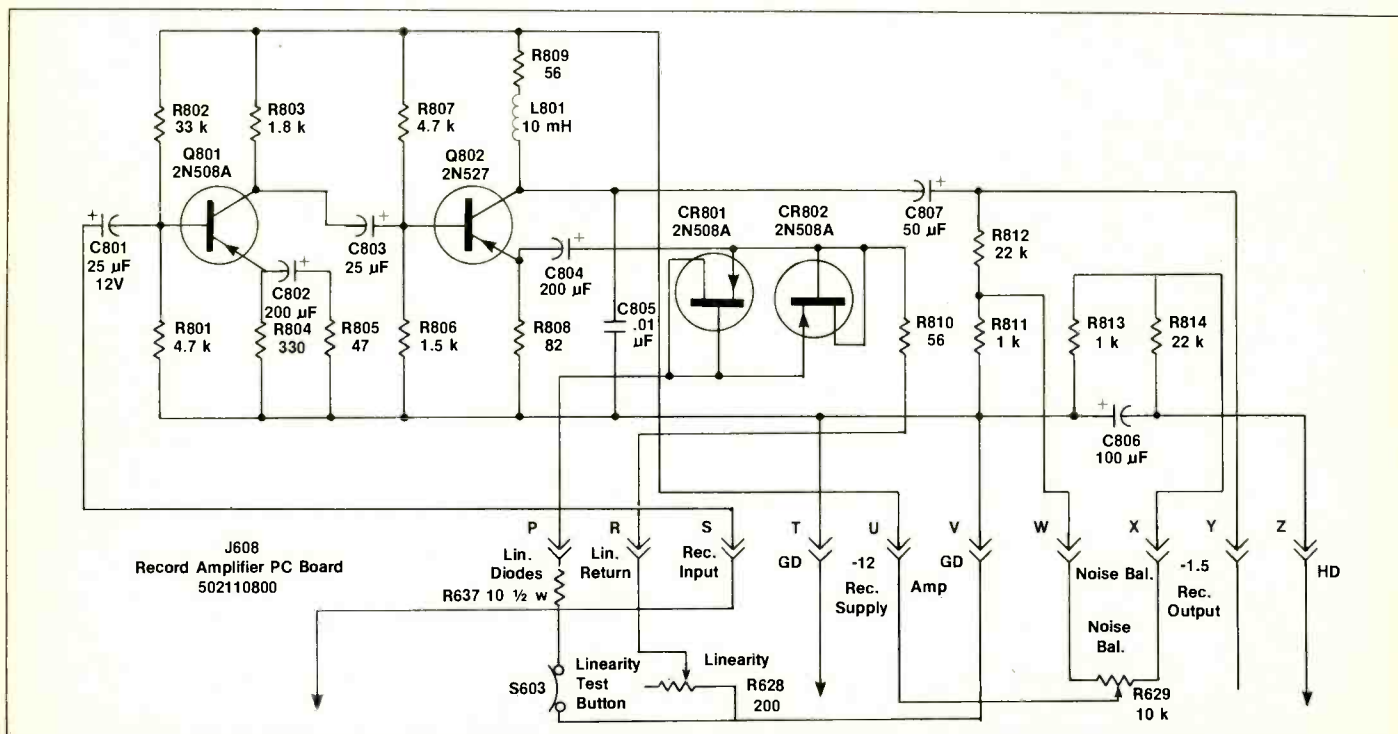
Leader of the Pack

I must thank you for the article by Craig Anderton, "Build A Dual Limiter," which was printed in the November 1979 issue. It came at a perfect time for me. Please continue with articles of this type and sophistication.

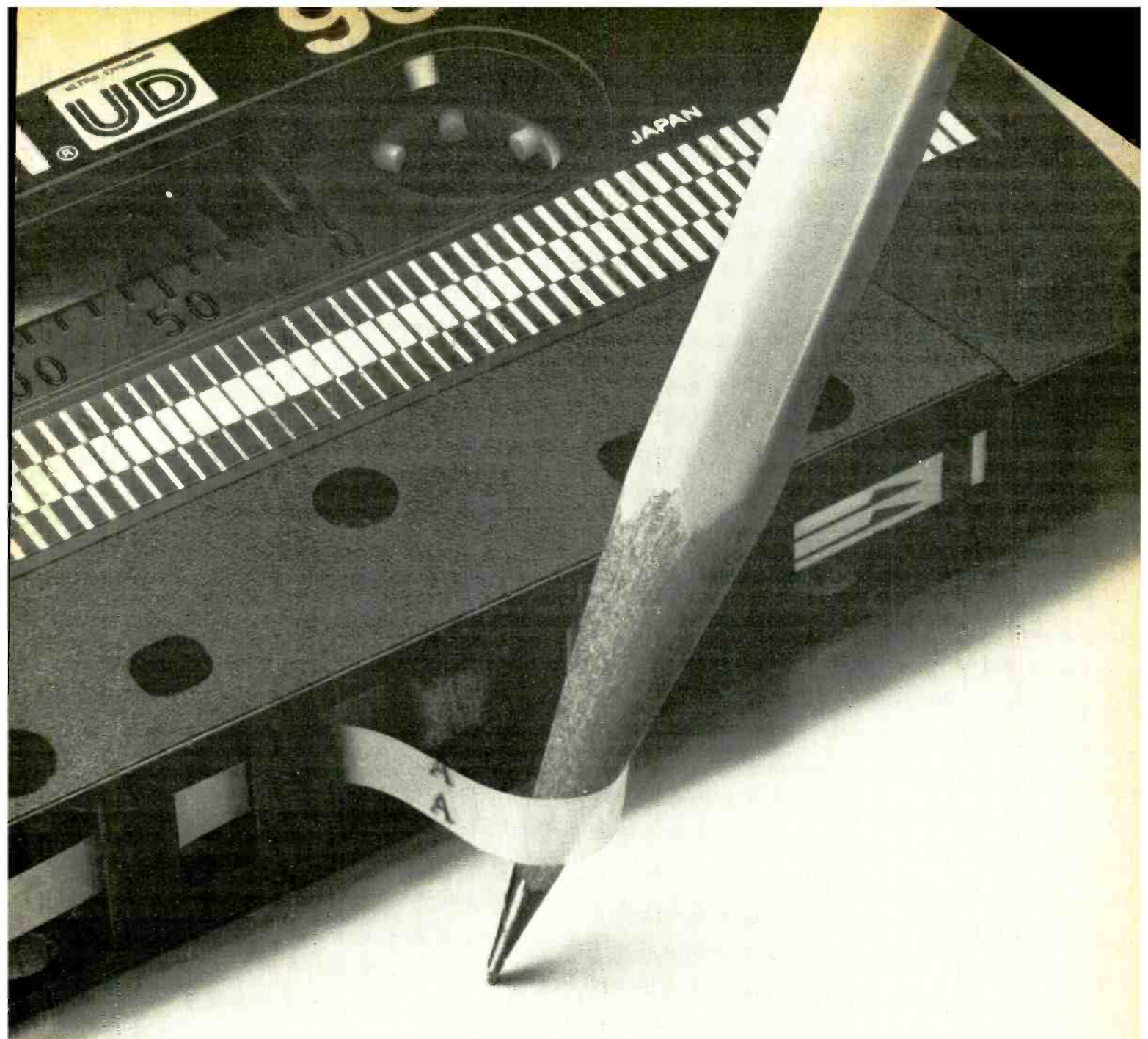
I have been trying to find plastic leader for cassette tapes in bulk form with no success. Can you direct me to a source for it? No one seems to know where to get it out here. Any information would be helpful.

—Dale McKenna
Lompoc, Ca.

Don't let Arthur Brandywine's seemingly derogatory comment, "We make



Schematic diagram of a Linearity Circuit.



We put more thought into our leader than most manufacturers put into their tape.

One of the reasons Maxell has such a great following is because of our leader.

It has a built-in non-abrasive head cleaner designed to remove the oxide residue other tapes leave behind, without damaging your tape heads.

It also points out what side of the tape you're on (A or B) as well as which direction the tape is traveling. So it's almost impossible to make a mistake.

It even gives you a five second cueing mark, so you can set your recording

levels without wasting tape. Or time.

Obviously, all the thought that went into our leader was designed to help you get more out of our tape.

So if you think our leader sounds impressive, wait till you hear what follows it.



CIRCLE 79 ON READER SERVICE CARD

Maxell Corporation of America, 60 Oxford Drive, Moonachie, N.J. 07074

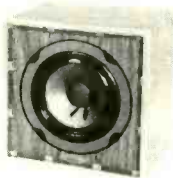
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CIRCLE 142 ON READER SERVICE CARD

everything odd!" fool you. Tapemaker, Inc. of Westbury, New York does make some odd — unusual — items but they all grew out of specific consumer requests. Tapemaker, in essence, offers a line of tape accessories that fills a specific void in the professional audio field. Brandywine likes to think that they pick up where the major tape manufacturers leave off. That view is shared by George Armes of Ampex, Inc. of Redwood City, California who recommended we contact Tapemaker when asked about the availability of bulk form cassette tape leader.

The leader you are looking for must be of a strength capable of withstanding the sharp stops and starts it will experience while at work in your cassette deck. Tapemaker offers a line of anti-static leader that comes in a standard length of 3200 feet on a 10½ inch reel. This reel, which comes in colors as well as white, sells for about \$4.75 to \$5.00.

Tapemaker, Inc., located at 48 Urban Ave., Westbury, New York 11590 (telephone number 516-333-2700), also offers a complete line of paper leader, splicing tapes and leader timing tape. If you have other "odd" requests, we suggest you get in touch with Tapemaker and see where it leads you!

Taking the Pressure Off Musicians

I would first like to compliment you on your fantastic magazine. I also have a problem that I believe you can help me find a solution to.

During my recording sessions, I use my cue VU meter as a phasemeter by sending mono signals to it. Sometimes, however, I forget that a musician is wearing headphones, which results in him having to bear a great deal of sound pressure on his ears. Can you give me a schematic of a phasemeter to rectify this problem? Any other solution or suggestions would be greatly appreciated, too.

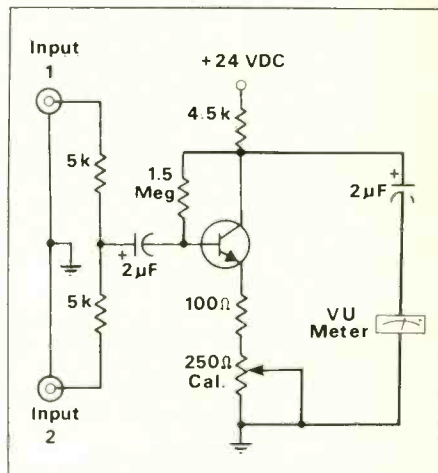
— Jaap Brunner
Gorkum, Holland

Some professional recording studios equip their consoles with an oscilloscope, as this is the most accurate way to measure phase conditions during a recording or mixdown session. The oscilloscope will display the instantaneous relative phase between any two channels. Another type of indicator which can be connected to the recording console is a correlation meter. This

is a center-zero scale meter similar in function to the phase oscilloscope except that it provides average rather than instantaneous phase information.

If you feel that out of phase conditions exist during your recording sessions, I strongly suggest that you check to see if all your microphones are in phase with each other. Even an improperly wired mic cord can cause a 180° out-of-phase situation, which can cause a real headache if you're stereo miking a single sound source.

The schematic below shows a metering device which will indicate whether two signals are "in" or "out" of phase with each other, providing that the signals feeding the two inputs are of



equal level. "In phase" signals, when mixed together are additive and should produce a higher reading on the meter than "out of phase" signals which tend to cancel each other.

— David Kalmbach
Chief Engineer
Atlantic Sound Productions
Marietta, Pa.

Giving "Live" Sound a Boost

My questions deal with the subject of equalization and analysis as used in "live" sound reinforcement systems.

How well can a sound system be tuned using an octave bandwidth graphic equalizer?

Is a 1/3-octave equalizer better? Why? How about a 2/3- or 1/2-octave equalizer?

Can an octave bandwidth spectrum analyzer be used effectively to tune a system when you're using a 1/3-octave equalizer?

Is a spectrum analyzer necessary in order to properly utilize a graphic equalizer?

Sorry, BGW.

Everybody knows the BGW 750B is a very good professional amplifier.

What you might not know is that we make a better one. It's called the Crest P-3500. And we're called Crest Audio. We're a brand new company—with brand new ideas.

The Crest P-3500 is more powerful, more versatile, more functional, and much smaller than BGW's 750B. (Only 3½" high, the P-3500 gives you more power while using ½ the rack space.) It offers you better sound, better control, better safeguards, even a better VU metering system. Just check the specs.

The P-3500 has all the features you'd expect from a great pro amp—and then some. Like the independent dual power supplies that provide more headroom while

virtually eliminating crosstalk. Like forced air cooling with massive heat sinks for cooler operation. Like built-in circuit breakers so you can forget fuses. Like modular construction for easy servicing. It even has circuitry for active balanced or unbalanced inputs—no need for an external transformer.

What about reliability? Glad you asked.

Although it's new, the Crest P-3500 has already proven itself on several major concert tours. It's been put to the test in huge stadiums. In discos. In recording studios. And it's

passed every test with rave reviews.

One last thing: We've got nothing against BGW. In fact, our founder worked there for years. It's just that we thought it was time somebody built a pro amp with the real needs of the professional in mind. So we did.

Ask your dealer to demonstrate the Crest P-3500. Then check out the BGW 750B. Go ahead, compare them. We want you to know what we've known all along:

The Crest P-3500 is the best pro amp in its class.
Sorry, BGW.

AMP	POWER OUTPUT			DISTORTION**			POWER SUPPLY	VU METERS		SENSITIVITY CONTROL	BALANCED INPUT	VERT. RACK SPACE	MFG. SUGG. RETAIL
	STEREO* @ 8 ohms	STEREO* @ 4 ohms	MONO @ 8 ohms	T.H.D.	L.M.D.	T.I.M.		LED'S	MODES				
CREST P-3500	250 watts/ch.	400 watts/ch.	800 watts	.06%	.01%	.01%	Dual	12 (color coded)	Bar or dot	Yes	Yes	3½"	\$1,099
BGW 750B	225 watts/ch.	360 watts/ch.	720 watts	.1%	.02%	.02%	Single	10 (all red)	Bar only	No	No	7"	\$1,199

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**Measured from 250 milliwatts to rated output into an 8 ohm load.



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Any insights you can provide me with will be greatly appreciated.

—Patrick J. Spahr
Greenbelt, Md.

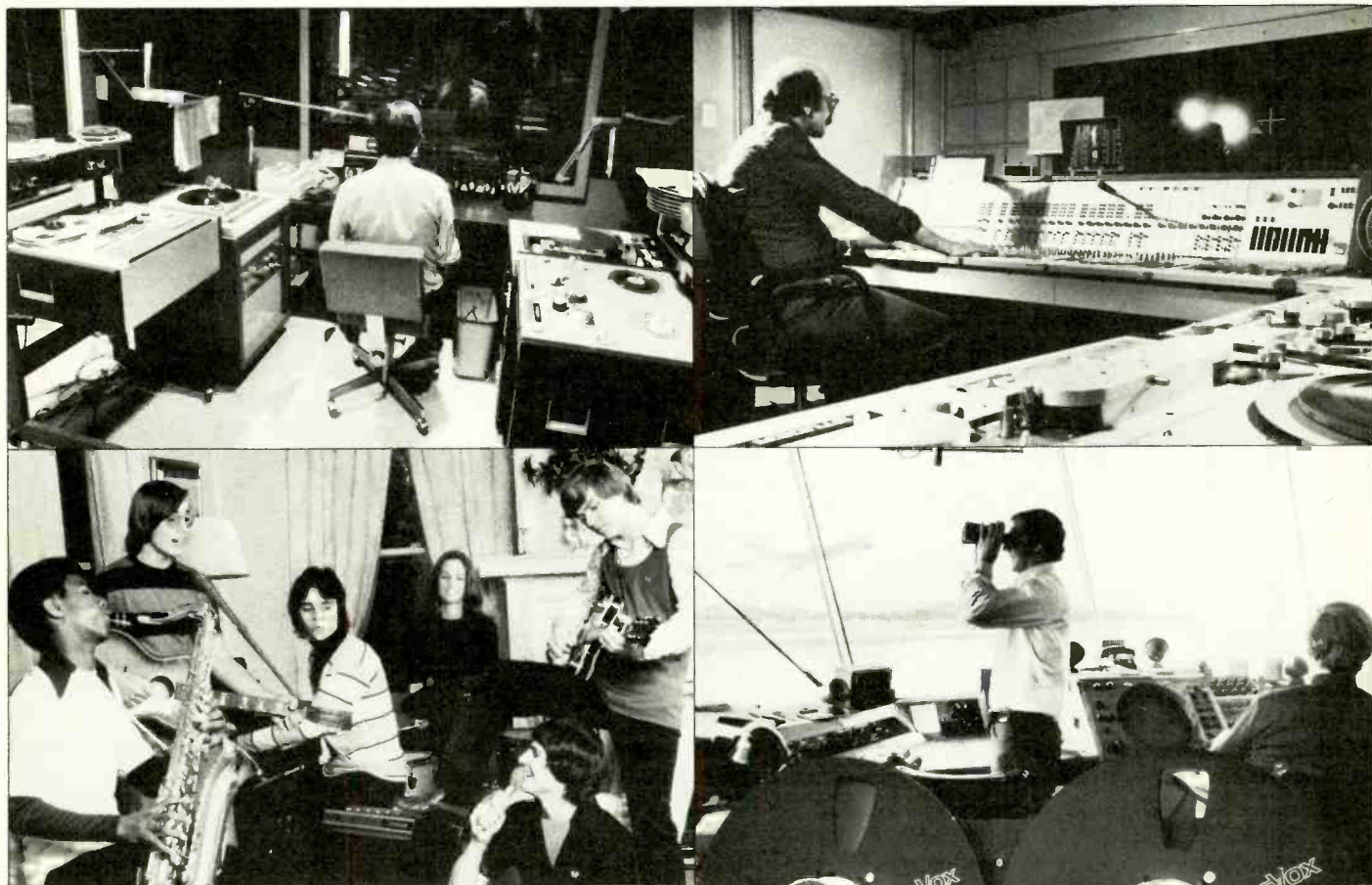
Your question deals with one of the most misunderstood and misused techniques available for the sound reinforcement field. I use "technique" because a great deal of interpretive judgment and experience is necessary to expertly use your P.A. system and the analysis system that measures its effect on the room. You must be aware of the limitations of both systems. The P.A. cannot perform beyond these limits without serious consequences. Basically, you can't buy a \$200 equalizer and expect \$2,000 worth of bass.

To begin at the beginning, the P.A. must be well balanced. Each speaker and amplifier must share an equal part of the load. There is no equalizer that can overcome major discrepancies in the stacks. Pay attention to the way the P.A. is aimed. Insure that you have good coverage by walking the hall and using the best analyzer available to date—your ears. Even coverage has no hot spots and produces even reflections resulting in a more pleasing reverberant sound from the room, much as a symphony excites the whole room.

You ask what EQ is best to use—no EQ is best. But we feel that to really optimize a system one needs a *general* control to trim the power delivered to each "way" of the stack and a more *specific* equalizer to compensate in narrow bands. The reason for this is that every EQ affects the amplitude and phase of signal as it passes through. Change in amplitude response is perceived as a loudness change but phase shift more subtly deteriorates the fidelity. The equalized part of the spectrum aurally appears to be misplaced or detached from the presence of the material. Signal phase is shifted as each EQ band rolls on and then rolls off to form the band pass filter. It seems best then to make general corrections using the least number of filters. We find that the crossover is the best place to make these adjustments. Drive levels are trimmed to compensate for speaker efficiency differences, hall high frequency absorption, and low frequency reverberation. The graphic is then used to make minor corrections in response within the crossover bands. Remember, large amounts of cut or boost result in correspondingly large phase shift errors.

Next, consider the measurement

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ity, and tape-protecting features like a motion-sensing logic-controlled switching system, the B77 is perfect for anyone who needs to record anything.

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- Stereo 2 way or Mono 3 way.
- 18 dB per octave Butterworth filters.
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- Frequency, Bandwidth and Gain control on each band.
- Peak indicator on each band.
- In/out switch on each band.
- Balanced in and out.

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CIRCLE 128 ON READER SERVICE CARD

system. Generally, spectrum analyzers available today are quite good. We have used many and find that most are more than adequate for sound system analysis. Be familiar with yours. Experience with the analyzer is very important.

The resolution of the instrument should be the same as or greater than your equalizer. That is, 1/3-octave analyzers work best with full 1/2- and 1/3-octave graphics. The problem occurs when a full octave analyzer is used with a 1/3-octave graphic. Full boost or cut in one of the EQ bands produces very little change in the full octave display. This could lead to an erratic EQ curve and a very displeasing sound. It might be wise to operate the graphic as if it were full octave by tuning 3 bands at once. When you are satisfied with the analyzer display, smooth the groups of three into a continuous contour.

Measuring microphone techniques cause more problems than any other single factor. One must understand what the mic is hearing before it may be used to full advantage. The mic must be of good quality with much better response than that of the P.A. This will insure that you are equalizing the system and not the mic. It must be omnidirectional to be sensitive to sounds coming from all directions. You must also understand that the mic does not "hear" the entire room. It is only sensitive to sound pressure levels at one location. This fact may be easily demonstrated by placing a mic and equalizing for a flat display. Now move the mic a few feet and you will no longer see a flat response. Many measurements must be taken over the entire room and the results interpreted by *you*. Average what you see in your mind and rely on your ears to reinforce your judgment. There is no analyzer that will give you an absolute curve with just one measurement.

—James M. Bornhorst
Vice President - Electronics
Showco, Inc.
Dallas, Texas

Doing Demos Down Under

You probably get fed up with people writing to you with requests for information, but I'm afraid that out here in New Zealand it's difficult to get pro opinions on equipment!

I have recently purchased a Sony Model TC-788-4 4-track and I also own a Sony TC-630. Because of government import restrictions, this sort of gear is not generally available here, and it fol-

lows that information is hard to get.

I am a semi-pro musician and—I guessed it—I want to use these decks to record demos at home, etc. My idea is to use the TC-630 to drive the TC-788-4 and also to use the TC-630 as the mixdown machine. I will be using Shure SM58 mics (two of them) and two AKG D200 mics. At the moment, I don't have a mixer, but a friend will probably build one for me, just a very basic 4/2 unit with volume and tone controls on each channel, a master gain together with an effects send/return.

Now, my problem is this. I am a drummer and thus have had very little to do with amps, leads, speakers, impedances, etc. I even hate to plug guitars in! I do, however, understand the general principles of recording. What I can't work out, however, are the following:

How to do a mixdown on the TC-788-4, i.e., after recording on all four tracks, how do I reduce them down to, say, channel one without a mixer? Can this procedure be carried out with the machine's on-board facilities?

Is the TC-788-4 compatible with the TC-630?

The only effects I have at my disposal are an Ibanez analog delay (model AD-150), an Ibanez compressor (model CP-830) and an Ibanez graphic equalizer (model 95, a renometer), all of which have unbalanced lines and hi-Z inputs and outputs. Are these compatible with the set up described?

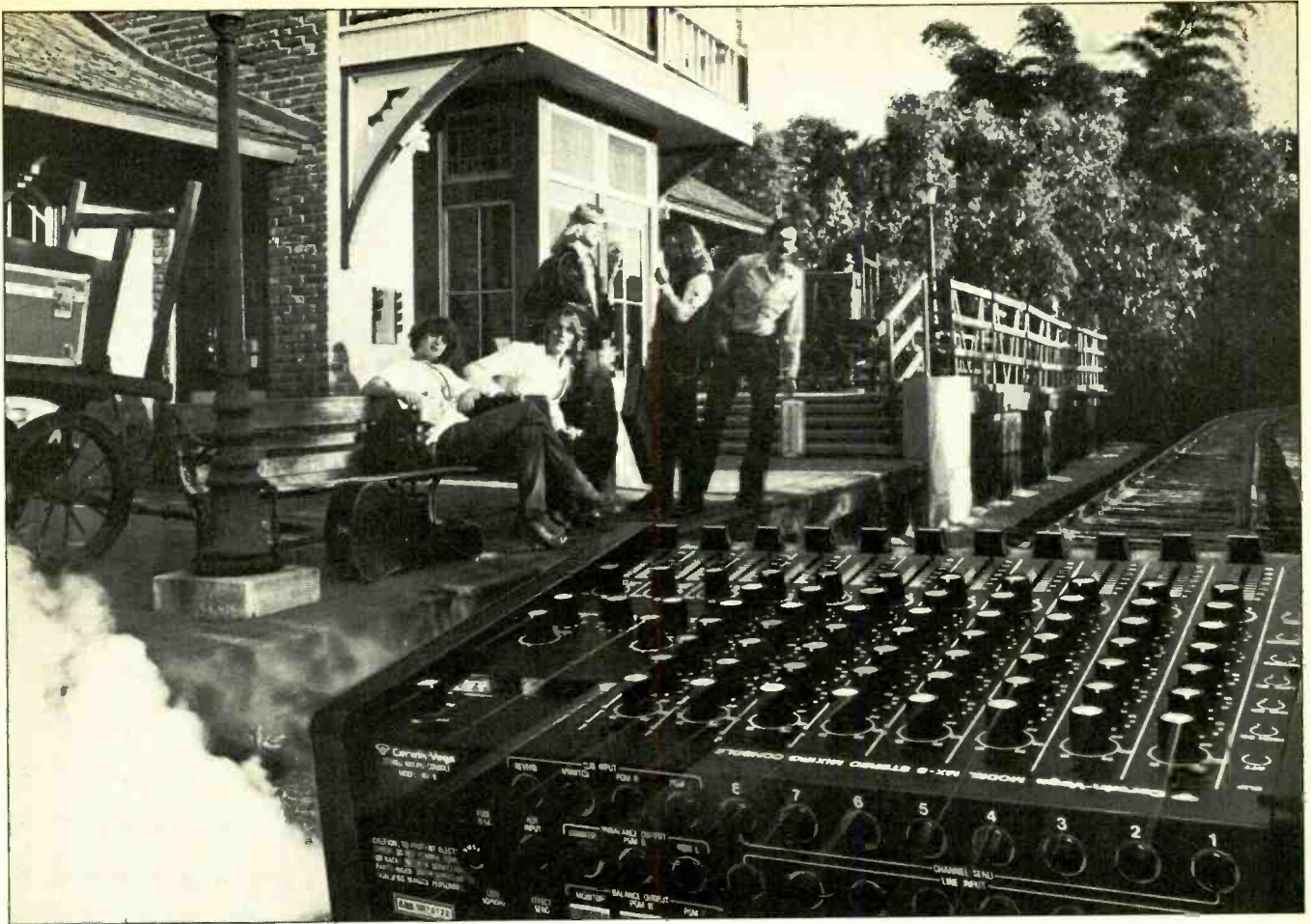
As you can see, it's very much a budget operation, but we're very limited as to the sort of units available here. Your reaction will probably be much the same as mine—check with the local Sony dealer. I did that, but they didn't have any more idea about my problems than I did! I have written to the Sony Corp. in Japan, and am presently waiting for their reply, but I thought I'd check with you guys, too.

—Roger Watkins
Wellington, New Zealand

[Roger et al: Please note, we do not get fed up with people requesting information. On the contrary, we are more than happy if we can help. —Ed.]

I will answer your questions as you have put them to me. Unfortunately, I have to begin by disappointing you.

There is no way to mixdown from the TC-788-4 to the TC-630 without incorporating the use of a mixer. The reason for this is that the TC-630 doesn't have mic mixing or line/mic mixing facilities.



Get aboard!

Now arriving—Just what you need to put your career on the right track: the new MX-8 Mixing Console from Cerwin-Vega!

The MX-8 gives you First-Class performance and operational features at an Economy-Fare price. And to make sure you aren't left standing at the station, we've built enough MX-8's to reach your town, whether it's on the Southern Pacific or off the Great Northern.

The MX-8 will get you where you're going in style: From sound reinforcement mixes in Atchison, to multi-channel recording mixes in Topeka; and pro sound set-ups in Santa Fe!

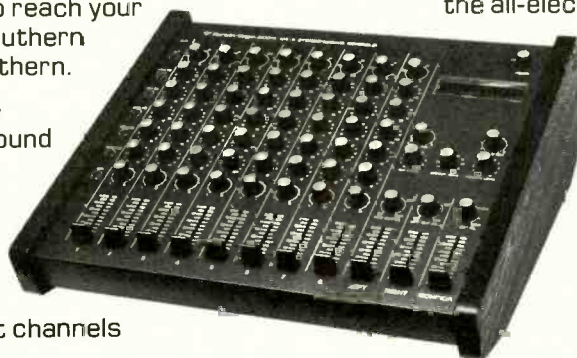
Each MX-8 gives you 8 input channels

and as many as 4 separate output mixes for monitor feeds or 4-channel recording. Need more tracks? Simple. Just couple a pair of MX-8's!

What about the Long Haul? Relax. The MX-8 is incredibly quiet and distortion-free* thanks to the most advanced BIFET integrated circuitry ever! And the all-electronic analog delay circuit provides reverb quality and control that's unheard of in other mixing consoles in its class.

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*Noise: (-125 dB "A")
Distortion: (Less than 0.05% typically)



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CIRCLE 135 ON READER SERVICE CARD

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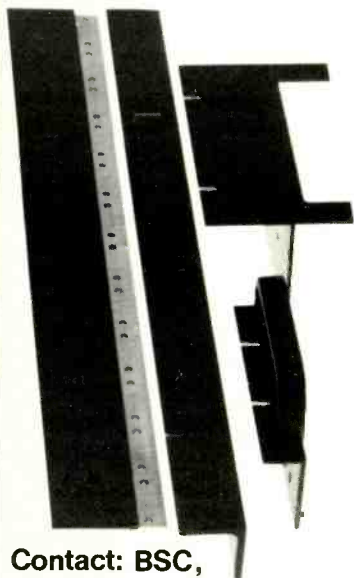


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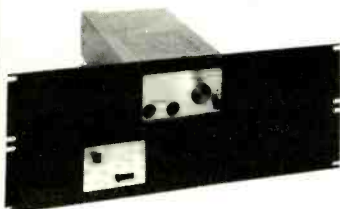
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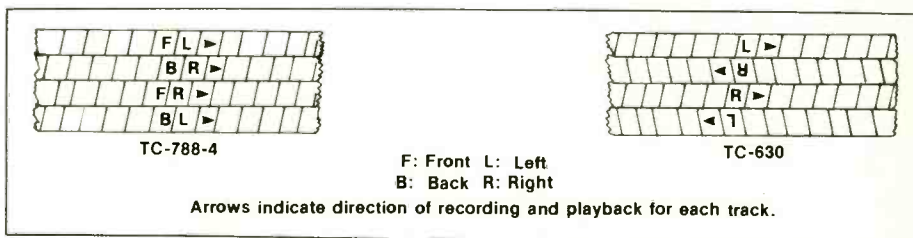
Now, that you've purchased the equipment . . . contact BSC to mount it!



PHONE NO. 312-452-5551

As to whether the TC-788-4 is compatible with the TC-630, basically they are not. The TC-788-4 is a 4-track deck and all the tracks are recorded in the same direction. The TC-630 is a quarter-track machine (2-channel recording) which means you can record on only two of the four tracks at one time. You can record on the other two tracks when you turn the tape to the other side. This means that every other track on the tape is recorded in the opposite direction, as shown in the diagram below.

However, if you record on just the front channels (left and right) of the TC-788-4, you can play back on the TC-630. Conversely, if you are content to play back just the front channel of the TC-788-4, you can use a tape that was recorded on the TC-630.



As for your question regarding the compatibility of the Ibanez equipment with this set-up, while I am not familiar with their precise specifications (such as input/output impedances, levels, etc.), I would imagine that as long as you prepared your hook-up cables properly, you could use them with your machines.

—Hideo Imai
Product Planning Manager
Sony Corp. of America
New York, N.Y.

No Aid for Homemade

I would like to make some record albums at home from my master tapes. Are there any disc-mastering lathes, disc cutters, etc., manufactured for semi-professional work (preferably under \$2,000)? If there are, please let me know how to get in touch with the manufacturers.

—Lee Prell
Mira Loma, Ca.

There are a lot of things you can take up at home, Lee, but apparently making discs isn't one of them. To find out if there was anything in your price range that would be suitable for home use, we checked with Gotham Audio in Manhattan first and then called several manufacturers and distributors of disc-cutting equipment, so as to leave no stone un-

turned. Unfortunately, none of these upended stones revealed anything within your budget. As a matter of fact, the prices we were quoted for lathes ran from \$20,000 and up; some second-hand ones from as much as \$5,000 to \$7,000. Obviously the amount of money that you are willing to invest would depend upon whether you were looking to make these records as an additional source of income, or for purely avocational and recreational reasons. Since your letter doesn't go into detail, we were forced to assume the latter.

Bob Bushnell of Westrex, Co., of Burbank, California gave us some background on the situation. Back in the nineteen-forties, several companies did exist that manufactured home cutting systems. Wilcox-Gay manufactured low-

priced pieces appropriate for home use, but they've been out of business for years. Rek-O-Kut, now a division of QRK, in Fresno, did manufacture disc-cutting equipment, but has since discontinued that line and concentrates on tone arms. Presto (check out the details on this company and a reader down in Georgia with a situation similar to yours in the March 1979 Talkback section, page 22, and the subsequent information offered in the May 1979 Letters to the Editor column, page 6) had a line in the pre-war years that was aimed at heavy home/light professional users, but they are no longer in business. Not to scuttle your plans, but Richard Marucci of Capps, Inc. of Valley Stream, N.Y., seemed to sum up the situation with his feeling that it might cost as much as \$30,000 to \$40,000 just for you to get set up, even utilizing used equipment.

Now for the good news. We've learned that small, professional mastering houses charge only about \$40.00 a side to master your tapes. The larger houses can charge as much as \$100. per side—but that's still twenty sides for your \$2,000. Apparently, the low cost and accessibility of these services helped to phase out the home disc-cutting market. And, unless you planned on making a great number of records from your tapes, having it done professionally certainly seems a reasonable solution to us.

Incredible...

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the XL-305
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Master Room™

- Totally new design approach
- The sound of a live acoustic chamber
- Natural sound, even on percussion
- Self-contained rack mount unit
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The Master Room XL-305 is a totally new design approach in reverberation technology. For the first time, the qualities and properties of a live acoustic chamber are available in a rack mount unit at an affordable price. There is a natural sound on percussion, as well as voices and all other musical instruments. This quality has not been obtainable from other compact reverberation devices. The XL-305 exhibits no unwanted side effects; it's as natural as a live chamber itself.

To hear this new advancement in reverberation, see your professional audio dealer and ask for a demonstration of this exciting new unit. Hear the XL-305 "Acoustic Chamber Synthesizer" for yourself, and you too will agree... it's INCREDIBLE.

MICMIX Audio Products, Inc.

CIRCLE 48 ON READER SERVICE CARD

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Dallas, Texas 75220

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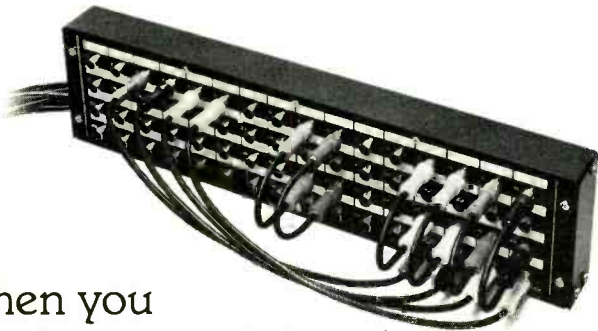


Dollar for dollar and spec for spec this is the best buy in an 8-track multi-channel recording rig. Period. The 80-8 is the most popular 8-track in the world, and the results produced on it



are a matter of record. Sometimes gold. The Model-5B with new IC's and color coded knobs. is the perfect companion mixer. Together, you'll have the most functional, economical 8-track hardware package you can buy.

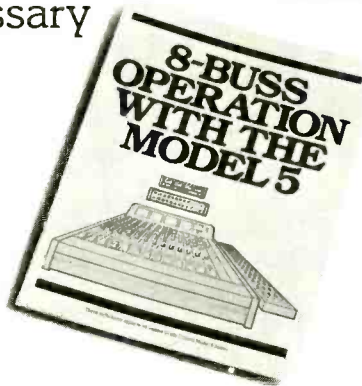
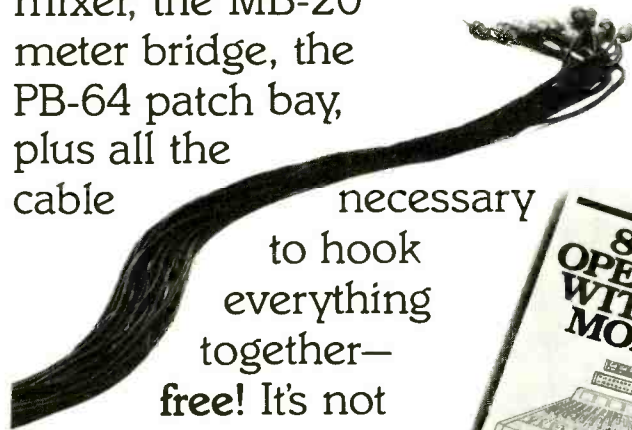
RIGHT NOW!



When you purchase an 80-8 and Model-5B, between January 1, 1980 and April 30, 1980, you get the Model-1 monitor mixer, the MB-20 meter bridge, the PB-64 patch bay, plus all the cable



necessary to hook everything together—**free!** It's not just ordinary cable, either—it's TEAC's exclusive low capacitance cable—the same high quality cable recommended for all Tascam Series systems interface.



Be sure to contact your Tascam Series dealer for details on this special limited offer. He'll show you the 8-buss operation brochure we prepared that takes you step-by-step through the most flexible, functional and economical 8-track recording system available. Now, more than ever, patchwork pays off.

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THE **PRODUCT** SCENE

By Norman Eisenberg

NEW ITEMS FROM JBL

Four new electronic products are featured in recent offerings from JBL. In the former group are the model 7510 automatic microphone mixer which comes standard as a four-input module, and is expandable to a 24-input capacity. The 7510 is designed for a broad range of professional applications and is said to be particularly suited for public meeting facilities.

For fixed-installation work, JBL also has announced three more products. The model 5302 is a mixer/preamplifier capable of combining two line- and six microphone-inputs. The model 6502 mixer/amplifier is an 8-input mixer combined with a high-power single-channel amplifier. The model 7130 is a dual-input compressor/limiter.



CIRCLE 7 ON READER SERVICE CARD

KOSS DIGITAL DISPLAY



Headphone and loudspeaker manufacturer Koss has entered a new product area with the announcement of its K/4DS digital delay system. The new device uses a patented single-circuit conversion unit said to be capable of storing nearly 17,000 bits of information. This technology, says Koss, accounts for the "price breakthrough" of the new system, \$500—which includes a built-in 15-watt amplifier. The device features four "environmental settings" for "small club, theater, concert hall and auditorium." Also included is an EQ switch for signal balance as well as an isolated stereophonic function with twin jacks and stereophonic amplifiers.

CIRCLE 8 ON READER SERVICE CARD

SONY'S WIRELESS MIC

Sony's wireless microphone system (already used on television), the model WRT-57, is described as being about half the size of conventional hand-held wireless microphones. It weighs 7 ounces, is 6.8 inches long and requires a 6.4-inch antenna wire. The full system includes the mic itself plus tuners and related units. A uni-directional type, the mic uses the UHF band (947 to 962 MHz, with fifteen available channels). Frequency response is rated as 50 Hz to 15 kHz, with "wide dynamic range that provides greater linearity than other wireless mics because the system uses no limiting or other noise-reduction systems to accomplish this wide range."

CIRCLE 9 ON READER SERVICE CARD

PASSIVE 1/3 OCTAVE EQ

In offering its model 4320 one-third octave passive equalizer, White Instruments of Austin, Texas, points out that passive EQ units "add no noise" and only "negligible distortion." They also are claimed to be highly reliable since they have no power supplies or active devices "to cause trouble." Furthermore, says White, they have the speed, slew-rate or transient response approaching a "straight piece of wire." Finally, White points out that its model 4320 has no insertion loss. It is designed to look at a very low source impedance, nominally 100 ohms or less, and to be terminated with 10 K ohms. Most modern audio equipment, says the manufacturer, can easily accommodate this installation. The model 4320 features twenty-seven one-third octave filters on I.S.O. centers from 40 Hz through 16 kHz. Each filter may be attenuated up to 10 dB. The front panel includes an EQ in/out switch; the rear contains two accessory octal sockets, one for a bi-amp or tri-amp crossover network, the other for a response-shaping filter such as a high- or low-pass network. Price is \$550.

CIRCLE 10 ON READER SERVICE CARD

COMPACT CASSETTE DUPLICATOR

A new compact cassette duplicator—the Otari model DP-4050-C2—is described as a compact version of Otari's DP-4050. The new version features a cassette master and two slaves. It also has the capability of adding up to nine more slaves in groups of three, for a total of eleven slaves all driven from one master. The new configuration retains all the features of the costlier versions. These include an 8:1 duplicating speed ratio, "long-life" ferrite heads, flip-down panel for easy access to alignment controls, modular transport units, large VU meters and duplication of all four tracks simultaneously in one pass. From two to eleven C-30 cassettes can be produced in less than two minutes, depending on the number of slaves. The DP-4050-C2 employs individual transport units so that failure of one unit does not disable the entire machine. In addition to automatic rewind and stop, the master transport has a ± 4 percent speed control to compensate for non-optimum cassette masters. Price with two slaves is \$2950. A three-slave add-on unit costs \$2750.

CIRCLE 11 ON READER SERVICE CARD

NAKAMICHI SHOWS METAL-COMPATIBLE DECKS

The new models 480 and 580M from Nakamichi are metal-tape compatible cassette decks priced, respectively, at \$495 and at \$690. Both are two-head recorders with improved transports and the necessary refinements to cope with metal tape. The model 480 features Dolby-B, memory rewind, separate bias and EQ switches, slider level controls, and 47-dB peak-responding meters. It can be operated by remote control and it also can be set for unattended timer operation.

The model 580M offers separate record and balance controls, an output level control and a built-in test oscillator with separate record-calibration controls to adjust tape sensitivity for Dolby tracking. Both models have logic control and both use a closed-loop dual-capstan drive. Specs generally run a little higher for the model 580M.



CIRCLE 12 ON READER SERVICE CARD

METEOR POWER AMP

Meteor Light and Sound is offering the Powermaster 190, a stereo power amplifier rated at 100 watts per channel RMS, 20 Hz to 20 kHz, into 8-ohm loads. Said to be built to meet the requirements of commercial sound installations, the model 190 "combines professional durability with sonic excellence." THD is rated at 0.03 percent. The amp employs totally complementary circuitry for wide bandwidth and high S/N characteristics. Suited for rack-mount, the model 190 features front panel fail-safe circuit breakers, LED peak indicators and individual channel level controls. Price is \$499.

CIRCLE 13 ON READER SERVICE CARD

"PANCAKE" POWERHOUSE FROM SAE

Described by the manufacturer as "the most powerful 1 1/4-inch high amplifier in the world" is the model P50 from the Professional Products Group at Scientific Audio Electronics, Inc. (SAE). Rack-mountable, the P50 is rated for at least 70 watts per chan-



nel into 8 ohms. The use of rugged 15-amp output devices plus a cooling fan, claims SAE, makes the P50 "the first professional power amplifier to successfully meet FTC specifications into 2 ohms with no thermal cycling."

The P50 features a third input jack at the rear which automatically disconnects the stereo inputs and bridges the amplifier into mono operation with a rated power of 350 watts. The P50 also has switchable high and low filters which can be modified to roll off at any frequency desired, thereby eliminating the need for an external crossover. The low-F filter also is claimed to allow using the P50 with the latest cinema noise-reduction systems.

CIRCLE 14 ON READER SERVICE CARD

REAL-TIME SPECTRUM ANALYZER

The Nicolet model 446AR is a real-time spectrum analyzer designed for system integration. Configured for rack-mounting, it has remote-control capability plus sensing and data transfer via a full IEEE488 (1975) interface built-in that allows communication and control by a variety of computers, calculators and other devices. The basic 400-line FFT analysis to 100 kHz of Nicolet's model 446A is retained in the 446AR. Other features include the mathematical comparison of two stored averaged spectra, the ability to integrate or differentiate for conversion of data from acceleration to velocity to displacement, engineering-unit calibration and RMS calculation of selected portions of the spectrum. Options include built-in 1/3-octave, dual-window expansion; digital plotting that preserves full annotation; and mass storage on digital tape. A programmable sequencer—the model 25A—also allows the 446AR to automatically store, plot or stack-plot at preselected intervals, or to carry out automatic spectrum data logging. Price is \$14,350.

CIRCLE 15 ON READER SERVICE CARD

BEYER OFFERS MATCHED PAIR MICROPHONES

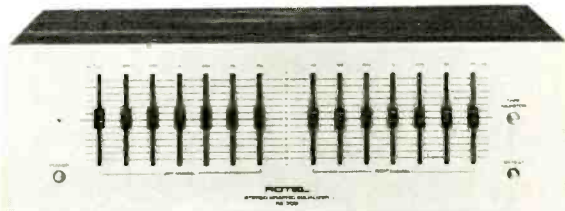
Aimed at recording buffs who are looking for a pair of microphones "versatile enough to capture many different types of musical events faithfully" is the Beyer M 818 LM matched microphone pair. The mics are individually tested and matched pairs of Beyer M 81 studio mics, dynamic types with cardioid patterns. Frequency response is stated as being virtually ruler-flat from 150 Hz to 16 kHz, with a smooth gradual rolloff between 150 Hz and 50 Hz. Output level is given as -55.8 dBm. Impedance is 500 ohms. Front-to-back separation is 18 dB. Each mic weighs 11.3 ounces including a 6 1/2-foot connector cable. Included with the pair are clamps, table stands, a stereo adapter cable, mounting bar and presentation case. Price is \$149.95. Optionals include foam windscreens, plug-in impedance-matching transformers and additional clamps.



CIRCLE 16 ON READER SERVICE CARD

ROTEL DEBUTS LOW COST EQ

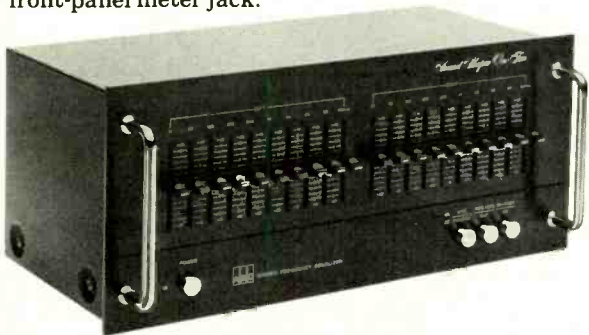
Seven bands on each of two stereo channels of equalization are offered in the Rotel RE-700, listing at \$180. The EQ range on each slider is ± 12 dB. Rotel claims a signal-to-noise figure for the device of 100 dB. Housed in a wooden cabinet, the RE-700 includes tape monitor and defeat switches.



CIRCLE 17 ON READER SERVICE CARD

BSR ANNOUNCES NEW EQUALIZERS

Two new equalizers from BSR are the Sound Shaper Two Mk II, and the One Ten. Priced at \$330, the model Two Mk II offers 12 bands of EQ, each with a range of ± 12 dB. An update of the model Two Mk I, it features dual LED metering. The front panel includes a jack for using an ADC sound-level meter. The rear panel contains two variable frequency-spectrum level balancing controls. The Sound Shaper One Ten—priced at \$230—is similar except that it offers 10 bands of EQ and lacks the LED meters, the level balance controls and the front-panel meter jack.



CIRCLE 18 ON READER SERVICE CARD

DBX—A RETAKE

In this column in our September 1979 issue I commented briefly on my first audition of the new dbx-processed disc recordings. I had heard a few at the Chicago C.E.S. in June, and I managed to play some more in time to meet our September deadline.

Since then, dbx has continued to release these astonishing albums. The latest four contain heavy symphonic material which is recorded with no gimmicks or the kind of sonic liberties that may be okay for pop music but which—if applied to classical stuff—would make you wonder about distortion in the source. In other words, what you hear with

these recordings is what the performers played, which makes them—to my way of thinking—well suited for evaluating both the processing and the playback equipment.

In the interim I also have updated my system with a Yamaha YP-D71 turntable, a very recent model that is rock-solid and seems happily oblivious to the shock-waves of acoustic energy that the dbx discs are capable of producing in a room when played at fairly high volumes.

The upshot of all this is simply to reaffirm, with gusto, that of all the so-called “superdiscs” I have heard, the dbx variety sounds to me like the winner. System noise-level, through the phono channel, is actually lowered by a few dB and dynamic range is enhanced by well over 20 dB, according to my measurements (which I repeated three times just to make sure I wasn’t kidding myself). If you think about it, this does more for disc sound than Dolby did for cassette tape sound.

I do not mean to imply a pooh-pooh attitude to other superdisc efforts. But where dbx has the edge is that it goes right to the cutter and effectively holds the original dynamic range of the master tape. Even a digitally-made master tape is at the mercy of the cutter, and the much-touted “80 dB or more” of S/N on a digital tape may be knocked down by 20 dB or more when transferred to a disc. And there is no way of getting it back once the disc is cut in the normal way. The dbx technique can “encode” all of that wide dynamic range in terms of the disc format, and then release it in all its sonic glory on playback, assuming decent playback equipment and the use of the dbx decoding circuit.

Which raises an intriguing possibility. Suppose the record companies—especially the influential majors—started releasing dbx-encoded discs accompanied by a sufficient publicity thrust, such as they mustered for the introduction of micro-groove (long-playing) records and for stereo discs. The equipment industry would then logically start including dbx decoders in amplifiers, the same as they have been including Dolby-B in cassette decks.

This could turn out to be the greatest thing that has happened to records since the LP and stereo. Playback would be, for equivalent gain settings, vastly cleaner and more realistic. Conversely, power requirements of amplifiers would come down. The added cost of the dbx circuit could be offset by the lower power demands. Even not counting that, imagine a disc with master-tape sound quality!

MUSICAL

NEWSICALS

CABLE AND CONNECTOR SYSTEMS

A unique solution to the problem of unwieldy multi-pair microphone snake cables is the Mainline™ from JHD Audio (presently available from Aspen & Associates, 13994 Simshaw Ave., Sylmar, Ca. 91342). The Mainline is a multiplexing system which electronically combines eight audio signals at one end, and decodes and separates them at the other end so that only a single microphone cable is necessary to transmit eight channels of audio from stage to mixer or vice versa. The Mainline™ uses a "time domain multiplexing system" to encode and decode the audio signals without any loss in audio quality. Frequency response is given as 20 Hz-20 kHz, +0, -2 dB, and the harmonic distortion + hum + noise amounts to no more than .12% maximum or .06% typical. The system incorporates a fixed amount of gain in each audio channel so that the output is always a low-impedance (500 ohm nominal) line-level signal with a maximum output level of +10 dBm. Crosstalk between audio channels is given as -60 dB under worst conditions, typically -75 dB. Three models are available, a low impedance mic model which has eight XLR-type connectors on the stage box and which has 30 dB of gain in each audio channel, a high impedance instrument model which

has ¼-inch phone connectors on both ends and which has 13 dB of gain and a high-level return model which is designed for the return of line-level signals from the mixer to the stage and which has ¼-inch phone jacks and uses only 3 dB of gain in each channel. Signal-to-noise ratios for the Mainline™ systems are -92 dB for the 1o-Z model, -103 dB for the hi-Z model and -102 dB for the line return model, all figures referenced to a 0 dBm output level. The Mainline™ is AC-powered from the output end of the system and consumes only seven watts of electricity. The Mainline™ system is furnished with a 100 foot microphone-type cable, but can be used with any cable length from 25 to 600 feet without sacrificing performance; longer cable lengths are possible with certain modifications.

CIRCLE 1 ON READER SERVICE CARD

SYNTHESIZER EQUIPMENT

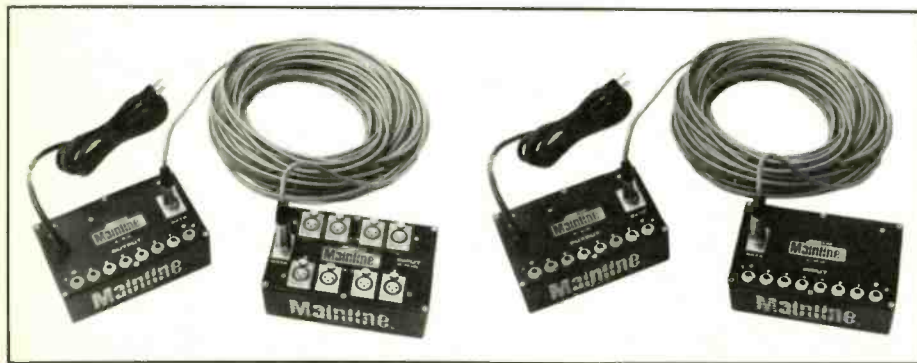
The Casiotone is a versatile new preset synthesizer from Casio which offers 29 different basic sounds ranging from piano through three guitar sounds, three harp sounds, bells, two harpsichords and four organs, to trombone, clarinet and two mixed woodwinds. The unit has a 49-note keyboard (C-to-C) and is polyphonic up to eight simultaneous notes. The 29 dif-

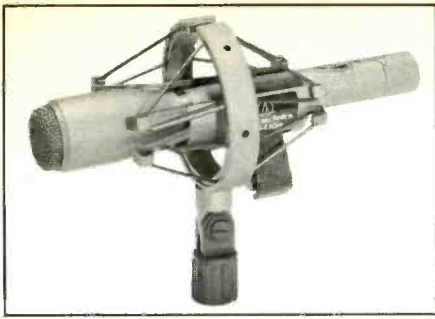
ferent voices are selected with the 29 white keys of the keyboard by moving a switch from Play to Set and hitting the appropriate key, then returning the switch to Play. In addition to the 29 basic sounds, another 29 sounds are available by flipping the Tone switch from 1 to 2, for a total of 58 different sounds. For added convenience, four of the 58 sounds can be remembered with the special Tone Memory which allows the player to switch between any of the four while playing. The Casiotone has a built-in vibrato effect and has provision for optional sustain and expression (volume) foot pedals.

CIRCLE 2 ON READER SERVICE CARD

MICROPHONES AND ACCESSORIES

Audio-Technica USA has added several items to its line of microphones and accessories including three shock-mounted microphones designed for rugged "on-the-road" use, and include the ATM10SM, ATM11SM and the ATM21SM. The first two of these models are fixed-charge condenser microphones, the ATM10SM being omnidirectional while the ATM11SM is a unidirectional design with a cardioid polar pattern. These mics differ from conventional electret designs in that the electret element is mounted behind the diaphragm rather than the diaphragm being part of the electret; this allows the use of a thinner and lighter diaphragm for better high frequency and transient response. The third model is a moving-coil dynamic design with a cardioid pickup pattern. All three models include a suspension-type shock mount designed to isolate the mic from vibrations transmitted through the mic stand. These three Audio-Technica microphone models were designed with instrument pick-up in mind and have





frequency response tailored to that application. Audio-Technica also makes several models designed specifically for vocal applications which feature triple-layer windscreens, internal shock-mounting to minimize handling noise, and response tailoring to maximize vocal projection and minimize feedback and noise pickup. To help the user select the correct microphone model for the application, Audio-Technica has designed three "slide rule" selection guides for recording, sound reinforcement and concert sound applications. The first two of these aid in selecting and using microphones from the professional series of A-T mics, while the third deals specifically with the new "road tough" Artist Series mics with the ATM designations. All three selectors provide a wealth of information about choosing specific mics for the particular instrument or type of use, and how to position the mic as well as model-by-model data on response and pick-up pattern. These selectors are available from Audio-Technica dealers or from the company directly by sending \$2 postage and handling to Audio-Technica US, Inc., 33 Shiawassee Ave., Fairlawn, Ohio 44313. (Remember to specify which of the three selectors when ordering.) Also available by writing to the above address is the more general booklet "A Brief Guide to Microphones," which is free of charge.

CIRCLE 3 ON READER SERVICE CARD

Elek-Trek USA is the source for a new total system for drum miking. To eliminate the typical clutter of mic stands and booms which must be fit in and around the hardware of the drum kit itself, Elek-Trek has designed their system around special microphones with integral clamps that attach to the kit hardware. Various models are available to clamp onto the rims of bass drums, tom-toms, snare drums, or to clamp onto cymbal stands under the cymbal. The mics themselves are

special electret condenser designs which have characteristics specially tailored to the requirements of miking drums and cymbals, and are contained in high-impact housings designed to withstand repeated shocks without failure. Besides the mics, the Elek-Trek system includes special mixers in four-channel and six-channel configurations which may be stacked to accommodate any number of mics. Each channel of the Elek-Trek mixers includes volume, bass and treble controls, plus a three-band equalizer specially designed for drum amplification and an LED overload indicator. Two basic versions of the system are available, the Stage Mix series which is high impedance throughout and uses ¼-inch phone connectors, and the Audio Engineer series which has both high and low impedance outputs and uses XLR-type connectors.

CIRCLE 4 ON READER SERVICE CARD

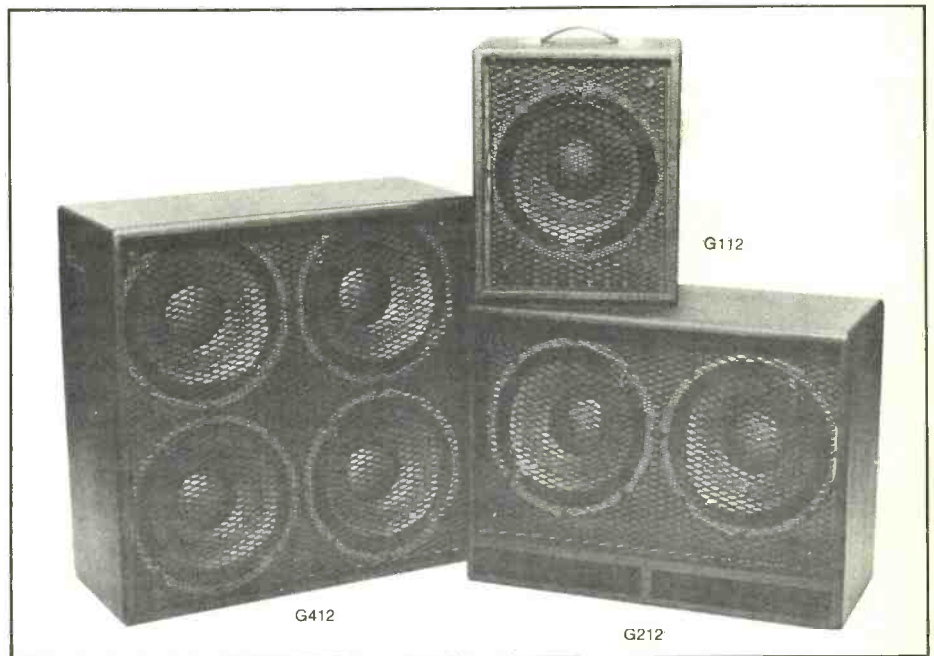
SOUND REINFORCEMENT EQUIPMENT

The Energy Group is a company which makes and sells speaker enclosures as well as using them on the road with its professional P.A. company. Besides their sound reinforcement and stage monitor cabinets, The Energy

expanded speaker damage are built in a small G112. They are front-replacement cabinets. In this series, there are two models available and 1×12", 2×12" available with 15-inch speakers. For Bass, two models are offered, a single 15-inch model and a twin 15-inch model, available with or without heavy duty drivers rated at 125 watts each.

CIRCLE 5 ON READER SERVICE CARD

Heppner Sound is not exactly a household name although it has been making loudspeakers for over thirty years. Recently, however, Heppner started to market a full line of speaker systems for musical instrument and sound reinforcement applications. For bass guitar or low frequency P.A. use, Heppner offers three models: the B-1 is a small bass-reflex enclosure with a single 15-inch driver, system impedance is 8 ohms and the speaker is rated by Heppner at 250 watts; the B-2 puts two 15-inch drivers in a quasi-horn cabinet for higher power handling (500 watts); the B-3 bass speaker is a single 15-inch, folded horn system for



Group offers a line of guitar and bass speaker systems, most of which are available with or without drivers. All Energy cabinets are constructed from ¾-inch birch plywood with a special scuff-resistant, spray-on Polyvinyl finish. All models have 16-gauge

high efficiency and good low frequency response. For the lead guitarist or for keyboards, Heppner makes the G2-12, a 2×12-inch reflex system rated at 250 watts and featuring a punchy sound in a compact cabinet.

CIRCLE 6 ON READER SERVICE CARD

Small Studios: The Lighter Side of Business

By James F. Rupert



If anyone who has ever bought a multi-track tape machine were to be strapped to a lie detector, shot full of sodium pentothal and threatened with repeated 90 dB pounding of selected cuts of Donny and Marie, he would be forced to admit that deep in his heart he has secretly yearned to own and run his own recording studio. The studio bug is planted as surely as a woman's sense of humor is somehow removed with her pre-marital blood test. The unfulfilled dream of owning a professional recording studio has left many an individual a pitiful figure, sitting trembling in a corner in a stocking cap and lap shawl mumbling, "... more headroom . . . more headroom."

The above description may be a tad overstated but there is no denying how infectious "studioitis" can be. Multi-track tape recording has undergone an unparalleled explosion in interest and available affordable equipment in the past few years. That one time nut down the street with all the hi-fi gear in his rec room is more and more becoming a semi-professional audio engineer. Thanks to magazines such as *Modern Recording* and several "how to" books currently on the market, the mystery of the ferric oxide jungle of the recording studio has gone the way of double-breasted suits, the Edsel and reasonable oil rates.

In the April '79 issue of *Modern Recording*, a Mr. T. M. DeRouin wrote to ask one of the most overlooked questions in our still adolescent industry: "What about the business aspects of starting and maintaining a studio?"

The road to financial insolvency is paved with the gravestones of small-business people who suddenly thought, "Wouldn't it be neat to open a studio!" Even a basement studio has

to operate within certain limits of sensible business practices. A hobby is one thing, a business (even a break-even business) is quite another. If an equipment specification sheet has ever overwhelmed you, take a gander at a tax manual sometime.

Hence, the purpose of this article is not to hit you with rave reviews of new gear, explanations of new recording techniques nor to inform you of a further foothill in the existing mountain of equipment specs. Nor is it my intention to supply you with a quick course in accounting, bookkeeping and tax evasion. We will be gathered together over this issue to try to decide if a studio, be it a basement or retail business site, really is in your future.

Look Before . . .

Before taking any further steps it would be wise to ask yourself a few questions. First off, how dedicated are you in projects you undertake? Any business requires multi-level commitments that no one realizes or appreciates until he tries it himself. The first and most obvious commitment, of course, being the financial one. Several equipment manufacturers use their advertising to try to convey the "Pay As You Learn" concept. Their gear can supposedly pay for itself by your charging other musicians to record their songs with it. True . . . but it ain't necessarily so. If for whatever reason the money doesn't come rolling in to you by the barrelful (why, it just happened to a guy two years ago!), are you ready to make the financial sacrifice in some part of your personal budget to keep and maintain the gear? This may seem like an elementary question, but this step number one can stop you colder than molasses in Minnesota. As

cheap as multi-track components seem in comparison to the available selection ten years ago, they still involve sizable amounts of mazuma invested. So as them dead Latin philosopher guys used to say, "*caveat emptor.*" (Roughly translated that means never buy a used Nehru jacket.)

Commitment also means time. If you work a day job or are a student, are you ready to give up nights and weekends for your art? Are you ready to learn your craft inside and out? Are you ready to perhaps take a few business courses or at the very least read a few business manuals? Is your family ready to see you only on Federal holidays? Is analysis really worthwhile? Is the theatre really dead?

How is your judgement? Are you broadminded and impartial? How about self-confident? Are you sold on your own ideas? Can you visualize results? Are you a self-starter or do you prefer to hold chairs down with your keyster to keep them from floating up to the ceiling? Any imagination? Are your hot ideas based on merit or pie-in-the-sky wishful thinking? Are you tired of bullies kicking sand in your face at the beach?

Perhaps now commitment in all its forms starts to take on its proper importance to us. Even a basement studio requires the dedication of time and money and effort and money and blood and sweat and tears. (And money.) I've even heard some folks of the opinion that a recording studio would be *glamorous* to own. My only consolation in the matter was that they were talking through a net over them at the time. Studio work should be fun, but it's like water skiing—you aint gonna stay up there all the time. But let's move on and assume that

everyone answered the aforementioned questions with a resounding, "You bet!"

Minding the Competition

It is now several months down the pike and you are about to open [My, how time flies when you're having a good time!—*Ed.*]. You know what the equipment can do and have learned quite a bit about yourself here lately. You've contacted a few people about doing some recording with you and they are coming over to take a look around and compare your equipment and rates with other studios available to them. As Karl Malden says, "What do you do?"

First, be prepared. The old Boy Scout motto rings true again. Be ready for your customer's questions. Some of them are going to be off pretty strange walls. This goes back to knowing as much as you can about the art of recording. Your clientele is going to range from the beginner who will confess his ignorance and is depending on you for guidance, to the wise apple who seemingly lays awake nights dreaming up questions he figures you can't answer. Shame on the studio owner who lets himself get caught by the short hairs twice on the same question. Customers are renting your brain as well as your equipment, so keep your head as fresh as your tape transports.

If your set-up is somewhat limited in comparison to your competition, emphasize the results, not the method. This may seem like you are alibiing your act, but it's not. Have a good sample tape made up of your best work. If you can get them, obtain a sample tape or two from your competition. Show the customer the difference, if any. This is one case where the end oftentimes justifies the means. If your tape does *not* sound quite as good as your competitors, your prices should not be quite as high. Know what you are up against with other studios and don't be afraid of it. If you weren't offering something different and desirable from what is readily available in the first place, your doors shouldn't be open anyhow.

Be ready to balance the positive against the negative. If only positive factors in your favor existed, there would be no need for a decision. Approval and acceptance of your studio would be blind and automatic. There must be some reason Brand X studios

across town keeps its doors open the same as you. Sell your strong points. If you haven't got any, get some! At the same time you are working to correct or improve your weak points, be willing to recognize them if the customer questions you.

This slides directly into our next point: don't allow your enthusiasm to trap you into exaggerating the benefits of what you are offering. Truth has a nasty habit of jumping up to hit you where the good Lord split you. If a customer asks if you have flanging effects available for him to utilize, don't cross your fingers behind your back and force your mouth to say, "Sure," when your mind is thinking, "Sort of." If a customer's description of the work he wants done sounds like he really needs Wally Heider and his boys to do the job, gently explain reality to him. If you are a four-track studio, show him how tracks can be bounced and built up. (A good time indeed to have that demonstration tape of yours ready to whip out!) Your clients are soon going to develop the gift of detecting when taffy is being distributed. Too many tall tales on your part and you will find your services about as popular and welcome as baked beans on a bus trip.

If a customer is hesitant concerning any possible limitations in your set up, be ready to anticipate and forestall any objections. If the objections are imagined on his part, try to set his head at ease without ridiculing the thought behind the questions. If he has hit on an actual weakness in your operation, deal with the question realistically and objectively. Some of the questions may sound too basic or downright stupid to you, but if the customer knew the answers he wouldn't be seeking your expertise. All questions the public puts to you really are compliments to your ability and experience.

If you know your limitations can be lived with, state so and why. If they can be minimized, tell your clientele how and when. Once again, the truth can set you free, hallelujah, but excuses will hang you. Be brief—but tell your studio's story. 'Nuff said.

Permit a full discussion on the client's behalf. Keep the discussion on a business track. You don't want to hear about all the places his group has played, and he doesn't want to hear about your used bicycle seat collection. If he hits you with a query to which you honestly do not know the

answer, make sure you find out for him—and yourself—at the earliest opportunity. Don't let him leave without all the information he needs and wants in order to decide intelligently whether or not to use your service.

Bad Habits

One of the worst habits any studio owner/operator can get into is making promises he can't keep. This breed of fish generally ends up being about as popular as poison ivy in a nudist colony. If you are doing commercial or jingle work, you know how absolute and final deadline-meeting is, so if you've promised a product on schedule, deliver it, no matter how many hours are involved. Incidentally, endurance is a quality I strongly advise any businessman, studio owners in particular, to keep available in his hip pocket. A few years ago, myself and another crazy person were completing a marathon mixdown session that we had begun at 6:30 the previous evening. It was five o'clock in the morning and the home stretch was not quite yet in view. After finishing a particularly troublesome mix of a stereo chain store jingle my partner suddenly looked over at me with eyes like varnished onions and blurted, "Nit nit nir!" After I expressed my bewilderment over the statement he very calmly explained that it was Rin Tin Tin spelled backwards. It suddenly dawned on me that we were both in big trouble because at the time "Nit Nit Nir" made perfect sense to me too!

The point of this little parable is that even though we both were ready on several hundred different occasions to pack it in and go home that night, we knew we had to have those commercial spots done and done well the next morning. The client just would not understandingly accept that we were both real tired and just *had* to go home and get into our 'jamies.

Heading around the far turn we come upon one of the most important points of this whole exercise. When you have followed all the correct steps in your presentation to the customer, go ahead and drive to a close. Don't leave him hanging in space with a "Well, what do you think?" atmosphere. Ask him when he wants to book some time with you. It is amazing how many people you talk to are just waiting to be asked to make a decision. Make the task of making a decision that much easier for them. If you

have presented your case well and answered all his questions, it should flow into this quite smoothly and naturally. You have done the best you can to prove your services are the ones he both needs and wants so it is now up to him to either fish or cut bait. So why not just ask? The percentage of success will knock you out. Also remember: if you won't do it, chances are your competition might. Beating them out of some business might be as easy as simply beating them to the punch.

A Tidy Business

Nonverbal communication is also extremely important in the studio game. You may not be able to afford the best looking or most expensive brands in the world but there is no excuse for an untidy to downright sloppy studio appearance (short of having your complex in a coal mine). Their first impression of your business is not going to be the tie you are wearing, or if your mother's picture is above your console, but how the studio itself looks. A studio highlighted by butts, beer cans and McDonald's sacks and which looks like it was decorated by Pa Kettle might impress a goat, but it will leave you clientele cold. Nobody wants

to record in an antiseptic hospital atmosphere, but they don't want to try to get comfortable at the city dump, either. Another excellent piece of public relations is to provide coffee and soft drinks as a surprise for your customers on a mid-session break. The more you help your customers to feel at home, the more they will want to come back. And that's where it's at.

It is probably becoming pretty evident that the average small studio owner wears many hats. He's an engineer, producer, composer, musician, accountant, bookkeeper, repairman, janitor and more. But if you'll notice one important thing about the above listed qualities and procedures you will quickly see that many of them involve salesmanship. Contrary to public opinion, the term "salesman" does not necessarily mean "liar." Having something to say and to sell is vital in business success, but if the point is lost to those whose business (i.e., money) you want, you might as well start making planters out of those mixdown machines. Salesmanship is second only to knowledge of your machinery and craft. You could be selling lemonade in the Mojave desert but if no one knows you are there your chances for success

are pretty slim.

Now if you're saying to yourself that all this is fine but how do I get the people through my doors in the first place, tune in an upcoming issue. Part Two of this series is entitled: "Stalking the Wild Studio Customer!" and will hopefully take a little heat off the melons of those of you with too much time open in your studio schedules.

• • •

With any luck at all this article has encouraged more cases of "studioitis" than it has cured. Few things in my life have ever been so rewarding as looking down at ink drying on a check received for studio services rendered and wondering how I could be so lucky as to actually get paid for doing something I enjoy so much. Many moons from now when I reach my own declining years and am reduced to my own particular corner with my very own stocking cap and lap shawl, I'm going to be able to think back on the seemingly endless hours spent sitting hunched over a recording console. And anybody who walks past and sees me is going to ask himself: "Why the hell does that old guy smile so much?"

See you next time.



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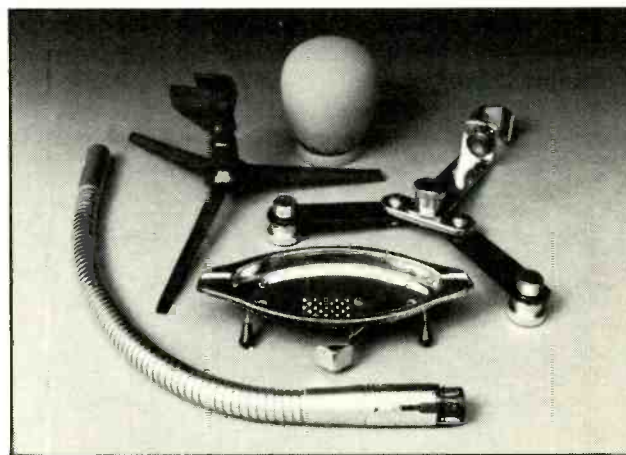
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ELECTRIC

Primer -Part IV

By Peter Weiss



In Part III, we looked at a simple circuit with capacitance and resistance, and discussed the concept of the RC time constant. That discussion described the process by which the capacitance was charged in an RC circuit. Now let's examine how a charged capacitance in an RC circuit *discharges* with time. *Fig. 1* is a schematic of the circuit in question. Note that there is no battery. None is necessary, since our discussion begins with a fully charged capacitance. When the switch, S_1 , is closed, the voltage that exists across C_1 due to the presence of charge on the plates, causes a current to flow through R_1 . This current represents charge moving from the plates of the capacitor, and as this charge moves, the total charge on the plates begins to diminish. As the charge on the plates diminishes, so does the voltage across the plates. When the voltage across the plates, V_c , diminishes to (approximately) 37% of its full initial value, the capacitance is considered discharged. The time from the closing of the switch to the time when the voltage drops to 37% of its initial value is $R \times C$ (in seconds). Again, the mathematics that illustrate this fact are beyond the range of these articles.

Now, nowhere in any of the discussions about charging or discharging RC circuits is there any mention of

why anybody would want to *wait* for a capacitance to charge or discharge. However, there are many applications of RC circuits and their time-related characteristics in electronics and audio. For example, power supplies that furnish DC power (that is, voltage and current that do not change polarity or direction with time) to audio amplifiers have in their output circuitry RC networks that, by means of long-discharge RC time constants, pre-

vent the output voltage of the power supply from dropping suddenly when a heavy demand is made on the supply. Readers who own high-power amplifiers (150 watts/channel and up) should consult the schematics in their owner's manuals and try to identify these RC "filters." Other uses of RC networks include fixed equalization curves such as those used in tape or disc recording and playback, or broadcast pre-emphasis/de-emphasis. These frequency

response curves (usually a boosting of the treble response for recording or transmission, and an equivalent cutting of the treble response for playback or reception) can be obtained by placing an RC network in the signal path. Such a network can be specified by using the RC time constant of its resistive and capacitive components. For example, "120 μ s equalization" is a specification often found on tape cassettes and cassette machines. The combination of resistance and capacitance that has an RC time constant of 120 μ s will provide the proper frequency response curve. Whether the RC network provides a boost or cut in the treble range is determined by how the network is connected in the signal path. We will discuss such fixed equalization curves, as well as other applications of RC networks, in future articles.

Before we leave the subject of capacitance (for a while), let's take a look at how capacitances combine in the same simple circuit configurations (series and parallel) that we examined for resistances.

Fig. 2 is a schematic showing three fully charged capacitors* in a simple series configuration. How is charge distributed among the capacitor plates in the circuit of Fig. 2? Well, the presence of a negative polarity due to the charging voltage (present when the three capacitors were charged, and then removed) at the left-hand plate of C_1 will cause that plate to be negatively charged to a certain degree. The negative charge present will cause an *equivalent amount* of negative charge to leave the right-hand plate of C_1 , causing this plate to become (equally) positively charged. The negative charge that leaves the right-hand plate of C_1 appears at the left-hand plate of C_2 , and as before, causes an exodus of (an *equivalent amount* of) negative charge from the right-hand plate of C_2 , leaving the right-hand plate (equally) positively charged. This process occurs again with the positively charged right-hand plate of C_2 , the negatively charged left-hand plate of C_3 and finally the right-hand plate of C_3 , which has on it the same amount of positive charge as there is negative charge on the left-hand plate of C_1 . The process (which is actually instantaneous) stops here because of the presence

*a component that is used in a circuit to provide a fixed value of capacitance.

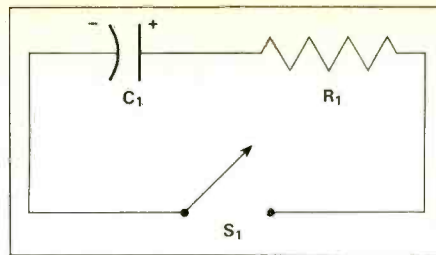


Figure 1

(during charging) of the positive polarity of the charging voltage at the right-hand plate of C_3 .

The above long-winded discussion was necessary to illustrate that each capacitor in the circuit of Fig. 2 has on its plates the *same amount of charge*. Also, if we replace C_1 , C_2 and C_3 with the total effective capacitance of the combination, C_T (this is shown in Fig. 3), this total effective capacitance will

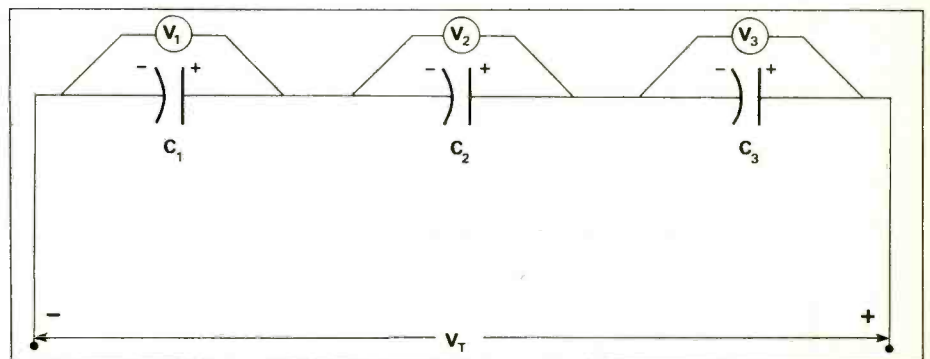


Figure 2

carry the same amount of charge as any individual capacitor in the circuit. The truth of this last statement is not immediately apparent, but can be proven. If C_T is to be truly equivalent to the series combination that it replaces, then the "left-hand" or negative plate of C_T can have no more (or less) negative charge on it then could be measured on the "left-hand" or negative plate of C_1 . A similar argument can be made for the right-hand positive plates of C_T and C_3 . Thus, the charge on C_T , Q_T is the same as Q_1 , Q_2 and Q_3 .



Now that we have established how stored charge is distributed in a series configuration of capacitors, we can use these facts, Kirchoff's voltage rule and the following relationships:

$$\text{Capitance (C)} = \frac{\text{Charge (Q)}}{\text{Voltage (V)}}$$

or equivalently,

$$Q = C \times V$$

or

$$V = \frac{Q}{C}$$

to develop a formula for the total effective capacitance of such a configuration of capacitors.

First, from Fig. 2 and Kirchoff's rule (remember the voltmeters in Fig. 2 are imaginary; connecting an actual meter across a charged capacitor would cause that capacitor to discharge through the meter):

$$V_T = V_1 + V_2 + V_3$$

Re-writing these voltages in terms of charges and capacitances:

$$\frac{Q_T}{C_T} = \frac{Q_1}{C_1} + \frac{Q_2}{C_2} + \frac{Q_3}{C_3}$$

But $Q_T = Q_1 = Q_2 = Q_3$, so the equation above can be written

$$\frac{Q_T}{C_T} = Q_T \left(\frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} \right)$$

Dividing both sides by Q_T leaves

$$\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}$$

This expression is the general formula for the effective total capacitance of a simple *series* combination of capacitors, and can be extended to any number of capacitors. The word "series" in the previous sentence is italicized because the *form* of the series capacitance formula just developed is the same as that of the formula for resistance in *parallel*. The two should not be confused. However, the mathematical similarity lends to conclusions that are true and helpful. When we dis-

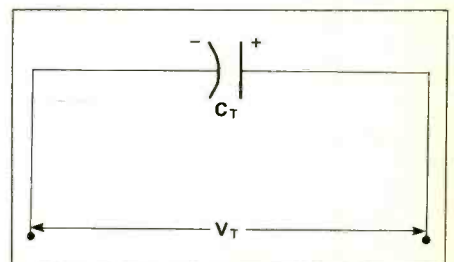


Figure 3

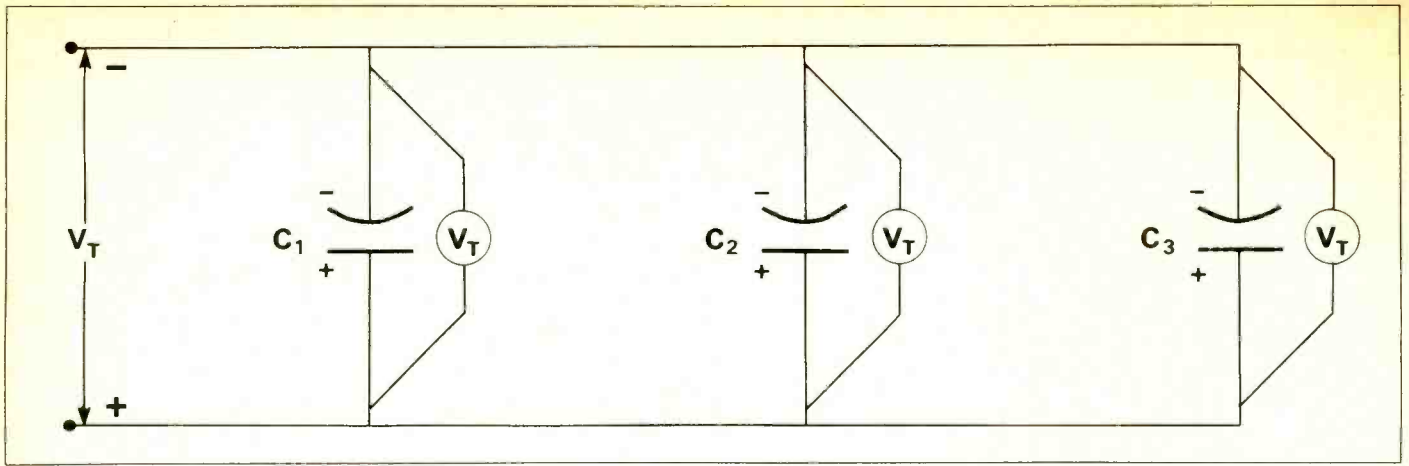


Figure 4

cussed resistances in parallel, we discovered that the total effective resistance of a simple parallel combination of resistances was *less than* the value of any individual resistance in the combination. Also, the greatest current (assuming that a voltage was applied to the combination, as in the examples in Part II) flowed through the smallest resistance. For capacitors in series, the total effective capacitance is less than the value of any individual capacitor, and the greatest voltage appears (when the combination is charged) across the lowest-valued capacitor.

Fig. 4 shows three charged capacitors in parallel. Fig. 3 will serve as the schematic of the equivalent circuit with C_T replacing the parallel combination of C_1 , C_2 , and C_3 . In this configuration, upon application of the charging voltage, no game of hot potato is played with charges. Each capacitor accumulates as much charge as it can at the charging voltage, V_T . The total charge, Q_T , which appears "stored" in C_T is simply the sum of the individual stored charges, Q_1 , Q_2 , and Q_3 . That is, $Q_T = Q_1 + Q_2 + Q_3$.

Representing these charges in terms of capacitances and voltages (remember, V_T appears across each capacitor and across C_T as well):

$$V_T \times C_T = V_T \times C_1 + V_T \times C_2 + V_T \times C_3$$

or

$$V_T \times C_T = V_T (C_1 + C_2 + C_3)$$

Dividing both sides by V_T leaves:

$$C_T = C_1 + C_2 + C_3$$

This is the general formula for the total effective capacitance of a simple *parallel* combination of capacitors, and can be extended for any number of capacitors. Again, although this is the formula for capacitors in parallel, it *looks* like the formula for resistances in series. Beware of confusion.

Before we go on to look at another important circuit value, inductance, we must sidetrack a bit and take a look at a subject that has been known and used since ancient times, magnetism.

From everyday experience, we know that magnetism affects certain materials in very obvious ways, while having no effect at all on other materials. For example, a bar magnet will attract iron filings, nails, paper clips or other objects made of iron or steel, but will do absolutely nothing to sawdust, plastic buttons or anything made of ordinary non-iron or non-steel materials ("non-ferrous" is the proper term for materials that do not contain iron). Magnetism and electricity are actually two aspects of the same phenomenon, i.e., moving charge, but before we discuss the connection between the two we should develop some tools for describing magnets and magnetism.

The first (ancient) use of magnetism was as a navigational aid. It was dis-

covered that pieces of a certain type of iron ore would, if allowed to rotate freely, always line up in the same direction, more or less north-south. Also, this action always involved the same ends of the piece of ore. That is, the same "end" would always turn to point northward, even if the piece of ore were turned completely around. This action, caused by the magnetic properties of the ore *and* the magnetic properties of the earth itself, led to naming the north-seeking end of the natural magnet (or lodestone) the "north pole" of the magnet, and the other, south-seeking end the "south pole." All magnets always possess *both* north and south poles, as was discovered when some clumsy navigator dropped a lodestone. Each fragment of the original magnet retained the properties of the original, including the north-south alignment. Also, the north pole of a fragment attracted the south poles of other fragments, but repelled north poles of other fragments.

In modern times, we still use

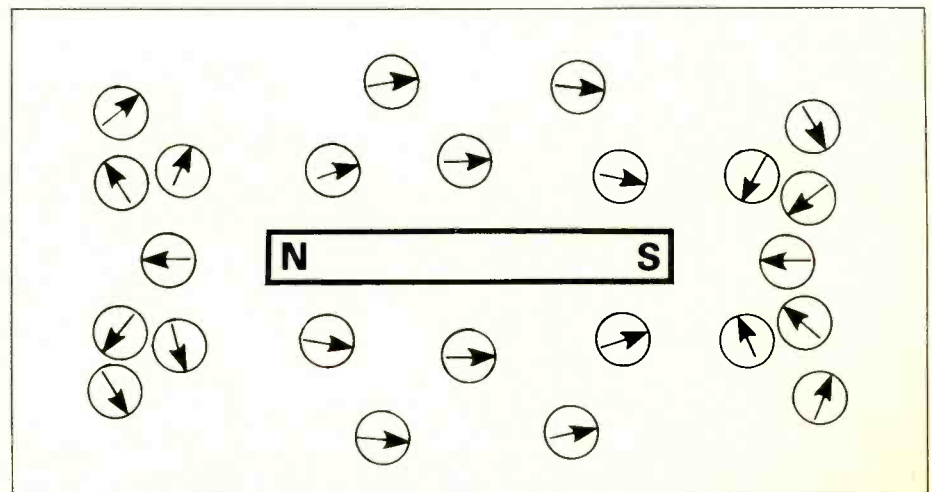


Figure 5

Technics RS-M95. When price is no object. But performance is.



There are countless cassette decks to choose from when your object is price. But when your only object is performance, look at the RS-M95 with metal tape capability.

The heart of the RS-M95 lies in its quartz-locked direct-drive capstan motor and its computer-controlled tape tension system. Together, they team up to provide constant tape tension, remarkably low wow and flutter and complete immunity from speed inaccuracy. So when you record an A flat, you'll hear an A flat. No more, no less.

But if more is what you want, you'll get it with metal tape. Because, compared to conventional tape, it gives you a frequency response with more dynamic headroom and more high end extension.

You'll also get the advantage of the RS-M95's three-head configuration: Source/tape comparison. What you don't get is azimuth error, because our HPF record and playback heads are not only precisely gapped, they're also precisely enclosed in a single housing.

To add to the RS-M95's three-head configuration, we added double Dolby*. So you can monitor your tapes with the full effects of Dolby noise reduction.

Another glowing feature of the RS-M95 is its two-colored fluorescent (FL) bar-graph meters. They're fast, thanks to a device attack time of just 5 millionths of a second. And accurate, thanks to a Technics high-slew-factor operational amp for absolute wave and peak detection.

Also included are 4-position tape selectors with bias fine adjustments. A built-in 400 Hz/8 kHz test tone oscillator. A separate, coreless DC motor for reel drive. A microprocessor tape counter with triple memory functions and feather-touch controls.

Technics RS-M95. Its performance is its only reason for being.

FREQUENCY RESPONSE (Metal): 20-20,000 Hz (± 3 dB). WOW AND FLUTTER: 0.03% WRMS. S/N RATIO (Dolby II): 70dB. SPEED DEVIATION: $\pm 0.1\%$.

*Dolby is a trademark of Dolby Laboratories.

Technics

Professional Series

CIRCLE 98 ON READER SERVICE CARD

magnetic compasses to indicate direction, but lodestones have been replaced by man-made magnets. The behavior of these magnets is still the same, and the behavior of a compass needle (which is itself a magnet) in the presence of another magnet is a useful tool in describing magnetic effects.

Fig. 5 is an illustration of the behavior of compass needles near a bar magnet—the north pole of the needle is depicted by the arrowhead. Note that all the needles are aligned with their north poles pointed towards the *south* pole of the bar magnet. If smooth curves were drawn connecting the compass needles and arrows placed on these curves to represent the direction in which the north poles of the needles were pointing, the result would be something like Fig. 6, which is a representation of a bar magnet with its

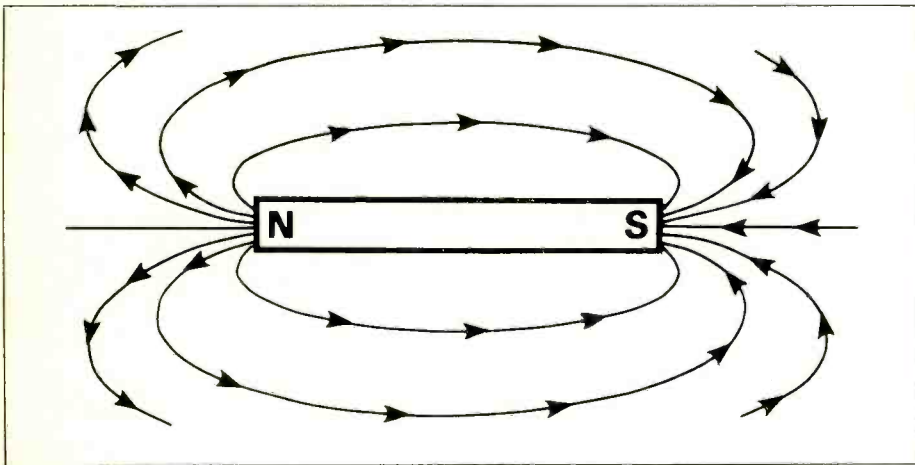


Figure 6

“magnetic field.” The directions of the arrows represent the “direction” of the magnetic field, which is *defined* as going from north pole to south pole. Remember, magnetic poles *always* occur in pairs, never singly. (It is also important to point out that the lines in Fig. 6 are just *representations* of a magnetic field for discussion purposes, *not* an accurate description.) Magnetic fields are described in terms of “field lines” or “lines of force,” but these too are just representations that make magnetic fields easier to handle mathematically. As for the arrows, they will become important when we relate electric currents and magnetic fields and how these phenomena interact.

In our discussion of electromagnetics (the combined study of electric currents and magnetism) we will come across one of the unfortunate results of the historical development of this

area of knowledge. In this series of articles, electric currents have been described as the motion of negatively charged electrons, moving from negative to positive polarities. This is the case *in fact*. However, for many purposes, current can be considered as the motion of *positive charges*, moving from positive to negative polarities. The case is similar to watching “chase lights” on a theater marquee (or Bee Gees concert stage). The lightbulbs can be considered as representing atoms of conducting material, a lit bulb being an atom possessing its outer electron, a dark bulb an atom missing its outer electron. When the lights “chase,” doesn’t it appear that the lit bulbs are “moving” in one direction while the dark bulbs are “moving” in the opposite direction? This is the case with the two views of current

flow. We have chosen to begin by defining current flow as the movement of negatively charged electrons (which is the experimentally proven case), and so we are watching the lit bulbs. This picture of current flow is called “electron flow.” The “dark bulb” version, which is considered as positive charge moving from positive to negative polarities is called “conventional flow.” The only area of discussion where these two views of current flow come into conflict is electromagnetism. Even here, the adherence to conventional current flow is necessary only to maintain the correctness of certain rules involving direction of current flow, direction of magnetic fields and certain parts of the human body. The relationship between electric currents, magnetic fields and very important parts of the human body will be examined in detail in Part V.

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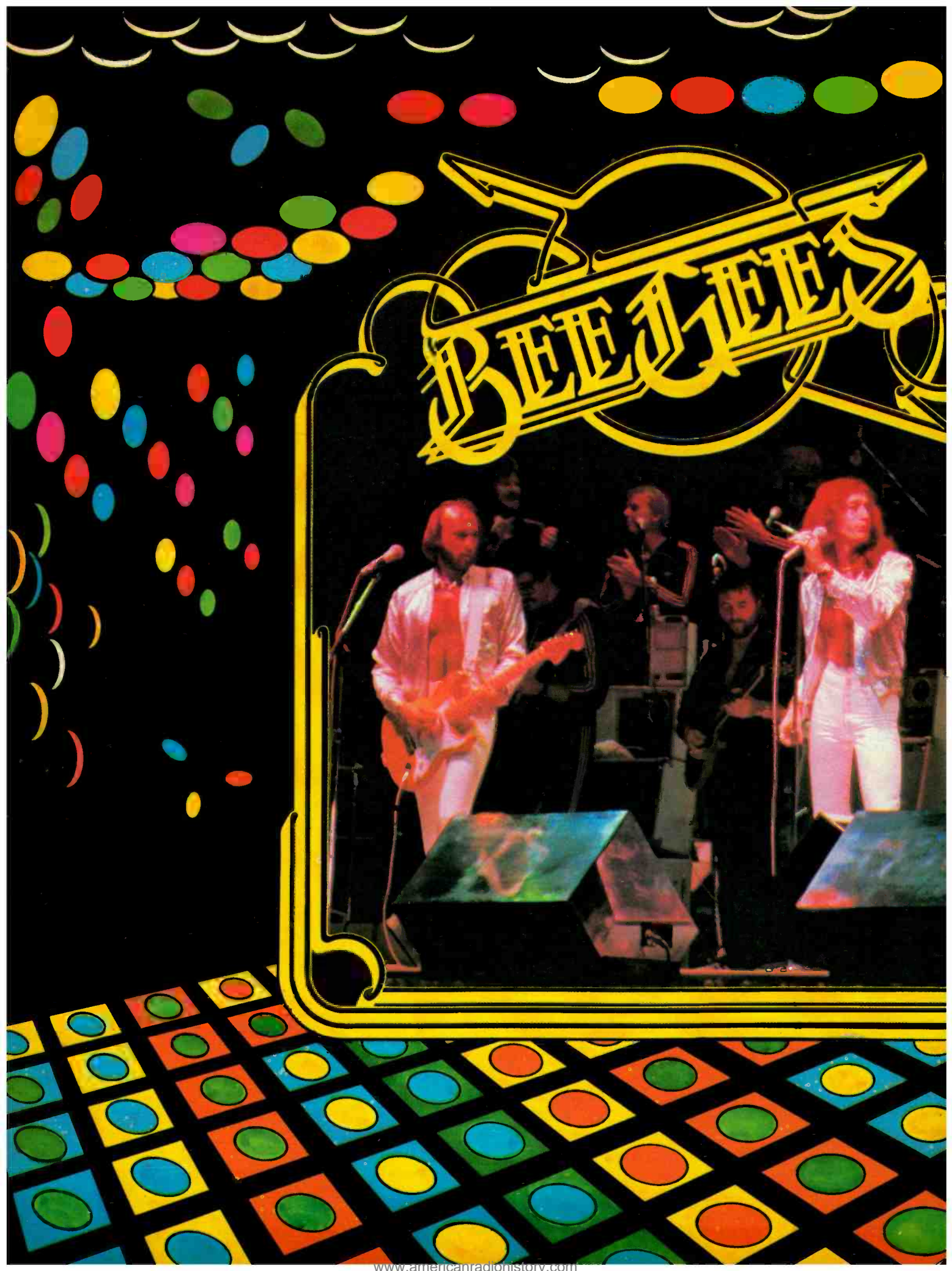
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BETTER



By Peter Weiss

The Bee Gees' fifty-performance 1979 North American tour was the first road outing for the Australian-grown trio of singers/songwriters/producers since 1976. Having enjoyed continuous success in pop music since the late 1960's, and having scored hugely with the *Saturday Night Fever* motion picture sound track in 1978, the group wanted the tour staging, presentation, production and sound to have a high level of quality and style, and to be truly unique—not just a repackaging of somebody else's tour production and hardware. The Bee Gees contacted Showco Manufacturing Corporation of Dallas, Texas to achieve all of these goals, since [they felt] Showco occupied a position of innovative leadership in the tour production field equivalent to the Bee Gees' status in pop music.

The Bee Gees first approached Showco in April 1978 with the idea of preparing a tour to start that summer. Various conflicting commitments prevented the Bee Gees from touring in 1978, and so the beginning of the tour was postponed until late June, 1979. The extra time made available by the postponement was put to productive



"LIVE!"

use by Showco engineers and designers in an effort to create a touring package suited to the Bee Gees unique requirements. The Bee Gees themselves, Barry, Robin and Maurice Gibb, contributed ideas to the production design, but more importantly, they planned a tightly sequenced performance repertoire that would remain practically unchanged for the entire tour, and would, by its make-up, dictate many of the staging and production requirements.

The first segment of the concert performance contains all of Barry Gibb's difficult falsetto vocal work. The numbers in this section include "Tragedy" (the opener), "Edge of the Universe," "Night Fever," and "Stayin' Alive." The next segment is a Bee Gees retrospective medley, consisting of hit singles from the entire time span of the group's career. The third main segment of the performance, the "boogie" section, is preceded by a transitional portion during which Barry Gibb does solo vocal work in "Words," followed by the whole ensemble (Bee Gees, full thirteen-piece band and back-up vocals) in "Winds of Change." The "boogie" segment begins with "Jive Talkin'," the last number before the Bee Gees leave the stage. The first encore number is a reprise of "Jive Talkin'," followed by "Dancin'," the finale of the show.

This broad range of musical style requires a flexible stage, lighting and sound system that can accommodate different musical formats in order to provide supportive atmosphere throughout the performance. This was the general requirement that the Bee Gees gave Showco; the touring system, including stage, lighting and sound reinforcement, must be able to complement the "disco" numbers, the retrospective medley, the intimate solo vocal work and the "boogie" numbers, and look and sound great while doing it all. In answer to this challenge, Showco designed and engineered a truly unique production package.



The multi-level performing stage (designed by Showco's Ian Knight) is made of Plexiglas panels and aluminum framing members. All vertical surfaces are mirrored. The broad steps on either side of the stage, leading up to the first main level, have unfrosted lightbulbs placed on 10 foot centers all

around the upper perimeter of each step. The upper edge of the first stage level has this same lightbulb design.

The top of the first stage level, which is where the Bee Gees spend most of their performing time, contains a disco dance floor lighting system similar to the one seen doing its stuff under John Travolta's Guccis in *Saturday Night Fever*. The tops of the steps also contain portions of this system. (More about the dance floor later.) There is an upper stage level for the six-man horn section, keyboard players and percussionist. Guitars, bass, drums and back-up vocals are all on the first level.

In addition to all the limits and requirements imposed by the performance repertoire, another prime goal was to make *everything* in the system visually appealing. So, instead of using standard or ordinary-looking lighting equipment, Delton Bass, Showco lighting designer, and Jack Calmes, one of the principals and founders of Showco, came up with the chrome-look lighting system and trusses. Actually, the trusses themselves are polished aluminum and the lighting unit "chimneys" are bright chrome.

As visually appealing as this design turned out to be, its execution was not without problems. Some of the aluminum trusses first delivered to Showco were found to have potentially dangerous cracks. The supplier, upon hearing the news, immediately issued a disclaimer against structural failure of the remaining trusses. After much back and forth maneuvering, Showco finally extracted a promise from the supplier to perform ultrasonic inspection of each truss. Two were found to be defective and were replaced just prior to the beginning of the tour.

In addition to providing a visually appealing means of supporting fixed lighting, the hexagonal overhead truss system also holds four overhead stage monitor cabinets, two sets of rotating lighting units and some glitter-bomb detonators.

While many concert stage lighting systems are built around fixed lighting units, maybe a laser or two, some strobes and a couple of follow spots, the Bee Gees touring system has all of these features, plus on-stage (the bare lightbulbs) and *in*-stage (dance floor) lighting. To control all of this requires three operators and a mini-computer controller designed and built by Showco staff to run the dance floor lights. The mini-computer controller is

capable of creating moving geometric patterns of lights (four colors) under the stage surface, and has a "repertoire" of twenty-four pre-programmed pattern changes. Certain portions of each pre-programmed pattern can be changed "on the fly" to suit immediate production needs. Also, the controller is capable of running the bare lightbulbs around the steps and stage, and can make them "chase" in either direction, flash on and off, or any combination of these. All of these control functions can be timed internally within the controller or can be keyed by any audio signal desired and available. As a back-up to the mini-computer, there are modified lighting control boards that can assume some control functions, but without the degree of control and flexibility provided by the mini-computer. The fixed lighting units, the spinning units and pyrotechnics are "manually" controlled by more or less standard lighting control methods.

A multiple-beam laser system emerges from a pylon behind the drummer's location on stage, and is used to project Lissajous patterns in red and green on the rear wall of the performance location. Other adjuncts to the lighting system are a large motorized mirrored ball, and a huge metallic, motorized "geodesic" ball that is packed in a case that is large enough to house a family of four.

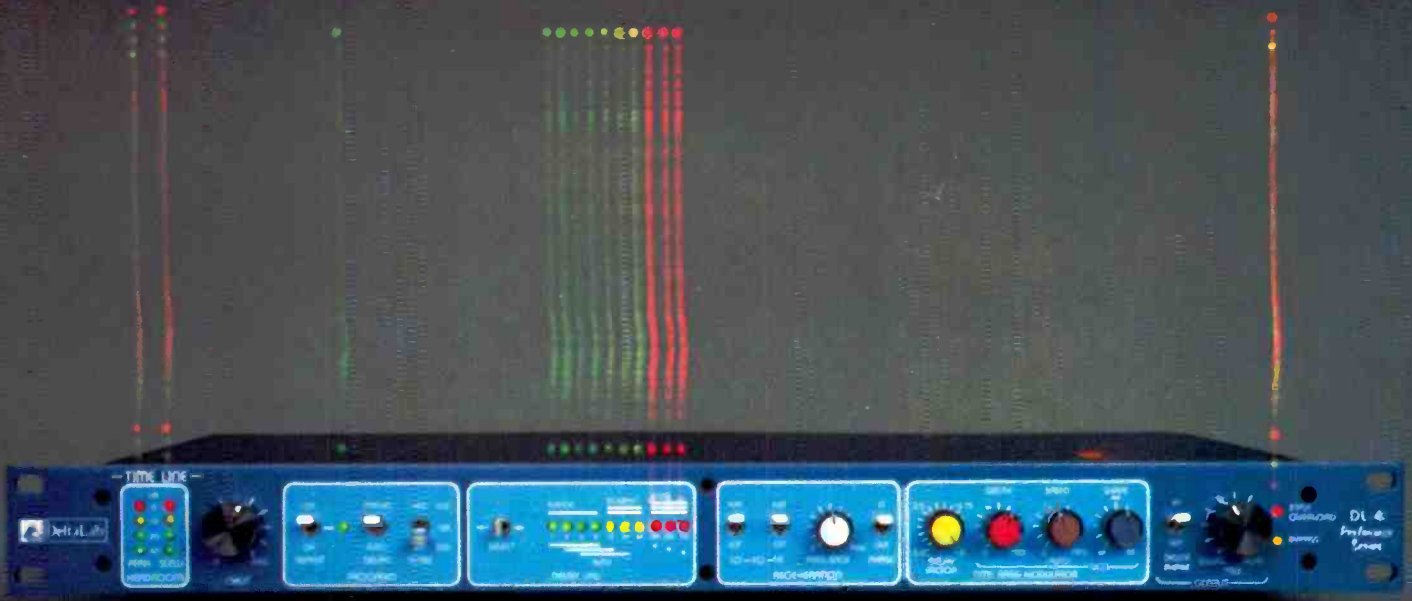


The comprehensive approach that is evident in Showco's stage and lighting design and engineering carries over into the area of sound reinforcement. Starting at the bottom of the speaker system and working up, there are eight refrigerator-size sub-woofer cabinets—four each left and right of the stage—each containing an 18-inch PAS driver. This sub-woofer system is powered by 5000 watts worth of Crown PSA-2 programmable power amplifiers. The low-pass filtering for the sub-woofers is one of the modes of operation built into the PSA-2.

In the "flying" house speaker system the bottom end is supplied by twenty cabinets, each containing four JBL K-140s in a pyramid-loaded configuration. The cabinets in the lower rows of the system each house a three-way system consisting of two JBL K 120's, two JBL 2482s driving 40°x90° horns mounted with the 90° dispersion



DL-4 Time Line™ *Performer Series*





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Rear panel provides easy access for all input/output and foot pedal control functions. Also included is a jack that interfaces with DeltaLab's Memory Module for up to an additional 2 seconds of delay.



DL-4 Time Line Performer Series™



WHAT?

The DL-4, TIME LINE is a studio quality, special effects processor designed for the professional musician to use in live performances. The DL-4 is a derivative of our highly successful DL-2, ACOUSTICOMPUTER™ and brings total performance to the performing musician previously attainable only in studio quality delay lines. The DL-4 features the same full bandwidth, low distortion, dynamic range and construction techniques previously associated with DeltaLab's Professional Module series. It also features a full ½ second (512ms) of full bandwidth delay which is unheard of in this price range.

WHY?

It has become more and more difficult for musicians to recreate on stage what is found in most recordings today. The TIME LINE bridges this gap by providing the musician with an easy-to-use, high quality processor that can effectively recreate the studio sounds that are essential to a convincing live performance.

WHERE?

As previously stated, the DL-4 is primarily intended for On Stage use during live performances. In this application, its ease of operation and sonic quality are second to none. The TIME LINE is also an impressive, special effects generator suitable for the recording studio. Many of its effects are unique and are not creatable in other units, not even in our own DL-2. In fact, two DL-4's can be externally cross-coupled to produce virtually any effect imaginable.

HOW?

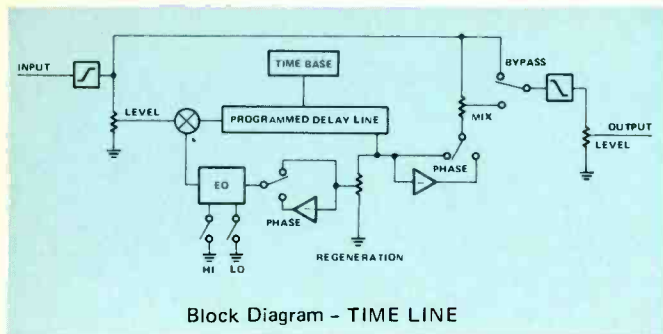
Only the latest technology has been used in the design of the DL-4. DeltaLab's unique digital encoding system, regarded by the professional industry as audibly superior, has been complemented by the use of 16K RAM's (Random Access Memory) used by the computer industry. This marriage of technology is responsible for the DL-4 providing 512ms delay at full bandwidth with no degradation in performance. No longer do you have to trade off audio quality for long delay times.

WHO?

In digital audio, experience counts. DeltaLab is a consortium of musicians, engineers and scientists with a combined experience of over fifty years in digital electronics and high quality audio. DeltaLab equipment is found in the best state-of-the-art studios today. We maintain an active R&D program and are constantly advancing the state-of-the-art in digital audio systems. The DL-4 has been designed to provide the performing musician and studio with the benefits of this experience.

WHEN?

While others promise, DeltaLab delivers. We have a track record for producing quality products as advertised. Digital audio technology is not a trivial issue, thus each DeltaLab product is thoroughly engineered before it is brought to the marketplace. It is with that same total confidence and commitment that the DL-4 has been conceived.



Block Diagram - TIME LINE

Specifications

Delay Range	Scale	
	X1	1 to 128 ms
	X2	2 to 256 ms
	X4	4 to 512 ms
Delay Factor	.25 to 1.0 of setting	
Frequency Response (@ -14 dB) +1, -3 dB	20 to 15k Hz @ all delay settings	
Dynamic Range		
A-Weighted	90 dB min, 95 dB typ	
C-Weighted (broadband)	85 dB min	
Headroom above 0 dB	6 dB	
Equivalent Pre-emphasis	50µs	
THD (Distortion Plus Noise)^{1 2}	Delay Factor	
	(X.25)	(X1)
Ref 1kHz		
0 dB	0.2% max	0.4% max
-10 dB	0.2% max	0.4% max
-20 dB	0.3% max	0.6% max
-30 dB	0.5% max	0.8% max
-40 dB	0.8% max	1.0% max
Inputs	Hi Level	Low Level
Unbalanced (Phone)	0 to 18 dBm	-20 to 0 dBm
Impedance	47K ohm	
Outputs		
Unbalanced (Phone)	Up to 18 dBm	
Impedance	50 ohms	
Time Base Modulator		
Delay Factor	Continuous from X.25 to X1	
VCO Depth	0 to 100% of Delay Adjustment Range (4:1)	
VCO Rate	From 0 to greater than 10 Hz	
VCO Shape	Triangular to sine to square wave - continuously variable	
Repeat	Repeats signal in memory indefinitely without degradation	
Regeneration	Recirculates delay setting to create multiple echo repeats	
Size	1¾ x 19 x 10 in. (4.45 x 48.3 x 25.4 cm)	
Shipping Weight	12 lbs (5.5 kg)	

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fanning out vertically and an undisclosed number of Motorola 3"x6" piezoelectric high frequency units. To improve vertical dispersion and general coverage all the radiators (except the K-120s) are mounted in two banks, with the large dispersion angles of the horns in a vertical position. In addition, the two banks are angled away from each other, up and down. This arrangement provides superior coverage all the way to upper seating levels in the rear of performance locations. Jack Maxson, chief engineer and mixer on the Bee Gees tour and a founder and principal of Showco, was at first a little hesitant to disclose specifics of the high-end speaker system (the piezo tweeters), but after a little encouragement said:

"What the hell, I might as well tell you. We use Motorola three-by-six piezo tweeters. You can make whatever comments you want, but they do the job for us, and they do it real well. Anyway, you'll hear for yourself."

The house speaker system is all Crown powered (34,000 watts total), and the frequency-dividing duties except for the sub-woofer feed are performed by a pair of Showco custom electronic crossovers with crossovers at 800 Hz, 2300 Hz and 4000 Hz.

The main house mixing console is a Showco designed and built "Superboard," with thirty inputs, eight mixing buses and four line-level output channels. Two output channels each feed one of the electronic crossovers, while the other two output channels each feed half the PSA-2s that power the sub-woofer system. Although the board is capable of delivering mono, stereo or quad feeds, all mixes are mono. The Superboard also has associated with it a complete patch bay to facilitate interconnection of outboard signal processing equipment.

The list of outboard equipment includes Showco noise gates (used for background vocals, bass, keyboards and drums, at the outputs of the buses carrying these signals), two each dbx 160s and UREI 1176LNs on vocals (one on the background vocal bus output, the other three units on the individual input channels for the Bee Gees vocal mics), an AKG echo unit and a DeltaLab delay line.

The Superboard, as mentioned, has a thirty input capability, but the actual number of feeds to the board (mics from the stage and line-level returns from signal processing and effects de-

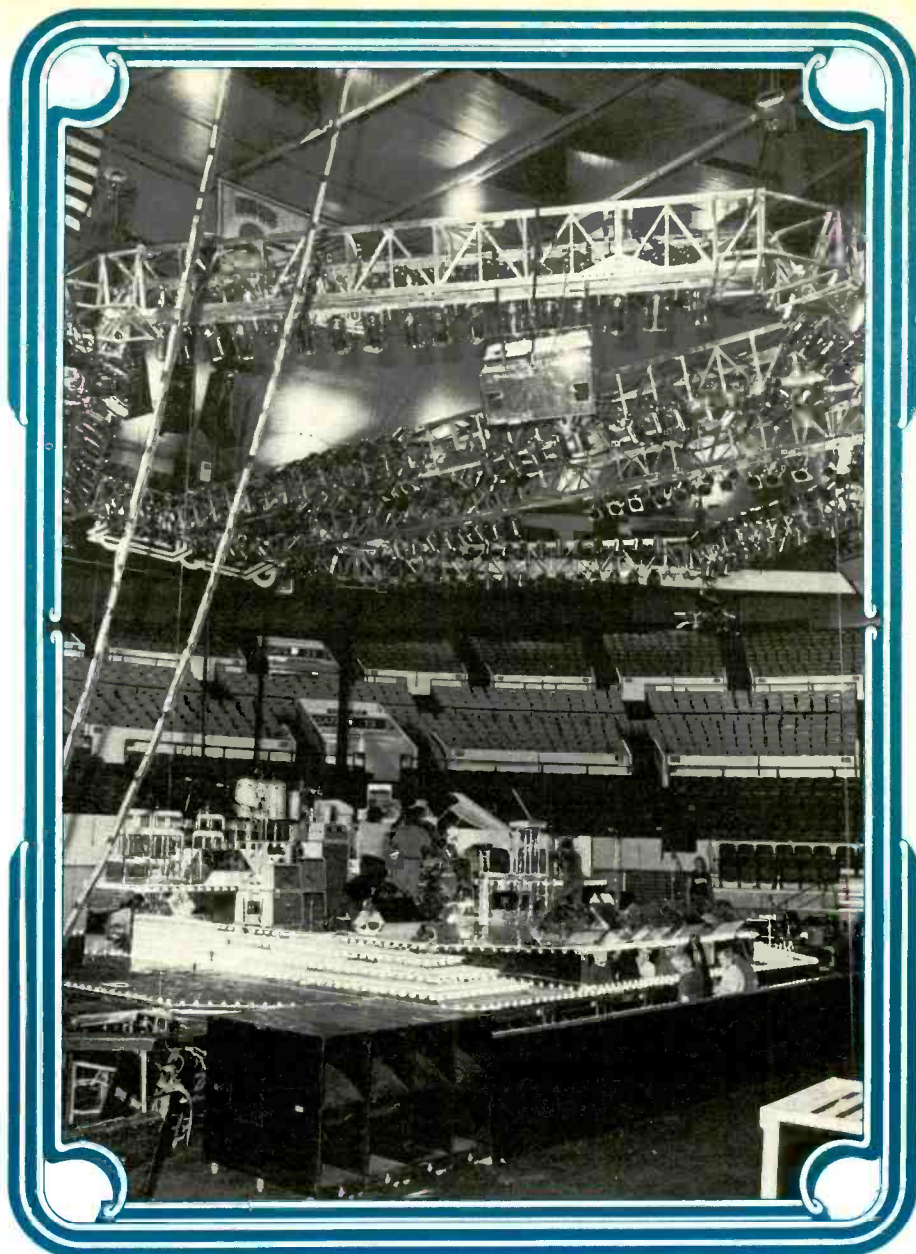


Photo of the elaborate, hanging lighting system at the Garden.

VICES) is a staggering fifty-four. Some pre-mixing is necessary, and this is accomplished using a Stevens board as an auxiliary. The pre-mixing for the Bee Gees tour is handled by M.L. Procise. M.L. also performs chief engineer/chief mixer duty on other Showco-supported tours.

Stage monitor mixing is handled by two Stevens 30x8 consoles, one to supply feeds to the floor wedges for the Bee Gees and back-up vocals, and one to supply feeds to the stage monitors for the band. These mixing chores are done by Mike Ponczek and Rich Adams. The stage monitor cabinets each contain one 15-inch JBL K-130, one JBL 2482 with a Showco custom horn and two JBL 2205 "bullet"

super-tweeters. This system is Crown bi-amped with an electronic crossover at 800 Hz and a passive crossover at 6000 Hz for the super-tweeters. The Showco crew members refer to this as their "pseudo-tri-amp" system.

Rounding out the list of industrial strength audio equipment is the microphone complement, which Jack Maxson was able to rattle off during a quick walk from the stage to the house mixing position.

"The vocals all get Shure SM58s, the keyboards get AKG D-12s. Let's see, are there any condensers? Oh yeah. The overhead mic on the drum set is an AKG C-451. The horn section is all Sennheiser MD-421s and everything else is Shure 548s."

The Bee Gees tour hit New York on Friday September 7, 1979 with the first performance that night in Madison Square Garden. There would be three nights of performing, a one night break to rest vocal cords, and then two more nights. This writer arrived at the Madison Square Garden truck dock early (*too* early) Friday morning in the company of Doug Hanewinkel, *MR* photographer. West Thirty-third Street, the location of the Garden truck dock, was full of gigantic white tractor-trailers with Texas plates, hostile New York cabbies (a redundant statement) and worried traffic cops.

Alaska is now the largest state in the Union, but Texans, displaced from their historic position as ambassadors of bigness to the rest of the world, may tend to overcompensate for their loss of status by doing things on a scale bigger than ever. At least that was the impression received from observing the Showco and Garden crews unloading the equipment cases from seven Texas-size tractor-trailers. It appeared that there was absolutely no wasted space in any of the seven semis, and that if upon re-loading, even a coil of wire were placed in the front of a van lying down instead of standing up, the rear doors would never close. Seven fully packed semis represent an awful

lot of equipment. Some individual pieces were pretty bulky, like the bungalow-size packing case for the "geodesic" ball, but there were hundreds of individual pieces to be unloaded. Enormous though the job was, Showco and Garden personnel managed it in less than two hours, and West Thirty-third Street returned to its normal level of noise and confusion.

Inside the Garden, work progressed just as smoothly as it had outside, as Showco's crew of thirty set about setting up. The house speaker systems were assembled and "flown" first, with a double-margin-of-safety rated system of electric chain hoists. The lighting trusses went next, also on chain hoists. Finally, the stage was assembled, lightbulbs were installed and the whole business was polished.

Once all the cables were run and connected, the entire lighting system was checked out and defective units were replaced while those that had been jostled during transit were re-focused. While the on-stage lighting was being run through its paces, Showco's female rigger, Jan Elliot, joined the Garden's house rigger Charles "Tiger" Land in hoisting and fastening the mirrored and geodesic balls to the ceiling. (Tiger earned his nickname when he fell from an overhead catwalk in the old Madison Square Garden into a

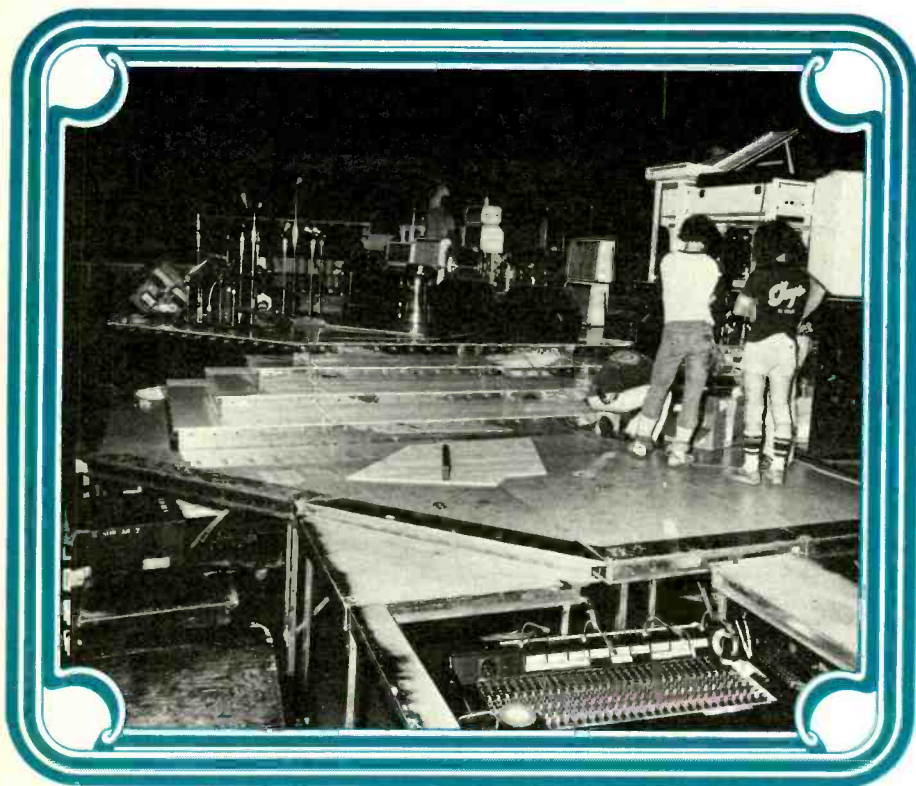
cage full of very large striped cats and a very surprised trainer.)

With the lighting and associated hardware squared away, the focus of attention shifted to the sound reinforcement and stage monitor systems. The first order of business was to send pink noise through the house system. Each band of the four-way system, plus the sub-woofer channels were checked individually, just to make sure everything was working. Everything *wasn't* working, and two power amps had to be replaced. The replacement took ten minutes, as Showco tours always carry enough spares of everything, and all the road equipment is designed with quick set-up and replacement as primary goals. With the power amps all working, the whole system, with pink noise blasting like a 747 at full throttle, was monitored on a Crown real time analyzer for overall tuning. Once the tuning was complete, each input from the stage was checked for proper function. The stage monitor system was given a preliminary run-through to check for malfunctioning components (none were discovered), but more definite adjustments would have to wait for the actual sound check with the band, back-up vocals and the Bee Gees.



During the break between the set-up and sound check, this writer was able to gather some information on the Showco operation, both historic and current. Started in 1970 by three men (Jack Calmes, Rusty Brutsche and Jack Maxson) who had been friends during their college years, Showco grew up with the sound reinforcement/tour production business to become Number One in this intensely competitive field. The principals of Showco who were available for comment, Brutsche and Maxson, attribute the organization's success to their uncompromising attitudes about designing and/or buying equipment that is "roadable," high quality and as trouble free as possible. Hiring of top-notch, creative staff and crew has helped maintain their lead in the field.

Currently, Showco Manufacturing Corporation is marketing sound reinforcement equipment (individual units and complete packages) with the same design emphasis as was given to the Bee Gees' and other touring systems.



Set up time at the Garden. Note the multi-level floor installed.

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Although the brothers Gibb showed up a little late for the pre-performance sound check, this operation went off without any major hitches. With everyone satisfied that all would go well for the performance that night, another break was called.

The back-up vocal group on the Bee Gees tour is the Sweet Inspirations, three beautiful women whose vocal blend is superb. The Inspirations also perform as a first act, prior to the Bee Gees performance. After a short break that Friday night, the band, and then the Bee Gees came on stage. Before describing the actual performance, it should be mentioned that the appearance of the production encompassed all of the salient features of contemporary American pop culture. The Bee Gees stage costumes were bright-white, disco-style affairs. The Inspirations were also dressed in disco style, one of them wearing what looked like sprayed-on disco tights. The under-stage lighting was of course reminiscent of a disco dance floor. The chromed lighting rig lent an aura of "high tech" decorating, and finally, the Bonnaroo Horns were all dressed in jogging suits.

The first number, as mentioned at the beginning of this article, was "Tragedy." As the tune progressed to the first time the title is sung in the first chorus, two large smoke bombs, two glitter bombs, the multi-beam laser array and the sub-woofers all got into the act at once. The smoke bombs (which also produce noise) were set off right in front of the center of the stage in order to provide a medium that would make the laser beams visible.

Whatever expectations this writer had about the sound quality at the concert, the reality of a thirteen-piece band, the Sweet Inspirations and the Bee Gees, run through a technically superior reinforcement system and mixed by people with professional ears and hands was impressive almost beyond verbal description. The clarity and articulation of the vocals was exceptionally good, as was the blend of all six voices. "Tragedy" sounded like the recording, only much, *much* louder.

The second number was "Edge of the Universe," during which the mirrored ball was rotated, slowly at first, and then increasingly faster, with a bright white spotlight focused on it.



Showco personnel arranging stage monitors during the set up.

This created the illusion (at least for the astronomically minded in the audience) of being in the center of a spinning galaxy of stars. "Night Fever" was next, with the entire lighting system brought into play. The visual aspect of the presentation was toned down a bit for the next tune, "Love So Right," but was restored to its previous level of activity for the last number before the retrospective medley, "Stayin' Alive."

For the medley itself the appearance of the stage and lighting system became much more subdued, in keeping with the time frame of the music being performed. Some of the more impressive elements of this part of the repertoire were: "Lonely Days," during which Jack Maxson made tasteful use of an AKG echo device and a DeltaLab delay line to make the performance even more reminiscent of the recording, "I Started a Joke," "How Can You Mend a Broken Heart" and "Nights on Broadway."

"Winds of Change" was the first number after the medley, and the production effects included good old dry ice fog, supplied by Showco designed and built foggers. For the last number before the first exit, "Jive Talkin'," the entire production machine was employed (except the foggers), layer by layer, as the dynamics of the tune built up. The band supplied a good dramatic ending to the tune and all the lights

went out at once, on the last beat. The audience responded approvingly enough and long enough to warrant an encore, and the Bee Gees gave the audience what it asked for. After the band, Inspirations and Bee Gees all caught their collective breath, the entire ensemble returned to the stage and began a powerful reprise of "Jive Talkin'." The excitement, both visual and aural, was raised several steps higher for the closing number, "Dancin'." The house mix was incredibly loud, yet was not painfully so. However, five minutes after the house lights came up people still had to shout to each other in order to communicate. Eventually, though, everyone's hearing returned to normal.

When questioned during the set-up about the magnitude of the production effort on the Bee Gees tour, and the compulsive attention to minute details demonstrated by the entire Showco crew, Jack Maxson had this to say: "This is the tour of the year, and we intend to treat it that way."

This writer's suspicion is that if anyone were to ask the same sort of question of *any* Showco chief mixer on *any* Showco-supported tour, the answer would be the same, and nobody would be fibbing. The list of Showco-produced tours includes Led Zeppelin, Wings, Jackson Browne and The Who. Clients such as these demand the best, and Showco is ready to deliver.

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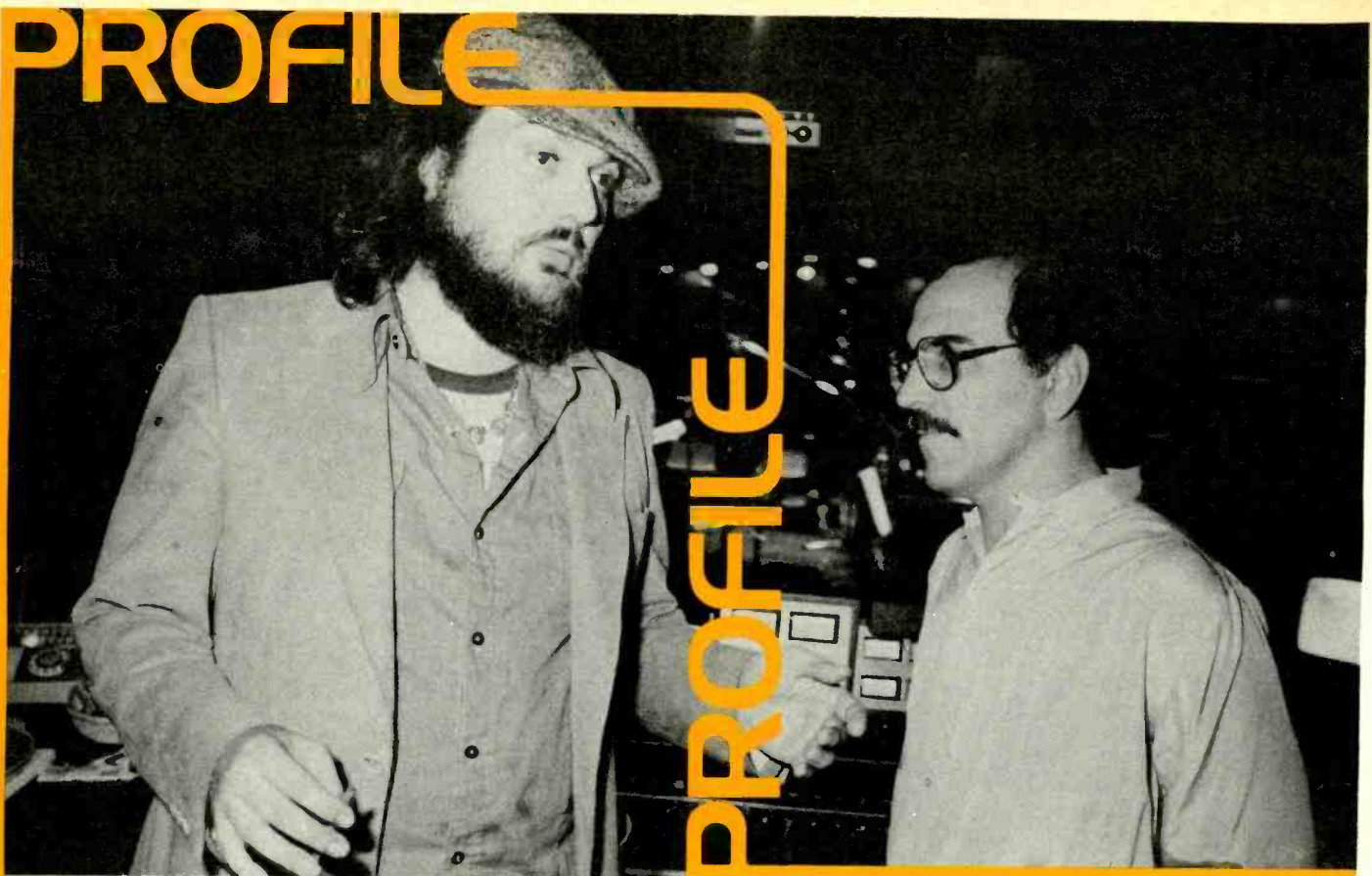
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PROFILE



Dr. John & Producer Tommy LiPuma

By Richard Richardson

Dr. John and producer Tommy LiPuma have long been involved in the business of making records. Dr. John is a multi-talented musician who because of his somewhat eclectic (some say) musical tastes has never truly reached the greater audience he deserves to reach. His knowledge of musical history is remarkable, specifically his knowledge of early rock and the music of New Orleans. A single listen to one of his albums will give you a realization of his talents.

Producer Tommy LiPuma, who worked with Dr. John on the sessions detailed here (LiPuma co-produced the album with guitarist Hugh McCracken), has one of the most impressive "track records" in the production field. He has

through his associations with A&M, Blue Thumb and Warner Bros. records compiled an almost staggering number of quality production dates with artists which include, among others, Jackie DeShannon, Dave Mason, George Benson, Deodato, Al Jarreau and Stuff. Mr LiPuma has recently rejoined Warner Bros. Records as "Vice President, A&R, Progressive Music."

Modern Recording sat with Dr. John and Tommy LiPuma shortly after the completion of the latest Dr. John release, Tango Palace, which was issued in the late fall of 1979. The interview is not of a very technical nature, and therefore allows the reader to grasp some of the finer points of style and philosophy as they apply to the art of recording.

MR: Do you have a system for working in the studio?

TL: We try to keep it loose; it's not really a system. But you do have to have some kind of organization. However, when it comes to the actual dates and the music itself, unless you want to do Sousa marches, there's no point in being *that* organized. When you're doing horns, or in similar situations where you use charts it's different. It has to be more organized out of necessity.

When we're doing the tracks we keep it loose to get the spontaneity. It's im-

portant to remember that not only is each act different, but also each album is different. You can walk into a studio and say, "*this* is the way we're going to do it,"... the next thing you realize is that *this* is *not* the way it's going to work at all.

MR: How did you record this album?

TL: The original dates were done with just the basic rhythm section (bass, drums, guitar and keyboard) and vocal. We then overdubbed the horns, percussion and some vocals.

MR: Did you keep any "live" vocals?

TL: Yes, in some cases we did. It's great if you can get [record and keep for the final product] a "live" vocal, but even if you can't, I believe that it's essential the musicians hear the melody line, the words, and get to react to the singer's emotions. I don't like doing tracks where the players are just looking at charts and don't hear a vocal. After awhile the musicians are just reading symbols and not getting the feel from the singer, which is what they should be doing.

MR: What about the personnel you used on the album?

TL: We used some really fine players. Hugh McCracken, who also co-produced the album, played guitars. Steven Gadd and Herman "the German" Ernst, who plays on most of the Allen Toussaint records, alternated on drums and percussion Abe Laboriel and Dennis Belfield played bass. Andre Fischer also played drums.

Very important to the sessions was Harold Battiste who did the horn charts and conducted the horn section. Harold is from New Orleans and has worked with Allen Toussaint a great deal. Charlie Miller, a trumpet player from New Orleans and New York was also outstanding.

MR: Do you find you work with the same musicians on a lot of projects?

TL: To a degree, yes, but it really all depends on what kind of music we are doing. I work with players with whom I have a rapport.

MR: Are you a daytime or nighttime worker?

TL: There was a time when I was a nighttime worker, but I think my metabolism has changed. I like working days now. I get musicians at a fresh part of the day. That way I don't get them after three or four other sessions or even after they've been up for that long a period of time.

MR: You seem to work very quickly, is that true all of the time?

TL: It varies. Sometimes it may take two or three days to lay down three or four things; other times you can lay down five things in one day. That's when a session gets hot. Basically it's all just a matter of getting what you're looking for. That's all that counts. The time involved is based on attitude, and, of course, people's attitudes change from day to day.

MR: Do you work primarily in one studio or do you move around?

TL: We usually do our tracks at Sound Labs and then mix down at Capitol. I don't believe in jumping around that much... for several reasons. For one thing, one's ears become accustomed to a studio. Another is the personnel. The people that I regularly work with understand what I like and what I dislike. I don't have to waste time and energy worrying about each individual thing being properly recorded. For example, Al Schmitt has been my engineer for the past nine years and has worked on every album I've done during that period of time. However, on this album, Norm Kinney, a fine engineer and producer in his own right, did the tracking

with us, and Al worked on the mixing.

MR: Why do you work at Sound Labs in particular?

TL: It's because the tracks come out with so much punch. I can hear things clearly on the monitors at Sound Labs. Also it's very comfortable working in the room. The engineers know the room and they know what I want. Linda Tyler, our second, is very musical and knows exactly what's going on at all times. The worst situation you can get into is where you have an engineer or a second who is not really into the music and who is just going through the motions of doing a job. The second has to be as adept at what he or she is doing as everyone else in the room, and they *have* to be interested in the music. The whole thing boils down to teamwork.

MR: Why don't you mix at Sound Labs as well?

TL: It's actually a personal thing. Many fine albums have been mixed at Sound Labs studio #2, but... it's what one becomes used to as an individual. Capitol just seems to work for me. I love the echo chamber there; that chamber has exactly what I want. Even though the room has an old Quad Eight board, it's really clean. Consequently you get this very open, transparent sound where nothing crowds anything else. You hear everything in perspective without the crowding. Also, the top end is open.

MR: How involved are you with the technical aspects of recording?

TL: The only time I get involved with the technical end is if I don't like the way something sounds. If that's the case, I'll go after it. But that is the reason I work with engineers like Al Schmitt and Norm Kinney. I have total confidence in the fact that they know what they're doing. I have enough to think about with the music and the casting of the musicians. If you want to be conscious of what's going on when the magic happens, you can't be thinking about moves (on the board).

MR: What is your attitude towards special effects?

TL: I utilize special effects whenever the need arises. However, I never use an effect just for its own sake.

MR: Today, people are finally placing a greater degree of importance on the mastering process. How do you deal with it?

TL: Mastering is the craziest time for me because there are so many variables. These variables are the subtleties that occur when you make changes by adding or subtracting a dB or two. You have to

remember that when you are adding to or taking away from something that you are also adding to or taking away from something else. I don't really try to change or enhance much in mastering. Those kind of decisions should have been made by then. Mastering is such a mechanical process—getting what's on tape onto a disc—that I just try to get a sound that feels right.

• • •

MR: On a more personal note, what home audio equipment do you use?

TL: At home I have a set of "Big Reds" [monitors] with Mastering Lab crossovers and custom enclosures. I also use Marantz amps, a Technics turntable, and a Nakamichi cassette deck. In my office I have mainly Technics equipment with the Mitsubishi DS-35 bookshelf speakers that I consider to be one of the best speakers ever made.

MR: What is the difference in dealing with Mac [Rebennack, a.k.a. Dr. John] as opposed to other artists?

TL: Obviously each artist is different. Mac is a real sweetheart to work with. He is a total professional because among other things he has spent a lot of time doing session work for other artists as well as doing his own albums. Mac is so creative that he has many ideas that he wants to try. It then becomes a matter of narrowing it down to the ideas that seem to make the most sense for any given tune. Mac is very open to suggestions. He knows when things are happening right and when they're not.

At this point Mr. LiPuma took a well-deserved break, and MR utilized the pause as an opportunity to ask Dr. John some questions.

MR: Mac, how would you describe the kind of music you play?

DJ: I try to do innocent, from-the-heart music as opposed to cold, calculated cash register music. You've got to write a song from feeling and for the love of a song rather than just for money. You've got to be close enough to reality to let innocent things come out. You've got to write about real things.

MR: Being a veteran session player yourself do you have a philosophy about dealing with the "hired hands" on your own albums?

DJ: In a lot of sessions there is no real marriage of sound in the room. You'll have guys playing at all sorts of different levels and not relating to one another at all. There are too many great players who get stuck into playing things that don't take advantage of their genius. It's a trap, but a guy gets hired

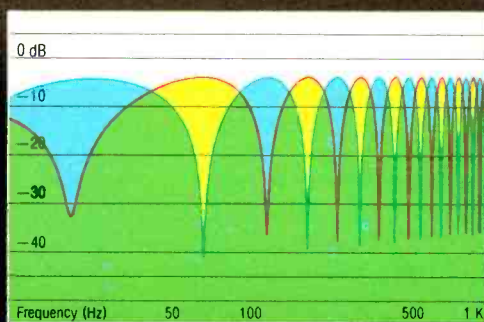
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Guitars:	Hugh McCracken Alvin Robinson
Percussion & Wingertree:	Fred Staehle
Percussion:	Steve Gadd on "I Thought I Heard New Orleans Say," "Renegade," "Something You Got" & "Bon Temps Rouler" Herman Ernst on "Louisiana Lullabye," "Tango Palace" & "Fonky Side" Paulinho Da Costa Neil Larsen Ronnie Baron
Horns Arranged by:	Harold Battiste and Dr. John
Horns:	Charlie Miller—Trumpet & Cornet Solo on "I Thought I Heard New Orleans Say" Oscar Brashear—Trumpet & Flugelhorn Warren Luening—Trumpet & Flugelhorn Benny Powell—Trombone Herman Riley—Baritone Sax Plas Johnson—Tenor Sax, Flute & Clarinet Jackie Kelso—Tenor Sax & Clarinet Gary Herbig—Tenor Sax Solo on "Bon Temps Rouler" Tommy Johnson—Tuba
Seawind Horns:	Larry Williams—Tenor & Alto Sax, Clarinet Kim Hutchcroft—Tenor & Soprano Sax
Background Singers:	Petsye Powell Tami Lynn Brenda Russell Ronnie Baron Jim Gilstrap Muffy Hendricks Denise Trammell Alvin Robinson & Dr. John on "Something You Got"

and he's got to do it. I feel that if you've got players that know how to blow, it's stupid not to let them blow. But a lot of producers aren't that adventuresome.

MR: What producers would you consider "adventuresome?"

DJ: It's guys like Tommy LiPuma, Tom Dowd, Arif Mardin, Hugh McCracken, Steve Cropper and a few others. These guys aren't afraid to fight for things they believe in. They are the ones who *set* the trends, as opposed to a lot of guys who bend with the wind.

I will say that it's difficult for a new producer to be adventuresome because he's under so much pressure to come up with something that sells. As a result he will come up with something that sells, sometimes forfeiting the spontaneity of

the art. He sticks with a proven formula.

MR: Can you give us some examples of this approach?

DJ: It's like the first guy who decided to use the mic check for the drums (playing straight around the traps to check each of the drum mics) as a drum fill. It's gotten to the point where everybody uses that as a drum fill. They've been doing that for twelve years. Some producers even feel that it's necessary in order to have a hit record. The drummer should be able to play what he feels. It's the same thing as when Isaac Hayes came up with "Shaft." Now there's got to be three or four thousand songs that sound exactly the same.

It's just that the musicians should be given a chance to express themselves

more. A lot of producers will tell a guy to "play like you did on that record," rather than saying, "Play it and see what you come up with." Why lean on the past when the present moment is so much more valid and spirited.

MR: You've been making records for a long time; what changes do you see?

DJ: I think the "fix it in the mix" mentality that came along with the advent of multi-track recording killed a lot of the life in making records. When things were recorded "live" it was a definite function of reality. The tape was rolling and that was it. Multi-track has taken a lot of the innocence and spontaneity out of making records.

MR: Would you be a bit more specific?

DJ: Well, up until about 1964 or 1965 horn sections never used to play on the center of a tone. The players would bend the notes around, create a fat sound. This was often done with three players. Nowadays they have to play right on the tone because they have to double their parts. As opposed to expanding upon the charts, they're locked into them.

MR: So you see a definite change in attitude towards the making of records.

DJ: Sure. When I got into the business it was young and no one knew enough to be that calculating about it. The problem today is that instead of the music being the most important thing, the business is. It's a trap to watch out for. If we don't, we might as well be grinding out soapflakes as music. Compromising that much makes the chicken farm look pretty good.

MR: You have a dim outlook on present day recording technology.

DJ: The technology has taken a lot of the heartfelt soul out of music. Today the number of tracks you have to play with is much more important than getting a performance down right the first time. It's like a lot of people will listen to an old Billie Holiday or Dinah Washington record and say, "Those guys sure are making a lot a mistakes," or "They didn't know how to make records back then. Today no one would ever dream of making a mistake."

MR: Since you're not crazy about modern studio technology, how do you feel about special effects or synthesizers?

DJ: I like using some things—especially phasers or flangers on a Rhodes. When it's something special that fits a song I'm all for it. But you have to watch out not to get too involved in gadgets and use things too indiscriminately. I play synthesizers occasionally, but I don't like programming them. They remind me of pinball machines.

Ambient Sound

BY LEN FELDMAN

First Experiments With Digital Recording

A couple of months ago, I promised to report to you concerning my first hands-on experiments with a digital audio recorder. At that time, I had already been loaned a Sony PCM-1 digital processor which, when hooked up to a video tape deck, would enable me to make PCM recordings with about 85 dB of dynamic range, less than 0.03% harmonic distortion and "zero" wow and flutter. An exciting prospect, you will admit.

All that I was waiting for was the Betamax Sony video tape deck to hook up to the digital processor. Finally, it came, and I was ready to begin my long-awaited experiments. As you probably know, the PCM-1 processor converts continuous analog audio signals into digital information. That is, the audio waveform is sampled some 44,056 times per second, and, at each sampling time, its instantaneous amplitude or level is expressed as a number. To express this number, binary codes, consisting of only 0s and 1s are used. The larger the number of 0s and 1s used to express the number, the more closely you can approximate the precise amplitude of the waveform at each sampling point. Or, to put it in terms we all understand, the lower will be the distortion when you convert all those binary numbers back into a continuous analog signal. In the case of the PCM-1, a 13-bit coding system is used. Now, if you figure that each "number" takes 13 bits (or "0s or 1s") and that over 44,000 samples have to be taken each second, you come up with a bit requirement of 572,728 bits per second! Actually, the number of bits required is far greater than that, since, remember, this is a stereo signal processor, so samplings have to be made alternately of the left and right analog signal waveforms. In addition, extra bits have to be used to compensate for any drop-outs or errors which might occur in the tape. So, in fact, the recording density required or produced when using the PCM-1 processor ends up to be a whopping 1,726,000 bits per second. Clearly, no known analog open-reel tape deck can handle that density of information, even if it were to operate at 30 ips. That's

where the video tape deck comes in.

Any video recorder has to be able to record signals whose frequency is 3.58 MHz or even higher (the frequency of the color burst signal) so a VCR becomes the ideal tape transport to use with a digital processor such as the PCM-1. But using a VCR also adds complications because in addition to all those "bits" of information, you [also] have to create the rest of a standard video signal which is needed for proper operation of a VCR, such as the horizontal sync pulses, the vertical sync pulses, etc. Since the horizontal lines (in video) occur every 1/15,750th of a second, that means all our little continuous "bits" produced by the PCM-1 have to be squeezed into the video signal *between* the horizontal and vertical sync pulses. That might lead you to believe that there will be discrete interruptions in the audio signal during playback, but that's not what happens at all. Thanks to a digital memory system built into the PCM-1, when those groups of bits (including the pauses between them) are "read" by the playback tape head, they are first stored in memory in the PCM-1 and then fed out in an uninterrupted continuous stream, just as they were produced in the first place. Pretty neat when you think of it.

With all of this understanding tucked firmly in my brain, I, all raring to begin, unpacked the Betamax. Much to my dismay, the particular Betamax was a portable model and had *no* pin jacks for video-out and video-in cables which have to be connected from the PCM-1. Since the particular model (SL-3000) was intended for use with a video camera, all it had was a special multi-pin connector designed to accept the multi-pin cable from the appropriate camera.

Undaunted, I paused for a while to think. It then dawned upon me that as far as the VCR is concerned, all it wants to receive and handle is a video-type signal (per American NTSC standards). Well, I happen to own a competing video tape deck made by JVC and even though it uses a completely different format, (VHS as opposed to Beta) I reasoned that this

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shouldn't make any difference. Happily, *my* machine did have video in and video out jacks, and, as matters turned out, I was right. So, the first thing I learned about the PCM-1 is that it will work with *any* video cassette recorder (providing the recorder has those pin jacks for video in and video out).

Further Experiments

After a quick test run to establish that the connections worked, I decided to try to measure all those great characteristics of the system that I mentioned earlier. Naturally, the first thing I wanted to do was record something that had more than 80 dB of dynamic range. Unfortunately, although I asked you readers to send me some "live" musicians in that earlier column, on the day that I was ready to test the digital recording system not a single music group showed up at my door. Clearly, transcribing any of my discs to PCM would prove nothing. Even my very best digitally mastered discs were still in fact analog, and no analog disc as we know it could contain better than 60 or 65 dB of dynamic range because of that blasted surface noise "floor" on any vinyl disc. My half-track reel-to-reel deck, operating at 15 ips would do a bit better, but then what would I use as program material? I am not fortunate enough to own any original undubbed masters of anything. My only alternatives were to: (a), sing real loud into a good microphone; or (b), come up with a brilliant idea.

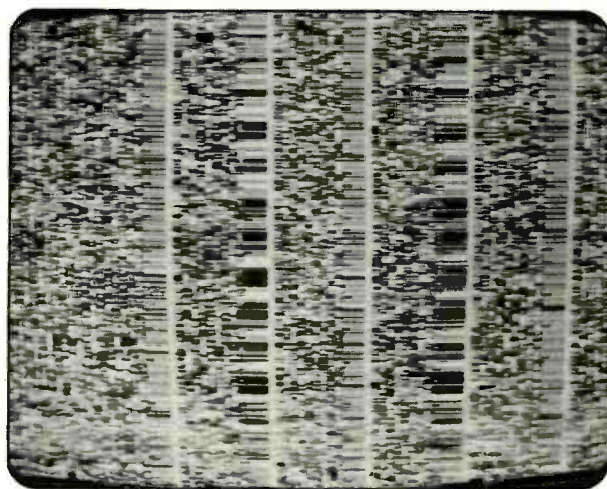
Quickly ruling out alternative (a), I came up with—you guessed it—a brilliant idea. I had recently acquired a dbx model 21 disc decoder plus the first dozen or so dbx-encoded discs. As readers who have followed this column know, the dbx-encoded disc is one which has been compressed by a factor of 2:1. Such discs can easily handle 80 or more dB of dynamic range (since 80 dB becomes 40 dB when encoded). In playback, the decoder expands the signals back out to their full dynamic range.

So, I fed the output of the dbx decoder into the line inputs of the PCM-1, played a couple of those dbx-encoded discs and allowed the fully expanded signal to be recorded in PCM format. Sure enough, the idea worked; when I played back the video tapes (via the PCM-1 processor) I literally couldn't tell the difference between the disc and the tape. The only additional noise I heard was an occasional "tick" or "pop," at a very subdued level, which, as I understand it, is the error correcting circuit filling in missing bits when dropouts occur in the tape.

The experience taught me the second important thing about PCM recording. The requirements for the tape used in digital recording are quite different from those necessary for analog or conventional tape recording. Tape saturation (or maximum output level) is no longer of great importance. Neither is residual tape

hiss or noise. All of the "pulses" which represent the "bits" of coded information are of uniform amplitude and so long as that amplitude is above the noise floor of the tape and below the saturation level, all will be well. What is important is particle density and lack of dropouts, for even though the PCM-1 contains all sorts of error correcting circuitry and even a sophisticated redundancy checking system, the fewer dropouts you have in the tape, the less of that "popcorn" noise you will hear when playing back the tapes.

Over-recording also causes a completely different effect when using digital recording. The PCM-1 has a pair of LED meter banks which read downward from "0 dB" to better than -60 dB. Unlike analog taping, however, you had better never exceed the "0 dB" mark. In an analog open-reel machine, when you ex-



How a digitally-encoded audio signal looks when "played" directly onto a TV set's screen.

ceed nominal 0 dB record level you slowly and smoothly get into higher and higher distortion levels. It doesn't all fall apart at once. In the case of the PCM-1 (and, I would imagine, all digital tape recording systems), once you go above the 0 dB mark things break up pretty quickly. That's because you have simply run out of "numbers" with which to encode higher and higher instantaneous amplitudes of signals being recorded. If you are familiar with binary notation and bear in mind that we are dealing with a 13-bit system, the "loudest" instantaneous amplitude you could encode would come out as binary number 111111111111. In ordinary decimal notation, that number equals 4,097. So, in a 13-bit digital encoding system you can describe an amplitude as lying anywhere from 0 to 4,097. But if a *bigger* number comes along, the digital encoding system runs out of available numbers and can't handle the problem.

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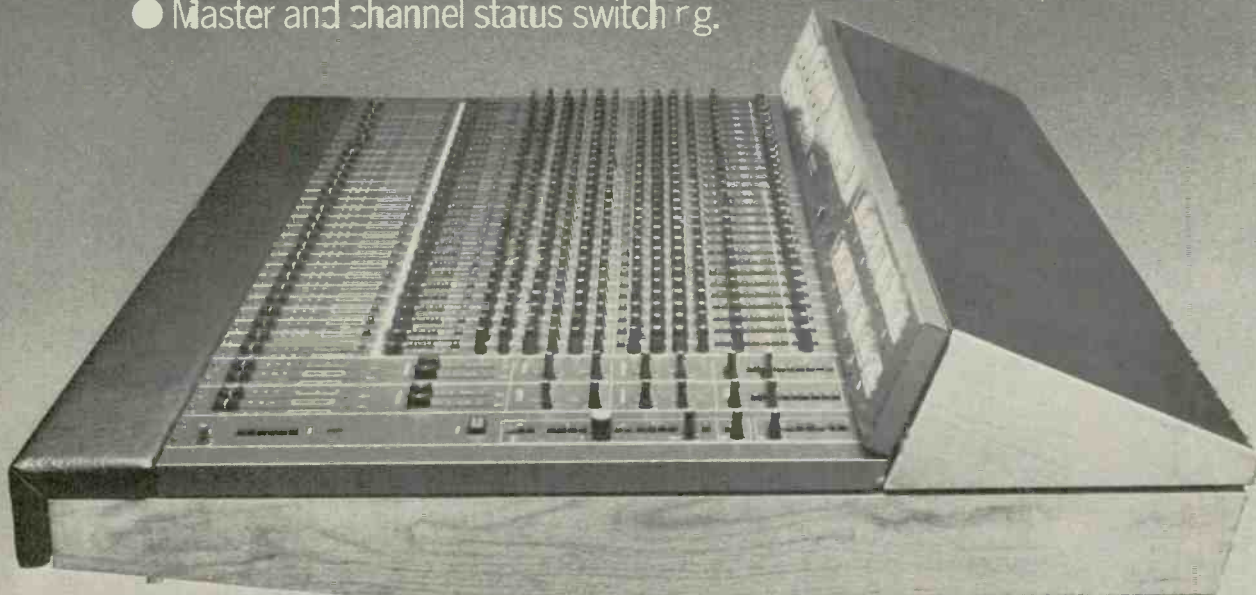
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In actual use, this is of course no problem. A 13-bit system gives you a theoretical dynamic range of 78 dB (6 dB of signal-to-noise ratio for every available bit). Sony does some other tricks with the system so that it ends up having the equivalent dynamic range of a 14-bit system, or around 84 dB of actual dynamic range and that's more than you are likely to need for any "live" recording situation. All I'm saying is that for the experienced recordist, who usually expected several dB of "headroom" above the 0 dB mark on the meters, it takes a bit of training and getting-used-to to make sure those LEDs never flash above the 0 dB mark. Sony adds a couple of spare LEDs above the scales which flash on and read overload if you insist upon trying to push record levels above the safe limit.

Working with a digital recorder for a while, one is easily spoiled. There is just *no* wow-and-flutter in the playback system. There is no evidence of modulation noise, and distortion for single tones recorded and measured during playback was indeed around 0.03%. And mind you, I'm talking about tones recorded at *any* level, all the way up to that arbitrary 0 dB mark! As for frequency response, the system was down around 2 dB at 20 kHz. Unlike analog recorders, however, that response (which was ruler flat below 20 kHz

and down to sub-sonic frequencies) remains exactly the same no matter what level you measure it at!

The system does roll off sharply above 20 kHz, however, and that is done deliberately. In any digital system, the highest frequency you can expect to record must be less than one-half the sampling frequency and, if you'll look back, you'll see that the sampling frequency for the PCM-1 was just over 44 kHz, half of which is 22 kHz.

As a final experiment, I couldn't resist the temptation to "play" the digital signal from the video tape recorder right into my TV set, just to see what all those millions of "bits" look like as a video picture. The results are shown here, and, while they don't make much sense, it is possible to see the spacings between digital "words" or numbers. They [the spacings] are those vertical white lines that run the height of the picture tube. Of course, a still picture such as this doesn't really do them justice. You ought to see how the screen flickers and dances with those millions of black and white spots as the music actually plays. Perhaps this is the start of a new multi-media form of entertainment. Listen to your digital recordings while you watch the black and white "bits" dance wildly on your television screen!



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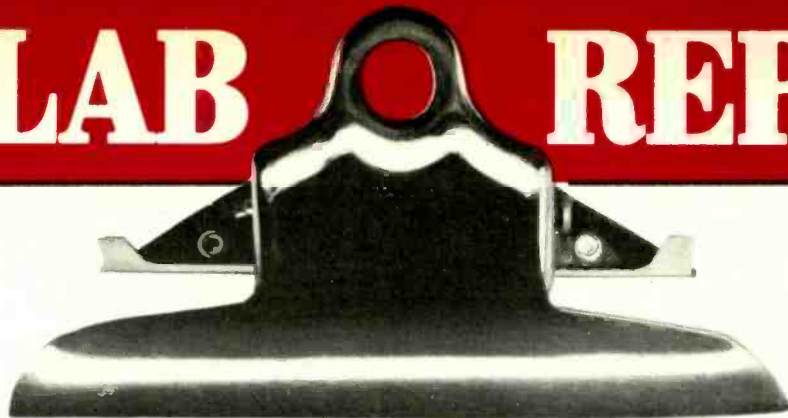
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CIRCLE 82 ON READER SERVICE CARD



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Soundcraftsmen AE2420-R Analyzer/Equalizer



General Description: The dual purpose operation of Soundcraftsmen's new model AE2420-R is suggested by the name "Scan-analyzer" given to it. The device is a full-function stereo graphic equalizer combined with a sound analyzer that includes a versatile pink-noise generator.

The equalizer itself offers 10-band (octave by octave) adjustments on each channel. The sliders are calibrated from +12 to -12 dB in 2-dB markings, with a very subtle detent at zero dB. The frequency markings are exact octave values starting with 30 Hz. In addition to the boost-or-cut sliders, each channel has its own slider for adjusting to zero-gain or unity-gain. This is done with the aid of LED indicators centered on the panel between the two groups of left- and right-channel sliders. In addition to general system/room equalization, the unit can be used to pre-equalize signals before they are fed to a tape recorder. Equalization also may be bypassed when desired, for making comparisons.

The major difference between the AE2420-R and other equalizers from Soundcraftsmen is the added analyzer that is built into the device. Inputs are provided for both microphone (such as would be used in room analysis), and for line sources (useful for analyzing tape deck and recording tape response, or amplifier response, etc.). For sound reinforcement work, the analyzer may be connected between the system mixer and amplifier, but note that the amplifier must have

its own gain controls since the level of the pink noise is quite high and it could damage some speakers. If the amplifier has no gain controls, the analyzer may be patched into the mixer's effects bus, which allows controlling the pink-noise level at the mixer itself.

Signals fed into the analyzer are compared by a differential comparator circuit against the pink-noise signals produced by the Scan-analyzer itself. Overall unity gain is adjusted, and then the operator introduces the octave filters one at a time while adjusting each slider for unity gain in each frequency band, using the LEDs as guides. When the octave-by-octave analysis is completed, the positions of the sliders may be marked on a "Computone" chart (several are supplied with the unit) for a record of the response characteristic produced by the analyzer. Introducing inverse amounts of EQ would then presumably result in flat response.

In its role strictly as an equalizer, the AE2420-R is fairly reminiscent of previous Soundcraftsmen models. It is supplied with a test-record containing 30-second bands of pink noise in ten octave steps, with spoken instructions. The AE2420-R includes all of the high-quality aspects of Soundcraftsmen's other models, including the use of op-amp synthesized inductors (as opposed to actual coils) in the band-filter circuits. The front panel of course reflects the added analyzer section and the built-in pink noise generator. In addition to the EQ sliders there are two knobs. One is a stepped control that selects the frequency bands individually,

or all at once. The other is a continuously variable control for adjusting the input to the Scan-analyzer. Other controls include pushbuttons for power off/on (with an LED indicator); LED defeat; EQ defeat; EQ tape record; tape monitor; pink-noise on or off; channel A and channel B select; and microphone hi-impedance select. Front-panel signal jacks (1/4-inch) include microphone and high-level inputs to the Scan-analyzer, and in and out connections for an external stereo equalizer.

The rear panel contains pin-jacks in stereo pairs for line in, line out, tape in and tape out. A screened diagram here also shows some recommended hookups for stereo hi-fi systems. The unit's AC power cord is fitted with a three-prong grounding plug, and an unswitched 3-hole AC convenience outlet is provided. The AE2420-R is supplied with wooden side panels which may be removed for installation in a standard rack-mount.

Test Results: Most of the AE2420's published specifications were confirmed or bettered in lab bench tests. S/N was measured as slightly below spec, but at 90 dB for rated output (and 102 dB for 10 volts output), it was ample enough. Especially commendable was the extremely low distortion measured (well under spec), and the accuracy of both the octave frequency settings and the indicated control ranges.

Examination of the innards of the device (see accompanying photo) revealed the special shielding structure surrounding the power transformer which is tucked away in a corner, as far as possible from the main circuit board. Note too the absence of any coils or wound inductors on the PC board itself; Soundcraftsmen has, for some time now, used so-called gyrator op-amp circuits to provide the equivalent reactances for the octave filter circuits.

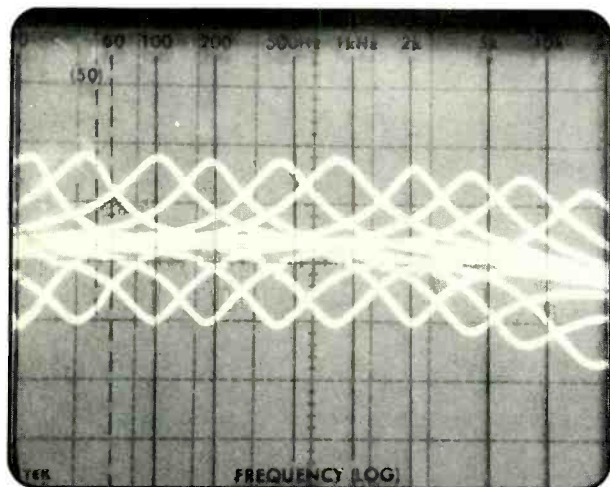
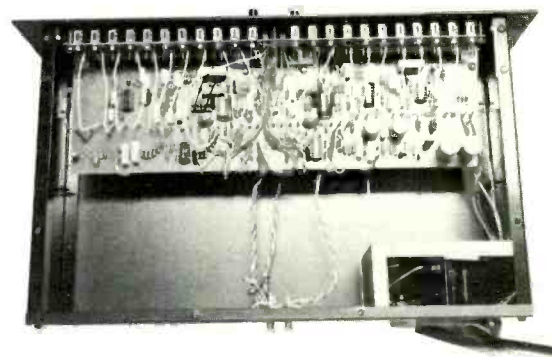


Fig. 1: Soundcraftsmen AE2420-R: Octave-by-octave control range.

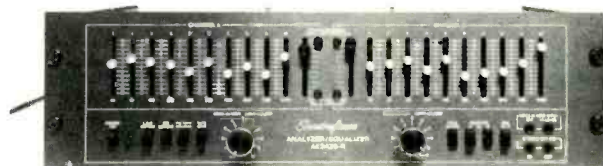


Soundcraftsmen AE2420-R: Internal view of chassis.

Fig. 1 is a 'scope photo of the control range of each of the octave bands of the AE2420-R. Now, if you look at our front-panel shot you will note that the sliders are not set at their mid or flat positions. They are, in fact, set as we found necessary to achieve "flat" response in a listening room with a given pair of speakers. The curves shown in Fig. 2 represent the response of that system with the controls set as shown in the front-panel photo. The upper trace shows the left-channel response; the lower trace, the right channel. Amplitudes are relative rather than absolute, since we simply displaced one curve from the other manually in order to show both curves clearly in the same 'scope photo. Note that both channels required fairly similar compensation, mainly at the high end. Bear in mind, however, that what we adjusted for was "flat" response out to 20 kHz. As a practical matter, most sound-reinforcement technicians would not go for "flat" response in a good listening room, but would opt for a gradual rolloff at the high end, the so-called "house curve." (Based on that idea, it looks as if our present system isn't too bad, even without equalization.)

General Info: Dimensions are: 19 inches wide; 5 1/4 inches high; 11 1/4 inches deep. Weight is 21 pounds. Price is \$499.

Individual Comment by L.F.: The Scan-analyzer portion of the Soundcraftsmen AE2420-R is reminiscent of a product introduced by Shure Brothers a few



Soundcraftsmen AE2420-R: Front panel view with settings corresponding to curves shown in Fig. 2.

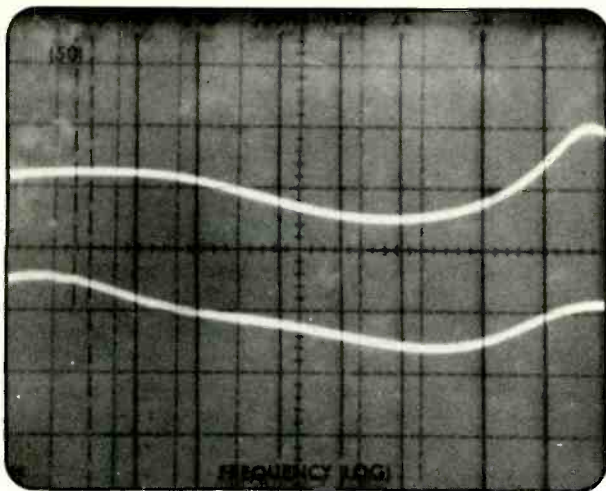


Fig. 2: Soundcraftsmen AE2420-R: Settings shown in front-panel photo yielded these response curves, required for "flat" response in our own lab.

years ago, in that both products achieve room or system equalization by indirect rather than direct means. The Shure device has a whole series of comparator LEDs (a pair per octave), but it was an analyzer only, lacking a built-in equalizer. The Soundcraftsmen unit, on the other hand, requires individual octave-by-octave filter adjustment to achieve total system or room equalization, but it does have the convenience of a built-in equalizer.

Using the pink-noise analyzer feature of the AE2420-R I found that the whole job of setting up the controls for flat system response took no more than a minute (a couple of seconds for each octave), including the second and third-time fine tuning which often is

necessary because of slight interaction between adjacent octave controls.

The AE2420-R is cleverly conceived to do a form of real-time analysis that I found to be more accurate than that obtainable with some of the LED-type analyzers that have recently appeared. The differential comparator circuit is extremely sensitive, and it responds to differences well below 1.0 dB. So, at just under \$500 the buyer of this unit gets an effective two-channel graphic equalizer plus a built-in means of verifying its settings and of measuring system and room response quickly and accurately. All told, a nice idea, and well executed by one of the first companies to deal seriously with graphic equalization.

Individual Comment by N.E.: In lab tests and actual use the Soundcraftsmen AE2420-R proved its mettle as both analyzer and equalizer. As a cleverly designed and effectively worked-out product it leaves little to be criticized. But I do note that the instructions for using it are divided among a rather poorly illustrated booklet, the narration on the test-record and on the jacket that contains the test record. The jacket, while it does contain an awful lot of information, is fairly cluttered. The record itself is fine in terms of its signals, but it contains an error of statement regarding at least one record company—to my knowledge, Columbia does *not* emphasize the low bass so as to require correction on playback, certainly not in its classical albums anyway. As we had occasion to point out in an earlier report on a Soundcraftsmen device (the TG3044-R third-octave equalizer), it would seem that Soundcraftsmen's information department needs to do some catching up with its strong and solid engineering department.

SOUNDCRAFTSMEN AE2420-R ANALYZER/EQUALIZER: Vital Statistics

PERFORMANCE CHARACTERISTIC	MANUFACTURER'S SPEC	LAB MEASUREMENT
Analyzer Section		
Minimum input	75 mV	Confirmed
Differential Meas. Accuracy	± 0.1 dB	Confirmed
High level response (± 0.1 dB)	20 Hz to 20 kHz	20 Hz to 25 kHz
High level gain, max.	30 dB	30 dB
Mic preamp response (± 0.1 dB)	20 Hz to 20 kHz	20 Hz to 20 kHz
Mic preamp gain, max.	80 dB	80 dB
Pink noise level	300 mV	280 mV
Bandpass filter center freq.	30, 60, 120, 240, 480, 960, 1.92 K, 3.84 K, 7.68 K, 15.36 K	Confirmed
Equalizer Section		
Rated output	2.0 V	Reference level
THD	<0.01%	0.0025% at 1 kHz; 0.005% at 100 Hz; 0.01% at 10 kHz
IMD	<0.01%	0.0037%
S/N re: rated output	100 dB	90 dB
S/N re: 10 V output	105 dB	102 dB
Octave control range		
all octaves set at max	± 16 dB	± 16 dB
all octaves set at zero	± 12 dB	± 12 dB
Gain/cut capability	+ 22 dB/ - 28 dB	Confirmed
Zero gain control range	18 dB	+ 6 dB, - 14 dB

CIRCLE 20 ON READER SERVICE CARD

BIC T-05 Cassette Recorder



General Description: The BIC T-05 is a compact, low-priced stereo cassette deck operating at the standard cassette speed of 1½ ips. It employs the two-head configuration (erase and record/play), and its mechanical transport is driven by a single motor. The press-to-operate transport keys handle stop/eject, record, rewind, play, fast-forward and pause. These are positioned below the cassette compartment which itself is covered by a see-through swing-down door. The recorder's AC power off/on button is at the left of the transport keys.

To the right and near the top of the cassette compartment are a three-digit index counter and reset button. The deck's signal meters are farther to the right. They are peak-reading, and marked from -20 to +5. The meters light up when power is switched on, and centered between them is a red LED that indicates the recording mode.

The model T-05 provides separate switching for high and normal bias, and for 70 μsec. and 120 μsec. equalization. These two switches are next to the switch for the Dolby system which has three positions (off, on and on with multiplex filter). The only other controls on the deck are separate recording level knobs for left and right channels. Also on the front panel are left and right channel microphone input jacks, and a stereo headphone output jack.

Stereo line-in and line-out jacks are at the rear, as is the recorder's AC power cord. The line inputs are overridden when microphones are plugged into the front panel jacks. Output level is fixed for both line and headphones.

The T-05 is supplied in a format similar to that used for BIC's other cassette decks—black metal case with highly legible white printing.

Test Results: Despite its small size, low cost and relatively limited number of features, the BIC T-05

boasts some very high-performing specifications which were either met or exceeded in our lab tests. Indeed, in terms of its audio performance as well as its wow-and-flutter, the BIC T-05 impressed us as being more than competitive with some decks priced considerably higher. Response, for instance, with either normal tape or high-bias tape, actually ran within the usual ± 3 dB tolerance from 20 Hz to just above 20 kHz. And with Dolby switched on, signal-to-noise reached 68 and 67 dB for normal and high-bias tapes, respectively. Such performance, in a deck priced as low as this, is little short of amazing.

The record/play response curves for both normal bias tape (we used TDK type AD) and for high-bias tape (TDK type SA) are shown in Figs. 1 and 2, respectively. In themselves these curves would not necessarily be remarkable. It is well known that response can be pushed up by deliberately underbiasing (and perhaps overequalizing) when recording. As a rule, however, doing that also produces higher distortion and a poorer signal-to-noise ratio. The T-05 suffers from neither of these faults, which means that the curves were not "phonied" at the expense of other performance characteristics.

General Info: Dimensions are 15¾ inches wide; 5½ inches high; 9¼ inches deep. Weight is 11.3 pounds. Price is \$209.95.

Individual Comment by L.F.: No, the table of "Vital Statistics" for this lowest-priced unit from BIC/Avnet is not an off-season April Fool's joke. Nor is its price. The reason we took the trouble to test and report on this model is to make a point. And that is, simply, if you want good performance with no frills, it still is possible to obtain it at a price that will satisfy the most bargain-hungry audio shopper.

This "bare-bones" cassette deck has those old-

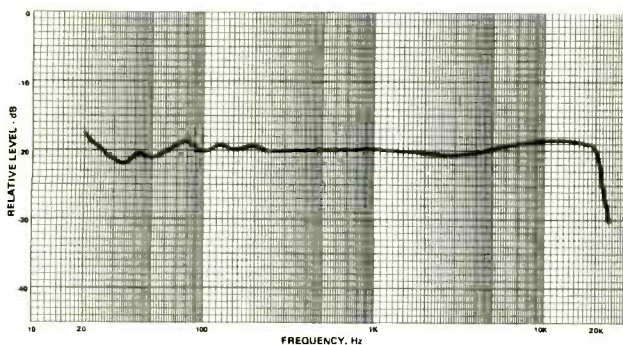


Fig. 1: BIC T-05: Record/play response using TDK type AD tape (normal bias).

fashioned mechanical piano-key-type transport controls. The meters also are mechanical (though peak-reading). There are only two bias settings and two EQ settings. Dolby is, of course, built-in, and there are separate left- and right-channel record level controls, but output level is fixed. Line inputs are overridden when you plug a pair of mics into the front panel. Outputs are provided for line and for headphones. And that's it folks, that's all there is.

But look, maybe twice, at our test results. I am told that the key to this splendid performance is what BIC calls "broadband electronics." I suspect there's more to it than that, such as intelligent choice of head gap, careful factory calibration and quality control, and lots more. Oh yes—may I remind readers that the T-05 was measured at 1 7/8 ips, not at 3 3/4 ips. I mention this because BIC was one of the first companies to introduce two-speed cassette decks about two years ago. This T-05 deck, however, offers only the standard 1 7/8 ips speed. What do you want for just over \$200?

Individual Comment by N.E.: While one obvious major trend in cassette recorder design is the increasingly complex array of options and features, BIC has brought out a deceptively simple cassette deck with very few features. In fact, it is almost easier to recite the list of things this deck does not have than to enumerate what it does have. The interesting thing about all this, though, is that you can very easily make

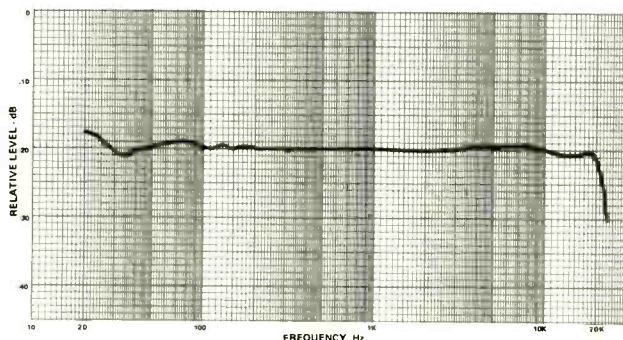


Fig. 2: BIC T-05: Record/play response using type SA tape (high bias).

do without all those extras, the more so in view of two very basic facts: one, the utterly fine performance of the T-05, and two, its utterly low price on today's inflated market. If that oft-used phrase "best buy" has any meaning, it surely applies to this product. The over-riding reality of this unit is simply that it makes, and plays, splendid-sounding cassette tapes. Obviously, there is some compromise in terms of the ultimate fine-tuning of bias and of EQ for various tapes. But the clean, open, wide-range, low-distortion sound of the T-05 makes me wonder just how important such fine-tuning really is in many applications. The very Spartan-like nature of the controls and features of the T-05 makes it easy to set up and use in a hurry, and you need not fear that the audio results will suffer as a result of this.

The major functional drawback of the T-05 is the lack of an output level control. This would not bother anyone patching the deck into a system that had a level control after the line output but it could bother some headphone users who would have no way of adjusting levels for private listening.

The transport system and its keys are of course hardly the latest. But would you believe they are capable of most of the tricks associated with fast-buttoning? I try this as a matter of course with every tape machine, but I hardly expected to find, in this model, the ability to go from one transport mode to another without having to press "stop" first. But you can go from rewind to fast-forward and vice versa; from either of those to play and vice versa; from either of those directly into record (by holding down play and record buttons at the same time); and from record into fast forward or rewind. The only thing that requires using the stop button is going from play into record. So this may be an old-fashioned mechanical transport, but someone somewhere must have done some clever updating on it.

Whether you regard this cassette recorder as a handy supplement, nice to have around as a dependable spare, or as someone's first deck for becoming oriented to tape, or as a no-apologies-needed unit for the budget-minded, it makes a lot of sense. I think BIC has a real winner with the T-05.

Editor's Note: Needless to say, MR doesn't very often test products of this nature (price?). A \$200 cassette machine aimed at the general hi-fi audience would ordinarily be run out of our pages by our readers in double time. But, for those of us who lug around cassette machines to rehearsals and sit around making copies of our latest studio creations for every A&R person in the country to hear—and who obviously can't afford to buy six \$1500 machines to leave at every stopping-off point on our daily routes—here is a unit to seriously consider.

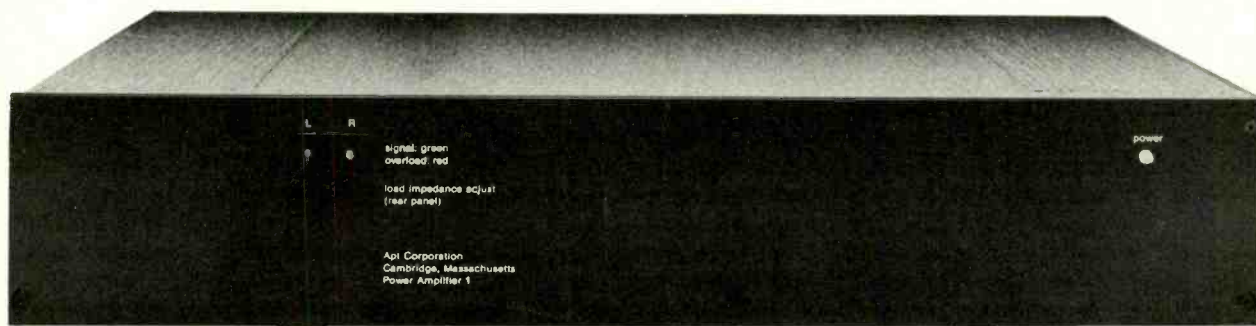
Please don't try to compare this recorder with units that previously have appeared on these pages, it really wouldn't make sense. This machine has very few features, but the ones it does have—fine response, good signal-to-noise and low price—make it worthy of your attention.

BIC T-05 CASSETTE RECORDER: Vital Statistics

PERFORMANCE CHARACTERISTIC	MANUFACTURER'S SPEC	LAB MEASUREMENT
Frequency response, standard tape	± 3 dB, 30 Hz to 18 kHz	± 3 dB, 20 Hz to 21 kHz
Frequency response, high-bias tape	± 3 dB, 30 Hz to 18 kHz	± 3 dB, 20 Hz to 21 kHz
Wow-and-flutter (WRMS)	0.07%	0.07%
Speed accuracy	NA	+ 0.4%
Signal-to-noise (re: 3% THD record level), Dolby out		
standard tape	55 dB	59 dB
high-bias tape	NA	59 dB
Signal-to-noise (re: 3% THD record level), Dolby in		
standard tape	63 dB	68 dB
high-bias tape	NA	67 dB
Record level for 3% THD (0 dB = 200 pWb/m)		
standard tape	NA	+ 8 dB
high-bias tape	NA	+ 7 dB
THD at 0 dB record level		
standard tape	NA	1.2%
high-bias tape	1.7%	0.9%
Line output at 0 dB	1 V	1 V
Headphone output at 0 dB	NA	65 mV/8 ohms
Mic input sensitivity for 0 dB	NA	0.15 mV
Line input sensitivity for 0 dB	200 mV	58 mV
Fast wind time, C-60	85 seconds	80 seconds
Bias frequency	NA	120 kHz
Power consumption	NA	12 watts

CIRCLE 21 ON READER SERVICE CARD

Apt 1 Amplifier

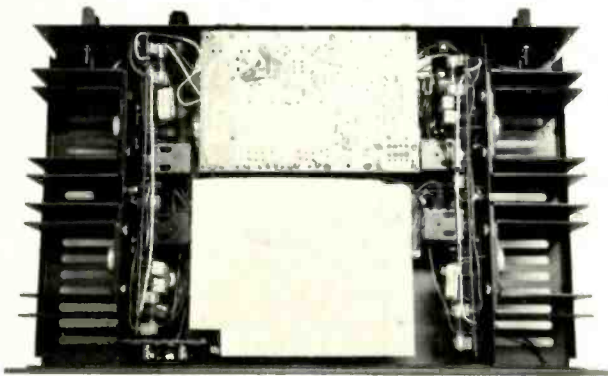


General Description: The Apt 1 is a stereo power amplifier conservatively rated to deliver 100 watts per channel into 8-ohm or into 4-ohm loads, across the normal audio band and at distortion levels (THD or IM) of not more than 0.03 per cent. It also may be used in a bridging mode for mono operation with an output power rating of 150 watts into loads as low as 2 ohms.

The front panel is unadorned except for a small square indicator panel and a power-on LED indicator. The indicators (one per channel) glow green when signals are applied, and change to red for overload conditions. An additional indicator, which comes on if load impedance is too low, shows the need to change the setting of the amplifier's load impedance switch.

This switch is found on the rear panel. Also at the rear is the stereo/mono switch. Signal inputs are hi-fi pin-jacks. Speaker outputs are standard 5-way binding-posts. There's also a fuse holder, and the amplifier's AC power cord which is fitted with a two-prong plug. The prongs are polarized and will fit only AC sockets that are polarized. The Apt 1 has no power off/on switch, and no level controls. Glued to its underside is a schematic diagram of one channel, and instructions for changing the power supply wiring for use on different line voltages (100, 120, 200, 220 and 240 VAC).

The "design philosophy" of the Apt 1 amplifier is detailed in a separate booklet supplied with the unit, and



Apt 1 Amplifier: Internal View

it would be impossible to present it all here. Essentially, however, it may be summed up in the statement: "The Apt 1 amplifier has been designed to perform optimally under the wide variety of conditions imposed by today's music systems." Thus, the load selector switch is designed to optimize the circuit for stereo loads of 8 to 16 ohms (mono, 16 to 32 ohms), or for stereo loads of 2 to 4 ohms (mono, 4 to 8 ohms). Special attention has been paid to dynamic headroom, stability with reactive loads, bandwidth, slew-rate, TIM and safe-area operation.

Test Results: Every published specification for the Apt 1 was easily confirmed or exceeded in our lab tests. Output power was well over the values claimed, and all distortion measurements were lower than claimed. In fact, IM distortion measured by the twin-tone method was literally unmeasurable, while the conventional THD and SMPTE-IM readings we got were about as low as the known distortion in our test signal sources.

The Apt 1 also exhibited about the greatest dynamic headroom (short-term power output capability above its rated output) of any amplifier we have yet tested—more than 3 dB into 8-ohm loads. This means that under short-term conditions (such as those encountered in music reproduction) the amplifier actually will deliver over 200 watts per channel, even though its continuous power rating (into 8-ohm or 4-ohm loads) is 100 watts per channel.

As far as stability with reactive loads is concerned, our tests confirmed what Apt claims in its literature: the capacitive load rating extends from zero to 1 uF, while the reactive load rating is a full 3.0 dB.

From all indications, we would say that this amplifier will stand up under the most severe punishment likely to be encountered in use. About the worst that may be expected is an occasional fuse blowing. But the output stages are so conservatively designed that there is no need for distortion-producing conventional protection circuitry. Thermal-limiting reduces the amplifier's gain before dangerous temperatures can be reached, while a safe-area limit detector causes a relay

to disconnect the amplifier from its load before damage can occur either to the load or the amplifier's own output stages.

General Info: Dimensions are 16.9 inches wide; 3.12 inches high; 10.2 inches deep. Weight is 22 pounds. Price is \$641.

Individual Comment by L.F.: Whoever said that an esoteric or super-audiophile type of power amplifier has no place in the world of pro audio simply didn't know what he was talking about. As proof of this, I submit Tomlinson Holman's new Apt 1 power amp, a sleek looking 100-watt per channel stereo amp that can be strapped for mono operation and that will deliver as much as 150 watts per channel even when driving 2-ohm loads.

Tom Holman personally delivered his new "baby" to our lab a few weeks ago, and spent an hour or so explaining his circuit design philosophy. (He even brought along his own slide projector, by means of which he was able to show the results of some sophisticated tests which he had made on his and on competitive amps, most of which related to the world of real loudspeaker loads, as opposed to the "laboratory" static loads customarily used to test amplifiers. (You'd be amazed at what some amps do when faced with highly reactive loads, but that's another story.)



Apt 1 Amplifier: Front Panel View

In brief, Tom seems as much concerned with dynamic distortion as he is with static distortion. He believes that, in a properly designed amp, such well known static distortions as THD and SMPTE-IM can be made to reach vanishingly low levels without sacrificing dynamic performance and such factors as transient distortion, dynamic headroom, slew factor and all of the other newly discovered phenomena which seem to correlate better with how an amplifier actually sounds when delivering music program waveforms instead of steady-state sine waves.

Several aspects of the design particularly intrigued me. One, for example, is the ability to adjust the power supply (by means of the rear panel switch) so that the amplifier works ideally into low-impedance as well as into higher-impedance loads. Even more impressive are the front-panel LEDs which tell you when the speaker impedance is so low as to require use of that switch, not to mention those other color-changing LEDs which remain green so long as any sound is being heard from the connected loudspeakers, but change to red when overload or high levels of distur-

tion are being produced.

As to the question of what are the differences between a pro amp and a super hi-fi audiophile amp, it seems to me that users of a pro amp want, above all, ruggedness, reliability and freedom from possible breakdowns at a critical moment. Surely, the audiophile-user also values these characteristics. However, the audiophile seeks an amplifier which, above all else, can handle the most complex signals that he can find to feed it with complete accuracy, without coloration and without "giving up" for want of dynamic range. Are these not characteristics that are wanted by the pro-audio user as well?

The point I'm trying to make is that as far as I am concerned, Tom Holman, with his introduction of the Apt 1 amplifier, has succeeded in coming up with an amp that can't be faulted in any way by either segment of the audio population.

Individual Comment by N.E.: The Apt 1 sounds so good, and has so much going for it in the way of internal design that certain aspects of its "physical personality" might be overlooked by pro users who can use a clean, reliable basic amplifier capable of delivering over 100 watts with the greatest of ease, and hiking this up to 200 watts or more when the program material calls for it.

The personality problems are, from a strictly performance aspect, superficial, but for our readers they should be mentioned. The Apt 1 has no input level or gain controls which means of course that listening levels must be controlled by preceding equipment in the sound chain. It has no power monitor to tell you at



Apt 1 Amplifier: Back Panel View

a glance just how much wattage is being produced, but if you need to know this information you always can add one of the several outboard readout devices available. It has no power off/on switch and so it must be turned on or off only by being plugged into the AC convenience outlet on some other equipment, such as a preamp or a tape deck with an extra AC socket. But note that the power plug is the kind that has one metal prong shaped so that it can be plugged only one way into certain outlets—those that are also polarized. The Apt preamp has such an outlet but how many others do? Nothing I had around would accept that plug, and I ended up plugging the amp's cord directly into a wall socket to turn it on, and pulling the plug to turn it off. Not the most convenient way of doing things. At that, there were no annoying thumps in the process, which again testifies to the superior internal design of the unit. The owner's manual mentions rack mounting, but the width and panel design obviously are not directly suited for standard rack widths, and there is no mention of any kind of side adapters.

These carpings aside, the Apt 1 certainly is another example of recent amplifier designs that seem to knock down the old dividing line between pro equipment and "super audiophile" equipment.

APT 1 AMPLIFIER: Vital Statistics

PERFORMANCE CHARACTERISTIC	MANUFACTURER'S SPEC	LAB MEASUREMENT
Continuous power for rated THD, 1 kHz		
per channel, 8 ohms	100 watts	120.9 watts
per channel, 4 ohms	100 watts	113.4 watts
FTC rated power (20 Hz to 20 kHz) per channel	100 watts	120 watts
THD at rated output, 1 kHz, 8 ohms	0.03%	0.0052%
1 kHz, 4 ohms	0.03%	0.012%
20 Hz, 8 ohms	0.03%	0.01%
20 kHz, 8 ohms	0.03%	0.0011%
IM distortion at rated output, SMPTE	0.03%	0.015%
CCIF	NA	0.0008%
IHF	0.01%	unmeasurable
Frequency response at 1 watt (for -1 dB)	10 Hz to 30 kHz, -0.5 dB	5 Hz to 290 kHz, -0.5 dB
S/N ratio, re: 1 watt, "A" wtd, IHF	80 dB	88 dB
S/N ratio, re: rated output, "A" wtd	NA	108 dB
Dynamic headroom, IHF	3.0 dB	3.2 dB
Damping factor at 50 Hz	200	200
IHF input sensitivity	0.0925 volt	0.093 volt
Input sensitivity re: rated output	0.925 volt	0.93 volt
Slew rate	NA	30 volts/ μ sec.
Power consumption, idling	NA	37 watts
Power consumption, maximum	NA	535 watts

CIRCLE 22 ON READER SERVICE CARD

Neptune Model 2709 Real Time Analyzer



General Description: The display of real-time response in the Neptune 2709 consists of twenty-seven vertical rows of nine LEDs per row (hence the model number) for a total of 243 LEDs. The vertical rows are spaced at 1/3 octave on ISO frequency centers labeled from 40 Hz up to 16 kHz. In each row, the center LED is designated as "0" with the four LEDs above and below marked 3, 6, 9 and 12. At the right of the display is a two-position toggle switch to select the range handled, 1-dB steps or 3-dB steps.

In addition the model 2709 includes a built-in pink-noise generator whose output may be fed into a sound system and, heard over loudspeakers, can serve as a reference source for equalization work. The 2709 will analyze the response while it also is feeding the pink noise into the system. To apply the sound of the system to the analyzer requires the use of a microphone (not supplied).

In addition to the response display, the unit's front panel includes a power off/on switch, a sensitivity control, another switch for the pink-noise option and a level control for the pink-noise signal. The rear of the unit contains a D3F-type locking connector for microphone input (transformer balanced, 200 ohms), plus two quarter-inch phone jacks for line in and line out connections. There also are a fuse-holder and the unit's power cord, fitted with a 3-prong grounding plug.

Test Results: The Neptune 2709 readily met its published specs in our lab tests. Hookup and operation were found to be fairly simple and straightforward. A comparison was made of the unit's analysis of an un-equalized sound system with the actual EQ curve introduced by an equalizer to accomplish flat response. This may be seen by noting, in *Fig. 1* [look closely at the lighter-colored LEDs], the LEDs on the Neptune that were lit when we picked up its pink-noise as reproduced by the unequalized sound system. Compare this curve with the required EQ shown in our report on the Soundcraftsmen AE-2420-R Equalizer (in this issue of

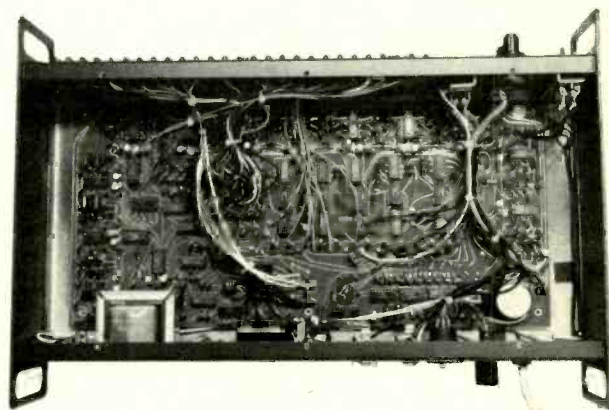
Modern Recording), and you will notice that the latter are a mirror image of the Neptune's displayed curve.

General Info: Chassis is 17 inches wide, but supplied with attachable side brackets for standard 19-inch rack-mount. Height is 3½ inches; depth is 11½ inches. Weight is 10 lbs. Price is \$1199.

Joint Comment by L.F. and N.E.: We have mixed feelings about this unit. A letter accompanying it states that it "... is intended to be used as a low cost equalization tool where more expensive units are now being used."

We're all for that, but can a price of \$1200 be considered "low" for a real-time analyzer these days? For considerably less, there are devices that provide real-time analysis with equalization in one unit.

We imagine Neptune will not be overjoyed by these remarks. They could respond of course by pointing out that all the examples just cited are octave-by-octave



Neptune 2709: Electronics needed for band-filters and LED drive consist largely of ICs on a single large PC board.

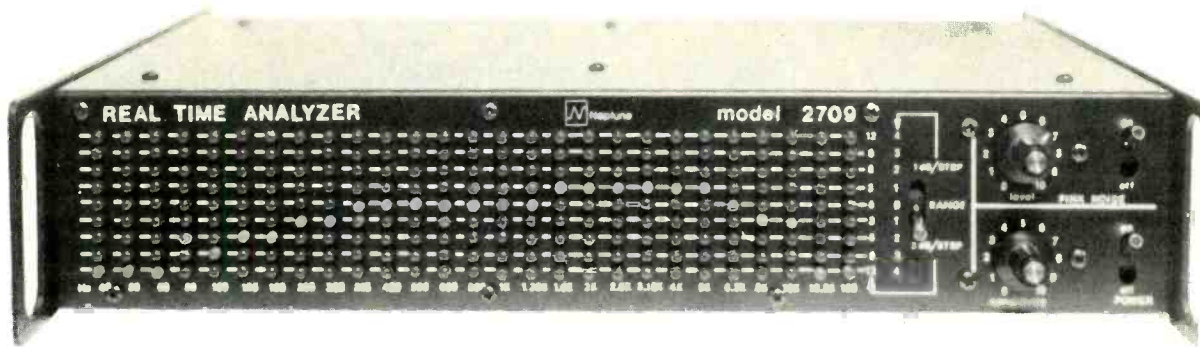


Fig. 1: Neptune 2709: Front panel view showing LED display.

real-time analyzers, while the model 2709 is a 1/3-octave device. True, of course, but we wonder if the 1/3-octave feature of the Neptune unit isn't offset by the fact that its LED display is tied into the pink-noise source insofar as its attack and decay times are concerned, whereas the other units mentioned above have variable times for attack and decay, as well as display ranges that can be truly calibrated in terms of

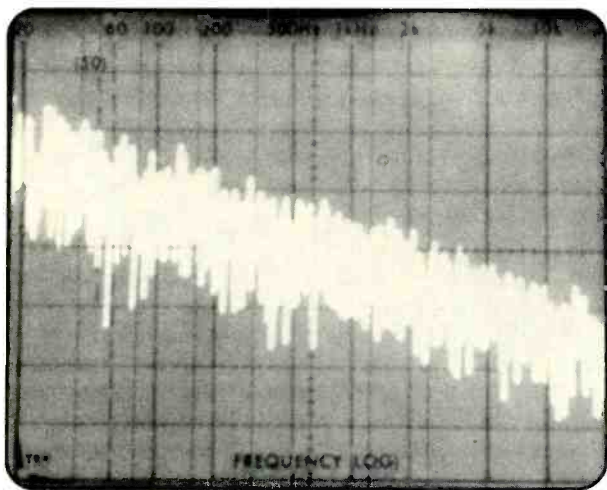


Fig. 2: Neptune 2709: Pink noise output of unit has required 3 dB/octave slope for equal-energy per octave.

dB/SPL. While the Neptune 2709 certainly provides enough range of control, both for the pink-noise source and for the display, once you get the LEDs blinking near center scale on each band, you have no idea at all about sound levels. Without some reference SPL value, how successfully can you equalize a system?

The range of 1 dB per LED should really be used only for balancing electronic components (not the acoustic response of a room or hall). Even at that, we found that the pink-noise source causes so much bounce to individual LEDs that we pretty well had to stay with the 3 dB per LED range for all of our tests. Using that range, things settle down nicely, but the question still comes up of how accurate is the EQ job when you are dealing with a tolerance of possibly ± 2.5 dB or even a bit more at any center frequency. In our opinion, octave-by-octave equalization—given a greater degree of control over display time constants—may well be capable of producing a more accurate overall curve than can the 1/3-octave system when that system is tied to a fixed time-constant as dictated by the particular noise source supplied.

What we're saying, in a sense, is that if a company is opting for the 1/3-octave approach in an analyzer, it would do better to go all the way and supply the user with all the "extra" that Neptune makes a point of having left out. If they can't do that, at a low price, they might do better to settle for an octave-by-octave equalizer and offer that at an even lower price.

NEPTUNE MODEL 2709 REAL TIME ANALYZER: Vital Statistics

PERFORMANCE CHARACTERISTIC	MANUFACTURER'S SPEC	LAB MEASUREMENT
Display Range	9 or 24 dB	Confirmed
Sensitivity for full scale	1.0 mV	0.8 mV
Number of bands	27 on ISO 1/3-octave frequency centers	Confirmed
Filter bandwidth	6 dB at adjacent levels	6 dB to 9 dB
Microphone input	D3F, 200-ohm, transformer coupled	Confirmed
Line input	10 mV to 10 V rms	Confirmed
Frequency range, pink-noise generator	40 Hz to 16 kHz	See Fig. 2
Output level, pink-noise generator	0 to 1.0 V rms	Confirmed
Power consumption	120V, 60 Hz, 0.2 amp.	16 watts

CIRCLE 23 ON READER SERVICE CARD



DeltaLab DL-2 Acousticcomputer

By John Murphy and Jim Ford

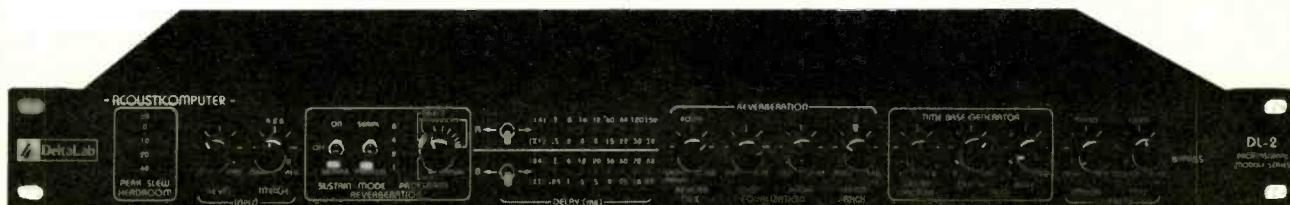
The DL-2 Acousticcomputer from DeltaLab Research, Inc. utilizes a stereo pair of programmable digital delay lines to produce a wide variety of special effects including echo, flanging and reverberation. It can provide up to 240 milliseconds of delay while maintaining a high level of audio quality, and has control features which make it attractive for use on the stage as well as in the studio. With more than a dozen front panel controls of operating parameters, the DL-2 has a very strong "toy appeal" and encourages creative experimentation with its wide variety of delay effects. The DL-2 currently sells for \$1,750.

General Description: The DL-2 is not a simple piece of equipment either in its functions or in the control of those functions. In general it is appropriate for novice users of complex signal processing equipment (such as the DL-2) to first carefully learn the operation of the unit. Studying a block diagram showing signal flow through the unit (see *Figure 1* for a block diagram of one channel of the DL-2) is usually the quickest way to learn how it operates. Knowing the operation, it then becomes easier to use it to maximum advantage.



signal can be either phase inverted or not.

The delay time of the delay line is adjusted in two steps. First, a pair of momentary toggle switches are used to set the coarse delay time with horizontal rows of LEDs indicating the range of delay selected. Then the delay time of the pair of delay lines is fine adjusted over a four-to-one range using the "delay factor" control. A VCO (Voltage Controlled Oscillator) in the time base generator section of the DL-2 can be used to vary the delay time. Both the depth and rate of the VCO are adjustable. Mixing the direct and delayed sound while using very short delays (0.1 to about 1 milliseconds)



The operation of the DL-2 can probably be best understood by viewing it as a pair of digital delay lines that can be used in many different configurations. Each of these delay lines has one input and three separate outputs corresponding to three different time delays along the line. Of these three outputs, the middle one is used as the main output of the delay line while the other two outputs are made available to be fed back to the delay line input for reverberation and repeating echo effects. The feedback network incorporates high and low frequency attenuation controls for coloring the reverberation as well as a "mix" control for adjusting the balance between the short and long delays fed back to the input. In addition, the feedback

and a slow sweep rate provides the familiar swept comb filter sound of "flanging." A vibrato effect can be created by using a short delay and selecting only the delayed signal in the output mix. The depth and rate controls of the VCO then control the depth and rate of the vibrato.

Reverberation is synthesized in the DL-2 by recirculating (or feeding back to the input) the long and short delays of the two channels. The fraction of the output signal fed back to the input determines the decay characteristics of the reverb. The greater the feedback percentage the longer it will take for the reverberation to decay. When either the highs or lows are attenuated in the feedback loop the decay time for the attenuated



frequencies is reduced in comparison to the other frequencies. With the DL-2 the best sounding reverberation is typically obtained by using a fair bit of low frequency attenuation and near maximum feedback.

The reverberation output for channel A is made up of recirculated delays from both channels A and B. Likewise for channel B. There is one long and one short delay from each of the two channels available for feedback to the input. This gives a total of four discrete delays that can be fed back in various combinations. Which of these delays is used for feedback depends on the setting of the DL-2's program indicator. The program indicator is composed of four LEDs that are either on or off. The four LEDs indicate the presence (or absence) of each of the four available delays in the reverberation. DeltaLab has a novel way of allowing the user to select any of sixteen possible combinations of these four delays. When the reverb program control is placed in the select position the LEDs cycle on and off in a binary counting sequence thus stepping through the sixteen combinations of discrete delays corresponding to sixteen different reverb "programs." When the desired program is reached the reverb program knob is set to the "Hold" position and the program sequencing stops where it is. If desired, the reverb program knob can be left in the sequence position and the reverb character will change continually as the unit sequences through its sixteen reverb programs. Rotating the reverb program control further clockwise to its "Random" setting increases the rate at which the DL-2 steps through the program cycle.

The input controls for the DL-2 are located at the left side of the front panel. First there are signal headroom indicators which indicate slewing headroom as well as peak level (amplitude) headroom. Each display consists of four LEDs labeled 0, 10, 20 and 40 dB.

Input level and image controls are located just to the right of the headroom indicators. The input level control simultaneously adjusts the input signal level for both channels. The input image control directs the signals to the opposite channel as the control is rotated from normal to reverse.

Located at the right of the input controls are the reverb program controls. The first control in this group is a three-position toggle switch labeled "Sustain." In the "On" position of this switch the input to the delay line is disconnected and the signal currently in memory is recirculated indefinitely with no degradation. Returning the switch to the center or "Off" position returns normal operation of the unit. The third position of the switch is labeled "Sample" and with the switch in this position the sustain function alternates between on and off at a rate set by the VCO. DeltaLab recommends using the "Sample" feature with the DL-2 set up for flanging to obtain a "digital step flanging" effect. The sustain function can be switched on and off via a footswitch jack located on the rear of the unit.

Next to the sustain switch is a two-position toggle switch labeled "Mode" with the positions labeled "Parallel" and "Serial." In the serial mode the two channel inputs are mixed and processed through channel A and then through channel B. The output of A is then delayed by the amount indicated for channel A. However, the output of channel B is now delayed by the sum of the delays indicated for A and B. Switching to the parallel mode, the two input signals are mixed (through the image control) and then processed independently. However, the reverberation for the two channels will be interrelated.

The final control in this group is the reverb program control previously discussed. The program indicator is located between the mode switch and the reverb program control.

Delay times for the two delay lines are adjusted by way of two momentary-type toggle switches located one above the other. The LED displays to the right of the switches indicate the 4 to 1 range of delay times selected for each channel. The range of delay times available is 0.5 ms (milliseconds) to 152 ms for channel A and 0.25 ms to 88 ms for channel B. When used for reverb these initial delays become pre-reverb delays.

Next, and just to the right of the center of the front panel is a group of four rotary controls labeled "Rever-

DeltaLab ACOUSTICOMPUTER - DL-2

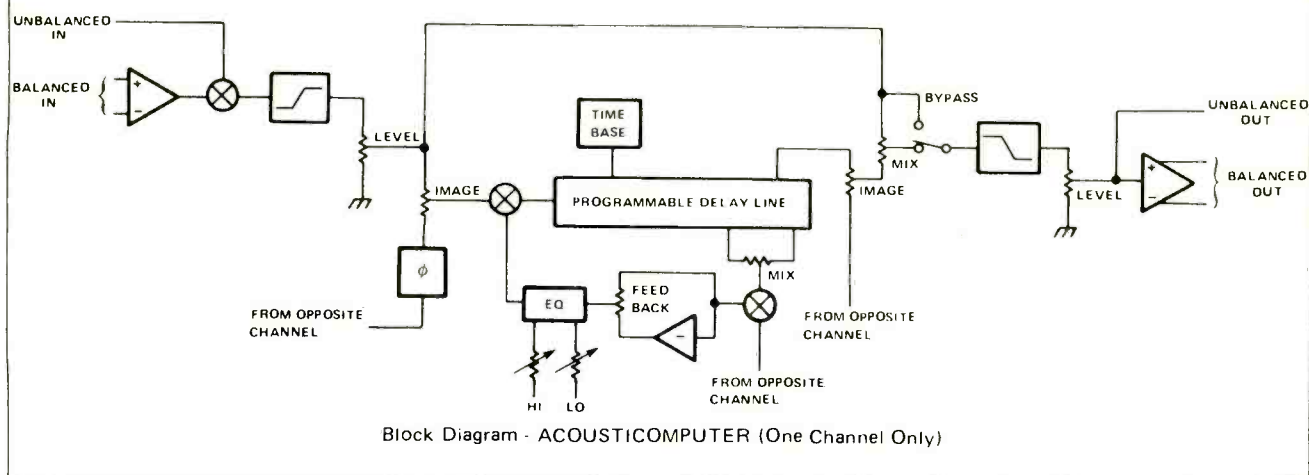


Fig. 1: DeltaLab DL-2: Block diagram of the unit (one channel only).

beration." The first control, "Reverb Mix," sets the mix of long and short delays fed back to the delay line input. This control simultaneously adjusts the relative levels of the four long and short delays available for feedback. The next two controls are labeled "Equalization" and provide high and low frequency cuts when backed off from their full clockwise "Flat" settings. The last reverberation control is the feedback control. With this control in the twelve o'clock position none of the delayed signals are fed back to the inputs. Rotating the control clockwise provides increasingly more feedback signal to the inputs. Counterclockwise rotation results in increasingly more of the delayed outputs being fed back to the inputs except that the outputs are first phase inverted.

The "Time Base Generator" is next and employs three rotary controls labeled "Delay Factor," "Depth" and "Rate." The delay factor is adjustable from 1 to 4 and provides fine delay time adjustment in conjunction with the coarse delay adjustment already discussed. The other two controls adjust the depth and rate of the VCO. The VCO can be externally controlled via a phone jack on the rear panel.

The final controls on the front panel are the output image and mix controls. The image control interchanges the channels as it is rotated clockwise from the normal to the reverse setting. The output mix control allows the direct and processed (delayed) signals to be mixed in the desired proportions. At the right of the output mix control is a bypass indicator. This LED lights to indicate that the system is bypassed through use of a rear panel footswitch jack.

The input connectors for the DL-2 are located on the rear panel. The unit accepts balanced inputs by way of XLR-type connectors and accepts unbalanced inputs via ¼-inch phone plugs. Likewise, both balanced and unbalanced outputs are provided employing XLR and

¼-inch phone connectors, respectively. A single screw-driver-adjustable control simultaneously adjusts the output levels of the two channels.

The rear panel houses three ¼-inch phone jacks for interfacing the bypass, VCO and repeat foot controls. There is also a five pin XLR-type connector for interfacing optional memory modules. Next to this connector is a slide switch labeled "Memory" with internal and external switch positions. Unless external memory is used, this switch should be left in the "Internal" position.

The DL-2 is packaged in a single space rack mount chassis and provides quite a lot of signal processing capability in very little space.

Field Test: We tried out the DL-2 during a leisurely four-track recording session and were quite pleased with the wide variety of effects that we could obtain. DeltaLab has provided diagrams which indicate control settings for some nineteen different effects and we experimented with nearly all of them. In addition there are blank control diagrams which allow the user to record control settings for additional effects. We tried the suggested "guitar reverb" control settings and were pleased with the results. The effect combined some audibly discrete echos along with more diffuse reverberation to provide a rather tasty combination of echo and reverb. The effect identified as "ambient reverb" provided what seemed to be the most natural sounding reverb for the unit. Even though this was a good reverb effect it lacked the quality of lush diffusion that is generally demanded of the finest [and costlier] reverberators. However, in many applications the DL-2 will provide quite satisfactory reverb.

Other classifications of effects that we found useful, besides reverberation, include varieties of flanging (DeltaLab provides five control recipes for flanging

“Once you get your hands on this machine . . . you’ll see what we mean.”

PERFORMANCE:

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

Playback Signal-to-Noise (electronics): 72 dB unweighted (with audio filter).

Headroom: +24 dB. Maximum Output: -28 dBm.

Overall Frequency Response (15 ips): 30 Hz to 22 kHz ± 2 dB.

Playback Frequency Response (MRL test tape): 31.5 Hz to 20 kHz ± 2 dB.

RELIABILITY: An unmatched four-year track record of on the job performance for the original compact professional recorder. Day in, night out. Just ask someone you trust.

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INTERFACEABILITY: With a flick of the output switch you can plug-in to any system: +4 dBm 600 ohm or -10 dB high impedance. No line amps or pads to mess with. A perfect match everytime.

ADDITIONAL BENEFITS: Three speeds, dc servo $\pm 7\%$, 1/4 track reproduce, full edit capability, over-dubbing, noise free inserts, XLR connectors, NAB/CCIR switching, unique three-position alignment level switch.

PRICE: Suggested retail price \$2,050 (USA).

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effects), echo (four recipes provided), vibrato and doubling/chorusing. We used the DL-2 to flange the output of an electric piano with excellent results. We were especially pleased with the consistently high level of audio quality when we processed signals through the unit. There was never any loss of highs and the unit's noise was never heard. The Acousticcomputer is really quite a high-quality device!

We performed our usual listening test by incorporating the DL-2 into a tape loop on our preamplifier. The DL-2 was set for 15 ms delay in each channel with no feedback or VCO employed. The output mix control was set to full delay so that we could listen through the delay chain with no other effects. When we played a disc back through our reference system we heard virtually no degradation when we introduced the DL-2 into the chain. I must say though that we allowed the DL-2 a healthy amount of headroom and were careful not to press the signal levels. In any event it was quite transparent and introduced no sound of its own.

Lab Test: We performed the usual variety of tests on the DL-2 and the specific results are provided in the "Lab Test Summary." We noted that the input section does not have a lot of gain as an input signal level of -2.2 dBV is required for a 0 dB headroom indication. Even though this appears to be the equivalent of a nominal "0 VU," some caution is necessary in setting levels through the DL-2 as there is only about 5 dB of headroom before clipping above the "0 dB headroom" indication. However, because of the low noise level of the unit (about 88 dB below 0 dB headroom) it shouldn't be necessary to push the input level. The output level at 0 dB indication was +15.0 dBV with the output level control at maximum, so there is plenty of output level.

The THD distortion at 0 dB headroom indication was about 0.1% in the midrange with the delay factor control at the X1 setting. Increasing the delay factor to X4 increased the mid-frequency distortion to 0.36%. Distortion also increases at the low and especially the high frequency extremes. The bandwidth through the delay line is better than 15 kHz, which is excellent. This wide bandwidth was not degraded with any control settings.

The slew rate limit through the delay lines was measured as 0.4 volts per microsecond. At a 0 dB headroom level (+15 dBV output level) this provides a slew rate ratio of 0.065 volts per microsecond. A couple of simple calculations reveal that in order to maintain a slew rate ratio of 0.5 (the recommended minimum) or higher, signal levels through the delay line must be no higher than 17.7 dB below the 0 dB headroom indication. With the output level control at maximum this would restrict the output signal level to less than -2.7 dBV. Slewing performance for the direct signal path is better. The direct output could not be driven into slew limiting because the small signal bandwidth (18.7 kHz) is less than the power bandwidth through the "direct" signal chain. If the power bandwidth were just equal to

the small signal bandwidth then the slew rate limit would be (from calculations) 1.3 volts per microsecond. Therefore the actual slew rate limit through the direct path is *at least* 1.3 volts per microsecond. Calculating the slew rate ratio based on this slew rate limit it was determined that the slew rate ratio will be *at least* 0.21 for 0 dB dB headroom signal levels. Keeping signal levels below -7.5 dB headroom (+7.5 dBV output) will insure that the slew rate ratio never drops below 0.5 for the direct signal path.

The preliminary owner's manual that we received with the DL-2 provided good explanations of the operation of the front panel controls and should allow users to get good results quickly.

Conclusion: The DL-2 Acousticcomputer by Delta-Lab proved to be a highly versatile digital delay sound effects unit. It provides high quality flanging and doubling effects with many subtle variations. Although its reverberation is not in the same class as the best reverberators available, it does provide a good reverb sound that will be satisfactory in many applications. In our listening tests we were impressed with the consistently high level of audio quality when listening through the unit. The DeltaLab Acousticcomputer is an excellent delay effects processor.

LAB TEST SUMMARY

(Note: 0 dBV is referenced to .775 Vrms, all tests made with output level control at maximum)

Input/Output Levels

Minimum input level required for 0 VU indication (unbalanced input):	- 2.2 dBV
Maximum input signal before clipping:	+ 19.2 dBV
Maximum output level at 0 VU (unbalanced output)	+ 15.0 dBV
Output clips at:	+ 20.1 dBV

Noise Performance

(20 kHz filter, unweighted)

With no input signal, noise at the output is:	- 73.3 dBV or - 88.3 VU
---	----------------------------

Distortion

(THD plus noise at 0 dB headroom indication, delay output)

Frequency	X1 delay	X4 delay
10 kHz	1.95 %	9.4 %
1 kHz	.113%	.36%
100 Hz	1.05%	1.25%

Bandwidth

(- 3 dB points)

24 Hz to 15.7 kHz (delay out)
17 Hz to 18.7 kHz (direct out)

Slewing Performance

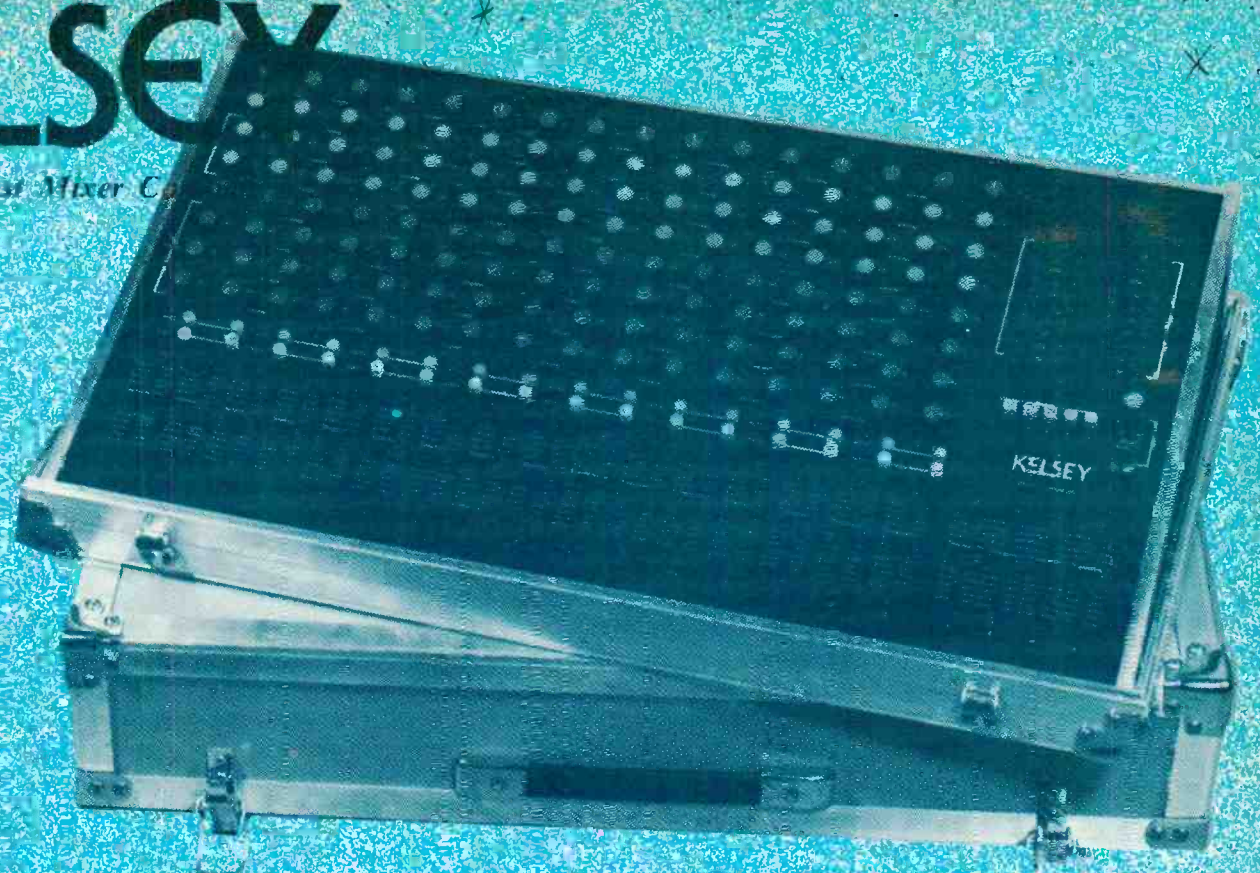
Slew Rate limit: 0.4 volts per microsecond (delay output)
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POPULAR

PETER FRAMPTON: *Where I Should Be.* [Peter Frampton and Chris Kimsey, producers; Chris Kimsey, Tony D'Amico, Scott Stogel, Timothy V. Boyle, and Peter Frampton, engineers; recorded at Cherokee Studios, Hobbit Land, Filmways/Heider Recording Studios and Sound City, L.A., Ca.] A&M SP 3710.

Performance: **Cut & dried**
Recording: **Standard**

Where should he be? One might well ask that after Frampton's last failure to repeat his absurdly successful multi-million selling *Frampton Comes Alive*, an album which seemed to predict that his next disc would cause him to metamorphose from phenomenon to institution. Success, as hard as it was for him to attain, seems to be even harder to duplicate.

If nothing else, *Where I Should Be* offers some clear examples of why Frampton's career is in its present state. For starters, the material is bland, the performance unenthusiastic, the attitude a curious mixture of disinterest and quiet desperation. And all this, combined with Frampton's usual flawlessly slick production, creates a formidable lack for anyone to overcome.

Frampton's abilities as producer and engineer are undoubtedly sufficiently developed yet he receives more than enough assistance to help mitigate any possible weakness and failings on his part. The results are predictably professional; the only real thing wrong with the production is that it is too polished,

too slick—not a guitar out of place or a backup vocalist distinct enough to add charisma. The sound is, of course, uniformly unexceptional. The drums are low, but not quite low enough to disguise the inadequate abilities of the drummer. Frampton's sluggish guitar comes through crystal clear in all its inoffensive mediocrity.

As poor as *Where I Should Be* is, it isn't a total failure. Two cuts, at least, stand above the drek: the pop-ish "I Can't Stand It No More" and the quasi-rocking "She Don't Reply," both of which have a driving rhythm guitar that gives them that extra energy which makes them appealing. Other than these, *Where I Should Be* is little more than a pathetic epitaph for one of the less startling phenomena of the decade.

M.D.



PETER FRAMPTON: Unexceptional

MERLE HAGGARD: *Serving 190 Proof.* [Fuzzy Owen, producer; co-produced by Jimmy Bowen; Hugh Davies, Gene Thompson, mixdown engineers at Capitol Records; Larry Boden, mastering engineer, MCA/Whitney Recording Studios, Universal City, Ca.] MCA MCA-3089.

Performance: **So convincing I hope his problems are not for real**
Recording: **Smooth and simple, like country oughta be**

In the late '60s, Merle Haggard made a name for himself by being the outspoken patriot of country music. In the thick of the "revolution," Haggard sang of being "proud to be an Okie from Muskogee," stating his dislike for long-haired, hippie types who didn't stand up and fight for their country. Today, if one goes by his lyrics, Haggard is more concerned about the demise of his own sense of morals than those of the good ol' US of A.

190 Proof is not a spunky country record, as Haggard's recordings of the past often were. This is an easygoing, reflective one. The preaching and anthem-slinging of the past is shaken, in favor of simple story telling and clean pickin'. Haggard's concerns now are the loss of love, the infringement of the demon alcohol, and the fruitless longing for the return of the good ol' days of yore.

Whether this LP is truly a reflection of Haggard's personal life is not so much the point, as is the fact that he carries out the motif so convincingly over the course of the two sides, that one can't help feeling a bit weepy over his plight. And the arrangements of his songs are

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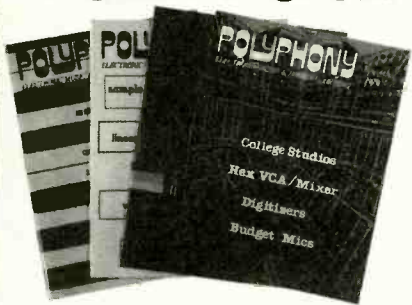
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tailored for his delivery. A bouncy, pedal steel-heavy sound—a happy sound—would not fit snugly with lyrics of abandoned love. The quiet, simple, acoustic guitar-based thread that runs throughout is all that is needed for Haggard's message to be conveyed.

Cleanliness is the byword of the production of *190 Proof*. Haggard's voice is the main instrument being spotlighted, and the solos by toned-down electric guitars, acoustic guitars, dobros, pedal steels, and the occasional sax or piano alternate, rather than piling up on top of one another for some grand but phony climax. The pace is easy but steady, and the sparseness is what makes it click. Harmony voices chime in intermittently rather than flooding the singer, and they're gone by the time he's ready to make another statement.

Only a few numbers here deviate from the rolling, folky tempo with which the record begins. "Got Lonely Too Early In The Morning" is a subdued blues boogie, and "My Own Kind Of Hat" is not unlike the so-called "outlaw" brand of country practiced by the likes of Willie Nelson and Waylon Jennings.

As for Haggard's politics today, *Serv-ing 190 Proof* doesn't offer much of a clue, except maybe subliminally. In "Sing A Family Song," for example, Haggard laments the passing of those times when mom and dad used to sit around, and "maybe Dad would take out his guitar." Perhaps Haggard's politics now are not too unlike a majority of folks' who like to think that things might get back to when everything seemed easier. Haggard sure would, but despite this, his music is as fine as ever. J.T.

MICHAEL MURPHEY: Peaks, Valleys, Honky-tonks and Alleys. [John Boylan, producer; Paul Grupp, engineer; recorded at Westlake Studios, Los Angeles; Woodland Sound Studios, Nashville; and Western Recorders, Hollywood; also recorded "live" at the Palomino Club, North Hollywood, Sept. 19-20, 1978, by the Record Plant remote truck; "live" engineering by Pete Carlson and Peter Lewis.] Epic JE 35742.

Performance: **Relaxed**
Recording: **Very good in both the studio and on stage**

Michael Murphey has not been snowed under by commercial success, although he has at least three well-known songs

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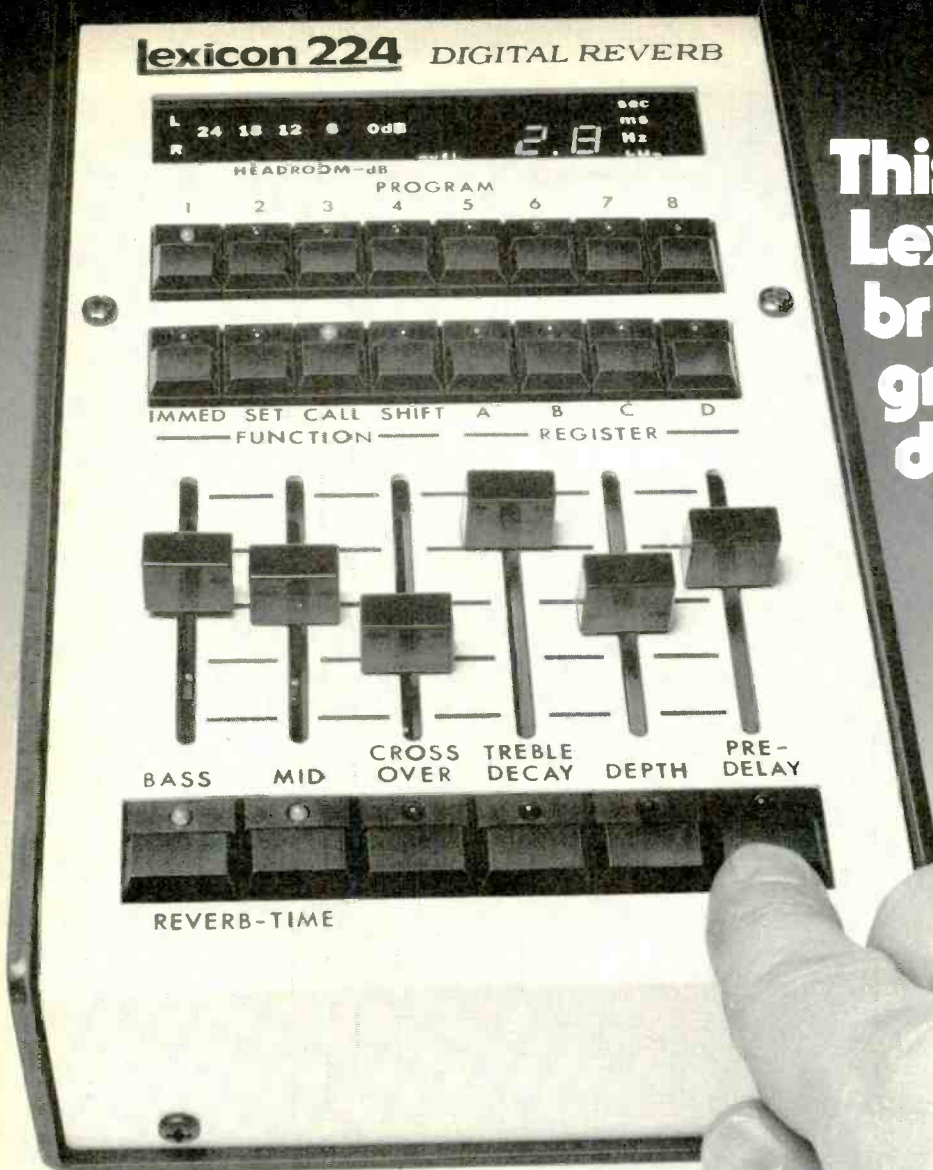


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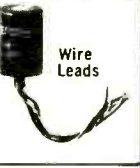
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that are staples on progressive radio stations—"Geronimo's Cadillac," "Cosmic Cowboy" and "Wildfire." His latest album is the kind that could, given the right exposure, move him into the front ranks of contemporary folk-country recording artists.

Half the album is from concerts, and the other half is from the studio, and both sides contain old and new material. Murphey's pleasing tenor voice, recalling Jesse Colin Young in the upper registers and Danny O'Keefe in the lower, is in fine form, and the material receives a sensitive performance and sympathetic recording.

The "live" side includes both "Cadillac" and "Cowboy" and both are received enthusiastically by the audience. The latter opens the "live" side and moves right into a bluegrass instrumental, with good fiddle work by Byron Berline and good banjo by Doug Dillard. The former closes the side and is a classic version of a classic song, with a dynamite ending.

In between are two new songs, "Another Cheap Western" and "Years Behind Bars," and both show Murphey to be in fine songwriting form. "Western" also becomes a nice lead-in to the 1958 classic, "Western Movies," before Murphey returns to the chorus of the newer song.

The recording of the "live" side makes the performance sound as if it were played before a small audience, and it's likely that the Palomino Club is no great, cavernous arena. The vocals are crisp and distinct, the instrumental work is fine, and one senses a rapport between Murphey and his fans.

The studio recording lacks the brightness of the "live" recording, however, and it does not provide a brittle quality that Murphey's music needs. The sound is almost too oily-smooth, too muffled or muted. One does not detect any noticeable tension between the vocal and instrumental parts, and the tracks all seem to blend into too homogeneous a sound.

The material is excellent, from "South Coast" (where has Nancy Ames gone?) and Sam Cooke's "Chain Gang" to two new songs, "Once a Drifter" and "Lightning." The new songs, as well as the old, are interesting stories of lost love and alienation, told against a wide-open space, and contain some memorable images and lyrics.

"Drifter" may come across with a little too much of an MOR sound, because of its soft chorus backup, but "Light-

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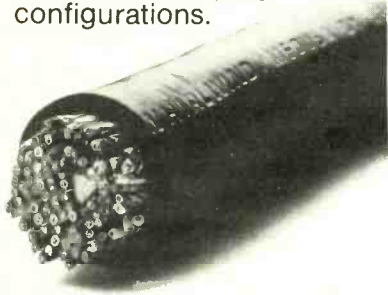
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ning" has a shimmering intensity at the beginning and a nice soft-rock sound during the body of the song that is quite effective and appealing.

One must overlook the drawbacks of the studio side sound, because the record overall is so engaging, so pleasingly performed. If you weren't a Michael Murphey fan before this, this album could convert you. S.R.

ELLEN FOLEY: *Nightout*. [Ian Hunter, Mick Ronson, producers; Harvey Goldberg, engineer; recorded at Mediasound, New York, N.Y.] Epic JE 36052.

Performance: **Buoyantly electric**
Recording: **Energetically crafted**

There are always mediocre vocalists whose meandering careers peak (and occasionally terminate) with a soppy first album that is noted for its poor inspiration, bad production, and a generally unpalatable consistency. Far less frequent is the appearance of a vocalist whose multi-talented accomplishments provide a background which allows them to sound dynamically fresh and vibrant. Ellen Foley, whose name is hardly a household word, is one of those few who fit solidly into the second category with her debut solo album which comes after such activities as performing with Meatloaf in the National Lampoon Show and on *Bat Out Of Hell*, and a leading role in the last Broadway revival of *Hair*.

Foley's talents are beautifully displayed on *Nightout* by the excellent production work of none other than Mick Ronson and Ian Hunter. Ronson and Hunter, who also contribute their formidable musicianship on guitars, keyboards, vocals, and percussion, give the album a well-balanced pop-rock sound—strong but not overpowering guitars, subtle string work, and solidly supportive percussion. The effect is to provide a firm background for Foley's sensuously appealing voice, without drowning it in distracting lushness.

The material is, for the most part, superbly chosen. One of the best tunes Foley does is Graham Parker's "Thunder and Rain," and she does it with a style and intensity that quite possibly outdoes Parker's original version. Foley also does equal justice to the Stones' "Stupid Girl." Other tunes by P. Rambow, F. Goodman, and Hunter have a more subtle impact but are just as well suited to Foley's style.

With the verve and power of Ellen Foley, *Nightout* should easily prove to be one of the best albums of 1979. M.D.

THE BOOMTOWN RATS: *A Tonic For The Troops*. [Robert John Lange, producer; Stuff Brown and Tim Friese-Greene, engineers; recorded at Relight Studios, Holland, and Dieter Dierk's Studios, Stommeln, Koln, Germany.] Columbia JC 35750.

Performance: **Best Irish rock 'n' roll I've heard since Van Morrison**
Recording: **Impressive**

Ireland's Boomtown Rats have come quite a long way since their 1977 debut which was released here on Mercury Records. Although they've used the same producer, Robert John Lange (who's also worked with Graham Parker and the Outlaws), the Rats have learned a few studio tricks and quite a bit about arranging their material since that relatively uneventful first try. Most of *Tonic* adheres closely to the familiar new wave attack patterns, but the Rats have also incorporated a sax and some fancy vocal work which gives their music wider appeal, and increases their chances for survival in a world already overpopulated with hard-driving rock 'n' roll bands.

Much of this record does use the basic guitars, bass, keyboards and drums foundation to make its point, but producer Lange has given those instruments a wider, fatter sound by multi-tracking them, and by spreading them out so that they don't drown each other in the mix. It's a full sound, and is immediately shown at its best in "Rat Trap," the LP's opener which has been receiving a fair share of airplay during the first weeks of the record's availability in the U.S. (it's been out in England for some time already).

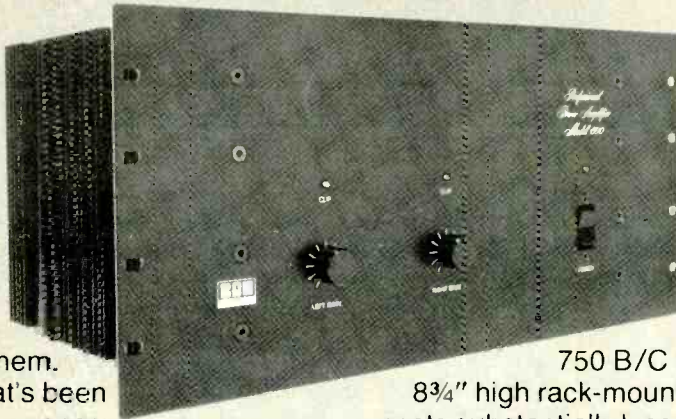
"Rat Trap" starts off with just piano and sax driving over a steady, thumping rhythm guitar and syncopated drum, and in a matter of seconds blasts into a full-blown Springsteen/Parkeresque R&B rocker. It sounds more like the Rats should come from Asbury Park than Ireland here, and on the basis of this track, one would never suspect that the majority of this record is bone-crunching, hard-core new wave rock 'n' roll. The Rats are fond of using surprising changes of rhythm and tempo, and often Lange stresses their in-



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JAZZ

JACKIE MC LEAN: *Monuments*. [Mitch Farber, producer; Pat Martin, engineer; recorded at RCA Studios, New York, N.Y. between Nov. 1978 and Jan. 1979.] RCA AFL1-3230.

Performance: **Excellent, if not quite monumental**
 Recording: **Good balance of a multi-faceted performance**

Jackie McLean's reputation as an outside avant garde jazz saxophonist is only partially deserved. Yes, he's been into that from time to time, but his roots are well grounded in Rhythm and Blues and Bird (Charlie Parker, for you neophytes). The dozen years that separated Bird's birth in Kansas City and Jackie's in New York make the difference. Jackie would have been an impressionable teenager about the time that Charlie Parker was breaking new ground in jazz and Fats Domino, The Ravens and others were laying the groundwork for what would shortly be a revolution in musical taste. Growing up in New York had to be a major influence on Jackie McLean's life and it shows here in a music that works at several different levels. These same influences evidently were a part of Mitch Farber's life, too. I don't know his biographical data, but he wrote most of the tunes and produced the LP.

One of the levels the music works on is narrative poetry. On the selection, "They All Seem To Disappear," respects are paid to friends, gone and forgotten and remembered, in spoken poem, sung lyric and above it all McLean's alto sax soars, making statements reinforced by the rocking rhythm section.

It's not fusion music, however. Fusion music, to me at least, means the fusing of elements which are foreign to each other into an artificial unity. These parts (spoken, sung and played, rhythm and blues or bebop and jazz) are all legitimate parts of the same artist and that's what makes this music so successful. It's all *real*. There's nothing phoney or cosmetic about it.


There are a lot of elements here to keep in balance and engineer Pat Martin has managed to do just that. I suspect, considering the time lapse between November, 1978 and January, 1979 in recording dates, that there was a lot of overdubbing and mix and match engineering done. But that makes it

dividual performing virtues by allowing each member to enter into a break by soloing briefly, before the entire number shifts its rhythmic focus. The drums and bass are mixed hot and simply on the whole record, and even the more complicated tracks are kept in line by keeping that rhythm section pumping away fast and sturdy.

Bob Geldof, the Boomtown Rats' vocalist, writes most of the material, and the songs are all intelligently composed, with both humor and frightening realities of life playing into the lyrics. "(I Never Loved) Eva Braun," for example, is supposedly Hitler's denial of involvement with the woman who was his mistress during his mad quest for power. But although the subject could be handled as a serious matter, Geldof and band do it as a takeoff on the Shangri-las '60s hit "Leader Of The Pack," with the track being introed by the question "Are you really going out with Eva?" The song is then treated as a New York-style girl-group rocker from that era, complete with call-and-response, a technique repeated on a few of the songs here. A similar treatment is given to "Living On An Island," a very frank suicide song, with lines such as "suicide leaves such a bad aftertaste on the soul" sung matter-of-factly.

Most of the LP's second side is done in the more traditional power approach common to the new wave, but the sense of expansion and sophistication which is established in the more experimental first side carries over to the simpler material. "Mary Of The Fourth Form," which also appeared on the debut LP, sounds something like Steppenwolf's "Born To Be Wild" for a while. It's the story of a schoolgirl who likes to tease the boys by bending over for dropped pencils. All of Geldof's songs tell stories of some sort, and even without the music stand alone as strong verse, unlike much of today's pseudo-poetic lyrics. The album's best track, the driving "She's So Modern," is more power-pop easy than scorching, though it does include a manic guitar solo, and "Joey's On The Street Again" closes it out with another Springsteen-like vocal and story, and a swirling organ that recalls the Young Rascals' hits of the '60s. As of today, the Boomtown Rats have been stepped upon by lesser talent in the race for commercial validity being undertaken by the new wave bands. But, if *A Tonic For The Troops* gets the recognition it deserves, their third LP will be awaited eagerly. J.T.

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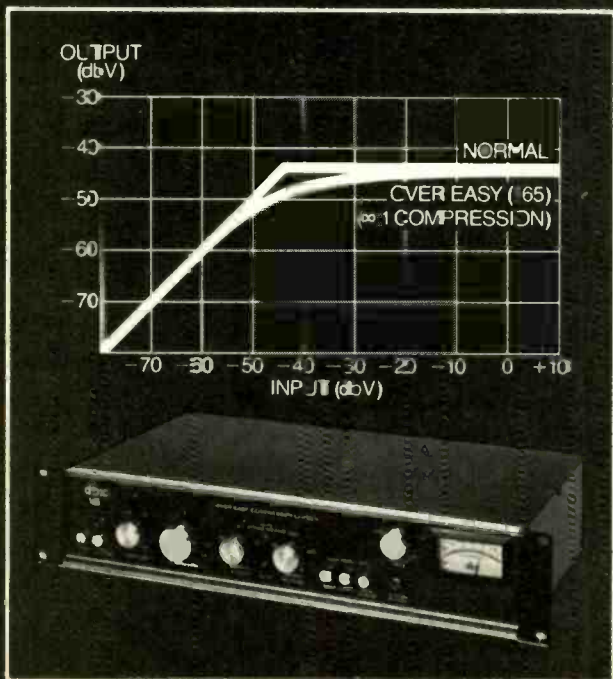
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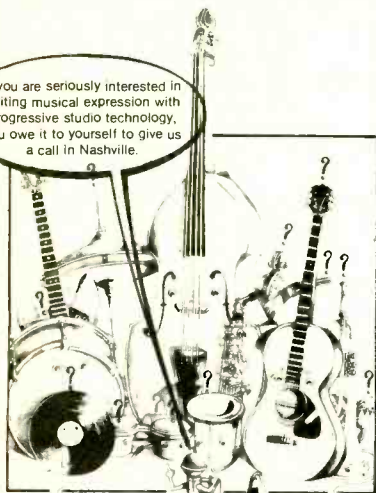


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even more difficult to keep all the separate elements properly balanced. Pat Martin has done it well. J.K.

SPYRO GYRA: *Morning Dance*. [Jay Beckenstein and Richard Calanra, producers, Jeremy Wall, assistant producer; Jack Malken and Michael Barry, engineers; Candice Munson, Darrell Gustamachis and Jason Corsora, assistant engineers; recorded at Secret Sound Studios, Rochester, N.Y.; Lawrence Swist and Mick Guzauski, engineers; recorded at PCI Recording Studio, Rochester, N.Y.; Charlie Conrad, engineer; recorded at House of Music, West Orange, N.J.; Lawrence Swist, engineer; Trackmaster Studio, Buffalo, N.Y.] Infinity 9004.

Performance: **Joyous, skilled**
Recording: **First rate**

"Good jazz" and "pop melody" don't have to be mutually exclusive terms, as shown by one of the brightest, catchiest, best-sounding instrumental records of 1979. The group known as Spyro Gyra has been knocking around a while, but the various members have never come together as well before as they do on this album.

Too often, young jazz performers today are writing dull compositions, ones that take a short, rather tuneless phrase and repeat it in front of different accompanying embellishments before reversing or mirroring the phrase and repeating that before other accompaniment. This shallow and rather unimaginative approach to jazz writing has a good beat, to be sure, but the overall effect is somewhat unsatisfying, because it is so empty of any real creativity.

Morning Dance does not suffer from any of these afflictions, happily, and yet the sound is not so middle-of-the-road or mainstream to turn off real jazz fans. There appears to be a good deal of improvisation (without branching into the avant-garde) and a great deal of skill and talent here, and what's more, the music is fun; the sound is crisp; the material even has some infectious good humor.

For this we probably can thank Jay Beckenstein, one of the driving forces behind Spyro Gyra. His alto and soprano saxophone work is a big plus on an album filled with plusses. He has told an interviewer in "Rolling Stone" that he is "end-product oriented." If this is the case, then his final product is something worth hearing.

But Beckenstein is not the only thing that makes Spyro Gyra go. The basic group—the one that likely will record a third album soon—is Tom Schuman on keyboards, Chet Catallo on guitar, Jim Kurzdorfer on bass, Gerardo Velez on percussion and Eli Konikoff on drums. But you won't find this lineup performing by itself on any of the group's nine tracks here; instead, they form the nucleus for a slightly larger ensemble sound that has hit upon quite a good thing. Added are such players as Beckenstein compatriot Jeremy Wall on keyboards, John Tropea on guitars, Randy Brecker on trumpet and Will Lee on bass. The strings, which are used sparingly but effectively, came from Quincy Jones. Larry Fast ("Synergy") programmed the synthesizer tracks.

The resulting mix is simply splendid, both from a musical point of view and from a recording point of view. The balance of sound is well-crafted so that one notices a lot of things going on at once. The horns here, a bass there, a guitar and keyboard line here, and the drums and percussion ever-present, driving the melody along.

The sound has a bright sheen—almost like that of a cymbal—and a crispness that few other jazz recordings have matched this year. The title track, "Little Linda" and "Song for Lorraine" are the best examples of this—a heady combination of melody and rhythm that catches the listener from the outset and keeps firm hold until the final notes. While the dominant rhythm is Latin-oriented, this is more than a samba-bossa nova-salsa-reggae record.

This is an album of unexpected pleasure (and pleasures), one that winds up back on the turntable quite a bit more than a lot of recent releases. Compared with the 1977 Amherst release, which tended to be a bit more somber and experimental, *Morning Dance* is the sound of a skilled and confident ensemble of musicians who can both write and play some very accessible jazz music. Let's hear some more. S.R.

WARREN BERNHARDT: *Floating*. [Warren Bernhardt, producer; Frank Laico, engineer; recorded November and December, 1978, at Columbia 30th Street Studios, New York, N.Y.] Arista Novus AN3011.

Performance: **Bernhardt at his best**
Recording: **Another miracle on 30th Street**

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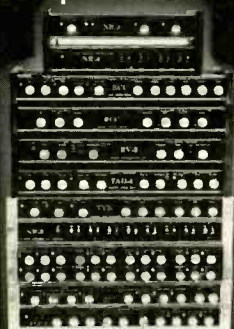


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VARIOUS ARTISTS: *Blue Montreux.* [Mike Mainieri, producer; Dave Richards and Martin Pearson, engineers; recorded July 21 and 22, 1978 at the Montreux Jazz Festival, Montreux, Switzerland.] Arista AB 4224.

Performance: **Eclectic but electric**
Recording: **Well, you know how it goes at jazz festivals**

Warren Bernhardt is a versatile man in the studio. If he's playing with a rock band he knows how to play electric piano as well as the next guy. If it's far-out space music, he knows his way around those games, too. But when allowed the luxury of a good Steinway grand piano and a studio like Columbia's 30th Street church facility, he can turn out an album of acoustic performances as excellent as this latest effort on Arista Novus.

Like most post be-bop musicians, Warren Bernhardt stays away from the standard jazz repertoire giving us a whole LP of world premieres, mostly composed by Warren Bernhardt. I know I've said it before, but a whole LP of unfamiliar melodies is usually a bit much for the average listener to absorb. However, in this case, I think the average listener will find it well worth the time and effort it takes to get into these delightful "songs and improvisations for solo piano" as Bernhardt calls them.

It's so good to hear a pianist like Bernhardt, who lately has been concentrating on the electric keyboards, in an album that concentrates on acoustic piano. He still remembers the beauty of tone and expression you can get on a Steinway (or a Bossendorfer or Baldwin for that matter) that you'll never get from a Fender/Rhodes. It's also nice to find another convert to the 30th Street sound. I've never heard another studio that is as well suited to acoustic piano sound. Frank Laico, the engineer here, has managed to capture it all.

I would point out simply to avoid confusion, not as any criticism, that the selection entitled "Song To My Father" is a Mike Mainieri original not to be confused with Horace Silver's classic "Song For My Father." Given time and sufficient exposure Mainieri's song may well become just as classic as Silver's.

In the *Blue Montreux* album, Bernhardt shows his flexibility by playing Fender Rhodes piano with Mike Mainieri, the Brecker Brothers and other electrified dudes including Larry Coryell. To today's ears it will be a

more acceptable idiom than Bernhardt's solo album but those of us, a bit older, who cherish the memories of solo albums by the likes of Art Tatum and Teddy Wilson and Bill Evans, it will be the other way around. Thank God it's not an either/or situation—those who like Bernhardt's solo work may well be interested to hear what Warren Bernhardt sounds like with a modern jazz/rock/fusion band, and those who dig him in a band context may well benefit from exposure to his solo virtues.

As far as recording goes, there's no comparison. There's no way the engineers at Montreux could isolate instruments and balance them as delicately in a concert situation as Frank Laico could in the studio. Also witness the fact that at Montreux there were some half-dozen players to be balanced and the engineers did not have the luxury of concentrating on Bernhardt's piano alone.

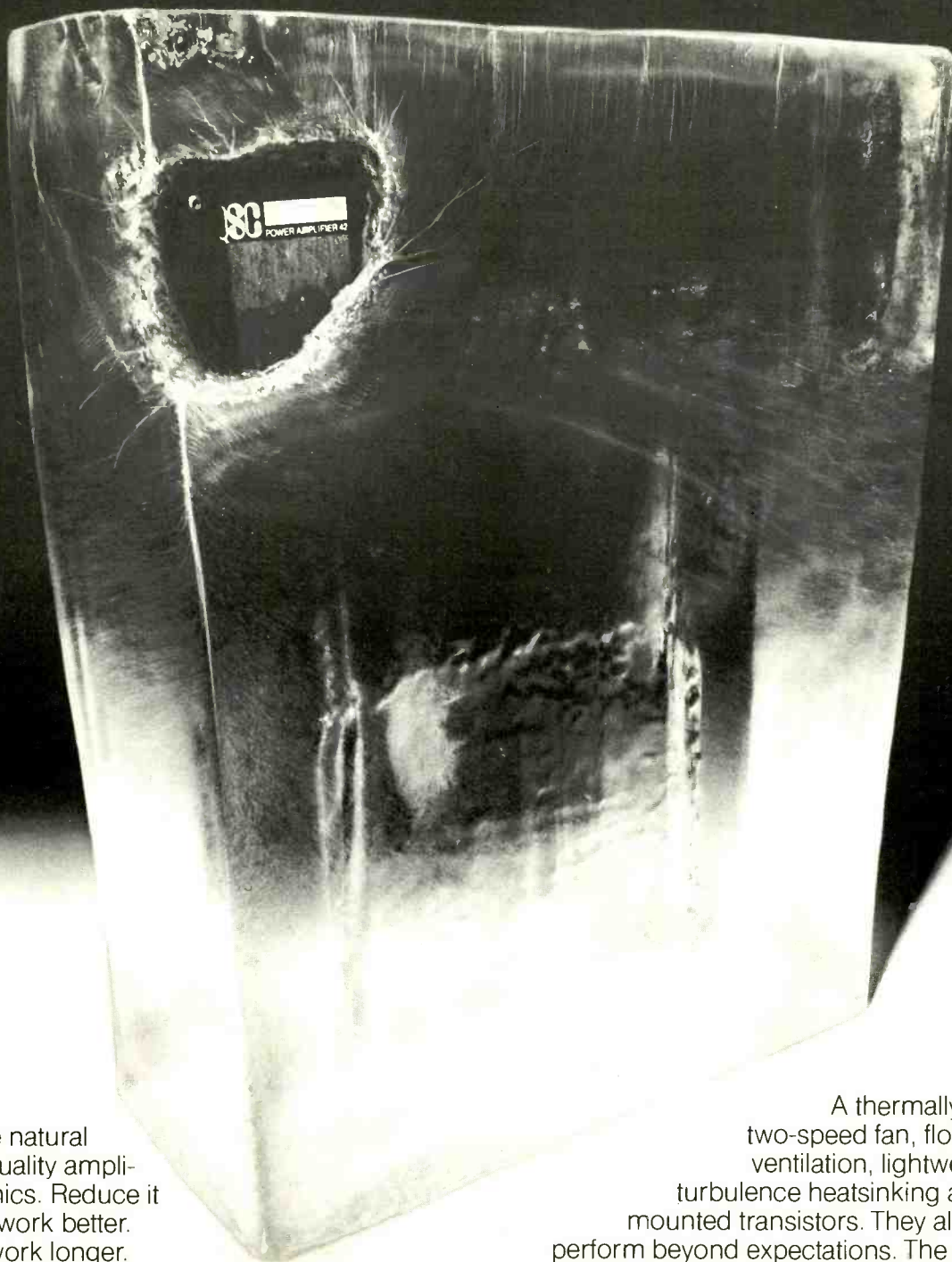
For an extra kick, there's the opportunity to compare "Floating" as a band piece on the Montreux album and as a piano solo on the studio LP. The versions are as different as the band is from a solo piano, but both work—and it's a wonderful tune as well. J.K.

NINA SIMONE: *The Family/Baltimore.* [Creed Taylor, producer; David Palmer, engineer; recorded January 1978 at Studio Katy in Brussels, Belgium.] CTI OJL 3.

Performance: **Just like the LP it came from**
Recording: **Overdubbed, sweetened, expanded range, widened grooves, supersound**

If you remember the September 1978 issue of *Modern Recording* you'll remember a CTI Nina Simone LP called *Baltimore*. Well, Creed Taylor, never one to miss a trick, has taken two tracks off the LP and remastered them with expanded range and with the grooves widened enough to take that kind of total sound... and put it out on a twelve inch 45 RPM disc. The publicity sheet that came with it says "Turn up the Volume; give the bass all it needs. Then hit the low filters and let the treble wail some." I did just that and I think I just totaled my speaker system. The record does what it claims to do. It gives you the same versions of these tunes you had on the LP with enhanced sound, not even the people at CTI know

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the complete trombonist and a duet BETWEEN GENERATIONS

By Nat Hentoff

If I had to list an all-star jazz band, with only one choice per instrument, Jimmy Knepper would have the trombone chair. He has it all—prodigious technique that is used to serve his ceaselessly inventive ideas; a wholly personal sound that can be lyrically intimate as well as exultantly buoyant; unerring jazz time; and the ability to fuse with any kind of ensemble without diluting his own identity. Furthermore, Knepper is an uncommonly skillful arranger and, when occasion presents, a resourceful leader.

Yet Knepper has never achieved the degree of recognition his wide-ranging originality merits. This is probably because he has spent much of his career as a sideman, most notably with the late Charles Mingus where, as ingenious an improviser as Knepper was, he tended to be overshadowed by the hugely protean bassist. Now, however, in a rare date of his own, *Jimmy Knepper in L.A.* (Inner City), the trombonist is very much to the fore in what will surely last as a classic illumination of jazz tromboning that is beyond category.

With tenor saxophonist-flutist Lew Tabackin and a firm, flowing rhythm section (Shelly Manne, Roger Kellaway, Monty Budwig), Knepper transforms standards and diverse originals into brilliantly, freshly conceived and executed improvisational designs that reveal the depth of this seemingly diffident man's passions. The quality of recorded sound is warm, clear, and full-bodied.

Passion is not quite the term that is usually applied to Anthony Braxton. He is unquestionably one of the most technically accomplished of the younger jazz frontiersmen—both instrumentally and as a composer who

is extensively knowledgeable in contemporary classical language, along with the full spectrum of black music history. But Braxton, on records and often in performance, has sometimes seemed lacking in emotional force, as if he derived more satisfaction from stretching his intellect than plumbing his feelings.

In *Birth and Rebirth* (Black Saint), however, Braxton—on alto, soprano, soprano, and clarinet—isn't the least reserved in letting his emotions go all the way, from room-filling shouts to tender introspection. One cause of Braxton's release is that he is not encumbered here with complicated scores. It's just him and the magisterial Max Roach in a series of astonishingly imaginative duets. Spurred by Roach's own strength of soul, as well as the drummer's total command of persuasive colorations and powerfully flexible exploration of time patterns, Braxton is compelled to go to his own emotional roots. The result is also a demonstration of how mutually rewarding a conversation between jazz generations can be.

The engineering is superb, giving full presence to the two creators while capturing all the nuances, many of them exceedingly subtle, of their interplay.

JIMMY KNEPPER: *Jimmy Knepper in L.A.* [Lew Tabackin, producer; James Mooney, engineer.] Inner City IC 6047.

MAX ROACH/ANTHONY BRAXTON: *Birth and Rebirth.* [Giacomo Pelllicciotti, producer; Carlo Martenet, engineer.] Black Saint BSR 0024.

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NINA SIMONE: Real warmth—again

the exact specs in CPS, but the LP gave you more tunes and even if the sound wasn't as spectacular as this, it was a good serviceable recording job.

If you're planning on turning your home into a disco—or if you have some neighbors who keep you awake nights and you want revenge—this record will deliver what it advertises. If you're just an average Joe Listener I wonder if the \$3.98 price tag for less than eight minutes playing time is worth it to you.

For those who don't have the September *Modern Recording* handy for reference let me refresh your memory. This is a fine LP of hit potential by a fine singer who communicates a lyric with real warmth and gets you involved with it.

If the majority of this review is about the technical aspects of the recording—it's simply because that's what the recording is all about. J.K.

ART FARMER AND JIM HALL: *Big Blues*. [Creed Taylor, producer; David Palmer, engineer; recorded February 1978 at Electric Lady Studio, New York, N.Y.] CTI 7083.

Performance: **The Farmer's in the groove—so is the Hall**
Recording: **An example of the state of the Art**

This may not be the best jazz recording I've heard this year but, then again, it may well be. I've been racking my brain trying to remember if any other current LP has given me as much listening pleasure as this set featuring the pungent, warm flugelhorn of Art

Farmer against pretty guitar chords, played as only Jim Hall can. The rhythmic assistance of Mike Moore on bass and Steve Gadd on drums propels things along swingingly and the vibes work of Mike Mainieri is also a joy. It's just a wonderful record.

The tunes include Benny Golson's "Whisper Not," which goes back to Art's days in The Jazztete with Benny Golson and Curtis Fuller. "Big Blues" is just that—a twelve-bar blues credited to Jim Hall in the same tempo and mood as Milt Jackson's "Bags Groove." But if you're tired of twelve-bar blues, this one has a few unexpected twists and turns in some of the rhythmic games that Steve Gadd is drumming up in back of the blues playing. The other songs are an interesting lesson in juxtaposition. Side one has Thad Jones' jazz waltz "A Child Is Born." Side two closes with Maurice Ravel's "Pavanne For A Dead Princess." The two works are the better part of a century and several continents apart, yet there is a kinship of melodiousness and a capturing of the spirit of the child in birth and death which one would not expect.

The recording matches the music. It is honest to the point of purity. That's unusual for a company like CTI who has the reputation for indulging in fusions and gimmicks. But then players like Art Farmer do not call for fusions and gimmicks so maybe CTI's reputation should be for giving the artist the kind of treatment the music calls for.

The short (under 20 minutes each) sides do not make for a bargain, but then what will you have—Art's art or a bargain basement boasting only of lesser abilities? J.K.

CLASSICAL

MUSSORGSKY: *Pictures at an Exhibition*. **SHOSTAKOVITCH: *Preludes Op. 34, no. 1, 4, 10, 12, 14, 15, 16, 19, 22, 24*.** Lazar Berman, piano. [Werner Mayer, producer; Hans-Peter Schweigmann, Gunter Hermanns, engineers.] DG 2531 096.

Performance: **Picturesque**
Recording: **Excellent**

MUSSORGSKY-RAVEL: *Pictures at an Exhibition*.
STRAVINSKY: *Firebird (Suite, 1919)*.

Philadelphia Orchestra, Riccardo Muti, conducting. [Christopher Bishop, producer; Michael Gray, engineer.] Angel S 37539.

Performance: **Thrilling**
Recording: **Gorgeous**

This is a pair of late model *Pictures* that can't help but please on all counts, even given the excellence and variety of the competition. To begin with the work in its original form, Lazar Berman's solo piano version is a thoughtful reading, one in which he shows infinitely more sensitivity than he is generally credited with. Often bullishly muscular, Berman here seems to go out of his way to create the aural equivalent of the varied picture gallery experience Mussorgsky was trying to evoke in composing the work, and he succeeds marvelously in focusing on the unique qualities of the individual pictures: the plodding Bydlo, the melancholy plaint of the singer before the old castle, the broad darkness of the catcombs, and the grandeur of the closing Great Gate of Kiev all come through as they should. Berman's playing is captured faithfully by DG's apparently close miking. In the Shostakovich *Preludes* that round out side two, Berman is again on top form and his readings cast these short pieces—which vary from the gently chromatic to the angular, with several cast in a characteristic Russian modality—in a sympathetic light.

Maurice Ravel's orchestration of Mussorgsky's *Pictures* is the frequently performed version these days, if for no other reason than that a competent conductor with a good orchestra is guaranteed a colorful sonic display. Here we have a conductor who is plainly more than competent with an orchestra that is quite a bit more than good. The Philadelphia plays at its best here, and the conductor, Riccardo Muti, will be taking up the orchestra's reins when Ormandy retires sometime this year. This is Muti's first recording with the orchestra, and the union is a happy one. It is also Angel/EMI's first encounter with Philadelphia, and the company has gone to great lengths to capture the orchestra at its shining best.

In the past, Angel has had tremendous problems with its disc sound, but that all seems to be cleared up now. The orchestral sound here is gloriously lush, with lots of ambience and hall resonance—particularly impressive when the brass and percussion are in full force, as in the closing moments of *Pictures*. Yet, all the

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ambience doesn't make the recording sound distant—no orchestral detail (and there is plenty of it in *Pictures* and the *Firebird*) is sacrificed. The performance of *Firebird* is impressive too, although there are several versions in the catalog that may be musically stronger. But for sheer beauty of sound, this disc is a gem.

A.K.

SHOWS and SOUNDTRACKS

BEATRICE LILLIE: *Queen Bea*. [Hugh Fordin, reissue producer; no engineer listed; originally recorded in London, between 1955 and 1958 and in 1961.] DRG DARC 2-1101.

Performance: **Bea-youthful renditions of Lillie classics**

Recording: **Fine in the fifties, less so in the sixties**

If there has ever been a better comedienne than Bea Lillie I was not fortunate enough to see her. I was fortunate enough to see Bea Lillie when "Inside U.S.A." played on tour in Chicago. It's an experience I recall vividly and won't soon forget.

Bea Lillie is so associated with British music hall comedy that it is a shock to find that she was born not in England, but in Toronto, Canada. She was still a teen-ager when she appeared on the stage in London and only in her twenties when she captured Broadway in *Charlot's Review*. From then until her Broadway farewell (1964) in *High Spirits*, a musical version of Noel Coward's "Blithe Spirit" starring Bea Lillie in the role of Madame Arcati, Broadway was hers any time she found the time to honor the gay white way with her presence.

Her repertoire leaned heavily on the work of another wry British humorist, Noel Coward. Although it could be wished that this album included her version of Coward's "Mad About The Boy," which she sang in the show *Set To Music*, there are some real gems of Coward here—"Weary Of It All" and "A Bar On The Piccola Marina" being among the best of Coward and the best of Lillie. To be sure, there's something missing in just a record of Bea Lillie. Not included here is "Come, Oh Come To Pittsburgh" from *Inside U.S.A.* because it never would have worked on

a record. You had to see Bea Lillie to appreciate her. But for those of us who saw her and remember her, these records are a delightful memento.

On three of the four sides included here she is accompanied by the fine piano duo of Eadie and Rack who were her accompanists in her one woman show, *An Evening With Beatrice Lillie*, which played Broadway in 1952, London in 1954 and 1955 and toured throughout Great Britain in 1956. These recordings, which were made for English Decca, some as early as 1955 and some as late as 1958 were previously issued in America on London Records. While they are now unavailable on London, they have been reissued by DRG as a follow up to their monumental Fred Astaire reissue series. It would seem that Hugh Fordin is a dedicated theatre person; maybe next we can expect a long overdue Noel Coward reissue series.

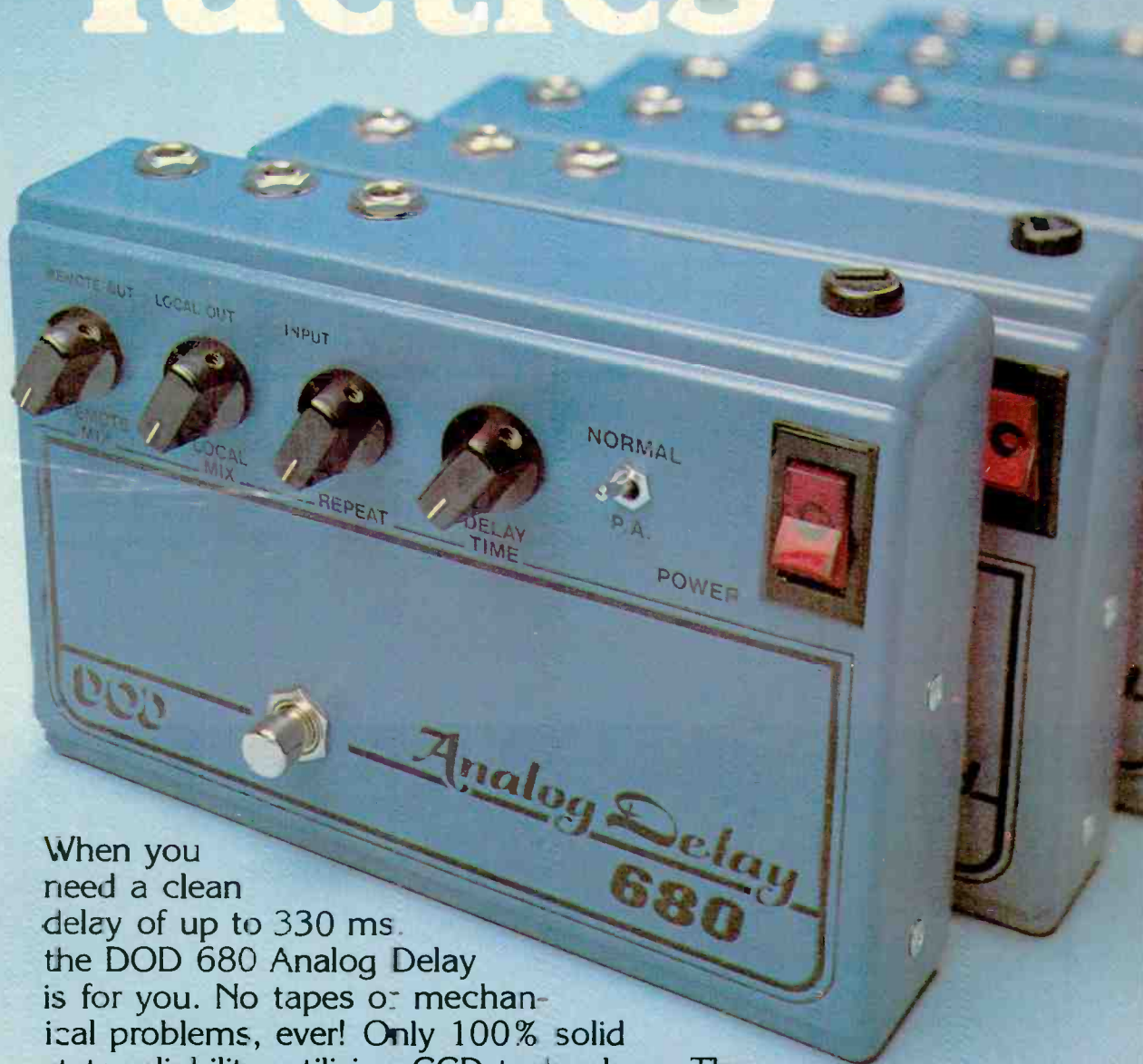
The British have long had a head start over America in the hi-fi field. Many of us became acquainted with the whole idea of hi-fi through English Decca/U.S. London's series of Full Frequency Range Recordings or FFRR, as the record labels called them. These pioneering attempts at hi-fi went back to the days of 78s. That's one reason why it is so surprising that the sides recorded in the '50s have more presence than the orchestral session of 1961. The orchestral accompaniments are rather non-descript Muzak themselves, rather than attempting to recreate the music hall atmosphere such as was done on some of the early Noel Coward HMVs. I also find most of the selections on side four less interesting than those on sides one, two and three. The only exception is Noel Coward's "The Party's Over Now." Even though this selection closes side four, it sounds to me as though it's from one of the earlier sessions. At least it is accompanied only by Eadie and Rack at their twin pianos. There's a hokey fade-out at the end of the fourth side that could have been done in English Decca's studios or maybe it was a gimmick that occurred to Hugh Fordin in reissuing this material. It's unnecessary, but it works and it's relatively painless.

Simply put, to have this much Bea Lillie material available again is worth any gimmick that anyone wants to use to reach us. The notes by Stanley Green are authoritative and exhaustive and the photos on the inner album sleeve are fascinating.

J.K.



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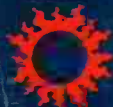


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