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AUDIO

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PRESTIGE RECORDS'
BOB WEINSTOCK**

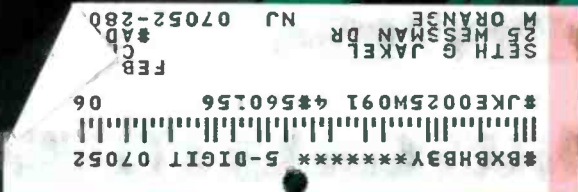
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AUGUST 1994

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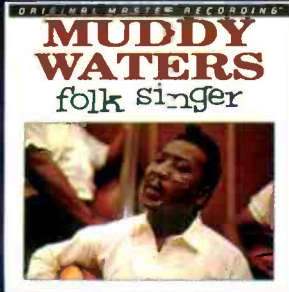
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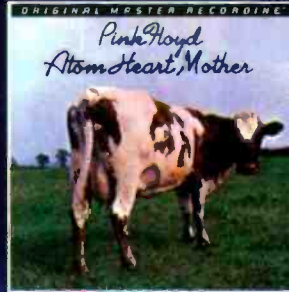
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UDCD 593



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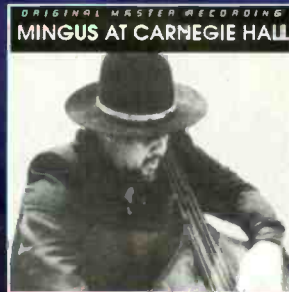
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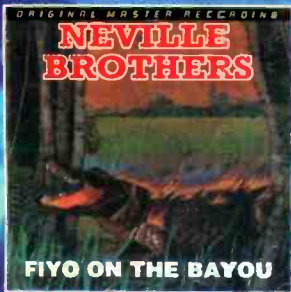
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UDCD 599



UDCD 600



UDCD 602



UDCD 603



UDCD 604



UDCD 606

NEW RELEASE



UDCD 605

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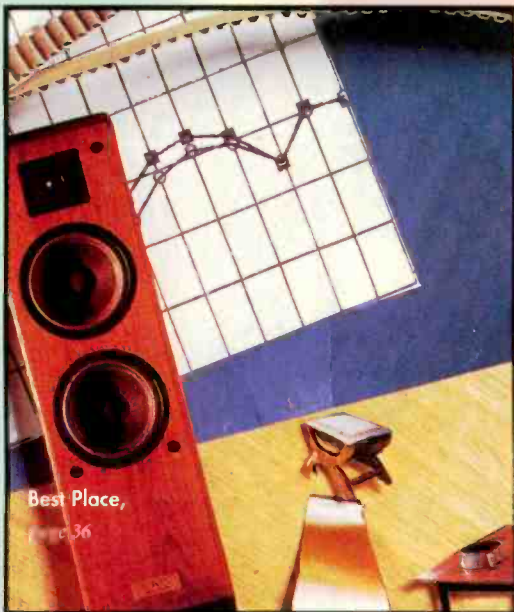


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features

- THE AUDIO INTERVIEW: BOB WEINSTOCK James Rozzi 30
- THE BEST PLACE FOR YOUR SPEAKERS?
YOUR COMPUTER KNOWS! Roy Allison 36

equipment profiles

- ACOUSTIC RESEARCH LIMITED
MODEL 2 PREAMP Bascom H. King 42
- EPOS ES11 SPEAKER D. B. Keele, Jr. 48
- AUDIOCONTROL C-101 SERIES III
EQUALIZER/ANALYZER Edward J. Foster 54

auricles

- SONANCE 2120 AMPLIFIER Edward J. Foster 60
- ALPHA-CORE GOERTZ MI 1 & MI 2
SPEAKER CABLES Fred E. Davis 64
- TERK LEAPFROG REMOTE-CONTROL
EXTENDER Anthony H. Cordesman 65

departments

- FAST FORE-WORD Eugene Pitts III 4
- SIGNALS & NOISE 6
- WHAT'S NEW 10
- AUDIO ETC Edward Tatnall Canby. 14
- CURRENTS John Eargle 17
- SPECTRUM Ivan Berger 20
- AUDIOCLINIC Joseph Giovanelli 24

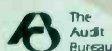
recordings

- CLASSICAL 66
- ROCK/POP 70
- JAZZ & BLUES 74

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Model 2 preamp

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What's New,
page 10

Spectrum,
page 20



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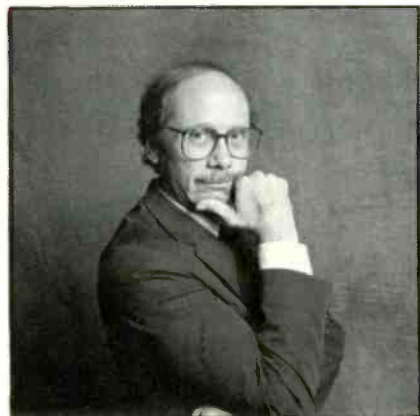
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Most magazines do research on their readers' opinions about magazine contents on a fairly regular basis. We are no exception. We do this to keep track of what you really want us to do between the covers and not just depend on editorial intuition or letters and phone calls. Several sorts of research can be done; we've just done two studies—one using focus groups on subscribers versus former subscribers and the other a mail survey. Since we learned and relearned some things that were important to me, I thought they might be interesting to you.

Our two focus groups each had 10 people in a room with a moderator who asked questions and kept a discussion going. The survey was an nth-name type performed by an outside specialist and it got what I'm told is a "fine" response rate.

The biggest "fact" to come out of the studies was that you readers want lots of equipment coverage, even more if we can find ways to put more "Equipment Profiles" into the magazine. (We're working on that, not incidentally.) This section of the magazine was ranked Number 1. While it was not a surprise to me that all other columns and sections were in second place, it both surprised and pleased me how strongly our "Profiles" dominated the rankings. It might be said that nothing else did better than third place. The reason I am happy with this is that I have long been convinced that our "Profiles" are the heart of this magazine and are the basic reason you buy *Audio*.

There are three sorts of equipment you most want reviewed and you are pretty definite about their relative importance—speakers are by far the most important, with amps second, and preamps trailing.

Second on the list of editorial favorites was the "Audioclinic" column, which placed higher up than I had anticipated. Even though the "Auricles" column does cover equipment, its rank was essentially equaled by our letters column, "Signals & Noise"; Edward Tatnall Canby's opinion column, "Audio ETC," and our pop/rock record column.

On the survey, the popular types of feature articles were ones on new technologies, basic electronic and sound theory, hints and tips for better sound, listening room design, and the history of high fidelity. Some in the focus groups expressed an almost nostalgic desire to see us return to publishing big construction articles. While quality you-build-it articles have been tough to get, we are working on an amplifier construction piece that should run shortly. Let me know how you like it.

Herewith is the first entry in Dr. Pitts' Fractured Dictionary: Alternative Physics, that branch of non-science wherein magic is performed with much arm waving in front of lots of mirrors in the midst of many clouds of blown smoke for the satisfaction of the electronically disadvantaged from whom pieces of green paper are extracted; said to take place in other universes; no feat of alternative physics has yet been verified by blind testing in this universe; greatness of the feats in direct ratio to the number of extracted pieces of green paper; termed "alternative" because its principles, when known and not "proprietary," do not match those of other practioners of alternative physics or those of standard science in this universe.

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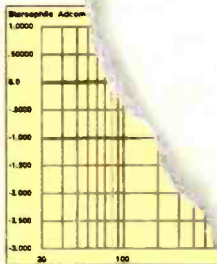


Fig. 1 Adcom GDA-600, frequency response (top); de-emphasis error channel dashed, 0.5dB/div.

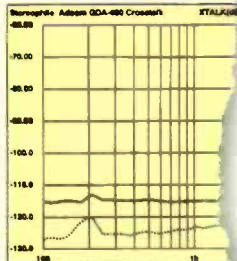


Fig. 2 Adcom GDA-600, cross-talk (top); dashed, 10dB/vertical div.

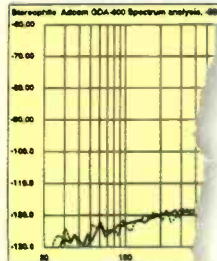


Fig. 3 Adcom GDA-600, 1kHz tone at -90dB; spurious (1/2-octave dashed).

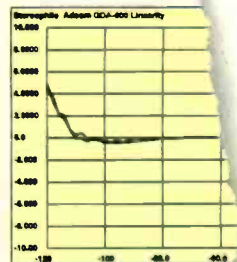


Fig. 4 Adcom GDA-600, dynamic range linearity (right channel); 2dB/vertical div.

“Nothing less than a steal.”

—Robert Harley, *Stereophile*

There's something in this review of our GDA-600 digital-to-analog converter that the competition doesn't want you to see. Maybe it's the fact that the GDA-600 makes digital formats sound richer and more musical. Or that it has advanced 20 bit conversion architecture and a Class "A" analog output stage. But what they really don't want you to see is that the GDA-600 costs much less than you might expect. For the full review see *Stereophile*, Volume 17, No. 3, (March '94). Or, if your copy has been stolen, give us a call.

ADCOM[®]

details you can hear



More Reflections on Mr. Hi-Fi

Dear Editor:

I read of Leonard Feldman's death with great sadness. I met him on two different occasions in Washington and heard him speak with great passion on audio and video topics. His passion mirrored my own.

I first met him at Audio Associates in 1986, at a seminar he gave on digital audio. After lecturing and answering questions, he reached into his jacket pocket with a twinkle in his eye and produced what looked like a miniature video cassette. It was a DAT and pretty much took everyone by surprise since DAT was not on the front burner of the audio world at that time. Len was genuinely excited about the prospect of a new digital tape technology.

When it was time for the door prize, lo and behold, my name was called out, and I went up to receive my prize and shook Len's hand. It was a very enjoyable evening.

The second, and last time, I saw Len Feldman was at an audio show in a hotel in the Tysons Corner area of Virginia. The show was wonderful, but what really took the cake was the debate and discussion between various speaker manufacturers, mediated by Len.

He was a great speaker who could really hold an audience's attention. He loved audio and it showed. I will miss him and his lectures. Len, may you live forever in "Audio Heaven." We will never forget you.

*Claude A. Whiting
Centreville, Va.*

Dear Editor:

I have always admired Leonard Feldman. My admiration only increased when he testified to Congress about the shortcomings of the CBS "notch" encoding technique for records. That took guts, especially since he was writing for *Audio* when it was owned by CBS.

I also admired the way he kept up on advances in technology and learned the nuances in such great depth. He was able to explain them in a way that was always very easy to understand.

Anyone who writes well soon realizes how difficult it is. To maintain a high level of integrity, honesty, and technical precision the way he did is truly amazing. I have read many technical articles in my life and have learned to interpret what is said and, even more important, what is not said. When I read Leonard Feldman's writing, I didn't strain to find out what I wanted to know. His writing was obviously not intended to be flashy or controversial, but to convey information. Most writers don't realize the constraints of editorial space limitations and therefore will never completely realize how much information he was able to pack into so few words.

I thank him for the wealth of information that I took from his writings.

*Ed Long
Oakland, Cal.*

Editor's Note: Mr. Long is a Contributing Editor to *Audio*.

Dear Editor,

I just heard, from Ken Pohlmann, the sad news of Len Feldman's recent death. It is a true loss to your fine publication and the fraternity of audio journalists.

I first met Len while I was at Clarion and came to appreciate his expertise and perspective. But most significantly, he gained my respect for the wonderful way in which he conducted himself.

The last time I saw him was the summer of 1989, when he represented *Audio* at the Lexus LS400 long-lead press conference held for audio publications. I felt a great deal of pride for the job we had done with the Nakamichi and Pioneer audio systems when Len paid his very high complements.

Best wishes for your magazine. It is an interesting and valuable reference on all aspects of "enthusiast-level" audio. Also, we were very pleased with Ivan Berger's "Roadsigns" column (February 1994) on the new Lexus GS 300.

*Fred M. Deutsch
Audio & Electronics Planning Mgr./Toyota
Torrance, Cal.*

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Ageless and Priceless "Reality Lessons"

Dear Editor:

I just read Edward Tatnall Canby's "Audio ETC" (December 1993) and want to share a couple of thoughts. In 1957 when I was a student newly bitten by the audio bug, I opened a hi-fi store that I operated part-time while in graduate school. It was the only hi-fi shop within a hundred mile radius of our town in the Missouri Ozarks.

At one point I wrote a letter to Mr. Canby who I imagined as an ancient, wizened Au-

dio Master. I probably sought his opinion on the purity of my Marantz Model 9 amplifiers; whether I should get a second Capps condenser microphone to make stereo recordings on the Concertone tape recorder; did he think the new AR speakers beat the Bozaks; the Scott tuner, etc. I am embarrassed to remember the beseeching tone of all this but it was true.

Mr. Canby graciously answered my letter with no less than two pages of handwritten comments addressing my many questions. I was honored and re-read the letter many

**EACH MAN MUST SEARCH
FOR HIS HOLY GRAIL;
FOR SOME OF US,
HI-FI PROVIDES
A VULGAR SUBSTITUTE.**

times. It was saved in an old trunk in the basement until destroyed by water from a leaking faucet some 10 years ago. The letter is gone but I remember Mr. Canby's closing comment exactly: "Each man must search for his Holy Grail; for some of us, High Fidelity provides a vulgar substitute."

You see, Mr. Canby was giving "Reality Lessons" back in 1957 too! It is marvelous that he continues to produce articles that inform, entertain, and instruct. And how is it that I have progressed from a callow youth to the edge of old farhood and Edward Tatnall Canby has apparently not aged?

Charless W. Fowlkes
Bozeman, Mont.

Coverlines or Coverlies?

Dear Editor:

On the cover of the December, 1993 issue, it says in quotes, "I'd sell my Mercedes to buy Quicksilver's M135 tube amp." Bascom H. King did *not* say that.

A fellow reviewer said (as a suggestion to Mr. King) and I am taking the quote from page 64, "Sell the Mercedes and the wife's mink coat...; go out and buy yourself a pair of M135s, forget about amplifiers, and simply enjoy the music."

Mr. Pitts, the quote you printed on the cover is *not true*. Besides, your editorial philosophy has been that all amps sound the same, or else so much alike that no one can pass a double blind listening test.

Not only have you been printing false information, but now you are printing untruths on the cover. What next? (You have my permission to print this letter if you have the courage.)

Tony Mauldin
Lewisville, Tex.

The Editor-in-Chief replies: Ever hear the phrase—close enough for government work?

AUDIO/AUGUST 1994

8

Discover Boxless Theater!

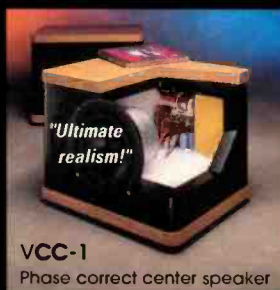
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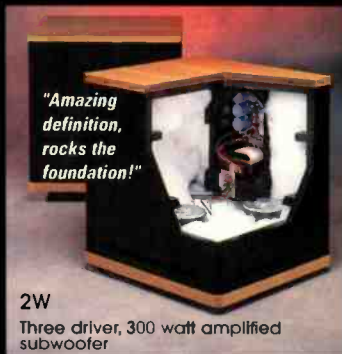
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This miniature headphone amp not only uses tubes but has a transformerless, Class-A output

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For literature, circle No. 100



Chase Surround Decoder

Completely passive, the Chase HTS-1 decoder has no built-in amplifiers but redistributes the power from your system's amps. Its switching and inputs allow it

to be used with systems having anywhere from two to five channels of amplification, and it can derive surround ambience from most surround formats. Price: \$99.95

For literature, circle No. 101

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to 20 kHz. Tiny microphones in the headset sense ambient low-frequency noise and transmit it to a pocket-sized controller; the controller feeds equivalent noise signals, in opposite phase, to the earphones, where the two noises cancel. A two-pin adapter is included for airline use. Price: \$299.99.

For literature, circle No. 102



built-in speakers include all three front channels plus two 10-inch subwoofers; two rear satellite speakers are supplied as well. The cabinet can hold up to a 35-inch TV plus four other A/V components;

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side compartments can hold video or audio discs or tapes. Dimensions are 57 1/2 in. H x 52 1/2 in. W x 19 in. D. Price: \$999.

For literature, circle No. 103



B & O Compact Music System

So highly automated that its doors open when a hand approaches them, Bang & Olufsen's Beosound 2000 is only four inches thick and can be wall-mounted. Other automatic functions include synchronous recording from CDs, automatic record level, 30 AM and FM station presets, and a "Start/Go" button to rewind and play a tape

in one action. All active buttons are illuminated in each operating mode. The system's handle doubles as an active FM antenna. The speakers are self-amplified, with electronic crossovers and Adaptive Bass Linearization; grilles are available in four colors. Prices: \$1,595, including remote control and table stand; wall bracket, \$25.

For literature, circle No. 104

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size."



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WHAT'S NEW

Avalon Speaker

Avalon's Monitor two-way system has a front baffle 3 inches thick, to minimize vibration. The 1-inch tweeter has a titanium dome, while the 7-inch, long-throw woofer's cone is a Nomex/Kevlar composite. Rated anechoic response is 60 Hz to 24 kHz, ± 1.5 dB; in rooms, its -3 dB point is below 48 Hz. The speaker is 18 inches tall (42 inches, with optional stand), 8½ inches wide and 10½ inches deep, and weighs 31 lbs. (53 lbs. with stand). Prices: Speakers, \$2,695 per pair; stands, \$340 per pair. For literature, circle No. 105



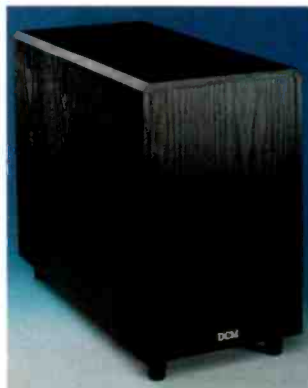
Hubbell Speaker

The aspect of the HS542 that Hubbell Sound Systems talks most about is its crossover. Its tweeter and mid-bass crossover components are physically separated to prevent crosstalk or other interactions, and only such parts as poly capacitors, non-inductive resistors, air-cored inductors, and Straight Wire cabling are used. The crossover and the drivers' roll-offs combine to produce a third-order Butterworth characteristic with a crossover point of 3 kHz. Price: \$799 per pair. For literature, circle No. 106



DCM Subwoofer

The DCM Sub-710 is a compact subwoofer with 50 watts of amplification built in. The drivers are two 6½-inch woofers, and frequency range is rated as 32 to 80 Hz. Price: \$399. For literature, circle No. 107



Hoffman Classic Audio Loudspeaker

This loudspeaker looks like a violin because it is one, transformed by Hoffman Classic Audio into the Violin Speaker. The 1-inch, fabric-dome tweeter and 4½-inch, polymer-cone woofer give it a rated frequency response of 60 Hz to 20 kHz, ± 2 dB. Sensitivity is 88 dB, and impedance is 6 ohms. Price: \$1,800.

For literature, circle No. 109

RCA Video Acoustics In-Wall Surround Speaker

The Video Acoustics VA-2200, from RCA, is one of the few in-wall speakers with the image diffraction recommended for surround channels. Each system's 5½-inch woofer fires directly into the room, while its 3½-inch midrange and 1-inch tweeter fire into an angled reflector. Power handling is 120 watts. The molded enclosure can be mounted to wall studs to reduce wall vibrations. Price: \$549/pair. For literature, circle No. 108



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EDWARD TATNALL CANBY

BOULEVARD OF BROKEN BRAHMS

What ever happened to the search for that elusive 1889 Edison cylinder of Johannes Brahms playing his own music and (perhaps) speaking his own name? Since the February issue, my last mention of it, a prodigious amount of information has indeed come my way concerning this minute bit of ancient audio. Progress has gone on apace—

that very reason its history, in this age of advanced digital restorations, is far from over.

It has been a fascinating exploration for me during these numerous months. The more information that comes in, the more astonishing

Coifman and other Yale University specialists. (See September 1993.) This enterprise is not yet definitive, and so I will be a clam myself until more news comes in.

I have also heard of assorted restorations on LP (always with other material, necessarily), but the outstanding U.S. source for most of the "sightings" and hearings reported to us was released in 1977, non-digital, by the International Piano Archive (IPA) in New York. This restoration—the sound still mostly unintelligible—is likely to be found in many archives, libraries, and radio stations and is surely our major source in this country.

All of these, alas, stem not from the original cylinder but from a set of archival acetate-disc copies made from the cylinder in 1935 in Berlin, including a long-missing limited pressing. There were evidently numerous trial attempts at that time, with considerable well-meant doctoring of the sound afterwards—hence, almost certainly, some of the distortions now heard by listeners.

There is astonishing confusion over the details of that 1935 operation.

(There may or

may not have been the broadcast often mentioned.) But it is known that the copies were produced by

playing the cylinder on an old acoustic machine and then recording the resulting sound via microphone! Shades of a recent

similar operation by an English CD label.

Then there are the London discs, apparently from the same source, discovered not far back in an English archive, wholly unidentified. (The English, I might observe, are well known for not cataloging their collections.) These were left in the

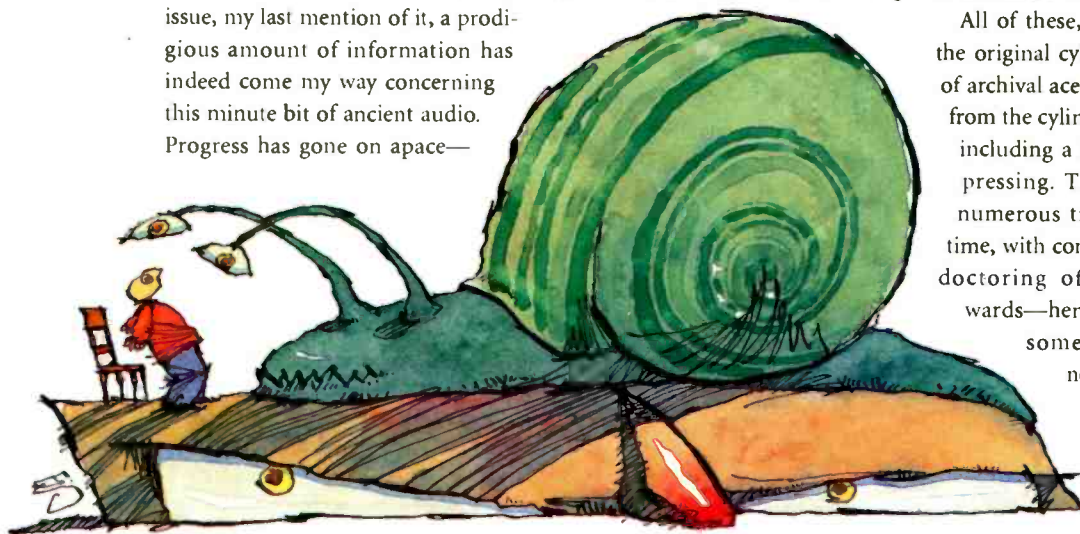
by which I mean, unfortunately, at a snail's pace. We have been the victim of a common disease today called Anti-Communication, much like antimatter: Those noxious segments of the Information Superhighway that inspire near-total bottlenecks in rapid data transmission! A vast spate of letters, for instance, mailed to me after the February issue, reached me more than eight weeks later. Say no more. You get me. My snails have been unusually slow this year. Probably the weather.

And yet this little one-minute sonic episode, the oldest piano recording extant today and the only one by the famous composer, is of considerable historic importance, the more so because in its existing forms it is almost unintelligible. For

are the ramifications, the contradictions, the unanswered questions, the "clamshell" silences (often understandable)—all of which mingle inextricably with the lil' snails. Seafood galore!

Remarkably, at this point the recording, after more than a hundred years, is actively "under development" via the latest state-of-the-art digital analysis, and this is not the first such treatment. Another was published in Vienna, in 1983, in the form of a 45-rpm EP disc. The 1994 treatment, as you may guess, is using the new approach of Yale math Prof. Ronald

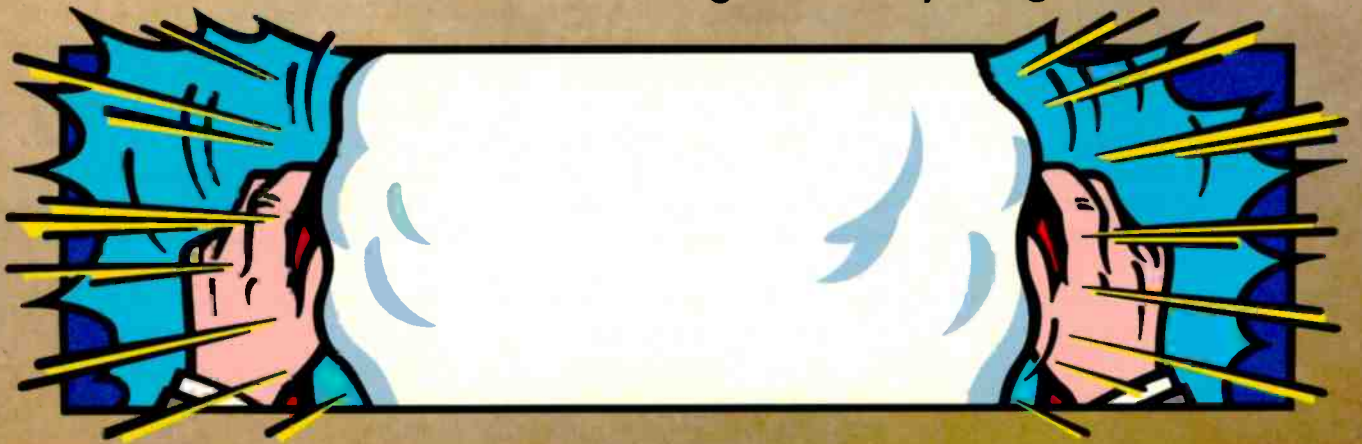
**THIS SONIC EPISODE
IS OF CONSIDERABLE
IMPORTANCE, THE MORE
SO BECAUSE IT IS
ALMOST UNINTELLIGIBLE.**





(airbag control)

You don't have time to brace yourself, much less think.
Meanwhile, it's thought of everything.



It happens so fast. How can an airbag trigger so suddenly? Let's just say it's the moment our little black boxes have been waiting for all their lives. **Delco Electronics**

will of the man who put out the pressing from the 1935 copies—he was president of the company, Lindström, and probably was on hand for the actual Berlin procedure. He later moved to England; speculation says these might be trial runs for the Berlin copying, carried away by him at the time. Were they? Nobody knows.

All of today's available versions of the recording come from one or another of these London discoveries, if I am right, and that includes specifically the 1983 Vienna 45 release. However, few of the other existing versions indicate a source, and here come the clams. The IPA LP made in New York says it is derived from "a tape." Tape of *what*? This is an old clam; there are much newer ones too. (IPA is now relocated as IPAM at the University of Maryland.)

But what of the cylinder itself, the Edison original? It has never been lost. It is alive, though not well, in Berlin today, where it has remained since it arrived there in 1935—assuming it is indeed the same cylinder! More on that later.

Something went wrong at the actual recording session in 1889 at the home of the Fellingings, Viennese friends of Brahms. The composer, several accounts agree, was very nervous about the whole thing and apparently started playing before the machine was ready—it was "misaligned," whatever that might mean. He would not make a second recording with the machine correctly set up (this poses some nice mechanical mysteries), and so the Edison operator, one Theo Wangemann, left the cylinder with the family. (Interim mystery: If Brahms started playing too soon, why is there an announcement on the cylinder that was apparently made by the very man who did the setting up, Theo Wangemann?) The Fellingings kept the cylinder for many years and often played it (i.e., it may have been faulty, but it did play).

There is a large blur in the cylinder's history at this point, almost 40 years, until it was somehow taken to the Berlin archive in 1935. The disc copies were made at that time as an archival precaution and as a gallant attempt at state-of-the-art (!) 1935 restoration. A man named Fritz Bose, probably not related to our Amar Bose, was the expert in charge. It was he who decided to use an old acoustic player rather than a modern pickup.

In all I have read so far, there is no clarification as to how the famous cylinder got to Berlin, though there may be information in a book (German) written by one of the Fellinging family. This is curious—anything could have happened, once the Fellingings relinquished what we might call control. It would have been easy enough for someone in possession of the cylinder, between Vienna and Berlin, to make a reasonably good copy and secrete the precious original for himself; who indeed would know the difference? Enough to say that I was wrong in my account (in February) of that so-called pantograph copying. The pantograph was not at all what I thought but, rather, a tight, tiny metal connector that tied an Edison player to another's recording head to make a single real-time copy that closely matched the

original. One of my correspondents has actually seen one of these in operation and heard the result, indistinguishable from the original, he says. I'll take his word for it.

As for the present state of the cylinder in Berlin (the archive was in the East zone and thus out of touch with the West until the recent reunification), it is in sad disrepair. At some time an operator evidently activated a cylinder scraper, probably by accident. This was attached to an Edison player to remove a layer of grooves to make a new recording, much as we erase a tape. The scraping was stopped in time, but the grooves are very shallow, which makes for immense difficulty in the copying. As I get it, this occurred after the 1935 copies were made—hence the repeated choice of those discs for later restorations, right up to the present. In addition (perhaps at the same time) a piece was broken off at the beginning, making it impossible to play all of the spoken introduction, though the name Brahms—Johannes Brahms—is clear

enough, at least to my ears. Yes, I have heard the 1983 version—or, rather, a copy on tape, which I trust to be authentic. In the alternative "original" on this 45—that is, the unchanged sound of the 1935 disc—the name seems to be something like "Robert Brahms," but in the restoration it is quite grandly "Johannes Brrrahms," with a greatly rolled "r."

Even worse, the cylinder's structure is weakened and cracked. And the Austrian engineers in 1983, who made arrangements with Berlin to have the cylinder on loan for several days, had to wrap tight rubber banding around each end before they dared put it on a machine. This covered up a segment of the music, as well as the opening spoken words. They tried six

times, using variable styli and point pressures, all to no avail (it says in a 1984 article by the engineers, translated into English). So in the end they decided to use the 1935 disc copy. Better sound. Without a doubt, however, those six attempts still exist on 15-inch tape in Vienna, though never used. That's a challenge! They may be the last copies ever to be made of this cylinder. Unless some ingenious soul fills it with reinforcing plastic or such to strengthen the structure enough to play, or at least turn at speed. A tracing of the grooves by laser? That is bound to come up sooner or later as well. It might make a crucial difference.

There is much, much more to tell, notably about events in this country (all of the above is strictly European). Note that I have omitted most names and sources of information in this month's account. Give you the (relatively) big picture first. All those names will come forth eventually, clams and snails allowing. The best is yet to come!



**BRAHMS' CYLINDER IS
ALIVE, BUT NOT WELL,
IN BERLIN, WHERE IT
HAS BEEN SINCE 1935.**

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Landmark research, conducted by the world renowned National Research Council, has clearly identified what good sound is, and also identified the measurable characteristics that are common to all good sounding speakers. This highly acclaimed research is the foundation on which PARADIGM speaker design is based.



SB-80 - SB-100 - SB-120

SB-Series Subwoofers are the perfect solution for adding bass to a variety of PARADIGM speakers. They are elegant, efficient, powerful and provide deep, tight bass with excellent definition and solid impact!

Smaller PARADIGM speakers (Micros, Atoms, Titans, Minis, etc.) integrate seamlessly with a single SB-80 or SB-100. Use the SB-120 with larger PARADIGM speakers or for greater bass output. SB-Series Subwoofers create a variety of outstanding "3-piece" systems - all able to provide stunning performance!

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channel speaker and you have a superb sounding compact home theater speaker system! For higher output capability add a second SB-Series Subwoofer. Operate them with a dedicated amplifier for astonishing results! Then add two PARADIGM speakers for the rear and a PARADIGM center channel speaker and you have a sensational home theater speaker system... better than many costing several times as much!

For more than a decade PARADIGM has earned a solid reputation for superb musical performance and unparalleled value! Built on this tradition, the SB-Series sets an entirely new value standard... *until now this quality of bass performance was simply not available in this price class!*

SB-SERIES DESIGN FEATURES

- ▶ **Single driver, high velocity, low noise, bandpass systems with critically tuned resistive ports.**

- ▶ **Bass reflex port.**

Multiple 3" ports with inner and outer radius allows for high air velocity with very low turbulence.

Ports "fire" down to further reduce unwanted midrange output.

- ▶ **Enclosure.**

Multiple-cavity design. Inert high-density hardboard limits unwanted panel resonances.

- ▶ **Highly flexible:**

A single SB-Series Subwoofer can be configured to operate in stereo or in mono (when using two subwoofers).

- ▶ **Convenient hook-up:**

Main speakers can be connected to either the receiver/amplifier or to the SB-Series Subwoofer.

- ▶ **All four sides and the top are finished allowing SB-Series Subwoofers to fit easily and elegantly anywhere in your room.**

- ▶ **PARADIGM built bass drive unit.**

Dual, multi-layer 1 1/2" voice-coils (2" on SB-120) with kapton formers ensure musical accuracy and long term reliability.

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Ultra-rigid highly-damped cone/surround assemblies maintain uniform piston motion even at high playing levels.

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Oversized power inductors roll off unwanted midrange output.



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4th order electro/acoustic at 100Hz. Frequency- and phase-corrected.

SB-120:

BASS/MIDRANGE DRIVER

310mm (12"), 2" voice-coil, aluminum former

LOW FREQUENCY EXTENSION*

26Hz (DIN)†

FREQUENCY RESPONSE

±2dB from 33Hz-100Hz

SENSITIVITY- ROOM/ANECHOIC

95dB/92dB

SUITABLE AMPLIFIER POWER RANGE

15 -250 watts

MAXIMUM INPUT POWER†

150 wattst

NOMINAL/MINIMUM IMPEDANCE

8ohms/6ohms

INTERNAL VOLUME

103 litres/3.62cuf

HEIGHT, WIDTH, DEPTH

43cm x 49cm x 72cm/16 3/4 in x 19 in x 28 in

WEIGHT

26kg/57lbs each

SB-100:

BASS/MIDRANGE DRIVER

255mm (10"), 1 1/2" voice-coil, kapton former.

LOW FREQUENCY EXTENSION*

36Hz (DIN)†

FREQUENCY RESPONSE

±2dB from 40Hz-100Hz

SENSITIVITY- ROOM/ANECHOIC

94dB/91dB

SUITABLE AMPLIFIER POWER RANGE

15-200 watts

MAXIMUM INPUT POWER†

100 wattst

NOMINAL/MINIMUM IMPEDANCE

8ohms/6ohms

INTERNAL VOLUME

60 litres/2.1cuf

HEIGHT, WIDTH, DEPTH

43cm x 44cm x 49cm/16 3/4 in x 17 in x 19 in

WEIGHT

19kg/42lbs each

SB-80:

BASS/MIDRANGE DRIVER

210mm (8"), 1 1/2" voice-coil, kapton former.

LOW FREQUENCY EXTENSION*

40Hz (DIN)†

FREQUENCY RESPONSE

±2dB from 50Hz-100Hz

SENSITIVITY- ROOM/ANECHOIC

93dB/90dB

SUITABLE AMPLIFIER POWER RANGE

15-150 watts

MAXIMUM INPUT POWER†

80 wattst

NOMINAL/MINIMUM IMPEDANCE

8ohms/6ohms

INTERNAL VOLUME

35 litres/1.23cuf

HEIGHT, WIDTH, DEPTH

43cm x 27cm x 49cm/16 3/4 in x 10 1/2 in x 19 in

WEIGHT

15kg/33lbs each

AVAILABLE FINISHES:



Block Ash (oil models) Block Gloss (SB-100 & SB-120) Rosewood Gloss (SB-100 & SB-120)

* DIN 45 500. Listening rooms reinforce bass. This reasonably indicates the audible (approximately -3dB) low frequency performance that can be achieved in most rooms.

† Maximum Input Power indicated is with typical program source, providing the amplifier is clipping no more than 10% of the time.

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JOHN EARGLE

PYRAMIDING PLATFORMS

Like the Compact Disc, the LaserDisc was designed primarily to deliver a continuous stream of serial data. In the case of CD, that data is digital, and the data rate was originally based on the requirements of two channels of 16-bit audio at a sampling rate of 44.1 kHz. With LaserDisc, the data is often a mixture of analog and digital, and the primary function is as a video storage medium. In their original intended applications, both media were normally asked to play continuously from beginning to end, but they have the added capability of directly accessing specific bands, tracks, or "chapters."

The CD and the LaserDisc have been adapted to alternative uses. The Compact Disc, for example, does duty as a read-only memory (ROM), as a storage medium for high-resolution photographs, and as the storage medium for a number of user-interactive systems. Both media have reasonable access times to any "address" on the disc, on the order of a handful of seconds. As long as the alternative use does not demand too rapid a movement from

one point on the disc to another, the disc functions well as a read-only memory. (The real secret to programming for these alternative uses is to reduce the frustration of waiting during look-up period by having some relevant activity take place on the screen while the disc is being scanned for new data.)

The ability to work interactively is not built into conventional CD and LaserDisc players. Instead, it is provided by additional processing capability, which may be either external or internal. In some cases, the mechanical performance of the transports may be upgraded for the greater load that will be placed on them.



I recently tried out Pioneer's Model CLD-A100, a combination LaserDisc and CD player (with separate drawers for each) that accepts plug-in modules for LaserActive applications. As supplied, the standard unit will play only ordinary LaserDiscs and CDs; for interactive purposes it is necessary to plug in a "control pack," a small box that slides into the front of the chassis

and has input jacks for handheld LaserActive game module controllers. The control pack functions as a computer and generates on-screen menus, translating user input from the controller unit. Two control packs were included with the system I received, one for educational discs and for NEC Turbochip and TurboGraFX-16 software, the other for Sega Genesis cartridges and discs. (Only one control pack is included in the system price of about \$1,000. The player costs \$735 alone; additional control packs cost \$485 each for games and \$350 for karaoke.) I evaluated a variety of LaserDiscs, both standard and interactive, but did not evaluate any CDs or interactive movies.

Because it's also a CD player, the CLD-A100 can read digital as well as

LaserActive game module in Pioneer's CLD-A100 LaserDisc player (right) and in use (above).

A stereo system

*doesn't have to
be complex.*

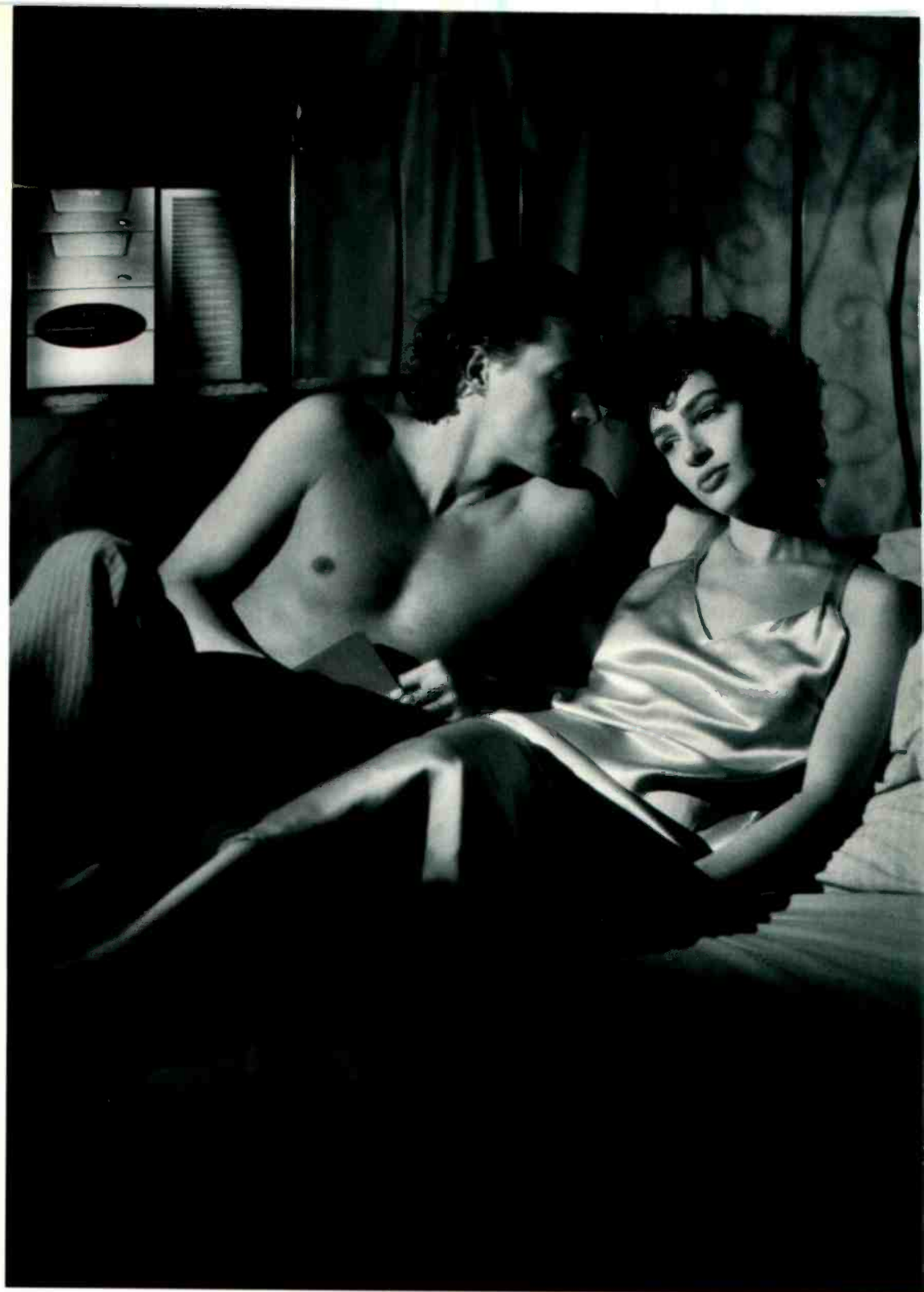
*A stereo system
can be simple
and approachable.*

*Uncomplicated
and true.*

*(The same
can be said
for relationships.)*

Festival from
*the legendary
Harman Kardon.*

*You'll know it
when you
hear it.*



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harman/kardon

Sega control pack and controller (left), pack and controller for educational discs and NEC games (right), plus remote control and software.



analog LaserDiscs soundtracks. Most recent music-oriented LaserDiscs, such as operas and concerts, now include digital sound, and the combination of crisp, stable color images and digital stereo is a joy to behold.

Those of you familiar with CD-based interactive programs may have, at least sometimes, been frustrated by sluggish performance and clumsy graphics. There is a limit to how quickly data can be taken from the CD to feed a hungry processor. With the LaserDisc as a source, the data rate is far more rapid, and programs can

**LASERDISC'S CRISP,
STABLE COLOR IMAGES
AND DIGITAL STEREO
ARE A JOY TO BEHOLD.**

be updated more quickly. As a result, the system is often well ahead of the user; it is waiting for *you* to make an entry.

Programming for interactive video is still in its early stages, and, it would seem, so are some of its conceptual aspects. For example, a disc given over largely to a tour and study of the Egyptian pyramids lets you browse through a wide range of direct and peripheral topics related to pyramids and the Pharaohs. Then, in the midst of all this informative stuff, you come across a video game.

Still other programs are basically video games and, as such, are the most interactive of all; your own commands at the controller determine what happens directly on screen. Some of these games tax the system to the limit. Graphics may be jerky and of limited resolution, presumably because they are being generated on a real-time basis. The control unit itself may get in the way; obviously, a joystick would be a more

natural way of trying to avoid an enemy missile than trying to coordinate your thumbs and the controls!

A further comment on the quality of the graphics is implied by the warning that appears on all interactive LaserDiscs. Summarized, it states that a very few individuals may be subject to seizures upon viewing interactive video and that care should be taken. The pronounced flicker in the display is apparently the cause.

For the most part, interactive LaserDiscs are handsomely packaged, with generous information on how to work each program. You are told which button on the control unit does what, and a detailed hierarchy of menus is given.

Overall, it is easy to walk away overwhelmed by the simple-mindedness of much of the programming. On the other hand, much progress is being made, especially in educational areas. Many concepts in physics and mathematics may be elucidated if a student can sit in front of a computer with the appropriate interactive videodisc, which is being done every day on college campuses.

Is this a good time to buy an interactive LaserDisc system? It depends on your, and your family's, needs and tastes. The basic unit can function as a LaserDisc player and provide movie and music entertainment of the highest technical order. While discs are relatively expensive, they can be rented for next to nothing. The choice of a platform for the interactive portion is more complex and should be made only after you have surveyed the available software. All of these may be obsolete sometime in the relatively near future, but I would hazard a guess that any investment you might make in a LaserDisc library would still benefit from backward compatibility of any new playback hardware.



Harman Kardon's Festival 500 Intelligent Music System

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Harman Kardon is one of the many worldwide companies which forms Harman International.

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Festival is one such product. SoundEffects by JBL and Epsilon by Infinity are other products which reflect the same perspective, although each does a different job.

Harman Kardon, JBL, Infinity, AKG, Lexicon and Soundcraft share the passion and share the fundamental objective of all Harman companies: to reproduce music flawlessly, to make the products easy to use and lovely to look at.

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IVAN BERGER

SONGS ON A SANDWICH



IBM researcher Kurt Rubin holding two-layer optical discs that can be sandwiched together as shown below.

The guy wearing the gloves, Kurt Rubin of IBM's Almaden Research Center, seems to be holding five discs. But you could say he's holding 10—or one; it all depends on how you look at it.

Each of the discs in Mr. Rubin's hand is a two-layer optical recording, and these recordings are de-

signed to be sandwiched together into a disc with up to 10 recording layers and a corresponding increase in information-storage capacity. Such a sandwich disc would be quite fat (about a half-inch thick, in IBM's initial mockup) because it would include not only the five two-layer data carriers but spacers between carrier discs and a rigid plastic substrate like that on today's CDs. In practice, says IBM, discs with four or more layers will be made of thinner materials.

The experimental disc system relies on optical disc equipment's extremely shallow depth of focus. Today's optical drives focus so finely, IBM says, that "light focused on any

layer is 10,000 to 100,000 times more intense than that hitting any adjacent layer."

The reflective backings used on today's CDs and LaserDiscs cannot be used on a multi-layer disc, as they would block the passage of light to other layers. Instead, the system relies on a balance between transparency of the layers and reflectivity of the surfaces and requires higher powered lasers than today's CD players do. The number of surfaces in a disc stack is limited by laser power, layer transparency, and cost. Prerecorded discs could have more layers than recordable ones, since recordable discs must be able to absorb some of the laser light during recording. However, players built to handle multi-layer discs would still be able to play today's single-layer audio, video, and data discs.

This experimental IBM system is also compatible with systems that raise data capacity by using shorter wavelength (blue) lasers or lenses with high numerical apertures for more precise focus. Such systems are being worked on by 3M, Sony, IBM, and many others.

It's unlikely that 10-layer audio CDs will ever appear, for the same reason 10-CD albums aren't around now—too little material whose length would justify this. But CDs with two to four layers would make sense, and adapting today's player designs to handle them might not be difficult. (Retrofitting existing players might not be cost-effective, though.) Today's players already have movable lenses to maintain focus even on warped discs. The Almaden researchers have found that it took only "relatively minor modifications" to adapt an existing CD-ROM drive to play audio and video tracks on two-layer, read-only discs.

CD Wins—At Last?

If trends continue, 1994 will be the first year that CD became the world's most popular recorded sound carrier. In 1993, according to





KEF Uni-Q

WHERE DOES THE TWEETER
OF A HIGH FIDELITY
LOUDSPEAKER BELONG?

Q - S E R I E S

This question may confuse those who believe that the measure of a loudspeaker is the number of its drivers. It will also elude those who have never bothered to question conventional driver placement, which always separates the woofer from the tweeter.

In fact, the most acoustically correct location for the tweeter is precisely at the *center* of the woofer. This strategic placement creates a single sound source, allowing high and low frequencies to reach your ears at the proper time, regardless of where the speakers are placed or where you are sitting. (No wonder KEF's patented Uni-Q® is the technology of choice for advanced Home Theater applications.)

Perhaps the greatest benefit of the KEF Q Series speakers is that they sound as good in your home as they do in the showroom.



Speakers From Space



Nautilus



Emphasis



House Pod

Not all British design is as traditional as Rolls-Royces (remember the Jaguar XKE?), as these three new British speakers show.

All three use B & W drivers: two are from B & W itself.

The four dynamic drivers of the Nautilus have independent, exponentially tapered "lossy waveguide" (transmission-line) enclosures. The 12-inch woofer's enclosure is coiled like the shell of the sea creature from which the speaker gets its name. Billed as "B & W's best loudspeaker ever," the Nautilus has rated bandwidth of 10 Hz to 25 kHz, +0, -6 dB, with response flat within ± 0.5 dB from 25 Hz to 20 kHz. The price is \$25,000 per pair.

The trumpet-like B & W Emphasis is a two-way system with a $6\frac{1}{2}$ -inch woofer. Its fourth-order vented woofer enclosure uses quarter-wave bass loading and a flared reflex port. The tweeter is mounted on a stalk for optimum dispersion. Frequency response is 45 Hz to 25 kHz, ± 3 dB, and the price is \$9,600 per pair.

The Blue Room House Pod uses similar B & W drivers. This is no surprise, as its designer, Simon Darwood Ghahary, first taught himself speaker design by making systems out of cast-off components from B & W's Steyning, Sussex, plant. (The plant's rubbish heaps are so well gleaned by local schoolboys, reports *New Scientist* magazine, that they need to be emptied only twice a year.) Like the Emphasis, the House Pod has a fourth-order vented cabinet. Response is rated as 45 Hz to 20 kHz, ± 2 dB, and the systems cost \$1,900 per pair.

While the swoopy, futurist shapes of these three speakers make a design statement, they also add rigidity and reduce internal standing waves. The time may come when the term "speaker box" refers only to the package a system like one of these came in.

the International Federation of the Phonograph Industry (IFPI), cassette sales dropped for the first time. The drop was a mere 2%, but combined with a 19.4% rise in CD sales from 1992 to 1993, it was enough to bring CD sales to more than 96% of cassette sales figures.

Cassettes continue to be the dominant medium in developing countries, but Compact Discs are the largest sellers in nine of the 10 countries that buy the most recorded music. And in the 10th such country, Mexico, cassette sales for 1993 dropped 19% while CD sales rose by 39.3%.

Hearing About Hearing

A workshop on "What We Know About Hearing" will be presented from Thursday, August 18 to Saturday, August 20, at the Indiana University School of Music, in Bloomington, Ind. The workshop is presented by Synergetic Audio Concepts (Syn-Aud-Con), a group which has long been engaged in additional education for sound professionals.

The workshop staff will consist of Dr. Jont Allen of Bell Laboratories, Dr. Larry Humes of the Indiana University Speech and Hearing Department, and Dr. Mead Killion of Etymotic, Inc. The conference will cover the ways listener physiology affects the sound reaching the eardrum, and how sound technology can exploit these factors.

For more information, contact Syn-Aud-Con at 12370 W. Co. Rd., 100 N, Norman, Ind. 47264. Telephone number is 812-995-8212, fax is 812-995-2110.

AR Heads West

The centers of the U.S. speaker industry have long been California (where the movie industry is) and the Boston/Cambridge area (where Acoustic Research was founded, in the 1950s). The presence of AR, which once dominated the speaker industry, built up a rich stock of speaker-building expertise, and a proliferation of speaker companies. Such companies as Advent, Allison, Boston Acoustics, Cambridge SoundWorks, KLH, RDL, Snell, and others can trace their ancestry back to AR. Today, even such British companies as Celestion and KEF are headquartered in the area.

So it came as something of a shock to learn that, after 40 years or so in Massachusetts, AR was moving to Benicia, Cal. There, it will be part of the new Specialty Audio Group of International Jensen, AR's owner for the past four years.

The AR Powered Partners' line of small, self-powered speakers will now be handled by Advent, another Jensen-owned company founded in the Boston area, which also once dominated the loudspeaker field.

Even AR's new location has some historical resonance: A plaque in the nearby town of Napa honors a speaker pioneer who long preceded that company: Peter Jensen.



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But It Looked Okay on the Meter

Q I was doing a charity recording of a "live" rock-club date, featuring musicians who seldom are in a position to play together. The recording was a unique, never-to-be-repeated event. I decided to use my Tascam 38 half-inch eight-channel open-reel recorder. I meticulously aligned it for 3M 996 tape.

At the session I bridged into the vocal mike circuits, premixed stereo vocals to two tracks, and premixed stereo drums to two other tracks. The remaining four channels were used for two lead guitars, bass guitar, and, on the last channel, harmonica and acoustic guitar solos. This was intended to give me a chance to optimize the balance when the session was done.

At the sound check, all levels were adjusted for the proper mix and recording level was checked, using the VU meters on the Tascam. The rest of the night proceeded without a hitch. Three sets and seven reels of tape later, I came away with a certain euphoria from having captured this rare event for history.

A day later, I set up the deck for playback and mounted reel 3. Reel 3 was the first half of the second set—the best of the evening. I found that nothing was on the tape! A quick review of the other six reels confirmed my worst nightmare. Nothing on any of them either.

I immediately descended into analysis mode, fighting off anger as I did so. The deck must have broken down, I told myself. This excuse quickly evaporated as I confirmed with scratch tape and an FM tuner that the deck was fine and recorded perfectly.

I went over each detail of mixer and mike preamplifier connections, yielding nothing obvious. I went into hypothesis mode: Perhaps the reels of tape were wound such that the backing was against the heads. Nothing doing!

It finally dawned on me. Perhaps, in a surge of overconfidence, I had plugged the mixer into the deck's outputs. That couldn't be! How could I have gotten such perfect levels even when the deck was in "reproduce"?

I quickly pulled out the maintenance manual and reviewed the wiring. The VU meter circuits in my deck are resistively coupled directly to the output jacks, with no intervening buffer amplifier! The mixer drove the meters directly, making for the perfect illusion of a "perfect recording."

Needless to say, I have burned into my mind a valuable and painfully learned lesson, which I share with any of you who may own similarly configured equipment.—T. Burkhard, New York, N.Y.

A I've owned at least two other makes of recorder wired like that Tascam—Magnecord and Ampex. The only reason I never made the same mistake was that the connectors for the output were different from those used at the inputs.

If it makes you feel any better, Mr. Burkhard, any of us who have been in the sound recording field for more than 40 years can tell his own horror stories. Here is one of my modern highlights of recording horror: I own a portable audio/video recorder that has the interesting ability to handle six (count 'em, six) stereo track pairs on a single tape. This is true only if the machine is switched to the "audio" mode.

Like you, I was making a recording that could not be made again. Sound was fine in my headphones. But when I got home, the playback was erratic. Worse, I lost my new recording as well as the other recordings on that tape. Leaving the machine in the "video" mode not only results in a recording made with no sync but also in the destruction of data on all of the stereo channels.

Welcome to the club!

Load vs. Tube and Solid-State Power

Q Many solid-state amplifiers' power output ratings almost double as the impedance of the load decreases by half. Yet tube amplifiers, even the best ones, seem to be rated at a more or less constant power regardless of the impedance connected to them. Please explain this difference and any

impact it has on matching amplifiers to loudspeakers.—Tom MacGregor, Barre, Vt.

A The power output of a solid-state amplifier would not increase when the impedance of its load decreased, if we truly matched impedances between the amplifier and its load. But the solid-state amplifier's output impedance is far lower than the load impedance (the amplifier's damping factor is the ratio between these two impedances), so the lower the load impedance becomes, the closer it approaches an impedance match with the amp's output.

We can never obtain a true impedance match, and we don't even want to. If we managed to match these impedances, the output stage would be destroyed as it tried to supply a huge amount of current to the load. This is much like attempting to match the impedance of a home appliance to that of the power line—simply a practical impossibility.

Tube equipment behaves differently, because the load is not connected directly to the output devices as it is in solid-state equipment. Most tube amps have output transformers whose primary winding is connected to the tube plates. The secondary winding is tapped in various places, and the speaker is connected between one end of the secondary and one of the intermediate taps. The tap chosen depends upon the impedance of the load. The highest load impedance (typically 16 ohms) is usually connected to both ends of the secondary winding, with 8- and 4-ohm taps at intermediate points.

This maintains a constant load on the output tubes regardless of the load impedance being driven. Because the match to the tubes does not change, the amount of power delivered to the load will be more or less constant, regardless of the load. If the secondary of the output transformer was not tapped, all loads would be connected across the full winding. We would then observe a significant decrease in output for lower load impedances.

If you have a problem or question about audio, write to Mr. Joseph Giovanelli at AUDIO Magazine, 1633 Broadway, New York, N.Y. 10019. All letters are answered. In the event that your letter is chosen by Mr. Giovanelli to appear in Audioclinic, please indicate if your name and/or address should be withheld. Please enclose a stamped, self-addressed envelope.



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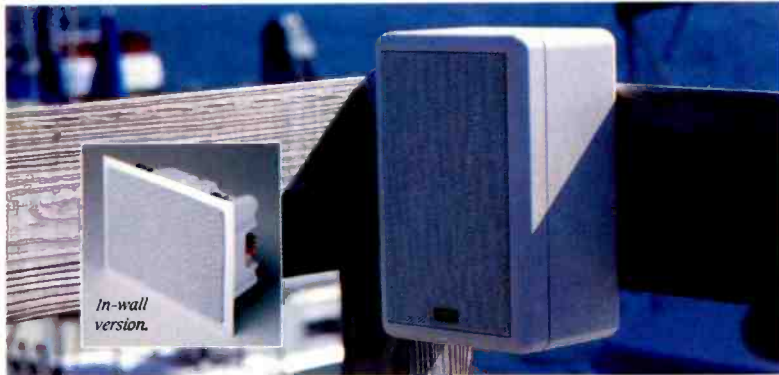
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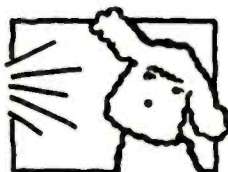
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Building and Equipping a Small Recording Studio

Q What equipment would you recommend for use in a small recording studio intended mainly for recording vocals? The dimensions of the area I have to work with are about 5 feet x 5 feet. I need to eliminate any undesired sounds. What kinds of materials would be required to build this type of room?—George Marrow, Jr., Washington, D.C.

A It is difficult for a performer to work in a room as small as the one you are planning. I have to hope that the singers won't be sharing space with the recording equipment and the engineer. If nothing else, the equipment is bound to add some undesired noise that will be picked up by the microphones.

Although I understand that this room will be used for vocals, what about the music behind the singers? How is that to be generated? If it is supplied by synthesizers, MIDI sequencers, or multitrack tape overdubs, fine.

At the least, you must use very heavy carpeting on the floor and really good acoustic tile on the ceiling and probably the walls. Don't forget to line the door with the tile.

External sound often enters a room because the walls are set to vibrating. If this is your problem, you will have to make these walls as massive as you can. The stiffer they are, the less they will vibrate.

I have obtained excellent results by lining all walls and the ceiling with thick, dense fiberglass, held in place with chicken wire. (No, it is not pretty to look at, and some people feel very closed in when working in this environment. But if this can be overcome, it works well.) The boominess often associated with small spaces is very much reduced. You may find a need to add more highs because of the lack of reflection from room surfaces. You will also want to add reverb, because the sound is *very* dead.

In order to determine the equipment you will need, you must list what work you plan to do. Obviously you will need some kind of a mixer. It doesn't need to be an elaborate one, with "track solo" and "monitor sends" and the like. You may well want the opportunity to place some special-effects processors between each mixer

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The Sensible Sound Issue #47

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position and the mixer bus for that stereo channel. Chances are that you only need two outputs.

The recorder can be a very good cassette machine, although I would choose an open-reel, VHS Hi-Fi, or DAT recorder. Chances are that you will want to copy your masters onto cassettes, so the cassette recorder still has a place in your studio.

If you only plan to use a sequencer, you won't need a multitrack recorder. If, however, you need to sweeten the music with instruments not available in your sound modules, then you will need a multitrack tape recorder of some kind—digital or open-reel.

The choice of microphones is a very subjective one. Many sound technicians use dynamic mikes. They're great when a singer really shouts it out and runs the risk of overloading a condenser mike or overloading the input the mike is feeding. I personally use some ribbon mikes made just for vocals, because I like a natural-sounding voice, free from peaks. But many find such peaks exciting and enhancing to the performance.

Negative Feedback, Pro and Con

Q *Negative feedback is considered to improve amplifier performance. Why, then, do some high-end audio equipment makers avoid using it?*—Ray Segura, New Orleans, La.

A Negative feedback definitely lowers distortion, but too much of it reduces sound quality. Years ago, a leading maker of audio gear introduced a high-quality line of preamps that used a tremendous amount of negative feedback, not only around the circuit as a whole but also around individual stages. To me, the preamps sounded mushy, as if the signal had to be pushed through them. When I removed some of the feedback from one of these units its sound improved remarkably.

However, preamps and power amps have different properties. Many power amplifiers, for example, employ Class-B output stages because Class-B circuits have good electrical efficiency and run cooler than other biasing arrangements would allow. This means lower costs for power supplies and cooling facilities.

However, Class-B circuits have inherently high distortion—especially at low power output levels, where they're operating in a more nonlinear portion of their input/output curve. Adding negative feedback to such a stage dramatically reduces the distortion. Class-B or even Class-AB circuits would be virtually unusable for high-fidelity applications without negative feedback.

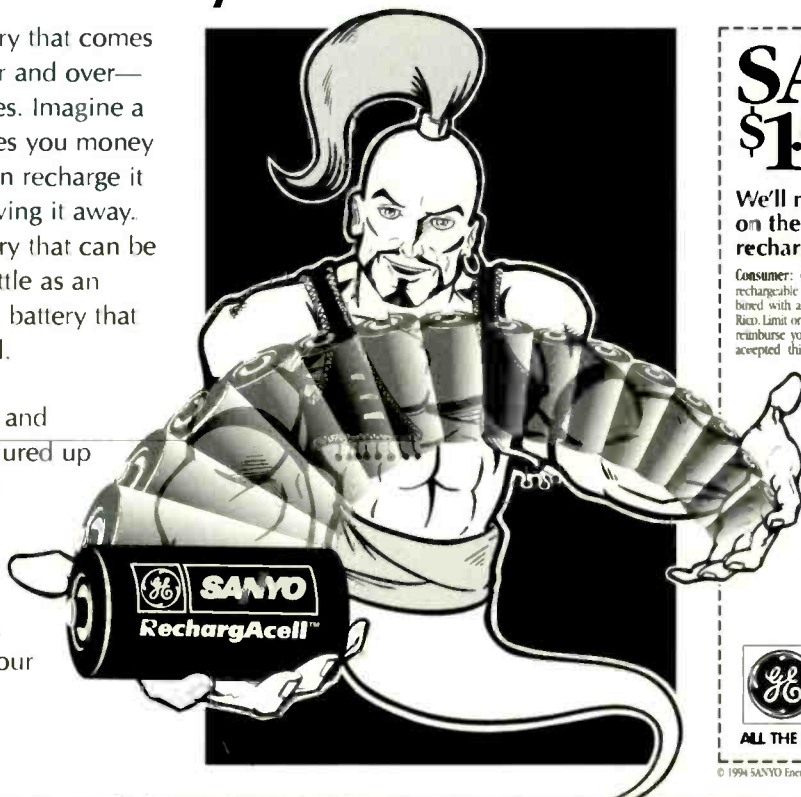
A high-end manufacturer, less concerned with cost, can lower distortion in other ways. He can, for example, use an output stage with inherently lower distortion (such as one using triodes instead of pentodes) and can also bias it for Class-A operation, despite much lower electrical efficiency than Class B. Even at low power levels, the input/output curve is always linear.

Measures like these allow a manufacturer to eliminate feedback or drastically reduce it. (For example, some amplifiers have no overall loop feedback but do use local feedback on early stages.) Yet I can't help wondering if the sonic performance of amplifiers that used no negative feedback at all couldn't be improved by using at least a bit of it. A

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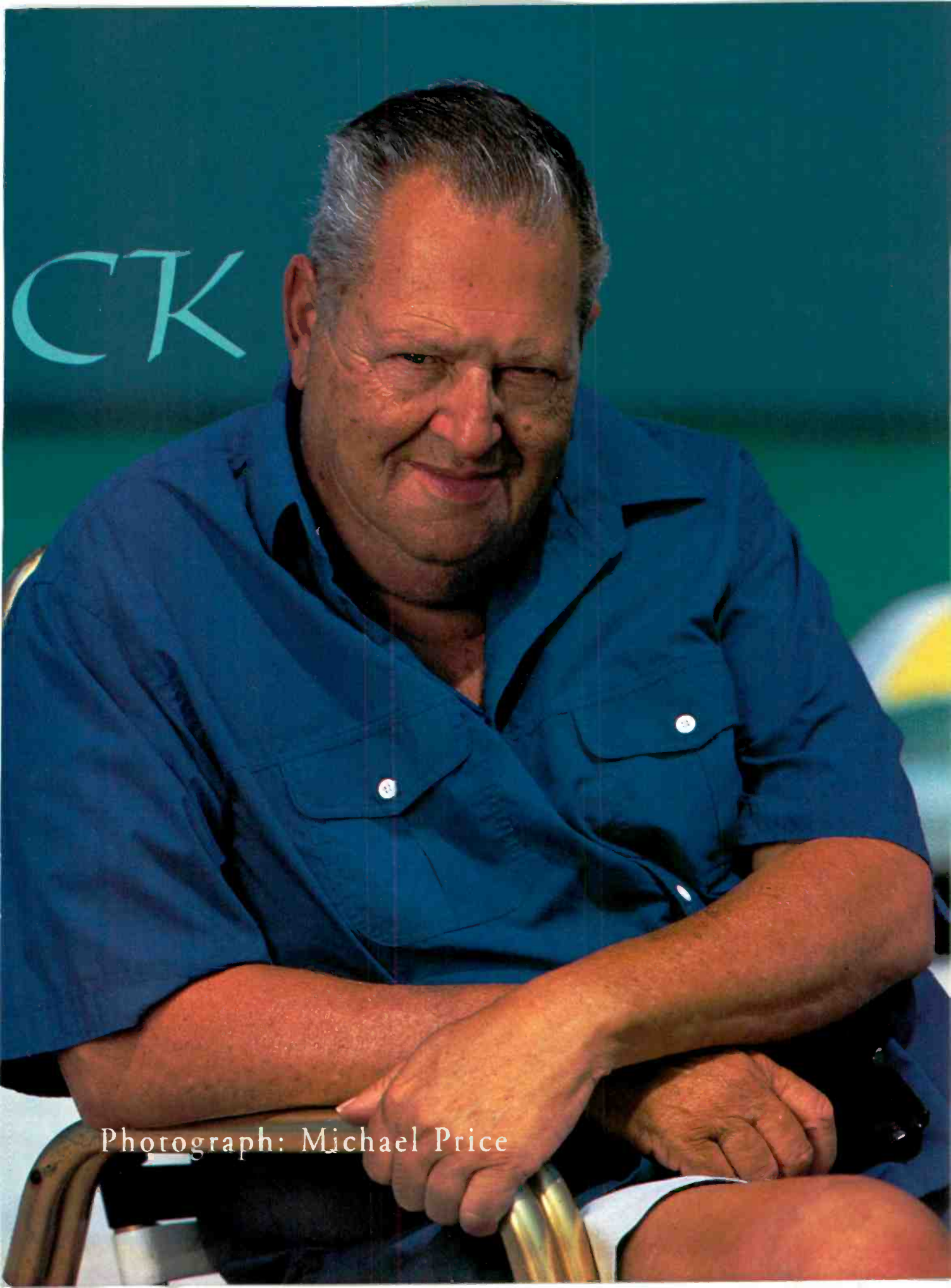
withstanding the sands of time

JAMES ROZZI



Without the Prestige label, the jazz record industry never would have achieved proper documentation of an art form based on the otherwise fleeting sounds of improvisation. Many hundreds of recording sessions, done by a virtual Who's Who of American jazz, took place in the decades following founder/producer Bob Weinstock's first record date in January of 1949. While Prestige's subsidiaries of the

1960s dealt with such diverse art forms as international music, folklore, and the blues, Weinstock's jazz vision as put to wax is his true claim to fame. Often compared to Blue Note Records, a company unquestionably responsible for further developing jazz with its encouragement of original compositions, Prestige differs by assuming the role of a veritable time capsule, capturing the standard repertoire of jazz's finest as perfected night after night in the clubs of New York. J.R.



CK

Photograph: Michael Price



By the time the musicians had unpacked, Rudy Van Gelder was ready.



When people think of Prestige Records, The Modern Jazz Quartet comes to mind.

When people think of Prestige Records, names like Miles Davis, Sonny Rollins, Eric Dolphy, The Modern Jazz Quartet, and John Coltrane immediately come to mind, and yet you grew up during the big-band era. Do you recall your musical tastes making the transition from swing music to modern jazz?

I had a record store before I started recording, and I carried every jazz artist you could think of. One day, Alfred Lion, who ran Blue Note Records, came in and said, "I have something new: Thelonious Monk." I said, "What the hell's that?" Alfred said, "It's be-bop." I listened

and the more I listened, I realized it had a charm to it. It was interesting. I was strictly into swing at the time. Be-boppers were calling people like us "moldy figs." The next thing I knew, I became obsessed with be-bop. I was attracted like a magnet down to the Royal Roost and Birdland. This was something that was unbelievable. The only other time I was so moved by music was when I saw the Bunk Johnson band that came from New Orleans.

How did you decide which musicians to record at your first sessions?

My first choice, naturally, would have been Charlie Parker and Dizzy Gillespie, but they were under contract to various companies. In fact, Bird would record for both Savoy and Dial, and they were always having contract disputes. I just went one jump forward into music more modern than that.

You were still in your teens at the time. With your first session comprising seasoned musicians like Lennie Tristano and Lee Konitz, how did they take to your presence in the studio?

I got a very rude awakening about the recording industry when I did my first session. Tristano was the leader of this "cult," the Tristano school. It was supposed to be Lee Konitz's session, but the cult decided that Lennie should be leader because he had a bigger name. Anyway, there they were, and they played it right down, a song called "Subconscious-Lee." I said, "That's good. Boy, that's good." Tristano said, "No. We didn't get it right." So, over and over, the same shit, and it all sounded good, man! Konitz blew his ass off. Well, we finished and I put the first two sides out. I went to put the second two out, and I called

Tristano on the phone. He said, "Don't put those sides out. They're not quite good enough." I said, "They're good; they're good!" He said, "If you put them out, I'll put a curse on you and that will be the end of your record company." I said the hell with it. What's he going to tell me about curses? I've got a Jewish mother. I put

JAZZ SHOULD
BE FREE AND LOOSE,
AND SHOULD SWING—
THAT'S THE
ATMOSPHERE
I WANTED.

them out, and the critics gave them five stars.

It's no secret that the jazz record industry had a number of tough, almost gangster types at that period. How did they react to your emergence on the scene?

This is funny. One day, I was walking up Broadway, away from the Roost, when a big Cadillac pulled up. The door swung open and Teddy Reig [of Savoy Records] yelled, "Get in!" I was a good athlete and afraid of no one, so I got in the car. Teddy was a huge, gruff man who must have weighed 400 pounds. He said to me, "You—you're upsetting the jazz world! You're paying too much money to these guys, and you need to start squeezing extra sides out of them." I had often wondered why Savoy would issue two different sessions on opposite sides of one record, and there was my answer.

You mentioned Alfred Lion of Blue Note Records. Many people see Prestige as being Blue Note's only serious competition of the day. How do you compare the two companies?



Photographs: David Gahr

I loved those Blue Note records. Even before I was in the business, Alfred Lion was my hero. The man was a giant. He had integrity. He made a fine product and recorded everybody from Sidney Bechet right up to Ornette Coleman. But aside from us using the same engineer in Rudy Van Gelder, we handled things differently. Blue Note's sessions were always prefaced by rehearsals with written arrangements. I found charts and rehearsals were the kiss of death. I believe jazz should be free and loose, and should swing. That's the atmosphere I always wanted to create, not the stress and strain of trying to work out some chart. Why are charts necessary when the musicians are so creative?

Did the musicians appreciate the lack of structure in the studio?

They liked it; they had a good time. They'd kid around and laugh it up. We had fun, but if it got rough, if I could see the guys were down, if they were up late or something, I'd say, "Okay, let's play some funky blues," and I'd let them go for 20 minutes.

It must have made life in the studio a bit easier when you eventually hooked up with Rudy Van Gelder.

I was having terrible problems with my studios. I was very annoyed with them. Sometimes they would run sound tests for an hour. From the very first session, when Rudy used his parents' living room, to the very end, I never said a word about recording to Rudy. By the time the musicians had unpacked, he was ready. He did not have to take tests. That was the beauty of recording with Dr. Rudy Van Gelder. He was a genius at sound recording.

When did you record your first bona fide bop session? Looking at the discography, I see it was in May of my first year, 1949: Kenny Dorham, J.J. Johnson, Sonny Rollins, John Lewis, Leonard Gaskin, and Max Roach were on the session.

Kenny Dorham was a very underrated player. Even when he was with Bird, he still didn't get enough recognition. J.J. was so far ahead, it was ridiculous. The way the man played...and he's one of the finest people you could ever meet, a wonderful person and a good family man. Sonny Rollins was too much! At that time, Sonny Rollins was a joke to all of the musicians. They loved him because he was a be-bopper and he knew everybody—played with everybody in the neighborhood group up in Harlem. But he hit so many clinkers that they would crack up when he played. They would tease him, but his ideas were so



great. Despite the clinkers, they all knew, just like I knew—because I signed him to a contract—that he'd be a force someday. And sure enough, he was.

When do you feel Rollins came into his own as a player?

Everyone wanted to see Sonny Rollins succeed, and the session when he really hit was the one that produced *Saxophone Colossus*. That day, the man showed a giant was emerging. I had known Sonny's playing for years prior to this date, but I sat there and couldn't believe what I was hearing.

It was incredible! Sonny is a wonderful person, one of the most unpretentious, laid-back people you could ever meet.

Prestige had a great deal of commercial success with Stan Getz.

When I recorded Stan Getz, I did not do it with commercialism in mind, but I had a tiger by the tail, as they say. I was confused, actually. He kept recording all these simple tunes, playing the melody, like a formula. I didn't understand it, but you don't argue with success. Symphony Sid was the one who started Getz selling. He had a jazz radio show that aired in 30 states east of

Symphony Sid made Stan Getz. He played the shit out of Stan Getz.



Sonny is a wonderful person, one of the most unpretentious, laid-back people you could ever meet.

SONNY ROLLINS
HAD SOME CLINKERS,
BUT EVERYONE KNEW
HE'D BE A FORCE
SOMEDAY.





Miles Davis disappeared after his Capitol sides, but I tracked him down and recorded him.



the Mississippi. He made Stan Getz. He played the shit out of Stan Getz.

Help us remember some of your other more commercially successful artists?

Our first real hit came in the form of “Moody’s Mood for Love.” It was originally an instrumental of saxophonist James Moody improvising over the changes of “I’m in the Mood for Love”, but Eddie Jefferson put words to it. When King Pleasure recorded it for us, that tune took right off.

Most of our best-sellers were vocalists: H-Bomb Furgerson, King Pleasure, the Cabineers, Mose Allison, Etta Jones. Instrumental sellers were the “soul jazz.” Miles Davis also sold very well.

Tenor saxophonist Gene Ammons must have had an impact on the soul jazz market.

Gene Ammons was the father of soul and funk. He started that music in 1950. I liked R&B. I heard a lot of bands play, and I knew there had to be room for an update, a modernization of rhythm and blues with a jazz flavor. The black people needed something to relate to besides all the singers and vocal groups. Everything we did had a good rhythm section and swung. Nothing was ever phony, just to make sales. Even when we got heavy into the funk, with organ groups and guitar and all of that, they were like the blowing sessions we did before, but with a different groove. They cooked.

Blue Note started producing soul jazz and funk as well.

Somewhere along the line, Alfred Lion got the taste for the big seller. Maybe it was *The Sidewinder* by Lee Morgan or a Jimmy Smith Record. I felt the main reason he would have rehearsals at that point in time was to be sure the guys would know funky blues tunes like those to record. See, I was willing to gamble on standards done in a commercial vein, as Lion was willing to go with arranged funk tunes. Gene

Ammons did “Canadian Sunset”; Groove Holmes played “Misty.” These were big hits for us. Miles even had a hit with *Blue Haze*. In the end, nobody ever knew if you were going to have a hit, but that was the prize. That’s what paid the bills and paid for other projects.

What were the circumstances that led to your recording Miles Davis?

Miles had vanished after he did those Capitol sides with the [*Birth of the Cool*] nonet; nobody knew where he was. Somebody had said that he might be at home in East St. Louis, so while I was in Chicago on business, I tracked him down. His father was a dentist, so I knew that his number would be in the phone book. I had met Miles at a Dial session where he recorded with Bird, but he didn’t remember me. Anyway, he said if I’d send him money to get to New York, he’d be happy to record. I said that I was interested in doing a series of recordings, and that I wanted to sign him to a contract. He said all right, just get him to New York and we’d talk about it then.

So, our basic idea was just to make records with different people, to record with the best people around. That’s what we did until the end, when he had the quintet with John Coltrane, Red Garland, Paul Chambers, and Philly Joe Jones. But everything up to that point developed from where we would sit down and talk about it. Miles would mention who was in town, who he would like to record with. I’d

say who I’d like to hear him record with. We’d kick ideas around.

Was Miles ever difficult to deal with?

No, not really. We’d get into these staring sessions. He’d ask for more money, and I wouldn’t answer. Then I’d look at him and he’d look at me; we’d just stand there. We went through this a lot. I’d give him the money, but I’d always say, “Okay, that means

we have to do another album.” He’d say, “I don’t want to do another album.” I’d say, “And I want better people than the last!” So, that’s how those sessions with Milt Jackson and Monk came about. Those were some of our best sessions, because before he’d get the money—this was part of the game—I’d make him think real hard about who he was going to get. Everybody wanted to play with Miles. One of the greatest compliments I ever received came from Miles. He never listened to a playback. He’d just ask me, “Do I want another take?” If I said, “No, it’s good,” he’d say, “Okay, let’s do the next tune.” He respected my judgment, as most of the musicians did.

OUR BASIC IDEA WAS
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PEOPLE AROUND.

Were you introduced to John Coltrane's playing prior to his sideman role with Miles?

No. In November of 1955, Miles brought his quintet into the studio, and that's when I first heard Coltrane. Bird had just died a few months earlier, but when I heard Coltrane, even though he played tenor, I couldn't help but think, "Here's the new Bird." His style and ideas were raw, but it was obvious that he was heading in an exciting, new direction. I approached him at that session to sign a contract. When he signed, I figured the usual three or four LPs a year, then take it from there, but two feelings about him surfaced the more I heard him play: First, I realized just how important he was and how quickly things were coming together for him, and second, I was taken by his demeanor. He was such a great person.

How did Coltrane end up on so many sessions?

The company was doing well, so for a certain period of time while I was supervising sessions, I had every Friday booked at Van Gelder's studio, often without anything in particular in mind. I had stopped going to clubs because I wasn't hearing what I wanted to hear. So, for my own gratification, I'd set up session personnel for the enjoyment of hearing certain musicians stretch out together. Most recordings were just loosely organized jam sessions. That's why most of the tunes are standards—and blues, which sold the records. Our profits from big sellers like Miles and Gene Ammons subsidized the recording of not-so-well-known people. That's how Coltrane was able to record so much, with everyone from Paul Quinichette to Idrees Sulieman to Ray Draper to his many sessions as a leader. But really, he was a beautiful person. That was the underlying thing—he was a beautiful person.

What led to the sale of Prestige to Fantasy in 1971?

It was obvious by that point that good records didn't mean anything. Good jazz just stopped selling. People lost interest in Monk and Miles and musicians like that. All that was selling was the soul jazz. We were selling more records than at any time in the history of the company, but it had become more of a merchandising business than anything. One of the main reasons I sold Prestige was in disgust at three-quarters of the records I was making at that time. I was pissed, man! We also had a problem with distribution. A lot of the independents were being consolidated into the bigger labels, which had their own distribution. Our distributors were going bankrupt left and right, and these people were the backbone of the industry for us.

Another thing that bugged me—really bugged me—was if Prestige or Blue Note discovered a musician and recorded him, bigger companies like Atlantic and CBS were waiting in the wings and would grab him away by offering more money than we ever could. I became totally disillusioned.

Fantasy has done a very nice job of keeping my product on the market. It makes me feel good to know that anybody who wants a Prestige record with

half a merit will find it available through Fantasy.

How do you feel about current trends in digital recording and remastering?

Well, I think nice sound is good, but good performance is better. What did it matter that all of these old records had a horrible sound? Do you have to hear some fu-

sion with tremendous sound, with all kinds of crap going on, and eight mikes on the drums? Just give me Max Roach, when you can hardly hear the drums, but you hear the cymbal going *shhhhh*. That other crap is all meaningless. Man, I don't care whether it's on sandpaper or toilet paper! The important question is, is the music really there at all? If it's there, dig it, listen to it, and be thankful it's been preserved. A

SURE, I THINK NICE
SOUND IS GOOD, BUT
GOOD PERFORMANCE
IS BETTER.

Our first real hit came in the form of *Moody's Mood for Love*, originally an instrumental by saxophonist James Moody.

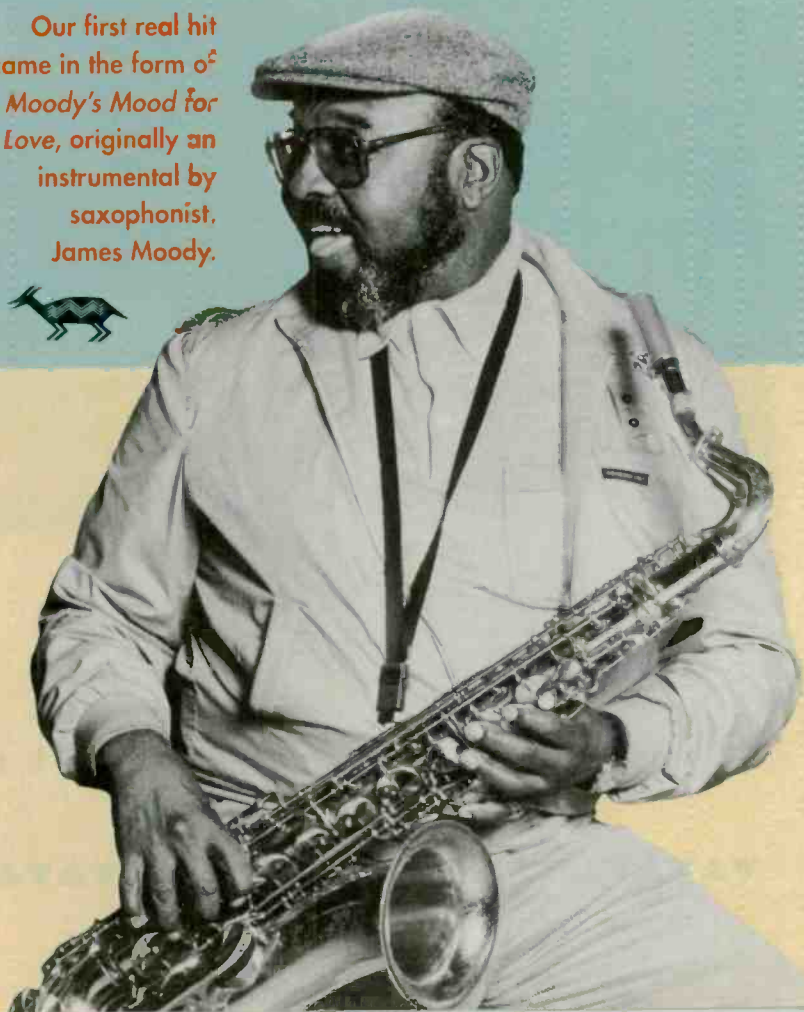




ILLUSTRATION: ELLEN WEINSTEIN

ROY ALLISON

THE
BEST PLACE
FOR YOUR
SPEAKERS?

Anyone who is familiar with my work knows that I've spent a lot of time on the problem of the ways speakers interact with room boundaries (walls, ceiling, floor) and how this affects sound. This work has led my current company, RDL Acoustics, to develop a simple, inexpensive (\$5!) program, *Bestplace*, for Windows or Macintosh computers; it can tell you a great deal about how your speakers will interact with your listening room.

Bestplace can tell you just where to place your speakers in your room to achieve the optimal interaction with room boundaries. You only need to enter three simple measurements; the rest is pretty much a matter of clicking on an on-screen "button" or pressing your computer's "Enter" key.

Let's look briefly at why and how the interaction between speakers and room boundaries occurs. The movement of the cone in a direct-radiator loudspeaker is determined almost completely by its own internal construction and its enclosure, not by

YOUR
COMPUTER
KNOWS!

any external forces. However, the sound power the cone motion produces is very much dependent on the cone's acoustic load—the radiation resistance, specifically. Throughout the lower half of the audible frequency range, nearly five octaves, a loudspeaker's ability to radiate sound power is sensitive to its nearby environment. Therefore, its power response is affected by its location in a room. The changes in response with location can be large, both additions to and subtractions from the loudspeaker's free-space power output. The variations with location are not intuitively obvious; they are calculable, but the math is quite tedious to perform without the aid of a computer. That is why we

Roy Allison, founder of Allison Acoustics, joined with Edgar Villchur and others to form RDL Acoustics, in Bellingham, Mass., in 1992.

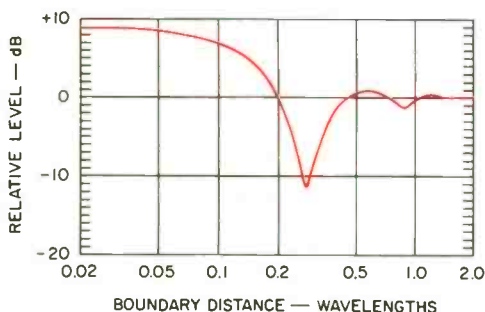


FIG. 1— AUGMENTATION OF THREE ROOM BOUNDARIES WHEN THE SPEAKER IS EQUIDISTANT FROM ALL THREE NEARBY INTERSECTING BOUNDARIES.

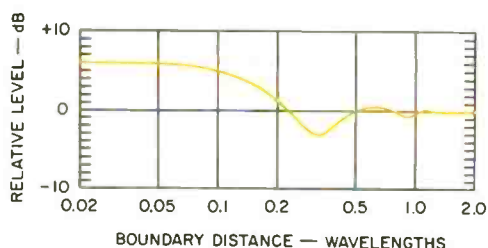


FIG. 2— AUGMENTATION OF TWO EQUIDISTANT INTERSECTING BOUNDARIES, WITH THIRD BOUNDARY REMOVED.

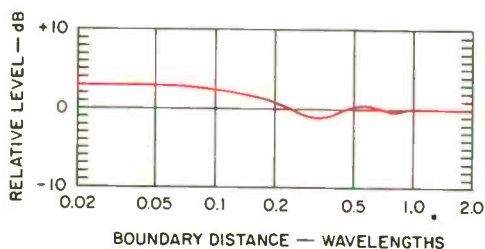


FIG. 3— AUGMENTATION OF A SINGLE NEARBY ROOM BOUNDARY; OTHER BOUNDARIES ARE FAR AWAY.

have developed *Bestplace*, a computer program to calculate and plot a room's augmentation to a speaker's anechoic power response. The only data you must enter in the program are the distances from the center of the woofer cone to the three nearest room boundaries. These numbers determine how the speaker's output will be changed by its environment.

THEORY

Suspended centrally, equidistant from opposite pairs of boundaries in a room, a loudspeaker system's power response is, for practical purposes, the same as it would be in an anechoic chamber. If it is moved down so that the woofer is *very close* to the center of the floor, low-frequency power output increases 3 dB because the reflected pressure, in phase with the direct output from the cone, doubles the radiation resistance. Moving the speaker again, so that the woofer is brought very close to the intersection of the floor and one wall, doubles the radiation resistance again, with another 3-dB increase in power output. If we next move the woofer very close to a three-boundary intersection—i.e., the floor and two walls—we would once again increase the output by 3 dB. Not bad: An eightfold increase in efficiency just by changing the location of the speaker!

But wait. You knew there had to be a catch, and there is. "Very close" in this case means at a very small fraction of a wavelength. This is easy to manage at low frequencies but rapidly gets more difficult as the frequency rises and the wavelength becomes shorter. The formula for wavelength (in inches) is 13,560 divided by the frequency; a 10th of a 30-Hz wavelength is 45 inches, but a 10th of a 300-Hz wavelength is only 4½ inches. It wouldn't be easy to design an enclosure that would put the center of a 10-inch woofer just 4½ inches from each of three intersecting room boundaries.

It is interesting to see the changing effects of boundary reflections on speaker output as the reproduced frequency rises. Waterhouse [1, 2] and Waterhouse and Cook [3] investigated the matter quantitatively, developing the formula described in the sidebar "The Waterhouse Equation." I confirmed their findings experimentally [4, 5] as they apply to loudspeakers in listening room environments, and pointed

THE WATERHOUSE



Waterhouse developed an expression for the ratio of power radiated by a small sound source, located near three mutually perpendicular room surfaces, relative to the power that would be radiated by that same source in free space—that is, with no boundaries nearby. ("Small" in this context means small in comparison with the wavelength of the frequency radiated. The usual direct-radiator woofer becomes progressively "smaller" as the frequency decreases below about 500 Hz.)

This ratio may be either a positive or negative number and is the sum of

out the design consequences. Ballagh [6] and Adams [7] have also made significant contributions.

Figure 1 shows what happens when the woofer is at the same distance from all three boundaries. At 0.1 wavelength, the power response has fallen nearly 2 dB from its maximum of 9 dB; at 0.2 wavelength, it reaches 0 dB, the free-space value, and at 0.28 wavelength, it has plummeted to 11.3 dB below its anechoic value! The power response then rises and ripples a dB or so above and below 0-dB augmentation. For perspective: If the woofer is 24 inches from each boundary, this distance is 0.1 wavelength of 56.5 Hz, 0.2 wavelength of 113 Hz, and 0.28 wavelength of the notch frequency, 160 Hz. The notch is created because the strong reflections combine at the woofer cone's surface in phase opposition to the direct output, reducing the radiation resistance at that frequency far below its free-space value. Above 0.5 wavelength (282 Hz in our example), the perturbations are minor.

Figure 1 shows the worst-case condition—fortunately. Suppose we have a large distance from one boundary, effectively putting the woofer equidistant to only two intersecting boundaries. The resulting

SE EQUATION

eight parts. The first part is the original free-space power, which is augmented (or diminished) by the sum of seven reflected impedances: Three from the individual boundary surfaces, another three from the two-boundary intersections, and a seventh one from the three-boundary intersection. The maximum possible output occurs when the source is at zero distance from the corner, in which case Waterhouse's formula has a value of 1 for each term. The total is then 8, for a gain of 9 dB. Of course, zero distance is not possible in the real world, and the gain drops rapidly as the distance between the source and the corner increases.

augmentation curve then looks like that in Fig. 2, where the maximum gain is 6 dB but the notch depth is reduced to 3 dB. Carrying the process one step further, by having only one nearby boundary, produces the curve in Fig. 3, which shows 3-dB maximum gain and only a 1-dB notch. There is a linear increase of 3 dB each time we bring the woofer close to another boundary but a decidedly nonlinear increase in the notch depth.

SMOOTHING THE AUGMENTATION CURVE

The problem of uneven augmentation would obviously be minimized if we could neutralize one room boundary. There are a few ways this can be done. One way is to mount the speakers in the wall, flush with its surface. Another way, feasible with true bookshelf-size speakers, is to place them in bookshelves surrounded by books. A third way, possible only in very large rooms, is to place them far from a third boundary. This would have to be at least 12 feet from one wall in order to limit the boundary's effect to below 50 Hz.

For one reason or another, none of these options is available to most of us. We must deal with three room surfaces close enough to our speakers to influence their behavior.

We can make that influence a good one, or at least a fairly neutral one, by taking advantage of the fact that the notch from a single boundary is mild. This can be done by making the woofer's distances to the three nearest boundaries as different as is practical, so that—rather than suffering the single crevasse in power output when all the distances are nearly the same—there are several much smaller dips and a smoother curve overall.

In most loudspeaker systems of medium to large size, the woofer is located not far from the center of the front panel, which limits the maximum value attainable for the distance ratio. If the woofer is on the top panel (or, in a floor-standing system, close to the bottom of the front or side panel), the minimum distance between the center of the woofer and one room surface can be as little as 6 or 7 inches. (Three of the four mid-size speakers I've recently designed are like this; the other is a bookshelf model.) Even with this advantage, however, performance should be optimized by evaluating the impact of the other room boundaries.

The *Bestplace* program (based on the Waterhouse formula) was developed to aid in this process, by allowing you to see in advance the effect of possible changes in speaker location. The program plots, in addition to the room augmentation curve for the distances entered, a power output curve for my company's speakers in that location. However, it is made more generally useful by a "Not an RDL speaker" option in the curve menu; only the augmentation curve is plotted with this selection. Figure 4 is a *Bestplace* augmentation curve corresponding to the curve in Fig. 1, obtained when 24 inches is entered for each of the three boundary distances. In Fig. 5, the distances are 10, 36, and 60 inches, yielding a much smoother curve.

If you know the anechoic power output of your speaker (not the on-axis anechoic frequency response), you can add it to the augmentation curve

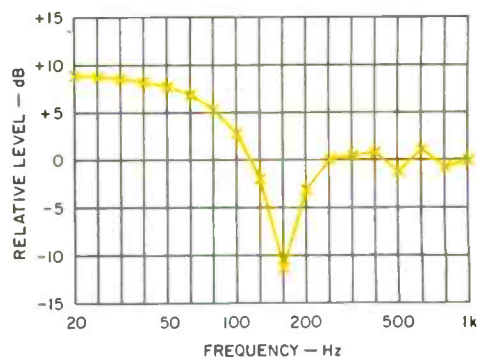


FIG. 4— AUGMENTATION, IN THIRD OCTAVES, FOR A WOOFER 24 INCHES AWAY FROM EACH OF THREE MUTUALLY INTERSECTING BOUNDARIES: PLOT HAS BEEN REDRAWN FROM *BESTPLACE* OUTPUT.

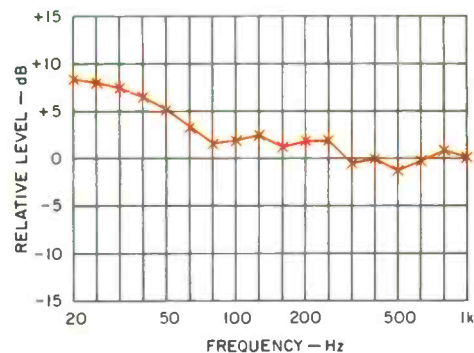


FIG. 5— AUGMENTATION, IN THIRD OCTAVES, FOR A WOOFER SPACED 10, 36, AND 60 INCHES FROM NEAREST ROOM BOUNDARIES: PLOT HAS BEEN REDRAWN FROM *BESTPLACE* OUTPUT.

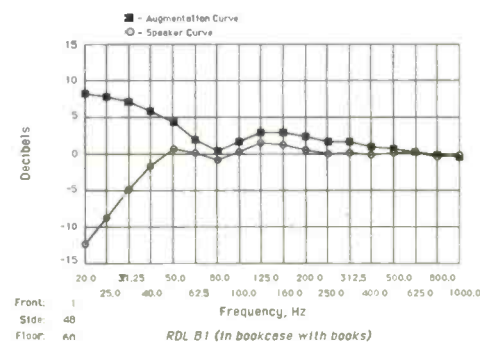


FIG. 6— *BESTPLACE* PRINTOUT, MACINTOSH VERSION, FOR RDL ACOUSTICS BOOKSHELF SPEAKER SURROUNDED BY BOOKS.

PROGRAM NOTES

(1) In the PC version of *Bestplace*, callout numbers for the frequency division (vertical) lines are not centered under the lines but begin just to the right of them. The program just couldn't seem to understand what was really wanted.

(2) All models of physical processes rely on assumptions which may not be fully valid: the model is not the process. One assumption made here is that the room walls are rigid and perfectly reflecting. Unless you live in a brick enclosure, this assumption doesn't completely hold true at very low frequencies. Therefore, the rise you'll often see in a speaker's augmented power response at the low end of its range is no reason for alarm unless it is more than several dB more than likely; this rise will help compensate for the bass that leaks through the walls.

(3) The IBM version, as described runs under Windows. On the same disk, for PC users who don't have or don't tolerate Windows, is an alternative version that runs under Lotus 1-2-3. Its file name is Boundary.WKL.

(4) As stated, the smoothest augmentation occurs when the distances to room boundaries are distinctly different. To achieve this, make the longest distance call it A as large a multiple of the shortest (C) as is practical. Then a good starting number for the intermediate distance (B) is the square root of the product of A multiplied by C .

(5) The Editor of *AUDIO* had the program lock up on his PC because it did not have enough memory; this was cured with an expansion.

Bestplace gives you to obtain your speaker's power output in that location. Note that a near-field woofer measurement is not the same as a full-space (or anechoic) total power measurement, on which the Waterhouse formula is based. To convert a near-field measurement to a rough equivalent of full-space power, you must subtract 3 dB below the frequency at which the cabinet's

front panel becomes a half-space baffle. The region of the transition frequency depends on the size of the baffle, but if you gradually phase in the change in level from 300 to 600 Hz, you probably won't be grossly off. As a corollary, if you are making calculations based on flush-mounting your speaker, you can use a near-field woofer measurement directly and not have to make the conversion. Flush mounting (or bookshelf mounting with surrounding books) is essentially a half-space environment to start with, which is what a near-field measurement simulates.

USING THE PROGRAM

When *Bestplace* is loaded in Windows, the welcome screen offers two choices. One button generates a help menu; the other, labelled "OK," clears the screen except for a three-choice menu bar at the top. These choices are "File," "Run Program," and "Help." "Help" brings down the same menu as can be accessed from the welcome screen.

"Run Program" drops a single-item menu labelled "Create graph." Pressing that button brings up a screen headed "Input Graph Parameters." The first selection, "Select a speaker type," scrolls a list of RDL Acoustics models and then the choice of "Not an RDL speaker," the general-use selection. Following the window for speaker choice is one with boxes for entering distances from the center of the woofer to the three closest room boundaries. Once these are entered, you are offered a choice of "Cancel" or "Graph" buttons to press. If you choose "Graph," a graph of boundary augmentation versus frequency will be displayed, based on the distances you have entered. If you selected an RDL model to investigate, its power output in that location will also be shown. (Figure 6 shows such a graph, from the Macintosh version of the program.)

When the graph has been plotted, you can plot a new one for a different combination of distances by clicking on the "Run Program" menu again. The menu bar remains on screen with the graph. You may also press "Help." Or, if you press "File," a drop-down menu offers three choices: "Copy to Clipboard," "Print," or "Exit."

Bestplace is available on diskette in both IBM and Macintosh versions; in the case of IBM, on either 3½- or 5¼-inch diskette. The cost is a nominal \$5, postage included. You may place an order by writing to RDL Acoustics (26 Pearl St., No. 15, Bellingham, Mass. 02019) or, if you want to use a credit card, by phone (800-227-0390). Be sure to specify which version you want. Both versions of the program can be downloaded free of charge from the RDL Bulletin Board (800-227-0391). If you'd like technical papers on room boundary effects, including the Waterhouse formulas and verification measurements, they are available free of charge from the same source. A

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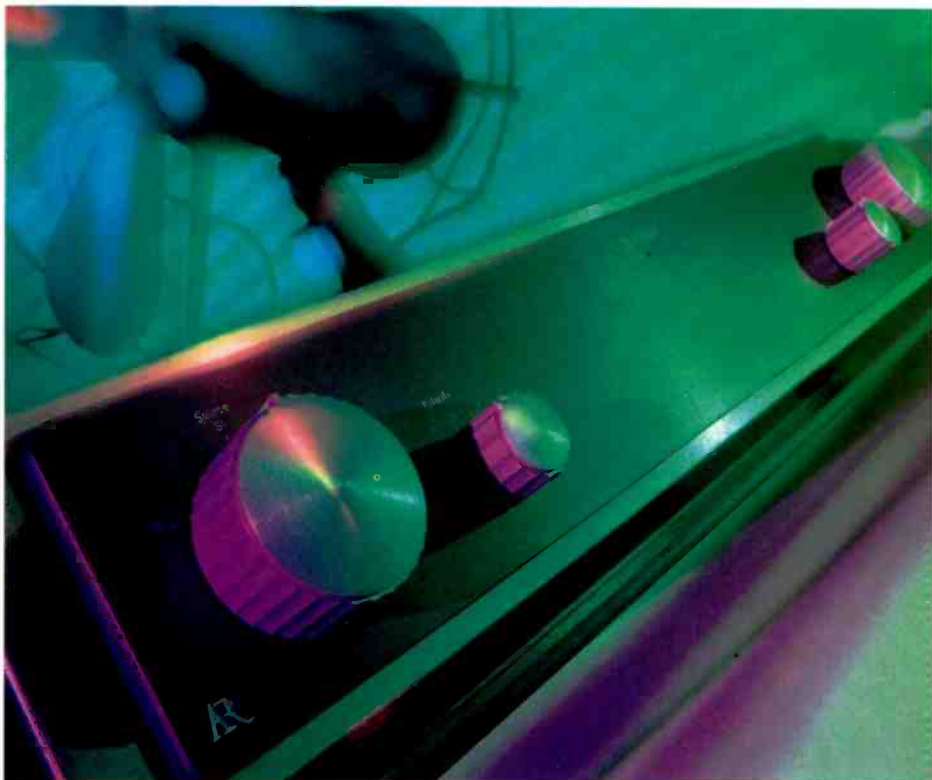
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ACOUSTIC RESEARCH LIMITED MODEL 2 PREAMP



The Limited Model 2 preamplifier is one of several components designed by some of the audio industry's top designers for Acoustic Research, a company best known for its pioneering development of acoustic-suspension speakers. An interesting discourse on the AR Limited engineering philosophy in the excellent and informative owner's manual states: "It has long been recognized that hi-fi systems, even the very best, are somewhat lacking when compared to live music." Despite improvements in source material, loudspeakers, and electronics, "Live music still reigns, and audio systems are still second." (I'll drink to that!) Although the Limited series

**TO OPTIMIZE SIGNAL
TRANSMISSION,
THE LIMITED MODEL 2
IS BALANCED
FROM INPUT TO OUTPUT.**

designs were optimized to play music, AR admits that they do have some slight personality but feels that it isn't imposed on the music.

In the numerous areas still open to audio designers, AR focused the development of the Limited series on two major points:

Signal equalization (which is handled in a very nice Limited series equalizer, the Model 6) and signal transmission. In order to optimize signal transmission, the Limited series' engineers decided that balanced operation was to be used wherever possible. Accordingly, the Model 2 is basically a balanced design, from input to output. Two balanced and three unbalanced inputs are provided, but the unbal-

anced inputs are converted to balanced by an input op-amp. Each unbalanced input circuit's gain can be adjusted in three steps by moving jumpers on the main board, yielding overall gain of 0, +6, or +14 dB. This feature helps to equalize the output levels of various unbalanced sources. With the balanced inputs, the overall gain is fixed at about 0 dB.

The four front-panel rotary controls are arranged in two pairs, one pair at the left of the front panel and the other at the right. The functions of these knobs, from left to right, are signal selection, output polarity and muting, balance, and volume. A small red LED at the top center of the panel tells when power is on. On the rear panel are the signal input and output connectors, a ground post, an IEC a.c. power-cord socket, and the a.c. power switch.

Within the Model 2, a large p.c. board takes up the whole internal area. All components—except the four-gang output-level attenuator, the a.c. power switch, and the RCA unbalanced input/output connectors—are mounted on the p.c. board. Power-supply components occupy about one-third of the board area, with the remainder devoted to signal circuitry. High-quality

SPECS

Gain: Balanced main input to line output, 0 dB; single-ended main input to line output (variable), 20 dB max.

Input Impedance: Balanced, 24 kilohms; single-ended, 50 kilohms.

Output Impedance: Balanced, 100 ohms; main single-ended, 50 ohms; tape, 1 kilohm.

Maximum Input and Output: Balanced, 20 V rms; single-ended, 10 V rms.

THD and IM Distortion at Rated Output: 0.002%.

S/N: 110 dB, A-weighted, re: 1 V.

Slew Rate: 20 V/ μ S.

Dimensions: 19 in. W x 4 in. H x 13 in. D (48.3 cm x 10.2 cm x 33 cm).

Weight: 15 lbs. (6.8 kg).

Price: \$2,200.

Company Address: 535 Getty Court, Bldg. A, Benicia, Cal. 94510.

For literature, circle No. 90

parts are in abundant evidence here, and the build quality of this preamp is first-rate.

Circuit Description

I was unable to obtain a schematic diagram of the Model 2 from AR, so the following is not as complete as I would normally report.

Unbalanced inputs are converted to balanced by two PMI OP275 dual op-amps per input pair. With all input signals in high-level balanced form, they are then fed to the input selector. This is a four-section, fully enclosed, and environment-proof switch with silver-plated brass contacts. The selected input is routed to the polarity/muting switch and also to the tape-out buffer. (Another OP275, along with a pair of discrete TO-5 transistors as output devices, is used for each channel's tape output). Signal out of the polarity/muting switch is passed on to the balance and volume controls.

THE OUTPUT SECTION IS FAST, AS SHOWN BY THE SQUARE-WAVE TEST AT 100 kHz.

The volume-control attenuator in the Model 2 is something to drool over. It consists of a four-deck, 59-position switch. Each deck is a p.c. board, with Dale miniature metal-film attenuator resistors mounted on it. Each attenuator divider point is picked up by a wiper contact that is, in turn, connected to a circular track that takes the attenuated signal out to the wiper terminal of the deck. An elegant detent mechanism completes the picture. These attenuators look very much like my memory of units used in the Cello Audio Palette, a totally beautiful piece of gear if there ever was one. I would surely like to have a couple of these attenuators to put in some of my own preamp designs!

Output amplifier circuitry consists of four unity-gain buffers that present high impedance to the output of the volume-control sections and present low impedance and current-driving ability to the main signal outputs. A number of TO-5 metal-can discrete transistors, along with a complementary pair of TO-220 output transistors mounted on heat-sinks, are used in each of the four output sections. In

my opinion, a topological flaw exists in the Model 2's unbalanced output: The two input phases of a channel are not combined, as they would be in an amplifier with differential inputs and outputs; instead, each phase is passed straight on to the corresponding output phase. This means that both phases of a balanced input are not represented in each output phase. This matters because some signal sources (such as the Sonic Frontiers SFD-2 hybrid D/A converter, which I have heard but not reviewed) deliver better sound from their balanced outputs than from their unbalanced output.

Power-supply circuitry starts out with a generously sized toroidal transformer feeding full-wave-rectified secondary output into a pair of 8,200- μ F, 44-V filter capacitors. A pair of high-current integrated-circuit regulators are used in an unusual configuration that employs an external low-noise reference voltage. Four power-supply isolation buffers follow the main voltage regulators. One pair supplies the single-ended input stages; the other pair supplies the four active output-stage circuits. Final delivered supply to the circuitry is +15 and -15 V.

Measurements

Gain and sensitivity data for the Model 2 is enumerated in Tables I and II, respectively.

Frequency response with unbalanced input and output is shown in Fig. 1 for instrument, IHF, and 600-ohm loads. Data shown is for S2 (single-ended input 2) configured for +14 dB gain. Output level was set at maximum. Response in the unbalanced mode was essentially the same for the three input-amplifier gain settings. Further, response in the balanced-in and balanced-out mode was essentially like that

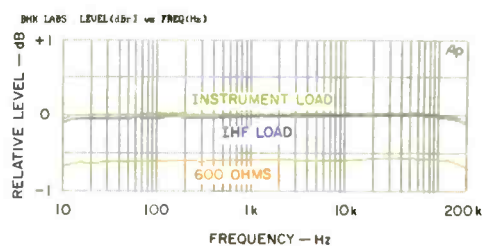


Fig. 1—Frequency response.

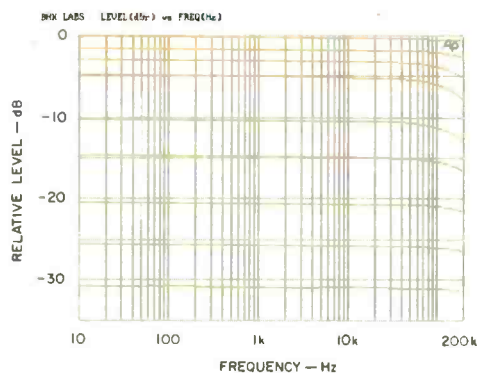


Fig. 2—Frequency response with various volume-control settings.

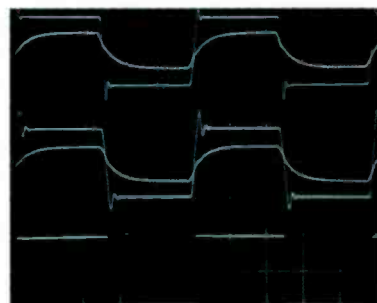


Fig. 3—Square-wave responses for 100 kHz with output polarity at zero (top) and at 180° (middle), and for 20 Hz (bottom).

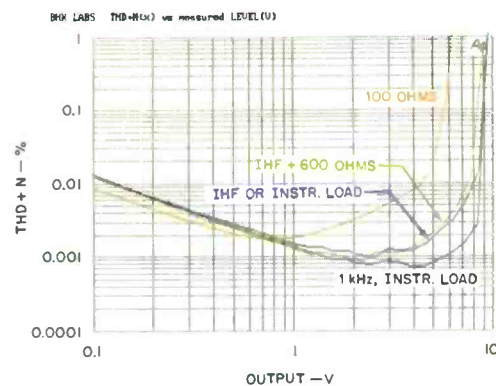


Fig. 4—THD + N vs. level and load. All curves are for 20 kHz except where noted.

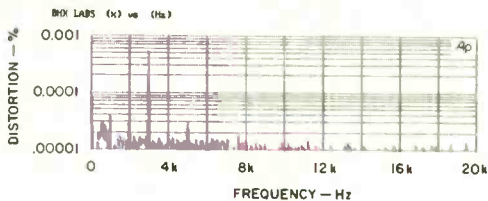


Fig. 5—Spectrum analysis of harmonic-distortion residue; see text.

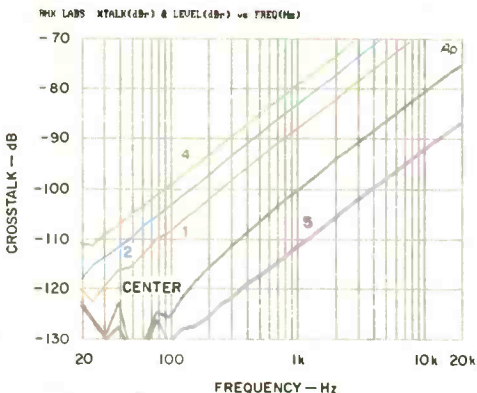
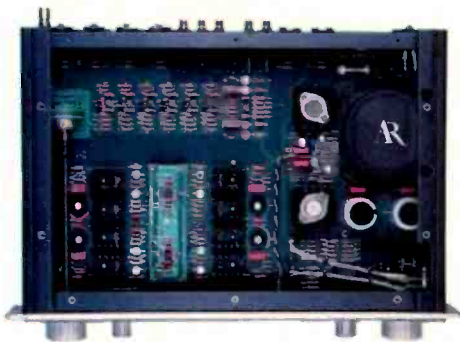


Fig. 6—Crosstalk, left-to-right direction, for various settings of balance control.

TABLE I—Gain, in dB, with various inputs (S1, S2, and B1).

	LEFT		RIGHT	
	INSTR. LOAD	IHF LOAD	INSTR. LOAD	IHF LOAD
Unbalanced In, Unbalanced Out				
S1, at 1X, to Main Out	-0.9	-0.13	-0.9	-0.13
S2, at 2X, to Main Out	5.9	5.86	5.89	5.84
S2, at 5X, to Main Out	13.88	13.84	13.86	13.82
S1, at 1X, to Tape Out	5.94	5.11	5.93	5.11
S2, at 2X, to Tape Out	11.93	11.11	11.91	11.09
S2, at 5X, to Tape Out	19.99	19.08	19.88	19.05
Balanced In				
B1 to Balanced Main Out	-0.14	-0.22	-0.14	-0.22
B1 to Unbalanced Main Out	-5.02	-5.09	-5.02	-5.06
B1 to Tape Out	-0.14	-0.97	-0.14	-0.97



shown in Fig. 1, except that the output drop with IHF and 600-ohm loads was twice as great because the balanced outputs' impedance is twice as high.

High-frequency response does vary with the setting of the volume control, as shown in Fig. 2 for unbalanced input/output. Worst-case roll-off looks to be about -2.5 dB at 200 kHz.

Square-wave response for unbalanced input and output in the left channel is shown in Fig. 3. As can be seen, this output amplifier is *fast*. The top and middle traces are for 100 kHz, and the bottom trace is for 20 Hz. The top trace is with output polarity set to "0°," and the middle trace was made at "180°." The faster, larger traces are for volume at maximum; the smaller, slower traces are with volume attenuated 6 dB. Results shown are for my instrument load; IHF loading didn't change much except to reduce the overshoot slightly. Slewing can be seen in the photo. At the higher output level, 10 V peak to peak, three edges are slewing at about 26 V/μs, and the positive-going edge for the "0°" polarity setting is slewing at a faster rate of 50 V/μs. At the reduced level, 2.5 V peak to peak, rise- and fall-times are close to 100 nS for the "0°" setting and more like 120 nS for "180°".

Total harmonic distortion versus output level for a number of frequencies and load conditions is shown in Fig. 4. These conditions are: 1 kHz with instrument load and 20 kHz with instrument or IHF load (the two curves are identical), with the IHF load paralleled with 600 ohms, and finally, with a 100-ohm load. I'd say the Model 2 would drive about anything!

A spectrum of harmonic-distortion residue for a 1-kHz signal at 5 V out with unbalanced input/output, IHF load, and +14 dB gain is shown in Fig. 5.

I noticed in my pushing and poking about that the tape output buffers would oscillate on the positive peaks when driven to clipping. This also occurred with the input amplifiers when they were driven into clipping. Since the op-amps are the same

EVEN WITH HIGH-GAIN AMPS AND HORN SPEAKERS, HUM AND HISS WILL LIKELY BE INAUDIBLE.

for both functions, this would seem to be an attribute of the op-amps and/or the particular way they are used in the AR Limited Model 2.

Crosstalk between channels was measured in both balanced and unbalanced modes. In all measurements, the crosstalk was essentially a rising 6-dB/octave function, indicating capacitive coupling between the channels. Figure 6 shows the crosstalk in the poorer (left-to-right) direction, using the unbalanced output and unbalanced input S1 configured for unity gain, and with volume at maximum. The numbers on the curves indicate the balance control's setting as the number of clicks to the right of center. As can be seen, all of the control's positions to the right of center degrade the crosstalk except for the one at the extreme right ("5"), which infinitely attenuates output from the left channel. Results in the right-to-left direction were some 5 to 8 dB better than those in Fig. 6. Results in the balanced mode were similar to those shown for unbalanced signals.

Output noise for unbalanced and balanced modes, and the three unbalanced input-amplifier gains (1X, 2X, and 5X), are listed in Table III. As can be seen, the Model 2 has very low output noise and will likely have inaudible hum and hiss, even with high-gain power amplifiers and horn speaker systems. The IHF signal-to-noise ratios are listed in Table IV.

A few final measurements: The a.c. power-line draw was about 220 mA. Output

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impedance at the unbalanced outputs was about 43 ohms and was double that at the balanced XLR outputs. Input impedance for the balanced inputs was about 35 kilohms with volume at maximum and 38 kilohms with the volume set for about -20 dB. Input impedance for unbalanced inputs was about 50 kilohms and was constant with volume-control setting.

Use and Listening Tests

Equipment in my system during the review period included an Oracle turntable fitted with a Well Tempered Arm and Spectral Audio MCR-1 Select moving-coil pickup used with a Vendetta Research SCP-2C pre-preamp. Krell MD-10 and PS Audio Lambda CD transports fed Sonic Frontiers' SFD-2, Sentec's DiAna, and other (experimental) D/A converters. Other signal sources included a Nakamichi ST-7 tuner, a Nakamichi 250 cassette deck, and a Technics 1500 open-reel recorder. Preamplifiers used included a Forssell line driver, a First Sound Reference II, and a unit from Quicksilver Audio—as well as no preamplifier at all. Power amplifiers on hand were a Crown Macro Reference and a pair of Quicksilver M135s. Loudspeakers used were B & W 801 Matrix Series 3s augmented with a Klipsch SW15 powered subwoofer.

As is frequently the case when I receive a new piece of gear, I loaned the Model 2 to a friend to try out for a while and get some hours on the unit. He reported favorably on the Limited Model 2's build quality and sound.

When I started formally evaluating the sonics of the Model 2, I had been using the excellent Sonic Frontiers SFD-2 D/A converter feeding balanced outputs into a Forssell tube line-stage preamp modified to have balanced inputs. This combination, driving either my Quicksilver M135s or the Crown Macro Reference, had been delivering extremely good sound with CDs. Best sound from the SFD-2 definitely comes from the balanced outputs, so when I started evaluating the Model 2, I used the balanced inputs for the SFD-2. Because I had determined during measurements that the Model 2 does not combine both input phases of a balanced input into the unbalanced outputs, I coupled the balanced outputs into the Macro Reference, with its in-

puts configured for balanced. Wow! This combination sounded exceedingly good. Definition and detail were of a high order, soundstaging was excellent, and there was an overall sense of musical believability. Although bass quality and definition were very good, bass extension and impact were not quite as good as when using the Forssell line unit driving the Crown in unbalanced input mode. All in all, the Model 2 is an excellent sonic performer. Operation was flawless, and there were no unexpected noises.

TABLE II—Sensitivity, in mV, with various inputs (S1, S2, and B1), for IHF load.

	LEFT	RIGHT
Unbalanced In, Unbalanced Out		
S1, at 1X, to Main Out	507.4	507.4
S2, at 2X, to Main Out	254.6	254.8
S2, at 5X, to Main Out	101.6	101.9
S1, at 1X, to Tape Out	277.6	277.8
S2, at 2X, to Tape Out	139.2	139.5
S2, at 5X, to Tape Out	55.6	55.8
Balanced In		
B1 to Balanced Main Out	512.6	512.6
B1 to Unbalanced Main Out	895.1	895.1
B1 to Tape Out	558.8	559.3

TABLE III—Output noise levels, in μ V, with various inputs (S1, S2, S3, and B1), volume-control positions (counterclockwise, worst case, and clockwise), and bandwidths.

	CCW	LEFT WC	CW	CCW	RIGHT WC	CW
Unbalanced In, Balanced Out						
S1, at 1X						
Wideband	25.3	56.1	21.2	21.2	57.5	19.3
22 Hz to 22 kHz	4.0	12.4	3.9	3.5	12.6	5.0
400 Hz to 22 kHz	3.3	11.6	3.4	3.3	12.0	3.5
A-Weighted	2.5	9.2	2.7	2.6	9.5	2.8
S2, at 2X						
Wideband	25.3	55.5	26.1	21.0	56.9	25.4
22 Hz to 22 kHz	4.0	12.7	5.5	3.5	12.7	5.5
400 Hz to 22 kHz	3.3	11.7	4.1	3.3	12.0	4.1
A-Weighted	2.6	9.2	3.2	2.6	9.5	3.3
S3, at 5X						
Wideband	25.3	55.2	54.1	21.1	56.7	54.1
22 Hz to 22 kHz	4.0	13.0	7.4	3.5	13.0	8.1
400 Hz to 22 kHz	3.3	12.0	7.0	3.2	12.4	7.1
A-Weighted	2.6	9.4	5.5	2.6	9.8	5.5
Balanced In, Balanced Out						
B1						
Wideband	22.3	63.5	26.4	22.6	59.6	26.7
22 Hz to 22 kHz	4.6	17.5	5.7	4.7	18.2	5.8
400 Hz to 22 kHz	4.4	16.7	5.4	4.5	17.2	5.6
A-Weighted	3.4	13.2	4.2	3.6	13.5	4.3

I do have a few nits, however. First is the aforementioned lack of differential-amplifier action in the output amplifier. Second, in this sample, the otherwise incredible volume attenuator had more rotary-shaft backlash in the middle of its rotation than at the ends.

In conclusion, the AR Limited Model 2 line preamp is a clear winner. Do go out and audition this one.

Bascom H. King

TABLE IV—IHF S/N, in dB, with various inputs (S1, S2, S3, and B1), for worst-case position of volume-control.

	LEFT	RIGHT
Unbalanced In, Balanced Out		
S1, at 1X	105.0	105.0
S2, at 2X	94.6	94.2
S3, at 5X	96.9	96.7
Balanced In, Balanced Out		
B1	101.2	101.0



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EPOS ES11 SPEAKER



unusual cabinet assembly, an extremely simple crossover network (two parts!), and a bass driver that has a phase plug instead of a dust cap.

The frame of the ES11 woofer is, as I've just noted, an integral part of the front panel and is injection-molded in one piece. According to Epos, "This insures that the coupling between the bass driver and the baffle is precisely and consistently defined, unlike conventional systems where the coupling is influenced by the varying tightness of fixing screws." The molding is very stiff and inert, minimizing vibrations of the front panel. Presumably, replacing the woofer requires changing the whole front panel. The tweeter is separately mounted to the front panel. The rear panel, which contains the input terminals, crossover, and reflex port, is also an injection-molded part.

The front and rear panels are held in place by four long hex-head bolts, located near the cabinet's corners, which pass

SPECS

Type: Two-way, vented-box, compact system.

Drivers: 6½-in. cone woofer and 1-in. dome tweeter.

Frequency Response: 60 Hz to 20 kHz (tolerance not stated).

Sensitivity: 87 dB at 1 meter, 2.83 V rms applied.

Crossover: 6-dB/octave high-pass on tweeter only (frequency not stated).

Impedance: 8 ohms nominal.

Recommended Amplifier Power: 25 to 75 watts per channel.

Dimensions: 14¾ in. H x 8½ in. W x 9¾ in. D (37.5 cm x 22 cm x 25 cm).

Weight: 17.6 lbs. (8 kg) each.

Price: \$895 per pair; available in black ash, walnut, or mahogany; foam grilles for earlier models, \$50 per pair; speaker stands, \$200 per pair.

Company Address: c/o Music Hall, 108 Station Rd., Great Neck, New York, 11023.

For literature, circle No. 91

Epos Acoustics, a small loudspeaker company owned by the larger British firm Mordaunt-Short (which in turn is a member of the much larger TGI group of companies that includes Tannoy, Goodmans, and KEF), was

founded by designer Robin Marshall in 1983. Epos (a Latin noun from the Greek, meaning an epic poem) currently has two speakers in its line, the compact ES11 and the larger,

8-inch two-way ES14, which has been the very successful, principal system of Epos since 1986. These two systems are to be

joined shortly by the ES25, a full-range floor-standing model.

The ES11, which was added to the Epos line in 1990, is a small two-way vented system utilizing a 6½-inch woofer and a 1-inch dome tweeter. Both drivers are custom designed and

manufactured by Epos, whose goals were to create an affordable, well-balanced design with high-end aspirations. Among the ES11's novel design features,

the most novel is the bass driver's frame, which is an integral part of the loudspeaker's front panel. Other features include an

**THE SIMPLICITY OF THE
ES11'S CROSSOVER
IS SAID TO ENHANCE
DETAIL RESOLUTION
AND WOOFER CONTROL.**

through the front panel and engage threaded inserts in the rear panel. Wood bracing is used internally for added strength. When assembled, and all four bolts tightened, the cabinet's 1-inch-thick medium-density fiberboard walls are sandwiched between the front and rear panels, forming a very strong and vibration-free structure.

The woofer's cone is thermoformed from a polymer material and shaped to optimize on- and off-axis response. The surround is a synthetic high-loss rubber that minimizes mechanical travelling waves on the cone's surface. The ES11's woofer has a phase plug protruding from the center of the cone rather than the more usual dust cap. The phase plug is stationary and is attached to the woofer's pole piece. The voice-coil and attached cone move fore and aft around the plug. The bullet-shaped phase plug is said to provide better polar response than is possible with a dust cap. The roll-off of the woofer's upper frequency has been carefully tailored so that the use of a low-pass crossover filter is not required.

The ES11 tweeter dome is fabricated from an aluminum alloy and is suspended by a polyamide material. The dome is acoustically loaded by a separate rear air chamber, while the voice-coil utilizes a magnetic fluid said to improve reliability and reduce dynamic compression. The crossover of the ES11 is a "minimalist" design. It contains only two components, a high-quality series capacitor and a parallel resistor, which form the high-pass filter driving the tweeter. The simplicity of the crossover is said to enhance the loudspeaker's ability to resolve fine detail, and the absence of a low-pass filter on the woofer allows better control of its motion by the power amplifier.

The ES11's input connections, which can be bi-wired, do not use the conventional double set of dual five-way binding posts with jumpers. The back panel contains only two sets of flush-mounted double-banana input holes. Single (i.e., not bi-wire) connections are accommodated by

the inclusion of two short banana-plug adaptor links, one for positive and the other for negative. Each link has a single banana plug on each end, one plain and the other containing a piggyback banana socket. In either configuration,

bare wire connection capability is not supported; banana plugs must be used! However, Epos does provide an extra set of double-banana plugs that can be attached to bare wires and then used to connect to the loudspeakers.

Measurements

The on-axis anechoic frequency response of the ES11 is shown in Fig. 1. Measurements were taken at 2 meters, halfway between the woofer and tweeter. With 5.66 V rms applied, the result was referenced back to 1 meter. A combination of elevated free-field and ground-plane measurements was used to derive the curve.

The overall curve in Fig. 1 is quite smooth, fitting a fairly tight 4.7-dB window (+1, -3.7 dB referenced to 1 kHz) from 100 Hz to 20 kHz. The bass response is down 3 dB (from the 100-Hz level) at 56 Hz and down 6 dB at 47 Hz. Below 50 Hz, the response rolls off at 24 dB/octave, as is typical of vented boxes. There is a mild but broad peak centered at 800 Hz and a slight, downward shelf at high frequencies. Except for slight irregularities, the curve is quite smooth. The speaker's foam grille does not affect the response much at all. This system is one of few that will not be sonically compromised if listened to with the grille on. Averaged over the range from 250 Hz to 4 kHz, the sensitivity of the EP11 was 85.5 dB, 1.5 dB below the 87-dB rating. The right and left speakers were matched within a close ± 0.5 dB.

THE EPOS ES11 IS ONE OF THE FEW SPEAKERS WHOSE GRILLE DOESN'T COMPROMISE ITS SOUND.

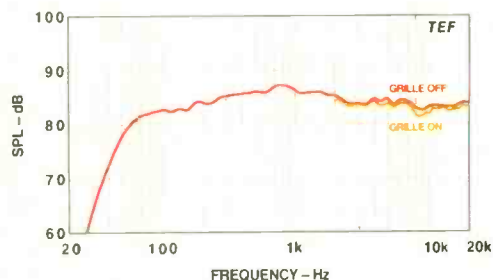


Fig. 1—One-meter, on-axis frequency response.

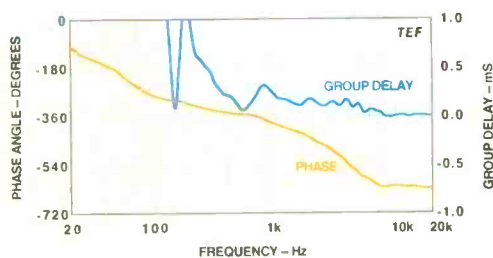


Fig. 2—On-axis phase response and group delay.

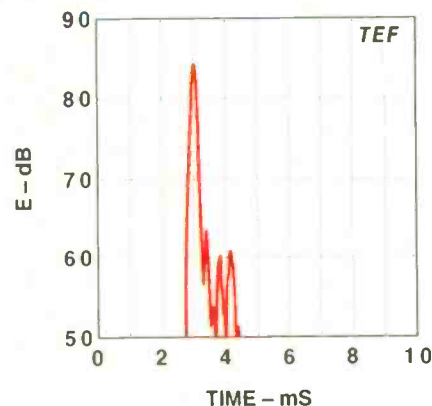


Fig. 3—Energy/time response.



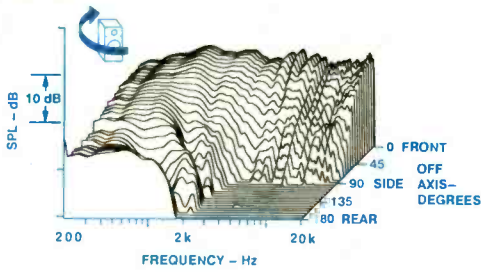


Fig. 4—Horizontal off-axis frequency responses.

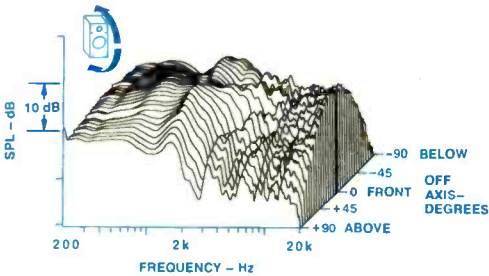


Fig. 5—Vertical off-axis frequency responses.

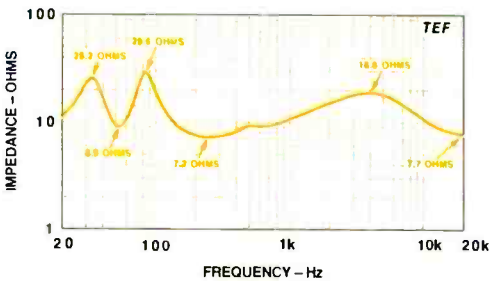


Fig. 6—Impedance.

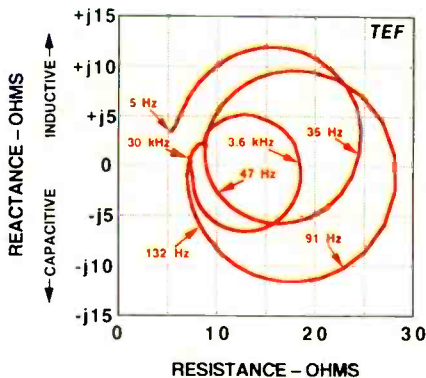


Fig. 7—Complex impedance.

The phase and group-delay responses of the ES11, referenced to the tweeter's arrival time, are shown in Fig. 2. The phase curve is well behaved and rotates an additional 240° between 1 and 20 kHz. The group-delay curve shows a fairly low offset of about 0.15 mS between the midrange and treble. The deviations between 100 and 200 Hz are due to minimum-phase variations in the amplitude response and would disappear if the response were flat through this range.

The ES11's energy/time response is shown in Fig. 3. The test parameters accentuate the speaker's response between 1 and 10 kHz, which includes the crossover region. The main arrival, at 3 mS, is very compact but is followed by minor delayed responses, about 23 dB down from the main peak and extending 1.5 mS after the main arrival.

Figure 4 reveals the horizontal off-axis frequency responses; the bold curve at the rear of the graph is the on-axis response. The off-axis horizontal response is very uniform. In the primary ($\pm 15^\circ$) listening window, the response is extremely uniform, staying within ± 1 dB of the on-axis curve all the way to 20 kHz.

The vertical off-axis frequency responses are displayed in Fig. 5; the bold curve in the center of the graph (front to rear) is on axis. The aberrations in the range from 5 to 7 kHz indicate that the crossover frequency is at a high 6 kHz. Because the woofer and tweeter are separated by $5\frac{1}{2}$ inches (center to center), a significant 2.3 wavelengths at crossover, the vertical off-axis response in the crossover range is quite rough and narrow. The curves in Fig. 5 verify the narrowness of the vertical response at crossover and show that the response is significantly irregular at angles of only $\pm 5^\circ$.

In Fig. 6, the ES11's impedance magnitude, a high minimum im-

pedance of 7.2 ohms occurs at 250 Hz and a high maximum of about 29 ohms occurs at 85 Hz. The curve's maximum-to-minimum variation is about 4 to 1 (28.6 divided by 7.2). Even though this variation is fairly large, the high minimum impedance of the ES11 ensures that the speaker will not be very sensitive to cable resistance. Cable series resistance should be limited to a maximum of about 0.11 ohm to keep cable-drop effects from causing response

STRONG MAXIMUM OUTPUT ABOVE 60 Hz ALLOWS THE ES11s TO BE USED BY THEMSELVES OR WITH A SUBWOOFER.

peaks and dips greater than 0.1 dB. For a typical run of about 10 feet, you can use low-inductance cable of 16 or 18 gauge.

The complex impedance, plotted from 5 Hz to 30 kHz in Fig. 7, is well behaved and exhibits no extraneous resonances. The impedance phase (not shown) reached a maximum angle of $+45^\circ$ (inductive) at 64 Hz and a minimum angle of -40° (capacitive) at 112 Hz. Even though these angles are fairly large, the ES11 will not be a problem for any amplifier (even for two in parallel), because the minimum impedance is quite high.

When subjected to a high-level sine-wave sweep, the cabinet of the ES11 was mostly vibration-free. There were some minor wall resonances of the top and side panels in the 370 to 390 Hz range, and slight activity of the rear panel from 460 to 480 Hz. The linear travel of the woofer was about 0.4 inch, peak to peak, with reasonable distortion; maximum travel was somewhat longer. The woofer overloaded quite gracefully. No dynamic offset was noted.

Minimum excursion occurred at 55 Hz, the frequency of the ES11's vented-box resonance. Cone displacement was reduced by about 50% after the port was closed. Vent noise at and near the box resonance was fairly low.

Figure 8 shows the three-meter room response, with both raw and sixth-octave smoothed data. The ES11 speaker was in

the right-hand stereo position, aimed toward the main listening position, and the test microphone was at ear height (36 inches), at the listener's spot on the sofa. The system was driven with a swept sine-wave signal of 2.83 V rms (corresponding to 1 watt into the rated 8-ohm impedance). The direct sound and 13 mS of the room's reverberation are included. If you exclude room-effect dips at 325 and 425 Hz, the averaged curve fits a tight, 7.5-dB window. Above 2.1 kHz, it fits an even tighter window of about 4 dB.

Figure 9 shows the E_1 (41.2-Hz) bass harmonic distortion with input power ranging from 0.05 to 50 watts (note that 20 V rms generates 50 watts into the rated 8-ohm load). The second harmonic reaches a moderate level of 10.6%, while the third attains a very high 51%. Higher harmonics include an 8.1% fourth, a high 22% fifth, and a 3% sixth. With a 50-watt input, the ES11 reaches a marginally usable 1-meter SPL of 90 dB at 41.2 Hz.

Because the E_1 distortion was very high, a result of being significantly below the ES11's passband, the harmonic distortion of a higher frequency, B_1 (61.5 Hz), was measured and is shown in Fig. 10. As be-

THE SOUND WAS SMOOTH AND WELL BALANCED, WITH A TOUCH OF FORWARDNESS.

fore, the third harmonic predominates but only reaches a moderate 7% at full power. Other harmonics are all low, 0.6% or less. The second harmonic, which reaches only 0.4%, is hidden behind the 61.5-Hz fundamental's bleed-through ridge at the left of the graph. With 50 watts in, the Epos reached a fairly usable 1-meter SPL of 98 dB at 61.5 Hz.

In Fig. 11, the bass harmonic distortion for A_2 (110 Hz), the predominant distortion is a low 1.9% second harmonic and 2.4% third. Higher harmonics are quite low, 0.7% or less.

The A_4 (440-Hz) distortion (not shown) rose only to the low level of 3% second harmonic. Higher harmonics were below

the noise floor of my measuring gear.

Figure 12 displays the IM distortion versus power, created by tones of 440 Hz (A_4) and 41.2 Hz (E_1) of equal level. The IM distortion rises to the fairly high level of nearly 19% at full power. The woofer handles both tones of this IM test, which contributes to this speaker's high level of intermodulation.

The ES11's short-term peak-power input and output capabilities are shown in Fig. 13. The peak input power was calculated by assuming that the measured peak voltage was applied across the rated 8-ohm impedance.

The peak input power rises from 10 watts at 20 Hz and, after minor undulations at 80 and 120 Hz, reaches a local maximum of about 1,500 watts at 250 Hz. After falling to 830 watts at 400 Hz (where the woofer exhibited a harsh buzzing sound), the peak input power rises smoothly to a healthy 6,000 peak watts at frequencies above 1.6 kHz.

As can be seen in Fig. 13, the ES11's maximum peak output SPL with room gain rises very rapidly from an unusable 71 dB at 20 Hz to reach a very usable 107 to 110 dB between 65 and 160 Hz. After reaching a peak of 116.5 dB at 250 Hz and falling slightly to 115 dB at 400 Hz, the output rises into the healthy range of 120 to 123 dB above 600 Hz. A pair of ES11s, operating in unison in a typical listening room, can attain even higher levels in the bass range. The strong maximum output above 60 Hz suggests that these speakers can be used either by themselves or as satellite systems with a subwoofer.

Use and Listening Tests

After working with some large systems recently, it was nice to handle a pair of speakers that I could hold under each arm at the same time. The ES11s were supplied to me with sturdy metal stands, which are optional and

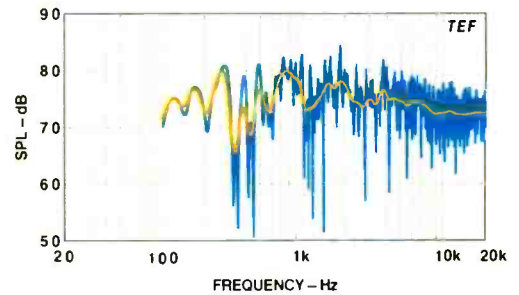


Fig. 8—Three-meter room response.

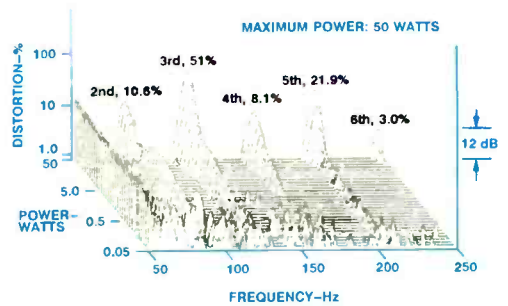


Fig. 9—Harmonic distortion for E_1 (41.2 Hz).

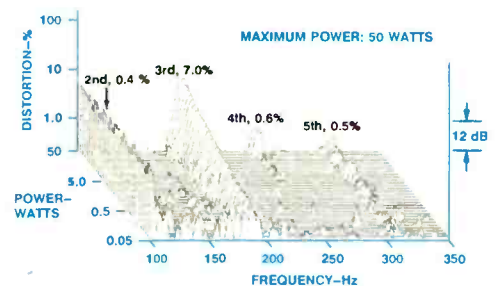


Fig. 10—Harmonic distortion for B_1 (61.7 Hz).

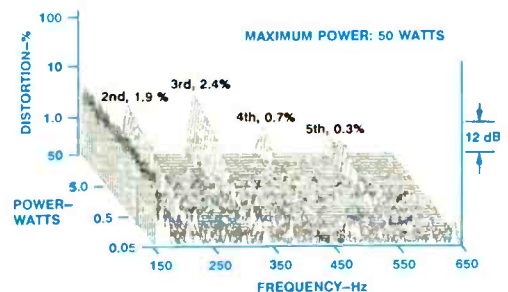


Fig. 11—Harmonic distortion for A_2 (110 Hz).

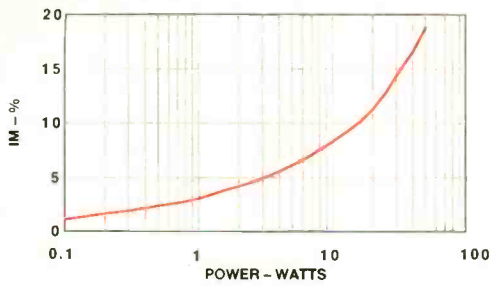


Fig. 12—IM distortion for A₄ (440 Hz) and E₁ (41.2 Hz).

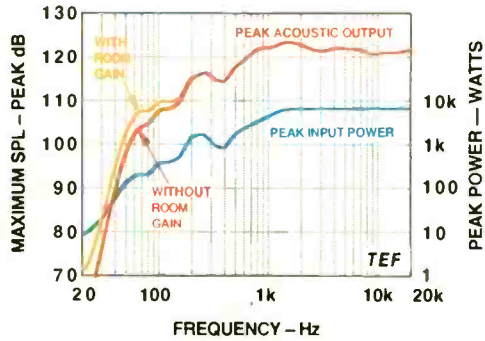


Fig. 13—Maximum peak input power and sound output.

have to be assembled. I chose to use my own metal stands, which are only about 1 inch taller and have spikes on the bottom.

The operating manual is brief but thorough and consists of four 4¼ x 5½-inch pages. Topics include power requirements, stands, positioning, connections, breaking in, and warranty. Epos points out that the ES11 was designed to be placed fairly close to the rear wall, within 20 to 30 cm (about 8 to 12 inches), for proper bass weight and definition. For some listening, I set the



ES11s closer to the rear wall than I usually do, about a foot in front of the bookshelves which line the rear of my listening room. I did most of my listening, however, with the speakers in my customary positions, well away from the rear walls.

My review systems were supplied in a very attractive walnut finish. Although Epos specifies that the finish is a veneer, it looked like solid wood; with the front panel removed, I could see what appeared to be unfinished walnut inside the cabinet. Construction and appearance were excellent. When first received, one system had a slight air leak at a point on the front panel's periphery. Tightening the four long bolts that hold the front panel to the cabinet sealed the leak.

My listening equipment consisted of the Krell KRC preamp and KSA-250 amp driving the ES11s through Straight Wire Maestro cabling. My reference speakers were B & W 801 Matrix Series 3s, while Onkyo and Rotel CD players provided source material. Listening was done in the regular (not bi-wired) configuration.

First listening revealed the ES11s to have a well-balanced, smooth sound, with a touch of forwardness, and significantly less bass than the reference B & Ws. Sensitivity was essentially the same as that of the references, and the two systems produced a similar overall balance and tone (excluding the low bass).

Female vocals, such as Clair Marlo on *Let It Go* (Sheffield Lab CD-29) and Trisha Yearwood on *The Song Remembers When* (MCA MCAD-10911), were very natural. There was no harshness, glare, or undue high-frequency emphasis. In fact, the overall high-frequency reproduction of the ES11 was quite similar to the 801's in level, smoothness, and extension.

On more dynamic material such as Bob Mintzer's jazz on *One Music* (dmp CD-488), the ES11s did quite well in handling high-level percussion transients and complex passages. The low-end kick and bass punch of the 801s was completely missing, however. Even though the low bass was

quite attenuated, the ES11s still had enough bass to be satisfying. At very high levels on this disc, the ES11s did start sounding somewhat congested; some audible modulation of the mids could be heard when high-level bass was present.

I also did some listening using Velodyne's F1500R subwoofer as an adjunct to the ES11s. (The F1500R replaced my F1500; the "R" version includes a remote. Having remote control of level and of bass

**THESE SMALL,
HIGH-PERFORMANCE
SPEAKERS ARE SMOOTH,
GOOD-LOOKING,
AND ACCURATE.**

on/off is a super addition!) The ES11s worked extremely well as satellites. With low bass added, the overall sound competed quite well with the 801s.

On the pink-noise stand-up/sit-down test, the ES11s exhibited significant tonal changes in the upper midrange when I stood up. Their spectral balance on pink noise was quite good but sounded slightly more forward than the 801s did and had significantly less bass. Smoothness, although not quite up to the B & Ws' standards, was nevertheless quite good. On third-octave band-limited pink noise, the ES11s did not have any usable output in the 20-, 25-, and 31.5-Hz bands. Although the output was just barely usable at 40 Hz, it was quite usable at 50 Hz. At 63 Hz and above, the ES11s could generate sufficient levels of clean bass.

On relatively sedate classical music, such as Boccherini's Cello Concertos performed on period instruments (Sony Classical SK 53121), the ES11s were quite open sounding, albeit a shade forward in the presence range. Stereo focus and lateral imaging were exemplary. Coloration was quite low, maybe due in part to the rigidity of the enclosure.

In summary, the ES11s demonstrated quite good performance for their size and price. They should be seriously considered by anyone who desires small, high-performance loudspeakers that are also accurate, smooth, and good looking. D. B. Keele, Jr.



Air guitar a little flat?



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AUDIOCONTROL C-101 SERIES III EQUALIZER/ANALYZER

The "2dB/4dB" button controls the analyzer display range, 2 dB per LED for a 16-dB total range or 4 dB per LED for a 32-dB range. "Slow/Fast" adjusts the analyzer response time; "Slow" gives a time-averaged reading that's useful when equalizing loudspeaker response with the pink-noise signal, while "Fast" lets you watch the music's antics.

From top to bottom, on the right of the display, are the four pushbuttons for the



Equalizers and analyzers are AudioControl's stock in trade. The venerable C-101, now in its third (Series III) incarnation, combines both in a relatively small, tasteful package. More important, it offers exceptionally good performance for the genre, especially vis-à-vis noise and distortion, a graphic equalizer's twin Achilles' heels. Consider its competitive price, five-year warranty, and inclusion of an excellent infrasonic filter, and you'll find that the C-101 Series III is a big winner in the cost/performance derby.

The C-101 Series III integrates a 10-band graphic equalizer and a defeatable infrasonic (a.k.a.

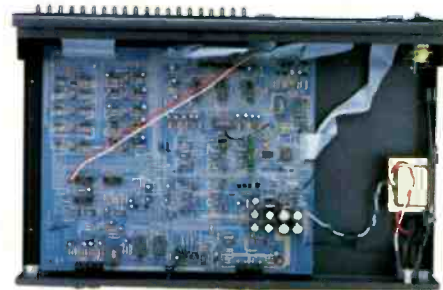
"subsonic") filter with a 10-band real-time analyzer and pink-noise generator. The system includes a "lab grade" microphone matched to the analyzer. (AudioControl advises that the microphone be used *only* with the C-101 and that no other microphone be substituted for it.) The mike is

on a 20-foot cable that terminates in a phone plug and fits into a jack at the front panel's lower left corner. Above the jack is a "Display Level" control that adjusts the analyzer gain to utilize the display range to its fullest.

At the top left corner is a "Power" switch, but since the C-101 consumes only 10 watts, it can be left on and plugged into a switched outlet of an amplifier or receiver. An unswitched outlet (200-watt maximum rating) on the C-101's back panel replaces the switched outlet you've used for the equalizer and is then switched on and off by your amplifier or receiver.

Four pushbuttons to the left of the display operate the analyzer; a bank on the right controls the equalizer. The top left button ("Display") quenches the dancing lights when you tire of their antics. "Pink Noise" activates an internal pink-noise generator and automatically substitutes the test signal for the normal feed to your amp.

**THE SLIDER SETUP
HELPS YOU EQUALIZE
BOTH CHANNELS ALIKE
OR EACH DIFFERENTLY.**



equalizer. "Equalize" engages or bypasses the 10-band equalizer, "EQ Recording" routes equalized signals to the tape output jacks so the C-101 can be used to equalize a recording, "Tape Monitor" replicates the tape monitor function of the amplifier when the C-101 is installed in a tape monitor loop, and "Subsonic Filter" engages or bypasses the internal 18-dB/octave Chebyshev high-pass filter.

Twenty sliders occupy the right half of the panel. These are arranged in adjacent left/right pairs to facilitate controlling both channels equally (a good idea to avoid the image smearing that can occur when left and right response and phase are modified differently). AudioControl's arrangement provides the best of both worlds. If you



choose to equalize differently to correct different response anomalies in the two speakers, you can do so; if you want to control both in like manner, it's also easy to ensure that you do. The 10 equalizer and analyzer sections are spaced on octave centers from 32 Hz to 16 kHz, which, considering the effective range of both sections and of the characteristics of human hearing, is eminently sensible.

The back panel is simple: Main input/output pairs for connection in a tape monitor loop (or, if you prefer, between preamp and power amp), and tape input/output pairs to connect with the tape recorder you wish to pre-equalize (and/or to replace the tape monitor loop lost to the equalizer when it occupies that position in the main signal path). Between these sets of gold-plated RCA jacks is a small control that adjusts the pink-noise level. At the extreme right are the power cord, the line

SPECS

Rated THD: 0.005%.
 Frequency Response: 10 Hz to 100 kHz, ± 0.75 dB.
 S/N: 118 dB, re: full output.
 Maximum Input: 8 V rms.
 Maximum Output: 8 V rms.
 Input Impedance: 100 kilohms.
 Output Impedance: 100 ohms.
 Control Bandwidth ("Q"): 2.5.
 Control Center Points: 32, 60, 120, 250, and 500 Hz and 1, 2, 4, 8, and 16 kHz.
 Control Range: ± 15 dB.
 Subsonic Filter: 20 Hz with 18-dB/octave Chebyshev alignment.
 Power Requirements: 120 V a.c., 60 Hz, 10 watts.
 Dimensions: 17 in. W x 3½ in. H x 11 in. D (43.2 cm x 8.9 cm x 27.9 cm).
 Weight: 9 lbs. (4.1 kg).
 Price: \$459.
 Company Address: 22410 70th Ave. West, Mountlake Terrace, Wash. 98043.
 For literature, circle No. 92

fuse, and the unswitched convenience outlet mentioned above.

Recommended hookups are given in AudioControl's "Operating & Enjoyment Manual," which is the finest audiophile operating manual I've seen. Its lighthearted style is easy to read, and it's packed with useful, accurate information on how to use an analyzer and equalizer for best results. It doesn't claim that the C-101 makes a silk purse from a sow's ear system (no equalizer/analyzer does that); it does encourage you to experiment with loudspeaker placement (and suggests guidelines) *before* resorting to equalization, and it warns against excessive boost. It's even honest enough to warn that you probably *won't* like the sound of your system after equalizing it for "flat" response. Refreshing!

Circuitry

The C-101 Series III contains two main circuit boards. One extends across the rear of the front panel and supports the main controls, and the other carries all active circuitry and the power supply except for the main transformer. The boards interconnect with four ribbon cables, soldered directly to the boards and affixed with adhesive. The boards are single-sided and use lots of jumpers but impressed me as being of good quality. With the exception of some flux residue, construction appeared to be good.

The equalizer is designed around five 4560 wideband dual op-amps for each channel. Each 4560 handles two non-adjacent control bands. The circuitry is in the front right corner, as far as possible from the power transformer (which is mounted near the rear of the left side wall). Solid-state switches control signal routing to minimize the length of the audio path.

Measurements

Although I measured both channels, I've based the curves and data exclusively on the left. Right-channel characteristics

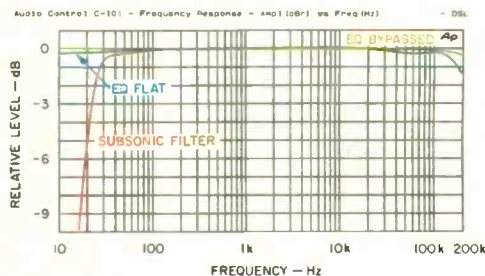


Fig. 1—Frequency response.

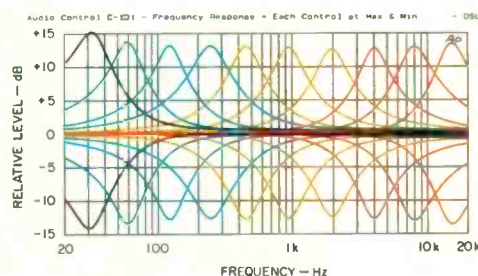


Fig. 2—Response of each slider at maximum cut and boost.

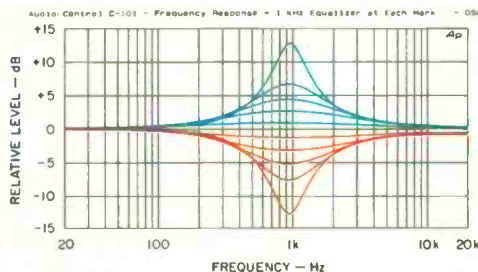


Fig. 3—Response vs. marked settings; see text.

matched those of the left so closely that no purpose would be served by presenting both. Channel gains were close to unity (-0.20 dB) and extraordinarily well balanced (within ± 0.02 dB).

The frequency response of the system is shown in Fig. 1 with the equalizer bypassed (± 0.05 dB from 22 Hz to 105 kHz), with the equalizer engaged and the sliders at their detents ($+0.00$ dB, -0.35 dB from 10 Hz to 100 kHz), and with both the equalizer and the infrasonic filter engaged. (The filter is operational even with the equalizer bypassed.) Chebyshev alignment (specified by AudioControl) implies some degree of passband ripple, but I saw no evidence of it in the data. As far as I can tell, the filter is

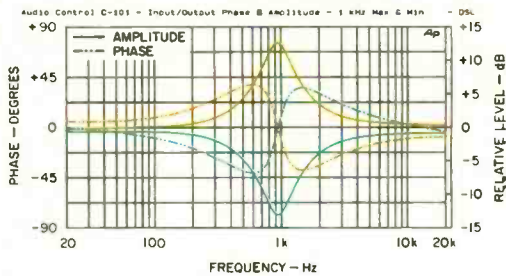


Fig. 4—Phase and amplitude at maximum boost and cut.

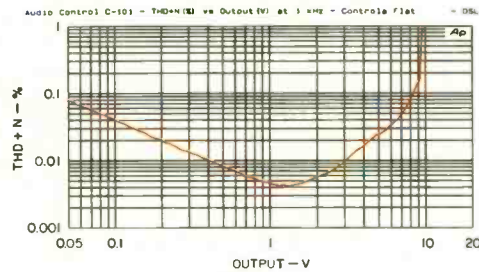


Fig. 5—THD + N vs. output voltage.

Butterworth-aligned, which is the “0-dB ripple” Chebyshev case. The -3 dB point occurs at 22 Hz with a slope of 18 dB/octave. Response is 5 dB down at 20 Hz and (not shown) -23.6 dB at 10 Hz.

Figure 2 is a composite of the response curves taken with each slider individually set for maximum boost and maximum cut, i.e., 20 curves in all. Band centers agree quite closely to the indicated markings, and, although the maximum boost and cut varies with the particular control that is exercised, each provides a range of at least ± 12.5 dB and some provide as much as ± 14.7 dB. Each control’s boost and cut is unusually symmetric, which testifies to good design.

I also plotted equalizer response with various combinations of slider settings: Each alternating between maximum and minimum, alternating in pairs (two up/two down, etc.), alternating in triplets (three up/three down), and so forth. Although the curves aren’t shown, suffice it to say that the C-101 performed pretty much as you’d expect from the “graphic” position of the sliders. Of course, each equalizer section affects those adjacent to it so that, if three are raised, more boost is given to the center band than would be obtained had

the adjacent ones not been boosted as well. But there were none of the anomalies I’ve seen with some “graphic” equalizers whose equalizer sections interact in such a way that the resultant frequency response doesn’t correlate with equalizer positions when more than one band is used.

Figure 3 is a composite of 10 response curves taken with the 1-kHz slider set as close as possible to each marked setting: ± 3 , ± 6 , ± 9 , ± 12 , and ± 15 dB. The actual boosts and cuts don’t correspond precisely with the markings, and at least half the range comes between the “12” and “15” marks. However, I don’t recall ever measuring an analog equalizer in which the markings really did correspond to the actual response modification, so I can’t downgrade the C-101 against its competition in this regard. By limiting the change that occurs with the sliders slightly off

center, you needn’t be precisely on the detents to achieve “flat” response. Since the AudioControl detents are none too definite, this is arguably a benefit.

Figure 4 is a composite of the response and input/output phase shift that occur with the 1-kHz slider at maximum boost and maximum cut. Note the symmetry in both the response and phase curves.

The C-101’s THD + N versus output level (at 1 kHz, with all sliders at the detents) is shown in Fig. 5. The downward slope indicates that noise pre-

dominates at output levels from 50 mV to somewhat above 1 V and that the C-101 can produce 7 V output with negligible distortion (0.05%). Clipping (1% THD) occurs at 9.65 V. The THD + N at 2 V output (not shown) did not exceed 0.0062% at any frequency from 20 Hz to 20 kHz, and some of this, too, was noise.

I’m impressed by how little distortion and noise the C-101 produces. Each equalizer section requires its own operational amplifier and associated components, and each inevitably generates some THD and

noise. Ultimately, these contaminants combine in the output stage so that when you design a 10-band equalizer, things can get pretty hairy. With distortion in the 0.005% range and an A-weighted noise of -93.2 dB referenced to 0.5 V (-99.2 dBV), the C-101 is outstanding in these regards. Referencing the A-weighted noise to maximum output level (9.65 V) yields a theoretical S/N of 118.9 dB! Clearly, the C-101 can be used in a variety of applications over a wide range of input levels without audible ill effects. Input and output impedances (100 kilohms and 110 ohms, respectively) and a generous input overload (9.9 V) further testify to universality of application.

A noise-spectrum analysis (not shown) revealed hum-related components at 60 Hz, 180 Hz, and 300 Hz of -90.1 dB, -91.8 dB, and -105.5 dB (re: 0.5 V), respectively. Since these occurred at odd harmonics of the power line, I suspect they were caused by magnetic coupling from the transformer. But the hum was negligible in level, and no other line structure was apparent in the analysis. Channel separation was 72 dB at 1 kHz and better than 51.5 dB from 20 Hz to 10 kHz.

Finally, I verified the “flatness” of the C-101 pink-noise generator by using the sweeping third-octave spectrum analyzer built into my Audio Precision System One and a real-time third-octave analyzer (operating in an Apple computer) that I devel-

oped for loudspeaker evaluation. Both measurements indicated that the pink noise the C-101 generates is more than sufficiently “flat” for its intended purpose on a third-octave ba-

sis, given the 2-dB per LED resolution of the C-101 analyzer. However, the Apple-based measurement was arguably the more accurate, since I could use an averaging time sufficient to integrate the level fluctuations that naturally occur in pink noise at low frequencies.

Use and Listening Tests

Since AudioControl advises against using the C-101’s mike other than with the analyzer, I evaluated it (and the analyzer) in my listening room by comparing the

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response curves of my loudspeaker as measured by the C-101 microphone/analyzer with a measurement made with my Apple-based setup and calibrated lab microphone. The two agreed within the limits of experimental error, which is to say, within the limits imposed by the C-101's resolution of 2 dB per LED.

While I was at it, I equalized my listening system for "flat" response. As AudioControl warned (and which I already knew from past experience), with most program material, the resulting sound was too harsh

and strident. This is not to say that using the C-101 to analyze/equalize a system is fruitless. Once you've "flattened" the system and corrected gross bumps and dips in response, you can modify the tonal balance as you wish. (AudioControl offers advice in this regard.) You're likely to want to lower the high-frequency sliders progressively to impart a gradual high-frequency slope to the overall response, and you may also want to add a bit of bass boost.

One word of warning and one of advice. As an octave-based analyzer, the C-101 can

only adjust octave-to-octave balance; it cannot correct response irregularities that occur over narrower bands. You will get optimum results if you start with a good pair of loudspeakers that have been placed in the room so as to minimize standing waves. The C-101 can help you find those ideal locations. Next, as AudioControl points out in its manual, you will find areas in which measured response seems to vary widely when you move the microphone slightly. These are *not* good listening positions vis-à-vis loudspeaker placement. Change one or the other until you get stable measurements over a reasonable area. I expect that the dissatisfaction that many express with analyzer/equalizers stems from not appreciating the importance of

**THE C-101 IS
CLEAN AND QUIET
IN THE LISTENING ROOM
AND PERFORMS SUPERBLY
ON THE TEST BENCH.**

listening/microphone placement and not realizing that you are unlikely to want truly flat response.

A component like the AudioControl C-101 Series III is not limited to loudspeaker equalization, and many may not even use it for this purpose. Once it's in your system, you'll not be able to resist the temptation to do a little creative tinkering with the sound balance of your record collection. After you've gathered some experience using the equalizer, you can do quite a bit to spruce up the sound of inferior LPs and CDs. And if you duplicate tapes for your car, you'll find the C-101 extremely helpful in tailoring recordings so they sound almost as good on the road as the originals do at home.

If you are interested in a graphic equalizer/analyzer, the AudioControl C-101 Series III should be high on your list of candidates. It performs outstandingly well on the test bench and is clean and quiet in the listening room. Of course, you can't call any equalizer "transparent," since it's *meant* to alter tonal balance, but if you could, the AudioControl C-101 would get my vote. It does only what you ask of it.

Edward J. Foster

AUDIO/AUGUST 1994

58

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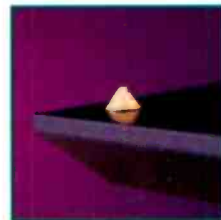
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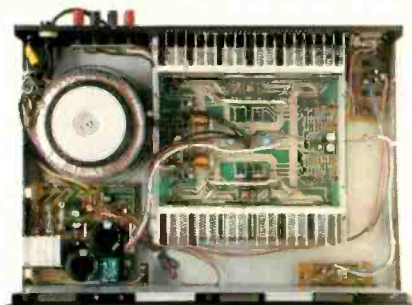
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SONANCE 2120 AMPLIFIER



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92673.

For literature, circle No. 93

Most of us associate Sonance with loudspeakers—in particular, with in-wall speakers. Arguably, Sonance was one of the first to elevate in-wall speakers from the P.A. dungeon to the high-fidelity stratum, and they've done quite well at their trade. Because speakers must be driven by power amps, it's not really surprising that Sonance has branched out of its niche into the electronics arena. But entering a new area is easier said than done; driver

design and circuit design are quite different arts. I must confess to having approached the Sonamp 2120 power amplifier with somewhat of a "show me" attitude, but "show me" it did. The 2120 is really quite a nice piece.

Clearly, the Sonamp 2120 was designed with an eye toward the custom-installation market, the one Sonance is most familiar with. "Auto On" circuitry brings the system to life within 1.5 seconds after detecting the presence of an input, and powers the amp down about four minutes after the signal has disappeared. You can defeat "Auto On" with a recessed back-panel slide switch, in which case the 2120's front-panel "Power" switch functions as you'd expect it to. If you use "Auto On," the "Power" switch should be left depressed.

This can be a little confusing at first, because the red "A.C. On" LED illuminates whenever power is applied, independent of the position of the "Power" switch. If the amp is plugged into a live output, the red lamp is lit; if it isn't, the line fuse has blown. A green "Active" LED lights when the amplifier is really on, i.e., when it senses the presence of a signal in the "Auto On" mode or when the "Power" switch is depressed in the—what shall I call it?—"Non-Auto-On" mode. (The "Active" light will also come on when the 2120 is first plugged in or after power is interrupted and restored. In the "Auto On" mode, it'll turn off after a few minutes if no signal is present.)

"Auto On" simplifies operation in multiroom or home theater applications but is, on the one hand, neither unique to the Sonance 2120 amp nor, on the other hand, the only multiroom nicety that the Sonance offers.

**WHAT YOU CAN EXPECT
FROM THE 2120 IS
AN HONEST WORKHORSE
WITH REMARKABLY
CONSERVATIVE RATINGS.**

On the back panel are stereo input and output jacks so that multiple

2120s can be daisy-chained ("looped") together without resorting to "Y" connectors. If you use many power amps in your system and are concerned about the power-line surge that may occur when all turn on at once, Sonance has available two line-protection sequential power switchers (the AC1 and AC2) that will eliminate the problem.

Recessed screwdriver-adjustable level controls on the 2120's front panel permit you to adjust sound pressure level in each area independently and ensure that you needn't operate your preamp's volume control at such a low setting that channel balance is impaired and/or that the control is difficult to adjust. I like the idea of recessing the gain controls and "Auto On" slider; they're one-time setups that can potentially be misadjusted by accident.

Sonance claims to have designed the Son-amp 2120 with "numerous protection circuits"—including surge, overload, and thermal-protection systems—that automatically reset after a fault has been corrected. Should any of the protection circuits trigger, the green "Active" LED flashes and output may be interrupted by an internal relay. This is all well and good, but not every 2120 "protection device" resets automatically; three internal power fuses and one back-panel line fuse must be manually replaced if blown.

The 2120 uses a discrete output stage (parallel pairs of Toshiba 2SC4029s and 2SA1553s in each channel) mounted to two reasonably generous heat-sinks, one per channel. The heat-sinks are apparently more than adequate, since the 2120 ran cool both on the test bench and in the listening room. Thermal sensors, mounted to each sink between the complementary-symmetry pairs, track and compensate for output-stage temperature. The output-stage drivers are mounted on individual heat-sinks. Most of the audio circuitry is on one main board that uses fairly wide traces to carry power and audio output current. A small board near the input and associated input circuitry.

The power supply is on a separate board, with a good-sized heat-sink used to cool the main bridge rectifier. A small independent bridge apparently is used to power the "Auto On" system. A rather large toroidal power transformer (rated at 600 volt amperes) mounts at the left rear of the chassis, near the line cord and fuse. The generously rated transformer should provide adequate current reserves, and the toroidal construction helps contain magnetic hum fields. But the filter bank used after the rectifier—a pair of 10,000- μ F, 65-V conventional electrolytics—is rather modest for a power amplifier whose output is rated at 120 watts per channel.

Construction appears to be reasonably neat. Although parts quality seems adequate, it's by no means exotic. Input connectors are solder-wiped, not gold-plated, and the five-way output posts

(one set, not two) are more functional than impressive. They are, however, mounted on 3/4-inch centers so they will accommodate GR-type dual banana plugs.

Those who require exotic parts and esoteric circuitry to get their jollies will not find either in the Sonamp 2120. I doubt they'll find them in any \$575 power amp (\$590 for the rack-mounted version) that is rated at 120 watts/channel. The Sonamp 2120 makes no pretense to having "dual-mono" construction, and, although I was not provided with a schematic, I doubt there's anything particularly novel in the circuit design either. What you can expect from the Sonamp 2120 is an honest workhorse with remarkably conservative ratings.

For example, the 2120 is rated at 120 watts/channel into 8 ohms and 160 watts/channel into 4 ohms, at 0.05% and 0.10% THD respectively, from 20 Hz to 20 kHz. At rated output on my test bench, I measured a maximum THD of 0.035% on the poorer of the two channels (0.028% on the better one) when using 8-ohm loads and 0.056% (on each channel) with 4-ohm loads. That's only half to two-thirds as much distortion as Sonance claims. Moreover, the distortion did not rise in the bass

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region (as might be expected, given the smallish filter caps). In practice, the worst case occurred at 20 kHz, and, from 20 Hz to 3 kHz, THD was no more than 0.010% with 8-ohm loads and 0.018% with 4-ohm terminations. Maximum output power at clipping (both channels driven) was 160 watts per channel into 8 ohms and reached a whopping 250 watts per channel into 4 ohms.

With both level controls fully advanced, channel balance was extraordinarily precise—within 0.01 dB, the limit of my test

equipment. Frequency response (on the poorer of the two channels) was within +0.00, -0.15 dB from below 10 Hz to 20 kHz and down 0.5 dB at 55 kHz. The -3 dB point occurred at 170 kHz. Input/output phase linearity was within +4.5°, -7.9° from 20 Hz to 20 kHz. Channel separation was 80 dB or better from 20 Hz to 3 kHz and 70 dB or better out to 16 kHz. (Many dual-mono amps don't do better, and some do worse!)

The A-weighted noise was -93.3 dBW, which implies a signal-to-noise ratio refer-

enced to rated power (20.8 dBW) of 114.1 dB—more than 14 dB better than Sonance specifies! The noise figures are all the more impressive when viewed in conjunction

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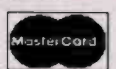
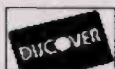
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with the 2120's higher-than-typical gain. With 8-ohm loads, it delivered rated output with a 1-V input (88 mV for 1 watt) rather than the more usual 1.5 V. Of course, you can reduce gain by readjusting the input level controls, so the 2120's extra amplification can only be considered an advantage.

Damping factor was 215 at 50 Hz and 190 at 1 kHz. Because the 2120 uses output protection coils, output impedance rises (damping factor drops) at higher frequencies. I measured an output impedance of about 100 milliohms at 5 kHz and 175 milliohms at 10 kHz.

Apparently someone at Sonance knows his way around circuit design, because the 2120 obviously did quite well on the test bench. It also did well in the listening room. I wouldn't go so far as to say it's the most pristine power amp I've ever heard, but I was surprised at how good it really did sound. It's quiet, bass is tight, and there seems to be adequate current available. High treble is not its strong point; it's a trifle brittle and somewhat alters the harmonic balance between fundamental and overtones in the violin's upper register. However, the difference between the Sonamp 2120 and the best power amps on the market is relatively slight and certainly far narrower than is the corresponding price difference.

For its stated use as a power amp for custom installations, I think you'll find the Sonamp 2120 hard to beat. The same applies for home theater applications. In fact, I'd have little hesitation employing the 2120 in almost any audio system, especially when budget is an issue. At this price, there's no cause for complaint—only admiration.

Edward J. Foster

AUDIO/AUGUST 1994

62

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ALPHA-CORE GOERTZ MI 1 & MI 2 SPEAKER CABLES

Goertz MI speaker cables from Alpha-Core have a substantially different geometry from the cables I examined in "Speaker Cables: Testing for Audibility" for the July 1993 issue. The Goertz MI cables consist of two, flat, insulated conductors bound together by an outer insulating jacket. Alpha-Core claims the benefits of its design include impedance matching and the elimination of distortion, high-frequency roll-off, crosstalk, skin effect, and emitted EMF effects. The cables are available with copper or silver conductors, and each version comes in two widths. Heavy, gold-plated connectors are available in banana plug, spade, and pin styles. Other accessories include mounting tape and clips. In 25-foot lengths, copper Goertz cables cost \$4.95 per foot for MI 1 and \$7.90 per foot for the heavier MI 2, while the silver cables, MI AG 1 and MI AG 2, respectively cost \$49.80 and \$88.70 per foot.

Goertz MI 1 cable is AWG #13, measures 0.4 inch wide and 0.05 inch thick, and has a resistance of about 4 milliohms per foot (both conductors). Goertz MI 2 cable, AWG #10, is twice as wide, with a resistance around 2 milliohms per foot. For 0.2 dBV of loss with 25 feet of cable, the minimum speaker impedance is about 4.3 ohms with MI 1 and 2.2 ohms with MI 2. Conductors in both cables are 0.01 inch thick, thus eliminating the over-rated skin effect at audio frequencies.

The flat, thin conductors in close proximity serve to lower inductance while raising capacitance. Goertz MI 1 has about 480 pF per foot and MI 2 about 1,000 pF per foot. The inductance for the pair of conductors is quite low, measuring less than 0.1 μ H for 25 feet of cable. These cables have

sufficient capacitance to maintain a flat impedance, much as ribbon cables do (see my 1993 article). From 20 Hz to 20 kHz, the impedance of the Goertz cables increases about 21%. In comparison, the impedance of standard AWG #12 cable increases 583%, which causes a

loss of about 0.5 dB for a 4-ohm load through 10 feet.

The name "MI" comes from "Matched Impedance," a term more commonly associated with r.f. transmission lines. Like other cables around 15 years ago (from Polk, Mogami, Discwasher, and AudioSource), Goertz MI cables have a low characteristic impedance. Such cables are typically more dispersive, though not audibly so. Since the lengths of speaker cables are very small fractions of an audio signal's wavelength, reflections will not be a problem.

The measured response with a loudspeaker load is generally flat; between 2 and 20 kHz the loss increases to 0.2 dBV for MI 1 and to 0.1 dBV for MI 2, a result of the test speaker's impedance minimum of

about 4.5 ohms. This indicates essentially no high-frequency roll-off with the Goertz cables. In comparison, the loss for standard #12 AWG

at 20 kHz is only about 0.8 dBV. Below 10 kHz, the Goertz MI cables perform virtually the same as standard #12 AWG. What frequency is necessary to get a substantial difference with 25 feet of cable and a 4-ohm load? It took 185 kHz to get 3 dBV of difference between MI 1 and #12 AWG.

One option when ordering the Alpha-Core cables is to have them cut to length and ready for termination. You may want to consider that option if you don't have power tools or arms like Pop-eye's. The thin layer of insulation bonded to each conductor is incredibly tenacious and requires substantial effort to remove. Once

**DISTINCTIVE AND
WELL MADE,
THESE CABLES
SHOULD DO FINE
WITH MOST SPEAKERS.**

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TERK LEAPFROG REMOTE-CONTROL EXTENDER

the insulation is removed, attaching the terminals is quite simple. The bodies of these heavy, high-quality terminals are not insulated, so care must be taken to prevent shorts.

I found both cables to be quite stiff, especially MI 2, and routing them can be challenging. They can be folded and bent, although sharp twists and bends tended to buckle and occasionally split the outer jacket. The inner insulation remained intact, and no shorts were found after this abuse. The thin profile lends the cable to installation under a carpet (but be careful to avoid tacks!).

The silver-conductor versions, MI AG 1 and MI AG 2, were not tested. Except for slightly lower resistance, there should be

**BLIND LISTENING TESTS
WITH 25 FEET OF GOERTZ
CABLES VERSUS #12 AWG
LAMP CORD PRODUCED
NO AUDIBLE DIFFERENCES.**

little difference in their performance despite the substantial increase in cost.

Informal, blind listening tests compared 25 feet of MI 1, MI 2, and #12 AWG cable; no audible difference could be found. Younger ears were also employed to see if something in the top octave was being missed. The measured differences still eluded human detection.

Why weren't the cable differences more audible? Our hearing becomes much less sensitive above 4 kHz, falling at about 10 dB per octave. Also, there isn't a lot of musical energy above 10 kHz, and this is easily masked. The result is a lack of significant audible difference in the top octave, while below 10 kHz the cables are effectively the same.

These are distinctive, well-made cables and terminals. Their measured performance is excellent, and they should work well with nearly any speaker as a load. If long cable runs are necessary with a low load impedance, it is possible that Alpha-Core's Goertz cables could make an audible difference. However, shorter runs and typical loads are unlikely to show much improvement over #12 AWG. *Fred E. Davis*

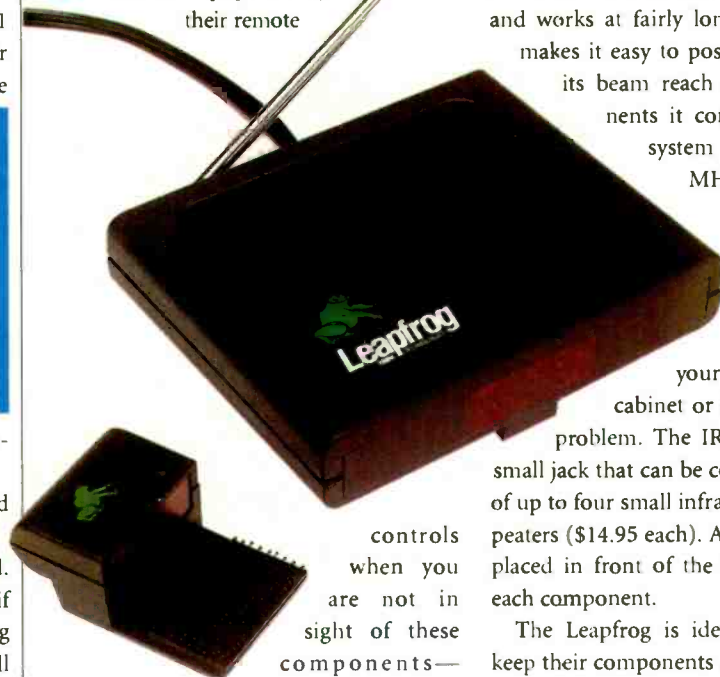
Terk Technologies' Leapfrog acts as a radio bridge between your audio components and their remote controls. It lets you operate your preamp, tape deck, and CD equipment by their remote

broadcasts them in their infrared form. The IR-5 can pick up signals from an IR-4 up to 150 feet away, and easily receives these signals through normal home and apartment walls. The IR-5's infrared output covers a wide arc and works at fairly long distances, which makes it easy to position and still have its beam reach all of the components it controls. Because the system operates at 418 MHz, its signal cannot interfere with audio equipment or FM.

What if you want to keep your components in a cabinet or behind a door? No problem. The IR-5 base unit has a small jack that can be connected to a series of up to four small infrared Model IR-X repeaters (\$14.95 each). An IR-X can then be placed in front of the infrared sensor on each component.

The Leapfrog is ideal for people who keep their components and speakers in different rooms. It makes it remarkably easy to set the exact balance for a given recording without moving your head, and to adjust volume levels to suit a given performance. The Leapfrog permits easy A/B testing, because components do not have to be visible and switching is so quick. And by attaching the Leapfrog to a universal remote control programmed for your equipment, you can use one Leapfrog transmitter to operate your entire system. (Such remotes are available for less than half the Leapfrog's price.) Finally—a high-end accessory that is affordable and really works!

Anthony H. Cordesman



controls when you are not in sight of these components—even from another

room. The Leapfrog should also be ideal for outdoor use, where sunlight can swamp an ordinary remote's infrared beams. The Leapfrog system costs \$69.95 for the IR-5 base station and one IR-4 transmitter. Extra transmitters cost \$19.95 each.

The IR-4 is a tiny, battery-powered, infrared receiver and radio transmitter that mounts on any infrared remote control. It is small, light, and unobtrusive and is fairly rugged. If the remote is dropped, the IR-4 detaches without breaking (it's attached with self-adhesive hook-and-loop fasteners) and can easily be refitted.

The IR-5 base station is a small, inconspicuous a.c.-powered device that receives radio signals from IR-4 transmitters, translates them into infrared signals that match those from the original remotes, and

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CLASSICAL RECORDINGS

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a school playroom. But with such amazing expertise.

What astonishes me is that it all seems to be *written down* in millions of notes on paper. The sounds, five different pieces, are all “by” William Kraft. That is, they aren’t just improvising. (Only once in a while.)

The second reason—and cause for review in this space—is that this is, as you may guess, what we used to call a Test Record. A whopper, par excellence, for those who want to show off their gear, system, fi or whatever. Now more than ever, as

the ads say. Remember “Death and Transfiguration”? Forget it. This is what you need. Wow, what sounds! Just in time for the modest subwoofers I installed (NHT) with the thought of keeping myself somewhat up to date. (They are surprisingly unobtrusive in most classical music.)

Don’t try the CD on a so-called boom box; the little speakers will probably pop right out of their frames. And check with family and neighbors before you start on your big gear. *Edward Tatnall Canby*

Dario Castello:
Sonate Concertante
Europa Galante

OPUS 111 OPS 30-62, CD; 65:00

Here are those Italians again, operating from France (the label is Opus 111) but in all respects out of the sunny south and the city of Parma—at last rediscovering their own native music of the past in authentic current-day terms.



Illustration: Rick Tulka



Percussion by William Kraft
Barry Silverman, Thomas Raney,
percussion soloists; Pacific
Percussion Ensemble; Percussion
Quartet from Tanglewood, Frank
Epstein, conductor; members Los
Angeles Philharmonic, Kraft
CRYSTAL CD 124, CD; 60:12



playing their strenuous thing: You never heard such whangs and bangs and rolls and whirs and all manner of other sounds—including a few discrete *pitches* out of such as a marimba. (Curious when that instrument has virtually no percussiveness at all and lots of pitch!) Having spent their vigorous lifetimes learning the incredible art of percussion, these guys simply rejoice in their skills. BOOM—what a whack! *Brrrring*—what a roll. Like kids gone berserk in



There are two excellent reasons for a CD such as this to exist. Neither, as I see it, has much to do with music—which doesn’t really matter.

First, here is a bunch of percussion fiends having enormous fun,

This composer is an Italian “unknown,” not yet made the big time on Broadway—he might as well, as far as we are concerned, be that well-known artist, Anon. For such reasons he caught my eye—then my ear. Good man, good listening!

You might call this proto-baroque. It is the early 17th century, here, the time of Monteverdi, Gesualdo, the young Schütz (who spent his learning years in Italy)—these being famous names. But Dario Castello? The notes tell us bravely that “his life is cloaked in mystery” and little is known of him. Which is to say, nothing at all. Except the music.

It is more than worthy of the famed Anon! The sound grew on me steadily as the hour-plus sequence of short pieces, “chamber works” a later age would say, unreeled on a twin pair of violins and a changing accompanying texture of modest variety. A very gently dramatic composer, this, in whose works one hears nevertheless strong hints of the intense dramatic innovations of that musically explosive time.

Not in words. All of it is in the playing, minus any hint of “story” to explain what goes on. Pure musical drama: Sudden, startling changes from fast to slow, dramatic pauses,

brief passionate bursts, rushing scales—very strange! For our ears, no apparent reason. But *some* audience, some group of players, must have been very startled and impressed in early performances.

The very early baroque had not yet discovered LENGTH—except as attached to words, sacred, in song or opera. No extended “movements” here, allegro, adagio, and so on. Instead, each piece is made up of a series of short sections one after the other in dramatic contrasts, no more than a few moments apart. This at first is confusing. Play through, and then it becomes evident that within

Stravinsky: Ebony Concerto; Babin (arr. D. Nygren): Hillendale Waltzes; Morton Gould: Derivations for Clarinet and Band; Bernstein: Prelude, Fugue, and Riffs; Artie Shaw: Concerto for Clarinet

John Bruce Yeh, clarinet;
DePaul University Wind and
Jazz Ensemble, Donald DeRoche
and Robet Lark, conductors
REFERENCE RECORDINGS
RR 55CD, CD; 52:17

Serious audiophiles know Reference Recordings as modest in scope but at the top of the heap when it come to sonics, and this CD, focused on the brilliant clarinetist John Bruce Yeh, reinforces that reputation. The Chicago Symphony signed Yeh at the age of 19; today he also teaches at DePaul University. The music on this CD runs quite a gamut, from the excellent (Leonard Bernstein, Igor Stravinsky, Morton Gould) through the banal (Victor Babin) to the almost rubbishy (Artie Shaw), but performance quality redeems everything.

During the big-band era, Benny Goodman not only held the uncontested title as King of Swing, he also recorded a number of the most important chamber works involving clarinet; with the violinist Joseph Szigeti, he

even commissioned Béla Bartók’s “Contrasts,” which they recorded with Bartók at the piano. Goodman’s only serious pop rival, Woody Herman, who aptly called his band The Thundering Herd, struck back by commissioning the greatest living composer, Igor Stravinsky, to write the *Ebony Concerto*. The recording they made together found Herman and his men technically on top of the score, but audibly, not really at home with all those jagged, asymmetrical, rapidly shifting rhythms.

How times have changed in half a century. Everyone involved here seems to have no more problem with even the most difficult stretches of these works than they might have with a Sousa march. If from time to time one might wish for an even sharper microtome precision of attack or syncopation, in general the accompanying ensembles match the soloist’s security and brilliance.

Inevitably, Stravinsky in spots sounds a bit square and alien to the jazz idiom, but Herman got his money’s worth in an enduring score. The agreeable but inconsequential Babin waltz variations (for which Dennis Nygren orchestrated the piano part) serve their purpose largely by permit-

ting the solo clarinetist to shine. The main surprise comes with Gould’s *Derivations for Clarinet and Band*, written for, and in collaboration with, Goodman: Solid, expertly crafted music, convincingly interpolating all sorts of authentic jazz elements, to striking effect.

Herman also commissioned the Bernstein work, but disbanded his last Herd before performing it; Goodman unveiled the piece with Bernstein conducting. The movements’ subtitles tell the story: *Prelude for the Brass*, *Fugue for the Saxes*, and *Riffs for Everyone*—insanfully recognizable as Bernstein, especially evocative of his energy-packed theater music.

Artie Shaw also had higher musical aspirations: At one point, after his recording of “Begin the Beguín” had made him world-famous and rich, he sought lessons from composer David Diamond. This flimsy non-concerto of his (contrived for the eminently forgettable film *Second Chorus*) bears no witness to that—but here again, as in all these works, the excellence of John Bruce Yeh, his colleagues, and Reference’s engineering make this disc something out of the ordinary. Richard Freed’s exceptionally good notes round off the package.

Paul Moor



these, shall I say, spurts of music is much variety, out of tightly limited means.

The two violins are absolutely equal. There is no favoritism. They share their ideas like twins with their associates in the accompaniment. But there is a certain dreamy quality in their playing, an occasional fading away—I tend to think is due to simply a lack of experience with microphones. That's just a guess. Do they swing and sway in place as they play, in the old traditional fiddler's style? That would do it. For the mikes, you have to stand still.

Edward Tatnall Canby

Mozart: Rondo and Horn Concertos

Ab Koster, natural horn;
Tafelmusik, Bruno Weil

SONY CLASSICAL SK 53369, CD; 63:30

Some fetchingly familiar horn music here as well as some unknown, but there is more: Old buglers, Boy Scouts, Marines, whatever, please take note. Here, in real sound, is what can be done, and *was* done, in the 18th century, on a simple horn—I mean a “French horn,” entirely without valves. Just the lips and breath, with hand held inside the bell of the instrument all to control the instrument's pitch and tone. Very much like a bugle.

Buglers today mostly play two well-known tunes, the get-up one, reveille (“revalie”) and the tune for the dead, taps, always a scary ordeal for the player. Plenty of other tunes are possible, whether for Marines or Scouts; but every last one, minus valves, is made up of only four, maybe five notes in the natural harmonic series. In my near-Scout years (I was edged into something called the Woodcraft League, non-military, lots of Indian lore) I once got a bugle into my fascinated hands and tried it out. To my immense chagrin, I couldn't produce any note at all. Just a breathy hiss. No taps for me. I was the more impressed by the good bugler who *could* play those three or four notes. On the natural horn recorded here, I think I would produce the same unpleasant hiss. Or maybe an unseemly blat. And so would you.

This is an all-“period” group, orchestra as well as solo horn. The five compositions include music that has re-surfaced, out of enhanced current musicology—one whole page of lost Mozart music turned up as recently as

1990 and was put with the rest of its musical body, so to speak, a lot of unsuitable orchestration and even sheer post-Mozart composition (the well-known Sussmeyer) was revised—all of which results in an easy natural Mozart—you may forget sequence of the musical events.

Though some of this horn music is new to almost all of us, there are very familiar sounds here, much beloved as played by horns with the usual standard modern valves. If you know what they can do you will be astonished at how easily this horn player, operating like a bugler, can play all the scales, arpeggios, rapid

runs, graceful melodies, trills, just as well as the regular hornists! Some earlier players of this revived older horn were not entirely able to smooth out the horn sound as between natural tones and those altered by the hand-in-bell technique. Not this player. The technique has advanced. Listen and you will hear. The horn tone is now even smoother, more like the human voice, than any produced by the modern instrument. Indeed, there is a controlled variety of tone, soft and gentle, that I find especially impressive. Do we need any more evidence? No—just more music, please.

Edward Tatnall Canby

HENRY COWELL

Cowell: Persian Set; Hymn and Fuguing Tune for String Orchestra; American Melting Pot; Air for Solo Violin and String Orchestra; Old American Country Set; Adagio (from Ensemble for String Orchestra)

Manhattan Chamber Orchestra,
Richard Auldson Clark

KOCH INTERNATIONAL CLASSICS
3-7220-2H1, CD; 64:07

Cowell: Piano Music: The Tides of Manaunau; Exultation; Harp of Life; Lilt of the Reel; Advertisement; Antinomy; Aeolian Dance and Sinister Resonance; Anger Dance; The Banshee; Fabric; What's This?; Amiable Conversation; Fairy Answer; Jig; Snows of Fujiyama; Voice of Lir; Dynamic Motion; The Trumpet of Angus Og; Tiger

Henry Cowell, piano

SMITHSONIAN FOLKWAYS 9307-40801-2,
CD; 60:36

Henry Cowell's career followed a time-honored pattern: In his early years, during the '20s, he shocked the pants off the international musical world as a wild-eyed radical by the standards of that time, only to wind up, well before his death in 1965, sounding downright conservative. He went down in musical history as the originator of “tone-clusters” (played on the keyboard with the fist or forearm), although Sorrel Hayes points out in the Smithsonian reissue of Folkways' 1963 recordings that the Czech composer Frantisek Koczwara used them (in *The Battle of Prague*) as early as 1788. He also elicited sound from piano strings by every conceivable direct means,



without keyboard and hammers as intermediary. Cowell, born in California of Irish heritage, had a life full of event but not without tragedy;

Dana Paul Perna's (appallingly edited) notes in the Koch set provide a slanted account of the four-year San Quentin penitentiary term he served in the 1930s. Later, as if to make restitution, Washington proudly sent him around the world as a



convincing, highly effective musical ambassador.

For recordings 30 years old, Cowell's own piano performances (originally produced by Peter Bartók, Moses Asch, Marian Distler, and his wife Sidney Cowell) sound amazingly good, thanks to superior electronic rejuvenation. Cowell's informal recorded discourse (13:18) about the individual pieces enhances this reissue's documentary value.

Koch's orchestral set shows another facet of Cowell: His enthusiastic ventures into musical ethnology. Rarely, if ever, does he actually quote authentic folk material, but in every instance—whether African-American, Celtic, French, German, Iranian, Latin, Slavic, or whatever—he had immersed himself so thoroughly into that particular *melos* that his original compositions sound ethnically authentic, in convincing performances, excellently recorded.

Paul Moor

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Jimmy Scott



Dream

Jimmy Scott

SIRE/WARNER BROS 9 45629-2,
43:32

Sound: A, Performance: A

try to imagine Bette Davis doing an imitation of Ruth Brown paying homage to Billie Holiday. Or how about Bobby Short after a hit of helium? That's about the best description I can offer for the eerily stylized, achingly sorrowful voice of the 68-year-old balladeer Jimmy Scott. On the surface, this might seem to have the kitsch appeal of Yma Sumac. But Scott's dramatic delivery and intuitive genius at behind-the-beat phrasing make him one of the most expressive and unique interpreters of American song since the late, great Miles Davis.

An androgynous, diminutive presence, Scott's uncannily high-

pitched, piercing voice is the result of a hormone disorder that has affected him since birth. After getting his big break in 1948 as the featured vocalist in Lionel Hampton's band, he went on to score triumphs through the '50s as a solo artist for the Roost, Savoy, and King labels. But frustration over broken promises and bad business dealings caused Scott to turn his back on the music industry for 20 years, during which time he worked as a shipping and receiving clerk at a Sheraton hotel in his home town of Cleveland. After hearing him sing at the funeral of his old friend Doc Pomus, Sire Records founder Seymour Stein helped instigate Scott's comeback in 1992 with the highly acclaimed *All of Me*, produced by Tommy LiPuma. Since then, he has had an avalanche of press and has garnered the attention

of celebrities such as directors Jonathan Demme and David Lynch, rock 'n' rollers Bruce Springsteen and Lou Reed, and movie stars Alec Baldwin and Kim Basinger. Clearly, it's Jimmy's time once again.

Like its predecessor, the aptly named *Dream* is awash in a romantic late-night ambience that can sweep the listener away. Nearly every track on this Mitchell Froom production is done at the kind of excruciatingly slow tempos that Scott likes to emote over, and nobody does it better. Using his heart-wrenching tones, dramatic use of space, and exaggerated vibrato to great effect, he puts his eerie stamp on a collection of mournful, hard-luck tunes about lost love, including late 1930s' chestnuts like "I'm Through With Love" and "It's the Talk of the Town." But he saves his most impassioned reading

Photograph: David Gahr

LATIN PLAYBOYS

SLASH/WARNER BROS.

9 45543-2, 37:34

David Hidalgo and Louie Pérez are best known as the songwriting linchpins of Los Lobos, while Mitchell Froom is the current producer savant, with albums by Richard Thompson, Jimmy Scott, and Elvis Costello recently notched on his belt. None of that will prepare you for the primal roots music they've put together as Latin Playboys. This is music born from the moment. Sounds are literally found in the kitchen and out in the streets. Structures are assembled from fragile improvisations.



With engineer Tchad Blake's mechanical filters, drum machines and guitars sound like they were salvaged from a futuristic junk heap.

Singing Pérez's lyrics, Hidalgo is by turns beat poet, haiku artist, and that guy mumbling over the steam vent over there on the corner. In the roots music of Los Lobos, his guitar artistry is sometimes lost, but amid these landscapes he creates twists and turns that would make Bill

Frisell do a double take.

Latin Playboys traverse a sometimes nightmarish landscape, with the footprints of Tom Waits in the rubble. But it's also full of joy and irony, a celebration of life and lineage. Allen Ginsburg would love this party music for a gone world. *John Diliberto*



for Lucky Thompson's earthy blues number, "You Never Miss the Water."

Peyton Crossley's sensitive brushwork helps set a dreamy tone throughout while bassist Ron Carter and pianist Junior Mance follow along in an elegant, understated fashion. Modern Jazz Quartet vibist Milt Jackson swings his way through the album's lone upbeat number, "I Cried for You," and saxophonist Claston Patience Higgins offers some smokey tenor work on the bittersweet Ellington/Hodges ballad, "It Shouldn't Happen to a Dream."

Jimmy Scott is an acquired taste, much like cognac and caviar. And equally classy.

Bill Milkowski

Last Day on Earth

John Cale and Bob Neuwirth

MCA MCAD-11037, 68:45

On the surface, *Last Day on Earth* appears to be an odd collaboration, but somehow this disparate pair pull things off. On what must be his first recording since the Velvet Underground reunion disc, Welshman John Cale contributes his signature vocals and viola along with keyboard textures, while guitarist and singer/songwriter Bob Neuwirth, an old crony of Bob Dylan, has a rapier wit and a knack for improvising songs. *Last Day* was originally a theater piece by the two, adapted here as a record. Part spoken (with all the necessary Foley effects), part instrumental, and part song, it is not a linearly plotted piece. But the songs are surprisingly sprightly, often haunting, and fun. This makes *Last Day* a challenging piece of listening that defies easy answers, but it is a most enjoyable conundrum, too. I suspect that *The Hitchhiker's Guide to the Galaxy* is a key influence.

Michael Tearson

The Mask & Mirror

Loreena McKennitt

WARNER BROS. 9 45420-2, 52:49

Loreena McKennitt's music on her previous album, *The Visit*, was primarily Celtic with her harp playing the key ingredient. Here, she filters her Celtic base through the Spanish moors, with Spanish and Arabic influences keenly felt. Hers is a timeless sounding music, resonant of ages past, yet inventive and new. Oddly, the harp makes only



Weight rollins band

IMAGO 72787-21034-2

CD; 53:34

Sound: B+, Performance: A

Henry Rollins is the MTV generation's very own "Mr. Warmth"—an author/musician/monologist with a bone to pick with everyone, himself included. If an old vaudevilian fart like Don Rickles (the original "Mr. Warmth") is master of the put-down and of obsolete borscht-belt ethnic jibing, Rollins entertains by unearthing everything you'd like to ignore. He's the psychotherapist from hell. Just an hour with any Rollins book or CD may have you combing the bins for Cashman and West records.

But while the Rollins Band (with guitarist Chris Haskett, bassist Melvin Gibbs, and drummer Sim Cain) exists to create music, specifically a Hendrix-meets-mosh-pit juggernaut, Henry's poetry of rage adds more than most could bargain for, and it's what makes this band so powerful. That's not to say, though, that Haskett's awesome riff on "Fool," those amazing chords on "Civilized," or the Gibbs/Cain rhythm section doesn't make for equally potent listening. This volatile band jams its behind off.

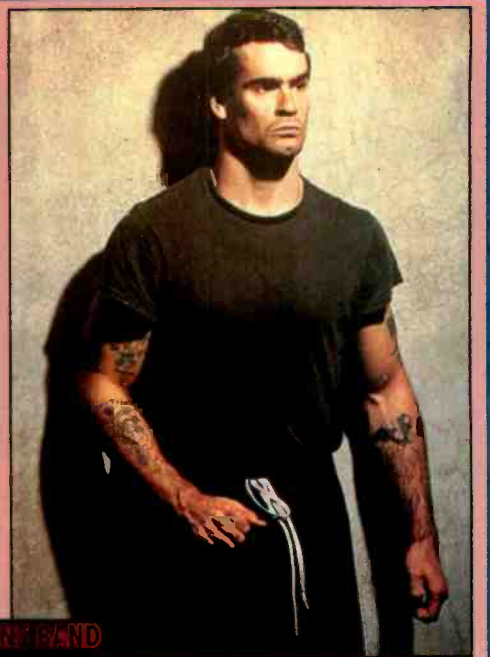
a cameo appearance, but the richness of textures and strong misterioso of McKennitt's music more than compensates for this absence. This is a gorgeous album that continues to unfold in unexpected ways with repeated listenings.

Michael Tearson

Through the Hill

Andy Partridge & Harold Budd
GYROSCOPE/CAROLINE 6608, 54:31

In this meeting between effervescent wit and sardonic somberness, somberness wins. Harold Budd is one of the original purveyors of ambient music, while Andy Partridge is the guitar-playing singer/writer with XTC. Here, Partridge leaves his hook-laden melodies and dense production behind, instead bringing an austere minimalism to this music, with



Photograph: Ross Halfin



And while they jam, Henry Rollins—a.k.a. rancor incorporated—screams (almost never sings) from a shit list on which nothing is sacred. To man-hating feminists:

"Sometime somewhere some man hurt you/I'm one of them so I get stuck with the blame." To fans who overstep the line between respect and idolatry: "You're desperate and in need/And then you meet me and your whole world changes/Everything I say is everything you've ever wanted to hear.../I'm a liar!" And if it's with cold, unsentimental detachment that Rollins distances himself from everyone, his hellhound fury locks perfectly with his band, and that's what makes them a real deal.

Mike Bieber

themes played out in repetitious, occasionally off-center cycles.

The sound is one of improvisation; two musicians stuck in a room, tape constantly rolling while they pluck and plink on percussion, pianos, and synthesizers until they finally hit on a pattern that holds more than momentary interest. It's those moments that make it to disc. Many of the songs have the feel of études and studies in static sound fields. Budd is renowned for his spartan yet textured themes, but *Through the Hill* makes albums like his *Plateaux of Mirror* sound baroque by comparison.

These artists have clearly found a communion, and if the music doesn't give that up,



Last of The Independents

Pretenders

SIRE/WARNER BROS.
9 45572-2, 49:17

Those first two Pretenders records are the result of an incredible rock 'n' roll quartet that can never be captured again. How many of us need to hear the late James Honeyman-Scott's incredible guitar solo on "Kid" or Chrissie Hynde's stark confessionality on "Message of Love" on a weekly basis? I do, but as long as Chrissie—one of the most important women in rock 'n' roll history—keeps making records under the identity of "Pretenders," it's really tough not to at least think about that great band.

On *Last of The Independents*, this temptation is even more prevalent;



Chrissie reunites with original drummer Martin Chambers, reforms the band as a quartet, and hires a Honeyman-Scott sound-alike (Adam Seymour) who, on one song, even cops vital elements of Jimmy's solo from "Tattooed Love Boys" with rote precision. But on this tune, "Money Talk," the spirit of vintage Pretenders' guitar energy is reunited with Chrissie's signature angst. This hasn't happened in quite some time and in fact, it happens throughout the entire record, yielding the revelation that her "new" band deserves to be accepted as genuine heirs to that long-gone original one. And to hear Chrissie balladeering "When I hear my baby cry" on the beautiful "977"—a John Lennon inspired plea against domestic violence—reminds you of her greatness.

Mike Bieher

the three poems do. Budd read his poetry on his previous album, *By the Dawn's Early Light* (Opal/Warner Bros.) but this time the surreal and erotic imagery comes from Andy Partridge. It's as if he and Budd have shared the same life, and that link is revealed in this interior music.

John Diliberto

Cotton Is King

Cotton Mather

ELM RECORDS ELM 9212-2, 47:46

Perhaps it's the lyrical wit and Biblical sarcasm of singer/guitarist Robert Harrison (a former advanced theology student) that make Cotton Mather's mutated, smart-ass pop (with guitar hooks galore) so appealing. From the wild opener, "Lost My Motto," to the end, they combine the Beatles' melodic sensibilities with the urgency of XTC and vintage Squeeze. And they're from Austin, Texas, of all places. All British influences aside, "Cross the Rubicon" settles neatly into a Booker T. and the MGs guitar groove, "The End of the Line" borrows styles from rock 'n' roll's first decade, and the monstrous metal riff of "Miss Information" builds



into a squally ending. Despite occasional weak spots (first single "Payday" could easily be a jingle for the candy bar), *Cotton Is King* contains all the right ingredients to be amongst 1994's strongest debuts.

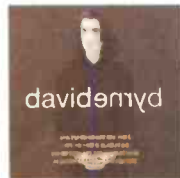
Tom Ferguson

David Byrne

LUAKA BOP/SIRE/WARNER BROS.
9 45558-2, 51:13

Darkly intimate, intelligent, lyrically enigmatic, quirky, and powerful, David Byrne's self-titled solo album works on you in two ways. Haunting confessionals like "A Long Time Ago" and "Self-Made Man" subtly insinuate themselves on your subconscious like some David Lynch-ian dream sequence, while tension-filled, big-beat numbers like "Back In The Box" and "Angels" (a kind of '90s sequel to "Life During Wartime") or the irresistible soca-flavored "You & Eye" help shake your spine loose and guide your feet to the dance floor.

After flirting with a Latin big-band sound on *Rei Momo*, Byrne has stripped things down to a basic rock formula, emphasizing



his catchy songwriting rather than elaborate arrangements. Bassist Paul Socolow and drummer Todd Turkisher are the heart of this new outfit. They kick with authority on the N'awlins shuffle-funk number "Lilies of the Valley" and burn down the house on "Strange Ritual," a dramatic number full of quintessentially Byrne-ish observations about "people in a remote village wearing digital watches" or "a skyscraper made out of abandoned car parts" or "an ambulance driver who wakes up in a Dairy Queen."

Byrne also flaunts some eager guitar chops on a few numbers, including his brutal Sonny Sharrock-ish skronk solo on "Nothing At All." He sings with geeky passion on the sparse closer, "Buck Naked," and even maintains a hint of twisted, tongue-in-cheek glee in the midst of the cloying McCartney-esque ditty "My Love is You."

This is far and away the best album that David Byrne has been associated with since Talking Heads' *Speaking in Tongues*.

Bill Milkowski

FAST TRACKS

Kickin and Screamin: Allgood (A&M 31454 0229 2, 39:44). This Georgia quintet represents two distinct audiences: Fans of southern rock who acknowledge them as contemporary torch carriers, and the "jam band" worshipping tie-dyed frat boys who consider icons like Blues Traveler frontman John Popper their gurus. On that often overlooked question of musicality, however, Allgood succeeds in tapping the vibe of Southern folklore with a sound that moves Highway 61 right through the live room at Muscle Shoals. This live EP is a good introduction.

M.B.

After the Rain: Jack Tempchin and *The Seclusions* (Night River Records, 38:20). Jack Tempchin penned some of the better, more country-flavored Eagles songs (among them "Peaceful Easy Feeling"). And now, with the Eagles reunion tour in full tow, he's released his debut record—with an excellent band—which shows off his fine tunemanship; sort of in the Eagles vein but grittier and better. (Night River Records, 103 North Highway 101, No. 1013, Encinitas, Cal. 92024).

M.B.

Sweetheart's Dance: Pam Tillis (Arista 18758-2, 32:57). A strong set, possibly Tillis' best yet, with sure-handed production of 10 excellent songs. Pam had a hand in writing only three of them, but all—especially the Tex-Mex flavored "Mi Vida Loca"—are aces. Terrific cover of Jackie De Shannon's "When You Walk in the Room."

M.T.

NO WORDS, NO BORDERS

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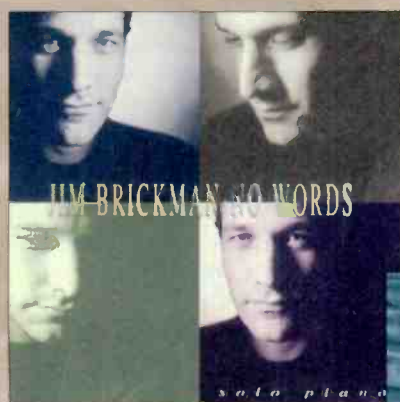
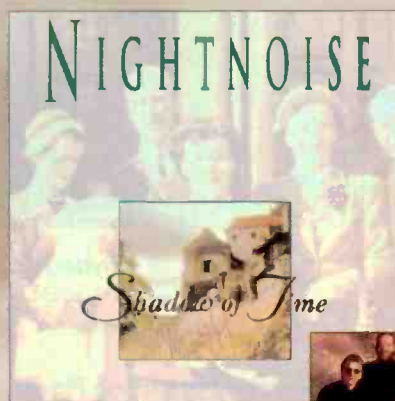
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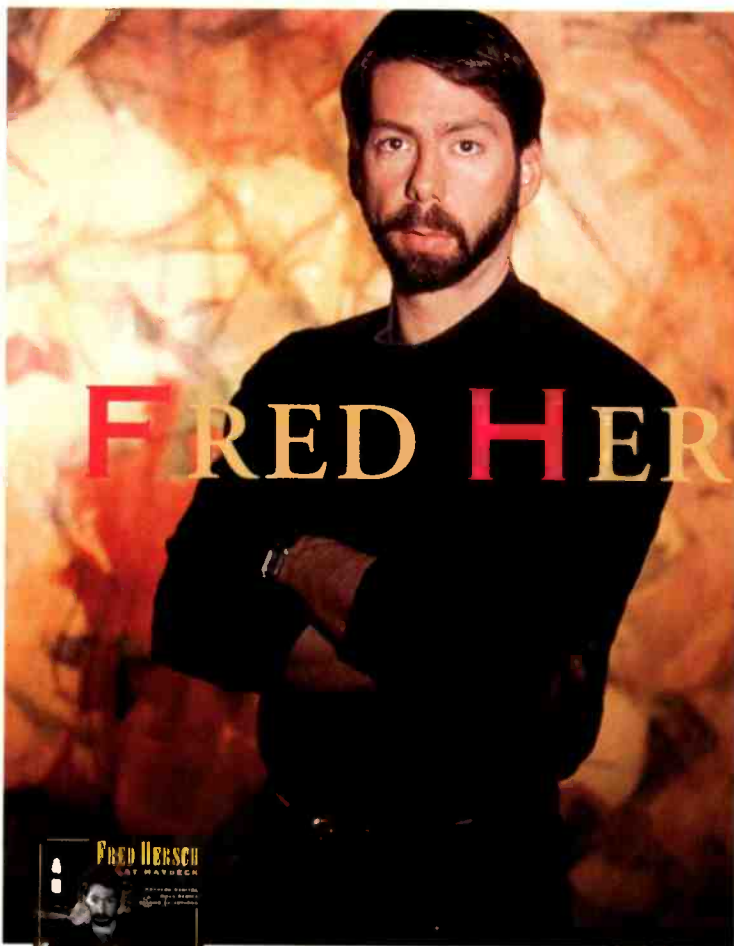
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JAZZ~BLUES RECORDINGS

Photograph: Luciana Pampalona



Fred Hersch at Maybeck
CONCORD CCD-4596, 67:34
Sound: A, Performance: A

The Fred Hersch Trio Plays
The Fred Hersch Trio
CHESKY JD 116, CD; 63:21
Sound: A, Performance: A-

Pianist Fred Hersch released his *Dancing in the Dark* album (Chesky) in 1993, and it went on to earn a grammy nomination. In that year he also released *Red Square Blue* (Angel/EMI), dubbed “jazz impressions of Russian composers.”

This year, to date, Hersch’s name and talents (which also include producer, composer, sideman, and benefit organizer) are associated with six

releases; three benefit albums, one as a sideman, and two—*The Fred Hersch Trio Plays* and *Live at Maybeck*—as leader.

Such output would have us believe Hersch is a man on a mission, and he is. As an increasingly important

voice in AIDS awareness (he was diagnosed HIV positive a few years ago) and gay issues, he’s an iconoclast relative to the heterosexual machismo of the jazz community. And being so out has, no doubt, fueled his creativity. But he’s also an artist with lots of brilliant music to share, enough to warrant abundant releases.

Live at Maybeck, Concord’s 31st in their ongoing solo piano series, is impressive from a number of standpoints. Hersch displays articulate prowess throughout, whether interpreting one of several popular standards here (notably Thelonius Monk’s “In Walked Bud”) or delivering his own introspective take on Herbie Hancock with “Sarabande.”

Meanwhile, *The Fred Hersch Trio Plays* is a superbly recorded disc that houses a series of quite divergent but always pleasing trio works.

All but one of the dozen pieces is an interpretation of a work by a great jazz composer. Hersch, diligent, intelligent, and with consistent sensitivity and modernism, entertains while moving deftly and subtly

through Miles Davis, Monk, Hancock, Ellington, Coltrane, Sonny Rollins, and others. The lone Hersch original, “Evanessence,” is strategically placed in the middle of the 12-pack.

Gliding easily over and through the different time signatures in each of these pieces, Hersch is capable of stopping, starting, and pausing by turns, without missing a beat. He remains delicate in his approach, but is unafraid to challenge himself or his bandmates.

Bassist Drew Gress is always where he should be in supporting Hersch, but it’s the pianist’s excellent rapport with drummer Tom Rainey that is most noticeable. The two seem to viscerally know where the other is, particularly during the album’s many moments of quiet. And Hersch’s ability to make his piano

Folklore

Vincent Herring
MUSICMASTERS 65109, 57:34

Vincent Herring may have been shot straight out of Adderly’s cannon (he currently commands the alto chair in Nat Adderly’s band), but he has exploded on the scene as a forceful



leader with a voice all his own. *Folklore*, recorded live at the Village Vanguard, brims with the same

buoyant spirit that Cannonball radiated and has a similar knack for memorable two-horn lines. Trumpeter Scott Wendholt proves to be a more-than-competent foil, and, with pianist Cyrus Chestnut as the anchor, Herring’s quintet never strays too far from its deep-blues grounding. Herring virtually sails out of Wendholt’s “Window of Opportunity” on the wings of his soprano saxophone for an impressive improvisational flight. Throughout, the young saxophonist displays enough confidence to look past his own horn and base his ideas on a group sound. As Chestnut’s two-fisted brilliance on “Fountainhead” suggests, he’s in good hands. *Larry Blumenfeld*

breathe in an almost Debussy-like manner is matched by Rainey's tender embrace of the cymbals.

Perhaps the only shortcoming here may be in the programming and sequencing of selections, one too many ballads. But it's really difficult to find any heavy fault with Hersch and this fine recording.

Jon W. Poses

Turn On Your Love Light

Bobby Bland

MCA MCAD2-10957, 2:16:35

Bobby "Blue" Bland has long had two strikes against him in winning over new blues fans; he doesn't play guitar, and his urbane music is poles apart from the more popular Delta and Chicago blues styles. Yet, as an extraordinary singer with stature among his peers, and with record sales to back him up, Bland is a giant.

This second compilation of his '60s Duke sides has more hits than the first (like the great gospel-flavored "You're Worth It All" and others). His "Farther Up The Road" inspired Eric Clapton, while the horn charts from "Turn On Your Love Light" (yes, Bland did it first) were long a staple for dozens of lounge acts. Credit Joe Scott for timeless arrangements that threw the thundering momentum of a small orchestra behind this extraordinary singer.

If only today's bands would study these sides with the same devotion brought to analyzing the latest guitar solo. They'd learn that musicians can punch out polished arrangements with drill-team precision without sacrificing a performance's passion and spontaneity. All you need is a vocalist in the same league as Bobby Bland.

Roy Greenberg

Up and Down

Milcho Leviev & Dave Holland

MA RECORDINGS M002A, 66:16

These two veteran players are at turns challenging and comfortable. Dave Holland is the most gifted bassist of his generation, while Milcho Leviev is a Bulgarian-born journeyman pianist who's been in this country since the early 1970s, playing with Don Ellis. Leviev brings a classical sense of phrasing to his jazz

AT THE DEER HEAD INN

*Keith Jarrett, Gary Peacock,
Paul Motian*

ECM 1531 78118-215, 66:33

Sound: B+, Performance: A

Okay, so the guy groans, and he requires absolute "appropriate concert-type behavior" at his gigs: No smoking, no coughing, and for God's sake make sure you hit the bathroom before he starts playing. But eccentricities aside, Keith Jarrett, particularly in a trio setting, seems to be getting better, swinging harder, and sort of coming back to the fold, as it were. Perhaps it's safe to say that his pretentious Köln Concert days are long since over.

At least that's what this less-formal live recording seems to indicate. For certain, Jarrett entered this sentimental project in a different frame of mind. Located in the Allentown/Bethlehem, Pa. area, The Deer Head Inn is the long-standing restaurant and music establishment where Allentown native Jarrett landed his earliest professional work, gigging at times as a drummer and even playing guitar on one occasion for Stan Getz. And this live date is perhaps a re-dedication, or even a catharsis. He reunites with drummer Paul Motian (after

16 years), and, with bassist Gary Peacock, the trio cuts a serious swath through some classic tunes.

Housed between the opener, Miles Davis' "Solar," and the closer, a great reading of the Rodgers & Hart ballad "It's Easy to Remember," are five tracks that demonstrate the trio's exceptional familiarity and appreciation of the jazz and standards literature. "Basin Street Blues" is basic, down, and dirty, while Jarrett mainstay "Bye Bye Black Bird" is a standout vehicle for the



group to play its improvisational heart out with. Quite simply, there's not a weak link in this seven-song, hour-plus-long program.

Jon W. Poses

improvisations that often lends a chamber mood even when he's crashing the keys or pounding out Charlie Parker's "Billie's Bounce." The duo mostly perform self-penned tunes, such as Holland's raucous "Jumpin' In," with Leviev moving from Cecil Taylor-ish sweeps to a splash of rag-time. But they also show a lyrical side, dipping into the underrated songbook of John Abercrombie.

John Diliberto

Lunar Crush

David Fiuczynski John Medeski

GRAMAVISION R2 79498, 57:02

Downtown N.Y.C. guitar hero Dave "Fuze" Fiuczynski and keyboardist John Medeski possess a more than ample supply of chops.

As served up here, they're covered for the most part by a messy but delicious layer of sonic cheese. But, as the album's opener, "Vog," bears out, this raucous outing is more satisfying—and more substantial—than any manner of store-bought junk food. With Fuze's guitar alternating between angular precision and wobbly fuzz, Medeski skips from clavinet through power organ to Fender-Rhodes; the effect is equal parts of Edgar Winter and '80s Miles Davis. Though vocals by Michelle Johnson and Gloria Tropp nudge the project toward art-rock pretense, the two principals bear more earthy inspirations (try "Slow Blues for Fuze's Mama" as proof). As a result, the not inconsiderable pyrotechnics achieve a distinct brand of postmodern funk.



Michelle Johnson and Gloria Tropp

Michelle Johnson and Gloria Tropp

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Mistérios

Wallace Roney

WARNER BROS. 9 45641-2, 59:10

Trumpeter Wallace Roney will never fully sidestep the shadow of Miles Davis, yet his own bristling tone and sense of harmonic invention nonetheless assure that his own horn shines. On his debut for Warner Bros., Roney enjoys some Miles-like trappings—most obviously in the form of quirkily lush orchestral arrangements by a man named Gil (Goldstein, not Evans) and in the presence of producer Teo Macero. Surely, Roney shares more than just a lonely, piercing upper register with



Davis: He employs notable restraint to create well-placed silences. Urged along here by a fine group featuring pianist Geri Allen and saxophonist Antoine Roney (Wallace's brother), Roney crafts a consistent structure over a wide range of compositions by people like Jaco Pastorius, Egberto Gismonti, Milton Nascimento, and others. He single-handedly revives John Lennon and Paul McCartney's "Michelle" from tired inconsequence, and rescues Dolly Parton's "I Will Always Love You" from Whitney Houston bombast.

Larry Blumenfeld

Catch Up With The Blues

Johnny Copeland

VERVE 314 521 239-2, 54:57

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With The Blues might be his best album in a career distinguished by remarkable consistency. The songs are varied and strong, Copeland is in typically fine form, and he trades licks with fellow Gulf Coast guitarists Lonnie Brooks, Clarence "Gatemouth" Brown, and Joe Hughes. Although modern in outlook, *Catch Up With The Blues* is blues without apology, built on the horn-driven shuffles at the heart of the Texas sound. Yet Copeland is equally at home with "Every Dog's Got His

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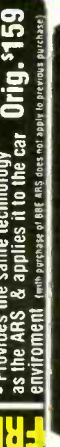
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Day," a soul blues with the Memphis Horns recalling the heyday of Stax. All told, it's state-of-the-art Texas blues that seems shorter than its running time even after a dozen plays.

Roy Greenberg

FAST TRACKS

In the Evening Out There: Paul Bley/Gary Peacock/Tony Oxley/John Surman (ECM 78118-21488-2, 56:19). This album is deceptive since these four intuitive improvisors appear together on only one of the tracks. The rest are solos and duos that sound like they could be outtakes from a previous session, which, given the 1991 recording date, I suspect they were. There are some interesting moments but a lack of vitality to these leftovers.

J.D.

My Guitar and Me: Hubert Sumlin (Evidence ECD 26045-2, 48:28). This 1975 session, one of the first for this legendary Howlin' Wolf sideman, brims with mostly instrumentals with a relaxed yet stinging sound full of fancy flourishes. Sumlin's fingerstyle makes his guitar whine with an almost vocal presence, while four excellent acoustic numbers and a bonus, previously unreleased jam make this reissue a very hot classic.

M.W.

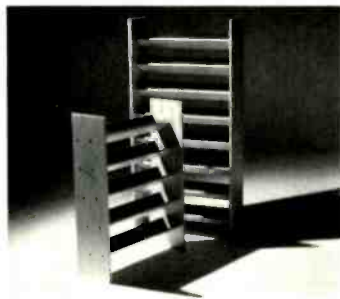
Urbanator (Hip Bop Records 7 38572 800123, 51:34). The jazz/hip-hop thing—like Acid Jazz—is typically a statement of fashion rather than a statement of music. But with Urbanator, the priorities are straight. Here, veterans Michal Urbaniak (violin), Lenny White (drums), and Al McDowell (plus newcomer Jon Dryden on keys) bring musicianship and artistry to an over-hyped experiment that has fallen flat in the hands of others. The one and only Herbie Hancock guests on a reading of his classic, "Chameleon." Kenny Garrett, Michael and Randy Brecker, and other notables also make contributions to this recording.

M.B.

The Soto Koto Band: (Higher Octave Music 7049, 39:24) Dynamic and sophisticated all-instrumental Gumbay music from the world root of blues and jazz, Gambia (remember Roots?). Mostly compositions of Paps Touray these very contemporary African sounds mix hypnotic, danceable guitar/synthesizer sound and percussion with some New Age guest musicians. What a delightfully unexpected "up" sound this release offers!

J.H.S.

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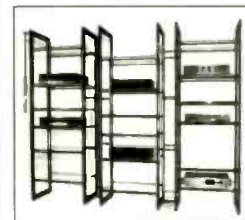
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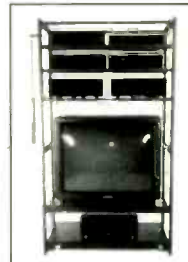


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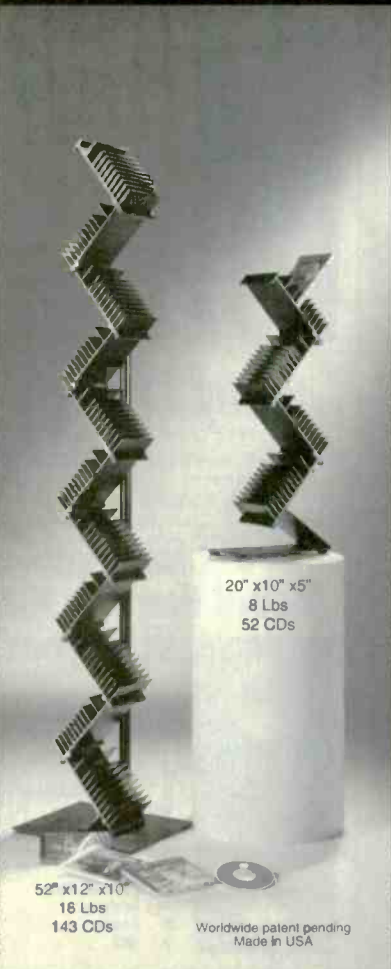


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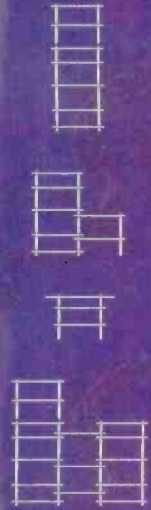
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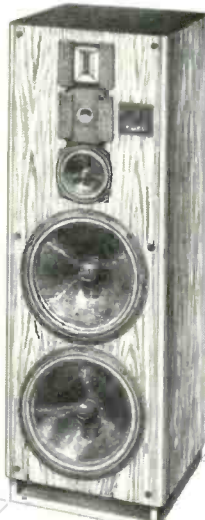
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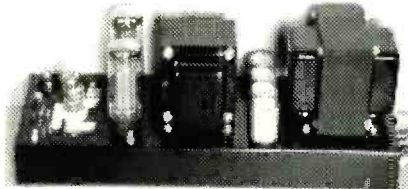
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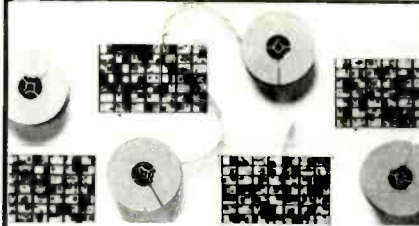


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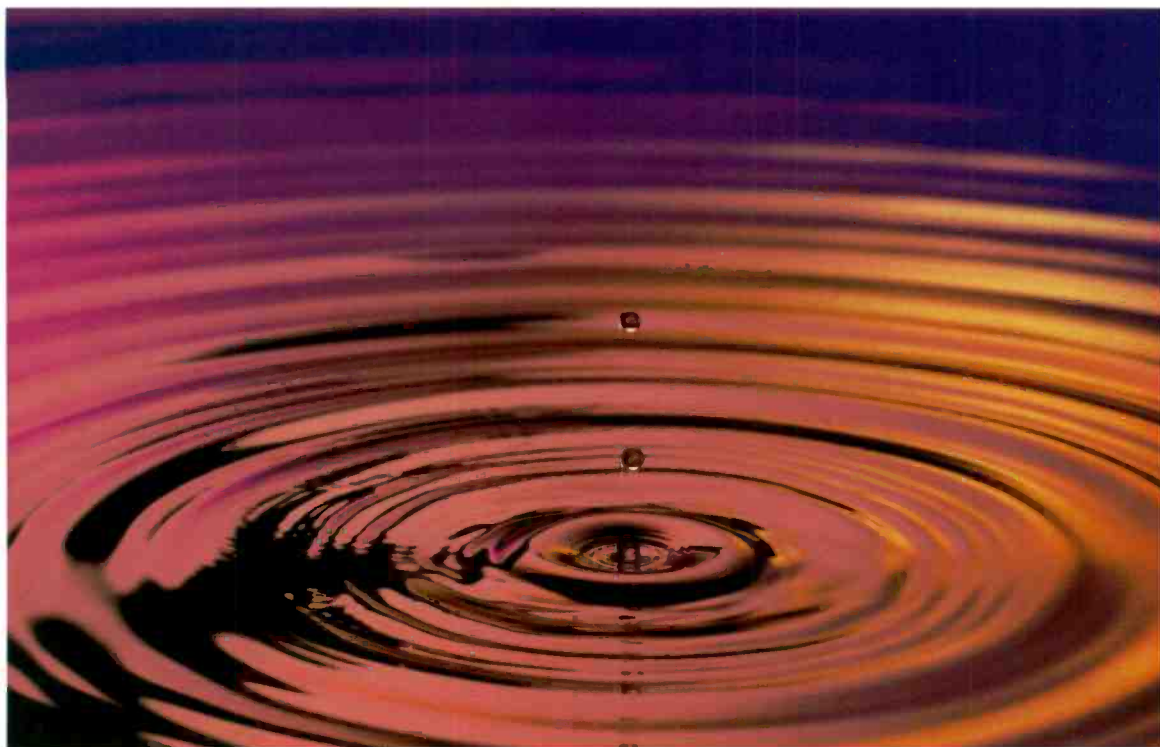
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AD INDEX

Firm (Reader Service No.)	Page
Adcom (1)	5
Audiophile Systems	*32 a&b, 53
AudioQuest	7
Bell'Ogetti (2)	9
Brystonvermont (3)	27
Cambridge SoundWorks (4)	26
Carver (5)	23
Delco Electronics	15, 61
Digital Phase (6)	45
GE/Sanyo (7)	29
GMC Truck (8)	11
Harman Kardon	18, 19
KEF (9)	21
Lineaum (10)	76
Linn Hi-Fi	53
Martin-Logan	Cover IV
MCM Electronics (11)	76
Mirage (22)	57
Mobile Fidelity (12)	Cover II & 1
New West Electronics (13)	62
Onkyo	69
Paradigm (14)	16 a&b
Parasound	Cover III
Pioneer (15)	3
Polyfusion Electronics (16)	13
Reel to Real (17)	28
Sanus (23)	59
Sound City (18)	77
U.S. Army	41
Vandersteen (19)	8
Velodyne (20)	25
Windham Hill	73
XLO Electric	47
Yakov Aronov (21)	58

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