

MODERN RECORDING

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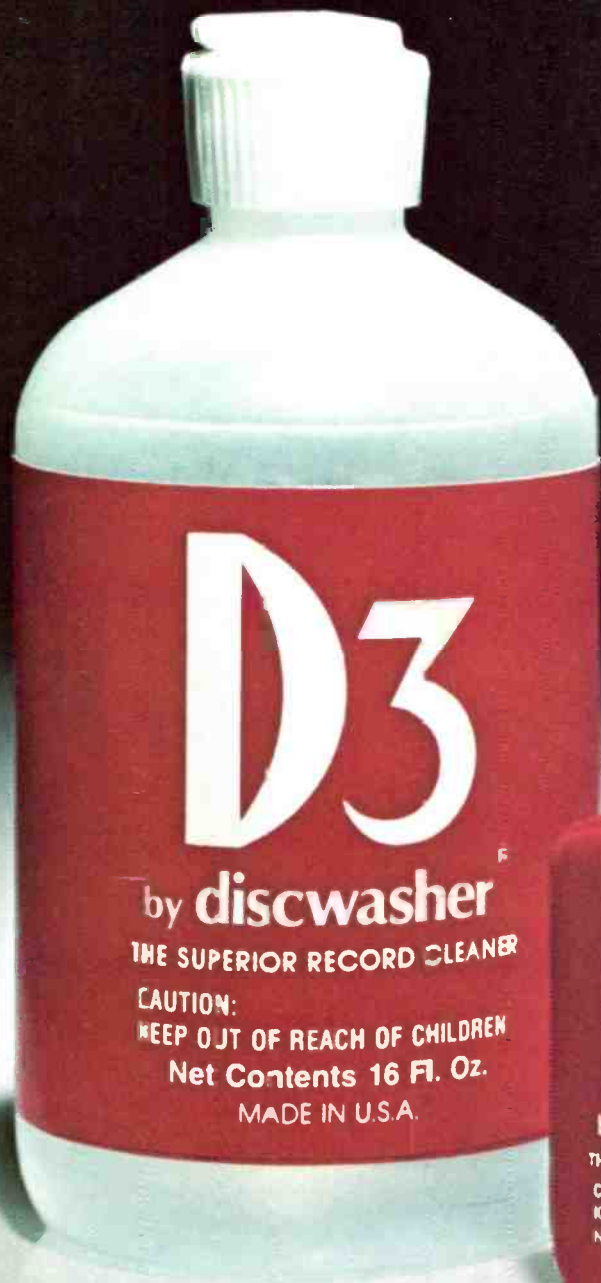
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Profile: Gary Burton

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CIRCLE 92 ON READER SERVICE CARD

MODERN RECORDING

FEB/MAR 1977
VOL. 2 NO. 3

SERVING TODAY'S MUSIC/RECORDING-CONSCIOUS SOCIETY

THE FEATURES

- THE FUTURE OF RECORDING— IS IT DIGITAL?** 32
By Robert Angus
Bob Angus, the man who gave MR the 6 part series on the History of Recording, takes a look at a revolutionary process that may very well alter the entire recording industry as we know it today.
- MONITOR SPEAKERS FOR THE RECORDIST** 40
By Rob Lewis
If you've wondered what to look for in selecting monitors for your home studio, or semi-pro set-up, read this article first.
- MIXING THE BOSTON POPS—"LIVE"** 48
By Michael Consi
Maestro Arthur Fiedler and his Boston Pops is every sound man's ultimate challenge or nightmare. Sound mixer Mike Consi gives a first hand account of his Nassau Coliseum bout with the 'Pops'.
- PROFILE—Gary Burton** 56
By Gil Podolinsky
Vibraphonist extraordinaire talks of his sessions with Chick Corea, his free flowing creative relationship with record company president, producer and friend Manfred Eicher, and his own position in today's Jazz/Pop marketplace.

Cover photo courtesy of Nassau Coliseum

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THE STAPLES

- PUBLISHER'S LETTER** 4
- LETTERS TO THE EDITOR** 6
- TALKBACK** 10
The Technical Q & A Scene
- THE PRODUCT SCENE** 26
By Norman Eisenberg
The notable and the new, with a comment on power and price.
- MUSICAL NEWSICALS** 30
New products for the musician.
- AMBIENT SOUND** 62
By Len Feldman
Binaural Recording? What it is and how it works, but what's it for?
- LAB REPORT** 64
By Norman Eisenberg and Len Feldman
Sansui BA 5000 Power Amp
MXR Digital Delay
Technics RS-1500US Open-Reel Tape Recorder
Crown EQ-2 Synergistic Equalizer
- GROOVE VIEWS** 74
Reviews of albums by Robin Tower, Jade Warrior, Eagles, Ray Barretto, Elvin Bishop and Linda Hargrove.
- ADVERTISER'S INDEX** 95

COMING NEXT ISSUE!

Equipment: What Should It Cost to Fix?
Mics by John M. Woram

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accompanied by return postage.

Letter From The Publisher

Dear Reader,
Finally . . . finally . . . finally—*Modern Recording*, beginning with the next issue (April 1977), will be published monthly.

It has been a long, tiring, exciting and proud year for the staff and myself here at *MR*. A little over one year ago, with no prior publishing expertise, *Modern Recording* entered the publishing field. We did so mainly because we felt there was a need for a publication that serviced the creative musician and active audio enthusiast. We were confident that there were many of you out there—we just didn't know how many.

We knew that recording is the creative vehicle for the serious musician, sound man and active audiophile, so we designed our editorial to be entertaining while at all times informative. Articles like "P.A. Primer," "How to Build Your Own Recording Studio," "Recording Session Techniques" (both "live" and in-studio), Talkback, Artist Profile and Lab Reports became the examples of our intent.

In the future we will maintain this editorial approach, while increasing our overall circulation in an effort to reach and service more of this growing semi-professional audience of which you are a part.

We at *Modern Recording* would like to take the credit for having established in such a short period of time, such a well-respected publication. However, in all honesty, the *credit is due you*, our readers. Without your support and input *MR* could not have survived today's overwhelming fatality rate for new publications. We would also like to thank those manufacturers who believed in your existence and in our ability to reach you.

So keep reading, and learning, and at all times enjoy—twice as much! Write us once in awhile.

Very truly yours,



Vincent P. Testa
Publisher



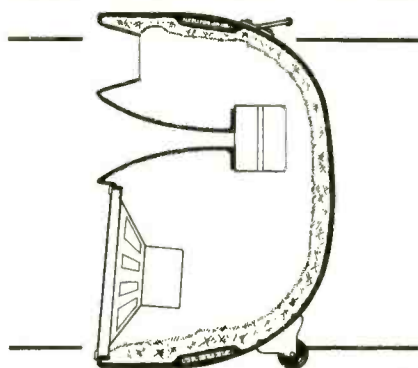


At first glance our cabinets look a little different. Which is understandable. They are.

It's quite plain that these are not your usual assortment of little flake-board boxes with holes. These are functioning enclosures whose dimensions, determined by the laws of physics, have been precisely stated in hand-laminated fiberglass.

All of our enclosures are of a solid round-backed design which frees them from the standing waves and out of phase diaphragmatic panels which plague "the boxes". Our design not only cuts down on unwanted resonances but also creates unparalleled durability and the strength to survive extensive touring and triumph over playful roadies. The GGM, our dual

driver ported bass enclosure, fills a variety of functions. As the bottom end of a PA stack it makes a dynamite low frequency cabinet. Pre-amped and powered it becomes a bass guitar cabinet the likes of which you've never heard. The PBL,



our super portable full-range cabinet, incorporates bass, port and HF horn in one rugged enclosure. Perfect for club PA applications, this unparalleled (literally!) cabinet is perfect for keyboards and other instruments and also happens to be a fantastic side fill stage monitor. And our NC12? Only the loudest, cleanest monitor around. And everything you need to hear is aimed right at your face. Write or call us for more information. It's time you got the best.

	HF DRIVER	LF DRIVER
NC 12	1" - 1 ³ / ₈ "	12"
PBL	1" - 1 ³ / ₈ " - 2" - 2.8"	15"
GGM	n.a.	TWO 15"

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CIRCLE 87 ON READER SERVICE CARD

LETTERS TO THE EDITOR

Brian and Jim—It's Your Move

Your June/July issue of Modern Recording was very interesting, especially the History of Recording Part 5. I wish that I had saved the entire series. I also appreciated the interview with Gus Dudgeon. I had a feeling that I was "listening" to a man that has two very good ears tied to the "gears between the ears," and knows what he is doing.

I wasn't so happy about the article, "P.A. Primer, A Guide to Sound Reinforcement, Part I," by Jim Ford and Brian A. Roth. It serves as a good guide to some of the basics in sound reinforcement. It seems a shame, therefore that they perpetuate one of the myths of our business in their discussion of bi-amplification. In their discussion of bi-amplification and its advantages they list one of the advantages as: "Decreased power-amplifier requirements since 'bi-amplification' gives approximately twice the effective power of full-range amplification, and 'tri-amplification' can deliver up to three times the effective power of full-range amplification."

Figure 12 illustrates the misconception. If they had integrated the area associated with the power developed by the combined signals, they would have found that the average power (often mislabeled RMS power) was exactly the same as the power required for the individual signals. True, the voltage swing requires a 200-watt amplifier, if clipping is not to occur, to develop 50 average watts.

Actually, since one can't get something for nothing, the authors should ponder the case where a single organ pedal tone is reproduced on their proposed biamp system. They are now at a 6.02dB disadvantage if they really believed that 50 watts is the equivalent of 200 watts in a single amplifier. The authors failed to consider Kirchoffs AC law in addition to the DC form used by the authors to calculate power.

A further problem the authors expressed in their article is a misconception of the type of intermodulation distortion that biamping avoids (and it is this facet

of biamping that justifies its use). It is not simple intermodulation but the clipping that occurs at low frequencies, thus generating a square wave with its resultant harmonics. The clipping causes extreme levels of high frequency distortion due to the harmonics passing through the crossover network into the H.F. driver. This is a transient form of IM distortion and is not included in the SMPTE IM measurement method. A low IM rating on an amplifier is irrelevant if such clipping occurs.

—Don Davis
President
Synergetic Audio Concepts
Tustin, Ca.

Recording Broadcaster

I only have had the pleasure of reading your magazine for a couple of issues, and I would like to compliment you on every aspect of your magazine!! It is great!!

One of the main reasons I am writing is to ask your opinion on my current situation. I am now attending the Ron Bailie School of Broadcast which is a very good school, and I am happy to be attending it. But I have always been interested in the recording field, and plan to make it my career if possible. Don't get me wrong I would like to be an announcer also, but my question is, "Is there some way I can relate my knowledge of broadcasting to the recording field?" Hopefully, after I graduate from R.B.S. of B., I will have my first-class FCC license and some know-how about electronics.

So if you could comment on the situation I would appreciate your time.

—Don Gretton
Denver, Colo.

There are certainly a number of different ways to relate broadcast knowledge to the recording field. However, rather than having to short-change you on an answer in this small amount of space, we suggest that speaking with the staff at your broadcast school would be much more helpful.

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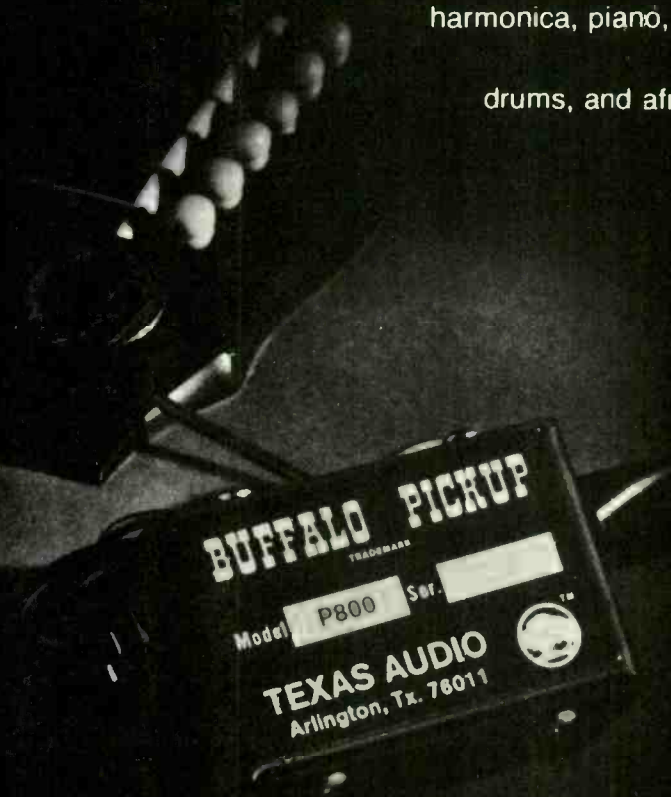
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CIRCLE 89 ON READER SERVICE CARD

Never-ending Neve Saga

I am upset with the way you allowed Mr. Nordahl to print a free ad for his product under the guise of responding to criticism of the Neve Console (MR Oct/Nov '76).

The quality (or lack of same) of the Neve Console is not the issue here. What I am opposed to is magazine editors who cower to their advertisers. How in the world is an engineer supposed to get useful information about a product when you will allow so-called "letters" like this to appear as apparent responses.

—Alan Cagan
Studio Manager
Harcourt Brace Jovanovich, Inc.
N.Y.C., N.Y.

We assume Mr. Cagan is a new reader who has not given our magazine more than a casual glance. Rupert Neve, Inc., has never advertised in MR, so there was no need to "cower" to them. We will print any letters that we feel would be of interest to our readers. Besides, it is so tiresome towing cows around to all your advertisers.

We're Blushing

Your magazine is fantastic in every respect. I enjoy its very educating and conclusive articles.

Although I don't have your first three editions, I feel it would be nice to collect every issue. I would like to see you come out with binders and a master index as your magazine could prove to be excellent reference material.

For heavens sake, keep up this excellent work. You are one of a kind.

—Richard W. Haviland
Glenwood, Ill.

I think, that as young as your mag is it surpasses every other level of (audio) magazine. It is informative, not only for the person that has been involved in this field and knows the wires, but also for we novices. The other magazines border on snobbery like: "we're the big guys and we write like this so you can't understand us."

Thanks again.

—Bill Montello, Jr.
Warwick, R.I.

More Sound Reinforcement

First, let me tell you how much I enjoy your magazine. I look forward to each issue, and I read it cover to cover. The three part series on P.A. systems was very interesting and informative and I was sorry to see it end. As an aspiring

studio and sound reinforcement engineer, I have noticed a marked imbalance in the amount of information available on the two with the majority being on *studio* engineering. Your article was a step toward correcting that situation. Although the two fields are closely related, the techniques, problems, possible solutions to those problems and much of the equipment are different. It would be helpful and appreciated by "live" mixing engineers if you continued to include articles on sound reinforcement in your magazine. The three part series was an excellent generalization and provided a good solid background of basic information. Future articles could single out specific areas and go into more detail. Also, the true life P.A. article was excellent in helping sound men like myself to prepare for, and anticipate on-the-job problems. Perhaps experiences of other sound men could be presented.

—T.D. Sikes
Jacksonville, Fla.

Speakers and Microphones

First I'd like to compliment your magazine, which in the short period that it's been out, has filled the void of subject matters not covered by the other professional and amateur audio mags.

I'm writing mainly to request that you consider testing and evaluating, along with the usual equipment, loudspeakers and microphones. These seem to be ignored by all the audio mags and I would be greatly aided in my search for new and better equipment by your doing so.

—Thomas Young
Thomastown, Ct.

PLEASE, More Syrup!

This brief letter is intended both as praise and as an inquiry about Modern Recording magazine.

First the praise. I want to state that I have never found a good magazine that dealt with tape recording—that is, until Modern Recording. The staff—none finer could be assembled; and let us not forget about the consulting writers and the unique policy of consulting qualified professionals (with reader's write-ins no less). The products advertised, the general literary qualities—truly a fine magazine.

Okay, enough syrup! I base these remarks on two issues that I managed to stumble into through local stereo shops (Apr/May '76 & June/July '76). Now you won't guess that I can't find this magazine anywhere locally. So I'm writ-

(continued on page 95)

OUR SECOND BEST IS BETTER THAN MOST OTHERS' FIRST BEST.

AUDUA is one of the world's finest cassette tapes. But it's not the best cassette tape made by TDK.

Our SUPER AVILYN (TDK SA) has the edge. And that's only if you're using the special bias/equalization setting on your tape deck.

However, if you're using the normal or standard setting, you'll have to settle for AUDUA—second best.

Chances are you won't find anything better, or with more consistent sound quality, for decks with normal tape selector settings. In other words, even if you don't own extravagant equipment, with AUDUA you can still hear extravagant sound reproduction.

You see, because of AUDUA's superior dynamic range at the critical high-end, you'll hear any music that features exciting "highs" with an amazing brilliance and clarity you won't get with any other tape. (And when it comes to open-reel tape, you'll probably find nothing comes close to AUDUA open-reel for reproducing highs.)

Whatever AUDUA you use—cassette or open-reel—you'll hear your system like you've never heard it before.

But there is something else you should hear before you try AUDUA. The price.

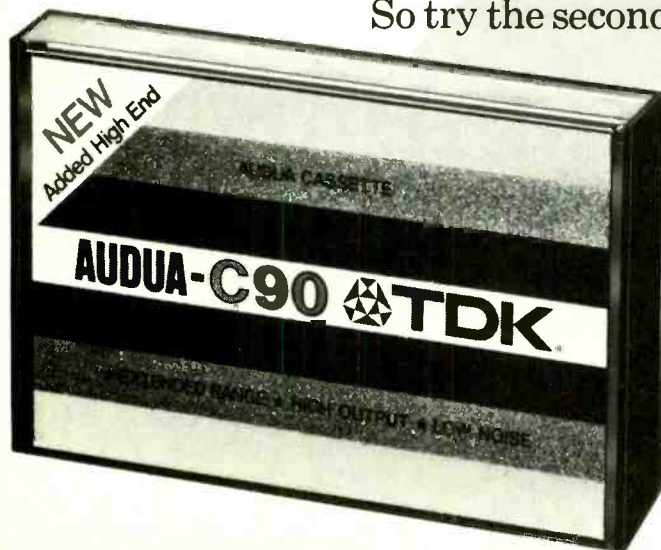
Unlike other so-called "super premium" cassettes, AUDUA's price is down to earth. (That should make AUDUA sound even better.)

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CIRCLE 46 ON READER SERVICE CARD

TALK BACK

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

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

Headroom and Flanging

I would like to know the meaning of two word-phrases constantly used in your magazine; they are:

- (1) "Headroom"
- (2) "Flanging."

—Mr. Charles G. Burch, Sr.
Buffalo, N.Y.

(1) Headroom can be defined in two ways. One, from a technical standpoint, and two, as it applies to the recordist.

Technically, the headroom of a system is the amount of level that can be applied without causing distortion. Measurements are made from the system's normal operating level, which varies from system to system, but is the level at which the system is designed to operate. If the system can put out a signal 20 dB higher than its normal operating level before distortion, it is said to have a headroom of 20 dB. If the system's headroom capabilities are exceeded, distortion will result.

From the recordist's view, headroom should mean two things: pay attention to the meters and listen for distortion.

Some instruments (like drums, piano, etc.), have large level peaks that are too fast for the meters to catch. Hence, that +2 on the snare meter might actually be exceeding the system's headroom and causing distortion. As experience is gained, the recordist learns which instruments produce these peaks, and how best to avoid the distortion that occurs with them.

It should be remembered that once the headroom is exceeded and distortion is on tape, your problems have not ended. When the tape is mixed to two-track, the distortion will increase, and will again on every successive generation that follows (at least five generations until it reaches the stores) until the passage becomes unintelligible.

(2) Flanging is a special effect used to bring interest to an instrument or portion of a tape. Its sound is hard to describe, but you might compare it to the sound of a blow torch when it is moved back and forth in front of you. Sort of a "whooshing" sound that changes frequency with a sliding motion. The term flanging itself comes from the fact that the rate at which the sound changes when you are using flanging can be controlled in part, by touching the tape reel or *flange* on one of the tape machines that is producing the effect.

Among the first records to use flanging was a song called "The Big Hurt" by Tony Fisher. Later it was popularized by the Small Faces on "Itchycoo Park" and was used extensively on Jimi Hendrix's *Axis* and *Ladyland* albums.

In recent months the effect has been used considerably with the advent of "Black Box" flangers, such as the one made by Eventide Clockworks which have simplified the process to a point where it no longer means hours of aligning and matching tape machines.

With the turn of a knob or two, flanging can be applied to any instrument or tape without any of the problems associated with tape flanging. There is, of course, a difference in the sound of "electronic" flanging as compared to "tape" flanging, but both have use in recording.

—Andy Abrams
Record Plant Studios
N.Y.C., N.Y.

Mic Features

My Shure SM-58 mics can be wired for three different low impedance levels. What practical advantages does this feature offer?

Is there any standard manner to wire XLR connectors? On cords that came with my Shures, I noticed that the female ends that connect to the mics split the unshielded wire to two terminals of the connector. On others I have examined, I've found this wire connected to only one terminal. Does it make any difference?

—J.A. Stewart
Cleveland, Ohio

The Shure SM58 has two taps on the transformer—one rated at 38 ohms and one at 150 ohms (EIA Ratings). The lower impedance tap has a 7 dB lower output than the 150 ohm tap, and in applications where the microphone is subjected to very high sound pressure levels, such as trumpets or loud vocals, the lower output tap may be used to minimize preamplifier overload in consoles or tape recorders.

Three-pin professional audio connectors are usually wired as a balanced signal line with a non-signal shield around the two conductors. Pin 1 is the shield and pins 2 and 3 are the signal conductors. Normally professional microphones

are phased so that a positive pressure on the diaphragm of the microphone produces a positive voltage on pin 2 of the microphone connector. In certain applications, such as in tape recorders, an unbalanced microphone input is used. This normally is a 1/4-inch phone jack. In this case the shield wire and the signal lead from pin 2 (black wire) of the female connector on the microphone end of the cable are connected together and go to the case or sleeve of the 1/4-inch phone plug, and the signal conductor from pin 3 (white wire) goes to the tip of the 1/4-inch phone plug.

In some of the newer 3-pin professional audio connectors there is an option of being able to connect the shield not only to pin 1 but also to the shell of the 3-pin professional audio connector.

—Kenneth R. Reichel
Shure
Evanston, Ill.

Studio Building Info

I enjoy your magazine very much, especially the Talkback section. I was also very interested in the article by Jeff Cooper on "Building Your Own Recording Studio" in the Dec/Jan 1976 issue. I hope you will continue to print this type of well-illustrated, easy-to-understand article.

I am a musician and for the past four years have been building a very successful band in the Milwaukee area. We are very much into recording our own music, so much so that we want to set up our own small studio. We have a budget of approximately \$5000 to \$8000 to spend on this project. The problem arises from the fact that no one in the band is an electronics or stereo buff. Our lack of technical knowledge leaves us at a loss on how to proceed with this undertaking. We thought perhaps you might have some suggestions. Any sources of information, reading materials or names of resource people that you could provide would be greatly appreciated.

—Paul Barry
Cudahy, Wisc.

In answer to your question regarding the purchase of recording equipment costing between \$5000 and \$8000, I must answer in rather general terms. The best advice I can give you is to seek out a professional or semi-professional equipment dealer who specializes in selling and servicing this type of equipment.

You may find a completely equipped four-track studio using a larger selection

Listen.

Now there is a mixer that cuts the noise out of music. The new ARP Minus Noise Mixer. The first mixer ever to apply advanced technology to audio signal processing.

The Minus Noise Mixer features a patented *Dynamic Noise Filter* that virtually eliminates noise from any program signal. And, when you add the many other professional features usually found on only the most expensive studio consoles, the result is the kind of clean sound quality you've always wanted but never could afford. For details and specifications on the quietly priced, quietly revolutionary ARP Minus Noise Mixer, see your ARP dealer, or cut out the coupon below.

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Please send complete specifications on the ARP Minus Noise Mixer.

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MR 2-77

CIRCLE 36 ON READER SERVICE CARD

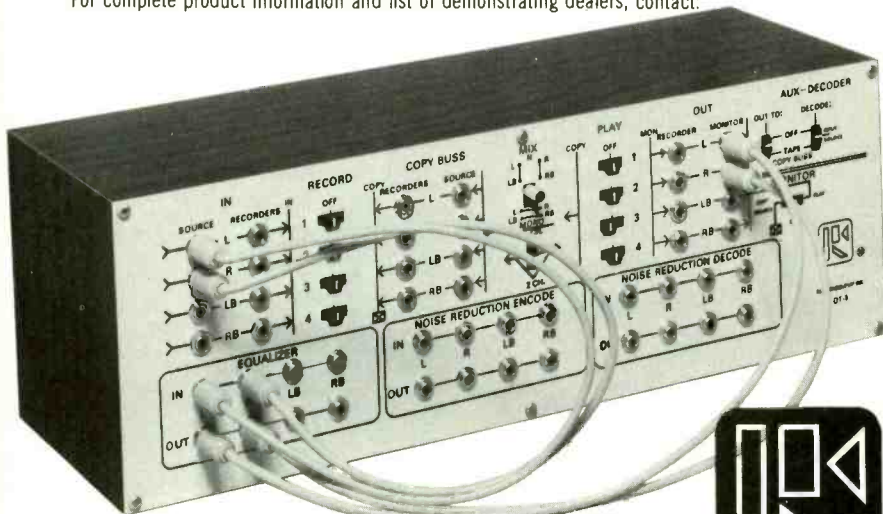
mix and patch like the Professionals

Russound's QT-1 audio control center and patchbay permits the tape monitor loop of your audio system to conveniently accommodate up to four tape recorders of quad, stereo or mono format in any combination, plus outboard noise reduction, equalizers, compressor/limiters, and SQ, QS, RM, and CD-4 decoder/demodulators. All accessories plug into phono jacks on the QT-1 rear panel (72 available) and are programmed from the front panel.

Use for recording, playback, dubbing and mixing down from tapes at the flip of a switch. Patch cords (12 furnished) permit convenient sound-on-sound, sound-with-sound, channel interchanging, and insertion of equalization, noise reduction, etc., anywhere in the audio chain and in any desired sequence.

The QT-1 is obsolescence-proof and provides professional studio type flexibility and convenience at an audiophile price of \$249.95.

For complete product information and list of demonstrating dealers, contact:



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Canal Street
North Berwick, Maine 03906

CIRCLE 90 ON READER SERVICE CARD

of microphones and accessories would be better than the added cost of a bare-bones eight-track setup. Whether you plan to add additional equipment above the initial investment at a later time and further enlarge your studio is something you did not say.

There is such a wide variety of this type of equipment now being made available, that only by sitting down face to face with someone who can explain and demonstrate what each piece of equipment can do for you will you be able to best determine the direction in which to proceed.

One piece of reading material I can highly recommend, is a new book just released—*The Recording Studio Handbook*, by John M. Woram. The book is an excellent background telling you what a piece of equipment does, but again it cannot tell you if you should buy it.

I would like to be more specific, but I don't think I can do this satisfactorily without long discussion.

—Sid Zimet
Audio By Zimet, Inc.
Roslyn, L.I., N.Y.

Mic Snake

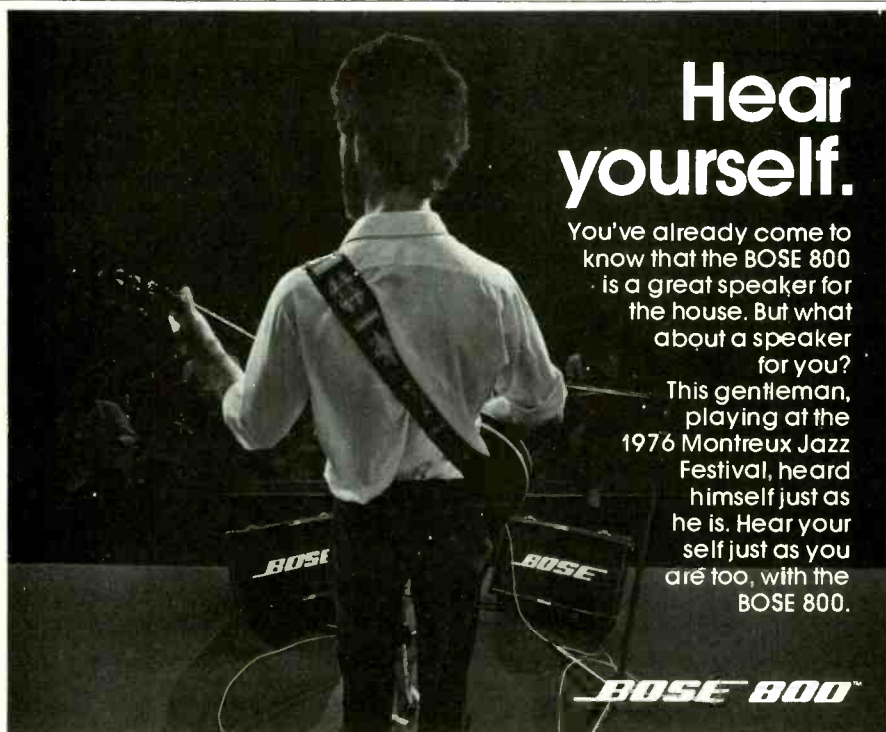
I am in the process of making a 150 ft. mic snake to be permanently installed in a church sanctuary. The plans call for a 12 paired cable (10 in — 2 out). The lines will be all low impedance balanced lines, 150-ohm input and 600-ohm output from the mixer to the amplifier. I intend to use 22 gauge 2-conductor, shielded cable. I need some advice on the type of wire and connectors to use.

—Tommy Scrivano
San Antonio, Tx.

It seems that your set-up is well thought out and professional. There should be no problem with the length of the snake, but since the installation will be permanent, take care to run the snake with protection from water and small animals. Rats have been known to chew through mic lines.

As far as the connectors are concerned, the most reliable are XLR types at all connection points. The secret is to keep all wiring in place. Take your time and be sure.

The 22 gauge wire will be fine because of the low impedance balanced lines. I suggest using the braided aluminum wire simply because it is easier to use and reliable.



Hear yourself.

You've already come to know that the BOSE 800 is a great speaker for the house. But what about a speaker for you?

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Be sure to check each connector and solder joint as you construct so you won't have to undo any wiring later to find a nick.

—Chip Allen
LeFevre Sound
Atlanta, Ga.

Mics and Distances

Just want to tell you what a fine magazine you've got going and that the amount of useful information, not to mention the fine insights provided in the "Session" section of your publication have won you a lifetime subscriber.

The product line is great and your evaluations of new equipment are to date the most thorough I've seen.

I have a Talkback question: would there be any advantage in miking, say, a vocal, by using more than two microphones at different levels and distances to obtain better ambience and spatial quality where signal processing equipment is not available?

—Paul Nanna
Boulder Creek, Ca.

Two microphones generally are enough to pick up some room sound if one is close to the sound source and the other is in the reverberant field (far away). One of the only possible advantages of using more than two microphones is to get stereo echo. Keep one microphone close and the others in two different locations in the reverberant field. The reverberant mics could be placed with one on the right and one on the left in the mix, and the close microphone mixed to the center. With no "signal processing equipment" you may not be able to mix three mics together easily, so you may have to use only two mics (if you have a stereo tape recorder).

Echo chambers were designed to simulate real rooms, not the other way around, so using real room reverberation is a perfectly acceptable method of adding spatial quality to a close-miked sound source. Echo chambers do give real advantages such as the ability to control decay time (T_{60}), but with an amplifier and speaker, you can even control T_{60} of a real room using the technique of "assisted resonance." Add an equalizer into the feedback path and you can dramatically change the reverberation time curve of a real room by increasing the T_{60} in selected frequency bands, making it sound like almost any room you want. However, if the NC (ambient noise) level of your room is not low enough, you may start

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The S600 has 110 watts per channel min. RMS, at 8 ohms, from 20 to 20,000 Hz, with no more than

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Simple to operate with direct-action pushbuttons and slide controls, the S600 has an unbelievably wide range of features and functions. Approx. retail value: \$750. Call toll-free 800-221-7502 for nearest JVC dealer.

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dbx little mother



just had Siamese twins

that give you true stereo tracking compression/limiting at less than 1/6 of the price of that big mother. dbx 162 rms level detectors are coupled to respond to the energy sum of the two inputs to give you precise stereo tracking you could never achieve with two separate compressor/limiters using their individual controls.

Like the dbx 160 little mother, the 162 Siamese twins let you compress any stereo source by any ratio from 1:1 up to infinite compression, and you can limit above any threshold from -38 to $+12$ dB.

The dbx 162 twins also inherited all the little mother's other excellent features including:

- True rms level detection to most closely simulate human hearing response
- Extremely low distortion even at high compression ratios
- Equivalent input noise -78 dBm (20 to 20,000 Hz)
- 60 dB meter range switchable to input, output, gain change and output sum (A+B)
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For four or more channel operation, 162s are ganged with threshold, compression and gain for all channels controlled by the master unit to provide perfect multi-channel tracking.

For complete information or to arrange a demonstration of the dbx Siamese twins, contact your dbx dealer or circle reader service number or contact:

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dbx

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to degrade your signal-to-noise ratio as you move a microphone further from the sound source.

—Ted Rothstein
Bearsville Sound
Bearsville, N.Y.

Tracks

Thank you for a fine magazine!

I am a "semi-pro" recordist with a fair amount of technical knowledge gained from practical experience as well as investing in many books on the subject. However, I have a couple of questions I wish you would answer, hopefully in the next issue, as I can't find specific information on these subjects.

I am doing quite a lot of production and dubbing for radio stations. Most of my potential "clients" utilize full-track tape machines, especially the AM stations, and I have two, 2-track stereo machines in my home studio. I have always assumed that, as far as head alignment, a two-track mono tape (recorded from a mono source with this mono source fed equally to both channels of the two-track machine—thus no stereo phase problems) would reproduce faithfully on a full-track machine, assuming both machines are in standard alignment. A friend at a local radio station tells me this is not the case. He claims that many production houses dub two-track for full-track but they deliberately mis-align the two-track heads for better reproduction when played on full-track. Is this true? I am aware of the "fringing" effect that causes a rise in low frequencies when a tape of larger track width is played on heads with smaller track widths, but I have found no information concerning the playing of smaller widths on larger heads, as far as *head alignment* is concerned.

Exactly what should be done to achieve satisfactory reproduction of a two-track mono (or stereo too, for that matter) tape when it is to be played on full-track machines? Also, another related question comes to my mind—can a full-track alignment tape be used to align the heads of a quarter-track machine? I know it is used for two-track—if so, how?

—Allen Freeman
Columbia, S.C.

Let me say right at the outset, that there is nothing better than using the right tools for the job. I suggest you invest in at least one mono full-track recorder. It will soon pay for itself, and

will help you avoid many problems which would otherwise arise.

However, in the meantime... a two-track machine can be used to record for full-track mono playback if extreme care is taken in the recorder's alignment. Use a full-track alignment tape to adjust the two-track playback calibrations. Needless to say, the playback level of each individual track should be aligned for standard operating level across the entire frequency range of the recorder. Once this is done, combine the playback of both channels so that you can read their combined level on a single VU meter. Now, while playing back a 15,000 cycle tone, adjust the playback head azimuth to achieve a maximum reading on the meter reading the combined two-track output. To set the record side of your two-track, feed a signal generator equally to both inputs of your two-track recorder. Adjust record level and equalization until the most linear response is achieved at normal operating level. Now, (and this is the important move) while recording 15,000 cycles adjust the record head azimuth until the combined playback reads maximum on your combined VU meter. You are now set to record properly both mono and stereo.

Another system commonly used is to record only on the left channel of a two-track. While this causes the tape to playback at slightly lower levels, many of the phase problems encountered with two-track mono are eliminated. In fact, many radio stations have converted all their mono recorders to record full-track, but playback half-track to avoid just such problems.

Also, of course, always be sure your tape is completely blank before recording on it. A poorly bulked tape might cause an audible "whump - whump" sound when played on mono equipment, since a two-track machine will only erase part of the tape.

As for using full-track alignment tapes for multi-track machines, the answer is yes. It is standard practice in the industry to align 24-track, two-inch tape machines with a full-track tape. Twenty-four tracks on two-inch tape is pretty close to the quarter-track configuration of quarter-inch tapes. The only discrepancy will be in the low end, but this is minimal and well within accepted standards of the industry.

Lastly, if a two-track has to be misaligned to achieve proper playback on full-track machines it is an indication that there is probably a poorly constructed two-track record head in which




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Anatomy of a 1/4" tape recorder



Automatic shut-off

Hysteresis three-motor drive

Electro-magnetic braking prevents tape spillage

Rugged

Neoprene head mount for good alignment

Heavy, 3/16" plate for good alignment

Pressure brush improves contact

10" NAB reels (or 5" or 7" standard)

Only seven moving parts

One-piece, 4 1/2 pound flywheel-and-capstan

Computer logic permits any command sequence

Remotable

Plug-in electronics

Remote record for no-thump recording

Two channel record/playback capability. (Other models with four, two or one channels; 1/4, 1/2 or full track; playback only. Extra performance options available.)

Compare all the features of the Crown CX-824 with any other reel-to-reel recorder you may be considering. And then compare the price. Crown represents the real value.

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the two separate pole-pieces are not in true mechanical alignment within the head itself. This was quite common in older two-track machines. The new ones don't have this problem.

—Fred Catero
Fred Catero Productions
San Francisco, Ca.

Ground Loop, Part 2

In the interest of safety, we should like to point out that the recommendations of Sami Uckan of Atlantic Studios (Oct/Nov 1976) on the problems of ground loops is a "shade tree" solution, a very dangerous practice and would definitely violate your local wiring codes anywhere in the U.S.A.

First, the removal of the ground pin would void the manufacturer's guarantee, make a folly of the AC protective ground and probably fry the musician at some unexpected moment, say at an outdoor gig where the grounding system is usually poor anyway (good for lawsuits if done by studio people).

The root of the problem is in the studio grounding system. The AC ground bus from point A to B (see illustration in magazine) is normally AWG

12 or 14 wire for a household circuit. This wire is too small to be used in a studio application, and because of its higher resistance causes some noise

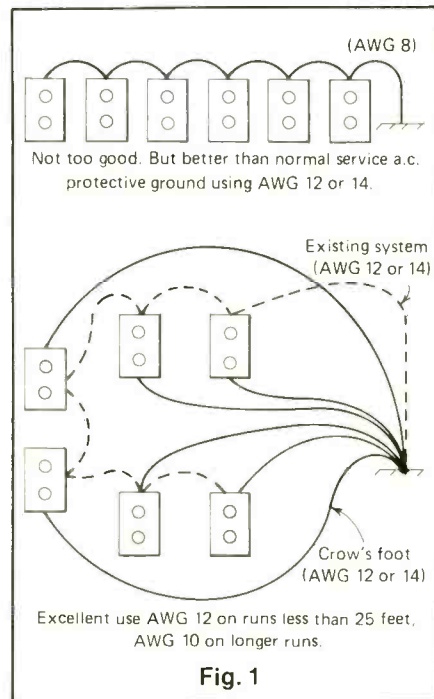


Fig. 1

currents to bypass it via the amp and console. The AC protective ground wire

in a high signal sensitivity area such as a studio should be AWG 8.

An alternative system which is the best yet and used by laboratories is the "Crows Foot" system. Here all of the AC protective ground wires are gathered at a central point. It may be installed over an existing ground system and it has the advantage of using cheaper wire (AWG 10 or 12). (See Figure 1.) The "Crows Foot" system collects the noise currents at one common point and has a resistance so low that any ground loops caused by signal connections are negligible.

As a last note have an electrician check all of the studio AC outlets for proper AC phase connections.

—Phil Coopy
Sounds Good
Falls Church, Va.

Combining Networks

I have several of the now popular high impedance output mixers which I have plugged together to form a production console. I bus these together by running the line outputs of one into the line inputs of a following mixer, on down the line. However, for obvious reasons, I'd

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Any critic who wants to do a completely fair and impartial test of a tape recorder is very fussy about the tape he uses.

Because a flawed tape can lead to some very misleading results.

A tape that can't cover the full audio spectrum can keep a recorder from ever reaching its full potential.

A tape that's noisy makes it hard to measure how quiet the recorder is.

A tape that doesn't have a wide enough bias latitude can make you question the bias settings.

And a tape that doesn't sound consistently the same, from end to end, from tape to tape, can make you question the stability of the electronics.

If a cassette or 8-track jams, it can suggest some nasty, but erroneous comments about the drive mechanism.

And if a cassette or 8-track introduces wow and flutter, it's apt to produce some test results that anyone can argue with.

Fortunately, we test every inch of every Maxell cassette, 8-track and reel-to-reel tape to make sure



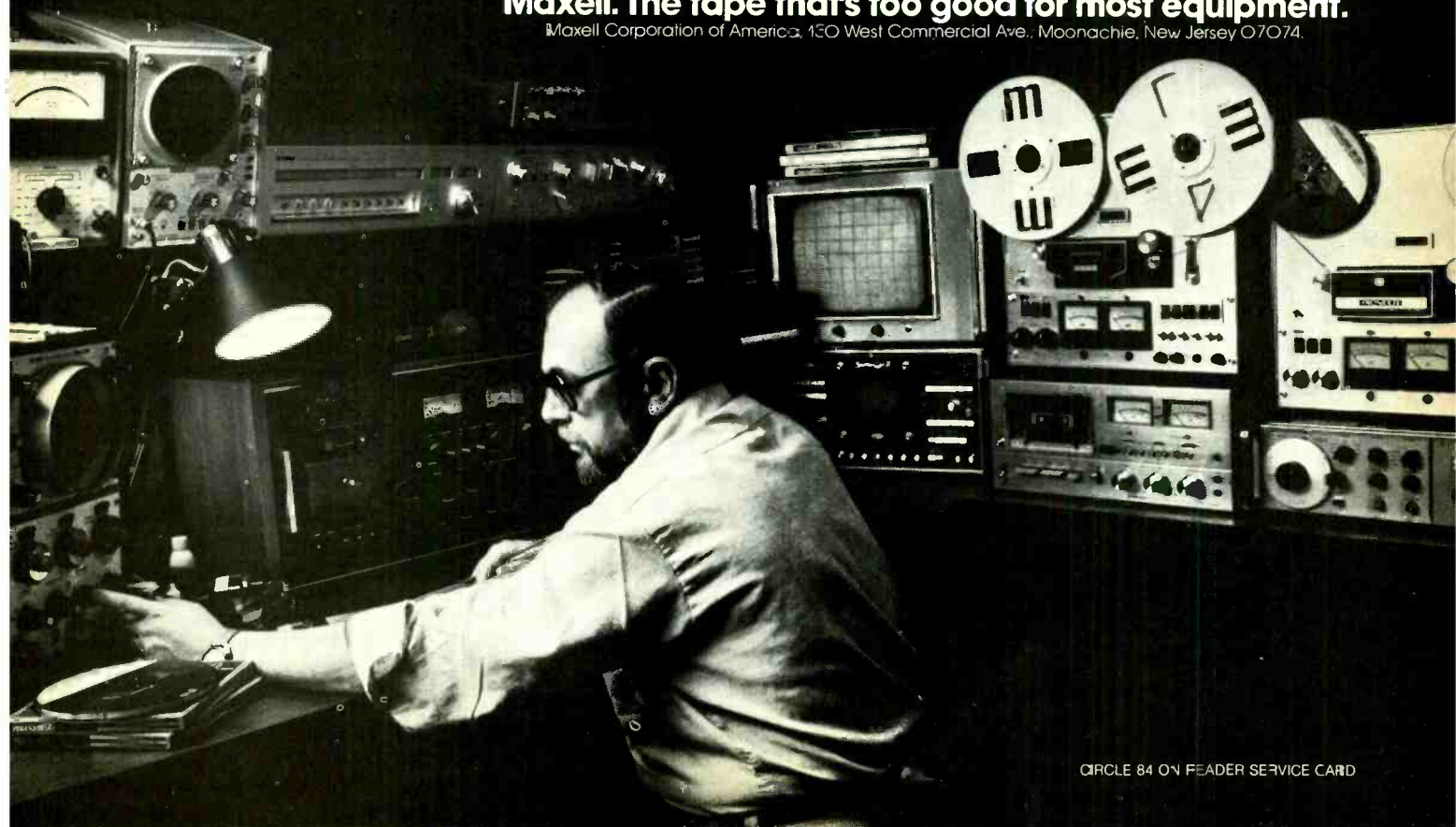
they don't have the problems that plague other tapes.

So it's not surprising that most critics end up with our tape in their tape recorders.

It's one way to guarantee the equipment will get a fair hearing.

Maxell. The tape that's too good for most equipment.

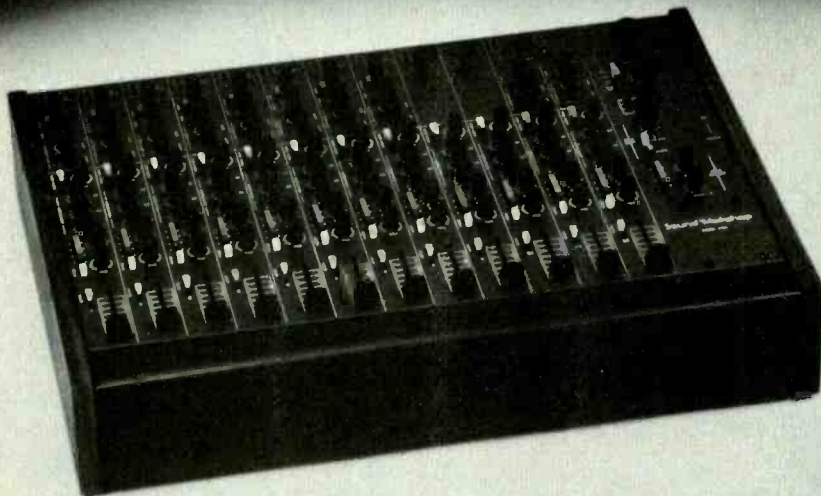
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Now that 8-track is the sensible way to go, **Sound Workshop** lets you do it right with its new **1280 Recording Console**.

The **1280** stacks up like this: 12 inputs, 8 outputs; 8 x 2 stereo monitor system; 8 x 1 musicians cue system with cue echo; 2 track mixdown buss; 3 band equalization; Solo; Mute; Panning; Pushbutton track assign; Control room monitor switching, with slate, talkback, and cue; Dual echo returns with panning and EQ: pre and post fader patch points; Total output level monitoring with **Sound Workshop's** unique TRI-LITE LED readouts that let you check recording levels on all 8 tracks at a glance. All this plus more...and of course it's **Sound Workshop** quality. We guarantee it. For 2 years, parts and labor.

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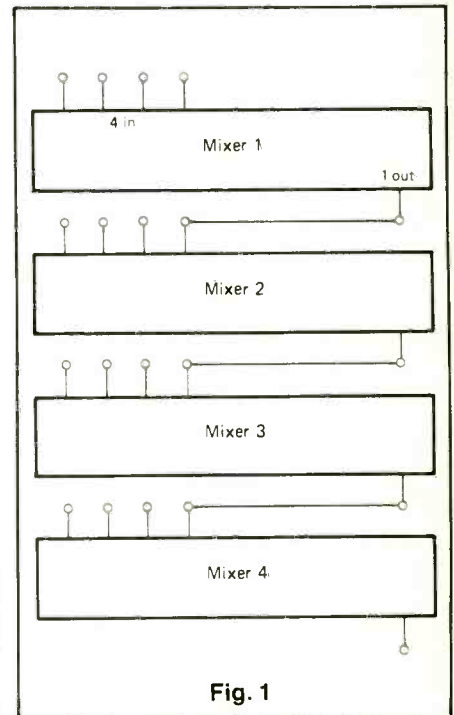
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CIRCLE 34 ON READER SERVICE CARD

like to tie all of the outputs together to free all the inputs and to achieve maximum versatility from each individual mixer. How can I correctly build a combining network from resistors to accomplish this without the use of an active combining amp? The outputs are from 10,000 to 100,000 ohms impedance depending on the type of mixer (I want to combine several types).

—Allen Freeman
Columbia, S.C.

You are correct in trying to get away from stringing your mixers in series. The inputs of the first unit have to pass through two or three more mixers on the way to your recorder or P.A. (See Figure 1.) In addition to the noise and distortion this adds, you lose "several" inputs. If we assume that each mixer has four inputs and that you use four of them then the result is only thirteen-in and one out with a lot of extra amplification.



It is also a problem matching impedances on the order of ten to one. Just to match the 100K outputs to the 10K would result in a loss of almost 16 dB. Why not build two combining networks instead: one for each impedance required? Each would result in a loss of only 6 dB between any two terminals. Each will require only five resistors or six if you don't need all three inputs. (Figure 2.) The value resistor required for the 10K network will be 5100, and 51,000 will do for the 100K network. If you do not use one of the terminals



225,287 people already know listening is only half the fun

A classic

TEAC's A-2300SX is the latest version of a classic. The most reliable tape deck ever made. As of April 1976, more than 225,287 have been purchased. And they have the lowest incidence of repair and maintenance of any deck on the market today.

What is it about the A-2300SX that makes its performance and acceptance so remarkable?

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The A-2300SX features TEAC's heavy-duty, 3-motor transport system. Each reel has a motor to assure proper tape tension at all times. A third motor drives the

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With three motor transport you get the flexibility of touch button control. You can switch instantly from mode to mode—play, fast forward, rewind, pause and record.

With our new cue lever control, editing is made easy. Instant starts. No bounce. No click.

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Three heads

Each of the three basic functions—erase, record and playback—is assigned to a separate head. Each head is designed to perform its specific assignment, and to keep performing use after use.

These are some of the reasons so many TEAC tape recorders have been sold. Another reason is that so many people get tired of just listening to music.

Listening is fun, of course, but if you really want to enjoy your stereo system, try adding fun... try adding a TEAC A-2300SX. Just remember, you won't be alone.

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of the network place either a 10K or 100K resistor across it. Good practice would suggest using a sturdy metal box and wiring it with short leads. Of course, always use shielded cable to and from the mixers. The easiest use will be

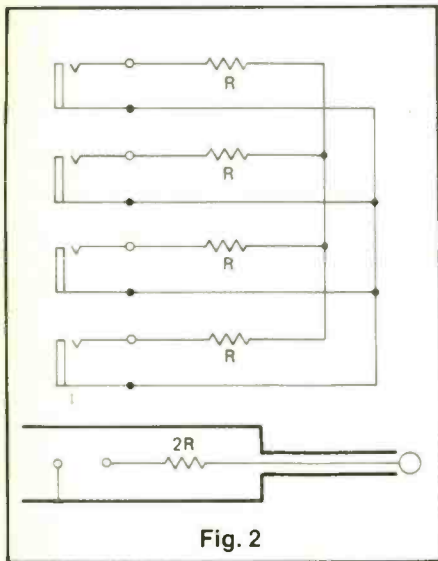


Fig. 2

achieved if you use connectors which match those on your mixers.

The result will be something like (Figure 3) fifteen-in and one out with a minimum of extra amplifying. In addition, two extra mixers can be entered into

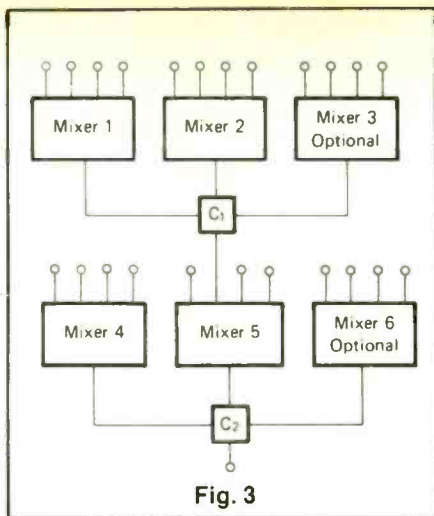


Fig. 3

the system with no penalty. Be sure to use your quietest mixers upstream.

—Ed Rehm

The Ken Nordine Group
Chicago, Ill.

dbx Differences

Different dbx lines vary radically in price, yet all purport to do pretty much the same thing, with the same quality of effect. Realizing that they are incompatible, why choose the more expensive line? Does it have something to do with the professional necessities, i.e., trans-

cription of the tape to the disc medium?

—J.A. Stewart
Cleveland, Ohio

There are two dbx tape noise reduction systems. The *dbx professional system* that is used in record companies and recording studios as well as in semi-professional applications, and the *dbx II noise reduction system* which is available for broadcast applications as well for the audiophile and home recordist.

The professional system was optimized for high-quality, studio-grade recorders with excellent frequency response and high tape speeds. The dbx II system was developed for broadcast applications and audiophile recorders having a more restricted frequency response and slower tape speeds. The dbx II system was also optimized for dbx encoded discs. Both systems provide the same 30 dB noise reduction, 10 dB additional headroom and 2:1 linear compression/expansion. The main difference between the two systems is in the level detection circuitry and this difference makes both systems incompatible with each other.

The professional systems are available in a wide variety including models with various numbers and channels in switch-

The New Reverb Price/Performance Leader:

Introducing the new *dual channel Orban/Parasound Spring Reverb*. The new 111B retains all of the electrical features of its popular single-channel predecessor and augments them with a new bass control and "quasi-parametric" midrange control. The new midrange equalizer permits stepless adjustment of its ± 12 dB equalization range, as well as continuously variable center-frequency and *bandwidth*. This equalization flexibility is unparalleled in the low-cost reverb field and effectively complements the simple equalizers usually found on low-cost mixers and consoles.

Included in the new package is our unique "floating threshold limiter" which minimizes "spring twang" and provides absolute protection from overload. And our highly-respected electronics provides a bright, super-clean sound with the best signal-to-noise in the spring reverb field. Most remarkably, the two-channel 111B costs exactly as much as our single

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At \$695 for two channels, the 111B provides the quality alternative to the cheaper, consumer-quality reverbs on the market. With industrial-quality construction, line-level balanced outputs, compact size, and smooth, four-spring (per channel) sound, the 111B is the ideal choice for the user with space and/or budget limitations. And as always, you can count on Orban/Parasound's reliability and prompt service. For more information on the new 111B, see your local Orban/Parasound distributor, or contact

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Sole Control.

It's a new concept in sound effects pedals from Maestro. Much more than just on-again, off-again, these pedals you can really play. With the sole of your foot.

The new Maestro Stage Phaser is one of them. It gives you the wild, gyrating, phase shifting sound of a rotating speaker. But with an incredible amount of playability and control.

For starters, the Stage Phaser's got Balls. That's an illuminated foot control wheel that lets you effortlessly adjust the intensity of your phasing effect... from a haunting whisper to a jet-like growl.

Stage Phaser also lets you toe instantly into three phaser speeds—two preset, one totally variable. In the variable mode, an illuminated speed wheel lets you sole tune the speed of

your spin to the mood and tempo of your music.

With all these clever controls, where's the on/off switch? Well, there's no little button to grope for. The whole pedal is a switch... just step on it anywhere. Even on a dark stage, you can't miss it.

More about the sound. Stage Phaser duplicates the braking and accelerating effect of rotating speaker without a trace of noise or cut in response. And, if you plug it into a two channel setup, you get an eerie, spatial, stereo-like sound that turns your axe into a whole new instrument.

So why settle for some ordinary turn-on? Check out Stage Phaser soon at your local Maestro dealer. And get yourself some real sole control.



Balls wheel allows effortless control of phaser effect intensity. Illuminates when AC Adapter used.

Status light glows when unit is on, easily visible on a dark stage.

Raised, three-position rotary speed selector lets you choose between fast and slow preset or a totally variable mode.

Entire pedal acts as on/off control. Step on it anywhere—the massive cast aluminum base holds its ground.

Speed wheel has large, easy to read calibrations, operates at the touch of a toe. Illuminates when AC Adapter used.

Fuzz

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CIRCLE 98 ON READER SERVICE CARD

able or simultaneous formats. Some professional models are modular with operator removable modules, balanced inputs and outputs, etc. The 150 series or semi-pro systems utilize the professional format and are compatible with any professional system. The professional system is also utilized by TEAC in their Tascam series machines. The main reason for the price difference between the professional and 150 series is that the professional series has higher output levels and balanced inputs and outputs, while the 150 series has unbalanced inputs and outputs, operates at lower

levels and far less expensive packaging. The audiophile or consumer series which are the 122, 124 and 128 operate at even lower input and output levels than the 150 series. The 120 series does channel switching in channel pairs versus individual channel switching on the 150 series. The 150 series and professional series will not decode dbx encoded discs.

As you can see by reading this, the answer to your question is far more involved than the question itself, but the difference in prices is reflected by the input and output levels, input and

output impedances, balanced or unbalanced inputs and outputs, packaging and flexibility.

—Larry Blakely
dbx, Inc.
Waltham, Ma.

Recorder Levels

The concept of your Talkback column, wherein questions are answered by a wide spectrum of practicing audio professionals, is truly outstanding! The area of recorder performance measurement, however, has not been covered in great detail and may be the basis for an article(s) written by your staff. Two measurements in particular are frequency response and signal-to-noise ratio.

Assuming that a deck is correctly BIASed and EQ'd for a specific tape, should frequency response tests be made by first:

(a) Setting a reference tone (e.g. 1000 Hz) to 0 VU and then introducing 20dB input attenuation, or

(b) Setting the reference tone to 0 VU, then adjusting the deck's record level to -20 VU and then recording 20 Hz to 20 kHz (or higher) tones with a constant input amplitude irregardless of how the deck's VU meters might vary at the frequency extremes, then play back the recorded tones looking into an AC voltmeter or dB meter noting the variance from the level of the reference tone which was (finally) recorded at -20dB or -20 VU? In addition, some "gray" areas are:

(1) To what should a deck's output level control be set or is any arbitrarily convenient level OK for a frequency response measurement?

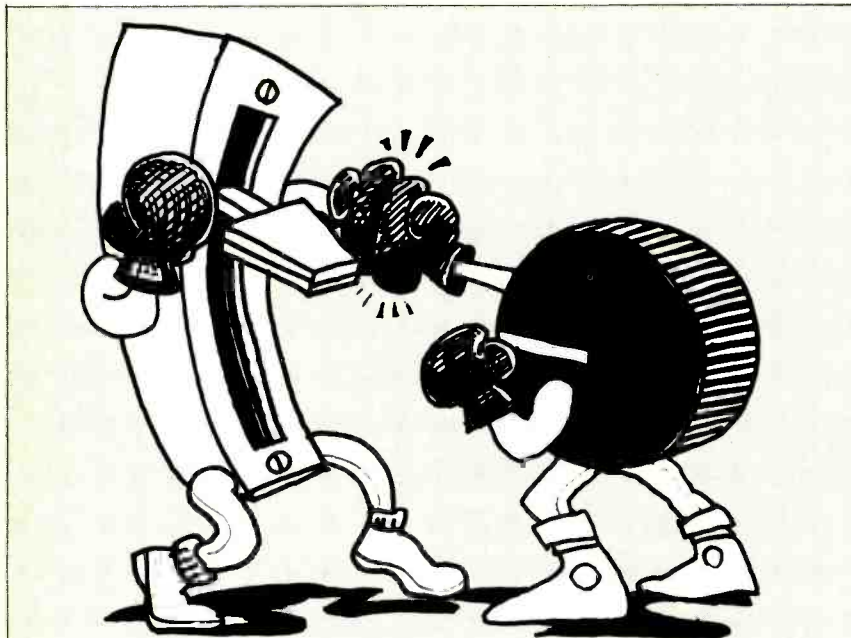
(2) How is a tape's output level specified and measured? Advertisements, for example, may state that a particular tape's output level is 59dB, or 65dB, or whatever. Since any deck's output level control is variable, what is the reference standard?

(3) Is one VU equal to one dB or are they different units?

And finally, how can a signal-to-noise ratio test be made using equipment usually owned or borrowed by a home recordist, such as signal generators, AC voltmeters, dB meters, etc.?

—Thaddeus P. Floryan
Los Altos, Ca.

In order to answer Mr. Floryan's question properly, it would require an article, instead of just part of a column. However, my first suggestion is that he obtain a test cassette from a standard supplier such as Standard Tape Labs or



Tangent presents:

Rotary Pot vs. Cheapie Slider

Super-Fi Electronics throughout a mixing system are not much help if the faders add noise.

In the bout between *Rotary Pot* and *Cheapie Slider*, three rounds are fought: *Cleanliness, Reliability, and Cost.*

Round One: Sliders, by design, have a long opening through which foreign matter can reach the conductive element and moving parts. Sliders are susceptible to dirt, dust, and any klutz that dumps his drink on the mixing board.

Rotaries, however, are protected by the front panel itself and the seal formed by the tightened nuts on each side of the front panel. No dirt, no noise.

Round Two: Once a slider becomes noisy, it means a trip to the shop. Downtime. Hassle. Unreliability.

No dirt, dust, or drinks can get at the working end of a rotary pot. No downtime. No Hassle. Reliability, job after job.

Round Three: Cost is the final area of contention. Rotary Pots rarely need servicing, so Tangent uses the money saved in warranty cost for the Super-Fi circuitry inside each Tangent Mixing Console.

A Unanimous Decision: *Rotary Pot* wins all three rounds . . . that's why Tangent uses the rotary pot fader.



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CIRCLE 93 ON READER SERVICE CARD

The Control of Power by Sansui.

For the audiophile who wants the finest matched stereo amplifiers and stereo control preamplifiers, Sansui offers the answer — its Definition Series. Look at two of these outstanding components. The Sansui BA 3000 is designed with plenty of power to handle those bursts of percussion and those dynamic fortissimos that give you concert hall presence. The CA 3000 controls and features are a true joy for the creative pro and audiophile who wants to tailor the music to his own personal preferences.

This extraordinary pair is designed for the most demanding tasks; recording studios, sound reinforcement and audiophile home listening. The Definition Series offers the clearest, cleanest fidelity available anywhere. Top of the line Sansui BA 5000, called the "Monster," is one of the most powerful amplifiers available today: 300 watts per channel min. RMS into 2, 4 and 8 ohms from 20 to 20,000 Hz with no more than 0.1% THD.

For complete information on the entire Definition Series visit your local Sansui dealer soon or write directly to us.



The CA 3000 phono preamplifier is within ± 0.2 dB of RIAA equalization curve. Offers everything desirable in a preamplifier and more. Triple tone controls. Left and right input and output channel meters. Tape controls for copy and playback. Sensitivity controls. Phono input capacitance selector.

The BA 3000 stereo amplifier. 170 watts per channel, min. RMS, both channels driven into 8 ohms from 20 to 20,000 Hz with no more than 0.05% THD. Safety abounds: 4 jumbo heat sinks (Sansui patent pending); triple protection circuits for ample power protection; and front panel LEC power/protection indicator on the front panel to show safe operation. Specially damped output power meter.

Each Definition Series component comes with a test data sheet, complete with all performance characteristics. And Sansui offers a limited 5 year warranty.

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CIRCLE 33 ON READER SERVICE CARD



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CIRCLE 77 ON READER SERVICE CARD

There's no point in having a separate tonearm unless you can mount it perfectly.

If your involvement in audio has led you to consider a separate turntable and tonearm, you don't need much advice from us. So we'll just describe the Luxman PD-121 and let you decide if this is the kind of turntable you've been hoping someone would make to mate with whatever tonearm you may be considering.

To assure accurate tonearm mounting, precision pre-cut mounting plates are available for six different tonearms: Shure/SME, Denon, Fidelity Research, Grace, Ortofon, and Stax. (The Shure/SME plate and an uncut plate are provided with the PD-121, the others are accessories.) A rigid bayonet socket mount lets you interchange tonearms rapidly and as often as required with the assurance that the established tonearm/disc geometric relationship will be accurately maintained.

The same attention to precision design is embodied in the platter and direct-drive system. The platter is die cast, 11 $\frac{1}{8}$ " diameter and weighs 5.3 pounds. Its direct drive brushless DC servo-controlled motor ensures the utmost in speed stability and vibration-free performance. A heavy die-cast aluminum frame and compliant support feet help minimize spurious mechanical vibration and feedback. Rumble is better than 70 dB (DIN-B weighted), wow and flutter no more than 0.03% (WRMS). An illuminated strobe provides direct numerical reading for 33 $\frac{1}{3}$ and 45 rpm, and speeds are variable over a 4% range.

If you would like further information (including the location of your nearest LUX dealer) you are invited to drop us a card or give us a call (phone 516-822-7070).



LUX Audio of America, Ltd.

200 Aerial Way, Syosset, New York 11791
In Canada: White Electronics Development Corp., Ontario

Ampex. With such a cassette and the associated literature, he will be much closer to aligning his particular machine. Also, most equipment manufacturers can supply a service manual for any product made by them. There is a nominal charge for this book, but it is priceless when it comes down to service and alignment procedures.

Just as in studio procedures, it is first necessary to align the playback section of the unit, then the record section is aligned to the standardized playback frequency curve, level, etc. In the first question, relative to input attenuation, either approach will produce the same basic results. It is important that the test signals be supplied by a reliable audio frequency source with a constant output, independent of frequency. Although most deck's VU meters are satisfactory for recording level references, I do not recommend them as a reference for test procedures. Instead, a reliable VTVM or other equivalent test gear should be used for both input and output level measurements. In aligning the record section; you should use the same frequencies and level references found on the test tape. Following those references will result in a more accurate alignment of the deck. A playback reference level will have been established through use of the test tape. Therefore, record levels are easy to set. Zero VU for the STL standard cassette test tape represents a recorded signal of 100 nanowebers per meter and a 120 micro-second EQ curve. This is a level approximately 5-1/3 dB below the zero VU reference level for a full-track 1/4-inch tape. By the way, on a properly calibrated system, 1 VU is equal to 1dB.

The reference by various manufacturers to their tapes output level is usually a specification of the signal-to-noise ratio of the tape. Of course, this also represents the maximum dynamic range of the tape under normal recording conditions.

I do not recommend that the average audiophile run extensive tests on his/her own equipment, unless he/she has both the knowledge and test gear to perform these tests properly. Instead, I suggest he/she locate a reliable service organization in the area, which is properly equipped to do the more exacting tests for S/N ratio, IM distortion, harmonic distortion, etc.

—Skip Frazee
Sound Techniques, Inc.
Dallas, Tx.





WE'LL STACK OUR'S UP AGAINST ANYONE'S

If it's performance with reliability you're after — we have it! Quality has been our objective for over 30 years, and one way we have obtained that quality is by not mass-producing. While appearance is one sign of quality, the real difference is what goes inside the product. Here are just a few highlights of CARVIN products:

SM1800 STEREO MIXER — 18 Balanced Inputs, Stereo Panning, (2) Ten Band Graphic Equalizers, Adjustable Bi-Amp Crossovers, Variable Line-Mic Atten up to -35 dB, Frequency Response 5 Hz to 25K Hz, Equivalent Input Noise -126 dBV, THD .05% typically, Main Outputs 10 Volts RMS balanced into 600 Ohms. \$1295. Other Carvin Mixers start at \$349(6 Ch), \$579(10 Ch), \$949(12 Ch).

HORN LOADED 1330 LO END SYSTEM — features the high efficiency JBL K130 in a folded port horn and front horn enclosure. \$259.

R520 RADIAL HORN — features the Electro-Voice Sentry IV Driver complete at \$179 or with the popular JBL 2470 Driver complete at \$299.

BM700 BASS AMP — Ch to Ch Switching of Normal or Sustain Channels, 7 Band Graphic Equalization, 2 MagnaLab 15" spks — JBL optional. \$429.

VT1500 TUBE STACK — Ch to Ch Switching of Normal or Sustain Channels, 100/50 Watt Switching, a conservative rated 100 RMS from 4 EL34s, 7 Band Graphic Equalization, 8 MagnaLab 12" speakers — JBL optional. \$779.

DC150 STEREO GUITAR — Schaller M6 Machine Heads, Hard Rock Maple Body and Neck, Humbucking Pickups with phase and Dual-Single Coil Switching. \$339.

Carvin products are available direct only — eliminating costly retail mark-ups. But more important than big savings, the product itself must be superior in every respect — at Carvin we have such a product for the professional.

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CIRCLE 78 ON READER SERVICE CARD

THE **PRODUCT** SCENE

By Norman Eisenberg

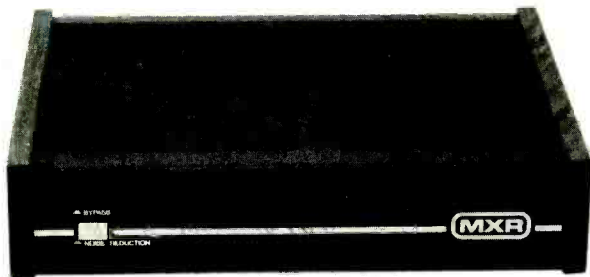
dbx LITERATURE PUTS IT ALL TOGETHER

dbx Inc. has released a comprehensive set of informational pieces describing its products which now include the model 142 for broadcast use; the model 194 which is a combined noise-reducer and five-channel input mixer for use with 4.2, 4L and 3 series Nagra recorders; the model 192, a two-channel system for the Nagra IV-S; the K9-22, a plug-in replacement for Dolby-A systems; the 157 two-channel r/p noise-reduction system; the 160 and 161 variable compressor/limiters; the 154 four-channel processor; the 216 sixteen-channel model; the 187 four-channel unit. In addition to detailed descriptions of these products, dbx also has general literature explaining its system and how it works.

CIRCLE 9 ON READER SERVICE CARD

MXR OFFERS COMPANDER

MXR Innovations, Inc. has just brought out a compander to serve as a noise-reduction device. According to MXR, the new device can double the dynamic range of most open-reel and cassette decks. Its operation basically is that of compressing the dynamic range of signals during recording, and expanding them on playback. All frequencies are processed at all levels in the same manner, thus eliminating the need for critical level adjustments, says the manufacturer. The MXR device is compatible with dbx-encoded material. Packaged in anodized aluminum with walnut side panels, the unit retails for \$129.95.



CIRCLE 1 ON READER SERVICE CARD

LOW COST CASSETTE DECK

A front-loading cassette deck with Dolby-B noise reduction and memory rewind, priced under \$250, has been announced by Bigston. The company also will release a lower-priced deck plus four portables which employ LEDs as indicators of battery strength and recording levels.

CIRCLE 12 ON READER SERVICE CARD

NEW LOW-F HORNS



Specially designed horn structures housing rugged drivers, for use where substantial bass power is required, have been announced by Forsythe Audio Systems, up to recently a regional producer (New England area) but now expanding its operations. There are two models, the SR-215 priced at \$375, and the SR-115 at \$280. The SR-215 holds two woofers with usable response down to 38 Hz; output at four feet with a 200-watt input is 135.8 dB SPL. The SR-115 with one woofer has usable response to 40 Hz with an output of 133.5 dB SPL for the same output. The enclosures are made of 11-ply laminated birch with 2 x 4 bracing. The SR-215 is 42 inches high, 36 inches wide and 27½ inches deep; weight (less drivers) is 149 lbs. The SR-115 is 26¼ inches high, 36 inches wide and 30 inches deep; it weighs 127 lbs.

CIRCLE 14 ON READER SERVICE CARD

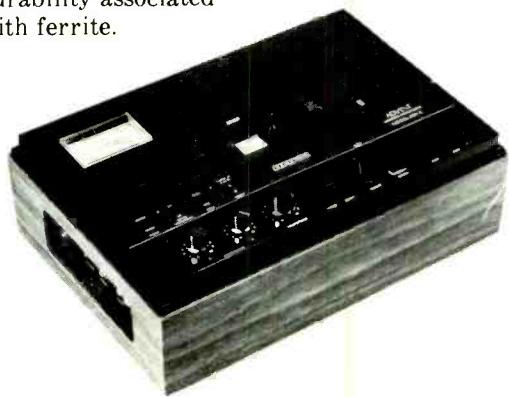
DOLBY DESCRIBES FULL PRODUCT LINE

Dolby Laboratories, Inc., recently moved to San Francisco from its former New York headquarters, has released descriptions and prices on its entire line which now includes A-type noise reduction units in the 360 series and MH series of which the most elaborate model is the M24H—a 24-track package priced at \$15,000; A-type noise-reducers for cinema use; a separate series for motion picture studio applications; various optional accessories for the above; and the B-type devices in the 330 series which include a duplication processor and another model for broadcasting, both stereo models and each costing \$1,350. For full details, contact the manufacturer.

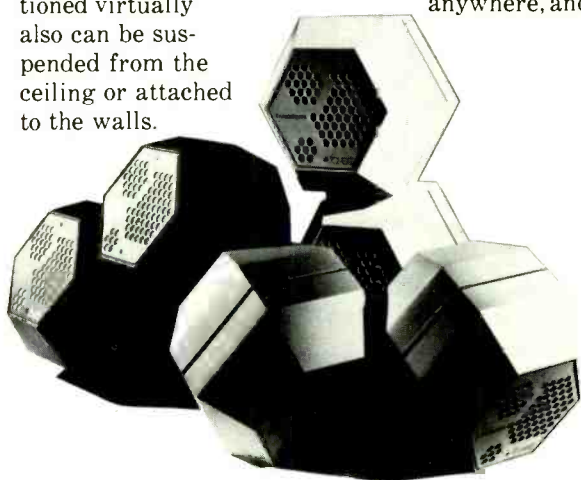
CIRCLE 10 ON READER SERVICE CARD

ADVENT UPDATES CASSETTE DECK

Advent, the company that first introduced a quality cassette deck—the 201—which combined Dolby-B noise reduction and the EQ and bias for using chrome cassette tapes, has word of an updated version of this device, the 201A. The new model uses a new r/p head made of Sendust alloy, said to be the first head material to combine the preferred performance characteristics of permalloy with the durability associated with ferrite.



In addition, the new model has a built-in headphone amplifier, a useful feature missing on the earlier version. Specs of the 201A include wow and flutter of less than 0.08%, frequency response from 28 Hz to 15 kHz within ± 2 dB input sensitivity of 35 mV for 0 dB and maximum output level of 1 volt. Distortion, said to be tape-dependent, is rated to be typically less than 0.1% up to and beyond tape saturation. With the Dolby system on, signal-to-noise ratio is listed as better than 60 dB with chrome tape, and better than 57 dB with regular tape.



CIRCLE 6 ON READER SERVICE CARD

NEW BASS-REFLEX SPEAKER

From Acousti-phase, Vermont-based manufacturer, comes news of the "Phase-Monitor," a two-way speaker system incorporating a 12-inch woofer and a mylar-dome tweeter. The woofer is loaded by a port for bass-reflex operation, and the tweeter has a level control. Size of the system is 25 by 15 by 14 inches. Priced at \$159.95, it is said to be efficient enough to be driven with as little as 10 watts. Maximum power handling capability is listed as 70 watts, and response is given as 32 Hz to 20 kHz. The woofer uses a double foam surround claimed to eliminate subsonic flutter.



CIRCLE 2 ON READER SERVICE CARD

TANDBERG OFFERS NOVEL SPEAKER

Known as the "Fasett" and already enjoying a vogue in Europe where it was first introduced is a new speaker system from the Norwegian manufacturer Tandberg. Shaped like a hexagon and available in black, antique white or orange, the Fasett is a compact bass-reflex system with a rated response of 50 Hz to 20 kHz. It houses a 5-inch bass driver and a 2¼-inch tweeter. Rated power handling capability is 25 watts (maximum continuous) or 40 watts (music power rating). The speakers may be positioned virtually anywhere, and also can be suspended from the ceiling or attached to the walls.

CARRY YOUR YAMAHA

There's now an attache-styled carrying case for a Yamaha—the cassette tape recorder, that is (not the bike). Called the TCC-1 and priced at about \$50, the case holds the model TC-800GL deck which can be operated on batteries. In addition to nestling the TC-800GL, the case also has compartments for microphones, headphones and spare cassettes.



CIRCLE 19 ON READER SERVICE CARD

DYNACO OFFERS EQUALIZER

Dynaco, a company well-known to audio buffs for its products in kit form, has announced its entry into the rapidly growing field of octave equalizers. The new Dynaco model has ten sliders per channel on a stereo unit, each slider with a specified range of ± 12 dB at octave intervals from 30 Hz to 15 kHz. Complete frequency range of the device runs from 10 Hz to 35 kHz within ± 1 dB. Maximum output is 8 volts. With sliders set at zero, output is 2 volts (rms) into a 10K—ohm load paralleled with 1000-pf capacitance. THD is given as not more than 0.04%; IM at 0.02%. Hum and noise are claimed to be 85 dB below rated output. Front panel source/tape and EQ in/defeat switches are provided.

The Equalizer can be used for altering tonal characteristics of program material (for listening and for recording) as well as to compensate for room acoustic conditions. Designated model SE-10, it sells in kit form for \$249; factory-built price is \$349. A wood cabinet is optional.

CIRCLE 5 ON READER SERVICE CARD

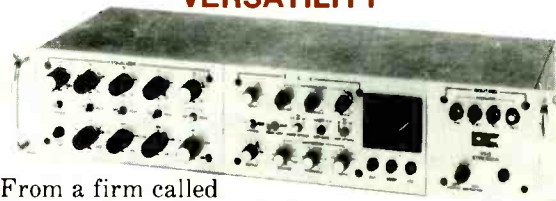
TELEFUNKEN OFFERS NEW COMPANDER

Gotham Audio, which handles AEG-Telefunken products in the U.S., has released information about the Telcom C4D, a signal compander made by AEG-Telefunken. In addition to its main purpose in improving the dynamic range of tape recording, the C4D has additional applications in telepho line transmissions which need level-adjustments due to the great number of amplifiers connected in series on such lines. The signal compander also may be used to improve the dynamic range of optical sound recordings.

The Telcom device divides the frequency range from 30 Hz to 20 kHz into four bands, each with an independent control system. This arrangement is claimed to suppress tape noise "breathing" and also assures proper management of the system's transient response. It is dB-linear and has the advantage that a shift in reference level has no effect on frequency response or on transients (which is what makes it useful for the telephone line function). Rated THD is less than 0.2%, and the device may also be used in Dolby-A models.

CIRCLE 13 ON READER SERVICE CARD

"STRESSOR" STRESSES VERSATILITY



From a firm called Chateau Seven Group Ltd. based in North Dakota comes word of the model OCA VS-1 Stressor which apparently combines the functions of a compressor-limiter-expander and a parametric equalizer. The VS-1 is said to be useful in production or mixdown work, to process the output of the program chain prior to feeding onto a microwave or telco line, as a final limiter just ahead of a transmitter at the transmitter site or as an enhancement device for DJ or studio microphones. A "routing" switch may be used to place the equalizer before or after the compressor-limiter-expander; another position inserts the equalizer into the control circuitry of the compressor section to create a frequency-sensitive compressor or, alternately, a "four-band dynamic equalizer." According to the manufacturer, this format creates a very powerful, bright and "punch" signal. Full specs on this and related audio devices are available from the manufacturer at Box 312, Pembina, N. Dakota 58271.

CIRCLE 3 ON READER SERVICE CARD

NEW SONY MIXER

The model MX-510 is a new portable, stereo/mono mixer featuring a variable pan pot. Manufactured by Sony it is distributed in the U.S. by Superscope, Inc. An active-type mixer, the MX-510 can combine up to five channels of input while providing two channels of output. The pan pot can be used to assign channel 5 signals to either left or right channel outputs. Each of the five input channels has a -20 dB mic attenuator.



The device features straight-line level sliders with reference indicators, a sliding master level control, five phone jacks for mic inputs, two VU meters, line input phono jacks, output phone plugs, stereo headphone jack and a button to check batteries if the unit is used with them. It also can be used on AC via an optional adapter, model AC-12.

CIRCLE 4 ON READER SERVICE CARD

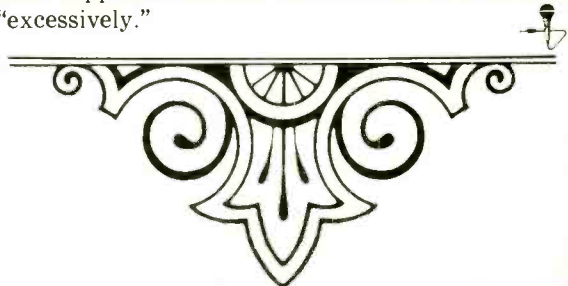
A.E.S. CAREER GUIDE

Finally, for the budding audio professional there's a new booklet titled "A Guide to Careers in Audio Engineering" published by the Audio Engineering Society, 60 East 42nd Street, New York, N.Y. 10017. Amply illustrated and well-written it is aimed at the newcomer and discusses various phases of work in professional sound, including audio in entertainment, communications and education, noise control, audio in medicine and science, etc. A section on educational requirements is included. The book also outlines the scope and membership rankings of the A. E. S. Its chief weakness is an avoidance of such practical matters as how to get one's first job and how much to expect in the way of salaries. But some information is better than none, and maybe the A. E. S. will publish a sequel that digs more into the nitty-gritty of, for instance, just how does one get hired to work the knobs at a recording studio.

OF POWER AND PRICES

Two items currently in the news may be of varying interest to the audio-minded. One concerns a change in the procedures used for measuring amplifiers in accordance with the FTC trade regulation rule. Apparently, some technicians—trying to measure THD at the low power level of 0.25-watt—have been getting analyzer readings that consist primarily of noise, rather than of actual harmonic distortion. Thus, a single-number harmonic distortion reading might seem to be greater than rated THD. To correct this misleading impression (which could "downgrade" a perfectly good product), low-power THD may now be measured with a spectrum analyzer, which will not confuse residual noise with true distortion content. Also, when there is a separate input to the power amp, it may be used instead of the formerly prescribed "auxiliary" input—again in the interest of keeping irrelevant noise-content out of the actual distortion measurement. So, congrats to the FTC for recognizing and correcting what could have proven a source of annoyance and confusion to both manufacturers and consumers.

Item 2 concerns a certain coyness that has characterized the pricing of some audio equipment of late, following in the wake of the doing away with "fair-trade." Instead of stating a retail price, some companies are using uncertain phrases like "less than \$500," or "approximate nationally advertised value"—and often price is not given at all. In the case of the first phrase the obvious question is "How much less?" In the case of the second phrase, one might ask: "How approximate, and which way—over or under the figure quoted?" And what the hell does "value" mean vis-a-vis dollars?" The problem it seems is that no one wants to be accused of "price-fixing" yet at the same time very few firms want to acknowledge that audio components may be significantly discounted by dealers, depending on the kind of equipment, the area, the specific amount of a given purchase at a given time. Keep in mind too that although price-fixing is out, some manufacturers are said to be limiting their supplies to dealers who are known to discount "excessively."



MUSICAL

NEWSICALS

SOUND REINFORCEMENT . . .

Yamaha has rounded out their line of professional mixers with the introduction of four new models. The PM-170 (\$495) and PM-180 (\$595) are both 6-in, 2-out mixers which mount in seven inches of rack space, and which were designed for use as companion submixers with other Yamaha mixers, or as independent mixers. The PM-170's inputs and outputs are unbalanced and are connected via phone jacks for convenient interface with Yamaha's EM-series integrated mixer/amplifiers, while the PM-180 has balanced inputs



and outputs with XLR connectors for use with PM-series or other professional mixers. Both the PM-170 and PM-180 feature two lighted VU meters, headphone output, auxiliary inputs to left and right channels and a 600 ohm +24 dBm output capability. Each input channel on these two models includes a 3-position input level switch for mic or line inputs, a two-frequency bass rolloff switch, low frequency and high frequency EQ controls with ± 15 dB range and a pan pot plus the channel volume control. The model PM-430 (\$1095) and PM-700 (\$2695) were designed to fill the gap between the small EM- and PM-series mixers and the large PM-1000 series of modular consoles. The PM-430 is an 8-input stereo mixer featuring a 3-position input sensitivity switch, low-frequency and high-frequency EQ with ± 15 dB range, pre-fader and post-

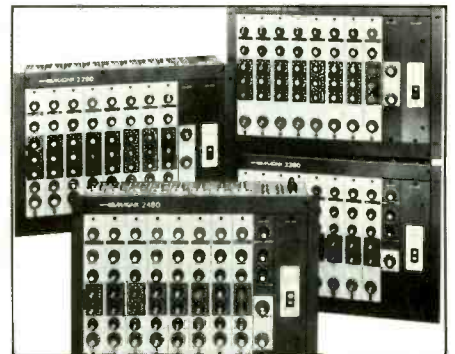
fader monitor sends, pan pot and fader on each input channel. Also included in the PM-430 are auxiliary inputs to the mix buses, master program faders, master monitor faders and two lighted VU meters which are switchable between main and monitor outputs. The PM-700 is a 12-input stereo mixer which has a 5-position plus "off" input sensitivity switch, low-, mid- and high-frequency equalization with ± 15 dB range, conductive plastic fader and cue button on each input channel in addition to the other features found on the PM-430. Also featured on the PM-700 are four lighted VU meters, talkback circuit and a plug-in gooseneck lamp. Both models use transformer-isolated inputs and XLR connectors, boast excellent frequency



response, total harmonic distortion of less than 0.1% at +20 dBm output and an equivalent input noise of -123 dBm. (Yamaha International Corp., P.O. Box 6600, Buena Vista, Ca., 90620).

The Sunn/Magna 2000 Series comprises four models of eight-input, rack-mountable mixers. All four models feature Auto-Match sensitivity control, XLR and phone jack inputs, phone jack outputs, equalization and monitor send on each input channel

and individual channel and master channel level controls. The model 2180 (\$500) is a mono mixer with 3-knob EQ on each input while the 2380 (\$600) is a mono model with 2-knob EQ and effects send on each input and an effects return on the master. Models 2280 (\$550) and 2480 (\$650) are both stereo mixers; the 2280 has 3-knob EQ on each input while the 2480 has a 2-knob EQ and effects send.



On the speaker side, Sunn has a new PA speaker, the Model 10 (\$450), and a new monitor speaker, the Concert Monitor (\$200). The Model 10 is a three-way speaker system rated at 100 watts RMS power handling which was designed for PA or keyboard amplification use. Bass is produced by two special design Sunn 12-inch speakers in a front-loading exponential cabinet. Midrange comes from a Sunn/Magna compression driver mounted on a unique Sunn wooden radial horn, and the tweeter is a piezo-electric unit. The crossover is a two-way circuit since the piezoelectric tweeter is self-crossing-over, and connections are provided for bi-amplification. The Concert Monitor is a compact, 2-way system designed for maximum versatility as a "front fill" monitor speaker. Two Sunn 10-inch speakers are mounted in a ported bass reflex enclosure along with a tweeter for good efficiency and high

accuracy. The cabinet itself is a special multi-angle design which permits a choice of several different placement angles. Each Concert Monitor has its own volume control and is rated at 50 watts RMS power handling. (Sunn Musical Equipment Co., Amburn Industrial Park, Tualatin, Ore., 97062).

INSTRUMENTS . . . Yamaha Musical Instruments recently introduced two keyboard instruments which take different approaches to producing the sound and feel of an acoustic piano in an electric or electronic instrument. The Electric Grand Combo Piano is basically a specially designed acoustic piano with built-in pickups and preamps. The Electric Grand's action is almost identical to that used in Yamaha's conventional grand pianos except that it has been ruggedized for



touring use, and has somewhat faster action thanks to improved dampers and buckskin hammers. Since the instrument uses electric pickups, the sound board has been eliminated, and this, combined with a unique "Humidiseal" pin block, gives the Electric Grand excellent tuning stability. Specially developed bass strings are used to retain grand piano tonality in a physically much smaller instrument. The instrument is built in two separately encased sections for greater ease in transporting. The lower section, which contains the action, and the upper section housing the strings and the electronics fasten together for use via recessed quick-release latches. The electronics of the Electric Grand feature bass, middle and treble tone controls and a tremelo circuit which pans the signal between two outputs for spatial effects with two or more amplifiers. The other new Yamaha instrument is the Electronic Piano, a purely electronic instrument which was designed to sound and feel like an acoustic piano without any of the disadvantages of an acoustic instrument. Unlike most other electronic pianos, the Yamaha Electronic Piano

has full touch control over expression and dynamics even though the note is generated electronically rather than mechanically. The action has been carefully designed with respect to key length, mass and pivot point to give true grand piano feel. The intervals between the notes are permanently pre-tuned, but the overall tuning of the piano is variable with a single knob. The Yamaha Electronic Piano is a true stereo instrument, and both output channels have a choice of piano, harpsichord, honky-tonk piano or guitar sounds. Additional controls are provided for volume, bass, treble, balance (panpot), sustain, tremelo rate and tremelo depth. (Yamaha Musical Instruments, P.O. Box 6600, Buena Park, Ca. 90620).

One of the most popular electronic pianos, the Univox Compac Piano, is now offered in an improved version, the CP115B (\$550). The new model utilizes a steel-reinforced keyboard chassis plus a new timbre control to vary the sound texture. (Unicord, Inc., 75 Frost St., Westbury, N.Y. 11590).

The new Ibanez Artist 5-string banjo, Model 593, is a more decorative version of the popular Ibanez Artist banjo. The new model has a 12-ply maple shell with a dark-stained gloss finish and mother-of-pearl inlay. The hand-shaped neck is also dark maple and has a steel truss rod for rigidity. Mother-of-pearl inlays adorn the peghead and the aged ebony fingerboard. All five tuning pegs are geared and all hardware is hard chrome plated. (Elger Co., P.O. Box 469, Cornwells Heights, Pa. 19020).

ACCESSORIES . . . Phase shifters have been popular accessories for several years, producing that familiar sweeping, swooshing effect. However, in the last year or so a number of devices have appeared which use "analog shift registers," "analog delay lines," or "bucket brigades" to produce a true comb-filter effect which the phase shifters can only simulate. These devices are commonly known as "flangers" after the original mechanical method of producing the effect with two tape machines. One of the latest additions to the flanger lineup is the Phlanger Kit from PAIA Electronics (\$59.95). This model has a built-in low-frequency oscillator for automatically swept effects, but also

has a control voltage input for foot-pedal controlled sweep or for interfacing with a synthesizer. Controls are provided for sweep span, sweep center, speed, accent and the mix of delayed and non-delayed signals (equal mix of normal and delayed signal gives the deepest notch filter effect, and using the delayed signal unmixed with normal signal gives a true vibrato). (PAIA Electronics, 1020 W. Wilshire Blvd., Oklahoma City, Ok., 73116).

Another flanger, introduced by MXR Innovations, is the first model specifically designed for "live" performance use. The MXR Flanger (\$199.95) is an AC-powered unit housed in a typical MXR cast aluminum housing. The circuitry generates a maximum delay of 16 milliseconds which produces over 150 harmonically-related notches in the audio spectrum starting at 63 Hz. Controls include sweep width, sweep spread, regeneration and a manual sweep control knob in addition to the bypass footswitch. Also new from MXR is the Envelope Filter (\$79.95), which produces wah-wah effects in response to the envelope of the input signal and is thus touch-sensitive. The circuit is basically a voltage-controlled low-pass filter whose cutoff frequency is determined by the output of an envelope follower. A threshold control varies the sensitivity of the envelope follower and thus adjusts the touch-sensitivity or the signal level at which the filter is activated, while an attack



control varies the attack time or initial response time of the filter. (MXR Innovations, P.O. Box 722, Rochester, N.Y., 14603).

New from Musitronics Corp. is the Mu-tron Micro V (\$49.95)—basically a lower-cost, simplified version of their new Mu-tron III, which was the first commercially available, envelope-controlled filter. The new unit boasts simplified operation with a combination sensitivity/filter frequency control and a high-low filter range switch for use with bass or keyboard as well as guitar. (Musitronics Corp., P.O. Box 57, Rosemont, N.J. 08556).

... is it digital?

the FUTURE of RECORDing

By Robert Angus

Exactly 100 years ago, Thomas Alva Edison invented the phonograph—not the one we know today, but the cylinder machine which carries on today as the dictaphone. Ten years later, Emile Berliner invented the flat record, spelling the eventual doom of Edison's cylinder as a home entertainment medium. Actually, it was to take another forty years before the cylinder finally bit the dust and the flat disc reigned supreme. Meanwhile, in 1899, Valdemar Poulsen invented the magnetic recorder. Nothing much was to happen to it for thirty-five years, until a group of German engineers switched from piano wire to tape. And Berliner's flat record was to continue virtually unchanged until 1948, when CBS Laboratories introduced the long-playing microgroove record.

Now the recording industry is confronted with a technological innovation at least as revolutionary as Berliner's flat record and CBS's LP—an innovation which represents a change as fundamental as that caused by Edison or Poulsen. It's called digital recording, and it's an offshoot of digital computer technology. It threatens not only to alter the format in which we store and reproduce music in the home from conventional discs and tapes to helical scan tape or

magnetic cards, but to render obsolete most of the noise reduction systems and high fidelity tape formulations introduced in the past few years.

Questions and Answers

Just what is digital recording, and what can it do? Like scientists at the dawn of the atomic age, digital's developers don't know all the answers to the second question. Among the things digital technology already has done are to restore some semblance of modern sound to acoustic recordings made by Enrico Caruso and, more routinely, to record music at a dynamic range of 85 dB—well in excess of analog capability.

Digital recording is a technique for converting the notes on a printed score or the sounds in a recording studio into a series of numbers, storing the numbers on tape, disc or magnetic card, then, when required, converting them back into musical sounds.

The type of recording developed by Edison and Poulsen is *analog* recording—in which the musical score or the "live" performance translates rather neatly into a continuous record groove or series of magnetic patterns. If you were skilled enough at reading microscopic squiggles which make up the record groove or those magnetic pat-

terns, you could follow the music in the same way a musician reads a score. The same magnetic pattern or high frequency excursion on the record denotes each appearance of a piccolo, the same wide bass excursions and magnetic patterns represent rhythm bass, and one is directly analogous to the other.

To record the same music digitally, a computer breaks each musical waveform up into hundreds of thousands of tiny particles and translates them into bits of information. These digital bits contain either a signal or no signal. Together, they represent a musical tone. To give you some idea of just how many bits there are and how tiny they are, let's suppose we have a 20,000-cycle tone. That signal will last exactly 0.00005 seconds—the time it takes the sine wave to go from zero to its peak in one direction, down to zero again, then to its maximum negative amplitude and back to zero once more. In order to give a proper electronic representation of that tone, however, we must sample it at several points along its path because we must know its amplitude. The number of sample impulses and their duration tell us its frequency.

Anyway, back to our 20,000-cycle tone. Let's assume that ten samplings

will give us a pretty good representation of it. That would mean that we would have to sample such a waveform 200,000 times in each second. Each of those 200,000 samples might actually consist of ten dots or pulses, meaning that we actually have about two million bits of information to represent accurately each second's worth of continuous waveform information.

How do you record and store that much of that kind of information? The key to the problem is bandwidth—the ability of storage media to record frequencies from the very lowest to the very highest. A very good stereo recording has a bandwidth of perhaps 20,000 cycles. Open-reel tape operating at the professional recording speed of 15 inches per second raises that to about 30,000 cps, while CD-4 four-channel records contain information up to 45,000 cps. With those limits, it's clearly impossible to cram two million bits of information onto conventional records or tape.

But color television utilizes a bandwidth of more than four million cycles per second, and even home video recorders like Sony's Betamax have little trouble coping with a mere two million. In fact, at the recent Japan Audio Fair in Tokyo, Sony showed how its Betamax deck could be used to record audio in true digital form. Since the two videodisc systems now under development for the U.S. market (RCA and Philips-MCA) both record pictures and sound digitally on records, their conversion to pure audio use would seem to be simplicity itself.

Why bother? After all, a bandwidth many times that encompassed by the human ear is vastly wasteful of tape or disc storage space, when compared to the conventional cassette tape or audio disc. One reason is that digital recording gives us full fidelity automatically as part of the process. An impulse is either there or it isn't. Since the amplitude and frequency of each pulse is essentially the same, it's a simple matter to fit them between the noise parameters of any storage medium. The pulse must be louder than background tape hiss or record surface noise, but not loud enough to saturate the recording medium and distort.

Farewell to Dolby?

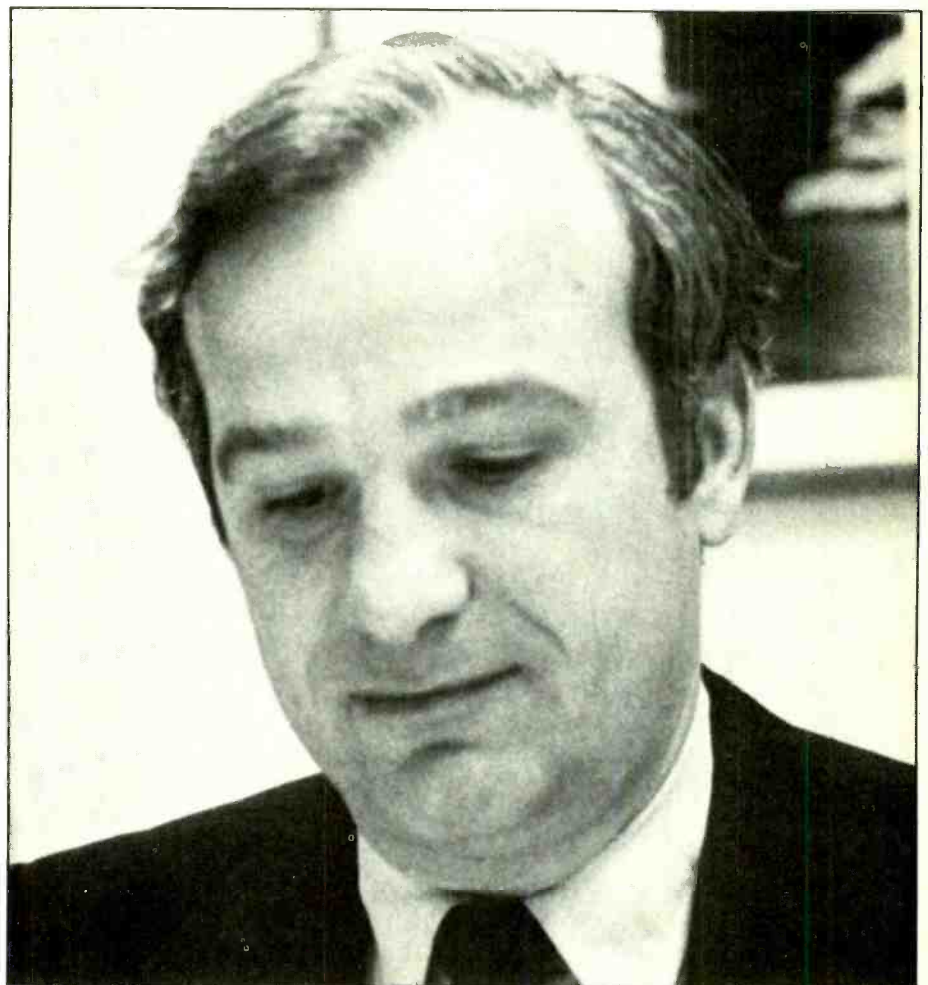
More to the point is what digital recording can do to reduce noise and offer virtually full dynamic range. In the case of "live" music, the dynamic

range may be as great as 80 to 85 dB. In the case of recorded or broadcast sound signals, it's much more likely to be 60 dB or so, (or about seventy-five per cent of that possible with digital recording), forcing recording engineers to compress the music so that it fits into that restricted dynamic range. It is, in fact, the restricted dynamic range and the residual noise which tells the listener that he's hearing canned music rather than "live" music. Since we're dealing only with the presence and absence of pulses, not with their shape or sound, the scanning device simply ignores residual background noise, which is still present in the tape or disc. Any noise introduced during storage is much lower than either of the pulse levels so that the reproducing system won't reproduce it. That means that instead of using a high-quality chromium dioxide tape, any ferric oxide coating will do—provided there are no dropouts which might eliminate a pulse that's supposed to be there. This results in not only full dynamic range in the recording, but in

the absence of any audible background noise as well.

And there's the rub. If digital recording supplants analog techniques, what need will there be for Dolby and dbx noise reduction systems, for JVC's Super ANRS and Toshiba's ADRES, systems which attack the dynamic range issue as well as noise reduction and are being groomed to run Dolby out of Japan for once and for all? What need for the precision tape oxide formulations so lovingly developed by Maxell and TDK, BASF and Philips, 3M and Memorex?

While there's some gain in fidelity, dynamic range and reduction of tape hiss when digital techniques are used to record the master tape, the major advantage of the process lies in keeping the information in digital form from the time sound enters the digital processor from the microphone until it's reproduced in the home. That, of course, requires not only a new recording medium, but a complete set of new playback equipment for the home. The translation of audio signals into digital



Dr. Stockholm: revitalizing the great Caruso

pulses and back again requires an incredible density of electronic parts. Microprocessors, the latest form of miniaturized component to appear from solid-state research laboratories, will play an important role during the transition period, which may be much closer at hand than most of the recording industry establishment realizes.

Future Choices

The public very shortly will be asked to choose among several systems for enjoying color pictures as well as sound from recordings. There are at least two disc systems with a third

waiting in the wings; and Panasonic and Toshiba-Sanyo both have tape systems designed to compete with Sony's Betamax, but not compatible with it. Smart money in the industry is betting that out of it all will come one disc and one tape system, each readily adaptable to digital audio recording.

The playback equipment, in fact, may become available long before there are digital recordings by name artists to play on it. If you're RCA or Columbia or Warner Brothers, with millions of dollars worth of conventional analog inventory, not to mention thousands of conventionally

recorded master tapes, you're not going to be in any hurry to start issuing recordings in digital form for home playback. You may adopt digital techniques to prepare master tapes in the future, but since the results aren't readily apparent in the conventional finished product, there really isn't much incentive. Since the millions of turntables and tape decks abroad in the land are crying for new analog recordings, not digital ones, there isn't even any commercial incentive—and even if video players are adapted to digital audio use, it'll be years before there are enough of them in people's hands to make digital recordings commercially practicable.

Stockham and Caruso

Not that the major record companies are altogether unaware of digital's potential. At RCA, for example, a digitally-processed recording released initially as a curiosity has become a sleeper best-seller. Instead of using digital technology to come up with a sonic blockbuster by John Denver or the Philadelphia Orchestra, the company turned instead to its vault full of acoustic recordings by Enrico Caruso. Thomas Stockham Jr., a professor of Computer Science and Electrical Engineering at the University of Utah, using a computer and digital recording techniques, had found a way of restoring a good deal of presence and dynamic range to Caruso's acoustic recordings.

As Dr. Stockham describes the process, "during the restoration process, the computer must determine the particular resonant and reverberant coloration effects for the recording at hand. This task is made additionally difficult because the computer must also be able to distinguish between the resonances and reverberation of the recording horn and those that represent and characterize Caruso's voice itself. The required discrimination is made possible by the fact that while the reverberations and resonances of the recording horn remain fixed throughout the entire performance, those of the voice are constantly changing as the singing progresses. By means of an averaging process the characteristics of the recording horn are isolated from those of the voice with remarkable accuracy. All of this is accomplished by comparing the sound volume of over 1000 different musical tones in the original recording with those contained in a similar

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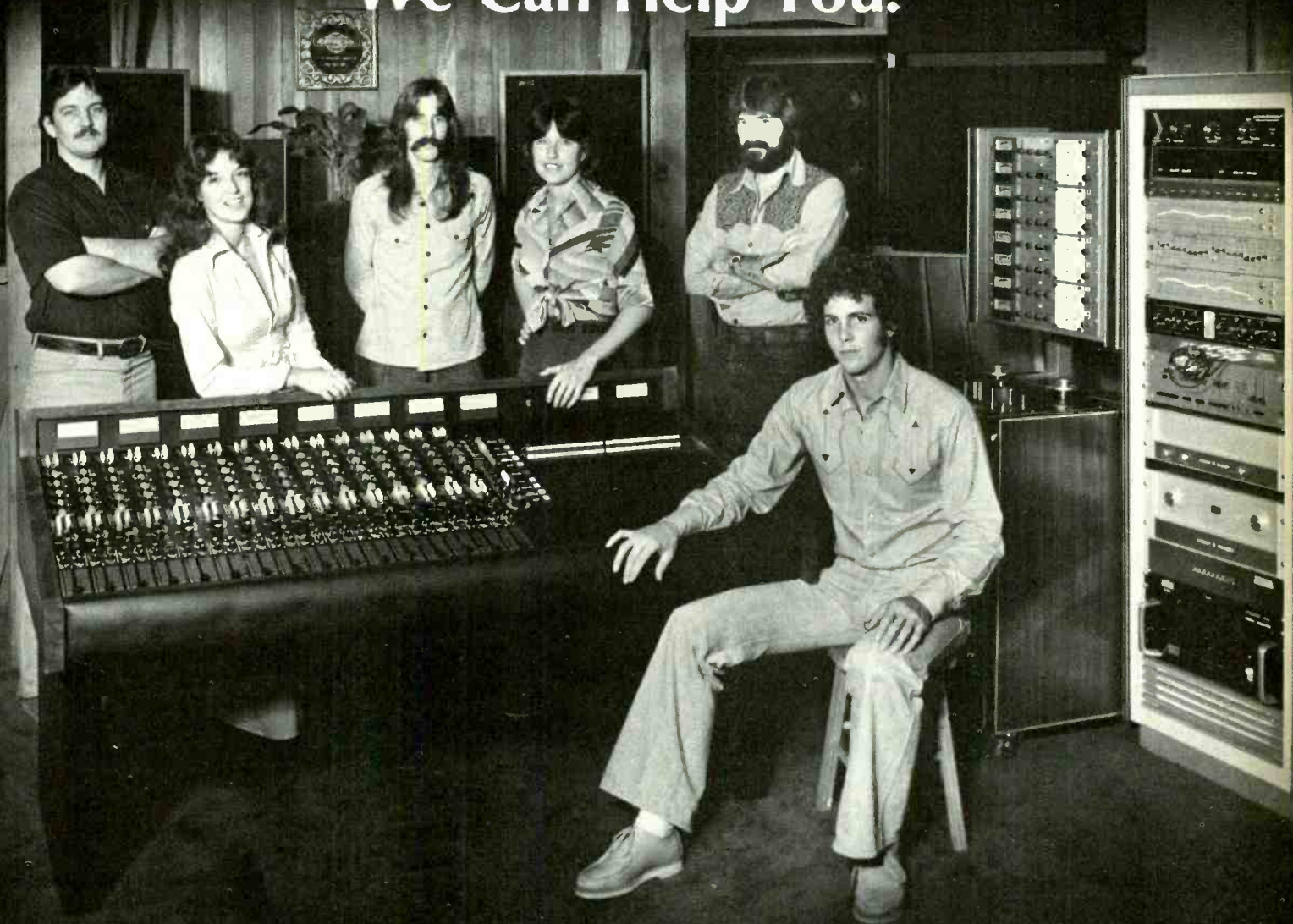
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CIRCLE 64 ON READER SERVICE CARD



Audio Pulse's time-delay unit

system which would utilize something like a 3" x 5" file card, magnetically coated, to replace the conventional record. Cards could be inserted into a digital playback unit which would connect to a high fidelity component system. Lest Dr. Stockham be written off as merely a starry-eyed dreamer, it should be noted that two of his backers are Dr. Amar Bose, the MIT professor who heads the Bose Corporation, and Malcolm Low, one of the founders of KLH. The same digital process used to restore the Carusos has also been used to remove blur caused by motion of the subjects and the camera in photographs taken during the assassination of John F. Kennedy. The results appeared in the December 1976 issue of *Esquire*.

modern recording. Once the comparison has been made the computer alters the volume of the musical tones in the original to match those in the modern recording."

Dr. Stockham processed the first four Caruso recordings simply to demonstrate what could be done with the process, for a paper he presented before the Audio Engineering Society. The results were so impressive that RCA considered the idea of a Caruso

album as a novelty release. The reviews and, more importantly, the sales figures were so impressive that RCA reportedly is considering other digital restorations of its archive material.

While the restorations constitute an impressive tour de force, they're not what Dr. Stockham is spending most of his time on these days. As president of Soundstream, Inc., he proposes a digital home recording and playback

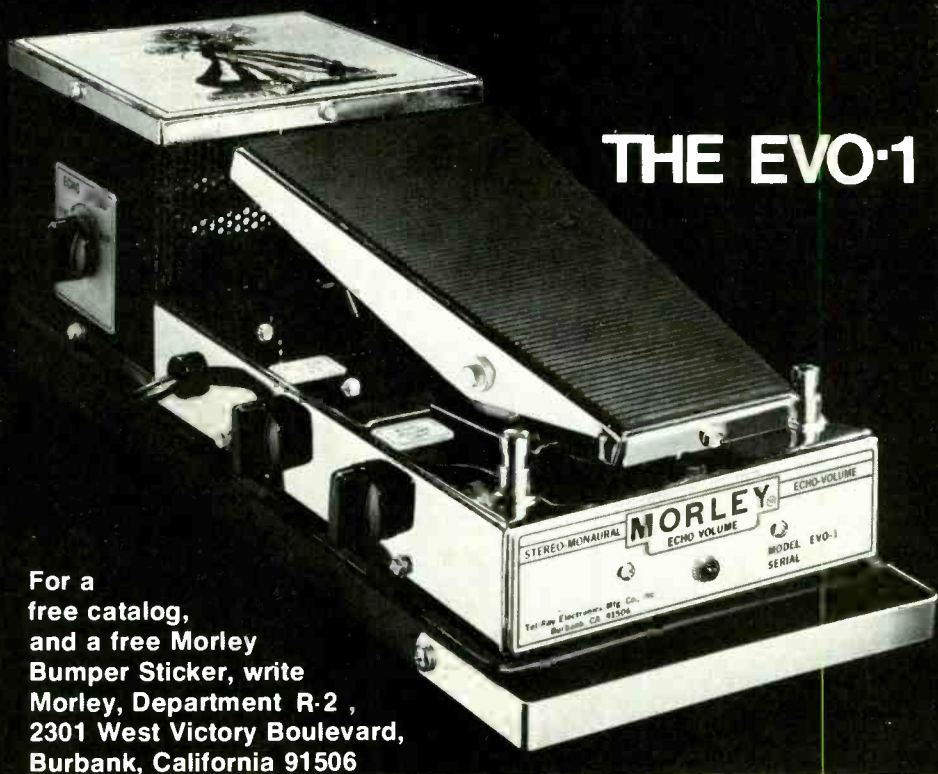
Availability

The recording industry in the United States may be in no great hurry to embrace digital recording, but in Japan the first manifestation appears to be a technique called PCM (Pulse Code Modulation) recording. PCM involves the use of digital techniques to encode part of the audio signal on the outside edges of standard recording tape,

The Morley EVO-1 Echo can add a new dimension to your sound. Free flowing Echo. Notes cascading and falling through time and space without beginning or end. On a background of velvet black silence. The sounds of multiple guitars where only one is playing. Echo without tape makes it all possible. And only Morley has it. The unique memory system in the EVO-1 holds every note unaltered from the deepest bass to all the highest highs of a piano. Vocals sing in unison and harmony without the least trace of distortion. When you consider the EVO-1 is priced less than any other "pro" echo available, doesn't it make sense to find out if the EVO-1 is right for you before you buy an Echo?

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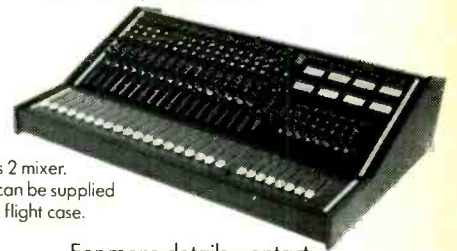
And even without modifications, the Series 2 is a highly versatile mixer with impeccable specifications. (Each model is made individually and by hand to make sure that the specifications stay that way.)

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along with conventional analog information in the middle. Since the tape equipment can read the digital information above the audio spectrum, it

recorders, which helps to explain Sony's PCM adapter for its Betamax deck. The video recorder sells in Japan for approximately \$1,200, and the

ket—although close investigation reveals them to be conventional analog recordings, which have been cut from PCM-processed tapes.

Already, digital audio equipment is beginning to appear on the U.S. audiophile and professional market, including Audio Pulse's time delay unit and Eventide Clock Work's "Harmonizer." Both of these units work on conventional audio signals—the Audio Pulse using analog-digital and digital-analog converters to help recreate the ambience of the concert hall, Eventide's black box to speed up or slow down signals before converting them back into analog information. Eventide's device allows you to change the pitch of music by as much as an octave either way. When you couple that with a speed-controllable tape deck, it's possible to compress speech so that an hour-long Inaugural Address can be telescoped into forty minutes or less without loss of intelligibility.

Digital recording obviously is an idea whose time has come, whether the recording industry is ready for it or not. Just what forms it will take and how it will develop during the next few years will be interesting to watch. 



Eventide's Harmonizer

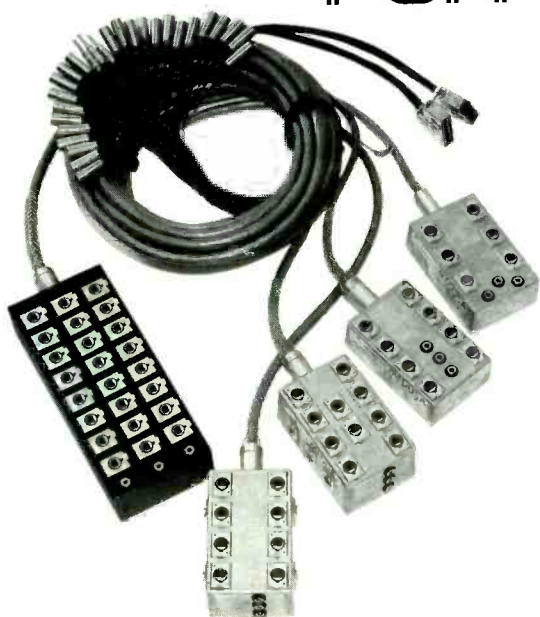
can reproduce these signals with virtually no background noise. The main reason for including analog information at all, according to representatives of Denon and Mitsubishi, the companies which introduced the idea at last year's Japan Audio Fair, is that given current technology, the tape would have to travel almost one foot per second if all of the information were digital. Record and playback heads are similar to those on video

PCM adapter was said to be comparable in price.

The main difference between Sony's PCM converter and the units demonstrated by Mitsubishi and Denon, however, is that the former is intended for the home, while the latter was developed for recording studio use.

Barely in its infancy, PCM apparently is catching the imagination of Japanese audiophiles. Already there are several PCM records on the mar-

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As you compare the MX-5050 with other recorders, keep this in mind. The MX-5050 is not a hi-fi machine with a few professional features added later as an afterthought. It was designed from the ground up based on Otari's 10 year experience as Japan's leading manufacturer of professional recorders and high speed duplicators. It is a full professional machine with the performance, features, and field proven reliability that you expect to find only in the larger professional recorders.

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Performance Features: Headroom is 19 dBm, a full 15 dBm over the switch selectable fixed output of +4 dBm. This standard reference level output can be rear panel switched to -10 dBm to drive a PA system or power amplifier. S/N ratio is NAB weighted 69 dB full track, 68 dB half track, and 65 dB quarter track. Crosstalk is greater than 60 dB half track. Outputs are 600 ohm balanced (standard on half track) or unbalanced. Line input and output connectors are XLR.



Operating Features: Bias is front-panel continuously adjustable (not limited to fixed positions). With built-in test oscillator (not available on other compact professional recorders) bias can be optimized in seconds when changing tape. Record EQ and standard reference level are also front adjustable. Straight-line tape path simplifies threading. Capstan is located on back side of tape for improved tape life. An extra reproduce head is standard on all versions to allow playback of tapes in different formats. For pitch control and freedom from power line variations, an optional dc capstan servo is available with ±10% correction range.



Easy threading; capstan on back side.

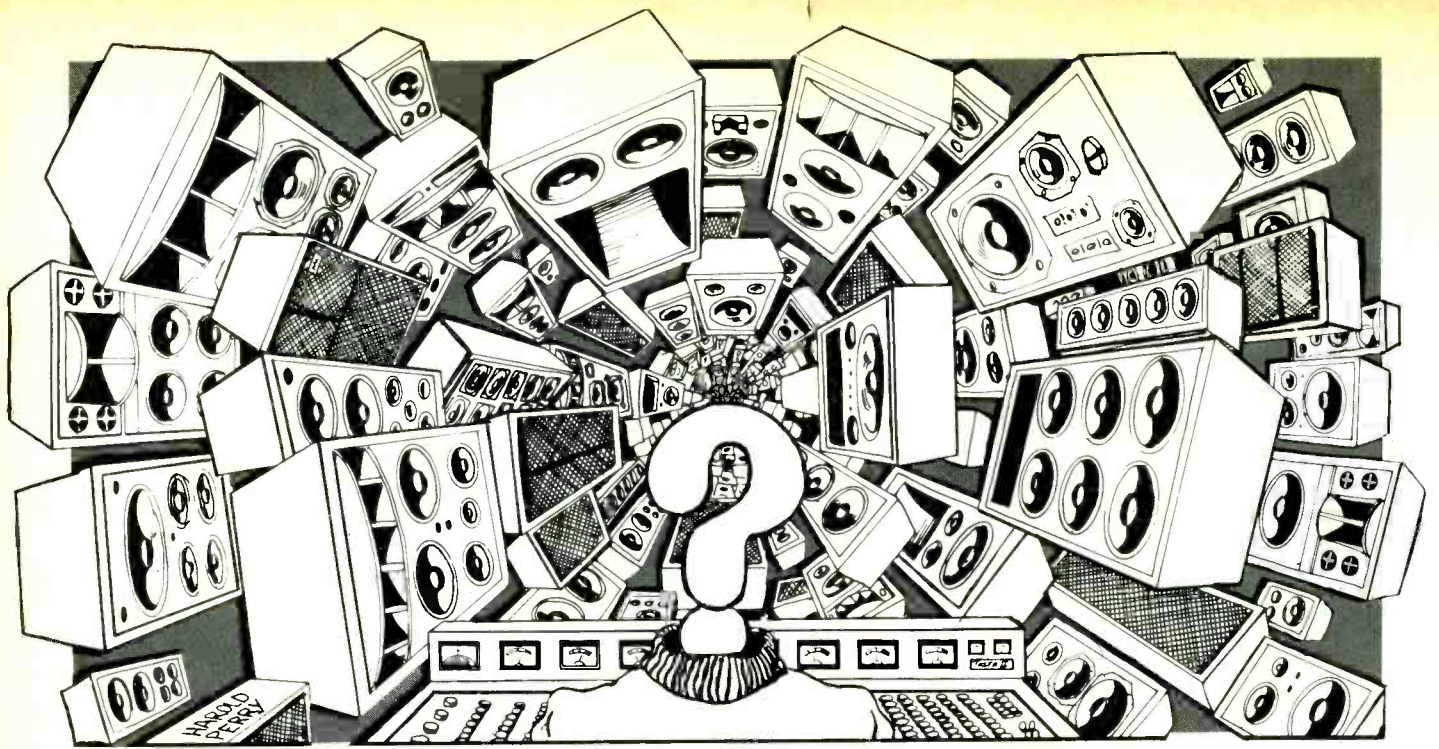
Versatility: Available in full-track (with half-track reproduce capability standard), two-track, and quarter-track versions. Walnut case (standard), rugged portable road case, rack mounting adaptor, or floor console. Universal power supply standard. Low impedance input and output transformers and remote control also optional accessories.

See your nearest Otari dealer for the full story or contact Otari. And, if it's multichannel you need, ask about the standard-setting four and eight channel versions of the MX-5050.

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MONITORS FOR THE RECORDIST

By Rob Lewis

Not so many years ago, you could have counted on the fingers of one hand the speaker manufacturers who ever used the term “monitor” in talking about any of their products. In those days, studio monitor speakers came in large, unwieldy gray boxes and were sold exclusively to audio engineers involved in the making of records and films. Compact size and cosmetic appeal were of minimal importance; the engineers simply needed a familiar, reliable tool to help them turn out a consistent product.

Then, half a dozen years ago, when large numbers of stereo hobbyists and amateur musicians started getting interested in the processes and equipment used to produce commercial recordings, somebody at JBL had the inspiration to package the company’s smallest studio monitor in a pretty box and sell it to home users. The ads that went with this bold marketing move stressed that if you wanted to hear the same sound the producer heard in the studio, you’d better use the same speakers. Which, after all, isn’t bad logic—at least on the face of it.

With the success of the JBL L-100, “monitor” quickly became a magic

word that could sell speakers of almost any size or description. Merely calling a new model the XYZ “Monitor” seemed somehow to lend it instant prestige and respectability. In their rush to buy this new crop of professional and quasi-professional speakers, few consumers thought to ask how these monitors differed from last year’s *non-monitor* models. Often, the new models didn’t differ at all.

Like all such marketing ploys, the monitor craze has a predictable ending, known in business as “saturation” and in folklore as “killing the goose that laid the golden egg.” The monitor mystique has been mined so thoroughly by now, with monitors tall and short, efficient and inefficient, unidirectional and omnidirectional flooding the market, that the thoughtful audio hobbyist might well ask, “If these vastly different speakers are all monitors, just what do they have in common that makes them live up to the name?”

So What’s a Monitor?

In the early years of audio, this question wouldn’t have even come up. Then, the operative meaning of

“monitor” was its most literal one: something used to keep watch. Thus, a monitor speaker was a speaker—*any* speaker—used to listen to a recording as it went onto wax, or a radio broadcast as it went out over the air. The rest of the signal chain had such limited fidelity that the question of speaker accuracy was almost moot; radio texts from the 1930’s talk about a high quality speaker as being one with smooth response from 200 to 5,000 Hz! Indeed, in those days the main impetus for improving speaker quality came from the booming film industry, with its need to fill ever larger movie palaces with decent sound using vacuum tube amplifiers of relatively puny power output in comparison to today’s standards.

To help their sound men mix and equalize the film sound tracks for optimum results in the theater, the Hollywood studios built “dubbing rooms”—actually scaled-down theaters designed to approximate the acoustic properties of a typical movie house. Naturally, this included using the same speakers, so the giant Western Electric (and later, Altec) horns were installed, becoming in ef-

fect the first relatively high quality "studio monitors."

Soon record engineers, desiring the wide response and high efficiency of the theater systems but not finding space for them in their studio control rooms, began adapting the designs to their own needs. Using the same driver components (almost without exception, 15-inch woofers and horn/driver high frequency units) they built smaller bass reflex enclosures that could be hung on the walls of their studios. With this step, the configuration to be used in virtually all monitors until recent times was established, and even today the majority of studio monitors continue to use this design. It remains popular today for essentially the same reasons it was popular in the 1940's and 50's: design simplicity, relatively high efficiency and output capability, and adequate performance (though the weight of tradition probably cannot be discounted as a further reason).

Of course, during their long history the demands on these "classic" systems have steadily increased, as improvements in microphones, studio electronics, tape technology, disc cutting and manufacturing, and home playback equipment have all sharpened the engineer's need to know precisely what he has captured on tape. A long series of evolutionary improvements has helped these most basic of monitors keep pace with advancing technology so that today they hold their own in many respects with far more complex designs.

With this bit of background out of the way, we come back to our original question, which we will rephrase as, "What are the defining characteristics of a monitor speaker that distinguish it from a 'non-monitor' speaker?" And, too, we may ask, "What do the differences mean to the recordist?"

The Criteria

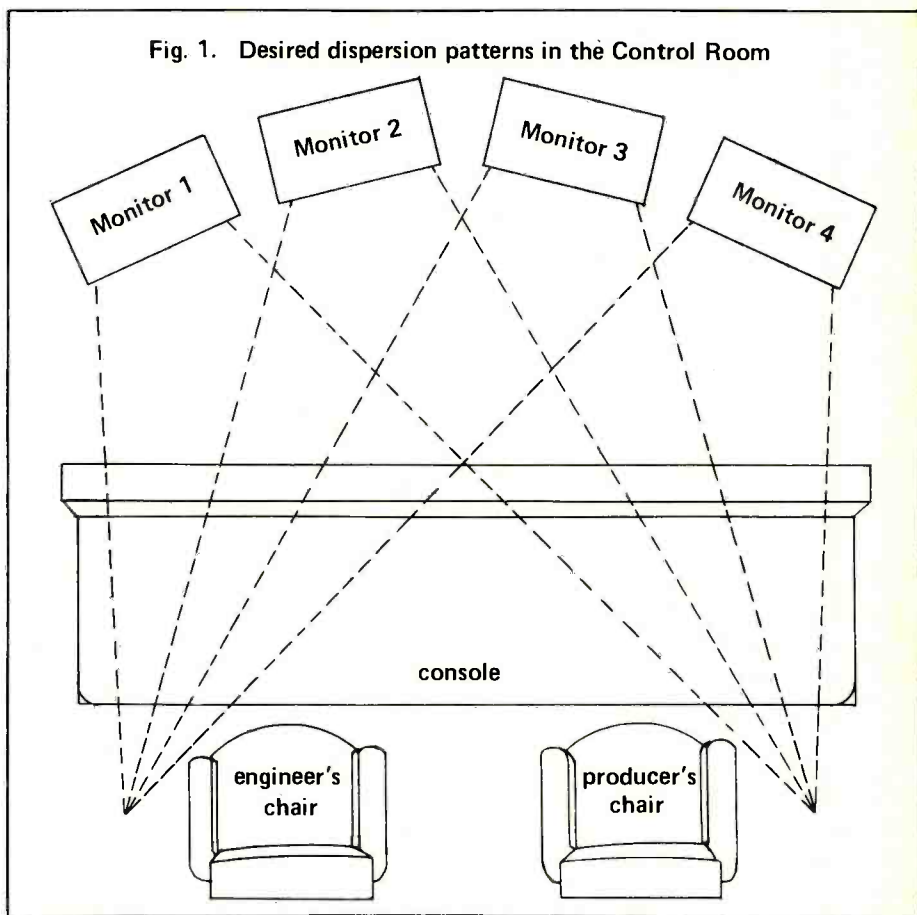
In attempting to answer these questions, we can focus on two kinds of criteria: performance (i.e., the measurable electroacoustic properties of the speaker) and "miscellaneous" (size, driver configuration, etc.). Let's first look at some of the performance parameters.

Frequency Response. If it comes as a shock to some that many popular monitors aren't especially flat in frequency response, it may be even more of a shock to learn that these deviations from the ideal "ruler-flat" re-

sponse are at least partly intentional—designed in by the manufacturer! As an example, one well-known builder of monitors has a reputation for always giving their systems an accentuated upper mid-range. They do not, in fact, deny this; one of their chief speaker engineers explains it by saying, "our speakers aren't designed to be kind to bad program material." He is, of course, right, since peaking response in the range where the ear is most sensitive and the pain threshold is lowest will accentuate any harshness in the program to the point of causing fatigue or even discomfort after a short time. This same manufacturer has traditionally tuned their bass-reflex enclosures for a slight rise in response around 50 Hz. When they recently introduced a new model designed for critically damped, max-

above 12 or 13 kHz may be falling off fast, and on the bottom end, few models have a cut off point lower than 40 or 45 Hz. It can be argued that these aren't serious shortcomings: at the top end, musical information above 12 or 13 kHz consists virtually entirely of random "noise" like cymbals or wind noise, or very high overtones of lower frequency notes—not the sort of stuff that normally has a great influence on creative decisions. Similarly, on the low end of the spectrum, it is an unfortunate fact that exceedingly few stereos could reproduce an honest 30 Hz note if it were present in the final recording. It very often isn't, having been filtered out during record mastering to get more playing time on the disc or to make the mastering engineer's job easier. Thus, trading those last few Hertz on the bottom end

Fig. 1. Desired dispersion patterns in the Control Room



imally flat bass, users complained so much about the "missing bottom end" that the design had to be changed to make it more like the older, non-flat designs!

Many popular monitors aren't among the widest bandwidth speakers to be found, either. Particularly in the case of two-way design, response

for a considerable gain in speaker efficiency seems to many to be a fair bargain.

Of course, if extremely flat response is desired, there remains the expedient of 1/3-octave equalization, which can take most of the peaks and dips out of just about any speaker.

Efficiency. Monitor speakers have

traditionally been high in efficiency. At first, this was a necessity, to allow playback at realistic sound levels with the 20 and 30 watt amplifiers that were the norm. With the advent of high power amplifiers, most engineers seem to have used the extra output capability simply to monitor louder and preserve more "headroom," so the requirement for efficiency hasn't been relaxed much. However, as watts have become cheaper and space in the control room tighter, there has been a trend toward smaller (and therefore less efficient) monitors. Even these are considerably more efficient than the typical acoustic suspension home loudspeaker, though.

Dispersion. Unlike the situation in the home stereo market, where the battle between front-radiating and omnidirectional speakers rages unchecked, the dispersion requirements of studio speakers are quite well defined. Very simply stated, one would like a monitor's dispersion to be just wide enough to let one or two persons seated behind the console hear an accurate reproduction of the program, and no wider. To see why, consider the layout in a typical control room (Fig. 1). The monitors, whether there are two, four or more, will almost always be found directly above and in front of the console, aimed down on an axis intersecting the engineer's ear level. With this setup, it takes only a narrow beam of sound to cover the desired area, and any extra dispersion can only cause problems by bouncing sound off the walls, ceiling, and objects in the room to blur the sharpness of the sound image and possibly interact with the direct sound from the speaker, creating peaks and dips in response.

Of course, *all* speakers are omnidirectional at low frequencies, a fact that is handled in the control room by constructing bass "traps" in the walls or ceiling to absorb unwanted reflections, but the important fact is that the diffuse, spacious (some would say vague) sound touted by omnidirectional fans would be disastrous in a studio, where pinpoint sound localization and razor-edge definition are of supreme importance. Thus, it can only be called amusing when a hi-fi manufacturer puts an omnidirectional tweeter in one of their "monitors!"

Clearly, then, a monitor's dispersion must be controlled. It must not, however, be *too* narrow; otherwise two persons seated side by side at the console

may hear two very different versions of the program.

Output Capability. Clearly, the trend in monitoring (especially during mixdown sessions) is LOUD, at least for pop music. Naturally, different people have different preferences, but it isn't uncommon to find 110 dB levels

an important factor in monitor performance. Perhaps someday it will be.

Turning now to the "miscellaneous" criteria mentioned earlier, we should first note that some of these factors do affect the performance of the system; however, their effects can often be "juggled" by the designer in such a way that two very different systems may have similar performance when measured.

Size and Shape. As was pointed out earlier, there has been a downward trend in the physical size of monitors, motivated by the need to put more of them in the limited space of the control room, and made possible by the development of more powerful amplifiers and more rugged speaker mechanisms, which make up for the efficiency lost in going to a smaller enclosure.

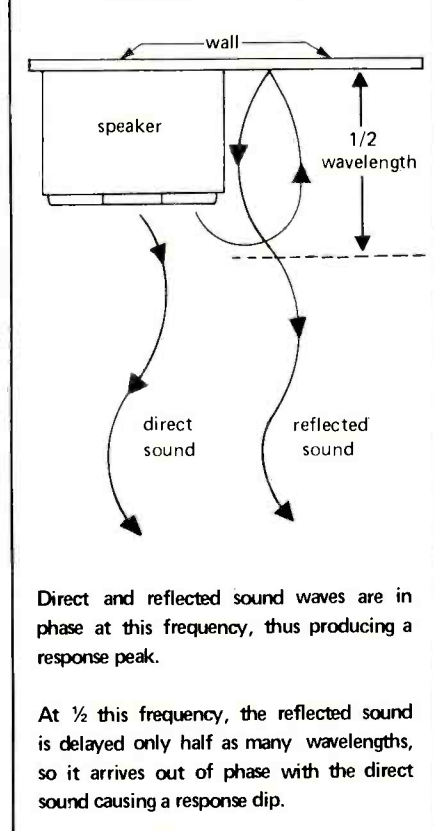
There have been decidedly few innovations in the area of shape, with the rectangular box still the norm. There is, however, a noticeable trend toward building monitors into the control room wall so the baffle board is flush with the wall surface. This provides smoother lower-midrange response, which can be explained by referring to Fig. 2.

At low and mid frequencies, sound waves emanating from the speaker diffract around the edges of the cabinet and propagate backward toward the wall. At the wall, they are reflected forward again, and a short time later meet the direct sound waves from the driver. If the wavelength of the sound is such that the reflections arrive *in phase* with the direct sound, response is reinforced, while if they arrive *out of phase*, a partial cancellation occurs. Since wavelength varies inversely with frequency, it can be seen that some frequencies will be reinforced and others attenuated, causing peaks and dips in response. Building a speaker in flush with the wall eliminates this problem.

Driver Configuration. The two-way, 15-inch woofer/horn high frequency configuration has already been described in some detail, and it remains one of the most popular to this day. Most systems of this type are bass-reflex, but in the last few years a number of less efficient designs in smaller, sealed enclosures have been introduced (again, the size vs. efficiency tradeoff).

These two-way systems tend to suffer from two problems, which a number of more recent designs have attempted to correct. One is a lack of extreme high-frequency response

Fig. 2 Response errors caused by interaction between speaker and wall.



in the control room. High levels are good for making sure that nothing on the tape goes by unnoticed, but can quickly lead to ear fatigue unless the reproduction is very clean. This need for high output capability is another point in favor of efficient speakers, since the power required to get 110 dB from an inefficient speaker can easily overheat and even destroy the voice coils. This is a major reason why exotic speakers such as electrostatics have never become popular as monitors—they simply cannot attain the levels that a moving coil dynamic transducer can attain.

Phase Response. Despite all the attention being paid to loudspeaker phase response in the hi-fi industry, and some experiments indicating that phase *can* be heard (contrary to older theories), it hasn't yet been considered



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and/or dispersion, a problem which is easily solved by the addition of a small ultra-high frequency driver and a modified crossover network. The second problem is midrange intermodulation distortion at high sound levels, especially when there is heavy bass in the program. The difficulty arises when a woofer undergoing large low-frequency excursions attempts to reproduce midrange at the same time. If the bass excursions are driving the woofer cone outside of its relatively small region of linear travel, then the midrange information will be "modulated" by the lows, producing both IM and FM (or "Doppler") distortion.

This problem is dealt with by adding a separate driver to handle the upper bass/lower midrange frequencies (say, 300 to 1200 Hz). This driver is usually a small cone unit designed for low distortion and smooth reproduction within its relatively narrow operating frequency range. With this arrangement, the entire system can play somewhat louder without objectionable distortion.

So, in addition to the classic two-way systems, there are now a number of three and four-way systems on the market. Even these have their disadvantages, though. Besides their higher cost, they cannot achieve the ideal "point source" sound localization simply because all four drivers cannot be mounted in the same spot. Indeed, one of the most popular monitors of all time, the Altec 604, is a coaxial design which achieves this point source effect better than any system using separately mounted drivers.

Crossovers. Crossover networks in monitor systems share many features with those in home speakers. Usually, separate level controls for all individual drivers except the woofer are provided, and are usually calibrated so a particular setting can be recorded and repeated at a later date.

Often, the crossover controls are placed on the system's front baffle board, eliminating fumbling behind the speaker to make adjustments.

Using a Monitor

If nothing else, the preceding discussions should have convinced you that the subject of monitors is far from cut and dried, and there is a good deal of room for personal taste and judgment in selecting one. But no matter which you end up choosing, there are some guidelines you should follow to make

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First and most important, *get to know your speakers*. You can do a lot with even a highly imperfect speaker, if you know its imperfections intimately. With enough practice, you can even reach a point where you "automatically" correct your hearing for the effects of the speaker.

Just as with fine wines, the best way to sharpen your perceptions of the "personalities" of different speakers is through direct comparison. Whenever you get a chance, you should "A-B" your speakers with other, known models and carefully note the differences. Does, for example, one speaker sound "warmer" than the other? Does one have more "sizzle" on the extreme top end? Does a kick-drum sound "thuddy" on one and "tight" on the other? Can you detect any mid-range coloration? Does one begin to sound strained at high volume levels that the other handles comfortably?

As you have a chance to critically compare your speakers with more and different systems, you will begin to develop a picture of the unique sonic characteristics of yours—a picture

that you should keep firmly in mind when monitoring or mixing your own music.

A factor that can't be overlooked when evaluating speakers and recordings is the room acoustics, for the "right" room can make a deficient speaker sound good, just as the "wrong" room can make even the best speaker sound absolutely horrible.

For monitoring purposes, the ideal room should be fairly dead acoustically, so that reflections don't interfere with the direct sound from the speakers. However, if it's *too* dead, the sound will be unnatural and you'll probably end up adding too much artificial echo to the mix in an attempt to liven up the sound.

Be especially wary of standing waves in the room (caused by parallel reflecting surfaces), since a bad case of them can turn the cleanest bottom end into a boomy, muddy blur. If you have this problem (which can be pinpointed by slowly sweeping your system, one speaker at a time, with a sine-wave oscillator between 30 and about 200 Hz), you can experiment with different speaker locations, or build sound-absorbing baffles and traps as

described in earlier issues of MR.

Once you've gotten the room/speaker situation as good as possible, note exactly how things are set up, and keep them this way for all critical work. Remember that moving furniture around, opening or closing drapes and doors or moving a speaker even a few inches, all have an effect on what you will hear.

Lastly, don't overlook equalization as a remedy for particular problems with your system. While the hi-fi type octave equalizers aren't usually selective enough to fix serious room resonances, they can be quite effective on other types of response errors. Of course, if you can afford it, half or third octave equalization is the best, but it takes a rather expensive real-time analyzer to take full advantage of the tuning capabilities of a narrow-band equalizer.

This is about where the monitor speaker situation stands for both the home and professional recordist. To condense it all down to one statement: no monitor is perfect, so buy the best one you can afford and learn to live with its imperfections.

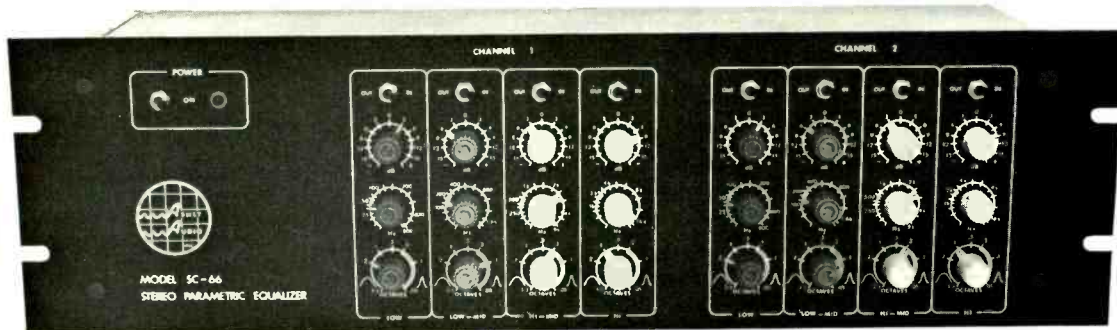
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A Session With The Boston

Conductor F

In the past, there has been minimal opportunity for orchestras like the Boston Pops and the New York Philharmonic to play to very large audiences. Normally these orchestras play for 1,500-2000 people in metropolitan halls specifically designed to enhance and reinforce the sounds emanating from the stage. Recently, however, more and more of the new sports coliseums springing up all over the country are becoming aware of the need to replace or restructure their existing sound systems in order to attract Philharmonic orchestras—and thereby bring their music to the many people living outside the major metropolitan areas.

The Nassau Veterans Memorial Coliseum in Hempstead, New York was one of the first to recognize the suburban demand for Philharmonic orchestras, but their first attempts at satisfying the demand produced less than desirable results. Therefore, Gregg Raffa, Sr., the Director of Sound satisfying the demand produced less than desirable results. Therefore, Gregg Raffa, Sr., the Director of Sound and Lighting for the Coliseum, began thinking about a restructuring of the sound system. He was the primemover in getting the Coliseum to install an Automated Processes 24-track recording console modified for sound reinforcement, a 3M M79 two-track recorder, Sony cassette and eight-track decks and a Thorens turntable with Automated Processes pre-amps. With this system the Coliseum would not only be able to do their normal sports events, but also the sound reinforcement for orchestras and pop groups. There would also be the additional ability to bring in a 16-track or 24-track recorder for "live" tracking.

The system was delivered and proof tested by API at the Coliseum. It passed its first performance—the New York Philharmonic, conducted by

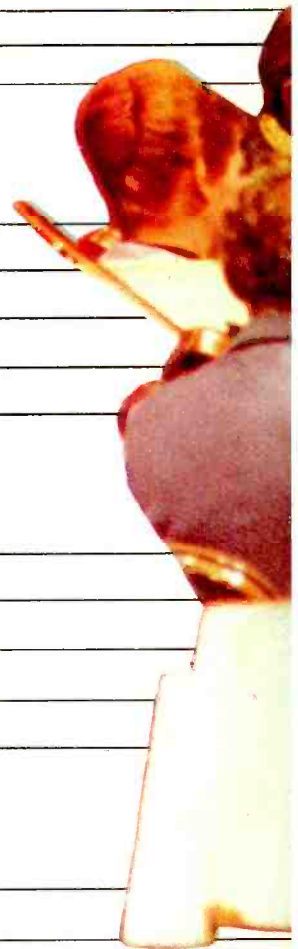
Leonard Bernstein—with flying colors. At that performance Gregg Raffa asked if I might be available, as a mixer, for any future sound reinforcement dates. Since I had spent many years as a mixer for a New York studio, I jumped at the chance to get my hands back at the controls. My chance came at a concert given by the Boston Pops orchestra conducted by the Maestro Arthur Fiedler.

Different Techniques

I was very aware that sound reinforcement was vastly different from studio recording. For one thing, I had never mixed anything for more than three or four people at a time. At this concert the Nassau Coliseum was sold out. There also was time, in a studio mix situation, to try different approaches, do re-takes and edit the final mix. For sound reinforcement it is *one take in real time—and watch out for feedback!*

Studio microphone technique also would be different. I would not be able to "tight" mic every instrument and I also would not be looking for the best possible separation between instruments. On the contrary, Philharmonic orchestras desire *less* than full separation to help create the total sound with the natural ambience of the surrounding environment. Finally, the audiences drawn by these orchestras are critical listeners. They come to these concerts to hear every nuance, tonal inflection and natural balance set by the conductor for the various orchestra sections. Totally foreign to this experience would be electronic hums and buzzes and emphasis where it should not be. Therefore, my major objective was simply to reinforce the natural sound coming from the stage while making that objective as unobtrusive as possible.

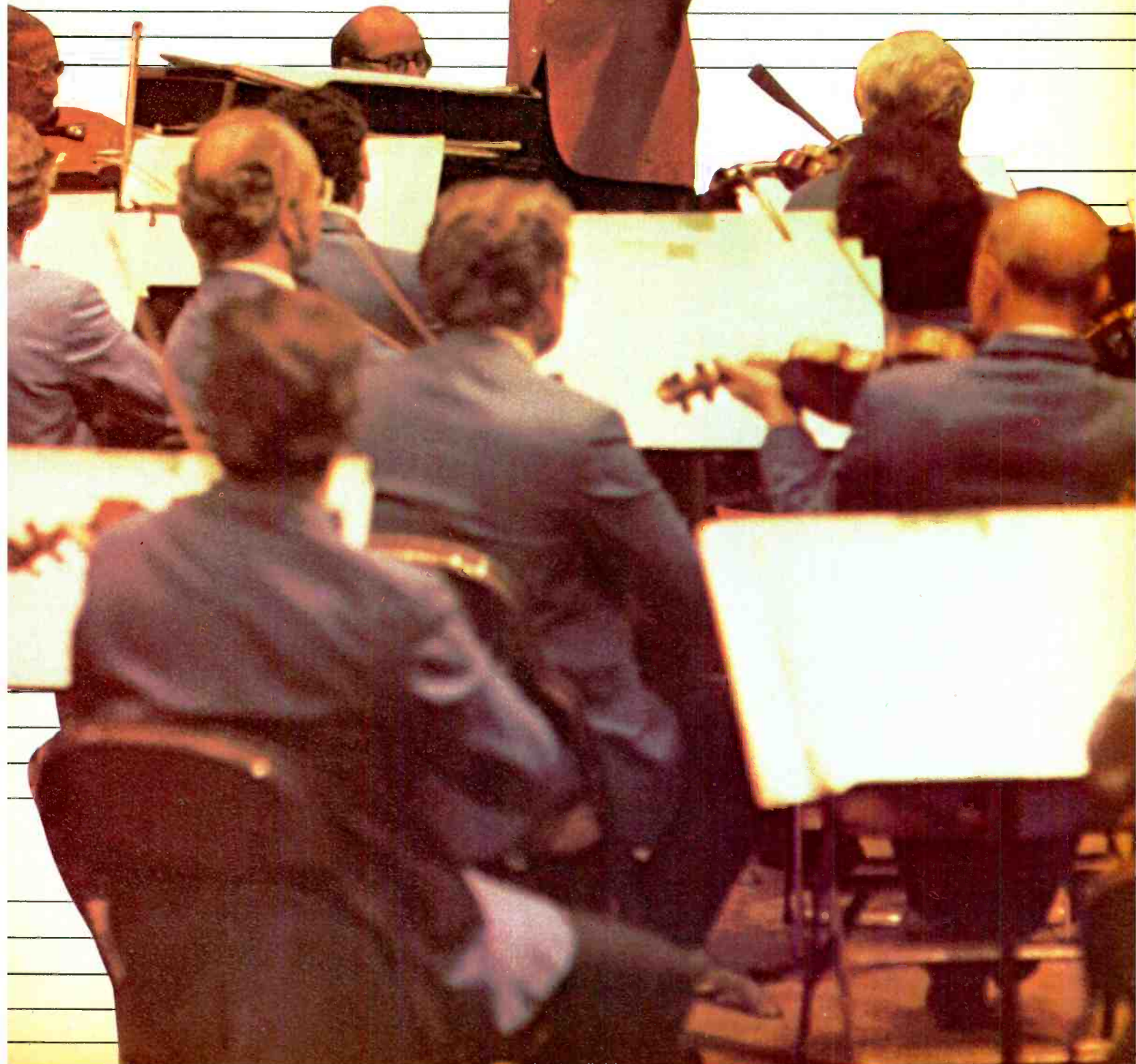
A couple of days before the concert I was notified that there would be no



on Pops

Arthur Fiedler

By Michael Consi



rehearsal. This created a slightly tense situation because I was not really familiar with the entire program and there would be no time available to me to hear those "natural balances" which I was planning to reinforce. Fortunately, Gregg Raffa, a former orchestra musician, assured me that he was totally familiar with the program material for the Boston Pops orchestra and would A&R the entire concert.

Layout and Placement

On the evening of the concert the Coliseum was the hub of activity a couple of hours prior to the first down beat. For those of you not familiar with the Nassau Coliseum, it has a large elliptical shaped floor area ringed by approximately 14,000 seats in several tiers. The stage is set up with band

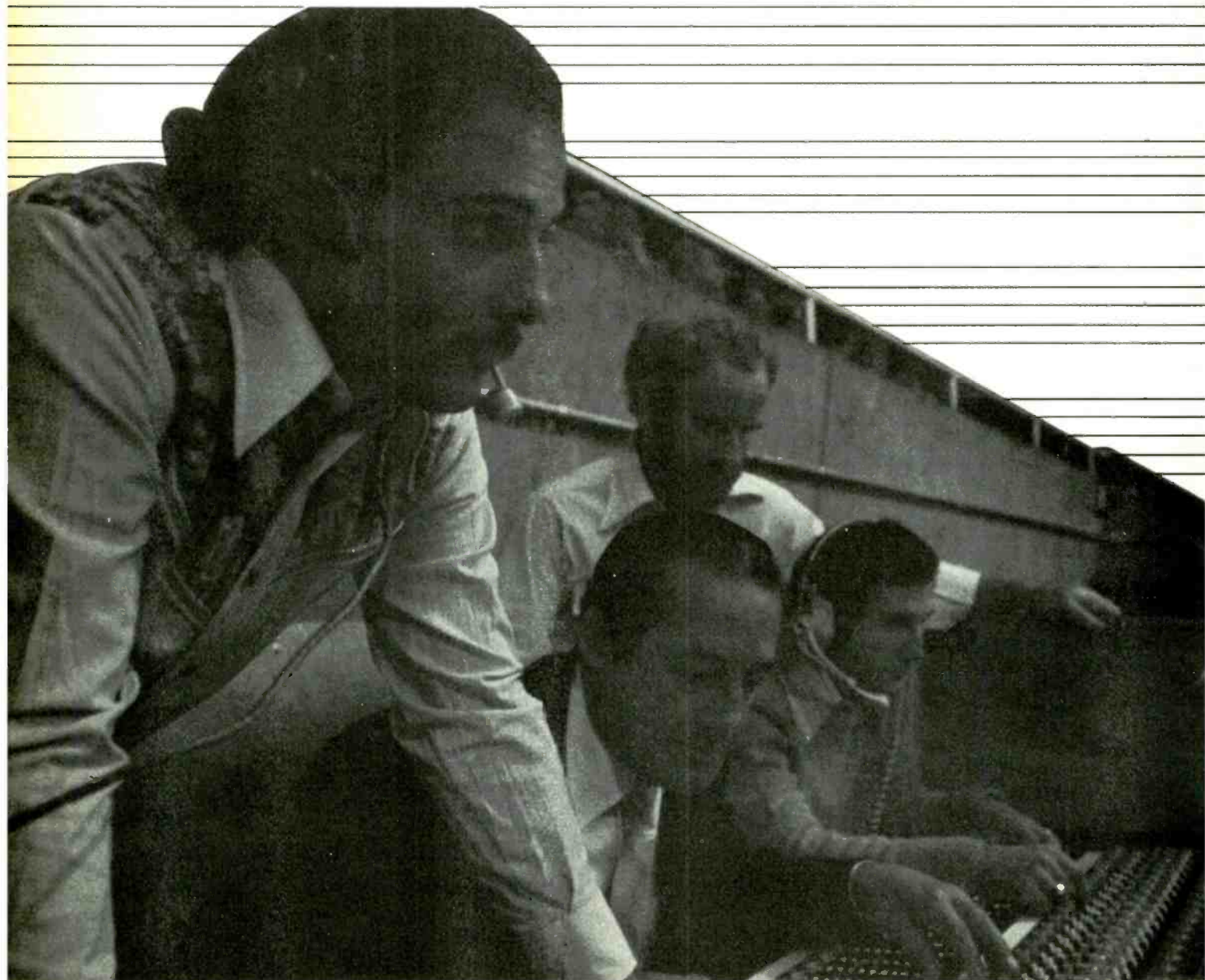
shells and is located at the northern passageway. Above and about twenty feet in front of the stage is the speaker cluster that is used for this type of performance. The coliseum also has a center speaker cluster above the four sided scoreboard. This cluster is raised high enough so as not to be in the radiation pattern of the active speaker cluster. The console is adjacent to the southern passageway, about one hundred feet from the stage, on a rugged platform behind the first tier of seats.

Folding chairs are placed in neat rows starting from the stage area and ending before the first tier where the console is located. Behind the band shells at the rear of the stage is a green velour curtain. The estimated crowd for the evenings performance was

about 12,000 people.

The stage was already set up when I arrived. The first order of business was mic placement and selection. The catwalks of the Coliseum super structure are an ideal place from which to drop hanging microphones. With the aide of the staff electricians we positioned four hanging microphones. One Electro-Voice RE20 was centered above the first violins at a distance of other RE20's were placed above the violas and second strings. For the cello

I chose a hanging AKG D224E. The rest of the eleven mic setup were all floor-boom mounted. I placed mics on all solo instruments—first violin and English horn. The remaining woodwinds and contrabasses also were miked. To capture the sound of the



(Left to right) Stage manager John Lala, Gregg Raffa, electrical foreman Kevin Costello and Mike Consi check mic levels and console settings.

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celeste and harp I used an RE15. The electric guitar and electric bass would only be used in the "Stephen Foster Medley." I therefore miked both of those instruments with RE15's and directed them (angled them) toward the percussion and trumpet sections respectively. I felt that these mics would capture enough of the percussion and trumpet sound, both direct and reflected (off the arched top of the band shells), thereby saving two mics in the setup.

By this time all the folding floor chairs were in place and I started mentally counting, multiplying and finally estimating their number as I made by way back to the southern passageway. The console was already fired up when I reached it. This API console is a modified Model 2488. It contains 24 inputs with Model 550A equalizers, Model 528 input modules and illuminated Model 440 faders, eight submaster buses and stereo and mono buses as well as a 16-track multi-monitor section. As a modification API put in twenty-four Model 475 faders which derive their muted feed from the EQ output. Above each of these faders is a toggle switch that routes the fader output to either of another set of buses called the "House Feed Buses 1 and 2." These buses can be used to feed the house system when the other buses of the console are being simulta-

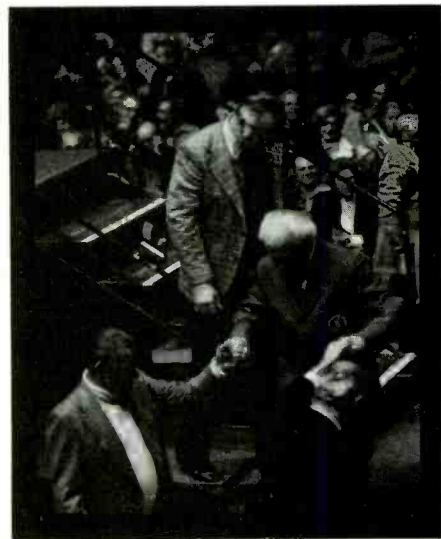
neously used to feed a multi-track and two-track tape recorder. But for this performance I decided strictly to use the input section of the console and mix the mics inputs to the stereo bus. The stereo output of the console is normally to a 3M M79 two-track recorder. I used the derived mono bus (sum of the left and right stereo bus) to feed the active speaker cluster. It had been decided to record the performance for the Coliseum archives on the M79. Therefore, after sound checking and noting where the feedback point was I assigned each of the eleven mics to the stereo bus and split them according to their position on the stage. As a way of keeping a running check on each mic input I also assigned them to one of the sixteen multi-track metered outputs. Although I was not going to use any of these outputs, the meters would allow me to see if any mic dropped out; because, mic 1 input appeared on meter 1, mic 2 input on meter 2 and so forth up to eleven.

The Concert

At this point, I was operationally ready for the performance. The Coliseum was beginning to fill with people. It was time to talk with Gregg about the program selections. We agreed that the best way to handle the no rehearsal situation was to set the faders about halfway in a straight line mix and then ease into a

balance once the first selection, "Precission Bacchus" by Delibes, commenced. From then on Gregg would be cueing me as to solos, etc. The mixing problem would be to create the impression, to the people seated half the distance to the stage and beyond, that the sound they really heard radiated from the orchestra uniformly in all directions. This was accomplished as we eased into the mix, taking note of the natural balance, and reinforcing what we heard. Under ideal conditions this process would have been unnecessary since the balances would have been predetermined at a rehearsal. Once we arrived at the balance during the first selection we used it as a basis for the remaining selections of the program that included—"Suite From Water Music" by Handel, "Overture Russlan and Ludmilla" by Glinka, "Capriccio Italien" by Tchaikovsky, "Stephen Foster Medley," "Waltzes" by Richard Rogers, "Fiddle Faddle" by Anderson and "Selections from Girl Crazy" by George Gershwin. At each new selection adjustments to the basic mix were made based on Gregg's knowledge of the arrangements. We began to feel confident, sensing the audience silence followed by resounding applause. That which seemed a few minutes to us turned out to be one hour and twenty minutes to the intermission.

With the intermission over, Arthur



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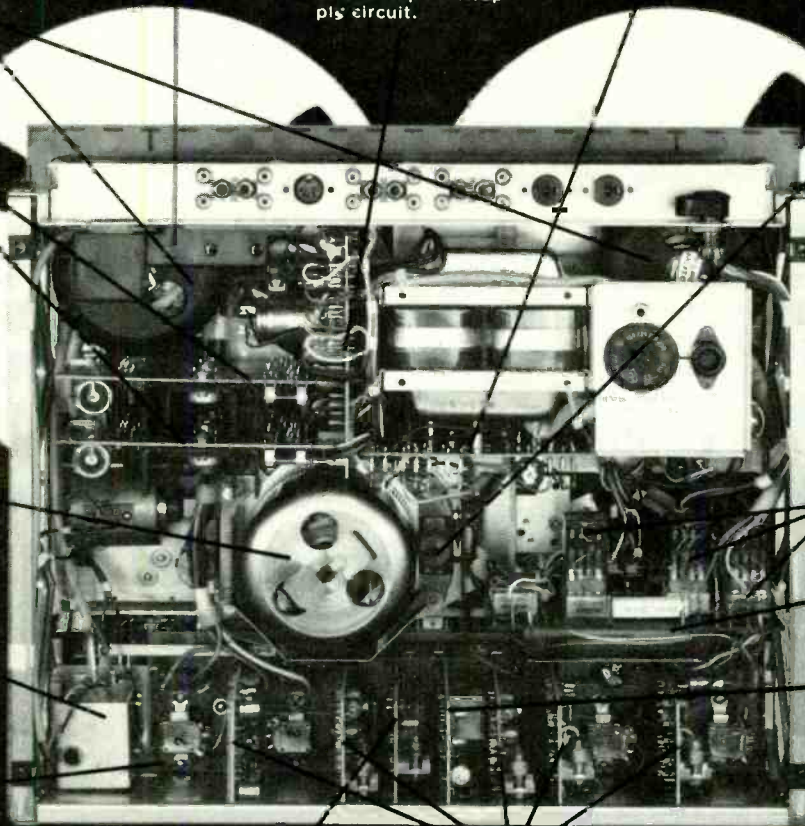
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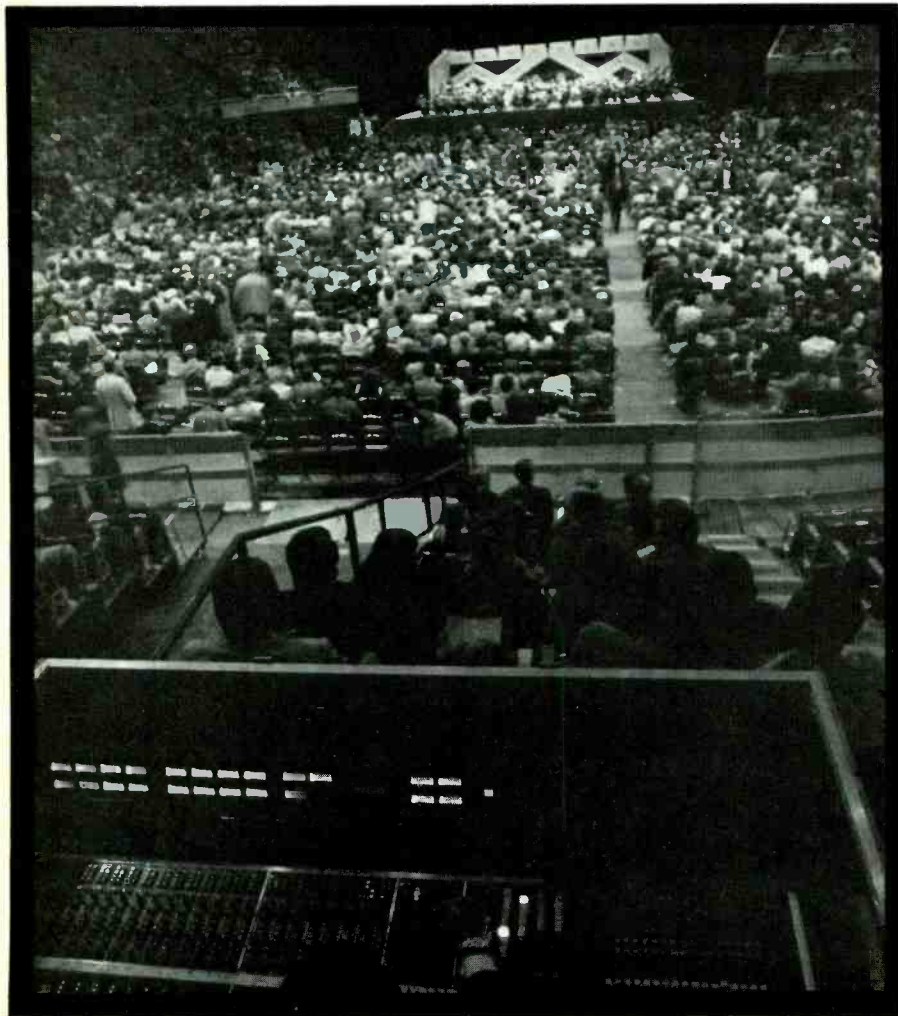
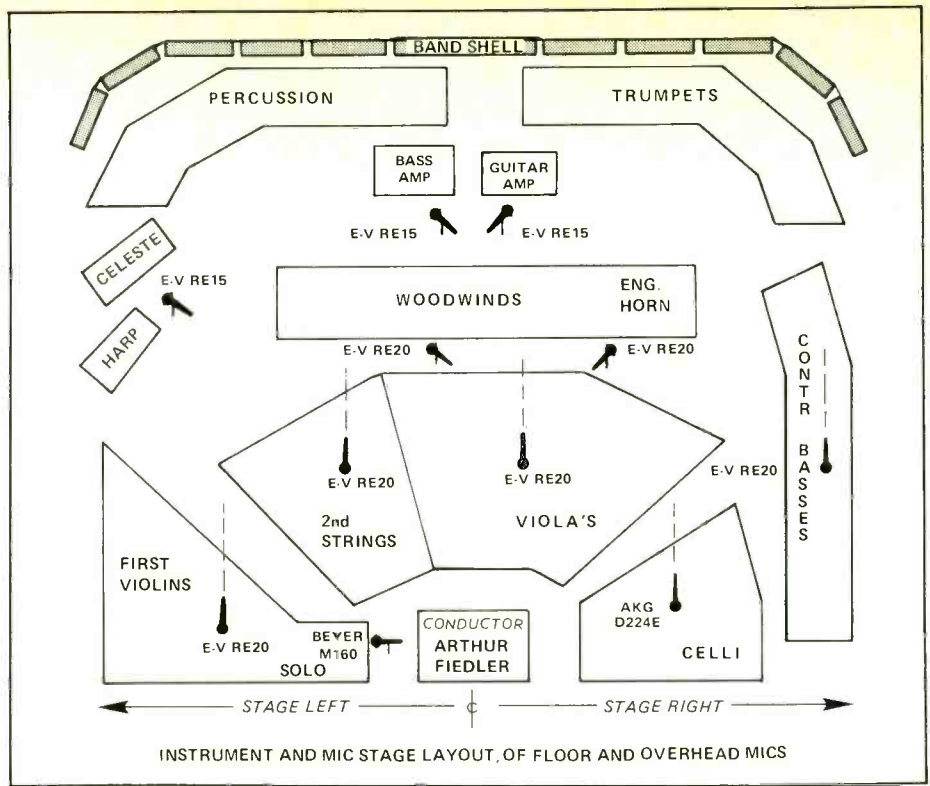
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Fiedler opened the second half with the "Stephen Foster Medley." Up to this point the mics I had placed for the electric bass and guitar had worked out as planned. We had plenty of percussion and trumpets. I was slightly concerned that when the bass and guitar started playing I would have to reduce their mic gain, thereby not getting enough percussion or trumpets. As it turned out the only significant gain change was for the guitar whose mic doubled as trumpet pickup. But the guitar was in for a few bars only and then out for good, during which time the trumpets were silent. I then returned the mic gain to the position originally set for the trumpets and was over that hurdle. Equalization throughout the concert changed very little from the initial settings made during the first selection. The remainder of the concert went as fast as the first half, and we encountered no stumbling blocks. When the last selection of the program was over the audience would not let Arthur Fiedler exit, instead they urged him on and he followed with "Yesterday" by Lennon and McCartney and "Boogie Woogie Bugle Boy." Maestro Fiedler was



whisked away upon the conclusion of the two encore selections although the audience remained—hoping for his reappearance.

Unlike after a successful studio mix, there is (for all concerned) after a successful sound reinforcement date such as this one, an *immediate* feeling of pride. One knows as soon as the last selection is over whether or not what you have attempted to do has either been accepted or rejected. It is something that I look forward to doing again.

Working for Automated Processes I get involved in many different console systems for our many customers, but seldom get the chance to operate one in this type of situation. There is nothing like first hand (operational) knowledge of a console's assets or drawbacks. I was happy to relate to my colleagues at API that this console was as straightforward to operate as previously had been touted.

The Nassau Veterans Memorial Coliseum, and Gregg Raffa, must also be congratulated for having the foresight to budget a sound system restructuring. This type of thinking can only lead to better musical productions for many people in suburban areas. I think the time has come for large sports complexes to follow the lead of the Nassau Coliseum.

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PROFILE

By Gil Podilinsky

Vibraphonist Gary Burton has been a major jazz recording artist for the past twelve years. His early quartet, featuring Larry Coryell and Steve Swallow, pioneered progressive jazz, creating an energy which influenced both jazz and rock. His duet works with Keith Jarrett and Chick Corea are leg-

endary. In this interview, conducted in Seattle during his group's tour with the progressive music group Oregon, Gary discussed his recording career which has culminated in a strong, personal relationship with producer Manfred Eicher and E.C.M. (Editions of Contemporary Music).

Modern Recording: Would you give me a chronological history of your career and how you came to be on the ECM record label?

Gary Burton: Right. I was first on RCA. In many ways I was satisfied with that label. RCA was totally cooperative—offering unlimited artistic scope. They backed us to the hilt on some extremely progressive projects, giving us good financial assistance in advertising the group. Overall, they did a good job. The problem with RCA is that their attitude towards us was one of tokenism—they really didn't take us that seriously. Since they considered us to be a one-of-a-kind attraction, we were destined to have limited success because that's how they saw us. We were clean, reliable, friendly, got good reviews which made the label look good and at the same time satisfied the need for a jazz group on the catalog. Then, after eight years, my contract expired. At that time, due to the death of one of the vice-presidents, RCA had a major change in administration, which resulted in my not knowing anyone. I didn't get on with the new staff, so I opted for Atlantic because I knew some of the people there. Atlantic was equally good in terms of artistic freedom up to a point where it had to conform to and be consistent with their image. For example, they wouldn't be up for a project with a symphony. They didn't go to the extreme of dictating songs or sidemen, but I was lost in the shuffle amongst too many artists and too few person-

nel. Atlantic's theory was that everything started at the top, in terms of promo and ad money, and worked down. So, whomever had the latest hit got the first crack, and so on down to the lesser-attracting groups. I would have stayed on after my three-year contract expired since my artistic desires weren't hindered, but the label didn't have the right feel. By that time, I had done an album for ECM, but I was skeptical of ECM, fearing loss of prestige being on a small, unknown label. People never take those labels or their artists seriously.

MR: How were you able to be on two labels at the same time?

GB: The attitude at the time was that this was some small German label and that the record would never see the light of day, so they (Atlantic) had nothing to fear. Other labels allowed their artists this freedom, too, and are now regretting it.

MR: Which ECM album are you speaking of and how did it come about?

GB: The album was the duet with Chick [Corea] *Crystal Silence*. It was either in 1971 or '72, I forget. It came about because Chick was already on that label and we were doing concerts together. Manfred Eicher, the producer, was excited to record the duet concerts. At first I was not at all intrigued because it was a small, non-imported German label, which at that time had only a few releases out, and could hardly be called a label. Chick was excited, but with Chick you never know what that means. Ironically, by

the time I'd joined, he'd left. Anyway, Manfred kept suggesting we record this project and since I was at the end of my contract with Atlantic I thought, "What have I got to lose?" We did the whole thing in one afternoon. It went very well. It was easy to do, a good time—one of the most natural I've ever done. Such a success tempted me to do more and avoid a large label.

MR: Is this what prompted you to join ECM?

GB: Well, I had always figured that working with a large label was unavoidable—you needed their finances, sales and worldwide distribution network. Although there was the influence of the others having done it [Keith Jarrett and Corea both left large labels to join ECM], I changed because of the rapport with Manfred. He promised U.S. distribution.

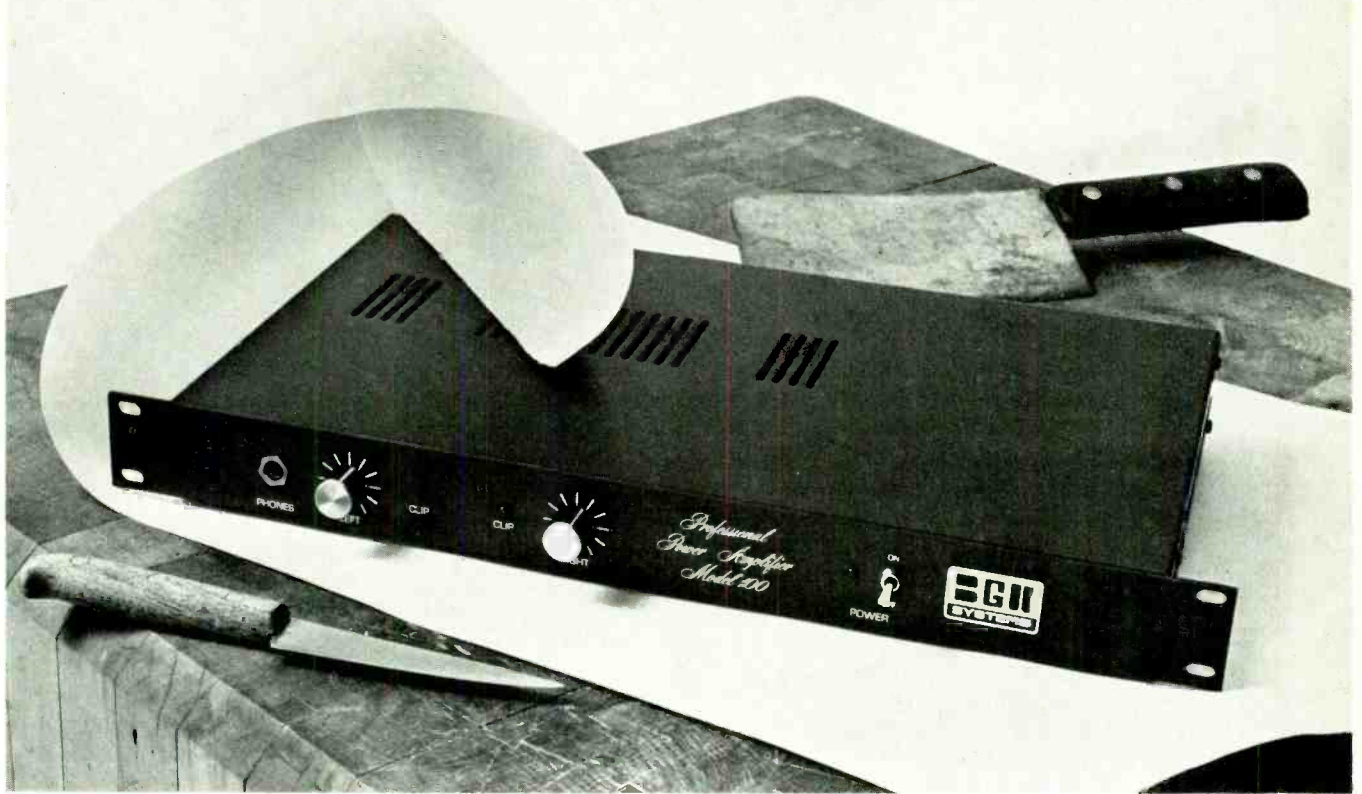
MR: Who was on the label at the time?

GB: Well, we were about it. Manfred never really signed artists, he just did one LP at a time. Keith had one. For the first few years the only ones he recorded more than once were Keith, Chick and me. Later he started with the Europeans. With the money made from each successful project Manfred would record two or three albums.

MR: You seem to be very content with your recording situation. Could you give me your impressions of how it is to work with Manfred and how you evaluate the success of ECM?

GB: Ok. Well, for me, my records are successful because I'm very good

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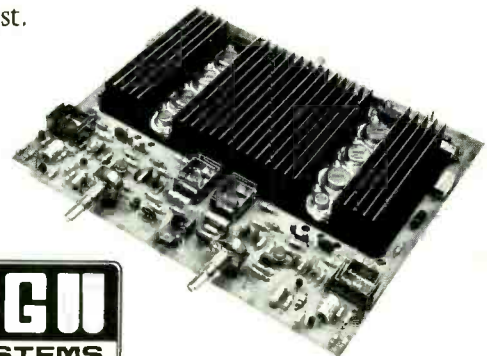
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friends with my producer, Manfred Eicher. That's the first contrast with a large company. With a large label, you're lucky if you can be friendly with your producer, let alone the president of the company. Usually they're twenty years older than you and have a different approach to life. The high level of success of ECM product results from the fact that Manfred stays personally involved with every record from beginning to end. He personally produces each one, so there is a consistency from record to record, and that's his identity—consistent product. Further, the consistency in product is achieved by Manfred's selection of engineers and studios. Since audio equipment is more or less equal the world over, the great variable is the engineer and his ability to use the equipment. Manfred has an excellent rapport with three engineers and their respective studios: Martin Wieland at Studio Bauer, Ludwigsburg, Germany, Tony May at Generation Sound Studios, N.Y.C., N.Y., and Jan Erik Kongshaug at Studio Arne Bendiksen in Oslo, Norway. All mastering is done either by Kongshaug in Oslo or Wieland in Stuttgart because Manfred feels he communicates best with those two engineers.

MR: With your years of experience in the studio, why do you feel that you need a producer?

GB: Well, one doesn't necessarily need a producer. I more or less produced my records at RCA and Atlantic. I was assigned a producer but I thought they served the purpose of being a link between me, my product and the label. I saw this as their main job, communicating to the label what we had done so they'd know how to merchandise it.

MR: Did they play a part in what material was selected?

GB: No, I decided what would be recorded, they had no influence in that regard.

MR: So, how does Manfred function differently?

GB: Well, to start with, all the other producers didn't know what I was playing. Manfred is more informed. At best, my other producers only partially understood my overall goal on each album, whereas Manfred plays an active part. He comes to hear me in concert, which is something my other producers never did. Also, being a musician, he understands what you want out of a piece. *That* is his strength and greatest asset for me because the

hardest thing in recording is to keep your perspective. After hours of doing the same piece, it's hard to stand back and get an overall view. I can ask for a musical opinion from Manfred and get an answer I can trust, which wasn't the case before. It's as though he's a member of the group.

MR: To what extent do you contribute to the production/engineering?

GB: As far as I'm concerned, I don't believe that a musician ever wants to get too involved in that. For me, it gets in the way of playing. Manfred will ask me if I like a certain part, or he'll ask another musician in the group if it concerns him, but that's about it. But each artist is involved to the end. You're involved in the mixing and Manfred will fly you to Oslo or Stuttgart for the final mixing. He is concerned with every minute detail and I think that that's the way it should be. As a result, I'm so relaxed and confident that I can play to my potential

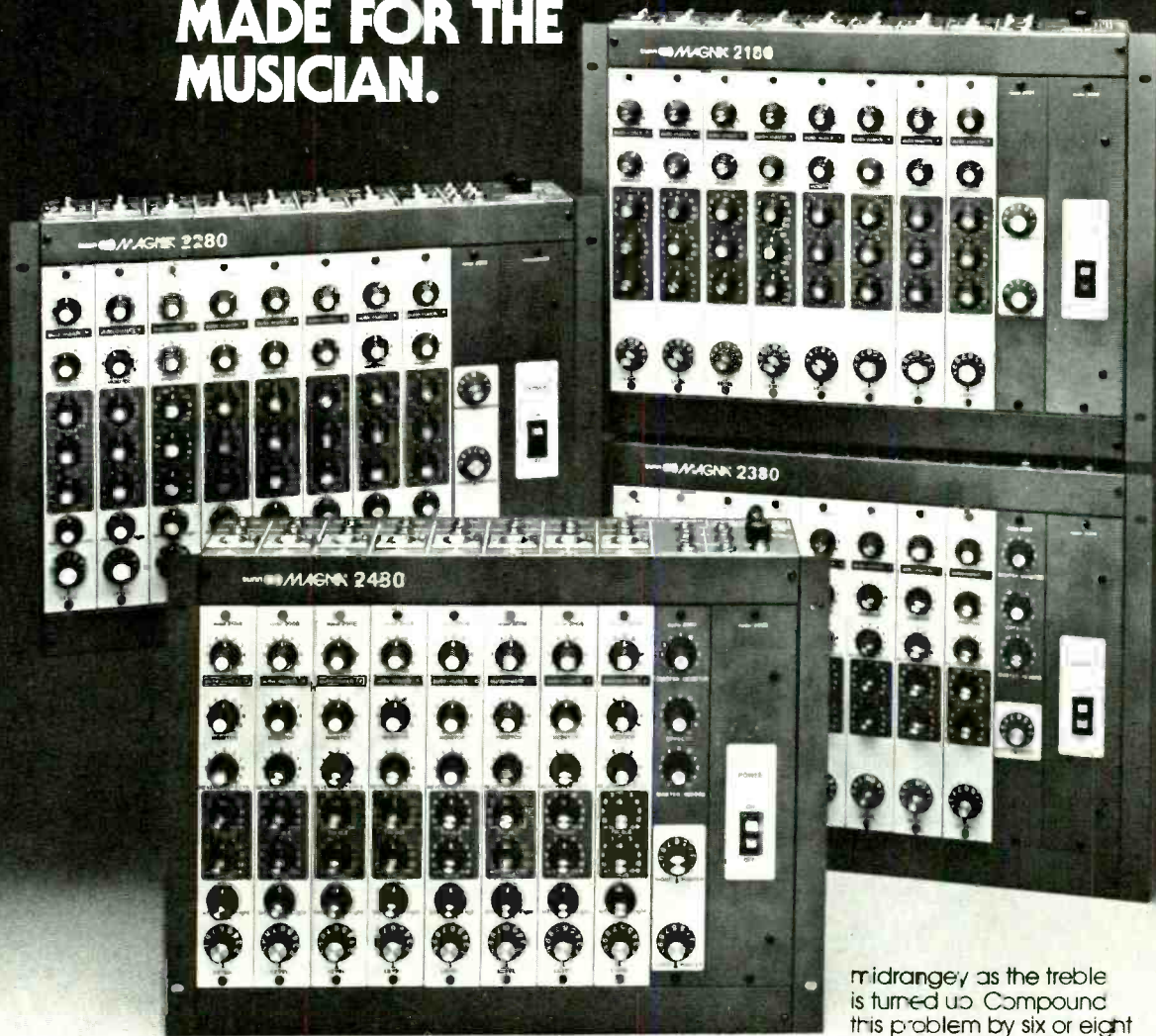
more consistently.

MR: Since Manfred is so involved in each project, do you find that as ECM grows, this becomes a hinderance, having to wait to record, Manfred having less time for you, etc.?

GB: No, you'd expect that to be the case, but no. Actually since I've been on ECM I've made more records in the same amount of time than I did at RCA or Atlantic. With a large company like RCA or Atlantic, it takes six months to a year to get around to my turn again what with studio line-up and producer's schedules. I've made eight records to date for ECM, I believe, including the new one of Carla Bley material. That's too many. I'm going to take six months to a year before I record another. You see, Manfred is very involved with the project ideas. For example, the duets with Chick were his idea. One of us will come up with an idea and approach the other with it. If he doesn't think the



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concept is feasible, we don't do it. He has a way of arranging things that's unique. His traditional idea of getting people to play together is to book a concert for them in Austria. That's how I met Ralph Towner and how *Matchbook* came about. Manfred will line you up with a good paying concert, fly you over and things have a way of working into an album—which was Manfred's plan at the outset. Anyway, Manfred now has some sixty-five records done and he plans to cut down. This past year almost cost him his health.

MR: Do you write out your arrangements?

GB: It's about half and half. Some are written out, some are just a loose sketch. Momentum for writing and need for material starts to build as a recording date approaches.

MR: What's your approach once you're in the studio?

GB: We record as "live" as possible, but it depends on the project. If it's a difficult project, I don't mind overdubbing if it's the easiest way to accomplish our goal. However, jazz is improvisation and so you're going for spontaneity, playing off each other's inspiration. You lose this if you record one instrument at a time. We recorded the new album of Carla Bley material totally "live."

MR: Why do you record in Europe when you could use the New York studio?

GB: If we're doing a tour of Europe, which we do every year around Christmas time, it's nice to record there because there are no interruptions. It's hard to make the transition in the States from playing to recording because when you're home there are always phone calls to return, business to be transacted, etc. Whereas in Stuttgart, you concentrate on recording only—with no outside interferences. We have a good feel for the studio. Plus, we've played so many different rooms that you stop noticing the difference. My only concerns are to keep my mood and to stay totally involved with the music. One of the biggest problems is that you're always being interrupted by technical problems so that everything moves at an incredibly slow pace. It comes from rock dates, I think, where it's common to take three weeks to do a single. It makes it more complicated than it really is. So it's hard for a concert group such as ourselves to keep a steady flow and variety going. They're extremely

efficient in Stuttgart. I'd guess that about two-thirds of the projects we've done have been tied in with a European tour. Manfred wanted Steve Swallow to do an album, and it was only natural that I do it with him. We recorded it at a local studio in Massachusetts because we wanted to use some of our own instruments which were too cumbersome to take to Germany.

MR: How much rehearsing do you do before you record?

GB: It depends on the situation. Some of the material we do is very complex, some simple. Some of the easier material can be worked out in five minutes in the studio. Some require four or five rehearsals before we go for a take. It's hard to rehearse on the road.

MR: Is it correct to say, then, that you go for feel and allow for mistakes?

GB: No, wrong. I go for feel rather than worrying about the recorded sound. The technician is concerned with achieving the highest quality in recording, and so am I, but not to the extreme of recording each instrument in a separate booth, unable to hear each other. I won't make that compromise just to be one nth degree better. We won't worry about trying to get it on the first take. I won't keep the first take just because it had the feel.

I don't want to keep mistakes; because on record mistakes have a completely different character and role than they do "live." Take everyday conversation, for example. We all makes mistakes in grammar. If we wrote them down we'd have to re-write them, but in conversation they roll on by. It's the communication that's going on that's important. If you recorded it to study what was said, the mistakes would get in the way of the flow. That's the problem created for music because recording is an unnatural phenomenon. Music was originally intended to be played into the air. It was very ethereal with people retaining whatever they could. This granted vast freedom to the musician because he wasn't held responsible; having each note held up to him for criticism. Recording, however, freezes that moment in time like a painting and in the process holds the musician far more responsible for every detail as opposed to the overall statement. The musician in the past, as well as the present, has always gone for the overall message, especially the improvising musician because he's

there with an audience and that's what the real experience is about—communicating to them and getting them caught up in it. The least of your worries is a slight mistake. In fact, if it lends a certain charm to what you're doing then more power to you for understanding the subtleties.

With recording, an entirely different situation exists where most musicians will approach the same piece quite differently. In the end you want the same result with the listener, but realize the difference in experiences. On the one hand, you [the audience] hear it once and see the artist playing it and in a sense he's talking to you. On the other hand, with recording it's the removed person looking at the picture on the wall and trying to get the same message. They are two totally different mediums.

MR: Have you always been concerned with this?

GB: It has always been incredibly obvious to me and, I think, to any recording musician who plays "live" as well, and has had the experience of hearing your record six months later and noticing all the things you don't like about it. When you first start recording, your first few albums usually contain all sorts of mistakes and flaws that years later you learn how to eliminate. So, almost at the beginning you learn that it's an entirely different ballgame than playing "live" before a few people. As a result, I have been aware all along. ECM helps because the feeling of striving for quality is there. Every record has some compromises in it. It's like an author who keeps making revisions. Eventually you get tired and figure that's good enough. A record has that quality to some extent. If you go too far you lose the spontaneity.

MR: So then you view all your records in terms of progressing, rather than in terms of trying to reach a peak period of performance like most classical musicians.

GB: Yes. We have a consistent direction in mind. When we first founded the quartet it was on the concept of an ensemble featuring improvisation of interacting musicians on an equal basis, rather than a rhythm section featuring a lone soloist.

MR: Is this consistent with the present line-up?

GB: It's been the ideology with any group I've ever had since the first quartet in the late '60's. We didn't sit down and form a credo or anything,

but we wanted to break away from the traditional jazz concepts that existed then. Essentially I think we've discontinued doing that. We haven't changed drastically to any other approach. Chick Corea for example, has changed drastically several times in the last ten years. We haven't. Our tunes tend to lead to other tunes. There's a progression to it all. There's an evolution happening as to how our style is developing and what kinds of tunes we do and who we play with, etc. Even our special projects fit our overall design as to exploiting what we can do as improvisers. Even though we haven't run out of possibilities we haven't drastically altered our style. All the way through I've kept the same type of instrument line-up and similar type of tune structure. We didn't decide that at the outset, it just hasn't died.

MR: How long does it take you to complete an LP?

GB: A couple of days, afternoons or evenings unless it's a complicated project.

MR: So from the beginning to the final mastering in which you're involved, it takes about a week?

GB: Well, twice now we've done two

records in a week of studio time where we'd record for four days and mix for two days and ended up with two finished albums in six days. We did the Bley album and Pat Metheny did a trio LP. Two summers ago we did *Matchbook* and *Ring* at the same time. That's average for us.

MR: You don't become disoriented doing two at once?

GB: No, more than two maybe, but two is workable.

MR: Prior to ECM, which do you feel was your best album?

GB: It would be hard to say. The album with Keith Jarrett [Atlantic] would be one. *Tong Funeral* another. One is a group project and one a special project, so it would be hard to pick just one.

MR: One overall?

GB: Yeah, one which was instrumental in focusing our direction was *Duster* [RCA]. It served as a turning point.

MR: Any on ECM?

GB: Certainly *Hotel Hello* was the most successful from my point of view.

MR: Why?


GB: Well, the music, naturally. It was an album made with my best

friend Steve Swallow—someone I've played with for ten years. I understand his music quite well, and he my playing. It was destined to have more personal identity for me. Also, I think some of my best playing and soloing is on that record. It was well designed to my strengths.

MR: Of all your projects, any which really didn't happen?

GB: A number of them. Most records don't happen at least part of the time. I can only think of a few I've made that were consistently on from beginning to end. I can almost say, "Well, that's the strongest" or "That's the weakest track on the record."

MR: Is that in retrospect, or do you realize it at the time.

GB: Usually you realize it to some extent at the time. In retrospect you're usually kinder to the record in that it's a year past and your most recent product is most representative of your playing at the present. Even if your past works are terrible, if you have a good new one you feel as though you have a clean slate because it's what you're doing *now* that counts. 

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Ambient Sound

BY LEN FELDMAN

Back to Basic Binaural

It is now more than 40 years since Bell Laboratories and A.T.& T. first demonstrated binaural sound to enthralled visitors of the Chicago World's Fair (1933-34). That earliest demonstration was repeated at the New York World's Fair of 1939-40 and is, even today, occasionally resurrected at various science museums in this country and abroad.

The premise of binaural sound (and for that matter, binaural recording) is that two pickup microphones, corresponding in location to the two ears of a human being, should be capable of picking up a complete sound field with all its spatial and localization information. If the mics substitute for our own presence at a concert hall, then two-channel recordings of what the mics "hear," when played back via two transducers directed at our own two ears (ordinary stereo headphones will do) should place us (psychoacoustically at least) in the exact spot that was previously occupied by those two microphones. Earliest experiments in binaural recording and reproduction were of scientific interest, but nothing more. After all, people in the 1930's (and 1940's and 1950's) listened to music via loudspeakers—not via headphones. That was all before the stereophone became a staple item in the component hi-fi category.

As everyone knows, once you reproduce music via two loudspeakers, *each* of the listener's two ears hears program material from each of the two speakers. For this reason, attempting to make a "live" stereo recording by placing a pair of mics just six inches or so apart (depending upon how fat-headed or thin-headed we are) will result in practically no audible stereo separation when such recordings are played back over widely separated loudspeaker systems. It was this realization that created the shift from binaural recording to true stereo recording, in which two microphones were widely separated during the "live" recording session, so that sounds picked up by each microphone would be vastly different from those picked up by its opposite number.

Multi-Miking

From that early, classical recording technique (rarely used today, even in "live" concert hall recording), it was only a short hop and a jump to the multi-mic, multi-track techniques that are in general use today in recording studios around the world. Certainly, the modern recording studio with its 16-, 24- or 32-channel mixing capability offers a degree of flexibility that was never dreamed of when stereo first appeared upon the scene. But with that flexibility comes a departure from sonic realism that to some still represents the avowed goal of high fidelity and recording. It was a desire on the part of some purists to capture the "true" sound field of the "live" listening experience that probably prompted earliest experiments in four-channel recording. We will not dwell upon the reasons why four-channel sound systems were not eagerly gobbled up by consumers. That sad story with all its confusing elements has been well documented in print many times in the last couple of years. But we do believe that there are still those among us who maintain a purist's desire for reproduced music that is *not* the electronic creation of a recording engineer working with often unrelated multi-tracks.

Nakamichi, the well known maker of top-quality cassette tape decks, has been championing a three-mic "live"-recording technique which they maintain is ideal for in-the-field "live" recording. In addition to the left and right stereo mics, a third blend mic is used for vocalist and center-image fill. Of course, the reproduced results are still definitely stereophonic, with no semblance of a 360-degree sound field. All of which brings us to the subject of binaural, its possible re-birth, and some interesting work that has been going on behind the scenes at JVC (Japan Victor Company). That company has been re-examining the virtues and limitations of binaural recording and reproduction and their studies have already resulted in the creation of one novel product, a combination binaural headphone-microphone system, designated as model HM-200E. Although similar in size and weight

to conventional headphones, the product also includes a pair of matched electret condenser microphones positioned near a simulated auricle (outer ear shape) in each earpiece. Recordings can be made either by wearing the phones normally and facing the "live" program source to be recorded, or by mounting the phone/mic combination on a supplied "dummy head."

The resultant recording (and we auditioned several of them) is completely three-dimensional—as though you were re-living the recorded event in person from the vantage point of where the phones were placed when making the recording. What is particularly uncanny about binaural recording and reproduction is that, unlike stereo, it is possible to sense *distance* from a sound source as well as angular direction.

The introduction of this product comes at an opportune time, for, both here and abroad, there is a growing interest in "live" or "in-the-field" recording. Where once the portable cassette was considered to be anything but a high quality recording instrument, there is now a growing number of high fidelity, wide-response, portable cassette machines which can produce every bit as good a stereo recording as is possible with the more conventional home-bound, AC powered, stereo cassette decks.

A few experimental binaural disc recordings do exist, but it is unlikely that major record companies would make a firm commitment to recording binaurally because of the headphone listening limitations imposed by this recording and reproduction method. All of which brings us to a second level of research which has been going on at JVC.

Binaural Reproduction Via Speakers?

One of the main reasons why binaural sound has never reached the popularity level which it rightly deserves is the requirement that such programming be listened to via headphones. The nation of hi-fi enthusiasts and ordinary record-listening folks is not about to abandon those stereo speakers. With that in mind, JVC has done some exploratory work in determining how a binaurally recorded program needs to be processed so that it can be reproduced over a pair of loudspeakers and still retain the illusion of precise localization. As we noted earlier, part of the problem with attempts to reproduce binaural sound via speakers is the fact that both ears are now subjected to sounds from *both* speakers, instead of one speaker per ear. To offset that effect, a processor was developed which applies some out-of-phase left channel information into the right reproducing channel and some out-of-phase right channel information into the left reproducing channel. A moderate amount of time delay is applied to these cross-fed out-of-phase signals, as well as a carefully researched amount of frequency response tailoring. JVC is temporarily calling this scheme a *binaural-stereophonic system*. We had an opportunity to audition it during a recent trip to Japan,

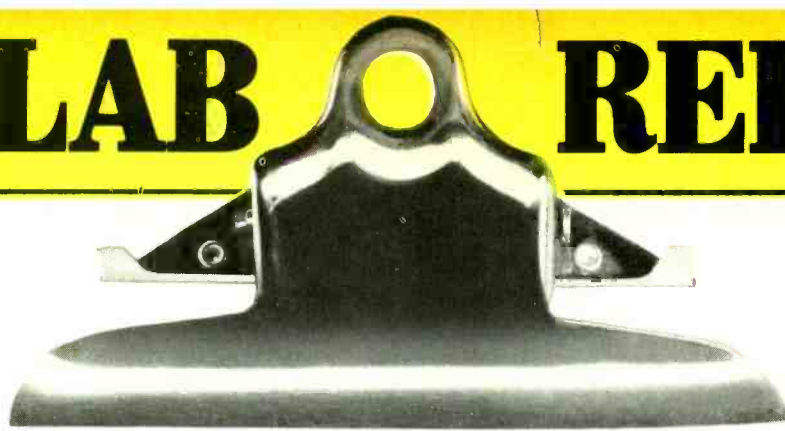
at the recently held Audio Engineering Society convention in New York, and most recently at a press conference held by JVC during which they demonstrated a variety of new research and engineering projects which have been going on at their research center in Japan.

First, the good part. One of the problems with binaural (or, for that matter, stereophonic) headphone listening is the inability to perceive sounds as coming from "up-front." Headphone listeners have always complained about that "sound inside the head" feeling. Listening to "processed" binaural sound, via a pair of speakers using JVC's processor, there is of course no problem with front imaging, as the speakers are located up front just as in a stereo array. Unlike stereo, we were actually able to hear sounds coming from our extreme right or left and even from slightly behind us—this with only a single pair of front-positioned speakers, mind you. The effect is uncanny and totally overwhelming. Also, on the positive side, as an added benefit, the processor has a circuit (with a special switch position) which permits you to "expand" the sound field using ordinary *stereophonic* program material. It's as if closely-spaced speakers are suddenly moved further and further apart and sounds definitely emanate (or seem to emanate) from beyond the speaker's actual locations.

Now, for the not-so-good part. Listener positioning is extremely critical—especially so in the left-right sense. The binaural-stereophonic listening experience is best enjoyed if you sit in a chair at a precisely predetermined "X marks the spot" point in the sound field. Also, relatively dead rooms work better than reverberant ones. Nevertheless, the binaural processor used to play binaurally recorded programs over conventional stereo speaker systems offers a kind of ambience and spatial realism that we never experienced when listening to any stereo material, however well engineered or produced. In many ways, the overall effect is somewhat like what everyone hoped quadrasonic sound would be able to deliver but never quite did. I have the feeling, too, that JVC, having committed itself by the introduction of those novel headphones-microphones (there are no present plans to offer the electronic processor in this country, though that may change) to the promotion of binaural recording and reproduction, is not likely to stop there. Conceivably, their study of the relationship of human hearing to perception of sound localization, ambience and more may well lead to improvements in the translation of binaural-to-stereo. After all, when we first started listening to stereo everyone thought we had to be glued to one spot in the listening room!

Multi-track recording has enjoyed phenomenal growth, and I am not suggesting its eventual demise. What I am saying is that it may not be the *only* way to create artistically and musically satisfying reproduction for home music listening. I would also suggest that if you've never heard binaural sound (even over headphones) you try to get hold of a disc recorded in that manner and listen to it through headphones. You may just be pleasantly surprised.





NORMAN EISENBERG AND LEN FELDMAN



Technics RS-1500US Open-Reel Tape Recorder

General Description: The Technics (by Panasonic) model RS-1500US is an open-reel three-speed (15, 7½ and 3¾ ips) stereo recorder of unusual mechanical design and very high performance. Its head configuration includes separate heads for two-track erase, record and play, plus a fourth head for four-track (quarter-track) play. It accepts reels up to the 10½-inch (NAB) diameter.

The most striking visual aspect of the 1500 is its tape-drive arrangement which is quite unlike anything we have yet encountered. The tape, from supply to takeup reels, describes a "U" path through and around a novel arrangement of guides, capstans and heads that makes for very close coupling of the tape to the heads and also helps to isolate the tape's motion from unwanted outside influences. This "isolated loop" tape path is achieved as a result of the use of a direct-drive capstan motor—a very slow-moving DC motor which is locked to a quartz-controlled servo circuit.

The motor drives an oversize capstan which is engaged by two pinch-rollers at the "tops" of the "U." The complete tape path extends over identical members on both sides of the "U" so that it is symmetric. The tape coming off the supply reel goes around a tension roller, then passes over a series of guides and

rollers, contacts two of the heads, wraps around a large bottom roller and continues up the "U" past two more heads, and a similar arrangement of guides, pinch-roller, and tension roller, and then winds onto the takeup reel. Despite the seeming complexity of the tape path, threading tape is very simple and involves little more than allowing the tape to descend down one side, fit around the bottom roller and come up the other side. One of the guides, on the ascending side just below the take-up tension roller, serves also as a "tape position marker." The bottom roller works in conjunction with an illuminated tape-strobe indicator, and there is a vernier adjustment elsewhere on the deck to vary tape speed by ±6 percent. The bottom roller-assembly also has a portion that, fitted with markers, can be used to locate a desired point on a tape for editing/splicing work without the need to mark or cut the tape at the head. The head-cover is fitted with a switch to select either the two-track or the four-track playback head.

Below the supply reel and to the left of the head assembly are two VU meters, calibrated from -20 to a bit over +3. Their ranges can be extended to +6 by a switch elsewhere on the deck. Below each meter is a calibration screw adjustment. Below the pair of meters

are four controls for power off/on; tape speed vernier or "pitch;" tape speed selection; and timer-start. The pitch control must be pulled to become operative; when speed is set (on the nose as per the strobe or deliberately under or over as desired) the switch may be pushed in to "lock" the adjusted speed.

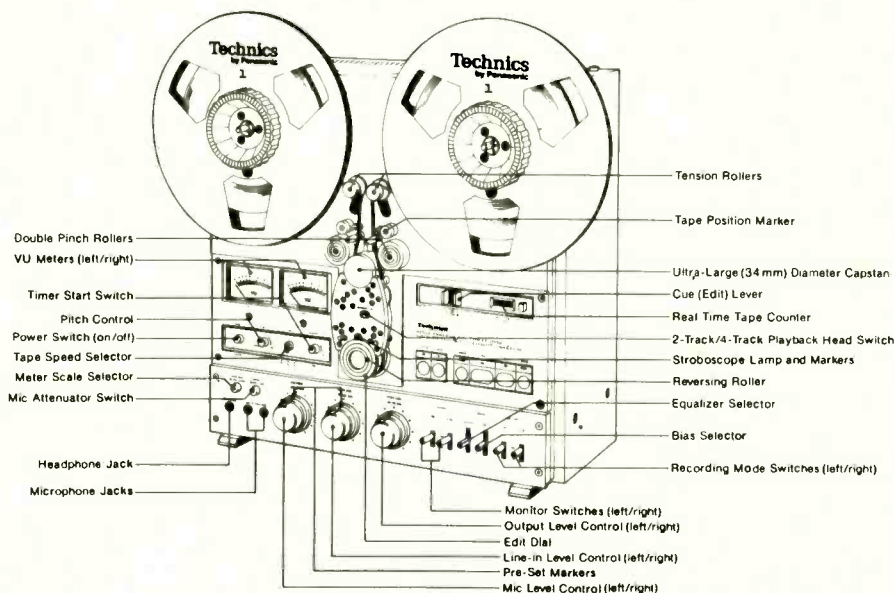
Below the takeup reel and to the right of the head assembly are a cue (edit) lever and a real-time tape counter and its reset button. The counter is referenced in minutes and seconds to the fastest speed (15 ips). For 7½ ips, the time shown is half true time; for 3¾ ips it is one-fourth true time.

Below these items are the pushbuttons for transport action. Operating literally at finger-touch pressure, they provide the usual functions of record, pause, re-wind, stop, play and fast forward. Complete fast-buttoning is possible, from any mode to any other mode. Speed also may be changed during record or play without stopping the transport, and a kind of "punch-in" recording is available in that if the play button has been activated, the operator may touch it

knobs are six lever switches. The first two are for tape/source monitor selection on each channel. The next two handle EQ and bias in three steps each. The last pair are left- and right-channel recording mode (on/off) switches.

The rear of the deck contains phono jacks for line in and out signals (there are two sets each for in and out), a socket for use with an optional remote-control accessory, a power selector for AC or DC (the 1500 can be operated on 24 volts DC if required), a grounding post, the power connector and cord and an unswitched AC convenience outlet. There also are several supporting feet that permit installing the deck horizontally. "Spill" recording is possible (i.e., running the tape at normal speed without using a takeup reel) if you hold down the upper tension roller for an instant to "fool" it as you press the start button.

Test Results: After some experimenting with the tape deck's EQ and bias switches (increasing numbers correspond to higher values, apparently), we settled on



and the record button simultaneously to put the deck into recording mode.

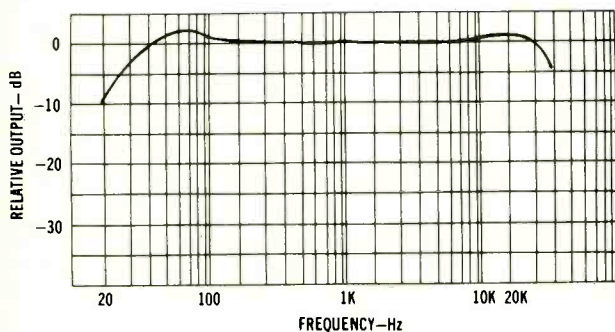
Electronic controls are grouped across the lower portion of the deck. At one end are the meter-scale selector previously mentioned, a microphone attenuator, a stereo headphone jack and left- and right-channel microphone jacks. To their right are three knob groups for microphone level, line input level and output level. These all are dual-concentric knobs for separate control on each channel. The input knobs also have movable outer rings which may be rotated against numbered scales that serve as reference markers. Mixing of mic and line inputs is possible. To the right of these

a "2-2" setting which seemed to work best for the TDK-Audua tape we used for measuring performance. On all counts, the Technics RS-1500US was either "on spec" or it did better than spec'd. For instance, response was consistently a little better than claimed; distortion lower; signal-to-noise, more favorable. Audio performance, in short, was at least as good as that encountered so far on any high-performing open-reel deck. Mechanical performance was exceptional, with outstandingly low figures for wow and flutter, extremely high speed accuracy and a general smoothness of tape handling that was exemplary. One operating aspect that we deemed notable (and which we had not

seen before) was the almost constant speed of the tape during either of the fast-wind modes, with none of the terrific acceleration of a tape reel as the end of the wind approaches. Yet, with all that control, fast wind of a 3,600-foot, 10½-inch reel took only 145 seconds.

General Info: Housed in a matte-black metal case with wooden sides. Supplied with two 10½-inch reel adapters; one empty 10½-inch reel; plastic slip-on cover; two pairs of signal cables. Dimensions are 18 inches wide; 17⅞ inches high; 9 inches deep. Weight is 51 pounds. Advertised price is \$1500.00.

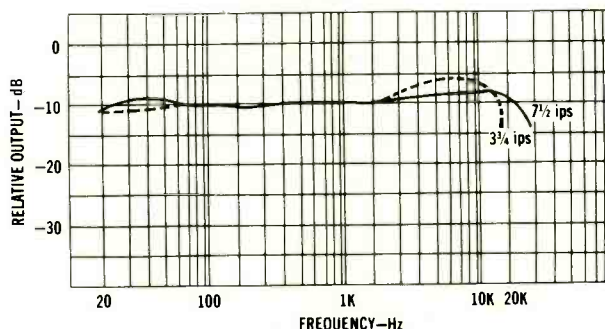
Individual Comment by N.E.: Ingenuity of design can be fascinating for its own sake, but when it results in a product of demonstrable excellence, as with this tape recorder, one can only applaud—and perhaps wonder too why someone had not thought of doing it this way before, and, concomitantly, whether this is the way more and more tape-deck manufacturers may be doing it in the future. The tape-drive system here is utterly sensible and effective in moving the tape smoothly and silently, and it is obvious—from studying and using the machine—that Technics engineers also have taken advantage of the overall design to enhance it with some very useful ancillary benefits, such as the speed-or-pitch-adjustment during record and play; the readily accessible head block; the clever means for locating a point on the tape for splicing; and more. It is easy, when contemplating all this, to overlook the purely sonic performance of the RS-1500US, but without doubt, its excellence (in terms of wide-range response, very low distortion, very good signal-to-noise) is in great measure related to the super-sophisticated transport action in addition to some very canny circuit electronics.



Technics RS-1500US: Record/playback response, 15 ips. 0 dB record level using TDK-Audua tape (Bias: "2;" EQ: "2").

Individual Comment by L.F.: It should be pointed out that in the RS-1500US not only is the capstan motor a quartz-oscillator controlled direct-drive unit, but the reel motors also are direct drive. There are, in short, no belts or other linkages in this transport; instead its three motors are totally electronically controlled. And instead of a double-capstan arrangement to achieve closed-loop tape drive,

Technics has come up with a huge (3.4 cm diameter) capstan which is a direct extension of the motor shaft, but which has a pinch wheel on either side to provide the desired "isolated loop." The resultant low wow-and-flutter figures speak for themselves. So does speed accuracy which is absolutely perfect. It is independent of line-frequency changes since the strobe-marked wheel rotated by tape motion is illuminated by a lamp flashing *not* at the usual power-line frequency but under the control of the same quartz oscillator that drives the capstan motor. I liked being able to alter pitch during recording as well as during playback; I also liked the general quality of construction of this deck which seems to me capable of providing the kind of continuous long-hours-per-day service demanded of machines in professional or studio applications. It is my guess that this deck would find a welcome place in such use as well as in the listening rooms of dedicated audiophiles who can appreciate its superb performance and brilliant engineering.



Technics RS-1500US: Record/playback response, 7½ and 3¾ ips. -10 dB record level using TDK-Audua tape (Bias: "2;" EQ: "2").

TECHNICS RS-1500US TAPE RECORDER: Vital Statistics

PERFORMANCE CHARACTERISTIC	LAB MEASUREMENT
Record/play frequency response*	
15 ips	±3 dB, 28 Hz to 38 kHz
7½ ips	±3 dB, 20 Hz to 28 kHz
3¾ ips	±3 dB, 20 Hz to 16 kHz
Harmonic distortion	
0 VU, std tape 15 ips	0.55%
7½ ips	0.50%
3¾ ips	1.6%
+3 VU, std tape 15 ips	0.85%
7½ ips	0.87%
3¾ ips	1.6%
Recording level for max 3% THD	
15 ips	+8 dB
7½ ips	+8 dB
3¾ ips	+5.5 dB
Best S/N ratio 15 ips	62 dB
7½ ips	63.5 dB
3¾ ips	60.5 dB
Input sensitivity, mic line	0.28 mV 62 mV
Output level, line headphone	620 mV 95 mV at 8 ohms
Bias frequency	125 kHz
Speed accuracy	±0.1%
Wow and flutter (WRMS) 15 ips	0.01%
7½ ips	0.015%
3¾ ips	0.04%

*Using TDK Audua tape; deck EQ and bias switches set to no. 2 positions.

CIRCLE 7 ON READER SERVICE CARD

MXR DIGITAL DELAY SYSTEM



General Description: The Digital Delay device from MXR Innovations, Inc. is essentially a self-contained audio delay line. An input signal is processed through the unit's circuitry so that it is delayed by a specific (and controllable) amount of time. The delayed signal then is mixed back with the undelayed ("dry") signal at the device's output. By varying the amount of delay time chosen the user can create a variety of "basic effects" such as discrete echoes, vocal doubling and hard reverb. Additional circuitry and controls, however, broaden the functions of the device to achieve additional effects which include flanging, pitch alteration (vibrato, pitch-bending), frequency modulating and infinite (non-deteriorating) repeat-hold.

The time-delayed signal is produced in this device by a digital random access memory, a method derived from computer technology which differs considerably from previous shift-register methods. In the MXR device, the analogue input signal is converted to digital form, stored in the memory circuit and removed at some designated later time. It then is converted back to analogue form and fed to the output.

The device, of rack-mount proportions, is controlled from its front panel on which all controls are logically grouped. These include: the power on/off switch; a series of ten pushbuttons for selecting the time-delay range; a delay time control knob; sweep width and frequency knobs; a mixing knob; a regeneration knob; and a level control. In addition, the front panel contains three phone jacks for delay bypass and for signal input and output. The rear apron contains additional jacks for external delay hold and for repeat hold, and the unit's AC power cord.

In the delay range button group, each switch selects a 4:1 (two-octave) range of delay. Amounts are indicated above each pushbutton ($\times 1$ msec.) and range from 1.3 to 640, in steps of double values (except for the first two which jump from 1.3 to 2.5). The actual delay time within any given range is adjustable via the

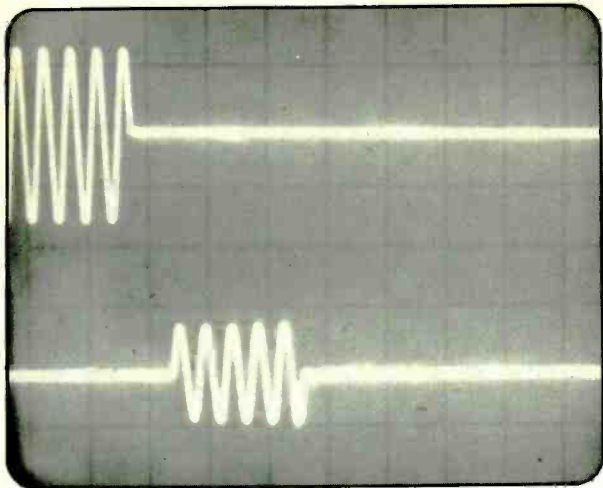
delay time knob. The sweep width control determines the effect of an internal sweep oscillator on the delay time, from inoperative (delay time may be manually controlled) to maximum automatic; the sweep frequency knob may be used to vary the rate of the sweep over a range from 0.1 Hz to 10 Hz. Pulling out this control provides a second range of 10 Hz to 1 kHz.

The output mix control varies relative levels of the dry and delayed signals; it too may be pulled out if one wishes to reverse the phase of the delayed signal before mixing it with the dry signal, which could prove useful for such effects as flanging. The regeneration control permits a variable amount of the delayed signal to be fed back to the input and delayed again, which enables (depending on the length of the delay time) such effects as multiple repeating echoes or a simpler reverb effect. The level control lets the user adjust input and output circuitry for an optimum match between the input signal and various operating levels of the device's internal circuitry. Associated with this control is limiting circuitry to prevent overdriving the input, and an LED indicator labeled "overload" will light up when limiting occurs. Externally controlled functions also are available. The front-panel delay-bypass jack allows the delay circuitry to be removed from the signal path by means of an external switch. The rear-panel delay jack may be used to disable the front-panel delay time control and thus allows external control of the delay time. The repeat hold jack allows an external switch to be used for activating the repeat-hold function, thereby enabling the user to simulate sequencer effects.

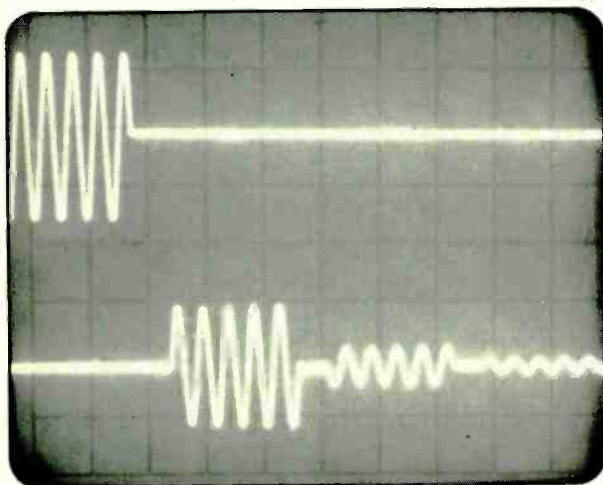
An optional accessory is a foot switch for controlling the delay bypass or repeat-hold functions.

The input to the Digital Delay uses a high-impedance balanced line; the output is low-impedance, unbalanced.

Test Results: The MXR Digital Delay device impressed MR's testing panel as a versatile professional



MXR Digital Delay: The upper scope trace in each photo is the input signal—a tone burst. In the photo above, the mix control has been set so that output contains only a delayed version of the input signal, displaced in time on the scope face—to the right of the input, as seen in the lower (output) trace.



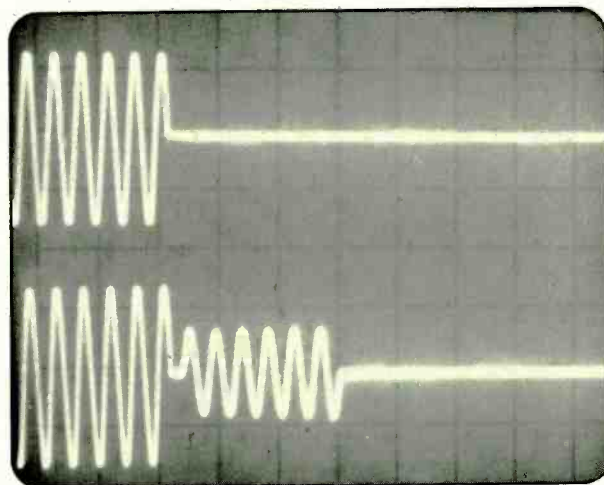
MXR Digital Delay: Turning up the regeneration control, we produce a delayed signal at the output which also has successive repetitions at a decaying rate to produce a reverb effect.

tool, capable of a variety of effects useful for studio and stage applications. Lab measurements and some 'scope patterns confirmed the unit's specifications, and its action in producing signal effects. Within the bandwidth selected, the device maintains flat frequency response, and very low distortion (harmonic and IM), plus a better than 80-dB dynamic range, and a noise-level low enough so as not to intrude on the many effects it is capable of producing. In use-tests, the MXR was put through several of its paces and it "did its thing(s)" responsively, and with none of the distortion, twanginess or raggedy quality of traditional spring-reverb (mechanical) devices. MR feels that in view of the device's versatility and generally sterling

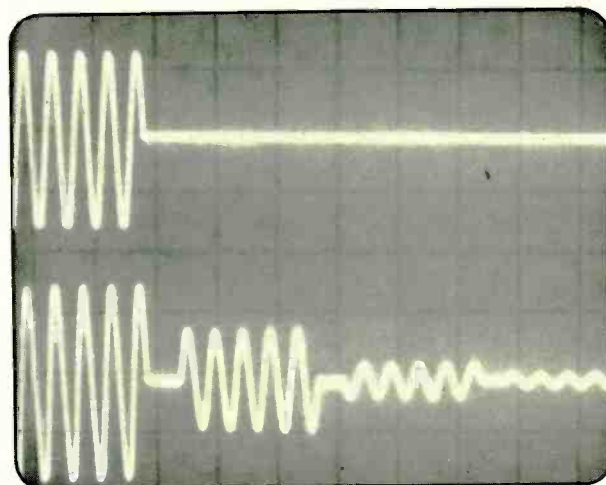
performance, its list price of just under \$1,000 represents very good value.

General Info: In black metal case with dark blue front panel. Dimensions: 19 inches wide (including standard rack-mount ends); 3½ inches high; 7 inches deep (6.13 inches behind mounting surface). Weight is 9 pounds. Price is \$999.95. Additional memory circuits, \$150; road case, \$39.

Joint Comment by L.F. and N.E.: Intrigued by the prospect of sonic miracles promised by this device we reversed our usual procedure for evaluating equipment, and decided to use it before measuring it. It would be impossible to detail all the effects achieved, but to summarize briefly: Single, discrete echoes were created. By choosing about a 40-millisecond delay and adding a little of sweep width, we recorded one person



MXR Digital Delay: By setting the mix control to a mid point, both "dry" and delayed signal are combined at the output.



MXR Digital Delay: Finally, the dry signal is added to the delayed-reverberant signal to produce the overall output signal shown in the lower trace.

singing; the playback sounded like two persons singing. In fact, the effect was so realistic, we double-checked the tape to make sure it did not actually contain separate tracks recorded at different times. Later, by means of the generation control we created reverb effects that suggested a room that was acoustically much "harder" or "more 'live'" than we knew the room in which we were in actually was. We also piped a rhythm sequence, using percussives, into the device and operated the repeat hold feature which made it available as accompaniment for as long as someone held his foot down on the external foot-switch.

Our conclusion, in short, is that this unit can do more and do it better and more economically—for the performing musician and/or the recording engineer—than the complex mechanical and tape-loop delay setups (most of which needed constant servicing or replacement) that were found in studios some years ago.

MXR DIGITAL DELAY: Vital Statistics	
PERFORMANCE CHARACTERISTIC	LAB MEASUREMENT
Frequency response, dry	+0, -1 dB, 20 Hz to 28 kHz
Frequency response, selected bandwidths	
20 kHz	+1, -3 dB, 20 Hz to 18 kHz
10 kHz	+1, -3 dB, 20 Hz to 10 kHz
5 kHz	+1, -3 dB, 20 Hz to 5 kHz
2.5 kHz	+1, -3 dB, 20 Hz to 2.5 kHz
Input impedance	200k ohms, balanced
C.M.R.R.	36 dB
Output impedance	100 ohms
Maximum input level	+20 dBm
Maximum output level	+20 dBm
Residual noise	-82 dB
THD (at 1 kHz, near overload level)	0.09%
(40 Hz to 7 kHz)	0.6%
IM (60 Hz/7 kHz, 1:1)	0.13%
(60 Hz/7 kHz, 4:1)	0.6%
Level matching range	-20 dBm to +15 dBm
Regeneration range	0 to 100%
Variable delay range	4:1 (continuous)
Sweep frequency range	0.1 Hz to 1 kHz (in two ranges)
Sweep width	0 to 100% (4:1)

CIRCLE 18 ON READER SERVICE CARD

Crown EQ-2 Synergistic Equalizer



General Description: The Crown EQ-2 Equalizer is a stereo (two-channel) "graphic equalizer" designed to enhance the general fidelity and enjoyment of playback by providing the listener with a flexible means of modifying the signal to compensate for amplitude deficiencies in room acoustics, reproducing equipment and program material. The description "synergistic" derives from the fact that in addition to the equalizer per se, the device also includes a hinge-point (shelving) tone-control system. Both the equalizer and the tone-control systems are completely independent on each channel, with all controls and adjustments duplicated for each channel.

The equalizer (on either channel) is divided among eleven sliders, each with a range from +15 to -15 dB and with detents at 0, 1, 2, 3, 4, 5, 6, 8, 12 and 15 in each direction. Nominal center frequencies run from 20 Hz, in octave values, to 20 kHz. Under each slide is a knob for adjusting the center frequency "around" its indicated nominal value.

Centered between the left- and right-channel sliders is the stereo tone-control system with eight knobs: four to handle treble and bass individually on each

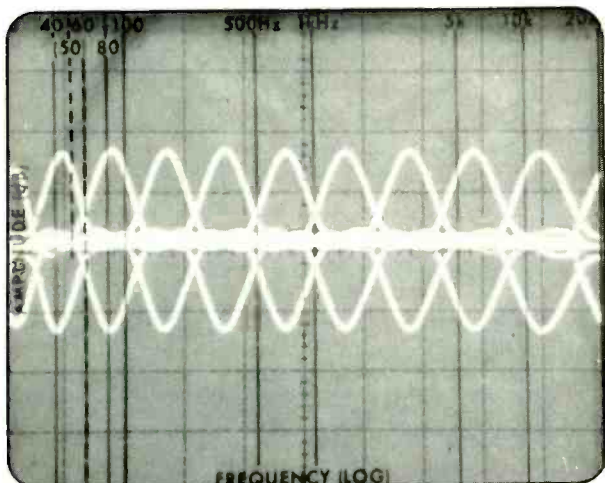
channel, and their respective hinge-point (the frequency at which tone-control action takes place) knobs. The main knobs are marked -20 and +20 dB at either extreme of rotation. The hinge knobs for the treble controls are marked at 1, 5 and 10 kHz; the hinge knobs for the bass controls are marked at 180, 900 and 1800 Hz.

Additional controls include pushbuttons for flat/equalizer and flat/tone on each channel, and the unit's power on/off switch. Visual indicators include a pilot lamp for power on, and overload warning lights for each channel.

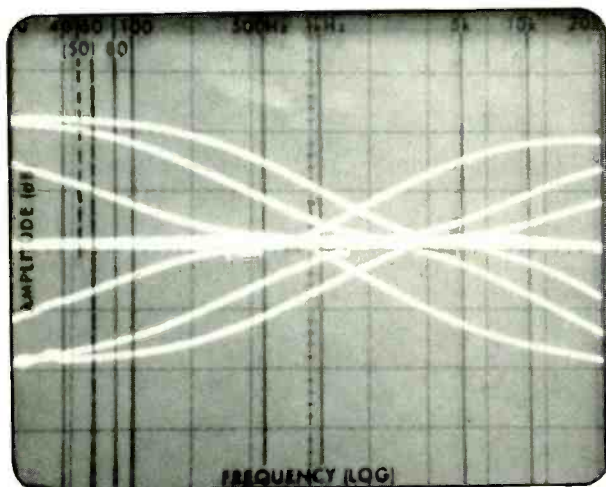
Signal connections are made at the rear. All connectors are standard phone-jacks. One stereo pair is for balanced inputs and has an associated level switch (0 or +10 dB gain). Another pair is unbalanced and each has a screwdriver level adjustment. There are two sets of outputs, one normal and the other inverted. The EQ-2 is intended for patching into a playback system between a preamplifier and a power amplifier. It also may be connected into the tape-monitor facility of an integrated amplifier or receiver via the tape-in and out jacks of such a unit.

An additional option for using the EQ-2 is cascading its two stereo sections for a mono full 1/2-octave equalizer with 22 bands. The device may be rack-mounted, installed in an accessory cabinet or placed directly on any convenient surface. Its line cord is terminated in a three-prong plug but Crown supplies a two-prong socket adapter with the unit. The EQ-2 is supplied for use on prevailing power in a given locale, but an internal jumper arrangement permits modifying the AC supply to operate on 100, 120, 200, 220 and 240 volts AC.

Input impedances are 25K [unbalanced, and 20K balanced (transformerless)]. The normal and inverted outputs may be bridged for 600-ohm balanced output. Normal output impedance is 300 ohms.



Crown EQ-2: Composite 'scope photo shows boost and cut range of each of the eleven equalizer bands. All frequency-centering controls were set to their mid-points for this display.



Crown EQ-2: Extremes and center hinge-points of bass and treble tone controls were used to trace these twelve response curves (plus flat response reference). Hinge points are continuously variable between extremes shown, as are amplitudes of boost or cut.

Test Results: To begin with, MR either confirmed or bettered all of Crown's specifications for the EQ-2. Within plus or minus 0.1 dB, response was flat from 20 Hz to 20kHz; within a 0.2 dB tolerance, response ran from 10 Hz to 100 kHz. The EQ-2 handled 12 volts RMS before clipping. At rated output of 2.5 volts RMS, hum and noise were 90 dB down, and IM was extremely low at a measured value of only 0.0045%. All controls and adjustments operated over the ranges claimed. During operation, the EQ-2 consumed 10 watts of line power.

Beyond measurements, however, MR's panel was impressed with the effectiveness of the EQ-2 in achieving its intended aural results in various playback systems and in different rooms (see individual comments below). MR also was impressed with the very sophisticated tone-control system included in the device. The use of the tone controls as the first step in the equalization process affords a degree of flexibility considerably greater than what might be obtained from the equalizer alone. That is to say, the tone-controls can introduce relatively broad changes over large portions of the audio spectrum, while the equalizer bands themselves may be used to compensate for very specific (and often narrow) bumps and valleys in the room's response.

Although some degree of compensation can be accomplished by ear, the EQ-2 is best used with additional equipment—specifically a pink-noise record (supplied with the EQ-2) and an SPL meter-microphone which is planned to be made available from Crown dealers on a loan basis to purchasers of the EQ-2.

Examination of the EQ-2 revealed workmanship and layout of the highest order. Identical glass-epoxy circuit boards are used for each channel's circuitry. Power supply parts are fully shielded in their own compartment, well removed from the signal-circuit boards. All twenty-two IC's are mounted in sockets. Active RC filters employing negative feedback are used to achieve the now-popular "inductorless L" for each filter band. Each equalizer band is actually a separate amplifier, and the outputs of all bands are added in a "summing amplifier" which results in the least amount of interaction between adjacent bands. Sliders are step attenuators using precision resistors rather than potentiometers.

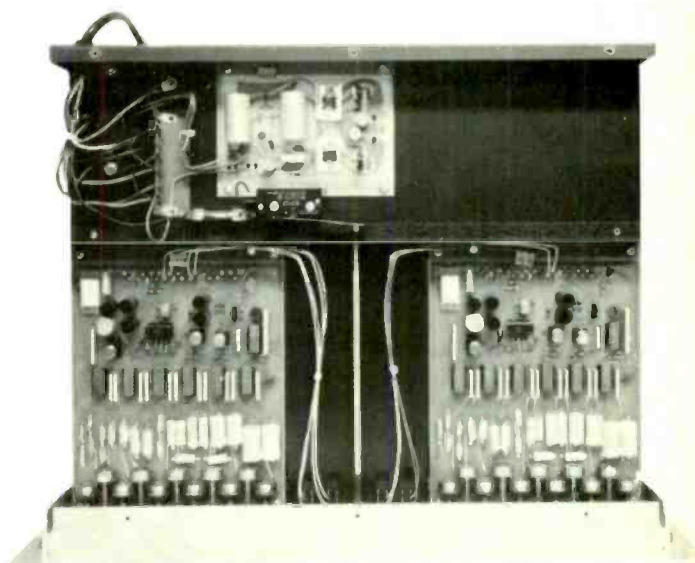
General Info: EQ-2 dimensions are 19 inches wide (including standard rack-mount ends); 7½ inches high; 14½ inches deep. Weight is 16 pounds. Supplied with signal case with brushed aluminum front panel. Supplied with signal cables and mounting hardware. List price is \$899.

Individual Comment by L.F.: There is much more to the Crown EQ-2 than "eleven sliders per channel" and it is the inclusion of these extras that distinguishes this unit from the other equalizers. A good deal of this has been explained above. In addition, I might comment on the unit's ability to "move"

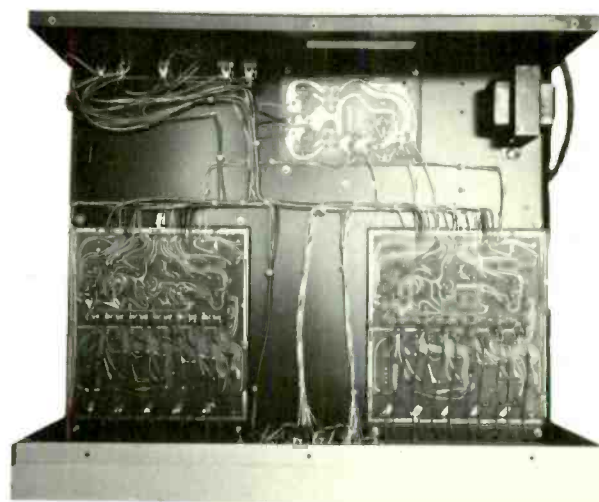
the center of each equalizer band's frequency range by nearly half an octave, a feature that makes the equalizer extremely powerful. The more I experimented with, and investigated the performance potential of, the EQ-2 the more impressed I became with it. Using a pink-noise source and a sound-level meter, I was able to equalize a listening room so that its end response closely resembled the "ideal curve" published in the EQ-2 owner's manual. This curve, by the way, is far from a ruler-flat line; rather it goes after flat response from 20 Hz to about 8 kHz, and then introduces a 6- to 8-dB rolloff above that frequency. If you are accustomed to listening to a playback system in a room that characteristically boosts certain low frequencies, and/or cuts highs, the experience of hearing "middle voices" with correct presence, clean bass and smooth but still-crisp highs—after that room has been correctly equalized—can be a thrilling rediscovery of what "hi-fi" is all about.

Individual Comment by N.E.: The pink-noise source and SPL meter technique is of course the preferred way to make best use of the EQ-2, but this device is so effective that even the most rudimentary compensation-by-ear can yield results that are audibly and demonstrably an improvement over one's previous acoustic environment. An approximation in one room of a low-frequency resonant mode prompted a lowering of that resonance via the appropriate slider channel (this happened to be for the right-hand channel), and suddenly the articulation of a massed chorus became startlingly clear where it had been blurred and indistinct before. In another test, a gross imbalance between two very dissimilar speaker systems was corrected to a greater extent than had been possible hitherto using conventional controls. There were two types of inferior source material that proved susceptible to improvement thanks to the EQ-2—one was the kind of "washed out" or "pale" sound of older record-

ings or of ineptly limited FM signals; the other was the overly beefed-up limited range kind of sound often heard in some newer recordings or, again, on FM. The EQ-2 comes mighty close to disproving the old adage of making a silk purse from a sow's ear.

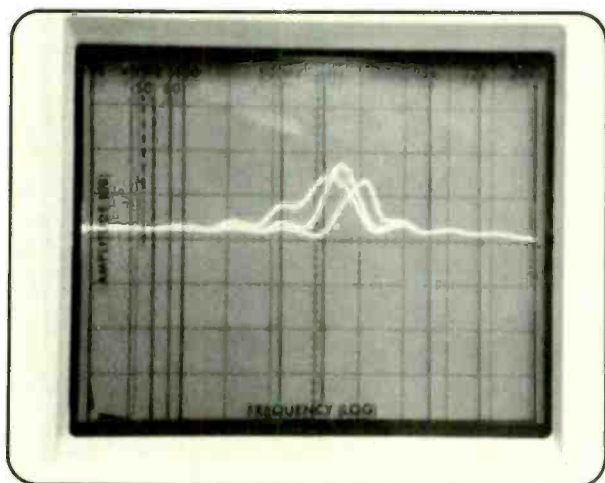


Crown EQ-2: Bottom view (above) and top view of internal wiring and layout.



CROWN EQ-2 SYNERGISTIC EQUALIZER: Vital Statistics

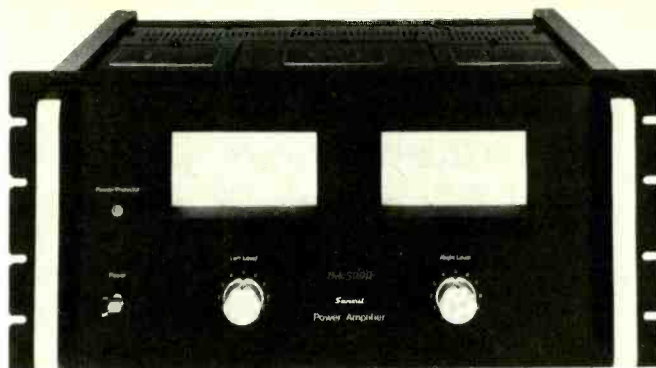
PERFORMANCE CHARACTERISTICS	LAB MEASUREMENT
Frequency response	±0.2 dB, 10 Hz to 100 kHz ±0.1 dB, 20 Hz to 20 kHz
Clipping level (before overload)	12 volts RMS
Hum and noise (below 2.5 v rated output)	-90 dB
IM (at rated output)	0.0045%
Equalizer range	±15 dB
Tone control range	±20 dB; adjustable bass turnover, 180 Hz to 1800 Hz; adjustable treble turnover, 1 kHz to 10 kHz
Input impedance	25K unbalanced; 20K balanced
Gain	unbalanced: unity; balanced: unity or 10 dB switched



Crown EQ-2: Each octave equalizer band is "tunable" over approximately one-half octave above or below its nominal center frequency.

CIRCLE 20 ON READER SERVICE CARD

Sansui BA-5000 Power Amplifier



General Description: The Sansui BA-5000 is a stereo basic or power amplifier for use with a separate preamp, or with any other device delivering a line-level or "high level" signal (rated input sensitivity for full output is 700 millivolts). The BA-5000 has its own input level controls, one for each channel. A switch at the rear may be used to convert the BA-5000 from stereo to mono, with a doubling of the output power available. The unit is housed in a rugged metal case. The front panel has handles for sliding in and out of a rack-mount or shelf. The rear also has handles which, since they are fitted with hard rubber "feet," also permit the amplifier to be rested vertically with the front panel facing up.

The front panel contains two meters that monitor the output. Each meter is calibrated in both watts (from below 0.02 to a bit over 300) and in decibels (from below -40 to +5), with zero dB corresponding to 300 watts which is the rated output per channel, both channels driven, from 20 Hz to 20 kHz with no more than 0.1% total harmonic distortion. The channel level controls are under their respective meters. Also on the front are a power on/off switch, and a power/protector indicator lamp which glows green when the amplifier is running normally, or turns red should the built-in protection circuits become activated. The panel is finished in semi-gloss black; the handles are heavy gauge bright metal, as are the end-strips that run across the top of the unit.

Inputs at the rear consist of a pair of phono jacks for right and left channels. To their left is a grounding post; at their right is the two-channel/mono mode switch. For speaker outputs on each channel there are four binding posts; in each group one is "ground" or "negative" and the other three are marked in values of output impedance: 2, 4 and 8 ohms. Between the ground and 2-ohm terminal on each channel the legend "25 V" appears. Between the two 4-ohm terminals (across the two channels) the legend "70 V" appears. These designations apply to the use of the BA-5000 in certain professional applications (as in multiple speaker sound-distribution systems) although no instructions on this subject are included in the owner's manual. Multiple speaker hookups are covered in terms of combining impedances for the optional 2, 4 or 8-ohm outputs (e.g., four 8-ohm speakers in parallel present a 2-ohm load; and so on).

Also at the rear is a convenience AC outlet, un-

switched and rated for 150 watts maximum. Dominating a large portion of the rear is a fan which is intended to come on automatically should the heat-sink temperatures reach 70 degrees (C).

The top side of the amplifier contains diagrams showing the wiring layout of the transformers, plus a block diagram of the amplifier circuitry.

The BA-5000 uses auto-transformers in each channel's output stage, which is how it can be spec'd to provide identical power outputs for different load impedances.

Test Results: In all of MR's tests, the Sansui BA-5000 exceeded its published specifications, indicating that not only is the unit "conservatively rated," but splendidly crafted, with ample margin for performance beyond its rated values which are very high to begin with. Power output exceeded the rated 300 watts by at least 25 watts before reaching the rated THD of 0.1%. In our tests (including the continuous rated power output measurements, and the FTC pre-conditioning test at 1/3 rated output), the cooling fan never had to come on, suggesting of course that the amplifier never reached 70 degrees (C). As for the protection circuits, the only way we could get them to trigger was by briefly shorting the outputs while the amp was delivering rated power. The program stopped instantly, and it returned just as quickly when the short was removed; there was no evidence of audible or physical damage.

A question was raised about the relatively low damping factor (10) which results from the use of auto-transformers in the output, but it is worth noting that the figure of 10 applies to 8-ohm loads (where the entire transformer winding is in the circuit, in series with the load). In this type of circuit, the damping factor actually goes up as lower impedances are tapped on the transformer, reaching about 15 for 4-ohm loads, and over 20 with 2-ohm loads (e.g., four 8-ohm speakers in parallel). Normally, only an amplifier with an output transformer tapped this way will accept such a load while delivering its full rated power output; transformerless amplifiers will invariably have their protection circuits triggered under such loads.

In listening tests, the BA-5000 performed in excellent fashion, providing good solid bass, an open midrange and adequate recovery from transients. Circuit construction and layout were first-rate, with over-

size parts and careful detailing. The chassis uses 2 mm-thick steel plates. Low-level circuits, such as input and driver stages, are energized from an independent dual power supply. The output transformer functions as a subsonic filter to block spurious signals (turntable rumble, or those produced by warped records, etc.) which otherwise could cause extreme speaker-cone excursion that could result in an increase in IM distortion or even in speaker damage.

General Info: BA-5000 is 19 inches wide; 8¾ inches high; 18½ inches deep. Weight is 108 pounds. May be rack-mounted. Owner's manual is thorough and well-illustrated; (printed in three languages: French, German and English). List price: \$1,300.

Individual Comment by L.F.: The use of output transformers (auto- or otherwise) may be arguable, but one thing is certain. By tapping into the auto winding to provide a perfect match between the output transistors (a total of eight per channel in the BA-5000—four in each half of the DC-coupled, complementary PNP-NPN circuit) and the auto-transformer winding (in this case, at the 2-ohm tap), an optimum impedance match is maintained between the outputs and the speaker load, be it 2, 4 or 8 ohms. And because the auto-transformer involves no high-impedance primaries (as with tube amplifiers), the usual objections to transformers—such as leakage inductance, loss of high-frequency power response, undue phase-shift and so on—do not apply here.

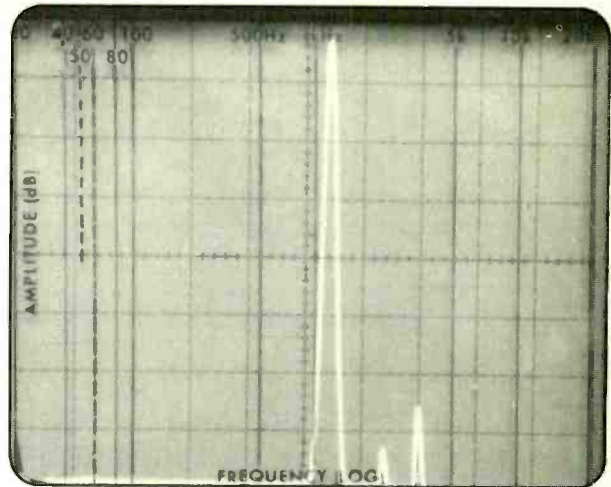
If there is one obvious disadvantage to this design approach it is the extra weight imposed by the two huge output transformers. On the other hand, the added poundage might not matter very much to anyone purchasing an ultra-reliable power amplifier that's intended for continued use day after day. Personally, in any event, with sound-reinforcement speaker quality being what it is, I'd hate to see anyone go to the expense of using this amplifier for that less-than-hi-fi application. The BA-5000 belongs in a recording studio, where its power capability and fail-safe reliability make it ideal for driving monitor speakers to the kind of distortion-free SPL levels that studio personnel and recording artists prefer. It also would do very well, of course, in a super home-installation.

To avoid possible damage (to the amplifier or to the user), I suggest that no individual try to unpack and install it alone. Get a fellow enthusiast to help lift that concentrated 108 pounds.

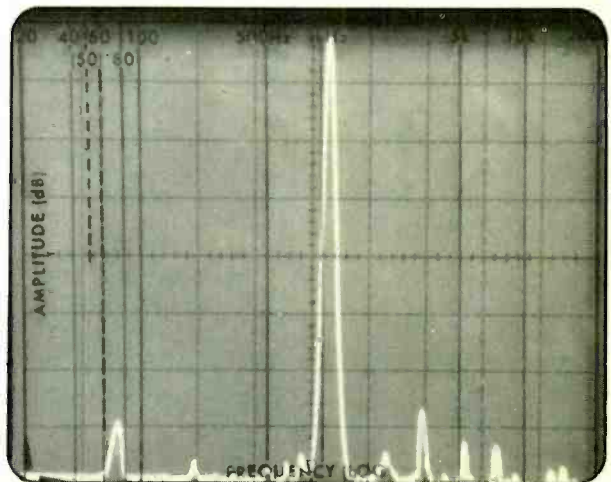
Individual Comment by N.E.: The only feature left out of the BA-5000 might be a set of wheels to move it about. Anyone have a block-and-tackle?

It might be pointed out, seriously speaking, that the BA-5000 is the flagship (and in view of its weight and bulk, this might be more than a metaphor) of the Sansui "Definition Series" of high-performing electronics which so far includes, in addition to this monster, a smaller powerhouse (the model BA 3000 rated for 170 watts per channel in stereo, or 340 watts strapped for

mono), and the CA-3000, a control preamplifier with a fairly sophisticated tone-control arrangement and front-panel meters, among other features.



Sansui BA-5000: At rated output, (300W, 1 kHz), 2nd harmonic is down 70 dB, while 3rd harmonic is down approximately 65 dB, compared to fundamental.



Sansui BA-5000: When driven beyond clipping, output includes decreasing amounts of higher order odd harmonics (primarily). "Pips" at left are hum components which develop when power supply is driven beyond its normal capacity.

SANSUI BA-5000 POWER AMPLIFIER: Vital Statistics

PERFORMANCE CHARACTERISTIC	LAB MEASUREMENT
Power output per channel (continuous, 1 kHz; 2, 4 or 8 ohms)	355 watts
Continuous power per channel (20 Hz to 20 kHz; 2, 4 or 8 ohms)	325 watts
Power bandwidth	18 Hz to 31 kHz
Frequency response	+0, -2 dB, 8 Hz to 45 kHz
Damping factor (8 ohms)	10
THD, rated output	0.02%
IM, rated output	0.09%
Hum & noise below rated output	-102 dB
Input sensitivity	620 mV
Power consumption	1,350 watts, max.

CIRCLE 17 ON READER SERVICE CARD



GROOVE VIEWS

Reviewed by:
SEDGWICK CLARK
CHAS FARREL-KIMBRELL
NAT HENTOFF
H.G. LA TORRE
STEPHEN PEEPLES
GIL PODOLINSKY
RUSSELL SHAW

POPULAR

ROBIN TROWER: *Long Misty Days*.

[Robin Trower, Geoff Emerick, producers; Geoff Emerick, engineer; recorded at Air London, London, England.] Chrysalis CHR-1107.

Performance: **Guts with taste**
Recording: **Electric**

It seems as though Robin Trower has been working toward this album for years. He's never lost the gritty style he learned from American blues and R&B men like Muddy Waters and James Brown, but it's taken him awhile to begin defining his own style after a pronounced middle-period influence by the immortal Stratocaster guitar dreamer—Jimi Hendrix.

Trower's derivation of the ethereal Hendrix style has been characterized by more than one jaded critic as overt plagiarism, but as one (not so jaded) critic fortunate to have seen Jimi Hendrix three times (each at a different phase of his abbreviated career), it's clear to me—and I daresay to Trower—that his incorporation of Hendrix styles is done out of a vast respect. It's not uncommon for a musician to idolize his teacher, and Trower learned his lessons well; what he lacks in imagination he makes up for with technique.

In some instances, Trower and his band James Dewar (bass and vocals), Bill Lordan (drums) still sound something like an evolution of the Band of Gypsies ("Same Rain Falls"),



ROBIN TROWER: Ethereal Hendrix

but in others Trower's identity begins to take on a more personal approach ("Caledonia," "Long Misty Days"). Though he's been relatively slow to develop his own distinctive style, Trower's latest effort shows he's made a lot of progress.

All but one tune, "Sailing," written by Gavin Sutherland and first recorded by Rod Stewart on *Atlantic Crossing* were written by Trower and company. More significantly, *Long Misty Days* is Trower's first co-production. With new co-producer/engineer Geoff Emerick at the board (Matthew Fisher produced the three previous Trower studio albums), the album has more of a "live" presence than any previous studio effort, especially on "Caledonia." Neither Trower or Emerick will talk about the "special technique"

used to record the band—they call it a "trade secret"—but the chemistry is in the grooves, and when all is said, what they came up with is more important than how they did it.

In any case, it's a good formula. In this album we are witnessing the slow but steady development of a guitarist still years away from his peak. Meanwhile, this reviewer values every step along the way—steps that further his limits a little more each time. S.P.

RAY BARRETTO: *Tomorrow: Barretto Live*.

[Ray Barretto, producer; Jon Fausty, engineer; recorded "live" at The Beacon Theatre, N.Y.C., N.Y.] Atlantic SD2-509.

Performance: **Honest**
Recording: **"Live" or Memorex?**

Unfortunately, no credit is given as to which mobile or recording studio was involved in this recording, for the overall presence of the performance is quite exceptional. Ray Barretto is a Latin percussionist whose blend of contemporary and latin music (salsa) has made him one of the most sought after percussionists in today's music. This double "live" record set incorporates several of his newer ideas. Forming a sixteen piece band all of whom, with the exception of the guitarist, are Latinos, Barretto experiments with jazz and rock while using salsa as a base. Musically, most of this attempt at cross-breeding is successful. Obviously, having a band comprised of Latinos helps to create the ethnic authenticity of the salsa-based approach, contrary to say, early San-



RAY BARRETTO:
An honest reproduction

tana, where only three of the six musicians had the "feel." Further, latin music seems to lend itself more easily to jazz than to rock, or at least for what's experimented with here, for the guitar, when featured, sounds totally out of place. Recording wise, this album succeeds where "live," big band type albums usually fall down. The trumpet sound seems to be a problem in most "live" recordings, especially in conjunction with brass and reeds. Normally the section mix is so spread out that you're left with the impression that everyone was in a different city—effectively canceling out the claims that the album was recorded "live." In this instance the sound is so warm and

thick that you'd swear everyone huddled around one microphone. Balance, from all instruments and the vocals, is even. The other major trumpet recording problem is that of capturing the horn as it cuts in and out within the arrangement. This can be especially glaring in the precise rhythms of latin music. Usually the initial note(s) is lost, effectively killing the emphasis of the written part. Quite often it is purposely done, for there is a tendency for the horn to come in sharp. This does occur on this record, but it is captured—adding further credence as to its "live" conception. Overall, quite an honest reproduction. G.P.

NED DOHENY: *Hard Candy*. [Steve Cropper, producer; Austin Godsey, engineer; recorded at Clover Studios, Hollywood, Ca., The Record Plant, Sausalito, Ca.] Columbia PC 34259.

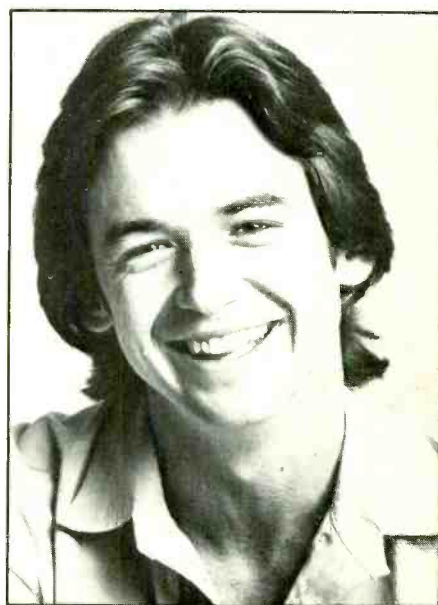
Performance: **New star on the horizon**
Recording: **Quite unexpected, actually**

This album, in many respects, is a pleasant surprise. First and foremost, Ned Doheny is gangbusters. Secondly, Steve Cropper did a damn good job producing *Hard Candy*, whereas in the past Cropper has often left me with the impression that he works at cross purposes with the artist.

The production problem we're getting out of L.A. these days is that, other than on group albums, Linda Ronstadt, Eagles Frey and Henly,

Tom Scott, David Foster et al play on every record. Consequently, everything sounds the same. They're here too, but surprise! For once their influence doesn't take over. The secret, as they say, is in the mix. Doheny has such a wide vocal range that the names singing background are shaded by his lead, creating a beautiful call and response effect.

Instrumentally, Cropper has some nice things going too. "Get It Up for Love," the lead-off tune, is a perfect example. It starts with a synthesizer introduction that fades in and out until Ned's acoustic guitar takes center stage, while the synthesizer gives way to bells and percussive instruments being slowly panned from right to left.



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CIRCLE 20 ON READER SERVICE CARD

Add the ever-present Rhodes electric piano with vibrato and volume pedal, in quick, sweeping pans throughout, criss-crossing a growling low synthesizer line. Doheny's searing vocal, very crisp, very hot, is in the dead center of the mix—on top of the guitar. Directly behind is the snare drum with echo sounding almost like a mechanical substitute. The bottom of the mix is a combination of instruments. The kick drum and bass guitar are a muffled background, almost inseparable. The synthesizer line mentioned adds body while an acoustic piano finally emerges at the end to expose the deceptively hidden remaining midrange line. To cap it all off, Cropper places synthesized strings under the vocal at the chorus and ending fade-out. Routine musical cliches which normally run amuck on albums with session musicians are pleasantly absent. It's obvious that great care goes into each arrangement, as is befitting the talents of Ned Doheny. G.P.

JESSE WINCHESTER: *Let the Rough Side Drag.* [Jesse Winchester, Marty Harris, Chuck Gray, producers; Chuck Gray, engineer; recorded at Studio Six, Montreal, Canada.] Bearsville BR 6964.

Performance: **Not his finest hour**
Recording: **Solidly simple**

Although pleasant enough, *Let the Rough Side Drag* will not be remembered as Jesse Winchester's finest hour. It's a bluesy, C&W tinged collection in which, I'm afraid, more than the rough side drags.

The basic and straightforward arrangements have been gloved in smoothly fitting recording and production techniques. No cavil with the sonics here; they are solid and quite good. But unusual in these days of electronic experimentation is the simplicity of presentation. Nearly all vocals and instrumentals emanate from dead center, and these rarely shift from well-defined front-, mid- and background areas. When such a rarity does occur as in the title song, it shines out with unmerited distinction. In "Rough Side," backup stretch notes on the pedal steel guitar become a series of short, silvery notes biding their time until the foreground vocal pauses and the instrument is subtly brought up to midground for its solo. A very fine, beautifully handled piece of electronics, but hardly as unusual as



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it appears in the context of this recording. This no spice, no exotic ingredient technical approach can probably be credited to the artist himself who, along with bassist Marty Harris and engineer Chuck Gray, cooked the disc up in the cool studio of Montreal.

One truly outstanding bit of technical artistry is the combination of Winchester's warm, easy foreground vocal with the harmonies provided by Marty Harris. The vocal blend level is perfect, the electronically subdued voice of Harris becoming a delicate reinforcing underline to Winchester's.

There really *are* some good cuts here, which unfortunately tend to get lost in the overall soporific tone of the album. Too many weak songs drain the strengths of those such as the bluesy "Step By Step" and "It Takes More Than a Hammer and Nails," both containing Paul Butterfield's sexy harmonica licks, "Brand New Tennessee Waltz" reprise, and "Blow On Chilly Wind."

A fair album, better than many on the market, but I repeat, not Winchester's cathedral.

P.W.

LINDA HARGROVE: *Just Like You.* [Pete Drake, producer; Linda Hargrove, Pam Rose, Jimmy Stroud, Pete Drake, Rex Collier and Lee Peterzell, engineers; recorded at Pete's Place, Nashville, Tenn.] Capitol ST-11564.

Performance: **Much progress**
Recording: **Good**

Hargrove has been a Drake apprentice at Pete's for more than a few years, singing backups and laying down rhythm guitar tracks on many of the studio's productions. On her solo albums she often sounded too much like a session musician on her own project. Never did the true qualities of her tough/warm songs and vocals come out.

Though Pete Drake again had a large part in her latest effort, he has this time taken some pains to provide a more credible forum for her songs by arranging them with more imagination than in the past.

Still, the backing vocals and sweetening are enough to keep *Just Like You* an arm's length from a true Linda Hargrove album. The Jordanaires may be a veteran bunch of back-up singers, but everybody in Nashville uses—and overuses—their talents.

The basic tracks are very well put together. Both Nashville vets and Drake up-and-comers are used, and the blend of energy and expertise shine on tracks like "Old Fashioned Love" and "20-20 Hindsight."

Hargrove's writing has become more consistent on this album, but more important is her development of greater vocal confidence and control, as shown on "We've Gone As Far As We Can Go." She hits clear and dynamic notes in her upper ranges, and a comparison to very early Emmylou Harris wouldn't be out of the ball park.

Just Like You contains the seeds of an independent future. Without knocking Drake, who is one of the best in Nashville and a mentor to many aspiring artists there, every step Hargrove takes toward fully advancing her musical identity will be a wise one.

S.P.

JADE WARRIOR: *Kites.* [Tony Duhig and Jon Field, producers; Tom Newman and George Chkiantz, engineers; recorded at Argonaut Studios, London, England and Island Studios, Hammersmith, England] Island ILPS 9393.

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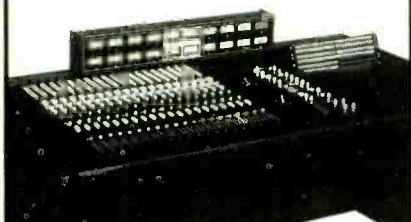
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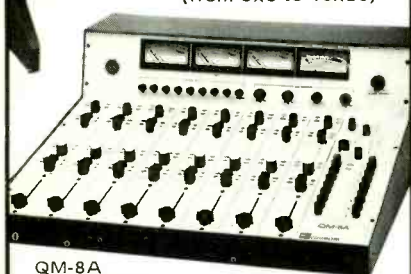
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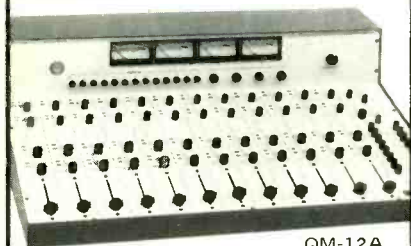
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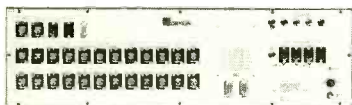


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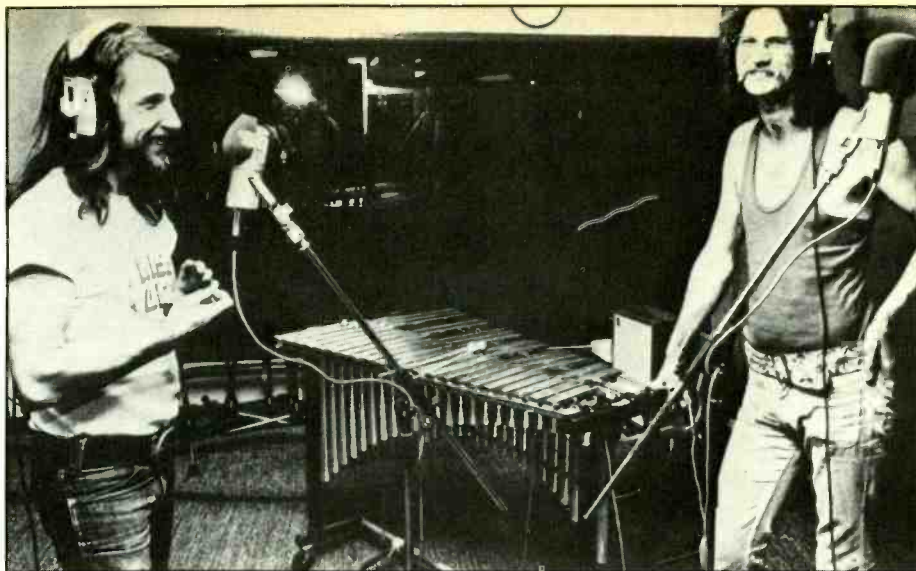
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JADE WARRIOR: A sensuous piece of craft

Performance: **Euphoric**
Recording: **Dreamy**

After sitting through more than forty minutes of these exquisite interweavings of pleasantries, the mind searches for similes to describe what it has just experienced. Generically, parts of Jade Warrior's music recall some of the early Soft Machine recordings, but Soft Machine utilized synthesizer effects more than Jade. Basically though, the aesthetics were the same; a tendency towards protracted sub-dominant notes, often in minor-key, with a major theme wavering in and out, often played on an airy instrument such as synthesizer or flute.

Basically, the plan of attack here follows that basic construct. Passing flocks of flutes, acoustic guitars and keyboards are enlisted to provide the basic melodic line, which, as befits the Oriental theme of this work, tends at times to emulate Eastern scales.

Fortunately, enjoyment of this work is quite possible for those who do not care to read and interpret the philosophical encyclical on the album jacket—the verbiage is quite incomprehensible. Threads of truth do emerge, though; it seems as though Side two is a tone poem dedicated to the dealings between warlords, peasants, monks, and other assorted heavies. The cuts are similarly named.

Side one, however, is a spacy anagram describing the flight of kites. For the sake of continuity, the work is played without interruption, the separation between the grooves being

infinitesimal. Yet a reading indicates that, indeed, the composition is divided into five parts, but due to the interwoven transitions, it becomes impossible to separate and identify them.

All this may just be fussy nitpicking; why quarrel with an enrapturing, sensuous piece of craft such as this? With a treatise of such complexity, the slightest recording intemperance could easily ruin the effect, but with the smooth integration of the various instruments and sounds, the engineers have shown marked fealty to the complicated requirements and characteristics inherent in this intricate work.

R.S.

STUFF: Stuff. [Herb Lovelle and Tommy LiPuma, producers; Jesse Henderson, Al Schmitt, Gil Markle, engineers; recorded and mixed at Longview Farm; mastered at Sterling Sound by George Marino.] Warner Bros. BS 2968.

Performance: **OK, who's the featured soloist here?**

Recording: **Clean**

There's an old adage in the record business that session musicians make terrible solo albums. What happens when you take six well-known session musicians (Eric Gale, Cornell Dupree, Richard Tee, Steve Gadd, Gordon Edwards and Christopher Parker) and incorporate them into a group? You get Stuff. Originally formed as a back-up band for Joe Cocker, here they are being featured. The result is that they're

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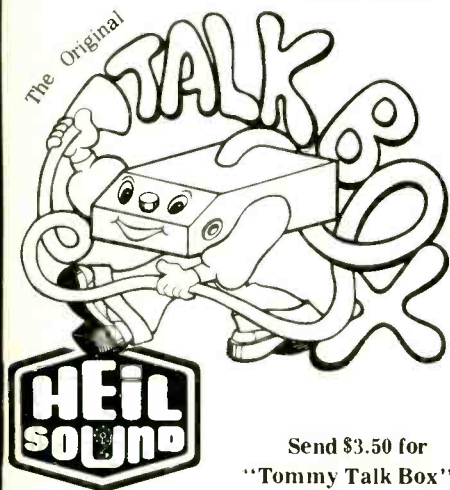
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Three Masters of Improvisation —and More

By Nat Hentoff

Musicians, like the rest of us, age at different rhythms and then, sometimes, don't seem to be their age at all. Benny Carter, for instance, had an authority way beyond his years before he was thirty. Other musicians looked up to him, came to him with their musical problems, and considered it a distinct achievement if he selected them for the bands, small combos and recording dates he commanded. And Benny's playing, from the early 1930's on, was always marked by an uncommon maturity and fullness of conception. He played what can now be called a classical jazz alto—elegant, aristocratic lines; a clear, singing tone; and a soaring beat which nonetheless cut clean and deep. Around the late 1940's, Benny disappeared into the Hollywood studios for a long time; and when he re-emerged a couple of years ago—first with singer Maria Muldaur and then on his own in some New York club dates—he was still crisp, lithely lyrical, and although just as authoritative, somehow spiritually younger in his late sixties than he had been for many years before.

On the other hand, Dizzy Gillespie, while irrepressibly brilliant during the dawning years of "bop," was still so full of pranks and chronic irreverence in the years after that he seemed younger than his age until well into the 1960's when it became overwhelmingly clear that Dizzy had become the most consistently accomplished and creative trumpet player in jazz since Louis Armstrong. The fire is still high, the wit still pungent, but the conception is now magisterial. Accordingly, hearing *Carter, Gillespie, Inc.* on Norman Granz's Pablo label is an historic event—these two classic jazzmen performing with such sustained inventiveness, incisive clarity of design, and the easeful power that comes of so many decades of the most demanding experience. The attentive accompanists for this master jazz class are Joe

Pass, guitar, Tommy Flanagan, piano, Mickey Roker, drums, and Al McKibbin, bass. The recorded sound is intimate though lively, but I would suggest you bring the volume up for maximum collective excitement.

Although Benny Carter and Dizzy Gillespie acquired a sizable jazz following fairly early in their careers, Jimmy Rowles was known mainly among musicians and lay devotees of vocal accompanists until he left the west coast studios a few years ago. Ben Webster had told me about Rowles in the 1940's ("there is a *tasty* pianist"), and then I heard him myself playing behind Peggy Lee, Tony Bennett, Sarah Vaughan and Carmen McRae, among others. It wasn't until Rowles began to play the New York club scene in 1974, however, that I realized what an extraordinarily subtle imagination, beat and color-sense he is able to orchestrate as a soloist. When, I wondered, would there be an album to fully reveal Rowles' inner scope? It now exists—*Grandpaws*, with Rowles' favorite bassist, Buster Williams, and Billy Hart on drums. The label is the aptly named Choice (245 Tilley Place, Sea Cliff, New Jersey 11579), and the engineering is marvelously and crisply balanced. This is the kind of set you'll be playing indefinitely because so much is so quietly going on. I would advise, for instance, that the second or third time around, you focus just on the big-toned, big-eared Buster Williams.

BENNY CARTER, DIZZY GILLESPIE: *Carter, Gillespie, Inc.* [Norman Granz, producer; Grover Helsley, engineer; recorded at RCA, Los Angeles, CA.] Pablo 2310-781.

JIMMY ROWLES: *Grandpaws.* [Gerry Macdonald, producer and engineer; recorded at Macdonald Studios, Sea Cliff, N.J.] Choice CRS 1014.



STUFF: Leaderless and suffering

leaderless, and the music suffers accordingly.

This is *not* a busy album. Production-wise there is little with which to work. There are no vocals, no effects of any kind, and it's hard to imagine that any overdubbing was done (or two drummers used, for that matter), for in each case the mix sounds so hollow and empty. It's even harder to imagine that six guys are playing on each track. Also, the production team should have made stronger choices in their use of original material. Using originals is nice when you have someone who can write, but when you don't, material should be selected to showcase the strengths—not the weaknesses—of the artist. The impression I have is that the recorded material is the final result of endless, low key jams, where it's hard to tell where one tune ends and another begins. Finally, the only thing that can be said about the engineering—either in defense or in favor of—is that it's clean.

G.P.

PARIS: *Big Town 2061*. [Bob Hughes, producer and engineer; recorded at Total Experience Studios, Hollywood, Ca.] Capitol ST-11560.

Performance: **Lacks identity**
Recording: **Poor**

To be charitable, the first album by Paris (guitarist Robert Welch, bassist and keyboardist Glenn Cornick, drummer Thom Mooney) was lousy. Produced and engineered by Jimmy Robertson, the midranges were missing, the top end sounded like flattened tin and the bottom seemed to have been dredged from what was left of the L.A. River. The lyrics were sophomoric and the arrangements smacked of *Led Zeppelin II*, not what most would expect from one of the most imaginative writer/guitarists to graduate from the Fleetwood Mac School of Music.

Side one of *Big Town*, Paris's second album, is little better than their first on the above-mentioned levels. Original drummer Thom Mooney was replaced by Hunt Sales (one of Soupy's progeny), which tightens the bottom somewhat, but the producer/engineer switch made little difference.

Interestingly, *Big Town's* second side shows a good deal of improvement, and some of the experimentations in their search for an identity work pretty well. There's a more economic approach to echo on cuts like "Money Love," and "Slave Trader" has the most thoughtful lyric message of anything Welch wrote for the album. The band's musicianship is more confidently displayed, but still they continue to grope.

It'll probably take another album (or two) for Paris to more fully develop this album's few successful ideas. Welch, for example, could write less and play more. Producer/engineer Hughes should continue to pull the sound out of its concrete tunnel; perhaps he should stick to one chair or the other—or neither—next time around.

S.P.

ELVIN BISHOP: *Hometown Boy Makes Good*. [Allan Blazek, producer and engineer; Bill Szymczyk, executive producer; recorded at Criteria Studios, Miami, Fla., and the Record Plant, Sausalito, Ca.] Capricorn CP 0176.

Performance: **Tight and confident**
Recording: **Clean; true to the band**

Hometown Boy has no producer's stamp on it—the album is a total Elvin Bishop Band effort, and a piece of work that everyone involved should be proud of. Each track has been crafted with a lot of care and affection, leaving a warmth and fullness that puts the album a good distance from a too-slick production.

Bishop, with about fifteen years as a player/performer behind him, has a well of experience from which he can draw for years. The Oklahoma native learned well his lessons during time

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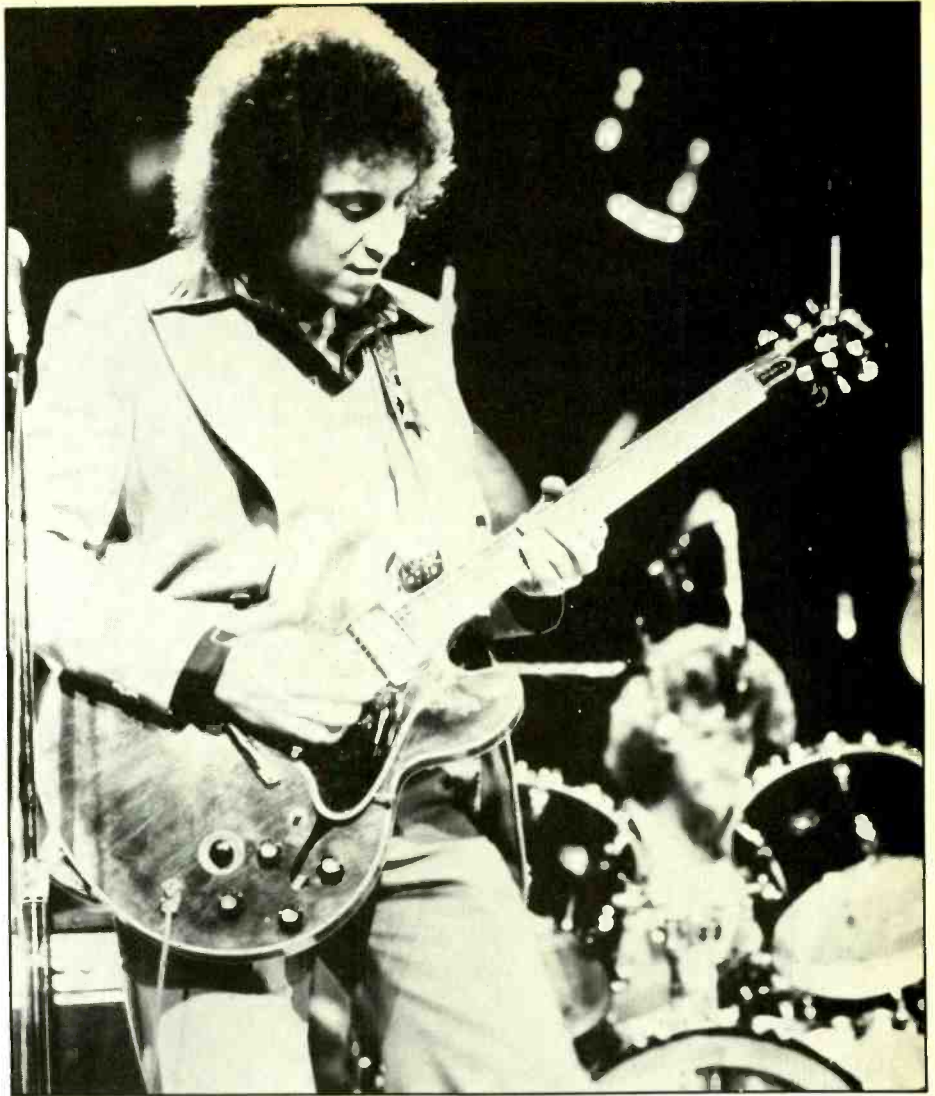
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ELVIN BISHOP: A cure for vinyl boredom

spent with Paul Butterfield's historic honkie blues band and the Muscle Shoals bunch when Boz Scaggs (among many others) played the new southern blues. Even his brain-fry days in the Bay Area taught him something.

But it wasn't until a couple of years ago that Elvin decided to quit partying twenty-four hours a day, put together a band that would lead to something and got serious about his fiery but inconsistent guitar playing.

Hometown Boy is the third release by the EBB, which hasn't had to endure constant personnel changes. *Juke Joint Jump* and *Struttin' My Stuff*, EBB's first two, were merely clues to *Hometown Boy*. The band (five players, two lead/backing vocalists) is now a well-organized and versatile bunch with diverse but now well-blended backgrounds and styles. Each track shifts focus to different ideas, all

of which work. No cereal filler—all meat.

Cases: "Sugar Dumplin'" is country funk. "Twist and Shout" is reggae/disco/funk. "Yes, Sir" is a country/jazz/blues shuffle. "Spend Some Time" is a gospel/slow-blues ballad. "Give It Up" is Oakland Funk. "Graveyard Blues" is rip-snortin', chicken-fried rock and roll. "D.C. Strut" is a little of everything. Tower of Power's horn section blows on three tracks, and they have no trouble adapting their style to the charts.

Best of all, Bishop *plays* more. Aside from his status as one of America's best slide players, his frequent but economic use of effects like echo, wah-wah, phasing and tone changes gives each passage on the album a different flavor.

Blazek's mix is near-perfect. Top, mid-range and bottom are crisp, and there is no sense of confusion even

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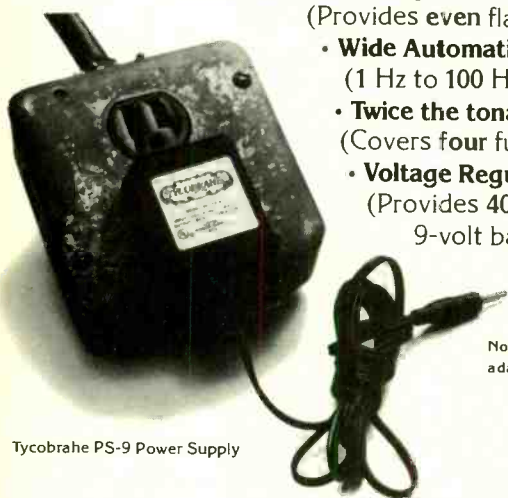
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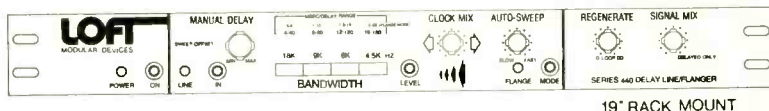
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with so many tracks in use.

It's been a while since this reviewer has heard such a strong balance of quality on so many levels. Some may find such diversity a little hard to digest at one sitting, but for most, *Hometown Boy* offers a viable cure for vinyl boredom. S.P.

JAZZ

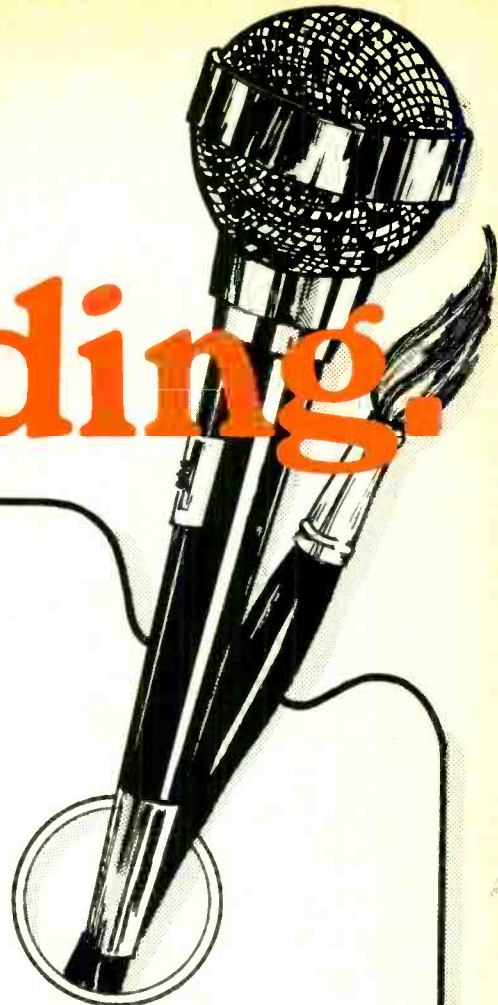
OSCAR PETERSON & JOE PASS: Porgy and Bess. [Norman Granz, producer; no engineer credited; recorded at RCA Studios, L.A., Ca.] Pablo 2310-779.

Performance: **Outdone themselves**
Recording: **Unique**

This is a rare recording in concept, production and performance. What makes this interpretation of Porgy & Bess stand out above the rest (apart from the mastery of Peterson and Pass), is their instrument selection. Approaching this basically blues-oriented work with the classical instruments of clavichord and classical guitar—while playing in a jazz vein—is novel and unexpectedly marvelous. Equally up to the task are the engineers, who unfortunately on all Pablo releases remain nameless. Both the classical guitar and the clavichord are by nature difficult instruments to record; each presents a totally different problem. The clavichord has a treblish, brittle sound with fainting projection, while the classical guitar is boomy, bass heavy and an instrument from which it is nearly impossible to eliminate the sound of fingers fretting and sliding up the fingerboard when it's being recorded. The engineer did a remarkable job in balancing the two instruments with respect to gain, while achieving true tone by leaving each instrument in its proper register.

Although I applaud the Pablo philosophy of capturing jazz in one take, leaving mistakes and not overdubbing, I do have a complaint for Pablo president/producer, Norman Granz. The highest-priced single album on the rack today is Pablo's at \$7.98 list. Although the music is some of the best jazz recorded today, that in no way excuses the terrible product and packag-

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ing. The vinyl quality is the worst, with every record warped to some extent; and the record sleeves are made from the lowest grade paper and design available. It's unfortunate that Mr. Granz doesn't take the same pride in product that Manfred Eicher does with ECM. G.P.

JEAN-LUC PONTY: *Imaginary Voyage*. [Jean-Luc Ponty, producer; Larry Hirsch, Burt Szerlip, engineers; recorded at Kendun Studios, Burbank, Ca.] Atlantic SD 18195.

Performance: **Hot jazz**
Recording: **Caught the feeling**

This is one of those albums that one listens to and is then tempted to utter that engineering isn't all that difficult. This is a very smooth recording with the level of presence being one of the best I've heard this year. It's so good you tend to take it for granted. There are no peaks, clips or dips, no overshadowing of instruments, even when solos are exchanged.

We've been saturated over the last few years with talk of combining

musical forms in terms of material, but there was never any discussion of the merging of recording methods in jazz, rock, etc. Achieving the perfect medium between the lively but flat or distant jazz recording and the hot, explosive, rock effect, this recording captures all the nuances and feelings of the music. The modern jazz violinist, Ponty and company inspire each other to create excitement on this album of original Ponty material. Each tune flows logically and consistently into the next, gaining momentum and showing diversity as it plays on. Practically without exception this album is one of the most creative, in all respects, of the year. G.P.

CLARK TERRY: *Clark Terry's Big-B-a-d-Band Live! at Buddy's Place*. [Ed Bland producer; Charles Repka, Ben Taylor, engineers; recorded "live" at Buddy's Place, N.Y.] Vanguard VSD 79373.

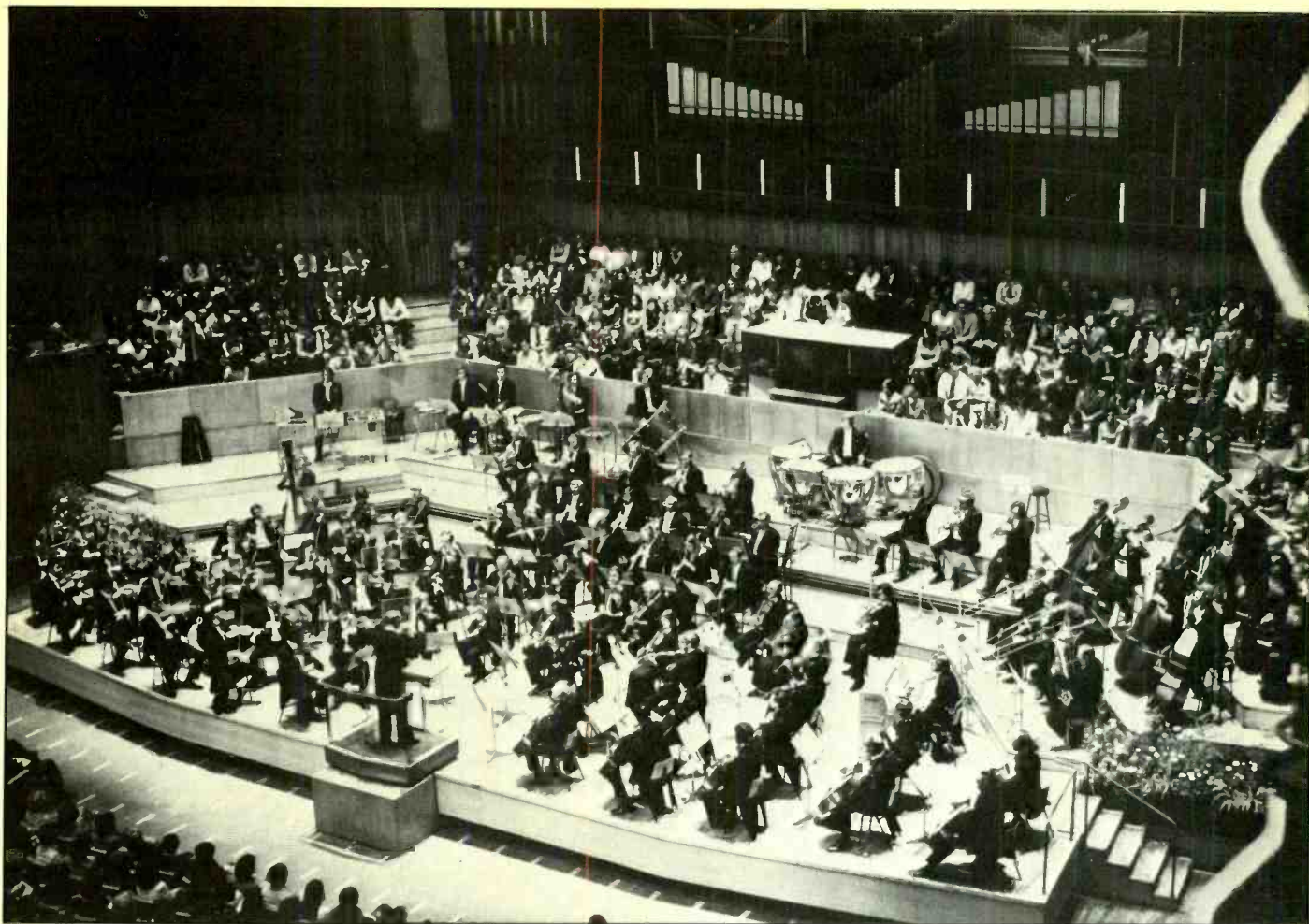
Performance: **Both named after the**
Recording: **producer—BLAND**

If it weren't for the lengthy album ti-

tle and the usual rap and applause tracks, you could never convince me that this is a "live" recording. The acoustics of Buddy's Place as portrayed by this recording are so flat and dull that you *could* convince me that all the engineers did was turn on the machines and head for the bar. I'm not suggesting that the record be mixed "hot" like in rock where there is a split second delay between initial impact and the actual recorded music to give the effect of having the music *jump* out at you, but just that there be some life to this recording other than from the audience mic. The most obvious irritation is when the horn section joins in on the refrain, contrasting the preceding solo by drowning it out with a piercing blast. The shrieking volume easily pinned the VU meters. Not all fault should lie with the engineering, however, for production and playing-wise, there is little energy expended on this outing. Everything is very polite, planned and routine, with both band and audience simply going through the motions. The engineers may have had the right idea. Maybe after a couple of drinks the album does come alive. G.P.



CLARK TERRY: Heading for the bar



HAITINK AND THE LPO: Serving Beethoven well

CLASSICAL

BEETHOVEN: *Symphonies 1-9.* London Philharmonic Orchestra, Bernard Haitink cond. [Volker Strauss, producer; recorded at Watford, London.] Philips 6747.307 (Seven discs).

Performances: **Beethoven's Beethoven**

Recordings: **Natural**

Recording quality is like Clairol: no one but the producer and engineers know for sure. For instance, Haitink's new Beethoven symphony set from Philips sounds rich and warm, but seems miked a trifle too distantly for details to properly emerge. Philips' recent Beethoven Fourth with Colin Davis and a different production team is another story—crisp and gutsy, with the mics close enough that Beethoven's deliberately rough edges are given their full due.

Ordinarily, I would have criticized Haitink's recorded sound from an *a priori* standpoint for being too homogenized and lacking impact due to the distant miking. But I heard the records soon after a pair of Carnegie Hall concerts with Haitink conducting the LPO, and although there was no Beethoven on the program, I can state with certainty that the sound quality (i.e., timbre, instrumental balances and dynamics), heard from mid- and rear-orchestra seats, which Haitink drew from his players is mirrored on these Philips discs. So even if I prefer the more detailed balance on the Davis Beethoven Fourth, I must admit that Haitink's producer has served him faithfully.

How has Haitink served Beethoven? Very well, indeed. No conductor could reasonably be expected to give completely successful performances of all these works, but Haitink is remarkably consistent on a high level throughout. The set should be particularly valuable to listeners coming to these works for the first time, rather

than the timeworn Beethovenian in search of a conductor's personal illumination of this or that detail. Haitink may rarely storm the heavens, but neither does he introduce any irksome eccentricities between listener and composer. Of the supposed "Beethoven's Beethoven" approach, Haitink is a strong recommendation.

The set is offered at seven records for the price of five. A further incentive is Philips' customarily impeccable surfaces. When was the last time *you* played a seven-record set with not a pop, tick, scratch or thump to be heard?
S.C.

MACDOWELL: *Sonata eroica*, Op. 50; *Woodland Sketches*, Op. 51. GRIF-FES: *Sonata*; IVES: *Three-page Sonata*; DETT: *In the Bottoms*. Clive Lythgoe, piano. [Werner Hellweg, producer; recorded in Holland.] Philips 9500.095 and 9500.096.

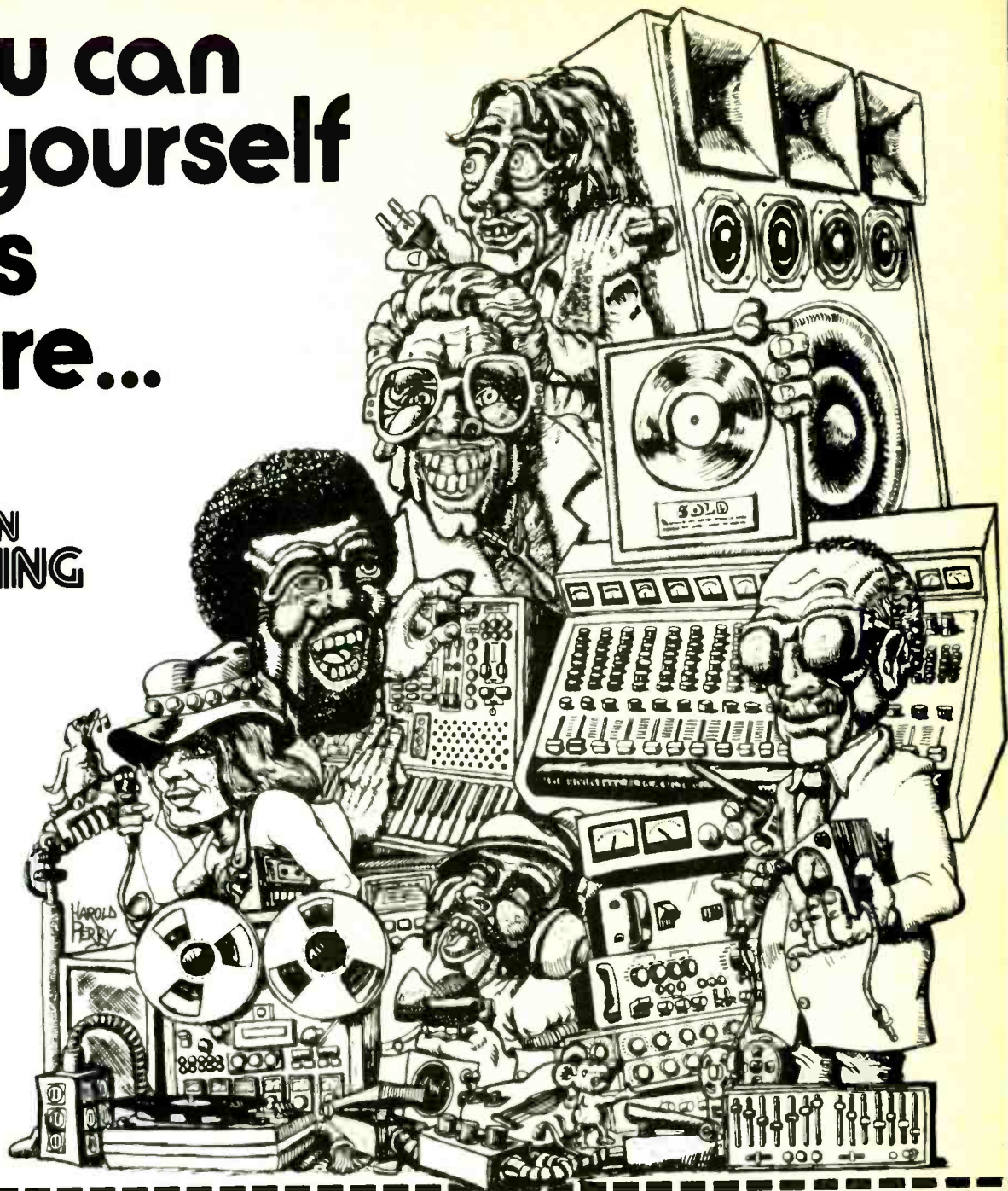
Performances: **Affectionate**
Recordings: **State of the Art**

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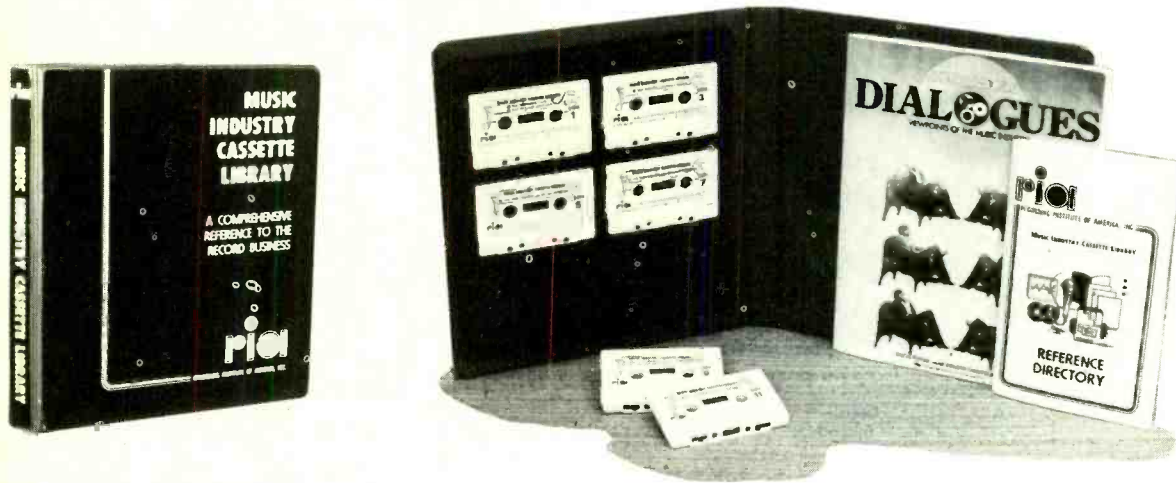
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These two records are representative of the finest piano sound on disc. A noticeable trend in solo piano recordings of recent years has been to position the mics so close that the action of the instrument and the sound of the pianist's fingers striking the keys—not to mention the sniffing, grunting and humming of such artists as Rudolf Serkin, Maurizio Pollini, Abby Simon and Glenn Gould—have been extremely obtrusive. Columbia and the Elite Recording team of Marc Aubort and Hoanna Nickrenz on Nonesuch and Vox are perhaps most culpable in this regard. London's engineers usually avoid these latter problems, but in their efforts to achieve large piano tone the instrument frequently seems so ludicrously larger-than-life that the stereo imaging clearly presents bass notes in the left channel and trebles in the right.

Phillips somehow avoids these pitfalls. Claudio Arrau, an inveterate sniffer when playing loud notes, has long received beautiful recordings from Philips which preserve his gorgeous tone with nary a snort. And although Philips has occasionally revealed the thumping mechanism of Stephen

Bishop's piano—apparently in an attempt to make his tone appear larger than it is onstage—the singing, humming and grunting that he does in concert miraculously escapes the grooves.

Now, here is another instance of a pianist being well-served by Philips. Clive Lythgoe is an Englishman who specializes in American music, and these are his first recordings. "Although originally trained as a singer," as the liner informs us, he lets his piano make the sounds. And what marvelous sound! Rich, warm, full of vibrancy, life and presence, but never so close that any extraneous noise obtrudes, the perspective is that of an "ideal" seat in an acoustically perfect hall.

Mr. Lythgoe undoubtedly loves the music on these discs and technical difficulties are no problem for him. It is possible that more straightforward less affectionate phrasing might be more appropriate for a first encounter, especially in the sonatas, but lovers of American music may be confident in their purchase of these records. Philips' surfaces were mostly fine, and Lythgoe contributes the informative liner notes. How about the two Mac-

Dowell piano concerti now, Philips—with Colin Davis conducting, perhaps?
S.C.

RIMSKY-KORSAKOFF: *Scheherazade*. Royal Philharmonic Orchestra, Leopold Stokowski cond. [Richard Mohr, producer; Christopher Parker, engineer; Anthony Salvatore, remastering engineer.] RCA ARL 1-1182.

Performance: **Sensual**
Recording: **Fine**

Stokowski first recorded Rimsky-Korsakoff's popular masterpiece for RCA with The Philadelphia Orchestra in 1927. His 1964 Phase-4 recording on London has dominated all others in the catalogue since its release, and now, twelve years later, here is yet another *Scheherazade* from the 94-year-old maestro.

The new performance differs in many details from the 1964 reading, yet still retains Stokowski's uniquely succulent, ultra-sensual view of this crusty warhorse, bringing it to life as no other conductor today seems either willing or able to do. Haitink's musicianly "symphonic suite" approach on Philips, generally considered the best younger-generation performance in the catalogue, sounds like a different piece of music after Stokowski's juicy wide-screen interpretation.

This time around, Rimsky's score is more closely adhered to, especially in regard to quiet string dynamics, although he still adds cymbals, tam-tams, harp glissandos, xylophones and the like to the composer's already luminous orchestration. The phrasing, quite different than in 1964, is always spontaneous and within the bounds of acceptability—although it would never do for a Brahms symphony.

If pressed, I would opt for London's rich Phase-4 sonics; the 20-channel pick-up unearths more instrumental detail and color than any other recording, and Stokowski at 82 could understandably get more precise playing from an orchestra. But the RCA recording is still worth owning, and might have been indispensable if the 1927 Philadelphia recording had been released as well—a follow-up to the company's inspired pairing of Stokowski's 1927 and 1973 recordings of Dvorak's "New World" Symphony.
S.C.

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INDIGENOUS

FRANK ZAPPA: *Zoot Ailures*. [Frank Zappa, producer; Michael Braunstein and Davey Moire, engineers; recorded at the Record Plant, L.A., Ca., except for "Black Napkins," "Live" in Osaka, Japan.] Warner Brothers ES 2970.

Performance: **Definitively irreverent**
Recording: **Captures the essence**

It is good to hear Mr. Zappa playing music again. Not that there hasn't been and will always be a market for Frank's gauche barbs on society's foibles, but those efforts which accentuated his satirical wit rather than his considerable musical virtuosity left one with the inescapable feeling that the performer was goofing off.

Zappa's best work, however, has always been the symbiotic interweav-



ing of sarcasm with instrumental finesse. This record is most assuredly a workable merging of Zappa's two main strengths—socio-literary and definitely individualistic philosophy of arranging. The result is a package of high quality.

Zappa's acid pen spares us no mercy throughout. On various cuts, we are treated to encyclicals describing the advantages of those \$69.95 mechanical love dolls, told how to stimulate a woman to ecstasy, treated to a view of shallow values prevalent among the disco culture, and given a looksee into the world of a barfing wino. Mean-

while, the lighthearted and often zany combination of instruments produce enough minor chords and truncated rhythms to add the required input of tonal goof to the verbal inanities.

Despite the frequent prevalence of funnier numbers, listeners are fortunate in having here two tracks which are vintage Frank Zappa, guitar player. The most representative of these is without doubt "Black Napkins," a bluesy number recorded "live" in Osaka, Japan about a year ago. Frank's ride, a string-bending cruise up the frets, is captured with fidelity, and with the absence of post-track applause, could pass as a studio cut.

The other material, recorded at the Record Plant, is virtually flawless. As with most Zappa epics, the narrative is occasionally undermixed, and tinkertoym gimmicks, such as the Mickey Mouse-sounding vocal, rear their head. Yet before such antics are attacked as juvenile, one must consider the source—the zany Mr. Zappa. R.S.

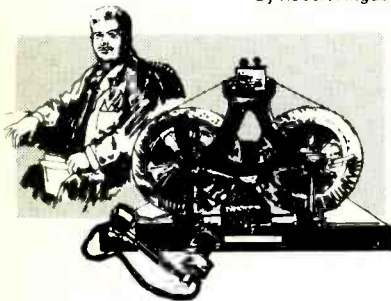


FRANK ZAPPA: Sparing us no mercy

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Mr. Skrotsky will be presented with the "studio" "on or about January 10, 1977." Word has it that lucky Skrotsky doesn't read Modern Recording, but perhaps we can send him a subscription free of charge so that he'll be able to tame all those goodies he now owns.

Good Luck Robert W. Skrotsky!

Advertiser's Index

Reader Service #	Advertiser	Page #
76	Acoustic Control	79
21	Appalachia Sound	92
36	Arp	11
No #	Sam Ash	94
28	Ashly	46
67	Audio Techniques	76
No #	BASF	1
50	BGW	57
77	BSC	24
No #	Bose	12
78	Carvin	25
62	Community Light & Sound	5
95	Crown	15
40	DBX	14
48	DiMarzio	77
58	Discwasher	Cov. II
60	Dokorder	81
74	Electro Voice	43
64	Express Sound	35
82	Fuji	55
87	Heath	6
71	Heil	82
38	Ibanez	44
79	Infitheatre	13
89	Interface	8
85	JVC	13
81	Loft	86
No #	Lux	24
86	MXR	51
24	Martin	61
84	Maxell	17
30	Morley	36
98	Norlin	21
26	Orban/Parasound	20
88	Otari	39
73	PAIA	82
52	Peavey	45
91	Quantum	80
69	RIA	87
No #	Recordist Pro Shop	91
72	Revox	53
No #	Rustang	94
90	Russound	12
92	SAE	2
80	Sansui	23
No #	Sennheiser	34
No #	Shaeffer	75
No #	Songwriter	78
32	Sony America	16
34	Sound Workshop	18
94	Soundcraft	37
75	Steiner/Parker	15
68	Sunn	59
54	Superscope	96 & Cov. III
46	TDK	9
93	Tangent	22
20	Tapco	76
44	Teac	19
97	Teac	47
70	Technics	Cov. IV
66	Texas Audio	7
96	Tycobrahe	85
22	Whirlwind	38
83	White	86

(continued from page 8)

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We Stand Corrected

Thank you for the nice review of "Turning Toward the Morning" which we received the other day (MR Aug/Sept. '76). Looks as though *Modern Recording* is a magazine we ought to subscribe to.

Not that they matter very much, but there were a few bits of misinformation in the article. I probably wouldn't even mention them, but for the fact that the magazine is devoted to recording information. So—just for the record (no pun intended):

We did not move the barn. The entire house was a barn for a hundred years before it was remodeled by a man named Metz in 1939. He made it into a short-lived music school as a sort of personal philanthropy.

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Again, thanks for the good review, and please look at all of the above technical info as nothing more than a plug for Studer and Charlie Fisher.

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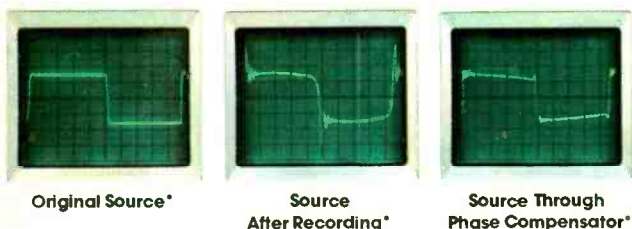
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And when you look at our price performance relationship it's easy to see why your next receiver should be a Technics.

Of course, we want you to listen to our receivers. Especially since all six have the reserve power to float through complex musical passages with a minimum of distortion and clipping. And they all have rugged transformers. Bridged rectifiers. As well as high-capacitance filtering.

Play a record. You'll hear it the way it was recorded. Quietly and with greater dynamic range. Because we use an overload-resistant 3-stage IC in the phono equalizer sections.

Tune in an FM station. Even a weak one. In addition to hearing all the music, you'll also get increased stereo separation. Negligible distortion. And a minimum of noise. Thanks to flat group delay filters and Phase Locked Loop IC's in the tuner sections.

So if you'd like to know a simple way to discover just some of the reasons why a Technics receiver is so good... it's as easy as PPR.

All cabinetry simulated wood.

Technics

by Panasonic



CIRCLE 70 ON READER SERVICE CARD