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AUDIO

RED HOT!!! JAZZ & HERITAGE FESTIVAL

THE EQUIPMENT AUTHORITY
JUNE 1995

TOTEM ACOUSTIC
ROKK SPEAKERS

YAMAHA KX-580
CASSETTE DECK

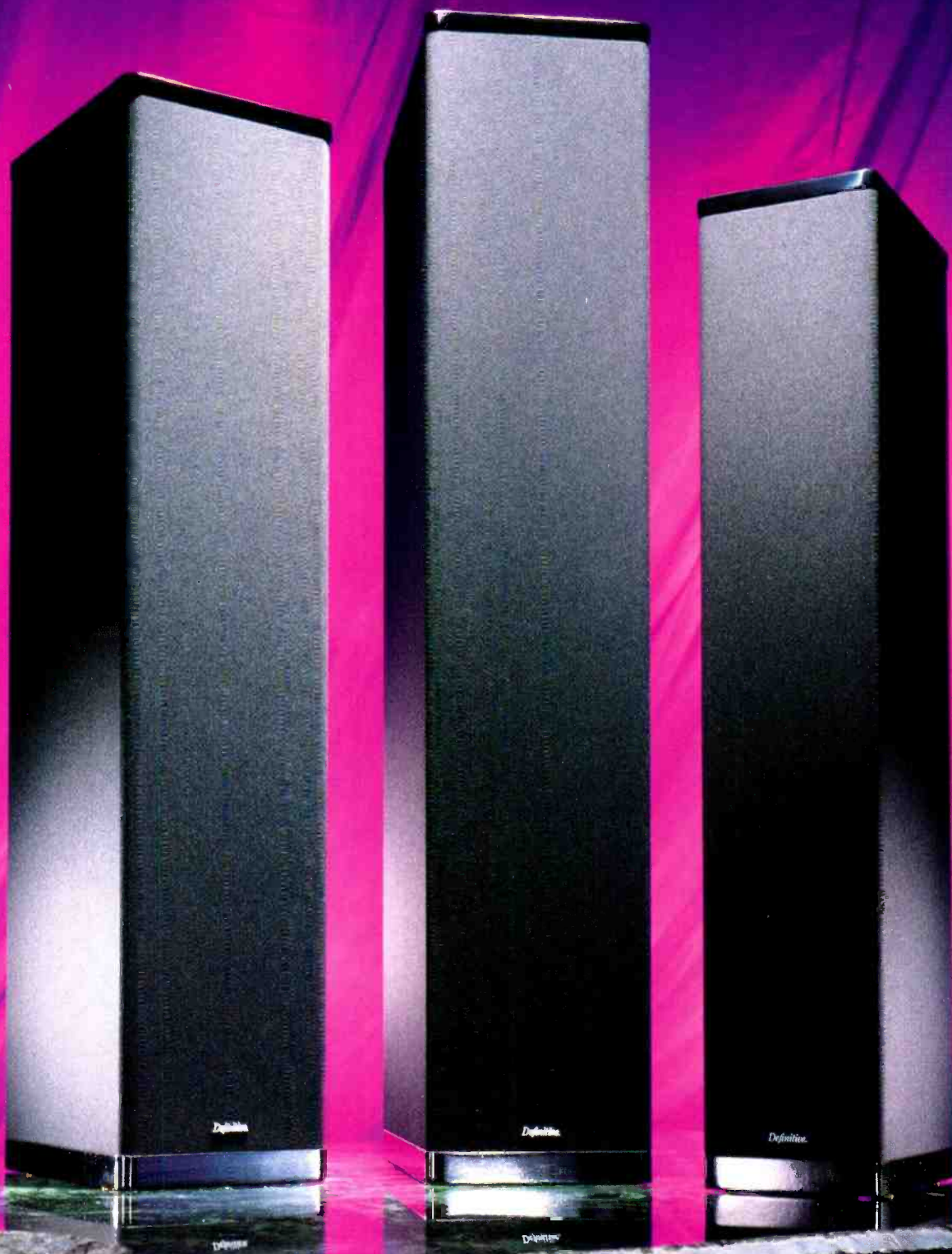
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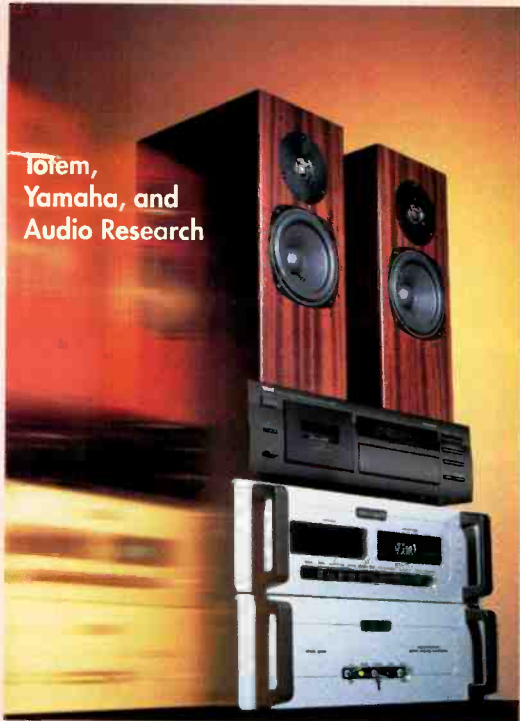
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AUDIO

THE EQUIPMENT AUTHORITY



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Totem, Yamaha, and Audio Research

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- HAFLER P1500 AMPLIFIER
- SUTHERLAND A-1000 MONO AMPLIFIER
- AUDIO-TECHNICA ATH-P5
- PORTABLE HEADPHONES 104



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No matter where you are, you're there.

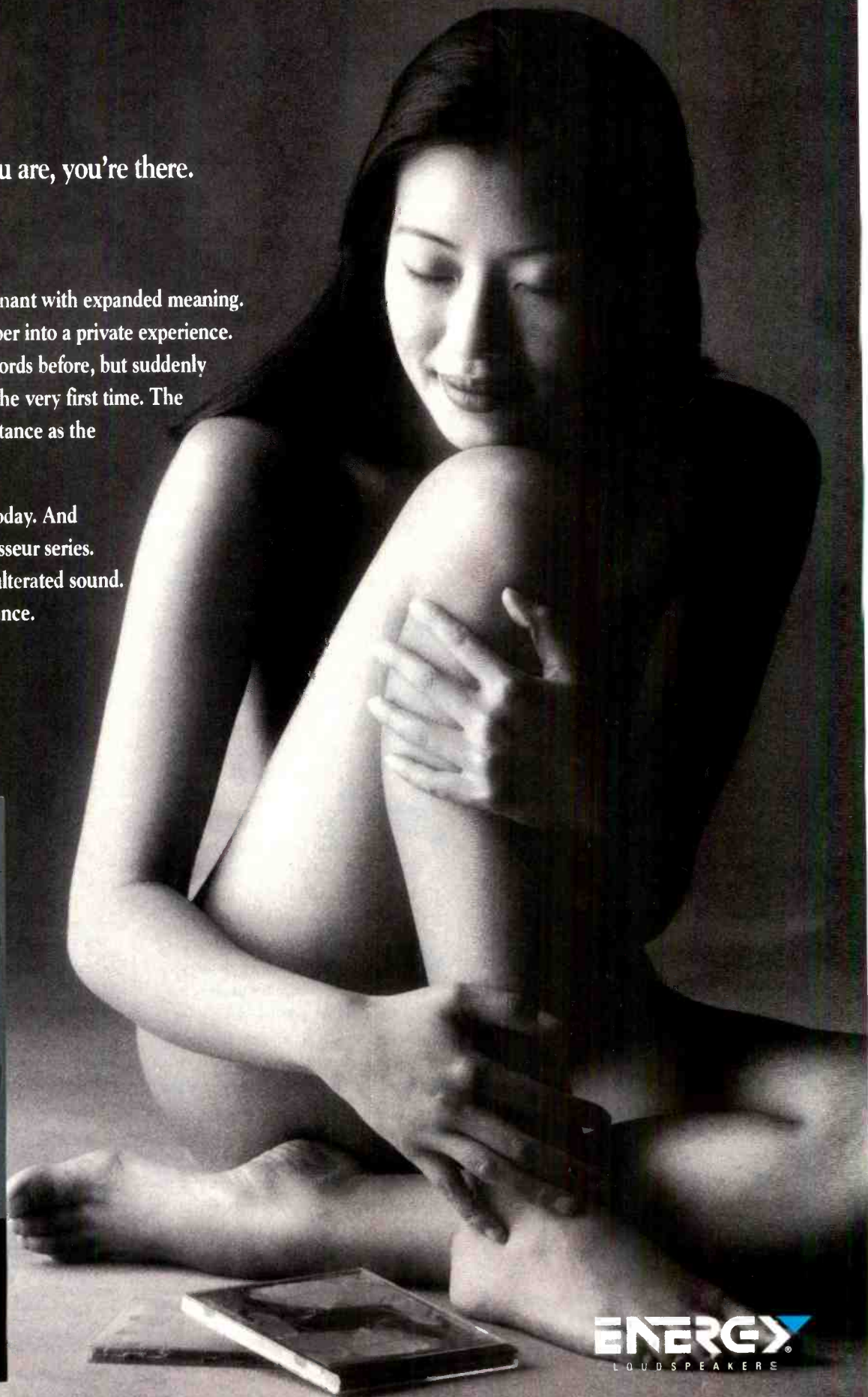
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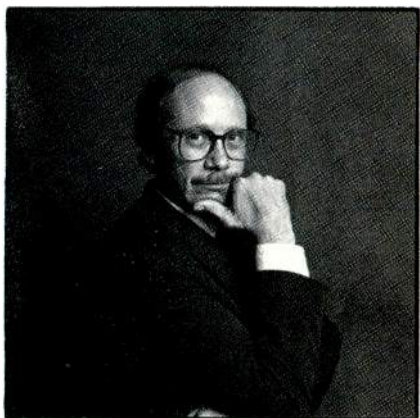
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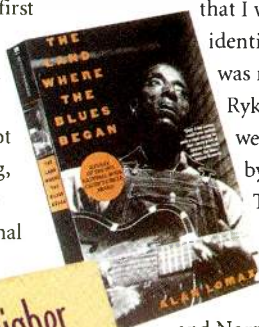


Often, it is better for a reviewer to just let a book speak for itself, rather than to show his own ignorance.

The first of two books in front of me is *The Land Where the Blues Began* by Alan Lomax, who at first with his father, John A., and then later alone “began recording Southern black folk songs in the field in the 1930s,” writes Alan in his Preface. They may not have been the first to do such recording, but John, and Alan after him, set high-water marks, showing very great personal courage and even more sensitivity.

From page 152: “In 1947 I played old John Williams’ story, along with some other bits of my Mississippi recordings, to Hodding Carter, the longtime liberal editor of the *Greenville Citizen*, the man who’d knocked Bilbo out of his Senate seat. Carter sat listening in astonishment. In all his career as a Southern journalist and a friend of the black Mississippi community, he said he’d never heard such frank talk from the black ‘lower depths.’ ‘I’ve tried and failed to cross that line,’ he told me. ‘As a Southerner, I congratulate you. But I don’t think you realize what a dangerous position you’re in.’ He paused, then went on. ‘Alan,’ he said, ‘promise me one thing. Take those tapes you’ve played me, lock them in the trunk of your car, and start driving. Don’t stop till you cross the [state] line, because if they catch you with those tapes in this state, I won’t be able to help you. You’ll be a goner.’”

What kind of songs and stories are on those tapes? Atlantic Records is reissuing the recordings of Alan Lomax’s Southern fieldwork in a four-CD boxed set entitled *Sounds of the South*. Meanwhile, in 1990, Rykodisc released a Lomax-recorded CD, *Blues in the Mississippi Night*, which has a special story attached to it, since the names of the performers were concealed for nearly 45 years. In 1946, Alan Lomax was producing a blues concert series in New York City’s Town Hall, which included Big Bill Broonzy, Memphis Slim, and Sonny Boy Williamson. The group “tore down the house.” The next day the four went into the Decca studios, where they cut sides of music and talk on a Presto disc recorder. When they listened to the sides, the three made Lomax “promise



that I would never reveal their identities,” and the whole story was never told until the Rykodisc release, when all three were dead. A powerful book, by Delta, a Dell imprint.

The other book is *Higher Superstition: The Academic Left and Its Quarrels with Science* by Paul R. Gross and Norman Levitt, published by Johns Hopkins University Press. Using language not usually found in the academic press, the authors have taken on the “pretentiousness [that] seems to have become a habit with many postmodern thinkers . . .

[who feel the] ‘privileged’ status of scientific discourse is yet another illusion deriving from the conceits of Western metaphysics, and must therefore be rejected.” And, most startling: “Once it has been affirmed that one discursive community is as good as another, that the narrative of science holds no privileges over the narratives of superstition, the newly minted cultural critic can actually revel in his ignorance of deep scientific ideas.”

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THE EQUIPMENT AUTHORITY

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8B THX

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CIRCLE NO. 7 ON READER SERVICE CARD

WHAT'S NEW



Paradigm Surround Speakers

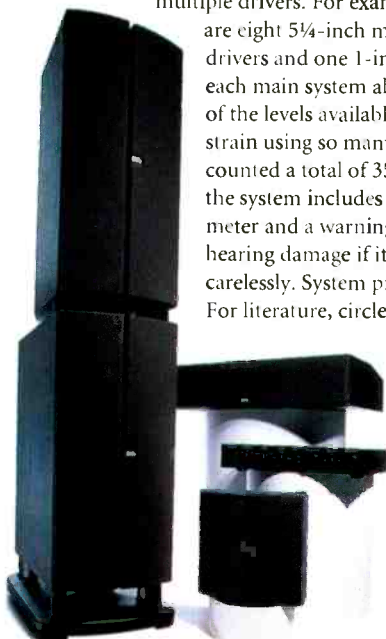
Unlike most dipole surround speakers, says Paradigm, the ADP 150 and ADP 100 deliver balanced bass when mounted on or near a room's walls, for enhanced match of timbre with the front speakers. The ADP 150, with a ¾-inch tweeter and

a 5½-inch bass/midrange driver, has a frequency response of 65 Hz to 20 kHz; the smaller ADP 100, with a ¾-inch tweeter and a 5-inch bass/midrange, has an 85-Hz bottom limit. Prices: ADP 150, \$399 per pair; ADP 100, \$319 per pair. For literature, circle No. 100

Polk Home Theater Speakers

Called designer Matthew Polk's "ideal speaker system," the Polk Signature Reference Theater (SRT) comprises seven speaker enclosures and one electronics control unit with remote. Shown on the left are one channel's main system on top of its subwoofer. On the right are (from top to bottom) the center-channel speaker, the control unit, and one of the system's two back-channel speakers. The subwoofers are powered by built-in 250-watt amplifiers. All of the speakers have multiple drivers. For example, there

are eight 5¼-inch midrange drivers and one 1-inch tweeter in each main system alone. Because of the levels available without strain using so many drivers (we counted a total of 35), Polk says the system includes a sound-level meter and a warning of potential hearing damage if it is used carelessly. System price: \$7,995. For literature, circle No. 102



Bose Computer Speaker

Near-field equalization and angled-back cabinets help optimize the sound of the Bose MediaMate loudspeakers for desktop computer use. Front-panel controls on the powered unit adjust volume and allow mixing or selection of computer and external sound. A headphone jack is included for private listening. Special circuitry provides good bass at low levels and prevents overload distortion. Each ported cabinet, which contains one 2½-inch shielded driver, measures approximately 3½ inches wide x 7½ inches high x 8½ inches deep. Price: \$339 per pair. For literature, circle No. 101



Duntech Audio Speaker

Hardly a miniature, the Statesman is nonetheless a somewhat scaled-down model in Duntech's Classic speaker series. It retains the company's "pulse-coherent" design and driver configuration. A pair of fiberglass-diaphragm 6½-inch midrange/woofers work in tandem; between them, at their acoustic center, is a 1-inch Ferrofluid-cooled dome tweeter. The Statesman stands just under 4 feet high. Price: \$3,995 per pair. For literature, circle No. 104



AudioSource Indoor/Outdoor Speaker

Equally at home poolside or supplying ambience in a home theater setting are the AudioSource Project One loudspeakers. The two-way design employs a ¾-inch soft-dome tweeter and a 4-inch polypropylene woofer. The case, molded of polymer resins said to be sonically inert, is mounted on an adjustable tripod. Three colors are available: White, black, and "computer platinum." Price: \$299.95 per pair. For literature, circle No. 103





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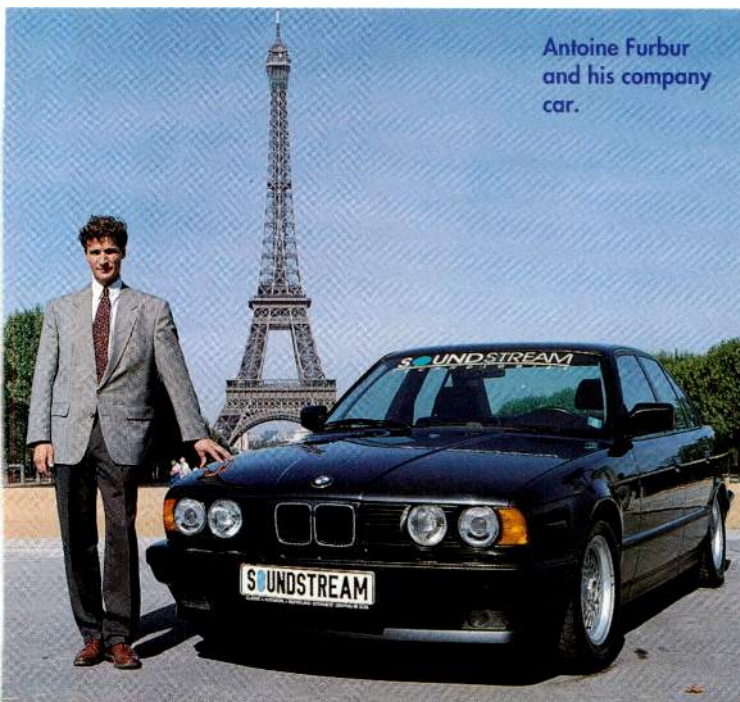


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and his company
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Sorry, the job's been filled. Antoine Furbur has it. As European Sales Coordinator for Soundstream Technologies, he serves as liaison between each country's Soundstream importer and the company's California headquarters. But his job also involves spreading the word through Europe about high-quality car audio, mainly through visits to dealers, attendance at hi-fi and automotive shows, and participation in sound-off competitions. During the Winter CES in Las Vegas, Furbur stopped to spread the word about European car audio to me:

"In Europe, people are clicking into the car audio experience. They can quickly tell that rubbish is rub-

bish, and they don't put up with it very long. No matter how good OEM stereos sound, people can still tell that there must be something better. Perhaps it's because they go more often to live concerts and have good systems at home.

"My impression is that Europeans, in general, look for quality first and only then compare the prices. I don't talk price to people; I just try to bring light on what music can and should sound like. We haven't been aggressive in our marketing; we just talk about getting a good home sound in the car, home audiophile sound that can also deliver the at-

tack and deep bass you need for today's music.

"The difference in markets among countries in Europe is really quite appreciable." One reason European tastes differ, Furbur says, is that people there grow up with a sense of their local music, which affects their taste in sound. "In the Latin countries, they have more appreciation of the mids and highs, whereas in, say, Belgium and Holland, they go more for the lower tones, the bass. In the Mediterranean countries, such as Greece, they're more into a softer type of music, such as ballads—not just love songs, but songs about life. So the lyrics are important, the singing is important.

"Between the ages of 18 and 25, European and American customers are about the same. In America, the majority of business is the younger customer, while in Europe I think there's a bigger share for those who

are 25 to 40. European youngsters are still intimidated, affected by what they're told by people who seem cooler than they are. But in Europe, I think car audio buyers have stronger senses of identity.

"Boom cars do exist in Europe, but people seem to get out of that stage more quickly than in the U.S. In two to three years, the boom-car owner will have bass response that goes considerably lower, and his system will be different. His taste in music will have evolved—mostly because of the new environment, the car, he's listening in. Most Europeans live in apartments, so they have to keep the volume down; in a car, you can really let yourself get into and be captivated by the music, with fewer distractions.

"I was really shocked, and pleased, at the reactions we got at the Paris car show to Oscar Stern's 3-series BMW with an all-Soundstream system. When people got into the car, I thought they would ask me, 'How loud will this go?' But most of them, even the young ones, asked me to turn it *down*. They would sit there, listen, and say, 'It's quite nice, very natural, but maybe in the higher notes it could be a little smoother.' The more musical the sound, the more they liked it.

"Sound-offs are coming along very well in Europe, because the competitors are taking a real interest in car audio as a hobby. In Sweden, a country with only 8 million people, there were 68 sound-offs in 1994, and 25,000 people came for the finals! The French finals had 40,000 people go through the gate; they combine it with a classic and sports car show, and the beauty of that is the chance we get to expose people to good auto sound."

Sound-offs in Europe follow rules that originated in the U.S., with the International AutoSound Challenge Association (IASCA), but Furbur feels that there's a conflict between those rules and European tastes: "What we're looking for in sound is different." Listening to cars with an

Photo: Arcadia, Paris

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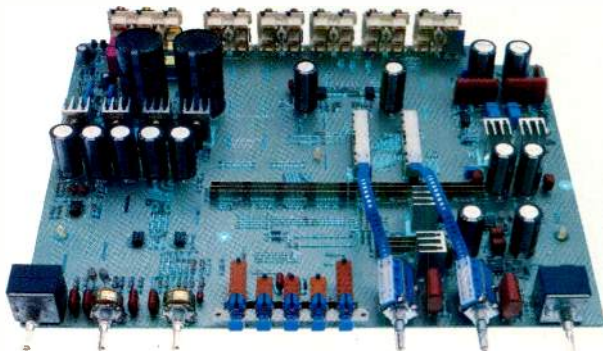
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The HT-12PWR

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experienced friend at the IASCA finals in the U.S., Furbur noticed that his friend “seemed only to like the cars with horn speakers and great imaging. But to me, for whom timbre comes first, there was very little depth to the instrument and vocals; they sounded very thin, with no richness or body.

“This made me start wondering whether I didn’t know what to listen for, even though I’ve been a head judge at several European sound-offs and I’m responsible for training other judges. Then, I found a car I thought sounded great, and drew it to the attention of Arnaldo Vinci, an Italian journalist who’s been an auto-sound judge for eight years. Vinci said, ‘I’ve been in a dozen

cars that were recommended to me, and I didn’t like any of them. But this one has the European sound—the warm, natural sound I enjoy.’ When the owner told us it had gotten a bad score, largely because of poor imaging, Vinci said, ‘This is what I want not to happen in Europe, because in Europe, we have a heritage of music that goes back centuries—it’s in the blood of the people. And these rules have to be interpreted in a way that will promote that real sound of real music—not just find-the-instrument, without caring how that instrument sounds.’ Vinci felt that the cars that were winning in the IASCA sound-offs were judged too technically, not following the feeling of the music enough. The IASCA reference CD

could have something to do with that: It’s based more on reproducing dynamics than on forms of music that involve feeling, warmth, or passion.

“I think that, in a few years, timbre will be a big issue. I think the rules and scoring criteria in Europe will gradually evolve to emphasize this. At first, we all said, ‘Let’s use IASCA rules. Why reinvent the wheel?’ But now we see the need to modify them. In the future, staging and imaging may be worth a bit less, percentage-wise, while ambience and the judge’s personal overall impression may be worth more. If a car has grand soundstaging and imaging but you don’t enjoy listening to it, and another is more enjoyable, should it win?” A

A SIMPLE LITTLE SYSTEM

Antoine Furbur’s BMW 525 is not just for transportation. He uses it to show new Soundstream dealers how the company’s equipment sounds, as a company demo car at sound-offs and car shows, and as a reference when training sound-off jurors. He’s also entered it in sound-offs (in the Expert category) and garnered a trophy or two—third place in the 1994 Belgian finals, for example.

The aim of his system was “a neutral, open, transparent, and warm audiophile sound,” says Furbur. “I look first at the timbre, then at the staging and imaging. While the timbre is very linear from bottom to top, we may need to do a bit more work with front speaker positioning to attain a perfect soundstage.

“I listen to jazz, rock, and most anything with naturally recorded vocals, and I want it to sound very natural. Yet it still works with other types of modern music. My system can play a measured 120 dB SPL. Even so, techno or rap fans usually say, ‘Well, it could play louder,’ but then they add, ‘I like how clear and clean and precise it sounds; I hear more detail than I’m accustomed to.’ The only people who want it to play louder are really looking for mobile PA systems.”

The system is all Soundstream, of course, right down to the cables. The music comes from a trunk-mounted DC1000 changer (with DTA•1 external D/A converter) and an STC•80 cassette/tuner unit (a European model) in the dash; the STC•80 also controls the DC1000.

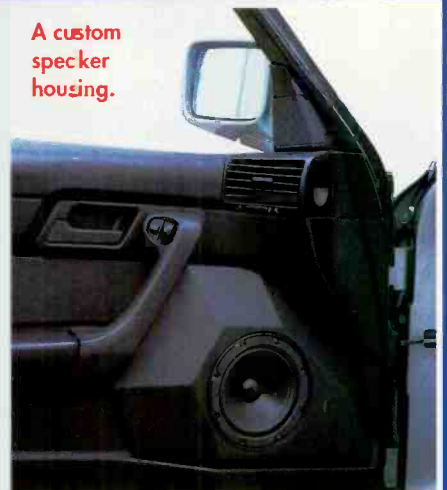
The front speakers are SS511 component systems, each consisting of a 5¼-inch midrange and 1-inch tweeter. In the rear, the car has only the SS511 midranges, rolled off above 3.5 kHz, to keep the image focused firmly in the front.

A pair of Reference Class A 6.0 amps, delivering 50 watts per channel into 4 ohms, feeds the front and rear speakers. A Reference•500 amp (125 watts per channel) feeds the two SS10R 10-inch woofers, which are connected in stereo and mounted in a sealed enclosure whose volume is 80 liters (2.8 cubic feet). Three 1-farad capacitors help regulate the 12-V feed to the amps. The system is filtered actively by an SVX4 crossover, which cuts off the subs at 24 dB/octave above 60 Hz and cuts in the front and back satellites at 12 dB/octave above 120 Hz. The front satellites use the PC2 passive crossover, supplied with the SS511 systems, between each midrange and tweeter.

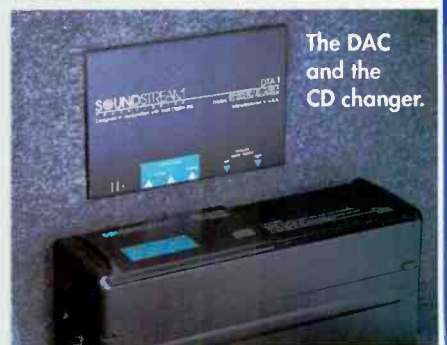
The installation was done by Roger Gaspak and Martin Schaad, of M+K, in Zurich, Switzerland. “Our system design philosophy,” says Furbur, “was to minimize phase problems by keeping the number of drivers to a minimum—only eight. I’m more into quality than quantity.

“As a possible future upgrade, I may add a pair of 8-inch woofers up front to give younger listeners a more memorable experience on demos. This will give the mid-bass frequencies a bit more attack, especially for some of today’s ‘heavier’ music. But it isn’t really needed for jazz or pop.”

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housing.



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and the
CD changer.



Amplifiers and subwoofer compartment,
with capacitors in background.



THE MOST CONVINCING ARGUMENT FOR A

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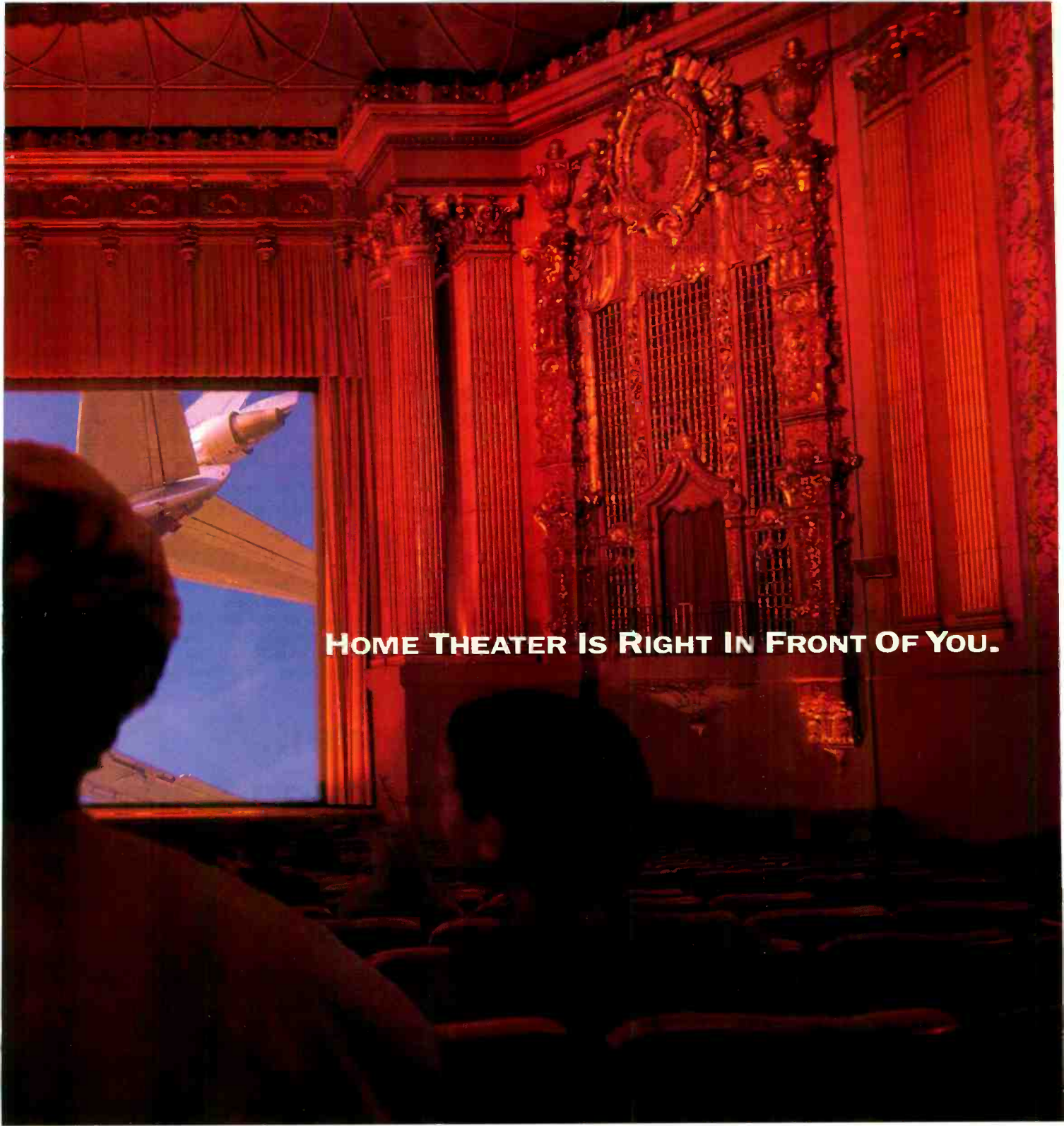
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"MPX" Filters

Q What is the purpose of an MPX filter?—Rick Wang, Irvine, Cal.

A The multiplex ("MPX," for short) system allows an FM station to transmit in stereo and to carry other signals (such as RDS information and background music). It uses subcarrier signals at frequencies of 19 kHz and up; these signals can cause problems if they get into the tuner's audio output signal when you're recording a broadcast. If you're recording with Dolby noise reduction, these signals will cause the Dolby circuitry to "mistrack," encoding the system improperly so that the frequency response and the amount of noise reduction in playback will be incorrect. Sometimes these frequencies can beat against the recorder's bias oscillator, causing squeals (or "birdies"). The MPX filters on many home tuners and receivers, and on

a few tape decks, prevent these problems. If the filter is in the tape deck, it should be turned off when you're recording from sources other than FM, so as not to limit the frequency response.

Digital Cable Bandwidth

Q I don't understand why we can use ordinary ribbon and shielded cables for data transmission in computer systems yet must use very expensive cables, with bandwidths exceeding 200 MHz, for data transmission of digital audio signals. Isn't the digital data essentially the same in both instances?—Ronaldo M. Franchini, Rio de Janeiro, Brazil

A In order to transmit complete, digitally encoded stereo waveforms fast enough to permit real-time analog reconstruction, the transmission rate must be vastly greater than that used for conven-

tional transfers via modem or MIDI. Don't be misled by the sampling rate; remember that two channels must be included for stereo, with sufficient redundancy to permit error correction. This means the bandwidth must be significantly greater than twice the sampling rate. Thus, ordinary cable will work fine for a modem but not for transmitting audio data.

Q & A on RIAA EQ

Q I have some questions concerning "split" passive RIAA equalization networks, by which I mean those using a separate bass-boost EQ filter with an input RC time constant of 3,180 μ s and an output RC time constant of 318 μ s, followed, after a separate voltage amplification stage, by a treble EQ filter with an RC time constant of 75 μ s. My questions pertain to EQ networks in tube

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 Audio-clinic, please indicate if your name and/or address should be withheld. Please enclose a stamped, self-addressed envelope.

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It took plenty of the right stuff (what Chuck would draw 'moxie') to even dream of producing a CD player with Arcam's standards of sound quality for under \$600*. But if anyone could do it, Mike could. Our chief engineer and his team of self-confessed audiophiles have a rather compulsive habit. They like to break old records (of which Arcam has a rather inelegant sufficiency).

Combining a liberal dose of obsession (and we're not talking

after-shave) with the same principles and techniques that produced the first complete UK manufactured CD player, they created the new Alpha One.

The British-built A1, as it is affectionately nick-named (for reasons you will fully understand when you check it out at your Arcam dealer), has all the hallmarks of Arcam's legendary quality.

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Check! Elegant appearance? Check!

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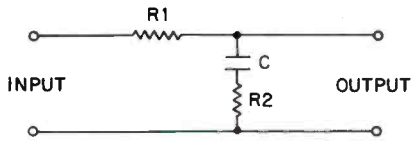
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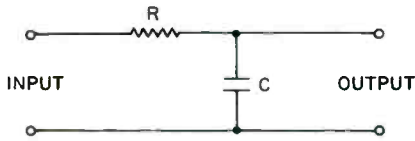
preamplifiers that have sufficient headroom to avoid distortion problems.

As you are aware, a bass-boost RIAA EQ filter is the following:



where R_1 includes source impedance of the input signal, and the output is to a very high load impedance, such as the grid of a cathode follower.

The separate treble EQ filter has the following configuration:



where R includes source impedance of the input signal from the previous voltage amplification stage, $RC = 75 \mu\text{s}$, and the output is again to a very high load impedance.

My questions are:

(a) Is the input RC time constant of $3,180 \mu\text{s}$ for the bass-boost filter supposed to be the product of R_1C or that of $(R_1 + R_2)C$?

(b) Is the output RC time constant of $318 \mu\text{s}$ for the bass-boost filter supposed to be the parallel combination of R_1 and R_2 (that is, $[R_1R_2] \div [R_1 + R_2]) \times C$ (i.e., $[R_1R_2C] \div [R_1 + R_2]$), or is it the product of R_2C ?

(c) What is the correct ratio of $R_1 \div R_2$ in the bass-boost filter?

(d) Will using these separate bass-boost and treble EQ filters, each following a separate voltage amplification stage, accomplish RIAA equalization with sufficiently high accuracy?—Ed Warden, Lynchburg, Va.

A Let me take your question, point by point:

(a) The input RC time constant ($3,180 \mu\text{s}$) of your bass-boost network is calculated from: $3,180 = (R_1 + R_2)C$, where C is the capacitance (in microfarads) and R_1 and R_2 are the resistances (in ohms).

(b) The output RC time constant ($318 \mu\text{s}$) is simply: $318 = R_2C$.

(c) Dividing one equation by the other and performing a little algebra shows that R_1 must be nine times larger than R_2 .

(d) In an ideal world, passive networks provide equalization accuracy commensurate with the accuracy of the components, and 1%-tolerance components are often used. In the real world, the source impedance of the stage driving the network must

**IN THE REAL WORLD,
FILTER PERFORMANCE
IS NOT EXACTLY
WHAT TEXTBOOK
FORMULAS SUGGEST.**

be taken into account when calculating R_1 (as you indicate in your question), and the stage fed by the network should indeed provide "a very high load impedance." It is particularly important that the reactance of the input capacitance of the stage (including circuit wiring) be much greater than the network impedance at the highest frequency of interest. In any event, it's usually best to keep the network impedance low to minimize hum and noise pickup.—E.J.F.

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CIRCLE NO. 34 ON READER SERVICE CARD

The Road Kill Diaries



May 3

Hung out with the other rodents.

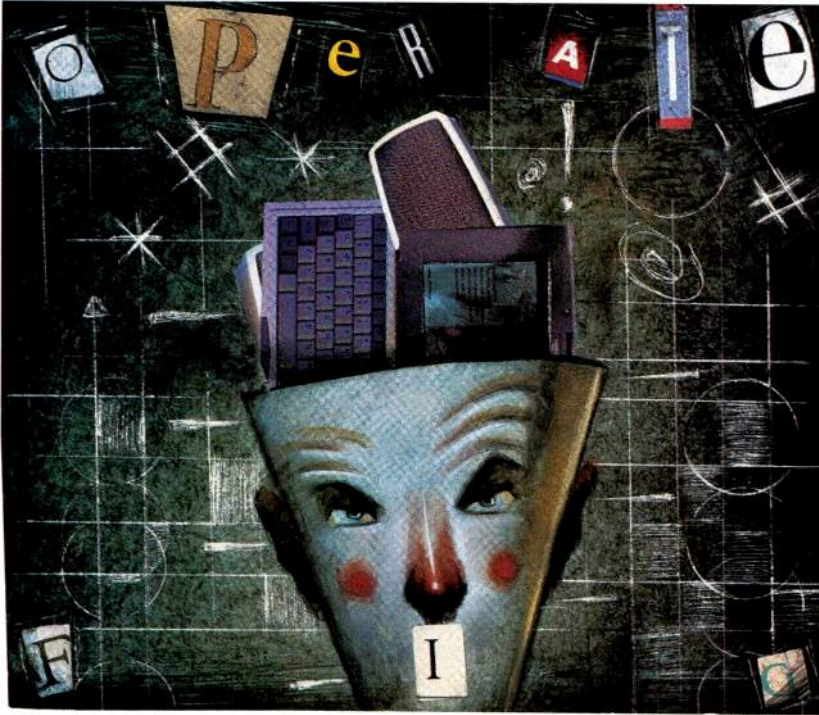
Ran out in the road.

Whatever nailed me sounded awesome.

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CIRCLE NO. 40 ON READER SERVICE CARD

A WORD ABOUT PROCESSORS



When one of our captains of industry told me, years ago at an AES convention, that computers didn't like him, he was practicing inanimate animism. That's assuming trees and fence posts and rocks have likes and dislikes and can talk. But computers *do* talk. They talk like crazy.

So do their junior stepchildren, the word processors. But these inanimate tools do no creative thinking at all, whereas computers are close to doing just that these days. The WPs merely reflect the people who, like me, are their operators. They "create" absolutely nothing except by sheer accident. It is not the WP's fault when I make 50 mistakes in 20 lines. But as an editing device, a tool that writes in fluid dimensions, this thing is extraordinary. Add words, subtract sentences, re-spell, delete,

compose new gems of meaning, and the space flows automatically to make room or fill up holes. Amazing!

Nevertheless, my WP intimidates me the way a strong football coach intimidates a quarterback. I cringe when I see what I have done, I bow my head in shame, I weep figurative

tears—and real ones too: The screen is hard on older eyes. There are times when I just have to quit, go out of doors, and breathe fresh air. There are times, too, when I dream up bad dreams.

In one of these dreams, my WP and I are sitting poolside, wrapped in fond embrace. We writhe and twist. Suddenly, *splash!* Right to the bottom of the pool, WP included.

"Help," I gurgle, without audible results. The WP, though, is programmed. "HURRY HURRY," it prints. "Time is limited! Offer expires soon. Only four minutes left! YES, I want to subscribe to (gurgle) ACT NOW ACTNOWWACT-NOWWW-owbeforeitstoolate. . . ." It dies. I wake up, breathing hard.

My WP's makers think I am a human subspecies. They provide everything I need in order *not* to think. And their tool in this respect is incurably faulty. It berates me for my supposed mistakes: It beeps. But many are *not* mistakes. Don't I know, it says, that my Editor's name is spelled Pits? No use trying to tell it otherwise—the WP just beeps at me in rage. Talk about animism! I find this officious WP tone of voice amusing; the thing acts like a perfect idiot, and I feel better for it, thanks.

Oh, yes—one of the non-think services available on my WP is an enormous file of sample business letters on all sorts of biz subjects, deadly serious, phrased in sanctioned terms. You are expected to edit these letters by inserting or substituting your own specifics, then print them out. (You can print your custom version but not save it. Clever.)

Audio? There is significance in all this. We in audio are terribly at the mercy of language, even when we are dealing with some form of music. The WP in my swimming pool could not shout or even flash "HELP," because it is programmed for a certain

EVERY BIT OF AUDIO EQUIPMENT IS SHAPED BY THE SOUNDS IT MUST PRODUCE OR TRANSMIT.

limited dialect within the great expanse of the English language. Music, too, is many languages with many dialects.

Today, our children grow up learning English, or whatever, by its sound. They begin the process as babies and continue into the years of supposed maturity, when communication of all sorts is vital. But, you say, audio is a means, not a language. The way people learn words (and



As virtually every speaker manufacturer rushes to deliver "home theater" speakers to the marketplace, M&K amasses nearly twenty years of experience in the field—dating back to Hollywood screening-room installations in the 1970s.

M&K engineers have spent well over a decade studying the varied aspects of surround

sound—including encoding and decoding; soundtrack recording; and the differences between reproducing sound in theaters and in homes.

M&K speakers excel in the reproduction of *all* source material. Accuracy, low coloration, pinpoint imaging, wide dynamic range, and deep-bass reproduction are all critical for music as well as film soundtracks. M&K Satellites and Subwoofers have been acclaimed for these attributes since the '70s.

And this is why M&K knows that any speaker that claims to be optimized for either music or film sound, one at the expense of the other, will never reproduce *either one* properly.

M&K Home Theater Systems

Conventional speakers make the music and effects on film soundtracks compressed and dull. But M&K's exciting dynamics and "quick" transients give you precise 3-D imaging and a lifelike presence.

M&K Satellites are *timbre-matched*, using virtually identical speaker drivers, crossovers, and frequency response, for a seamless 360° surround-sound performance. With an all-M&K home theater system, voices and effects do not change char-

acter when their sound moves from left to right or front to back in your room.

Even if you are just adding an M&K subwoofer, front/center, or surround



speaker to your present system, M&K's unique timbre controls allow you to "fine-tune" the sound of your new M&K speakers to achieve the closest possi-



ble timbre-match with your existing speakers—even if they are not M&K's.

M&K Center Channel Speakers

Beware of inexpensive "center channel" speakers. In Pro-Logic, the center channel speaker is driven the hardest, and often reproduces as much sound as the left and right speakers combined.


Each one of M&K's six individually-available Satellites has exceptional dynamic range and high output to meet and exceed the tremendous demands of the center channel.

M&K Powered Subwoofers

Legendary for their massive output, exceptional detail and articulation, M&K's thirteen internally-powered Subwoofers set the industry's standards for high-performance deep bass.

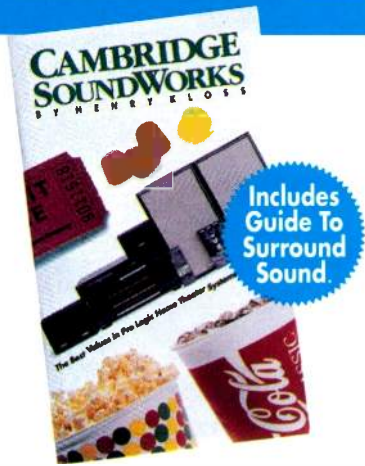
M&K's innovative Push-Pull Dual Driver subwoofers deliver a major improvement by virtually eliminating even-order harmonic distortion, and doubling efficiency (same as doubling amplifier power) with four times the output of single driver subwoofers.

Whether you choose our state-of-the-art Home THX® Audio speaker system, an add-on set of surround speakers, or anything in between, no other speakers will give you the exciting performance, sound quality, flexibility and compatibility of M&K's home theater component speakers.

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music) is not *our* responsibility. But we *are* responsible! Every bit of equipment ever designed is shaped by the sounds it must produce or transmit: The words, or the musical notes, or any other sounds.

It is thus fascinating, in my very brief experience, to see how differently the WPs I have used are slanted in the design of the equipment. My first, a Smith Corona, is clearly typewriter-orientated, out of two ancient and dignified brands going back nearly a century (Corona and L. C. Smith). In the 1920s, my mother bought a little Corona portable with three figures on each type bar: LC, CAP, and FIG—respectively, one lower-case letter, one capital letter, and one non-alpha “figure.” As a kid I was fascinated. I put the thing into FIG mode, and when I typed ordinary letters, out came all sorts of oddities, from & and * to !, “, and %. Brilliant thought: I immediately memorized this as a private code and still can type it. *P2V\$ %*8\$?.

Smith Corona sticks to this principle via a “Keyboard II,” representing the old FIG. My current word processor, from Brother, goes even further—a Keyboard III, the characters not visible on the machine. You either memorize them or, I suppose, hold the instruction booklet in one hand! I tried Keyboard III, blind, and found myself writing in Greek.

Smith Corona emphasizes manual typing. The Brother model I have is all business: Vast quantities of spreadsheet and hundreds of pages of (for me) incomprehensible instruction. I’m learning by experiment. I tried a key marked “Operate,” for instance, wondering what it did. Can you imagine? It justified the lines. Would you have guessed? Weeks later, after I’d naturally forgotten what “Operate” meant, I looked it up. The single indexed manual entry—which refers to the *word* “operate,” not the key—reads, in part:

... The # operator performs only integer exponentiation. If the exponent (the next operand after #) has a decimal value it will be rounded to the closest integer before exponentiation is performed. Therefore this operator cannot be used to calculate roots. . . .

What we have here is calculator-talk, obviously a reference to some other function.

The user is again hooked into a strict language frame, deliberately devised by the designers of the equipment itself. That’s fine—and it’s useful. Is this so different from audio, every last bit of audio?

Audio is *always* designer-shaped if it is any good—for words, for different kinds of music, whatever. And therefore it speaks its own language best in one area, less suitably in others. Again, I suppose, I am speaking the elusive obvious. But when I hear the sonic booms emerging from cars on our roads, I know that the equipment inside

**WE IN AUDIO
ARE TERRIBLY AT
THE MERCY OF LANGUAGE,
EVEN WHEN IT’S MUSIC
WE’RE DEALING WITH.**

speaks that language and speaks it very well, though it can be made to speak another sort of audio, say, harpsichord music! The medium is indeed the message, even a word processor. Or, as previously discussed here, a subwoofer.

We are now well into the battle of the digitals: DCC, MD, DAT, not to mention the wider abilities of CD-ROM, all alongside the existing “standard” (for how long?) formats. Some audio enthusiasts are naive enough to think that the prognosis depends on sheer measurable audio. Yes, there is marginal inferiority in systems that use digitally compressed sound and video. It is a part of their “language.” Many of us are truly purists, and glad to be so. But keep in mind the astonishingly small sacrifices that now are exacted by relatively huge compression ratios. We do have different ears, and eyes, for different messages—audio purity being but one, like it or no.

This has been a lot of “ETC,” hopefully not too unrelated to audio. As our older pro audio engineers have converted to digital, which we hope now likes them, so I convert to WP. It’ll be months before I can cast aside my instruction book and move on my own into this particular new age. But I am happy, because I am sure my WP will learn to like me, no captain of industry at all, as I learn to use its language. After all, it’s just another tool. **A**

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The people who work at Cambridge SoundWorks - including our cofounder Henry Kloss (who also founded AR, KLH and Advent) - have been involved with the concept of home theater from the beginning. In 1969 (years before VCRs and cable TV), Henry Kloss founded Advent, the company that introduced the first home theater audio/video systems - complete with big-screen TVs and digital surround sound. We have had an ongoing relationship with the people at Dolby Laboratories, creators of Dolby Surround Sound, since Henry Kloss introduced the *first* consumer products with Dolby noise reduction over 20 years ago. And now at Cambridge SoundWorks we believe we have set a new price-to-performance standard for home theater components.



Surround Speakers

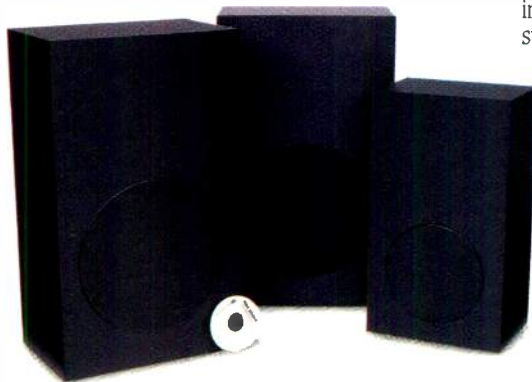
Cambridge SoundWorks makes two "dipole radiator" surround sound speakers. Dolby Laboratories recommends dipole radiator speakers for use as surround speakers.

The Surround has a very high power handling capacity and is often selected for "high end" surround sound systems. *Audio*, describing a system that included *The*

Surround said, "In many ways the surround sensation was every bit as good as far more expensive installations." **\$399 pr.** The smaller *The Surround II* is arguably the country's best value in a dipole radiator speaker. **\$249 pr.**

Powered Subwoofers

The original *Powered Subwoofer* by Cambridge SoundWorks consists of a heavy-



duty 12" woofer housed in an acoustic suspension cabinet with a 140-watt amplifier and a built-in electronic crossover. *Stereo Review* said it provides "deep powerful bass...31.5 Hz bass output was obtainable at a room-shaking level... they open the

way to having a 'killer' system for an affordable price." **\$699.** Our *Slave Subwoofer* uses the same woofer driver and cabinet, but does not include the amplifier or crossover. It can only be used in conjunction with

the *Powered Subwoofer*. **\$299.** The new *Powered Subwoofer II* uses a 120-watt amplifier with an 8" woofer. **\$399.**

Our *EXO-1* electronic crossover can be used with either of our powered subwoofer systems,

or with powered subwoofers made by other companies. Its high pass filters keep strong, low bass signals out of the main stereo speakers, and directs them to the powered subwoofer. **\$299.**

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We have assembled a number of home theater speaker systems that consist of center channel, surround and main stereo speakers. The



combination we show here is our best seller. It includes our critically acclaimed *Ensemble* subwoofer satellite speaker system (with dual subwoofers), our *Center Channel Plus* and a pair of our best surround speakers, *The Surround*. You could spend hundreds more than its **\$1,167** price without improving performance.

For information on other home theater speaker systems - or on any of the products we make and sell - call 1-800-FOR-HIFI for your free color catalog. Thanks.



Because we sell carefully matched and tested home theater speaker systems factory-direct, with no expensive middlemen, you can save hundreds of dollars. We believe the products on these pages represent the country's best values in high performance home theater components. Audio critics, and thousands of satisfied customers, agree. *Stereo Review* said "Cambridge SoundWorks manufactures loudspeakers that provide exceptional sound quality at affordable prices." *Audio* suggested that we "may have the best value in the world."

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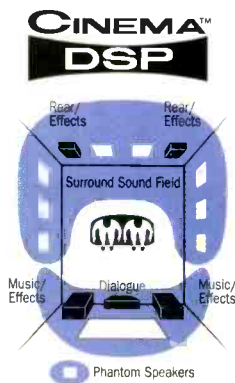
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Lured by Louisiana

The New Orleans Jazz and Heritage Festival

I waited 25 years to make this odyssey to the land of The Big Easy and home of the legendary Professor Longhair.

Sometimes I step into a city and become immersed in a flood of joy. It happened with New Orleans. I could live the rest of my life there. I have stepped deep into this flood before—in Paris, in San Francisco, and in Albuquerque.

The New Orleans Jazz and Heritage Festival was born in 1970 when the New Orleans Foundation asked George Wein, along with his associates Quint Davis and Allison

Minor, to start an annual festival featuring predominantly Crescent

City music, crafts, and food. As you may know, Wein was the force that made the Newport Jazz Festival great. Quite possibly, the first New Orleans Festival had more musicians and vendors than people in the audience.

This year's Festival, held in April and May, was the 26th anniversary, and there were more than



**HENRY ROELAND BYRD:
PROFESSOR LONGHAIR**

.....
Wisconsin-born photographer David Gahr fell in love in the 1950s with Brooklyn, blues music, and a beautiful but now departed wife, Ruth.

Photography and Essay by David Gahr



AUDIO/JUNE 1995

ALLEN TOUSSAINT



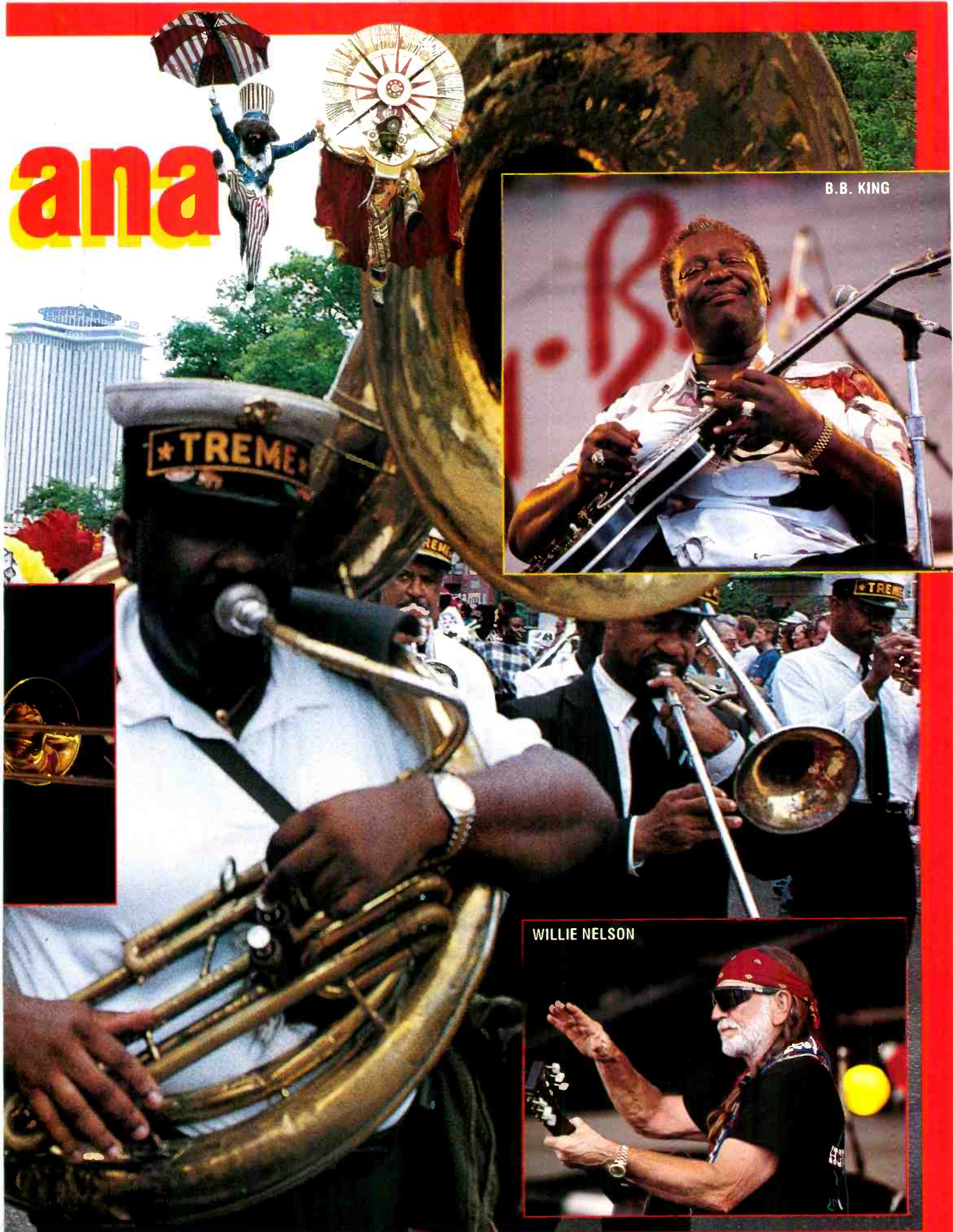
BENNY POWELL



ETTA JAMES



ana



B.B. KING

WILLIE NELSON



400,000 in attendance to hear more than 580 musicians. Performers in the 1994 edition I celebrate here included relative unknowns such as D. L. Menard, Johnny Adams, and Dave Bartholomew on up to superstars of country and blues such as Willie Nelson, B.B. King, Max Roach, Etta James, Buddy Guy,



Aretha Franklin, Walter "Wolfman" Washington, Little Richard, Allen Toussaint, and the duo of Ry Cooder and Ali Farka Toure. Many great Louisiana musical families are there almost every year: The Marsalis clan, the Batistes, the Neville's, the Jordans, the Paytons, and Big Chief Harrison and his son Donald.



LITTLE RICHARD

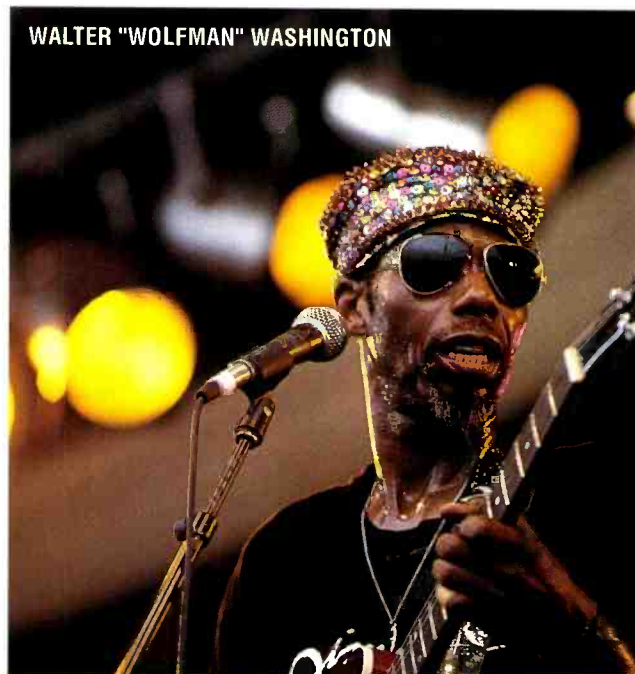
after daybreak, we jumped out of bed and hurried to one of the local schools, where we found an auditorium's worth of students.



CHARLES NEVILLE

Day One of the 1994 Festival began with a dramatic outpouring of exotic, colorful dancers and musicians along Rampart and Canal Streets. This was the first time such a daylight event occurred at the Festival. More than 100,000 people witnessed this great start for the coming events.

For me, the morning sessions started early, due to the urgings of my guide, lawyer, chauffeur, and musician-friend, Joel Siegel. Too soon

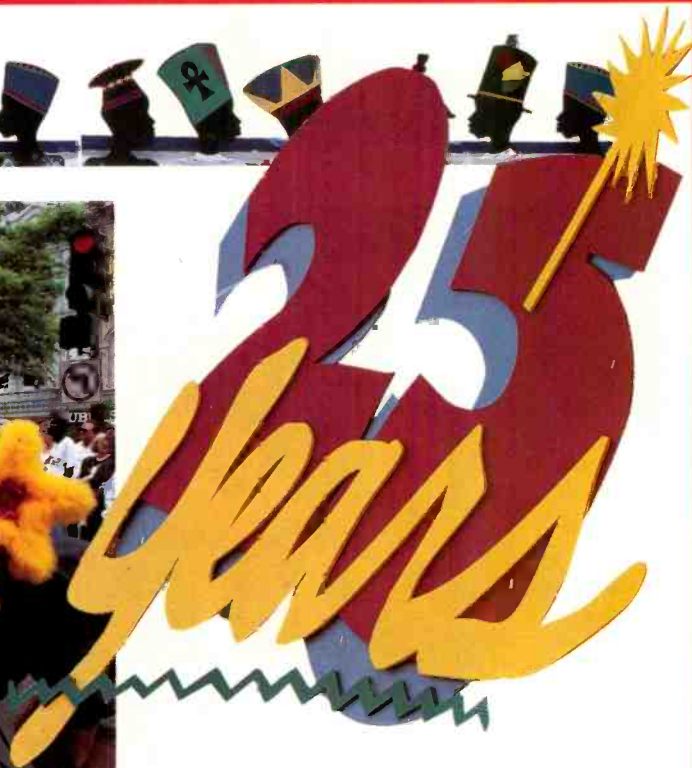


WALTER "WOLFMAN" WASHINGTON



CYRIL NEVILLE

At one school, the great Wardell Quezergue treated the students to his music and educated them with his business acumen. On another morning, Taj Mahal, filled with wit and wisdom, charmed a thousand children with his simple but sophisticated



African-American music. Yet another day began with Ron Winan, the intense black gospel singer, overawing the youngsters with his magnificent baritone.

In December 1993, the New Orleans Fair Grounds racetrack, where the main part of the Festival is held, suffered a calamity: The grandstand and clubhouse burned to a tangled mess. Under Quint Davis' direction, huge tents were found as replacements. Too large to be trucked in, they came by plane and were put together in a miraculously short time.

There were 11 locations for music at the Fair Grounds, in tents or on open stages, interspersed with cultural or "museum" areas. Happily, there was very little seepage of sound from one tent or stage to another. And hundreds of artisans and vendors in kiosks, selling dozens of varieties of food, paintings, posters, crafts, and sculptures,

created a carnival of seductive colors and smells—perfect accessories for the Festival.

The Fair Grounds' tents and stages were jammed with performers every afternoon, representing all sorts of music: Cajun and zydeco, jazz, pop, blues, and both African and American drumming, as well as gospel,

SOLOMON BURKE



ARETHA FRANKLIN

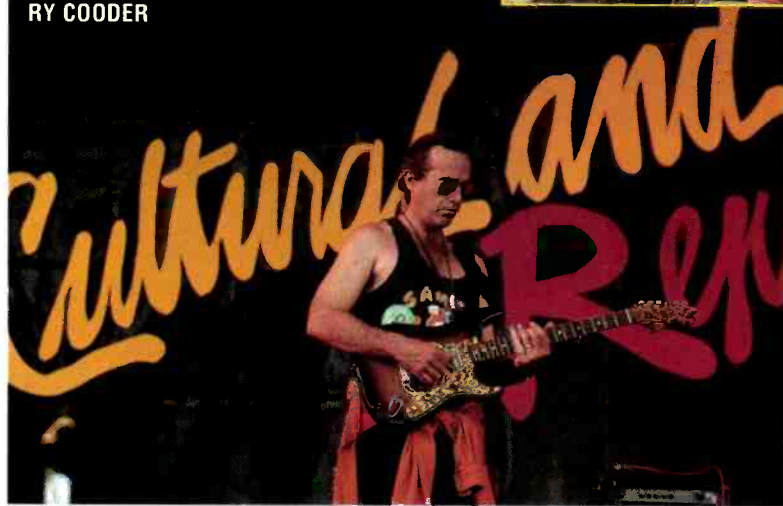




soul, and country. All 11 tents and stages were in operation at the same time, resulting in crisis after crisis for people like me who wanted to hear, see, and/or photograph each of the many unique and important musicians who

were performing simultaneously. For example, one Sunday evening at 6:00, I had to be in six places at one time. Was I to hear Irma Thomas or Cyril Neville or The Batiste Brothers or Dr. John or Allen Toussaint or The Holy Hill Gospel Singers? An impossible choice.

RY COODER



The New Orleans night brought a more leisurely charm to various concerts that took place at the Ernest N. Morial Convention Center. One in particular celebrated the Dew Drop Inn, a legendary nightspot

in the Crescent City, with performances by Ruth Brown together with Charles Brown, Ernie K-Doe, Jimmy Witherspoon, Wanda Rouzan, Johnny Adams, Bobby Marchan, and Tommy Ridgley—all backed





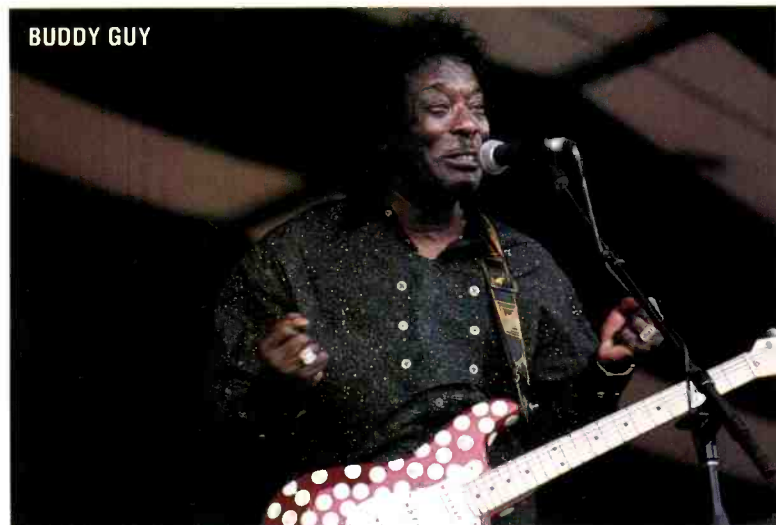
by Wardell Quezergue and his orchestra.

Now, when I am back in my New York City home, what do I remember most?

Simple: Aretha, of course. But also the quiet and superb bluesman R. L. Burnside, the Scottish Jean Redpath and her soaring, eloquent voice, and an unbelievably exciting concert by the dean of jazz organists, Jimmy Smith. And, too, there were my joyful reacquaintances with master

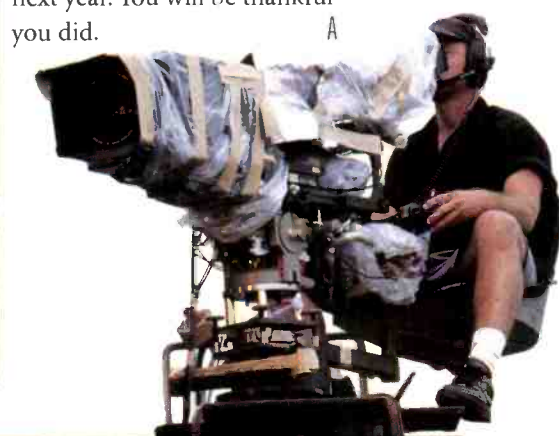


ERNIE K-DOE



BUDDY GUY

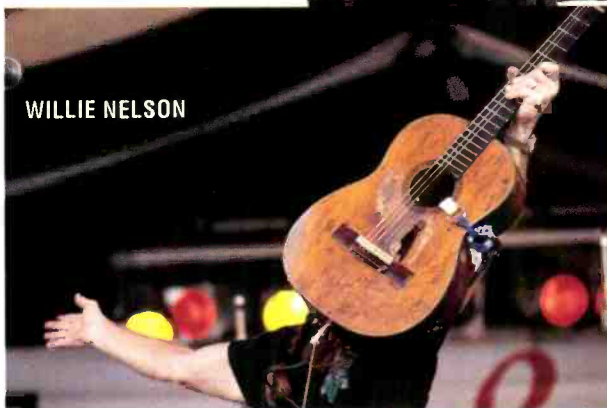
few walls to keep them from you. But if you didn't go, be certain to make plans for next year. You will be thankful you did.



pianist Richard Abrams, with Doc Cheatham late on a rainy afternoon, with the fluent trumpeter Marlon Jordan, and with an old friend,

Wynton Marsalis, who had time enough to pass a remark or two with me.

I hope you went to the Festival this year and partook of its greatest treat—meeting and conversing with the musicians, face to face and at close range. There were



WILLIE NELSON

Zobels a



PHOTOGRAPH: PITO COLLAS

and All That

BY
HANK ZUMBAHLEN



When designing a loudspeaker system, the crossover design is at least as important as the driver selection and enclosure design. The physics of sound reproduction make it very difficult for a single driver to handle all frequencies. Therefore, most speaker systems consist of multiple drivers, each reproducing a separate segment of the audio spectrum. A speaker driver can be thought of as a mass-controlled piston working into an acoustic load that derives its response curve from the cancellation of two opposing effects. The first effect is the cone excursion, which is inversely proportional to the square of the frequency. The second is the resistance of the acoustic load, which is directly proportional to the square of the frequency. These effects cancel each other out in the center of a speaker's response, creating a region of flat response.

At some high frequency, where the wavelength of the acoustic wave is less than the circumference of the driver, the acoustic resistance levels off, and the response of the speaker rolls off at 12 dB per octave. At the resonant frequency of

the driver, the excursion is dominated by the compliance of the suspension rather than by the mass of the cone. This causes a roll-off, which is also 12 dB per octave. Therefore, reproduction of low frequencies requires a driver that has a relatively large surface area, allowing it to move the large amount of air needed. The driver surface should also have relatively high stiffness so that it moves as a uniform piston and doesn't flex. This stiffness usually implies higher mass.

For high frequencies, the tweeter should have as little mass as possible so that it can respond to the input signal quickly. And even though designers would like a massless driver, it still needs stiffness so that it doesn't flex.

Typically, most loudspeaker drivers work well over a frequency ratio of about 10:1. This means that designers customarily use three drivers to cover the three decades of the audio spectrum of 20 Hz to 20 kHz. In the interest of

Hank Zumbahlen is a Senior Field Applications Engineer in the Components Group Applications area of Analog Devices in Campbell, California. This article is adapted from "Speaker Crossovers," a section in Analog Devices' book entitled System Applications Guide.

simplicity (and cost), designers sometimes try to cover the spectrum with two drivers.

This places greater demands on each driver and usually requires sharper cutoff rates in the crossover filter to limit the out-of-band signals from reaching the driver. It is especially important to limit the low-frequency energy to the tweeter in order to limit its excursion.

Since we have separate drivers covering separate sections of the audio spectrum, we need to divide up the input signal to direct the proper portions to the proper drivers. We accomplish this with crossovers, usually passive filters placed between the drivers and the power amplifier. Sometimes, however, the designer may want to implement the crossover at line level. There are some advantages, as well as disadvantages, to each approach, a situation every design engineer finds normal.

The passive crossover is simply a high-level passive filter. The driver is the load impedance of the network. The designer generally assumes the zero source impedance (as opposed to using a source termination), which ensures that maximum power is delivered to the load.

where V_{IN} is the input voltage, V_L is the low-pass output voltage, V_M is the band-pass output voltage, and V_H is the high-pass output voltage. Phase does not appear in this equation.

$$|V_L + V_M + V_H| = |V_{IN}| \quad (1)$$

It is not possible to pass a signal through a ladder network and preserve both magnitude and phase. Therefore, APCs are desirable because they do not introduce variations in the speaker's amplitude response.

The other popular network is the CPC, where the output power of the network is equal to the input:

$$|V_L|^2 + |V_M|^2 + |V_H|^2 = |V_{IN}|^2 \quad (2)$$

The use of the CPC type of crossover in commercial loudspeaker systems predates the APC's use by many years. It is interesting to note that odd-order systems are both APC and CPC.

The next thing that the designer must determine is the order (number of poles)

driver cancellation are more troublesome. (Inter-driver cancellation occurs when two drivers putting

out the same frequency are separated by an odd multiple of $\frac{1}{2}$ of the wavelength of the signal.) A first-order system is a minimum-phase system as well.

Second-order systems are considered by many to be the lowest practical order for a crossover network. The number of components is still manageable, the required operational range is better controlled, and the phase shift of the network is still relatively low. In contrast to odd-order crossovers, second-order (and all other even-order) crossovers are relatively insensitive to system phase relationships.

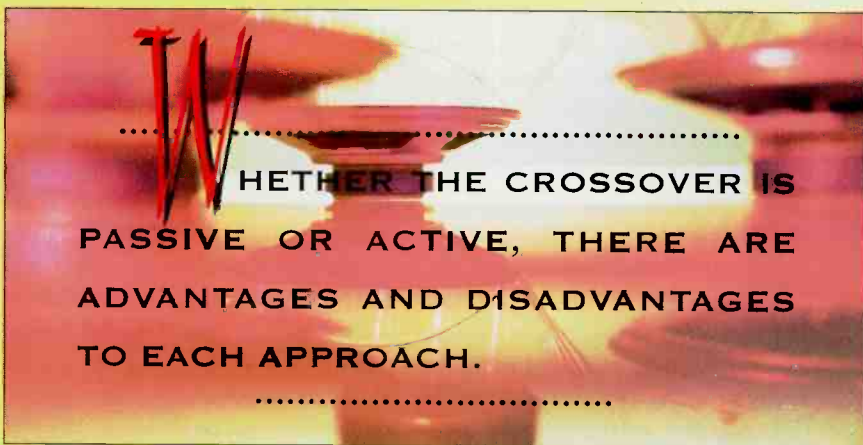
Third-order systems are also very popular. Since they are odd-order, they are both APC and CPC. The number of components is still manageable, but the phase shift of the network is greater.

Fourth-order systems are sometimes used, generally where a high cutoff rate is required (often to reduce the excursion of a tweeter). The disadvantages of fourth-order systems are a high number of components, with a resulting high cost, and high phase shift in the network.

IMPEDANCE COMPENSATION

All design equations for crossover networks assume a constant load impedance. However, the impedance of a driver is anything but a constant (see Fig. 1). The designer should, therefore, add networks to try to equalize this impedance. Typically, this takes the form of a series RC paralleled across the driver terminals; it is called a Zobel network (see Fig. 2).

Unfortunately, this equalization is only an approximation, as the Zobel network only partially compensates for the driver's impedance variation. The impedance does not rise with frequency, as a series LR network does, but more closely approximates the $R\sqrt{L}$. This is sometimes referred to as a semi-inductor. The simple Zobel network, optimized at the crossover frequency, does a good job of flattening the impedance in the frequency range around the crossover, however, which is where we need it most (see Fig. 2).



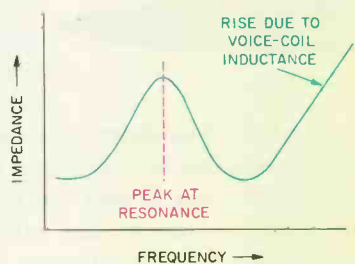
The first thing a designer determines is the crossover type. The two most often used are the all-pass configuration (APC) and the constant-power configuration (CPC).

The APC, introduced by Garde, seems to be the current favorite. When the outputs of the filter are combined, the resultant has the same magnitude as the input at all frequencies. This is shown in equation 1,

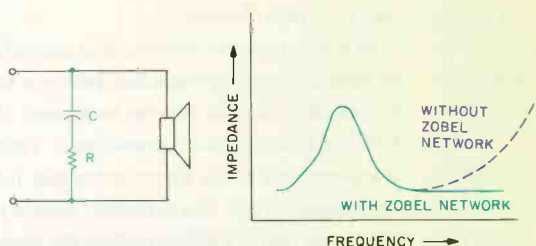
of the system. All-pole systems ultimately roll off at $6n$ dB per octave, where n is the order.

First-order systems are attractive, because few components are required. However, because of the low roll-off rate, the response of the drivers must be flat well beyond the crossover frequency. As a practical matter, since the driver responses overlap so much, problems such as inter-

**Fig. 1—
Speaker
driver
impedance.**



**Fig. 2—
Zobel network.**



**Fig. 3—
Resonance
compensation.**

There is also an impedance peak at the resonant frequency of the driver, and this peak often has a fairly high Q. The designer can devise a series LRC network to equalize this peak, as shown in Fig. 3. However, as the frequency goes down, the size of the required inductor (in all respects: Electrical value, physical volume, and cost) gets large. While compensation of this type is therefore rare for woofers, it is more common (though not universal) for midrange drivers and tweeters, especially when the resonant frequency is situated within an octave of the crossover frequency. Since these are high-Q circuits, their transient response is not optimum, and they tend to ring.

the sum of the pad resistor and the speaker, which should still be compensated by impedance equalization. This approach, while saving a resistor, doesn't allow the flexibility of adjustment offered by the L-pad.

The quality of the components is crucial to good performance. Inductors should have low d.c. resistance because of the high peak currents that they will carry. These currents may actually be larger than the ones in the load and can approach tens

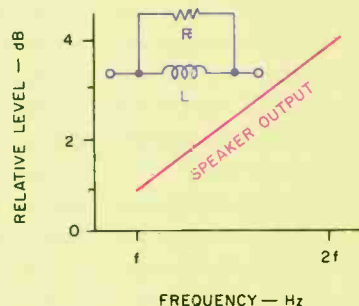
The designer can add networks in series with the speakers to control response variations. These networks are usually parallel LR for rising response with frequency (Fig. 4), RC for falling response with frequency (Fig. 5), or LRC for a hump in the frequency response (Fig. 6).

Figures 7 and 8 show how effective this Zobel and resonance compensation can be with a real midrange—three Audax HD12P25FSM drivers in parallel, actually.

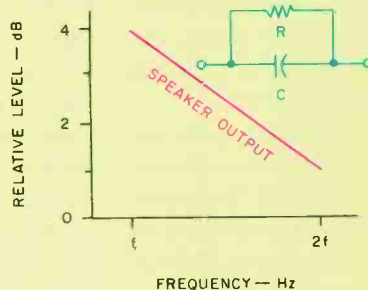
One last function that should be accomplished in the crossover is to equalize the sensitivities of the drivers. This is commonly accomplished with an L-pad so that the level can be adjusted without affecting the load impedance seen by the network. An alternative is to use a resistor in series with the load. The total crossover load, using a series resistor, is then

of amperes. Since the impedance of most crossovers is low, it doesn't take much resistance to turn an LC network into an LRC network. The formulas for passive crossovers assume ideal inductors with no series resistance. Therefore, the inductor should be wound with large wire. (Most crossover inductors are wound with AWG #16 or #14 wire.) Iron-core inductors should be designed so that they don't saturate, even under high peak-current conditions. Many audiophiles dislike iron-core inductors for their susceptibility to saturation, but they do allow higher inductance values for a given amount of wire, which translates to lower d.c. resistance.

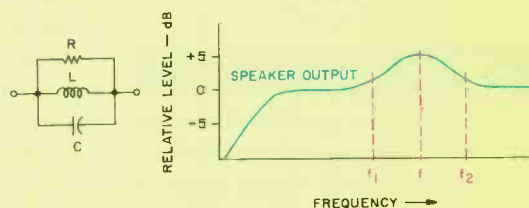
Capacitors for audio use should have a film dielectric. Electrolytic capacitors should be avoided whenever possible. Because there is no polarization voltage in



**Fig. 4—
Compensation
for rising
response.**



**Fig. 5—
Compensation
for falling
response.**



**Fig. 6—
Compensation
for a hump
in response.**

UNDERSTANDING SPEAKER CROSSOVERS

the audio signal, a nonlinear response is caused by an electrolytic capacitor.

Also, the equivalent series resistance (ESR) and dielectric absorption (DA) of electrolytics are poor. Unfortunately, film caps are only available up to about 100 μF , and at these values they are physically very large.

Resistors should be large enough to absorb at least the amount of power that is being delivered to the speaker. The square-section power resistors seem to be the best. They are inexpensive, fairly accurate, and stay resistive (rather than becoming reactive) throughout the audio range.

In wiring the drivers, it is desirable to run two separate wires (hot and common) to each set of drivers rather than running a common return for all drivers. This minimizes the inductance and impedance in the return and prevents the modulation of one driver by the other. Some people even extend this idea by running two separate cables, one for the woofer and one for the midrange and tweeter, back to the amplifier. This is referred to as bi-wiring.

Some final points regarding the passive crossover are in order. If the inductors are oriented so that their magnetic fields overlap, unwanted voltages may be induced from one inductor to the other by mutual inductance. This can be avoided by orienting coils that are close to each other at right angles to each other. Separation is the best way of avoiding mutual inductance.

The physical size of the components, the resistance of even high-quality inductors, and the limitations imposed by the speaker as the terminating load all compromise the accuracy of the passive crossover. This has tempted designers to go to active crossovers instead.

ACTIVE CROSSOVERS

Active crossovers are active filters that divide up the frequency spectrum. In practice, they are line-level circuits placed in front of the power amplifiers. A separate power amp is therefore required for the driver in each frequency range, materially raising system cost, and this is the active crossover's chief disadvantage. There are, however, many advantages.

First, the active crossover network is isolated from the speaker's impedance by the power amp. This makes the design of the filter simpler and more accurate. Second, the impedance of the filter can now be scaled so that component values can be made more practical. Another advantage is that inductors are not used in active filters, and it is much easier to tune an active filter than it is a passive filter because of the isolation between the various sections of the active filter.

Another possible advantage, which can be implemented in an active crossover but not in a passive filter, is time delay. The acoustic center of a driver is usually located at a point approximately where the voice-coil attaches to the cone (or dome). When you mount different drivers on a common vertical baffle, their acoustic centers often do not line up. The resulting time difference can be cancelled by delaying one driver's output relative to another's, and this can be accomplished with an all-pass filter. This alignment of signals can also be done by mounting the different drivers on baffles that are physically offset or slanted. However, this increases manufacturing difficulty and may cause problems with diffraction around the baffle edges.

In the active crossover design, impedance-matching circuits may be eliminated. Almost all modern amplifiers have very low output impedances at audio frequencies. This means they will provide whatever current is required, within the amp's current output capability, to develop the correct voltage across the load. Therefore, speaker-impedance changes with frequency do not affect overall performance.

Another advantage is that since each driver is connected directly to an amplifier, the damping ratio of the amp can control the back electromotive force (EMF) of the driver. This is especially important for the woofer. A dynamic driver works by developing a voltage in a coil of wire—that is, the voice-coil—which then moves relative to a fixed magnet. Back EMF is produced by the voice-coil moving through a magnetic field due to the momentum of the

cone, not because of an input signal. This sets up a voltage in the coil. If the coil is connected to a low-

impedance source, such as a power amp, the induced voltage is effectively shorted out. If there were a passive crossover between the amp and the driver, this back EMF would distort the signal because of the finite driving impedance. Eliminating this effect results in better transient behavior (i.e., "faster" bass).

In active network designs, it is advisable to have a coupling capacitor between the power amp and the tweeter to protect the tweeter from turn-on transients. These transients can easily turn the tweeter into an expensive fuse! The capacitor should be chosen so that it does not affect the transfer function, and it is more than sufficient to have the corner frequency a decade or more below the upper crossover frequency. A high-quality film capacitor should be used in this application.

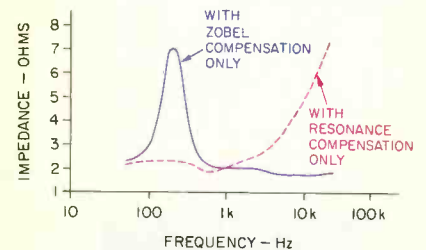


Fig. 7—
Effects of Zobel and resonance compensation.

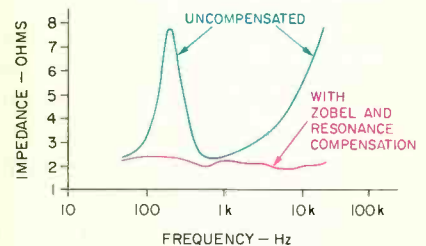


Fig. 8—
Combined effect of Zobel and resonance compensation.

Subjective evaluations have indicated that active crossover networks sound better than their passive equivalents. Although active crossovers offer the ultimate in audio performance, their cost-effectiveness must be determined by the designer and the consumer.

DESIGNING BY COMPUTER

On a final note, computer programs have been written to aid in the design of crossovers. Robert M. Bullock's original work (a classic series of articles that appeared in *Speaker Builder* in January, February, and March 1985; January 1986, and April 1987) is available in the form of a EASIC program for two- and three-way designs. Several shareware programs have been written to spice up the presentation of the data, but these programs suffer in

particular from not being able to factor some of the terms in the higher order APC equations.

A significant advance in modelling allows the frequency response of the individual drivers to be factored into the crossover. Most simple computer programs, such as Bullock's, assume a flat response from the driver. Later programs, such as CALSOD (Computer Aided LoudSpeaker Optimization and Design), allow the designer to use the response of the driver as an input. Some programs can automatically take the response of the driver when used with the proper hardware.

Many programs exist for the design of active filters, running the gamut from simple spreadsheets to very elaborate graphics interface programs. A good source of audio-related software is the Madisound bulletin board (BBS) at 608/836-9473. A

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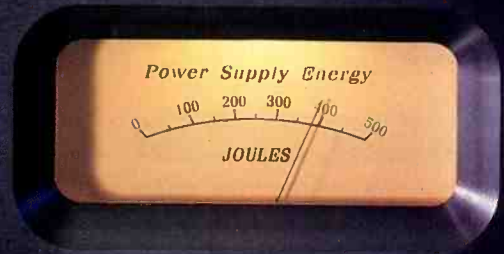
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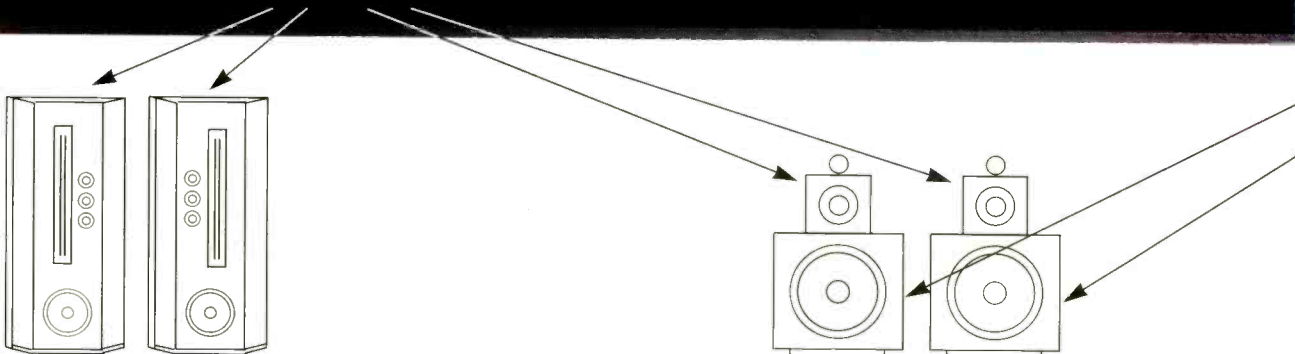
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It's not a 9 watt triode of course, and we wouldn't want it to be, but it does share a very important characteristic with one. It incorporates the current-source (high output impedance) property of a triode -- the very property that is *the* dominant factor (perhaps ninety percent) of the sonic magic that makes listening to classic vacuum tube amplifiers so much fun. So when you choose our current-source output connections for your system, you'll have a sumptuous high end, and a midrange that positively glows.

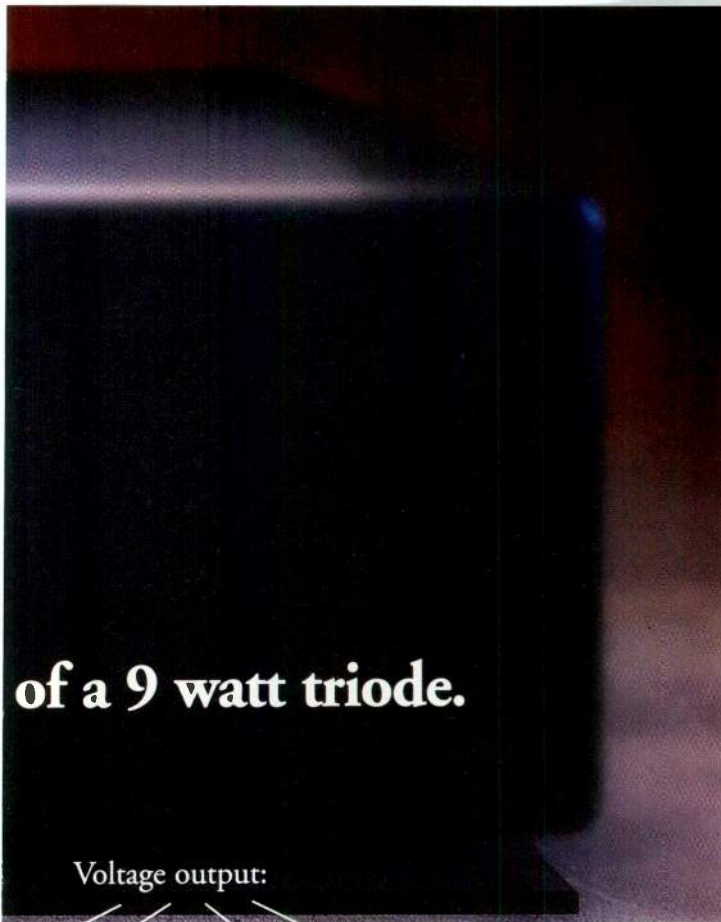
At the same time, the new Sunfire amp, with its uncanny tracking downconverter, has the ability to raise goose bumps with its awesome power. Using 12 herculean International Rectifier Hexfets, it can drive *any* load to *any* rationally usable current or voltage level.

A choice of outputs.

You can connect most speakers to the voltage-source

Sunfire Corporation

.....from the mind & soul of Bob Carver

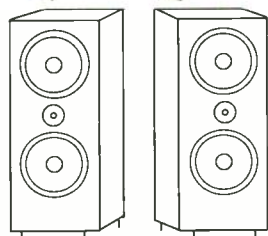


* F.T.C.: 300 watts continuous per channel, both channels driven into 8 ohms from 20 Hz to 20 kHz with no more than 0.5% THD

Inputs are gold XLR balanced and gold RCA standard.

of a 9 watt triode.

Voltage output:



output, with its near zero impedance, to experience the powerful dynamics and tight bass you've always wanted more of.

Or let's say you own electrostatic, planar magnetic or ribbon speakers, then connecting the higher impedance current-source output can coax forth a sensuous, delicately detailed musical voice associated with low-powered classic tube amplifiers.

Or if you're able to biwire, you may just arrive at the best possible interface: voltage output to woofer

for incredible bass whack, current output to midrange and treble for a huge three-dimensional soundstage with detail retrieval so stunning that you will often hear musicians *breathing*.

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The basis for all this is designer Bob Carver's versatility. He's worked successfully for over twenty years with both tube and solid state designs, and he understands the intrinsic subtleties of each.

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Price: \$2,175

Dealer inquiries invited. (206) 335-4748 Ask for Bob Carver.

For more information on the Sunfire, and especially the uncanny tracking downconverter, use the reader service card or write to Sunfire Corporation, PO Box 1589, Snohomish, WA 98290

EQUIPMENT PROFILE

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NAKAMICHI 1000 CAR STEREO SYSTEM

Unlike many of today's aftermarket head units, the 1000td does not have a removable faceplate for security. But a removable faceplate would preclude the 1000td's unusual pivoting CD display panel. The 1000td does have a security circuit that can disable the system if it's removed from the dash. The catch is that, if the system is armed and the 1000td loses power for any reason (say, when you replace the battery or you remove



From left to right: Nakamichi 1000mb CD changer, 1000td tuner/cassette deck, and 1000dac D/A converter.

As Nakamichi aficionados are no doubt aware, the "1000" designation traditionally has been reserved for Nak's premier products—usually those that mark a radical departure from conventional thinking. For example, the original Nakamichi 1000 was the world's first three-head cassette deck. The 1000 car system reviewed here had three components: The 1000td tuner/cassette deck, the 1000mb MusicBank CD changer, and the 1000dac D/A converter. Each is available separately, as is the 1000pa amplifier (not tested), and may be used with other components. However, these 1000 units seem made to work together.

The system's head unit is the 1000td, an AM/FM tuner/cassette deck/preamplifier with two auxiliary line-level inputs (one for a CD player and the other for any other line-level source). The input connectors are gold-plated RCA jacks on umbilical cords that extend from the rear of the unit. A similar pair of cables con-

nect to front and rear power amps. A standard antenna jack and a changer-control cable terminating in a 13-pin DIN connector also emerge from the back of the 1000td. The changer cable is designed to interface with any of Nakamichi's MusicBank changers.

Separate power-amp and motorized-antenna control lines are provided, so the antenna extends only when the 1000td is in one of its two tuner modes, while the power amps come on whenever the 1000td is turned on.

the 1000td from the dash), the unit remains disabled until you have a Nakamichi dealer reset it.

Power, volume, and front/rear and left/right balance are set by concentric knobs at the upper left. I'm the old-fashioned type who prefers continuous controls to touchpads, and I like the way the volume knob latches out when adjusting balance, so you don't have to keep pulling against a spring. Nakamichi provides bass, midrange, and treble tone controls, each adjusted by a rotary control with center detent. These are grouped at the lower right and are normally flush with the panel; they can be popped out for adjustment.

Above the tone controls are four tuning buttons. The outer pair seeks up and down the band for the next strong station; the inner two manually tune in steps of 200 kHz (FM) or 10 kHz (AM). Many head units have a single up/down pair of tuning buttons and a third that toggles between seek and manual operation. I much prefer Nakamichi's



The 1000td in tape mode (top) and CD mode (bottom).

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everyday audiophile, a substantial amount of your hard-earned audio dollars. Its savings are so great, it can't be exposed here - you must contact an authorized agent of Sonic Frontiers to find out more.

In addition to outstanding value, this power-pack pair also provides an unbeatable level of performance. The TransDAC (as the Assemblage DAC-1) and the UltraJitterbug, have individually received acclaim and raves from the critical press. Teamed up, they expose unjust behavior found in many digital sources. Giving the old 'one-two' to a stream of ones and zeros, these crime fighters first whip the signal into shape as it passes through the

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BREAKING THE SOUND BARRIER

approach. Above the rectangular tuning buttons are six round station presets. The "FM/AM" button, next to the "Bass" control, cycles among one AM and two FM banks to store a total of 18 stations (12 FM,

six AM). In tuner operation, a display shows the bank designation, station frequency, and preset number. A slide switch on the side of the chassis (accessible when the 1000td is removed from the dash) de-

termines whether a time display will appear on the panel when the tuner is not in use.

Tape-transport controls, illuminated for identification, are clustered in the center of the panel, below the loading slot. The eject and pause controls are to the left and right of the play key; beneath them are two fast-wind buttons that function as program-search controls when double-tapped. The system identifies a 4-second space as the beginning of a program and, as with all such systems, can be fooled.

Nakamichi's deserved reputation as the premier manufacturer of cassette decks encourages it to follow its own way of thinking. The 1000td makes this apparent in several ways. For example, whereas most decks automatically select playback equalization based upon the cassette-shell keyways, Nakamichi makes you choose it yourself with the "120/70" button, which is to the left of "<< Skip." The argument is that this lets you properly reproduce a tape recorded with the "wrong" equalization, to reduce background hiss on a "normal" tape with 70- μ S EQ or to extend high-frequency headroom on a "chrome" tape with 120 μ S.

Although virtually every car cassette transport has auto reverse, the 1000td goes in one direction only—and the direction seems to be backward. That is, the play key has a left-pointing arrow (" $<$ "), rather than the right-pointing arrow you'd expect, and "<< Skip" is actually fast forward, not fast reverse. (The latter, "Skip >>," looks like fast forward to most common folk.) Nakamichi's argument against auto reverse is that azimuth misalignment occurs when playing a tape in the direction opposite from that in which it was recorded. However, the 1000td's azimuth control (just beneath volume) permits you to match play-head azimuth to the recorded pattern on the tape. Nakamichi thus solved the azimuth-alignment problem that might occur with bidirectional playback but without providing a bidirectional deck!

The buttons between the azimuth knob and the EQ switch activate Dolby noise reduction, toggling between Dolby B and C NR. I found it difficult to tell whether these buttons (and that for EQ) were in or out, and there's no confirming display. To the right of the rewind key are buttons to select the "AUX" input and turn on the tuner when in a fast-wind tape mode ("R.Mon.").

SPECS

1000td Tuner/Cassette Deck

TUNER SECTION

FM Sensitivity: Less than 25 dBf.

50-dB Quieting Sensitivity: Less than 25 dBf.

FM S/N: Greater than 65 dB.

Stereo Separation: Greater than 30 dB at 1 kHz.

AM Sensitivity: 38 dB μ .

CASSETTE SECTION

Wow and Flutter: Less than 0.05%, wtd. rms.

Frequency Response: 20 Hz to 22 kHz.

S/N: With Dolby C NR, 71 dB; with Dolby B NR, 67 dB.

Channel Separation: Greater than 35 dB.

Crosstalk: Greater than 60 dB.

Fast-Wind Time: Approximately 75 seconds with C-60 cassette.

PREAMPLIFIER SECTION

Frequency Response: 30 Hz to 50 kHz, ± 3 dB.

Output Characteristics: Level, 1 V; impedance, 1 kilohm.

AUX Input Characteristics: Level, 0.5 V; impedance, 10 kilohms.

THD: Less than 0.018%.

Tone-Control Range: Bass, ± 12 dB at 20 Hz; midrange, ± 10 dB at 200 Hz; treble, ± 6 dB at 20 kHz.

Operating Voltage: 14.4 V d.c., negative ground; 10.8 to 15.6 V allowable.

Maximum Current Consumption: 6.5 amperes.

Dimensions: 7 in. W x 2 in. H x 6 $\frac{1}{2}$ in. D (17.8 cm x 5 cm x 16.5 cm).

Weight: About 4.2 lbs. (1.9 kg).

Price: \$2,800.

1000dac D/A Converter

Type: Four 20-bit DACs with eight-times-oversampling digital filter.

Sampling Frequencies: 44.1 or 48 kHz, automatically selected.

Frequency Response: 5 Hz to 20 kHz, ± 0.5 dB.

S/N: Greater than 105 dB.

Dynamic Range: Greater than 100 dB.

THD: 0.0025% at 1 kHz and 0 dB.

THD + N: 0.003% at 1 kHz and 0 dB.

Channel Separation: Greater than 100 dB.

Output Characteristics: Level, 1.5 V at 0 dB; impedance, 600 ohms.

Maximum Current Consumption: 0.7 ampere.

Dimensions: 6 $\frac{3}{4}$ in. W x 2 $\frac{1}{2}$ in. H x 8 $\frac{7}{8}$ in. D (17 cm x 6.5 cm x 22.5 cm).

Weight: About 4 lbs. (1.8 kg).

Price: \$1,400.

1000mb MusicBank CD Changer

D/A Converter Type: 18-bit dual DACs with eight-times-oversampling digital filter.

Wow and Flutter: Below measurement limit.

Frequency Response: 10 Hz to 20 kHz, ± 0.5 dB.

S/N: Greater than 92 dB, IHF A-wtd.

Dynamic Range: Greater than 90 dB.

THD: Less than 0.008% at 1 kHz.

Channel Separation: Greater than 88 dB.

Analog Output Characteristics: Level, 1.5 V at 1 kHz and 0 dB; impedance, 600 ohms.

Digital Output: 75 ohms, coaxial.

Operating Voltage: 14.4 V d.c., negative ground; 10.8 to 15.6 V allowable.

Maximum Current Consumption: 1 ampere.

Dimensions: 8 $\frac{3}{4}$ in. W x 5 $\frac{5}{8}$ in. H x 11 $\frac{3}{4}$ in. D (22.1 cm x 14.3 cm x 29.9 cm).

Weight: About 14.3 lbs. (6.5 kg).

Price: \$2,200.

Company Address: 955 Francisco St., Torrance, Cal. 90502.

For literature, circle No. 90

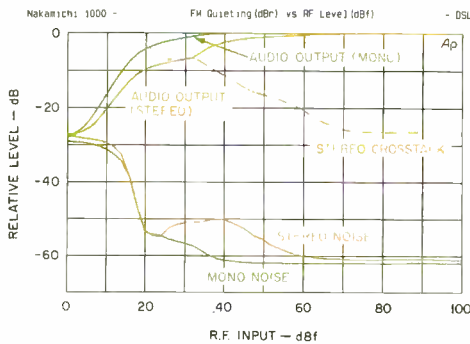


Fig. 1—FM quieting characteristics and stereo separation.

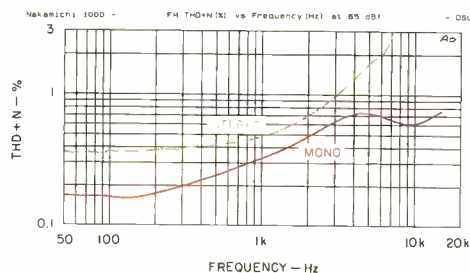


Fig. 2—THD + N vs. frequency, FM section.



Fig. 3—FM frequency response (A) and tone-control range (B).

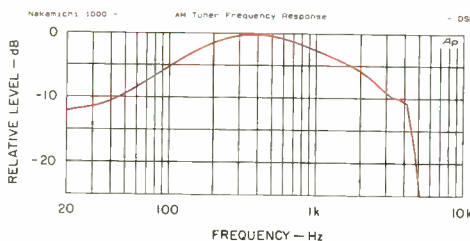


Fig. 4—AM frequency response.

When you switch to CD by pressing the center of the 1000td's azimuth control, a motorized flap covers the cassette slot and the eject, play, and pause buttons. The flap brings forth a new play/pause pad and a secondary display designed specifically to operate the 1000mb MusicBank changer (or Nakamichi's other changers). This CD display also takes over when you select the auxiliary input.

Used with the 1000mb MusicBank, the azimuth control's outer ring switches discs, while what formerly were the tape deck's fast-forward and rewind controls now switch tracks. (Thankfully, the arrows on the skip buttons now point in the logical directions.) Pressing either skip button multiple times jumps ahead or back in the normal manner. However, Nakamichi provides no means to fast scan through tracks (you can only access the beginning of each), nor will you find such commonplace features as randomized playback, intro scan, or customized memory in the Nakamichi 1000.

The 1000mb is a seven-disc CD changer based on Nakamichi's MusicBank mechanism, which "stocks" CDs on an internal elevator rather than in removable magazines. The 1000mb can be suspended from overhead or mounted on the floor (brackets for both are provided) but must be oriented horizontally. To isolate the drive from airborne vibrations, the unit is sealed with an "air shield" held by two screws. Once the screws are released, the air shield folds down; discs can then be loaded or ejected by pressing the button corresponding to the slot whose contents you wish to change. A disc tray emerges to deliver the current disc or receive a new one. The 1000mb is able to handle 3-inch discs, but only if placed in Nakamichi adaptors (seven are supplied with the changer).

Since the 1000mb has an internal D/A converter (actually, 18-bit dual DACs with eight-times-oversampled

digital filters), it can feed the 1000td's CD input directly. In a simple installation, the 1000mb's analog outputs connect to the 1000td's CD inputs; the DIN cable supplied with the 1000mb couples between its panel-mounted control jack and the control cable emerging from the 1000td. The 1000mb receives power through the control cable; there's no need for a battery hookup.

For improved performance, Nakamichi also offers a separate D/A converter, the 1000dac. This connects to the 1000mb's digital output via a coaxial cable supplied with the 1000dac, and the 1000dac in turn feeds analog audio to the 1000td. The 1000dac requires its own power and turn-on connections, since the control cable from the 1000td still goes to the 1000mb. The 1000dac uses four "Enhanced Linearity" (EL) 20-bit DACs with eight-times-oversampled digital filtering, and it automatically switches between 44.1- and 48-kHz sampling rates (for CD and DAT).

Measurements

This isn't an inexpensive system, so I set my standards accordingly. On that basis, I give good grades to the 1000td tuner/cassette deck and an A++ to the 1000dac—I much preferred the test performance of the 1000dac external DAC.

As shown in Fig. 1, the FM tuner is reasonably sensitive but has a relatively high noise floor, even with strong signals. It's not clear how audible that noise would be in a moving car; I'll leave that to *Audio's* Technical Editor, Ivan Berger. The shape of the noise curves is unusual, in that the noise floor with a stereo signal begins to rise before the tuner actually produces any semblance of stereo. Nonetheless, the 1000td opens out to stereo at a relatively low r.f. level and reaches 50-dB stereo quieting sensitivity of 42.9 dBf—quite good. At that point it produces a separation of almost 12 dB. Mono 50-dB quieting is reached at 20.6 dBf, and IHF usable sensitivity (not shown) measured 19.7 dBf. Signal-to-noise ratio for 65-dBf signal is 62.1 dB with mono broadcasts, 60.6 dB with stereo.

Usually, good capture ratio implies rather poor selectivity, since the two trade off against one another. The 1000td, however, was quite impressive in both respects. Capture ratio (1.6 dB) was somewhat better than I've seen from recent car head units,

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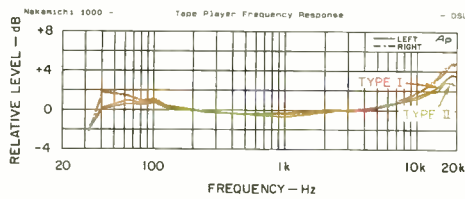


Fig. 5—Cassette frequency response.

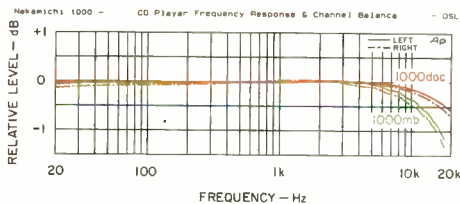


Fig. 6—CD frequency response.

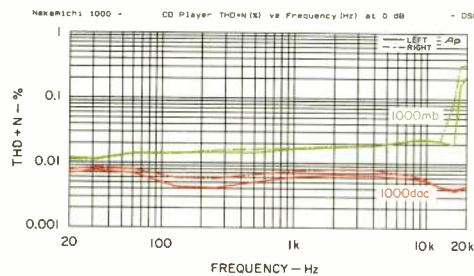


Fig. 7—CD THD + N vs. frequency, at 0 dB.

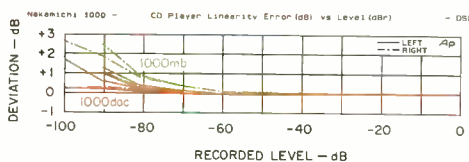


Fig. 8—CD linearity error.



Instead of conventional magazines, the 1000mb CD changer uses Nakamichi's MusicBank loading system.

yet adjacent- and alternate-channel selectivity (at 25.5 dB and approximately 84 dB, respectively) were admirably high.

The 1000td's FM distortion (Fig. 2) is reasonably low. At the three standard benchmark frequencies (100 Hz, 1 kHz, and 6 kHz), THD + N measures 0.17%, 0.32%, and 0.70% in mono and 0.36%, 0.49%, and 1.9% in stereo. Image rejection clocked in at 54 dB, and AM rejection was approximately 72 dB. FM separation for a 65-dBf input was better than 28.5 dB at 1 kHz, above 25 dB from 20 Hz to 3 kHz, and better than 20 dB to 7 kHz.

Figure 3A shows tuner response in expanded form. It is within +0.4, -0.8 dB from 20 Hz to 15 kHz. The curves for maximum and minimum settings of the bass, midrange, and treble controls are shown (at normal vertical scale) in Fig. 3B. Most bass-control circuits reach maximum effect quickly and shelf below 50 or 100 Hz. In Nakamichi's design, maximum boost and cut from 100 to 200 Hz is modest (+6.0, -5.3 dB at 100 Hz), and the range continues to expand as the frequency drops (+8.0, -7.5 dB at 50 Hz and about ± 10 dB at 20 Hz). Nak's "midrange" is centered around 190 Hz, where it provides a range of +8.4, -7.7 dB. (Most midrange controls reach maximum effect two octaves higher.) And Nakamichi has designed its treble control with a relatively narrow range: +5.3, -6.6 dB at 10 kHz, and just a tad more boost at 15 kHz. I find most tone controls overly aggressive and therefore welcome the relatively tame action and more useful turnover points characteristic of the 1000td.

Compared with FM performance, that of the AM tuner is best forgotten. Response (Fig. 4) is "telephone quality" at best. It peaks at 400 Hz, is down 3 dB at 140 Hz and 1.15 kHz, and reaches -6 dB at 85 Hz and 2.1 kHz. The AM sensitivity, measured to the old IEEE Standard, was a solid 2.8 μ V.

Other than running surprisingly fast (+2.9% with a 14.4-V supply, +2.8% at 10.8 V), the tape section of the 1000td is vintage Nakamichi. Wow and flutter was an exceedingly low 0.035% on a weighted-rms basis and only $\pm 0.06\%$ on a DIN-weighted peak basis. Most home decks can't hold a candle to this in-dash unit! The A-weighted noise on virgin tape was also admirably low: -57.7 dB (re: DIN 0, 250 nWb/m) on Type I tape without noise reduction, -67.0 dB with Dolby B NR, and -73.8 dB with Dolby C NR. With Type II tape, the results were -61.7, -70.1, and -77.2 dB, respectively.

Figure 5 shows the deck's frequency response using Type I and Type II test tapes after adjusting azimuth for best high-frequency resolution with each. The smooth midrange, well-controlled bass "head bumps," and rising high end are typical Nakamichi. The company has traditionally compensated for playback head-gap loss by

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changing the playback equalization, while many others compensate in the recording EQ. Although Nakamichi is theoretically correct and on the side of motherhood and apple pie, its decks often show a rising high end (albeit not quite so much as this one) when tested with standard tapes. Be that as it may, over the test tapes' full range (31.5 Hz to 20 kHz), the 1000td is within +2.9, -2.0 dB on the left channel (+4.8, -2.1 dB on the right) using Type I test tape and within +3.7, -1.6 dB (left) and +4.9, -2.1 dB (right) with the Type II tape.

I tested the performance of the 1000mb CD changer, using both its own internal DAC and the 1000dac external converter. With one exception, crosstalk, the external DAC's performance was significantly better than that of the 1000mb's converters. Channel separation between 2 and 16 kHz was essentially independent of the converter, ranging from 56 to 68 dB, which suggests that separation in this region is limited by the 1000td. Channel separation improved



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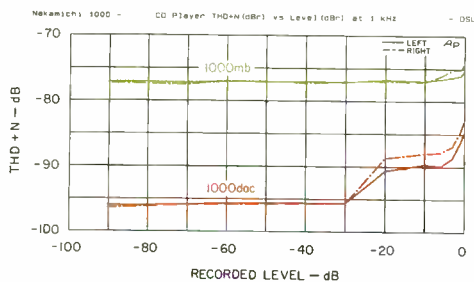


Fig. 9—CD THD + N vs. level, at 1 kHz.

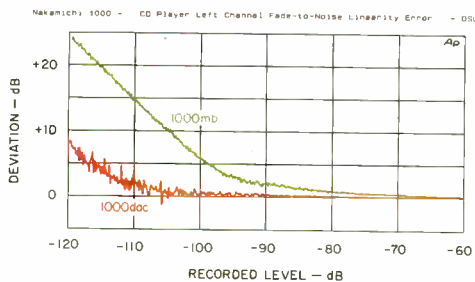


Fig. 10—CD fade-to-noise linearity error.

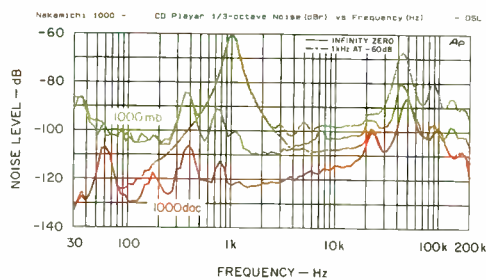


Fig. 11—CD third-octave noise vs. frequency.

to about 74 or 80 dB at 1 kHz, with the internal converter having the better number at this point. At lower frequencies, separation with the built-in DAC continued to improve (to 96 to 106 dB at 125 Hz); through the 1000dac, the figure dropped off (to about 56 dB at 125 Hz).

Figure 6 shows the frequency response of the two converters. Here the 1000dac performs notably better than the 1000mb. On the 1000dac, response from 20 Hz to 20 kHz is +0.02, -0.58 dB in the left channel and +0.04, -0.71 dB in the right. With the 1000mb DACs, the results from 20 Hz to 17.6 kHz are +0.03, -1.17 dB on the left channel and +0.01, -1.33 dB on the right.

THD + N as a function of frequency at 0 dB (Fig. 7) also demonstrates notably better performance from the 1000dac. With the

1000mb's built-in converter, THD + N is below 0.022% to 12.5 kHz, rising to 0.21% (left channel) and 0.32% (right channel) at 20 kHz. While this isn't bad out to 12.5 kHz, the 1000dac is far superior: THD + N is no more than 0.0075% (left channel) and 0.0084% (right channel) through the entire frequency range. That's excellent indeed!

Although the 1000mb's DAC is almost as linear as that in the 1000dac, it seems to have a much higher noise floor. You can see what I mean in Figs. 8 through 11. Figure 8 shows converter linearity error with dithered and undithered signals. The 1000mb's DAC is off by 0.13 dB in the left channel (0.36 dB in the right) at -70 dB without dither, and results with dither are not much different. Take just the worse-case (right) channel. The error is 0.88 dB at -80 dB without dither and about 0.1 dB better with dither; at -90 dB, error is 2.47 dB without dither and 1.85 dB with it. On the test disc's -100 dB track, recorded only with dither, error is 2.62 dB. These are basically very good numbers, but the 1000dac is better across the board. Again, if you look at the results for the worse (right) channel, there is essentially no error at -70 dB. The error is 0.29 dB at -80 without dither (0.21 dB, with); at -90 dB, the error is 1.06 dB without dither and an amazing 0.33 dB with it. Even at -100 dB, the linearity error is a minuscule 0.27 and 0.25 dB for the two channels, arguably the best I've ever measured.

Although there is relatively little difference in linearity error between the two converters, there is a huge difference in the plots of THD + N versus level, shown in Fig. 9. With THD + N bottoming out at about -77 dB at -10 dB and below, the 1000mb's internal converter is substantially worse than average. (I had to expand my scale by 10 dB to include the curves!) On the other hand, the 1000dac's converter is superb. Judging from the shape of the curves, I believe Nakamichi is using a level-shifting system, with one pair of DACs handling the top four bits (levels from 0 to -24 dB) and the other pair handling the rest. On

the top four bits, THD + N in the slightly worse (right) channel drops from -83.16 dB at 0 dB, to -88.08 dB at -10 dB, and to -88.78 dB at -20 dB. Between -20 and -30 dB, when the converters shift down past the first four bits, THD + N virtually vanishes, to -95.67 dB (left) and -95.74 dB (right)!

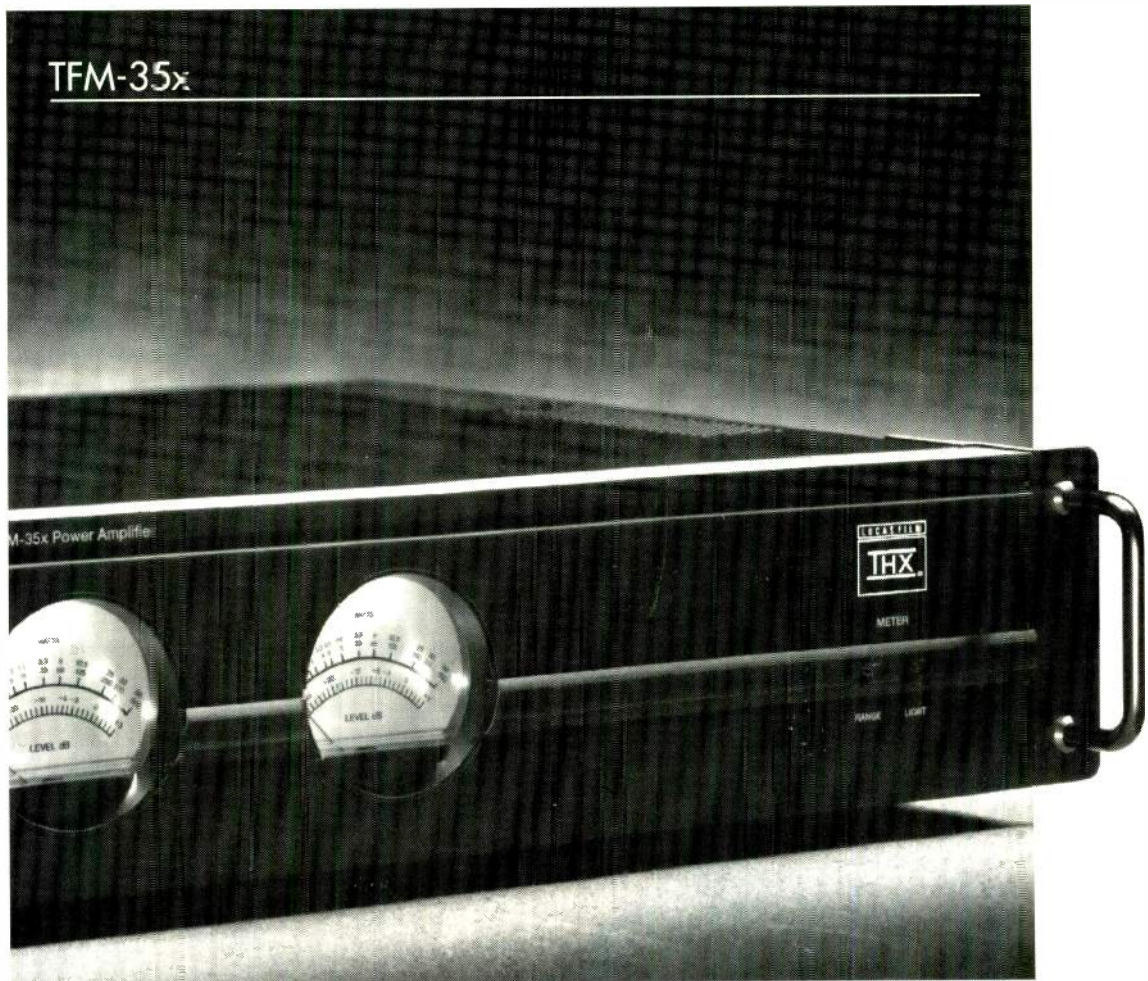
A similar difference appears in Fig. 10, which plots the left channel's deviation in the fade-to-noise test. (The right channel was essentially the same.) Again, I've changed my usual scales to accommodate the performance of the 1000mb, which exhibited a whopping 25-dB error at -120 dB. In contrast, the 1000dac converters are vastly superior: Almost no error down to -100 dB, only a couple of dB at -110 dB, and about 8 dB at -120 dB.

The final curves (Fig. 11) show the likely reason for the difference in performance. These are third-octave noise spectra taken on the left channel, using a -60 dB, 1-kHz recording and an "infinity zero" (totally silent) track. The 1000mb's converters produce considerable amounts of sampling-frequency energy in the output, especially on the -60 dB track. You'll also see third- and fifth-order harmonic distortion at 3 and 5 kHz and extraneous components around 35, 360, and 720 Hz. Although there are a few "extras" in the 1000dac converter's outputs, they're far lower in level.

The difference in noise level also affected A-weighted S/N, dynamic range, and quantization noise. With the infinity zero track, the 1000mb's converter produced an A-weighted S/N of 86.5 dB, while the 1000dac registered an amazingly good 104.5 dB—almost a full 20 dB better! Dynamic range was 87.2 dB, A-weighted, and 79.5 dB, unweighted, on the 1000mb converter. On the 1000dac, the results were 98.9 and 95.5 dB, respectively. Quantization noise (re: 0 dB) was -83.5 dB on the 1000mb and almost 10 dB better (-91.9 dB) on the 1000dac. Relatively little intertrack difference showed up; I've reported the data for the poorer of the two channels.

Measured at the outputs of the 1000td, the 1000 system delivered plenty of drive for the power amplifiers: 1.45 V from a fully modulated FM carrier, 0.37 V from a 30% modulated AM carrier, 1.21 V from a DIN-0 (250-nWb/m) tape recording, 2.64 V from a zero-level CD with the 1000mb's converter, and 3.07 V from the same track

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CIRCLE NO. 13 ON READER SERVICE CARD



with the 1000dac. Output impedance was a low 990 ohms.

On the basis of the lab tests, I recommend that the 1000dac be used in the system. Hey, when you've shelled out this much, what's a few more bucks? *E.J.F.*

Behind the Wheel

By any standard, this Nakamichi system is impeccably High End: It's expensive, a bit impractical—and sings with the tongues of angels.

The impracticality is that the 1000td, perhaps the most expensive head unit on the market, has no real theft protection. All secret-code "protection" can ensure is that anyone who buys a 1000td from a thief will find he has wasted his money—but not until after the thief has collected and the original owner has suffered his loss. (With a pop-off panel, the 1000td could have enhanced security.)

The lack of a pop-off panel or pull-out chassis is just one sign of how relentlessly untrendy the 1000 system is. In a market where the swing is toward CD, the head unit plays cassettes and doesn't even feature



**EVEN AT -100 dB,
LINEARITY ERROR
IN THE 1000dac WAS
A MINUSCULE 0.27 dB,
THE BEST I'VE SEEN.**

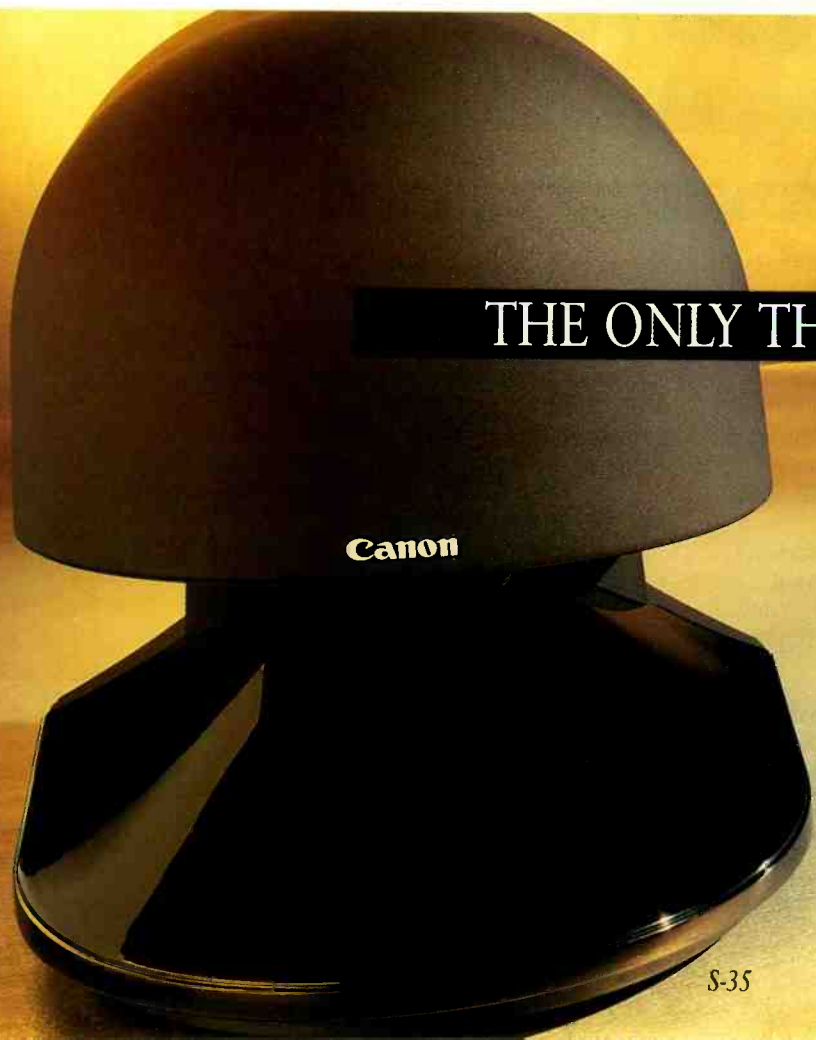
auto reverse. In a world full of cartridge-loading changers, the 1000mb loads CDs one at a time (but so handily it might start its own trend).

What the 1000 system has to recommend it is performance—which is spine-chillingly good. Tune in your favorite FM station, and you'll almost think you've been hearing it on AM until now. Play a CD, and you'll sometimes think your former car player was handling cassettes all these years. Play a

cassette, and you'll almost wonder if you're hearing a CD. In short, this is High End, even by Tony Cordesman's exalted definition. Sound quality is paramount—and achieved.

As I wrote this, I was listening to an old, familiar tape, Huxtable, Christensen & Hood's *Wallflowers* (Philo PH 1053). On my home system, it sounded a bit veiled, yet harsh, unless I switched to the wrong EQ and rolled the top off—which just veiled it further. On the 1000td, the harshness was relaxed a bit; while the high end was still overemphasized, it was also clarified. So turning up the midrange control just a little restored just enough warmth to make it clean and natural, with more extended, rather than more plentiful, highs than I'd heard before. I suspect the low wow and flutter helped achieve this clarity. And while the azimuth control would be even more useful in an auto-reverse deck, it still helped get the best out of any tape on this one-way mechanism.

When I first picked up the car after Stratford Mobile Sound installed the system, I tuned it to FM for the drive over to my



THE ONLY THING THAT WILL SOUND

wife's office. She heard the difference in clarity and sonic balance as soon as she stepped into the car—no need for careful, hesitant A/B comparisons here. (The higher noise floor Ed Foster measured in his lab was, indeed, inaudible while on the road.)

The Nakamichi also received more stations clearly than my reference Alpine. Of 28 FM stations, the 1000td picked up five stations much better than the reference, 10 stations a bit better, four stations a bit worse, and nine equally well. The Nakamichi also received poor but discernible signals from six stations the Alpine couldn't pick up at all. On AM, the Nakamichi was much better on six stations, slightly better on nine, and equal on three—and picked up nine poor signals the reference could not get. However, the Alpine's AM frequency response seemed flatter and a bit more extended.

For CD, I listened through the 1000dac, not the D/A converter in the 1000mb. The difference between the 1000 system and the Alpine was sometimes almost as clear-cut as it was on FM. (Yet the Alpine sounded a bit better than its competition when I first

installed it, and just about identical to most of the head units I've put up against it since.)

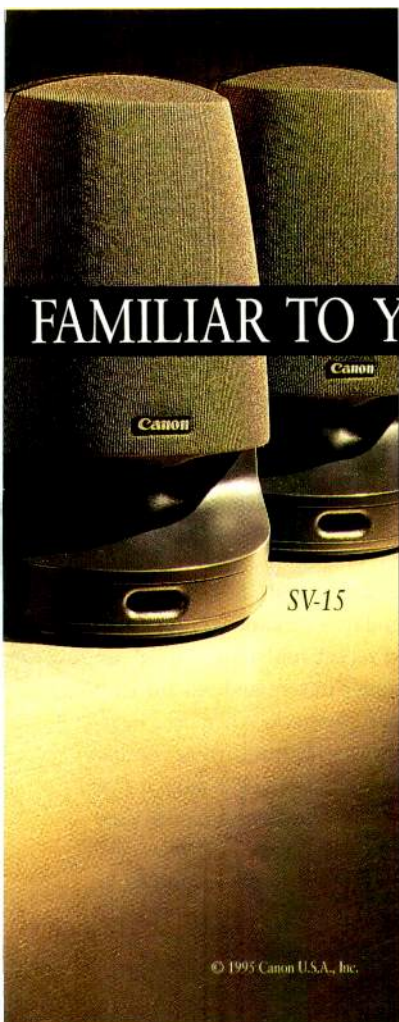
I found myself now hearing tiny differences in sonic balance between one tape or CD and another. The 1000td's tone controls are perfectly designed to take care of this. A set of bass, mid, and treble controls is *far* more flexible than bass and treble alone. The fact that the 1000td's controls are variable in fine increments (no gross digital jumps) and have limited range made it easy to fine-tune the sound exactly as I wanted it. On cassette, the combination of manual EQ selection and adjustable azimuth let me really get the best possible sound from every tape I tried. The only problem was that if the road was any bumpier than a billiard table, it was almost impossible to turn the azimuth control without pushing it—which instantly switched the 1000td from tape to CD mode. Annoying.

I liked the smooth-turning volume knob, the way the tone controls popped in when not in use, and the mostly logical control groupings. I really liked having separate buttons for manual and seek tuning, and

did not miss tuner scan controls or CD programming options (though I *did* miss having audible scan on CD). Both the tuner and CD displays were easy to read, day or night. Night illumination was a bit sparse, more intended to give a few landmarks than to point out every control.

The 1000mb's ergonomics were also interesting. With the MusicBank system, it's easier to load and unload individual discs, though harder to load groups of CDs, than with cartridge changers. The MusicBank also changes discs more rapidly (a mere 7 seconds from disc to disc). Lights in the 1000mb help you see when you're loading and unloading discs at night. If the vault-like "air shield" door is left open, play is interrupted by almost every bump in the road. With it closed, severe bumps can still interrupt play occasionally.

It's doubtless no coincidence that the best factory-installed sound system I've heard (the upgrade system on the Lexus) was also by Nakamichi. As to the 1000 system, I wish it were more theftproof. I wish the head unit played CDs. Most especially, I wish I could afford it. *I.B.*



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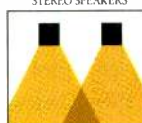
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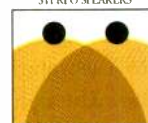
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EDWARD J. FOSTER

YAMAHA KX-580 CASSETTE DECK



Gurus who gaze into crystal balls are prone to myopia. According to these wizards, cassettes died long ago and were replaced by MDs or DCCs, depending on which camp holds sway over your favorite guru. Well, it ain't happened yet. Blank cassettes are selling as well as they did five years ago, and Dolby S noise reduction, rather than withering on the vine, is experiencing a resurgence. Why, Dolby Laboratories even promoted S-type noise reduction at this year's Winter Consumer Electronics Show—which is a lot more unusual than it sounds!

Dolby S NR claims to provide (more or less) the dynamic range of a CD on cassette and to be backward compatible (more or less) with previous Dolby NR systems. Until recently, it's been a bloody expensive technology confined to upscale recorders that didn't sell, since everyone knew that the cassette format had died or, at the very least, was in its final throes. With Dolby S

recorders now available at reasonable prices—the Yamaha KX-580 lists at \$399—reports of the cassette's demise may have been premature.

The KX-580 is a two-head, two-motor, single-capstan, belt-driven recorder that, on the surface, seems pretty conventional. The deck senses the generic type of cassette that's loaded and sets bias and equalization accordingly—quite conventional. What's not conventional in two-head decks at this price level is an automatic calibration system that trims bias and record-amplifier gain to match the requirements of the specific cassette being used. (Dolby Labs mandates a tape-matching system on Dolby S equipment, which is one reason prices have been high.) The calibration procedure takes about 20 seconds, during which a series of tones are recorded, and the tape is rewound and played to find the best settings. These optimal settings are then maintained until another type of tape is loaded or the deck is turned off.

The “Auto Tape Tuning” button is behind a tilt-down door, as are most of the other electronic controls. To its right are two “Dolby NR” pads. One cycles the B/C processor from “Off,” through Dolby B (without MPX filter), Dolby C (without MPX filter), Dolby B (with MPX filter), Dolby C (with MPX filter), and to “Off” again. The other pad cycles the Dolby S circuitry from “Off,” through settings with and without MPX filter, and back to “Off.” It's a rather unusual arrangement that I presume was chosen to permit the main p.c. board also to be used in the KX-480, a similar deck but without Dolby S NR. Note, too, that the KX-580's Dolby S circuit resides on a separate board that plugs into the motherboard. In any event, the NR setting is shown in the display, as is the tape type and an indication that auto tuning has been performed on the current tape.

Another oddity is the presence of a manual “Bias Adjust” control below and to the left of the “Auto Tape Tuning” button. Why you'd want manual bias adjustment in a deck that sets bias automatically (and better than you could do by ear in a two-head, non-monitoring, recorder) mystifies me. Yamaha suggests you set the “Bias Adjust” to the detent, run “Auto Tape Tuning,” and then play with the bias adjustment to your heart's content. (Of course, you won't know what you've done until you back up the tape and give a listen!)

To the left of “Bias Adjust” is a headphone level control and a headphone jack; to the right is a “Play Trim” control that modifies treble response of the playback amplifier prior to Dolby decoding. It can be helpful to compensate for overly bright (or dull) commercially recorded tapes or those recorded on a different deck. To the right of “Play Trim” are recording “Balance” and “Level” controls. “Balance,” “Play Trim,” and “Bias Adjust” have center detents; the others are free-ranging.

Three buttons placed above the headphone jack and its level knob control memory-stop and repeat functions. “Reset” returns the counter to zero and sets the start point for repeat playback. When used by itself, “Memory” stores the current counter reading and causes the deck to stop at that reading from either fast-wind mode. Used in conjunction with “Repeat,” “Memory” will set the end point of the section to be

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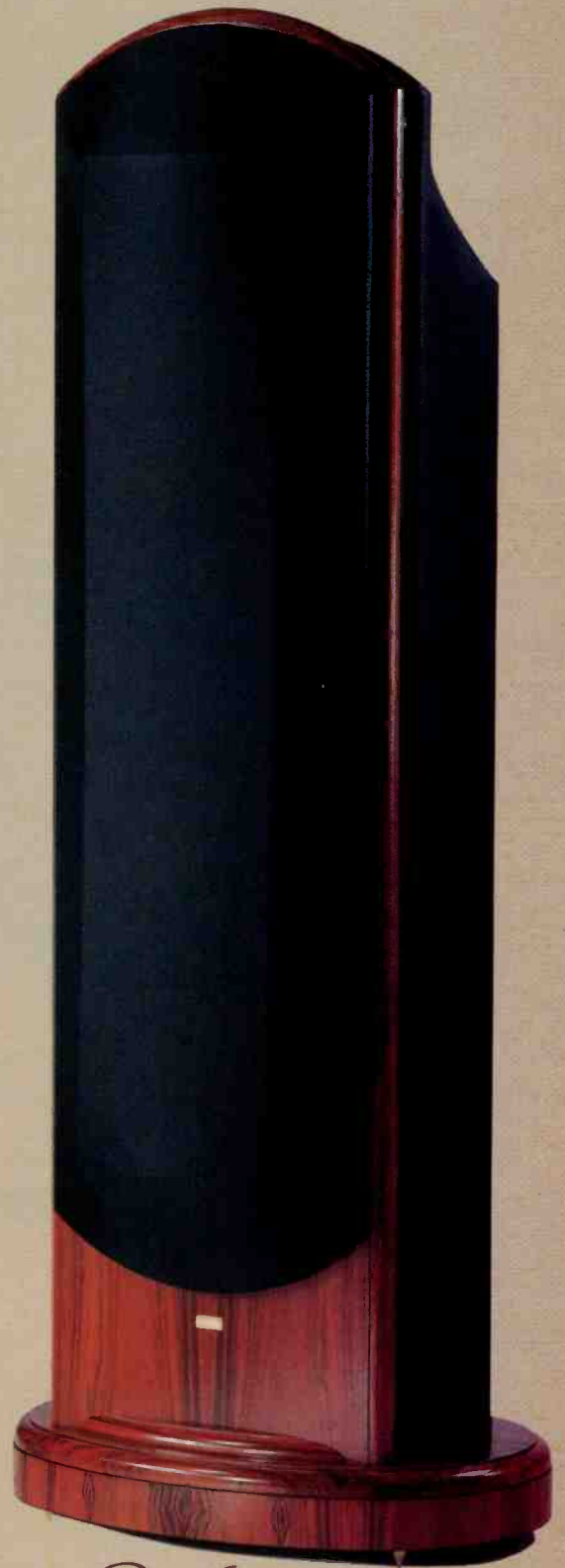
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repeated and cause the tape to rewind to counter zero. You use the "Repeat" button (marked "Off/0—M/Full") to choose whether to repeat the marked section or the "full" tape. Legends for "Memory," "Repeat 0—M," and "Repeat Full" appear in the display, as appropriate.

Transport controls are on the main panel, to the right of the display. These include the usual "Stop," "Play," and fast-wind keys, two combination buttons ("REC/Pause" and "Mute/Search"), and two "Intro Scan" buttons that call up the beginning of each program while scanning the tape in either direction. When pressed after entering a fast-wind command, "Mute/Search" will find the beginning of the next (or current)

SPECS

Frequency Response, ±3 dB, at -20 dB Recording Level: Normal (Type I) tape, 20 Hz to 17 kHz; CrO₂ (Type II) tape, 20 Hz to 18 kHz; metal (Type IV) tape, 20 Hz to 20 kHz.

S/N: Without NR, 60 dB; with Dolby B NR, 68 dB; with Dolby C NR, 76 dB; with Dolby S NR, 80 dB.

Harmonic Distortion: 0.8%.

Wow and Flutter: 0.05% wtd. rms, ±0.08% wtd. peak.

Input Sensitivity: 100 mV.

Rapid Transport: 90 seconds for C-60 tape.

Input Impedance: 50 kilohms.

Output Level: Line, 570 mV; headphones, 1.5 mW.

Output Impedance: Line, 1.0 kilohm; headphones, 8 ohms.

Channel Separation at 1 kHz: 40 dB.

Crosstalk at 125 Hz: -55 dB.

Motors: Capstan, d.c. servo; reel, flat-torque d.c.

Heads: Record/play, hard permalloy; erase, double-gap ferrite.

Power Supply: 120 V, 60 Hz.

Power Consumption: 16 watts.

Dimensions: 17½ in. W x 5 in. H x 10½ in. D (43.5 cm x 12.6 cm x 27.7 cm).

Weight: 10 lbs., 2 oz. (4.6 kg).

Price: \$399.

Company Address: 6660 Orange-thorpe Ave., Buena Park, Cal. 90620.

For literature, circle No. 91

program; if it's pressed during record mode, 4 seconds of silence will be recorded and the deck will go into record/pause mode. During recording, the rewind key returns the tape to the point at which the current recording commenced.

To the left of the KX-580's cassette door are the "Power" switch, a three-position "Timer" switch ("REC/Off/Play"), and the "Eject" button. The back panel carries line inputs and outputs (ordinary RCA jacks) and the power cord.

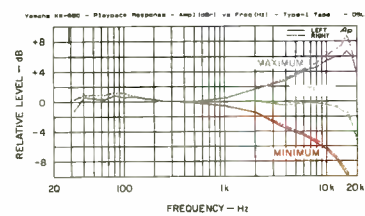
Although the outer cassette door is removable, access to the heads and capstan is not much better with it off than on; the KX-580 has an inner door with an opening just as small as that in the outer one. I presume that the inner door and leaf springs in the cassette slot are what Yamaha calls a "Secure Holding Damper Cassette Stabilizer," which is said to "reduce unwanted vibration and modulation noise." The well isn't lit, and judging tape position visually is problematic. Other goodies claimed for the KX-580 are Dolby HX Pro Dynamic Bias Servo and a higher-than-typical bias frequency (160 kHz) to reduce cross-modulation of the bias with the treble program content.

Although the KX-580 doesn't come with a remote control, an infrared sensor is on the deck; a remote (RS-KX1) is available as an option, and the deck will work with Yamaha's receiver remotes. If you operate the KX-580 with a Yamaha CD player that has a "Synchro" button on its remote, synchro recording can be initiated from the CD player.

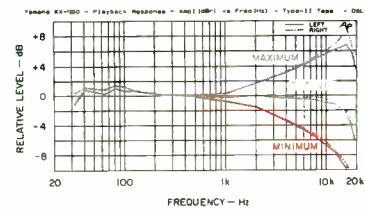
Measurements

The KX-580 spent many hours on my bench. Although it seems to be a rudimentary deck, it packs in a lot of technology for the price and thus required quite some time to explore fully.

I made my measurements with the level control set so that a 500-mV input produced a 250-nWb/m recording. Most measurements were made using TDK SA (Type II), TDK MA (Type IV), and TDK DS-X (Type I) tapes of C-90 length. With "Bias Adjust" at the detent, I let the deck auto-tune each tape before testing. I also ran a second set of response curves at -20 dB (without noise reduction), with "Bias Adjust" at each extreme to check its effect.

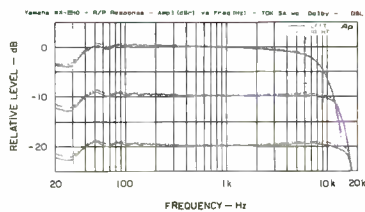


A

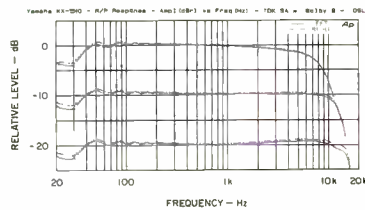


B

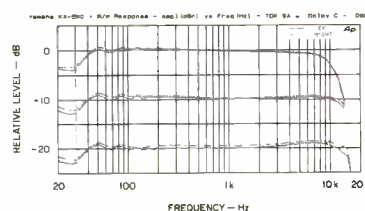
Fig. 1—Effect of "Play Trim" control on playback response, using Type I tape (A) and Type II tape (B).



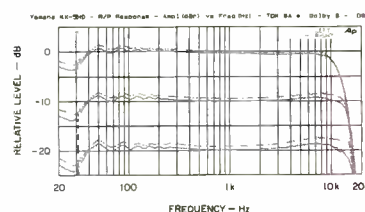
A



B



C



D

Fig. 2—Record/play frequency response for Type I: tape without noise reduction (A), with Dolby B NR (B), with Dolby C NR (C), and with Dolby S NR (D).

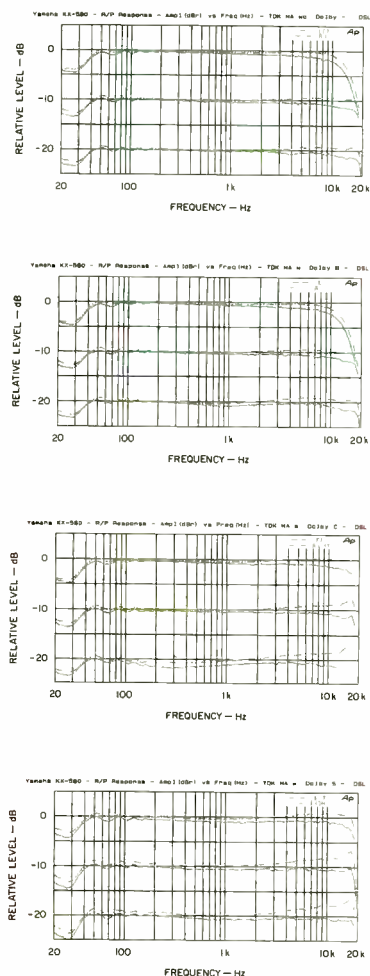


Fig. 3—Record/play frequency response for Type IV tape without noise reduction (A), with Dolby B NR (B), with Dolby C NR (C), and with Dolby S NR (D).

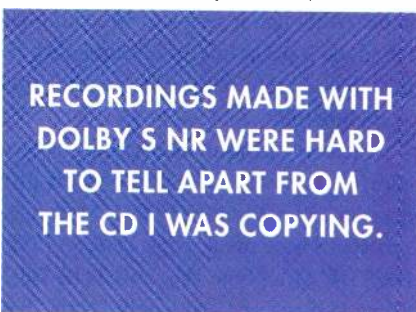
Figure 1 shows playback response using Type I and II test tapes with “Play Trim” at its detent and at maximum and minimum rotation. With Type I (120- μ S) tape (Fig. 1A), response on the left channel is within +0.5, -3 dB (re: 315 Hz) from below 31 Hz (the lowest tone on the tapes) to about 17 kHz; response at 20 kHz is down 5.3 dB. Right-channel response is within +1, -3 dB from below 31 Hz to 18 kHz, with 20 kHz down 5.9 dB. The positive excursions occur at 80 Hz and are likely due to the fringing effect caused by playing a full-width recording; they’re not likely to be there when playing a normal prerecorded tape. Response with the Type II (70- μ S) test tape (Fig. 1B) is almost the same: +0.6, -3 dB from below 31 Hz to about 16.5 kHz on the left chan-

nel, and to approximately 17.5 kHz on the right (within the same tolerance). Response at 20 kHz is -6.8 dB on the left and -6.4 dB on the right. As the curves suggest, head azimuth was quite well aligned. I confirmed this by measuring interchannel phase error, which averaged 8.5° at 10 kHz with a variation of $\pm 16.7^\circ$. The “Play Trim” has a range of approximately ± 8.4 dB at 16 kHz.

A recording made at DIN 0 level (250 nWb/m at 315 Hz) produced a 580-mV line output and, with the headphone level control fully advanced, 2.26 V at the headphone jack. Line output impedance was a relatively low 1,360 ohms; headphone output impedance was 150 ohms. At reference level, the deck delivered 5.5 mW into 600-ohm headphones and 6.3 mW into 50-ohm phones. With matched-impedance (150-ohm) headphones, the output would reach 8.5 mW. With the recording level control fully advanced, the KX-580 needed 115 mV to reach reference recording level. Input impedance was just over 40 kilohms, and the input was essentially overload proof.

Figure 2 shows record/play response curves using TDK SA tape at three recording levels: -20, -10, and 0 dB re: DIN 0. Figure 3 displays the same tests taken on TDK MA, while Fig. 4 reveals the equivalent measurements on TDK DS-X. In Figs. 2 through 4, results are shown for all noise-reduction settings.

Generally, response is quite good on all the tapes. Head bumps in the deep bass are negligible, and response without noise reduction on both channels remains well within +1, -3 dB (re: 315 Hz) from approximately 35 Hz to 17 kHz or higher on Type I and Type II tapes, and out to about 19 kHz on Type IV. Switching in Dolby B NR has



almost no effect on response with Type IV tape, and shaves only a kilohertz or so off the high end with Type I and Type II. The difference between Dolby B and C response is small on the Type II tape; the slight dif-

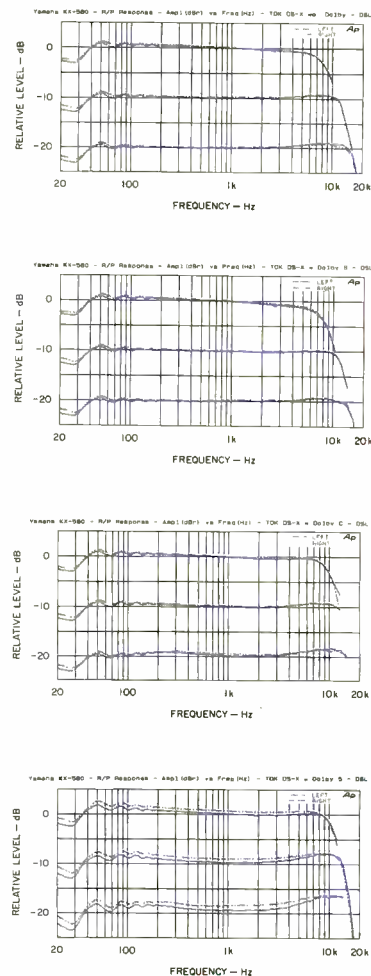


Fig. 4—Record/play frequency response for Type I tape without noise reduction (A), with Dolby B NR (B), with Dolby C NR (C), and with Dolby S NR (D).

ference at -20 dB is compensated for by the increased treble headroom that Dolby C provides at higher recording levels. With Type I tape, there is somewhat more tracking error but little difference in overall response. With TDK MA, the tracking error is more pronounced, but note the almost flat response (on the right channel) at the 0-dB recording level.

As can be expected, Dolby S NR expands the bass head bumps and increases whatever other response anomalies exist. For overall response smoothness at -20 dB, TDK SA fares best, yielding left-channel response within +0.8, -3 dB from 32 Hz to about 16 kHz and right-channel response within +1.2, -3 dB over that range. Left-channel response on Type IV tape is extremely

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GREENBERG: "The main reason the HTMs are so superior to any movie speakers I've heard is solely because these are music speakers first and foremost."

NOUSAINE: "This speaker is accurate. Dialogue and vocals are always intelligible and natural. Music sounds sweet and clean."

GREENBERG: "The sound of the B&W Matrix HTMs is so much better than any of the movie speakers I've heard, even systems costing many times the price of the HTMs, that it's a joke."

NOUSAINE: "The Matrix HTM is a tremendous performer. It makes a terrific center speaker and a pair of them would

even do a great job as mains in a music-only system. I'd be proud to own one."

GREENBERG: "This is the best sound I've ever had in my home theater, bar none. Whether I played movie LDs or music CDs, the sound of the B&W Matrix HTM was honest, accurate, and the very definition of the term 'high fidelity.' It's a speaker system you'll want to live with for a long, long time."

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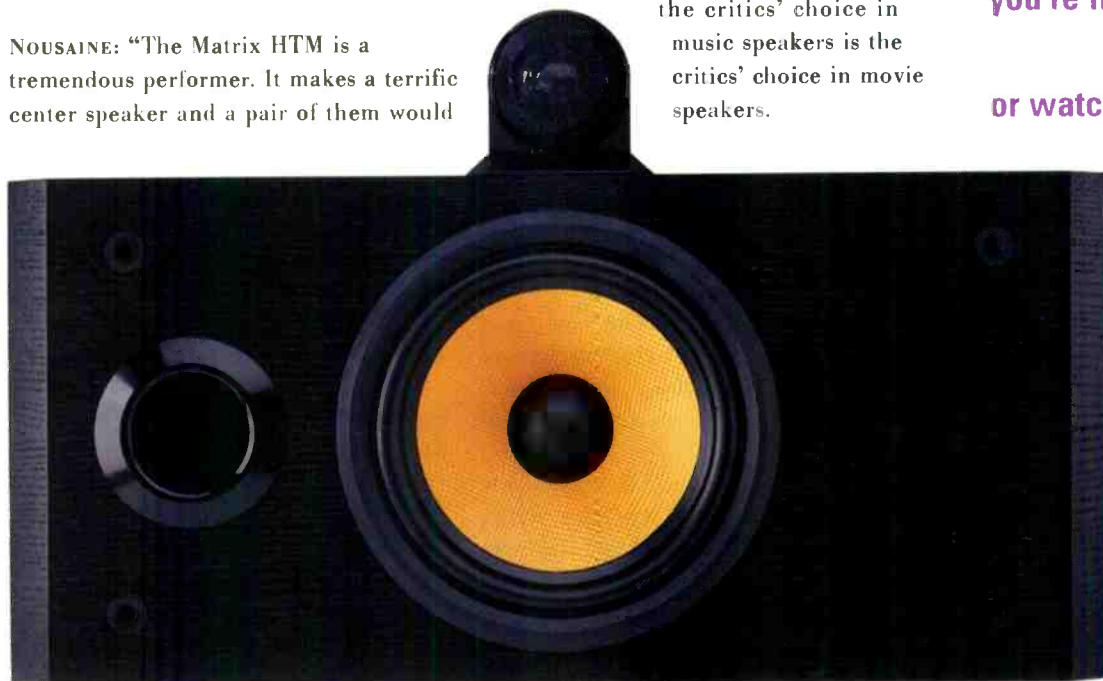
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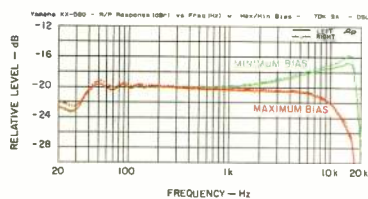
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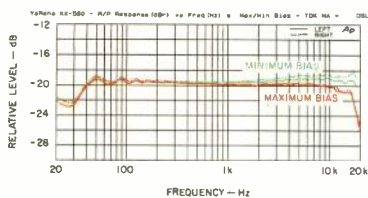
you're listening to music

or watching movies.

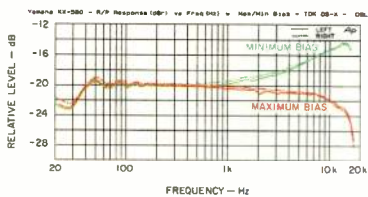




A



B



C

Fig. 5—Effect of bias adjustment on record/play response (without noise reduction) for Type II tape (A), Type IV tape (B), and Type I tape (C).

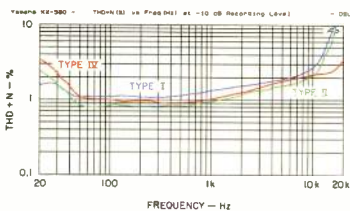


Fig. 6—THD + N vs. frequency.

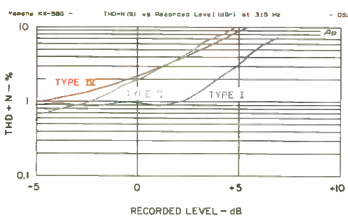


Fig. 7—THD + N vs. recorded level.



smooth (+1, -3 dB from 32 Hz to about 20 kHz), but the right channel exhibits a rising high end that peaks at +3.5 dB at 18 kHz. With DS-X, there is considerable level mismatch and, again, a rising, if less extended, high end. I rate response on it at +2.3, -3 dB from 32 Hz to about 15 kHz on the left channel and +1.7, -3 dB over the same range on the right.

Figure 5 shows the effect of the manual “Bias Adjust” control on the three tapes. Figure 5A was taken using TDK SA, Fig. 5B with TDK MA, and Fig. 5C with TDK DS-X—in each case at the -20 dB level without noise reduction. As expected, “Bias Adjust” has greatest effect on the Type I product and least effect on metal tape.

Figure 6 is a plot of THD + N, as a function of frequency, with a recording level of -10 dB at 315 Hz. These measurements were made without noise reduction and after “Auto Tape Tuning” for each formulation. Over my reference range (50 Hz to 5 kHz), THD + N is less than 1.6% on TDK SA, under 1.8% on TDK MA, and below 1.9% on TDK DS-X, although, as you can see, high-frequency distortion is lowest on metal tape.

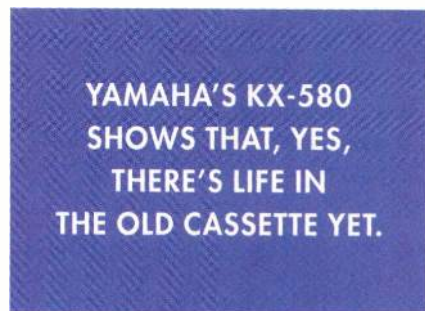
The KX-580’s 15-segment level indicator has readings that range from -30 to +8. The display responds quickly (in about 0.6 mS), is free of overshoot, and decays by 20 dB in about 600 mS. All in all, I’d say it’s far better than average. At the DIN-0 level, the first red segment (0 to +2) illuminated; THD + N was 1.7% on SA (Type II), 2.2% on MA (Type IV), and just under 1.0% on DS-X (Type I). The recorded level for 3% THD + N was +1.4 dB when I used SA tape and +1.1 dB with metal tape. The headroom (re: DIN 0) was so slight with Type II and Type IV tapes that the indicator reading didn’t change at all, so one probably shouldn’t push this deck past the “0” mark when using these tapes. The KX-580 had more low-frequency headroom (+4.7 dB) with Type I tape, and the indicator had advanced to the +4 to +6 segment. Figure 7 plots THD + N at 315 Hz as a function of recorded level for each formulation.

Certainly, I’d prefer greater headroom (especially with metal tape), but with a combination record/play head, this is the price paid for attaining usable response to 20 kHz. To resolve 20-kHz recordings requires a very narrow head gap; this pre-

cludes penetrating deep within a high-coercivity tape when recording. As a result, the full benefits of metal tape can’t be achieved.

On the other hand, two-head decks are theoretically free of record/play azimuth error, since the same head is used for both functions. Indeed, I measured an average interchannel phase error of only 0.4° at 10 kHz, with a spread of ±14.6° due to dynamic tape skewing. Record/play channel separation was good (51 dB at 315 Hz), and the erase head did an acceptable job wiping the tape. With metal tape (the most difficult to erase) and a 100-Hz recording, erasure was 59.1 dB. The MPX filter notched the 19-kHz pilot used in FM-stereo broadcasts by a decent 30.7 dB and was reasonably well aligned; maximum rejection (37.0 dB) occurred at 19,150 Hz.

Record/play S/N ratios re: DIN 0 are given in Table I. I measured S/N on both an A-weighted and CCIR/ARM basis (normalized to 2 kHz) on each tape, without noise



reduction and with each Dolby NR setting. Each of the third-octave noise spectra in Fig. 8 shows results for one tape type with the four NR settings.

The transport in my test sample ran a tad fast (0.9%), but its speed was invariant over a line-voltage range from 105 to 127 V. The DIN-weighted record/play wow and flutter measured ±0.12%; on a weighted EIAJ rms basis, wow and flutter was 0.08% weighted rms. It took about 130 to 135 seconds to fast-wind a C-90 cassette from end to end.

Use and Listening Tests

I was very favorably impressed with the KX-580’s sound, especially with Dolby S noise reduction. I played a few commercial Dolby S cassettes recorded on Type I tape; they sounded far superior to run-of-the-mill Dolby B fare—much quieter, with a better high end and generally cleaner.

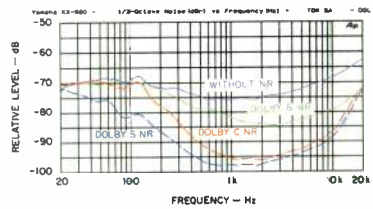
I tried “Play Trim” on these tapes and on cassettes I had recorded on other decks.

Since the KX-580's head azimuth is almost spot on, I usually preferred the sound with "Play Trim" at the detent. However, I did find a few cassettes (mostly of the commercial variety) where a little "Play Trim" boost did wonders for the top end.

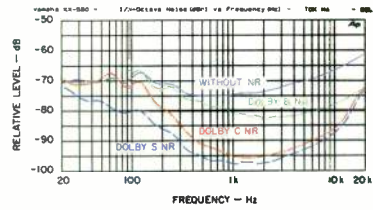
To give the KX-580 a more thorough workout, I dubbed several CDs onto a number of tapes of each generic type. I had the deck auto-tune for each tape before recording but left "Bias Adjust" at the detent. I recorded every tape using each Dolby NR setting, matched levels as best I could, and made a direct comparison with the CD. Invariably, Dolby S NR came out on top, and I usually preferred the sound with Dolby B NR to that with the C-type system. Although "C" was obviously quieter than "B," the dynamics seemed altered and the transparency impaired. I've often found this to be the case with Dolby C NR—and I'm not faulting the KX-580. Dolby S NR goes a long way toward overcoming the aggressive behavior of Dolby C and, if anything, is quieter.

The Dolby S recordings weren't indistinguishable from the CDs, but they came mighty close. Dubs of harpsichord recordings, for example, maintained the instrument's character far better than I've come to expect on cassette. The main differences seemed to be a somewhat heavier, thumpier bass and a slight thickening in overall sound, but without the CD for direct comparison, I think you'd have no cause for complaint.

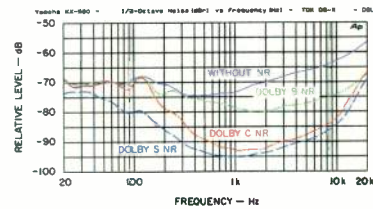
I got the best results with "standard" grade cassettes from the top manufacturers. "Premium" cassettes often sag in the upper midrange and peak in the high end when used with standard record equalization. This may make the "premium" tapes sound brighter on some decks, but with Dolby S NR and HX Pro, the KX-580 doesn't need or want them. In fact, some of the best dubs I made were on Type I tape, which, to my ears, has always been more "transparent"



A



B



C

Fig. 8—Third-octave noise spectra for Type II tape (A), Type IV tape (B), and Type I tape (C).

Table I—Record/play noise, in dB re: DIN 0 level.

	A-Weighted Noise, dB		
	TYPE I	TYPE II	TYPE IV
Without NR	-55.5	-60.0	-58.9
With Dolby B NR	-64.7	-68.4	-67.5
With Dolby C NR	-71.8	-75.0	-74.7
With Dolby S NR	-73.2	-77.6	-77.0

	CCIR/ARM-Weighted Noise, dB		
	TYPE I	TYPE II	TYPE IV
Without NR	-52.3	-57.5	-56.0
With Dolby B NR	-63.0	-67.9	-66.5
With Dolby C NR	-72.4	-76.8	-75.8
With Dolby S NR	-75.2	-79.3	-78.1

than Type II. With Dolby S NR to take care of noise and HX Pro to extend treble headroom, there's no reason not to use Type I formulations. I'd reserve metal tapes for material that has unusual amounts of high-frequency energy; Type I has better low-frequency characteristics on this two-head deck and would be my choice for the majority of recordings.

Yes, Virginia, there's still life in the old cassette yet!

some equations are simple.  KIMBER CABLE

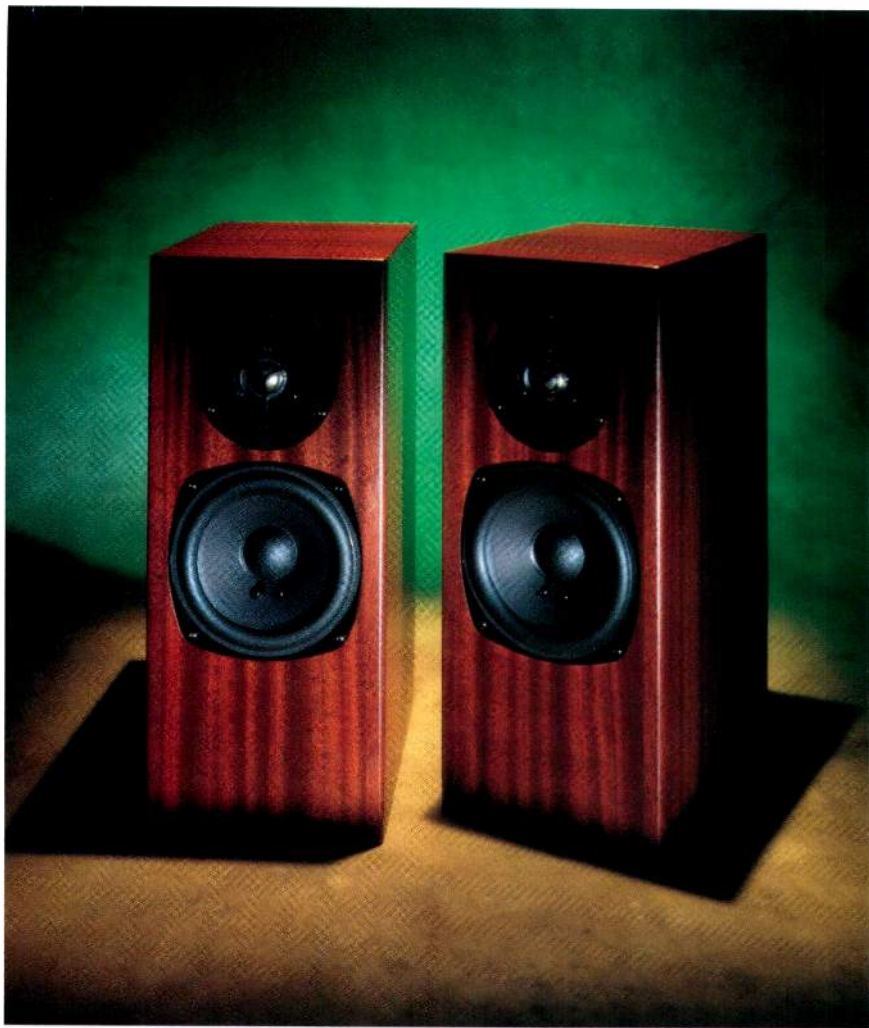
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D. B. KEELE, JR.

TOTEM ACOUSTIC ROKK SPEAKER



Totem Acoustic was founded in 1987 by Vincent Bruzzese in Montreal, Canada and is marketed in the United States by May Audio. According to Bruzzese, Totem's primary goal was to produce a quality line of speakers "capable of a truly musical and involving performance," speakers that "provide an affordable soul mover for the music lover." Even the name Totem was carefully chosen in an attempt to communicate the company's direction. Totem represents, in Bruzzese's words, "a guiding force, a trans-dimensional bridge to a higher musical

awareness, a step towards higher communication and truth."

Bruzzese emphasizes that his speakers are primarily designed using research techniques that bypass conventional measurement-oriented regimens and that heavily stress "exacting and complete listening tests in varied yet normal listening environments." He further states his position, saying "We put emphasis on a speaker able to transmit sound which would be correctly interpreted by our brain, but not necessarily properly interpreted by measuring instruments in anechoic chambers."

The Rokk is the next-to-least expensive of the six systems manufactured by Totem Acoustic. These range from the Mite, at \$595 per pair, up to the MANI-2, at \$3,995 per pair. All Totem speakers are two-way mini monitors built around small, direct-radiator, dynamic drivers. And all are clearly aimed at the high-end market; they feature exotic materials and sophisticated construction techniques, and stress uncommon design attributes. Starting with only a handful of U.S. dealers in 1990, Totem Acoustic now has, through the distribution efforts of May Audio, more than 70.

Superficially, the Rokk appears to be a small, understated, two-way vented design—like many others. Totem deliberately chose a classic, slim-line look that would have long-term appeal for almost everyone, instead of a more ephemeral avant-garde look.

Atypical, however, is what you don't see. Rather than the standard, vinyl-fold, wrap-up design, the box of the Rokk is a strong assembly, lock-mitered on all faces and joints. Its MDF panels are veneered on both sides, and the enclosure contains a sturdy cross brace. Bruzzese says that these construction techniques promote long-term rigidity and cabinet life. All inside surfaces are coated with a spray of borosilicate damping compound to reduce panel vibrations and internal acoustic reflections. The use of this compound makes other absorption material, such as fiberglass filler or wadding, superfluous. Indeed, when I first looked into the box after removing the woofer, I was surprised at the absence of any stuffing material.

The Rokk is designed to be used without a grille. (The American importer, May Audio, does offer an optional grille for situations where pets or small children may be a concern.) The exposed drivers look quite eye-catching and distinctive. All six sides of the cabinet are finished. The first systems I received were supplied in a very attractive dark mahogany. A second set, finished in black ash, was quite good-looking too.

On the rear of the cabinet, near the top and centered laterally, is a port tube, 3¾ inches deep and about 1⅜ inches in diameter. An input-connection cup is recessed at the bottom. Input connections consist of a pair of gold-plated, five-way binding posts on standard ¾-inch centers

Photos: Michael Groen

with bi-wire straps. Large cable, up to 0.2 inch in diameter (AWG No. 6), is handled by the posts.

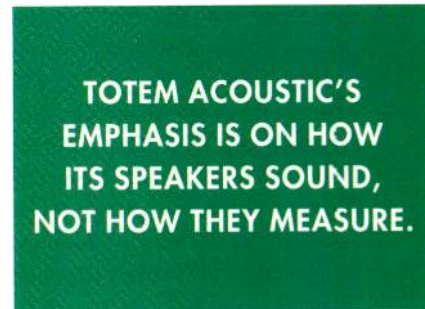
The Rokk's woofer is a 5-inch, high-excursion driver with a fiber cone and butyl rubber surround. The tweeter contains a 1-inch, Ferrofluid-cooled, titanium dome. (Actually, the dome's formed-metal surround measures 1 inch, while the dome itself is about ¾ inch in diameter.)

The Rokk's hand-wired crossover is attached to the rear of the input-connection cup. All internal wiring is done with small-gauge, solid, oxygen-free copper wire. All connections are made with solder of high silver content and are Teflon coated for maximum life and freedom from oxidation. Only top-quality parts are used in the crossover, which is a first-order, minimalist design consisting of a series resistor and capacitor driving the tweeter and an inductor in series with the woofer. The inductor is a special air-core unit made by Solen, using multistranded Litz wire. Metal-oxide resistors are used, along with a polypropylene capacitor bypassed with polystyrene units

of lower value. The three-element crossover is made up of six components (two resistors, one inductor, and three capacitors).

Measurements

I started this review in a bit of a dilemma. Normally I do a significant amount of the listening for my reviews before I do the measurements. For the Totem Acoustic Rokk, I violated this policy somewhat to take advantage of a break in the weather for the outdoor ground-plane measurements, which are required for accurate determination of low-frequency response. In the



process of measuring frequency response (which routinely includes a wideband curve, from 100 Hz to 20 kHz), I discovered what I thought was a problem with the Rokks supplied to me.

Measured at 2 meters on the tweeter axis, both systems exhibited a one-octave-wide, 12-dB suckout in the on-axis frequency response at 3.5 kHz and a 6-dB peak at 6.5 kHz—hardly flat response! As the suckout roughly matched the Rokk's 3.2-kHz crossover frequency, I suspected that the tweeter section of the crossover was inadvertently wired in reverse polarity. I checked this by measuring the speaker with the tweeter hookup reversed at the bi-wiring connections. This reversal resulted in a *significantly* flatter response through the crossover region but a moderate (third-octave-wide) dip centered at 7.2 kHz, approximately replacing the former peak.

Before I review a speaker, I attempt to make sure that it is operating as the manufacturer intends. In this case, I had my doubts. I therefore called Totem, and subsequently a second pair was sent to me. The new speakers measured essentially the same as the previous ones, complete with the octave-wide dip at crossover and the peak at a higher frequency.

What to do? Should I decline to review the model due to the poor measured re-

sponse I obtained? Or should I continue the review as is, judging both measurement and listening on that basis? In the meantime, I got a call from Vincent Bruzzese. He said that the Rokk really does have a response dip at the crossover but that I (or a customer) should feel free to use it with the tweeter connection reversed if the system appeared to perform better that way.

There was my answer: I should evaluate the Rokk both ways! I then took duplicate sets of measurements on the speakers, with the tweeters connected normally (as factory supplied) and with the tweeter connections reversed. Not all measurements are shown here, however.

The on-axis, anechoic frequency response of the Rokk is shown in Fig. 1, both with the tweeter connected normally and with it reversed. Measurements were taken 1 meter from the front of the cabinet, on the tweeter's axis. The input was 2.83 V rms (equivalent to 2 watts into the rated 4-ohm impedance). A combination of ground-plane and elevated free-field measurements was used to derive the resultant curves.

As can be seen in Fig. 1, the reversed tweeter connection provides a much flatter response curve. With the speaker connected normally, the response fits a rather loose window of about 13 dB. When reversed, the response fits a much tighter window of about 7 dB in the range of 70 Hz to 20 kHz but doesn't meet the manufacturer's rating of 50 Hz to 20 kHz within a 4-dB window.

Averaged between 250 Hz and 4 kHz, the Rokk's sensitivity measured 85.2 dB with the normal connection and 86.6 dB with the reversed configuration. The latter essentially meets Totem's 87-dB rating. The right and left systems matched within a close ± 1

SPECS

Type: Two-way, bookshelf-size, vented-box system.

Drivers: 5-in. cone woofer and 1-in., titanium-dome, magnetic-fluid-cooled tweeter.

Frequency Response: 50 Hz to 20 kHz, ± 2 dB.

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

Maximum Sound Pressure: 107 dB SPL before dynamic compression.

Crossover Frequency: 3.2 kHz.

Impedance: 4 ohms, nominal.

Recommended Amplifier Power: 20 to 80 watts per channel.

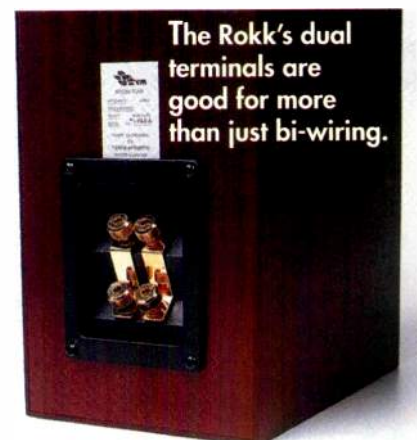
Dimensions: 15 in. H x 6¾ in. W x 9¾ in. D (38.1 cm x 16 cm x 24.5 cm).

Weight: 11.4 lbs. (5.2 kg) each.

Price: \$895 per pair; available in black ash or mahogany; optional grille, \$40 per pair.

Company Address: c/o May Audio, 10524 Lexington Dr., Suite 300, Knoxville, Tenn. 37932.

For literature, circle No. 92



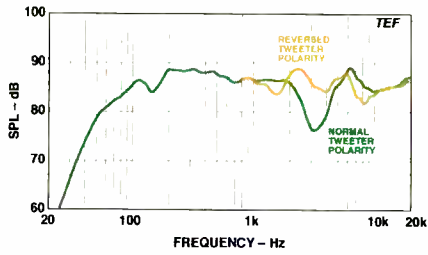
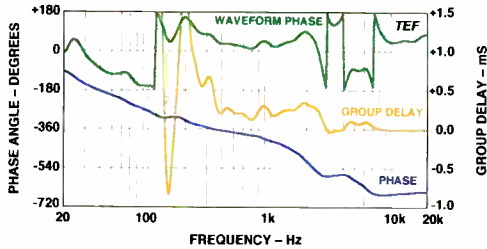
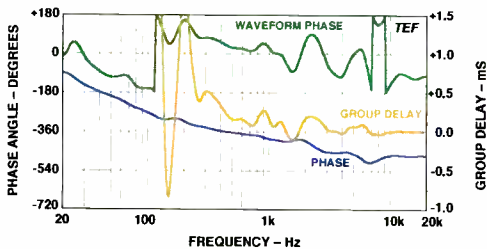


Fig. 1—One-meter, on-axis frequency response.



A



B

Fig. 2—On-axis phase response, group delay, and waveform phase for normal tweeter polarity (A) and for reversed polarity (B).

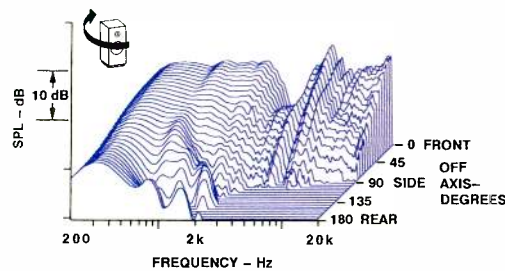


Fig. 3—Horizontal off-axis frequency responses.

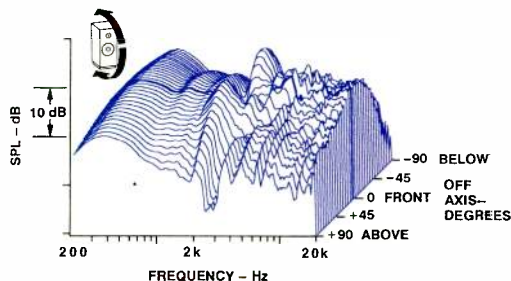


Fig. 4—Vertical off-axis frequency responses.

dB from 100 Hz to 20 kHz. That is, each pair of speakers matched this closely, but a set-to-set comparison yielded a looser (± 1.75 -dB) match.

Figure 2A shows the phase, group-delay, and waveform-phase responses with the tweeter connected normally, referenced to the tweeter's arrival time. The phase curve is well behaved, with no major anomalies, but decreases 245° between 1 and 20 kHz. The group-delay curve indicates that the woofer/midrange lags the tweeter by about $450 \mu\text{s}$ in the upper midrange. The waveform phase, although near zero below 1.5 kHz, varies around 90° to 180° between 3 and 9 kHz. (The sharp transitions at 3, 4, and 7 kHz are merely wraps where the phase cycles through the 180° limit of this measurement.) This test indicates that waveforms will not be preserved very well in the tweeter's response range. Note that frequency response must be nearly flat, and waveform phase close to zero over an appreciable frequency range, for waveforms to be preserved.

For comparison, Fig. 2B shows the same measurements with the tweeter connected in reverse. Immediately apparent is that the phase curve exhibits 180° less rotation above 1 kHz than in Fig. 2A; it changes only about 70° above 1 kHz. The group-delay curve is much improved, exhibiting much less delay between 800 Hz and 2.5 kHz. The waveform phase is also improved and stays closer to zero in the range between 1 and 6.5 kHz. Only at and above about 7 kHz does the waveform phase go above $\pm 90^\circ$. Neither connection, however, will faithfully preserve waveshapes over the tweeter's entire range. Note that, above 10 kHz, the normal connection yields waveform phase values closer to zero.

Another situation that needed to be investigated was whether the drivers were connected properly to the crossover with respect to their

inherent polarity. In other words, would a positive voltage applied to the positive terminal of the tweeter (or woofer) move the diaphragm forward? I checked this by applying a d.c. voltage to both the tweeter and the woofer. In both cases, the diaphragms moved out, indicating that each driver was connected properly for a first-order crossover. So, in the normal connection mode, the drivers' negative terminals are properly connected to crossover ground.

Why, then, are the measurements better with the tweeter reversed? Apparently the Rokk's driver and crossover magnitude and phase responses favor the reversed connection over the in-phase connection. In theory, however, a correctly implemented, pure first-order crossover (with pure 6-dB/octave roll-offs in acoustic response) yields best results and perfect waveform reproduction when both the woofer and the tweeter are connected in the same relative polarity. In that situation, a reversal of driver polarity should have no effect on the magnitude of response, but should add 180° of phase rotation to the phase curve, and the system will therefore not reproduce waveforms accurately.

The Rokk's 1-meter, on-axis energy/time response is not shown here. The curves for normal and reversed connections were fairly well behaved, however.

Figure 3 illustrates the horizontal off-axis responses with the Rokk's tweeter connected normally; the curve at the rear of the graph is the on-axis response. The off-axis horizontal responses are quite uniform all the way to 20 kHz. The dip in the crossover region is immediately evident.

The vertical off-axis curves are shown in Fig. 4; the bold curve, halfway back in the graph, is the on-axis response. The dip in the on-axis response at crossover is not clearly seen, because it is hidden by other curves. The response through the crossover region gets significantly better at larger angles (not clearly seen). This has significance when the tweeter is reversed, which makes the response better for downward angles than upward angles. (The practical consequence of this will be discussed later.)

Figure 5 shows the Rokk's impedance. Note the energetic nature of the curve, with a high of 49 ohms at 87 Hz and a low of 4.4 ohms at the vented-box resonance of 44 Hz

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By Martin Colloms
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The VT 150 is, without question, the best power amplifier I've heard... The VT 150s went far beyond any descriptions of sonic qualities. Instead, they were truly

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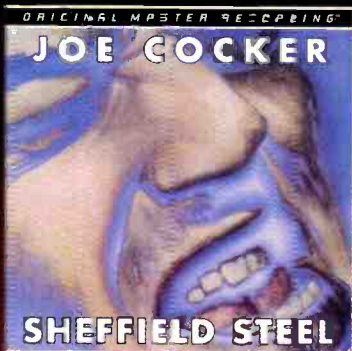
UDCD 571



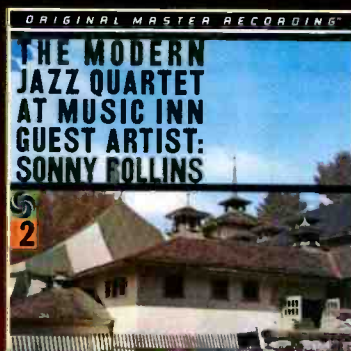
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UDCD 629



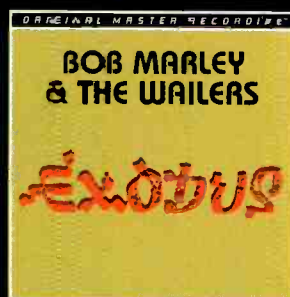
NEW RELEASE UDCD 631



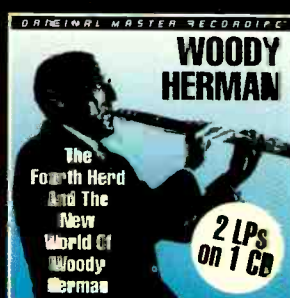
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and at 240 Hz. A high of 43 ohms is also reached at 2.9 kHz, near the crossover. Below 100 Hz, the classic impedance curve of the vented-box enclosure (two peaks and a dip) is clearly seen. Note the slight squiggles in the curve at 550, 800, and 1,200 Hz, which may be due to side-wall or internal resonances of the box.

The Rokk's high max/min impedance variation of nearly 10 to 1 (43 divided by 4.4) means that the series resistance of cable and amp should be limited to a maximum of about 0.057 ohm to keep cable-drop effects from causing response peaks and dips greater than 0.1 dB. For a typical run of about 10 feet, a minimum of 14-gauge, low-inductance cable should be used.

Figure 6 shows the complex impedance of the Rokk over the frequency range from 5 Hz to 30 kHz. The plot exhibits a nearly classic three-loop impedance characteristic (circles of three different sizes). The largest circle appears segmented, due to under-sampling in my measurement technique. Maximum phase was +58.6° (inductive) at 74 Hz, while minimum phase was -57.1° (capacitive) at 102 Hz. Although these phase values are high, the Rokk's fairly high minimum impedance of 4.4 ohms should present no problem to any solid-state amplifiers, though tube amps might have problems with the 10-to-1 variation.

A high-level sine-wave sweep revealed that the Rokk's cabinet is fairly rigid except for some vibration of the front, top, and

OVERALL BALANCE WAS GOOD, WITH DEEP BASS, EXTENDED HIGHS, AND ADMIRABLE IMAGING.

side walls at and near 520 Hz. The maximum excursion of the 5-inch woofer was about 0.4 inch, peak to peak, and when overdriven it made no harsh sounds apart from high levels of third-harmonic distortion. No dynamic offset was noticed. The vented box works quite well and reduces the cone excursion at box resonance by about one-half. This can be seen by comparing cone excursion with the port open,

as is normal, to the cone's excursion when the port is covered. Minimum woofer excursion occurred at 45 Hz. Port wind noise was fairly high at high power in the bass range, but the rear location of the port reduces these effects.

Figure 7 shows two sets of 3-meter room responses, one set with the tweeter polarity normal and the other with it reversed. Both raw and sixth-octave smoothed responses are shown in each set. The Rokk was in the right-hand stereo position and aimed at the test microphone, which was at ear height (36 inches) at the listener's position on the sofa. The system was driven with a swept sine-wave signal of 2.83 V rms (corresponding to 2 watts into the rated 4-ohm impedance). The direct sound and 13 mS of the room's reverberation are included. For these measurements, I placed the speaker on a 23-inch-high stand. The Rokk was right-side up for the normal tweeter connection and *upside down* for the reversed connection. I did this to insure that the system's response lobe at crossover would be aimed in the upward direction for both tweeter connections. (See previous comments describing the vertical off-axis responses in Fig. 4.)

As before, the response is significantly flatter for the reversed tweeter connection. Excluding room effects (a peak at 170 Hz and a dip at 415 Hz), the averaged curves fit a 10-dB window for the normal connection but a tighter 7-dB window for the reversed connection. More important, the reversed connection provides a much flatter room curve in the region between 500 Hz and 8 kHz.

Figure 8 shows the Rokk's E_1 (41.2-Hz) harmonic distortion, with input power ranging from 0.025 to 25 watts (10 V rms into the rated 4-ohm load). Although the system could handle 50 watts (14.14 V rms), the excursion limits of the woofer were reached, which raised the third-harmonic distortion to nearly 100% at full power. At 25 watts, as seen in Fig. 8, the second-harmonic distortion reaches 12%, while the third attains a much higher 33%; higher harmonics are 11.6% fourth, 11.7% fifth, and 4.4% sixth. At 1 meter in free space and driven with an input of 25 watts, the system generated a fairly usable 88 dB

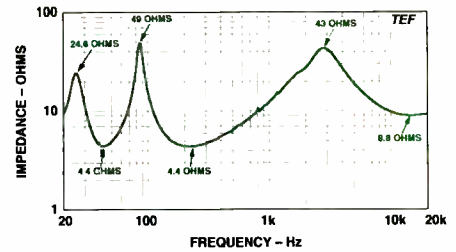


Fig. 5—Impedance.

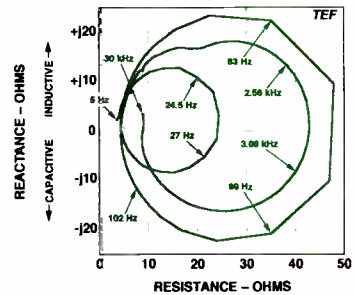


Fig. 6—Complex impedance.

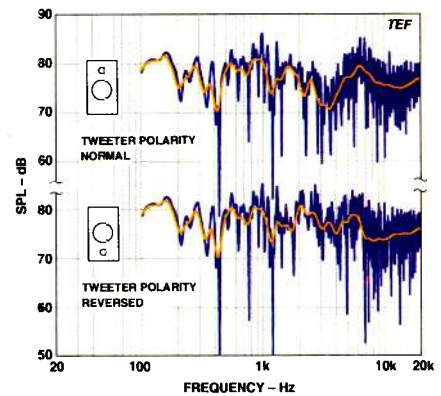


Fig. 7—Three-meter room responses.

SPL at 41.2 Hz, and, you must remember, this is a small box.

Figure 9 shows A_2 (110-Hz) harmonic distortion with a 25-watt power limit. The predominant distortion is a moderate 13.6% second, 7.5% third, 5.1% fourth, and a much lower 1.2% fifth. Driven with 25 watts, this speaker reached a fairly loud 100 dB SPL at 110 Hz.

The A_4 (440-Hz) distortion data (not shown) reached only 1.8% second at 50 watts and 1.1% second at 25 watts. Higher harmonics were negligible.

The IM distortion is shown in Fig. 10. Distortion rises to the fairly high level of 17.5% at full power (50 watts). This level is reasonable considering that the two tones of this test are handled by the same driver.

The Rokk's short-term, peak-power input and output capabilities are shown (with normal tweeter polarity) in Fig. 11. The peak input power was calculated by assuming that the measured peak voltage was applied across the rated 4-ohm impedance.

The peak input power starts at about 10 watts at 20 Hz, rises to 50 watts near box resonance, falls slightly to 42 watts at 50 Hz,

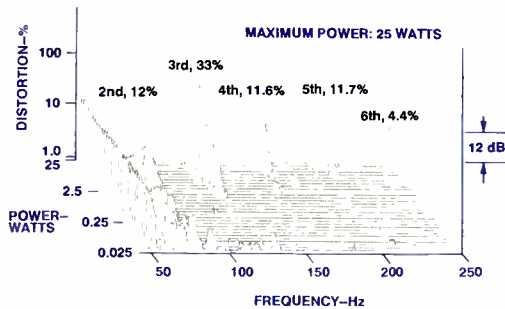


Fig. 8—Harmonic distortion for E₁ (41.2 Hz).

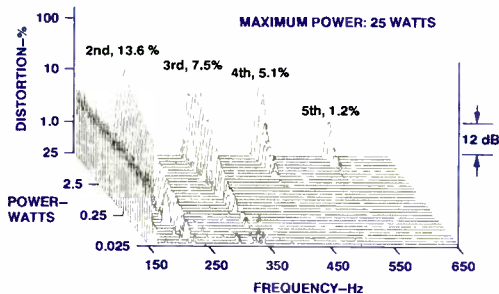


Fig. 9—Harmonic distortion for A₂ (110 Hz).

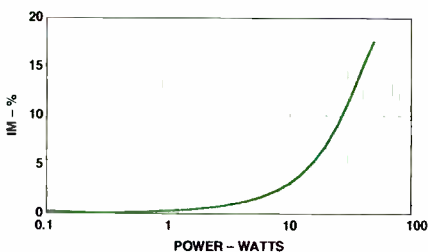


Fig. 10—IM distortion for A₄ (440 Hz) and E₁ (41.2 Hz).

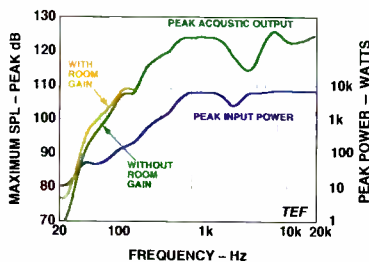


Fig. 11—Maximum peak input power and sound output.

and then rises smoothly to a high 6 kW at 700 Hz. At higher frequencies, the power drops somewhat, to 2.4 kW, at the bottom end of the tweeter's range and then rises smoothly to a high 5.6 kW above 4 kHz.

With room gain, the maximum peak output SPL starts at an unusable 77 dB at 20 Hz, rises rapidly to 100 dB at 55 Hz, and then reaches 110 dB at 160 Hz. At higher frequencies, the maximum peak output rises to between 115 and 125 dB. Between 2 and 5 kHz, the maximum output is restricted by the dip in the on-axis frequency response. Note that this speaker can generate quite usable output of 95 dB SPL or higher in the important bass range at and above 40 Hz.

Use and Listening Tests

As I've said, the Rokk's appearance and fit and finish were outstanding. The cabinets were quite well constructed and put together in craftsmanly fashion. The mahogany pair was particularly good-looking; the black pair would likely suit a home theater. The small size really contributed to ease of setup. The heavy-duty binding posts worked particularly well for hookup. I did most of my listening without bi-wiring the speakers.

The Rokk's owner's manual is a single legal-size sheet, printed on one side. It recommends using high-quality stands filled with lead or sand. Totem recommends that the speakers be placed 2 to 3 feet or more from the side walls and at least 1 foot from the back wall, and states that the systems can be placed as far from the back wall as you want. Significant toe-in is recommended if the speakers are placed far from the back wall (as in my listening room). Totem recommends at least 85 to 90 minutes of break-in. I did this for the second set of systems I received (the first had considerable use before I received them).

Components in my system included Onkyo and Rotel CD players, Krell's KRC preamp and KSA250 power amp, Straight Wire

Maestro cabling, and B & W 801 Matrix Series 3 reference speakers. The Totem speakers were placed on 23-inch stands (raising the tweeters to about 36 inches high with the systems upright). They were about 8 feet apart and well away from rear and side walls, my customary locations, and aimed toward my listening position.

As stated earlier, I did take some measurements of the Rokk before I did any listening. Even with some admitted bias against the systems, due to the previously discussed measurement problems, I initiated some serious listening. What I heard was a system that, overall, really did quite a good job on almost everything I played. It had smooth, extended bass (particularly considering the size of the design), good overall balance, an extended high end with no undue emphasis or de-emphasis, and admirable imaging and lateral-soundstage capabilities. These speakers could be played cleanly and without harshness at useably loud levels.

The Rokks did, however, have a tendency to move instruments and soloists from a front and up-close position (as properly reproduced by my reference B & W systems) to a position much farther back in the soundstage. Also, when I stood up, the Rokks' sound changed significantly—but not necessarily to their disadvantage. In general, instruments and soloists tended to move forward, closer to their correct positions, when I stood up. This indicated that whatever problem existed when I was seated was alleviated at higher listening angles.

Of course, having already seen some problems in the measured frequency response, I conjectured that the depression in and through the crossover region in the on-axis frequency response was the cause of the instruments' moving back in the soundstage. To check this, I performed several listening experiments with the two pairs of systems I had been sent.

I first placed both pairs of the Rokks in a standard stereo setup (two on each side, side by side) for A/B comparisons between the pairs. The mahogany pair was on the outside, the black pair inside. Each set was upright, with its tweeters connected in normal (factory-supplied) polarity and with the bi-wire bypass straps in place. In this situation, both pairs sounded essentially identical for seated and standing positions. I could not tell which set was playing except

by walking up close to the systems. On pink noise, I noted some very slight, insignificant differences.

Then, with both speaker pairs still upright, I reconnected the tweeters of the outside systems in reverse polarity. This immediately improved the problem of soloists being placed far back in the soundstage when I listened to the systems sitting down. However, the reversed-tweeter pair sounded significantly worse when I stood up (not better, as it had with normal tweeter polarity). I then turned the outside systems (the ones with the tweeters reversed) upside down, so that their tweeters were at the bottom of the cabinets. The sound was then

I FOUND MYSELF LISTENING MORE TO THE ROKKS THAN TO MY BIG REFERENCE SPEAKERS.

much closer to that of my reference speakers for both seated and standing positions!

With the normal tweeter connection and the speaker upright, the Rokk's directional lobe at crossover was launched in an upward direction, which meant the speaker's response sounded flatter and truer to life for standing listeners. With the tweeter polarity reversed, the lobe was launched downward, degrading the sound for a standing listener. Solution: Flip the speaker over! Previous measurements (not shown) revealed that the responses for seated and standing positions were much closer together for the upside-down, reversed-tweeter polarity condition than for the normally connected tweeter with the system right-side up! (Refer to the 3-meter room curves in Fig. 7.) I conducted most of my subsequent listening and comparison to the B & Ws with the Rokks upside down and their tweeters connected in reverse polarity.

When the Totem systems were in the unmodified upright state, I listened to *Musical Truth*, by The Holly Cole Trio (Alert Music DPRO-240, an excellent promo disc available from Energy Loudspeakers). Unfortunately, Cole's vocals were shoved far back in the soundstage. With the Rokks upside down and their tweeters reversed, Cole was

brought back forward, which resulted in a balance and soundstage that compared quite well with those of the B & W 801s. This was true whether I was seated or standing.

Remember again, however, that with the exception of the stated problems with response in the upper midrange and poor vertical coverage, the Rokks did an exceptional job on the many other areas of its performance. Reversing the tweeter and flipping the system upside down made an already formidable design much better.

On organ material with heavy but only moderately low-frequency pedal notes, the Rokks did a very good job for their size. With the low end extending down to an honest 40 Hz, the Rokks' high/low balance is near optimum. They cannot play at room-shaking levels below 40 Hz, but would be a very fine choice for a dorm system (although not for a student into high-level heavy metal).

On band-limited pink noise, the Rokks could not generate any usable bass output in the 20- and 25-Hz third-octave bands. Some usable output was noted at 31 Hz and much more output at 40 Hz and higher. Port wind noise was not a problem because the port faces to the rear.

An excellent demo of the Rokks' clean, wide-range performance can be found in a recent release from Sheffield, *Sonic Detour* by the Freeway Philharmonic (Sheffield Lab 10050-2-F). Check out track 3 ("Good Vibrations") and track 6 ("Hoedown") for some very innovative and fun sonic material. The percussion particularly shows off this speaker's capabilities.

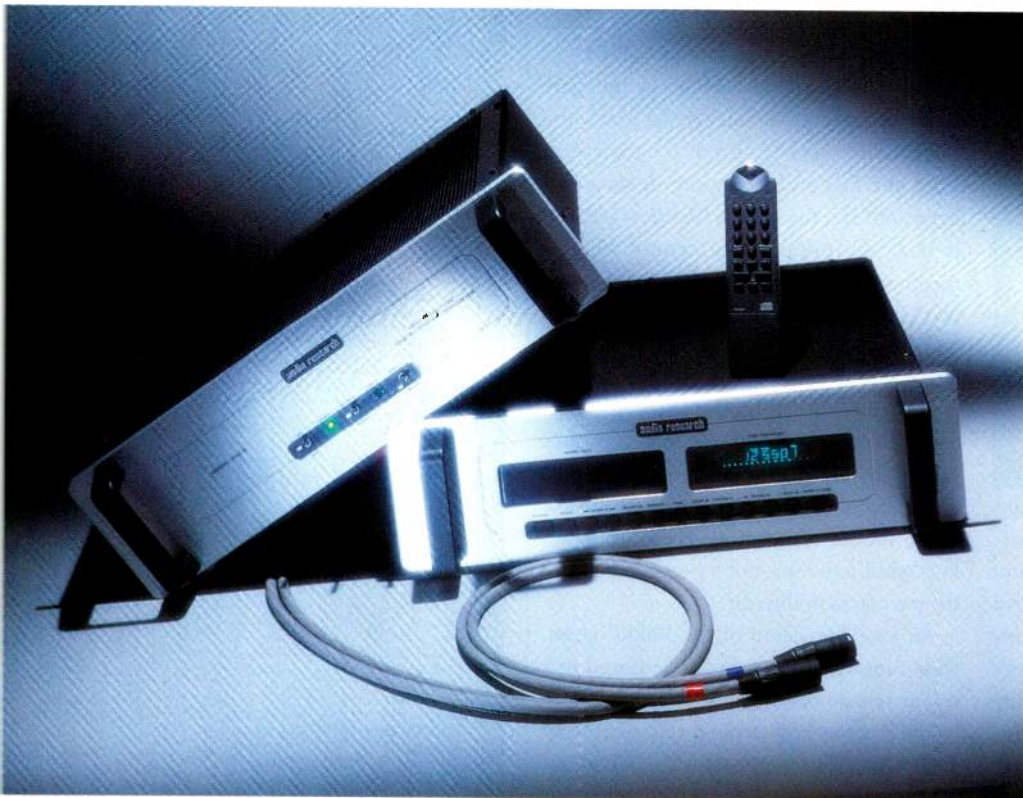
With classical music, the Rokk is well suited to small ensembles, such as chamber groups. When I compared the Rokks directly to the 801s, I found myself voluntarily listening more to the Rokks even though the big guys are decidedly better performers. Only systems with good overall performance compare this well with the 801s.

The Totem Acoustic Rokks deserve serious attention for use as a wide-range main system or as a high-performance second system. The Rokks will also work very well in a home theater setup with a subwoofer. And try my easy "modification," which makes this good system even better. This may sound like a whack; it isn't. These little speakers are good!

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AUDIO RESEARCH DAC3 D/A CONVERTER & CDT1 CD TRANSPORT



The Audio Research CDT1 transport and DAC3 converter come as close as any CD combo I've heard to the sound of the best tube preamps. In fact, the DAC3 is the first fully satisfactory tube DAC I've encountered. Some others have been euphonic, but at the cost of softening or blurring detail in the upper octaves, reducing dynamic contrasts, and/or imposing their own soundstage on every recording which they process. In contrast, the DAC3 offers the special dynamics and harmonic

integrity of the best tube preamps, without artificial "romance" or euphonic coloration. And it offers exceptional soundstage depth and detail without significantly imposing its own character on the recording.

As one might expect from Audio Research, these are products of luxury quality, with luxury price tags. The CDT1 sells for \$2,495 and the DAC3 for \$3,495. Although their quality/price ratios are "reasonable" compared to some competing products that sell for more than three times as much, these components are anything but cheap.

The CDT1 transport is the more conventional of the two units. It offers the full standard feature set, with typical Audio Research styling.

Its Philips CDM-12.1 drive mechanism uses magnetic disc clamping, and careful attention is paid to mechanical damping. Electronic stripping techniques are used to reduce jitter, and the transport has a three-beam laser diode and grating unit as well as a digitally controlled, low-inertia, linear positioning servo. The advanced power supply has two transformers and extensive regulation. The CDT1 uses high-stability, crystal-controlled reclocking for all its outputs, which include an AES/EBU, an S/P DIF with a BNC connector, an ST-type glass-fiber optical, and a Toslink plastic-fiber optical output. The AES/EBU and S/P DIF outputs are driven by a high-current, balanced line driver and are transformer-coupled.

Tray movement and loading are excellent, and the CDT1's display is easily readable at a distance. There are no unusual programming features. The only thing I found striking about the ergonomics is that the small black buttons on the front panel blend in with the black background. This would make operating the CDT1 a bit difficult if it were not for the remote, which is almost certain to be the control panel of choice for most audiophiles.

The DAC3's power-supply and digital circuits are not radically different from those of a number of other top D/A converters, but its analog circuitry takes full advantage of Audio Research's long history with tube preamps. The power supply reflects a typical high-end emphasis: The a.c. line input is filtered, and one transformer feeds the digital input and converter while a second feeds the analog circuitry. Audio Research believes that separate transformers provide a cleaner and more dynamic performance. A total of 10 regulators covers each critical stage of the circuit. The power supplies for the analog section are identical to those used in the LS5 Mark II preamp. The circuitry is on a heavy, double-sided board. Special attention is paid to grounding, to

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Audio Research selects its digital devices and passive components on the basis of exhaustive listening tests as well as good engineering practice, and the company tends to be a bit proprietary about details. For instance, the DACs and some of the ICs are painted over. The broad topology of the digital circuit, however, is clear. The DAC3 has a monolithic, 24-bit input receiver and a delta-sigma D/A converter with eight-times interpolation, which is followed by a 64-times-oversampling delta-sigma modulator. The resulting dynamic range is said to be 107 dB.

The analog circuitry draws on the output of the delta-sigma modulator, which feeds a one-bit signal to an all-tube, analog low-pass filter derived from the LS5 Mark II preamp. Four 6922 dual triodes are used in this circuit, and two-stage jitter reduction is provided by two separate voltage-controlled oscillators. One is located in the digital audio interface, and the other is incorporated in a proprietary PLL circuit located between the delta-sigma converter and the analog output.

The features of the DAC3 are increasingly typical of the breed. There are AES/EBU (XLR), S/P DIF (RCA jack), ST optical, and Toslink inputs and outputs. The front-panel switches include on/off, polarity inversion (accomplished in digital mode to reduce distortion), and a three-position input selector with automatic muting.

As is typical of the best recent transports, the CDT1's sound is difficult to describe. Its practical resolving power equalled that of my reference Theta Digital (the Data) and Krell transports, and was very similar to that of PS Audio's Lambda. The CDT1 performed very well with CDs that sometimes make poor transports skip, and did very well with a range of older, low-quality CDs. Although all transports differ somewhat in resolving power and vary slightly in performance from disc to disc, the CDT1 ranks near the top of what I have used to date. The only transport that I would rate higher is the Mark Levinson

No. 31, which costs nearly three times as much. The CDT1's performance with the AES/EBU output seemed slightly better than with the BNC and ST outputs, but this might change when using D/A converters other than the DAC3 or with different digital cables.

The sound of the DAC3 was a great deal more easily identifiable. Digital signals are processed by D/A converters in slightly different ways, and a reviewer cannot normally distinguish the relative effects of the digital and analog circuitry. In broad terms, however, the DAC3 seemed to do a very good, but not outstanding, job of resolving the digital signal from CDs. I have auditioned two other converters, the Mark Levinson No. 30.5 and the Theta Digital DSPro Generation V, that could resolve

more low-level detail and produce cleaner upper octaves from older, poorer quality CDs than can the DAC3.

That said, I know of no D/A converter that is more musical with really good CDs

than the DAC3, although a number of top converters provide equally musical sound of a somewhat different nature. With a clean CD, the DAC3 delivered extraordinary harmonic integrity and sweetness in the strings and woodwinds without losing any high-frequency information or detail. Further, while most tube CD players and D/A converters I have heard have tended to slightly soften the upper octaves, the attack of certain instruments, and some aspects of musical dynamics, the DAC3 delivered virtually all of the musical information to be found in a first-rate CD.

This exceptional ability to deliver music may take a bit of time to understand if you consider lower quality transistor units as "normal." The DAC3's upper octaves, transients, and dynamics do not have the slight obtrusive edge common even in some high-end transistor equipment, and the sound may initially seem a bit soft. You have to hear the triangle or the characteristic bite of a modern violin to appreciate that all of the music is there, and that what is missing is electronic coloration. Extended listening will make it clear that the up-

per octaves emanating from the DAC3 are extraordinarily convincing.

As a good practical example, I suggest the Chicago Symphony version of Berg's Violin Concerto (Deutsche Grammophon 437 093-2). This is a great performance of some of the most demanding music you can ask a digital system to reproduce. It has exceptionally complex string tones, dynamic contrasts, and orchestral soundstage detail, plus extraordinary low-level information. This kind of CD makes you search for equipment with every possible bit of added musicality, as it is just a bit below the top standards. With a truly high-quality CD, the DAC3 is even more musical. With such recordings, the soundstage is filled with information—and with layers of depth that match soundstage width. The imaging is remarkably natural, and the soundstage is stable, with excellent center fill.

If there is any slight shortcoming in the DAC3's sound, it may be a slight touch of warmth in the lower midrange/upper bass and in the very deep bass. My Krell and Theta reference units seem to do slightly better in defining the deep bass, at least when it is reproduced through woofers and subwoofers of extended range and rich in dynamic detail. Still, many audiophiles may consider these aspects of the DAC3's sound to be strengths rather than shortcomings, however subtle.

I should make two caveats about my praise for the CDT1 and DAC3. First, I am defining musicality in terms of the CD, not other recording media. Good as today's CD equipment may be, none I have heard competes with the best 20-bit professional digital tape recorders, and the best phono units have superior musicality in some respects. Today, state-of-the-art CD sound does not mean perfection. Second, I have only briefly heard the new HDCD process, which should become commercially available shortly and may overcome some of the technical limits of CDs.

These caveats aside, the Audio Research CDT1 and DAC3 are strong competitors for the best sound available. No CD or DAT equipment I have ever heard has been more musical than the DAC3 with truly good recordings, and no combination has ever done a better job of engendering sheer musical enjoyment. In this case, tubes make good on their promise. A

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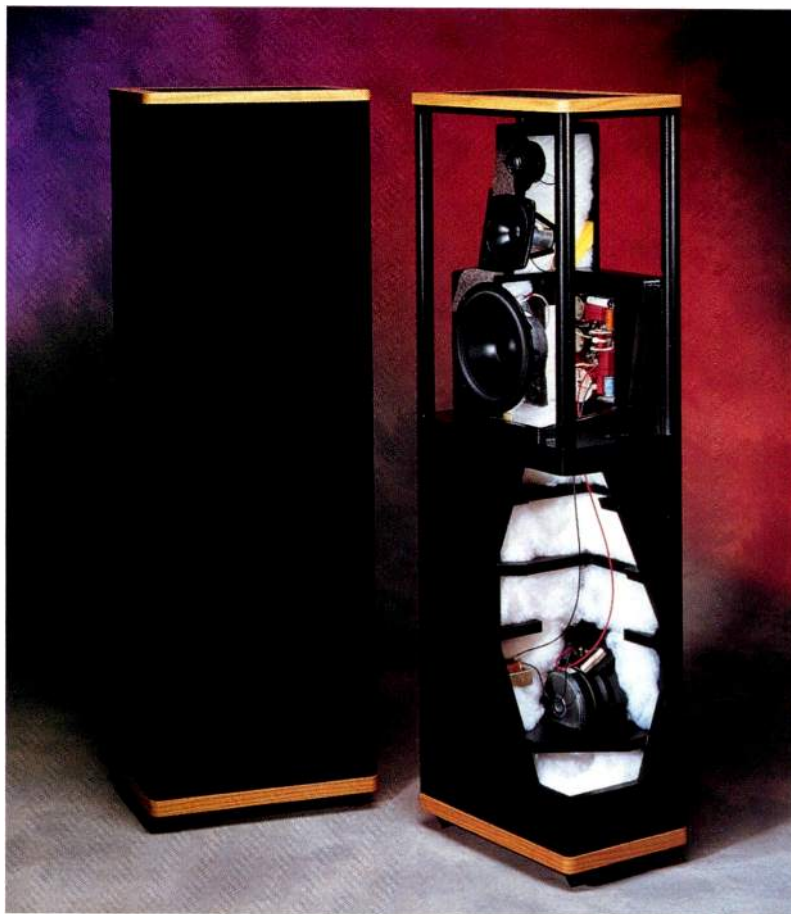


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VANDERSTEEN 3A SPEAKER



Once upon a time, speaker reviews were easy to write. You simply listened for the dominant frequency colorations, described them, and then let the reader make up his own mind. You might also have discussed dynamics, bandwidth, and distortion, but frequency colorations were usually so severe that they were what *really* mattered. It has, however, been a long time since good high-

end speakers could be judged primarily in terms of their frequency colorations. While treble directivity is still a problem, particularly with smaller monitors, most of the better high-end speakers must now be judged by other aspects of sound quality: Transparency, soundstage, imaging, and dynamics as well as the speaker's ability to reproduce the upper treble and deep bass.

This is certainly true of the Vandersteen 3A. It has excellent frequency response down to at least 40 Hz and up well beyond 20 kHz. It sounds exceptionally smooth and flat in the critical region from 100 Hz to 5 kHz, and is remarkably free

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of the kind of "boxy" coloration that listeners once took for granted. This is a speaker that yearns to be judged in terms of nuance, not a few striking colorations—plus, it has a superb, open soundstage.

The Vandersteen 3A is a recent upgrade of the Vandersteen 3, which came out last year. It lists for \$2,595 per pair and differs significantly from its predecessor. For starters, it has a new "acoustic coupler" driver, a new woofer, an improved tweeter, and a completely revamped crossover network.

This speaker represents the result of years of computerized Fast Fourier Transform (FFT) analysis and the company's research into diffraction effects, driver designs, crossovers, and enclosure materials. From the outside, the 3A may look like an ordinary box, but appearances are deceiving: Behind the grille cloth is a series of stepped enclosures.

The bottom enclosure holds two bass drivers, a long-excursion 8-inch woofer and a rear-firing, 10-inch "acoustic coupler" (so called because it shares the same enclosure, though it has its own signal feed and crossover point). The acoustic coupler, at the bottom of the bass enclosure, has an alloy cone and a heavy-duty, 1½-inch, four-layer voice-coil; it covers the spectrum from 26 to 35 Hz. The 8-inch woofer has a poly cone and a 40-ounce, focused-gap magnet structure; it covers the spectrum from 35 Hz through 600 Hz. Both drivers have extended pole pieces with copper shorting rings, plus dual spiders. The 10-inch active acoustic coupler, 8-inch woofer, and crossover are designed to complement each other in ways that reduce box loss, thermodynamic loss, and active/passive transfer irregularities.

On top of the woofer enclosure is another enclosure that holds a 4½-inch midrange driver with a linear surround, a curvilinear polycone, and a proprietary die-cast basket-and-magnet structure. This particular driver is set back from the 8-inch

driver to preserve time coherence, and is angled to control dispersion. It covers the range from 600 Hz to 5 kHz. Above the midrange is a 1-inch, metal-alloy dome tweeter. This driver uses a dual chamber to reduce reflections, has Ferrofluid voice-coil cooling, and covers the frequency range from 5 to 30 kHz.

The baffles holding each driver are kept as small as possible, to eliminate early reflections and edge diffraction off the baffle. The alignment and positioning of the drivers were determined using FFT techniques so that the drivers act as an apparent point source and maximize phase coherence. The

**VANDERSTEEN'S 3A
MAKES MUSIC
COME ALIVE OVER
A WIDE LISTENING AREA.**

crossover, which uses first-order networks to preserve phase integrity, is compensated to allow the drivers to operate in absolute polarity with each other. The crossover also uses high-quality air-core inductors and film capacitors in the signal path, and is tested to ensure a deviation of less than 0.1 dB from a reference circuit. The 3A will allow bi-wiring.

The net result of all this technology is an impressive set of specifications. The FFT impulse response is excellent, as is acoustic phase response. Frequency response is ± 3 dB from 26 Hz to 30 kHz and is ± 1.5 dB from 30 Hz to 22 kHz. Dispersion at 30° off axis is ± 3 dB from 26 Hz to 17 kHz. Sensitivity is 86 dB SPL for 1 watt. Impedance is 4 to 6 ohms, and while the Vandersteen 3A requires an amplifier that is stable into 4 ohms, its impedance curve is very smooth and never drops below 4 ohms.

According to Richard Vandersteen, the numerous goals of the engineering effort behind the 3A included devising a speaker that would have precise dimensional imaging and a wide listening area, excellent "real-world" transient response, a high level of transparency and detail, enhanced efficiency, and greater dynamic range. These are scarcely unusual goals for a high-end speaker, but this time the manufacturer has made good.

The system requires careful attention to set up properly. It needs about 100 hours of break-in to perform at its best. As far as room placement is concerned, the 3A requires at least several feet of clearance from the rear and side walls, and its deep bass response makes it a bit more sensitive to location than many speakers of its size. However, if you position the 3A according to the instruction manual (which contains one of the few truly intelligent, detailed discussions of speaker placement I have ever seen in an instruction manual), you

will get very good transparency and one of the most accurate and open soundstages around. (I should note that I listened to this speaker using the optional Sound Anchor rear brace, which costs \$200 per pair.)

In fact, the Vandersteen 3A comes extremely close to combining the large, open soundstage of the large planar speakers with the precision of an apparent point-source speaker. The soundstage extends from well to the left and right of the speakers, through the center, in a nearly seamless arc. There is no etching of instruments and

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no artificial imaging detail, but both left-to-right and front-to-back imaging are as natural and realistic as recordings permit. The dispersion and directivity of the 3A provide a wide, stable listening area without losing soundstage detail.

A properly placed Vandersteen 3A transforms good stereo recordings into exciting listening experiences. You can hear every rustling score, chair movement, and cough on live recordings. The 3A gives you the sensation of being in an orchestra seat, slightly forward of mid-hall, with all the

sound cues the ear needs to place the strings, percussion, and other sections of the orchestra. Additionally, you get an excellent sense of hall effects with church recordings, fine natural definition of choral music, and a very good sense of theater with those few opera recordings that deliver drama along with the music.

Frequency response is quite smooth. The bass is very deep, and the highs are wonderfully extended. The Vandersteens do have a slight upward tilt in frequency response relative to a number of competing

speakers, but this tilt begins comparatively low in the midrange. This is obviously the result of deliberate design choices regarding upper octave balance and not because of irregularities in the crossover or drivers. Performance with voice is very good, as it is with solo violin, piano, and guitar. You will get no major surprises in frequency response, despite the rising high end.

All speakers have limits and involve trade-offs, however. While the 3A does reproduce very deep bass, it uses only a 10-inch driver and a relatively small enclosure to handle this region of the spectrum. It does not have the dynamic slam, deep bass definition, or bass power of much larger speakers. This, in turn, produces the kind of trade-off between dynamics and frequency response I hear with most floor-standing speakers of this size and price—particularly those designs with flat, very high-quality tweeters. That is, the top octaves outperform the bottom octave, so you might consider using a subwoofer (such as the Vandersteen 2W) if you are seeking deep bass that truly matches the rest of this speaker's performance.

The 3A's apparent transient speed is not quite as good as that of the best ribbon drivers, although it comes very close to—or equals—the transparency and apparent speed of some electrostatics. The overall life and dynamic energy of this speaker is also slightly limited (although this is very much a function of the amplifier used); the speaker becomes much more dynamic the moment you begin to listen to music at live-performance levels.

Life isn't perfect, reviewers aren't perfect, and neither is the Vandersteen 3A. It is, however, a damn fine speaker and a good value in one of the most demanding price ranges in the high end. It offers exceptional soundstage performance, and while it may seem strange to say so, it is a speaker for audiophiles with families and friends: Its small trade-offs manage to make music come alive over a wide enough listening area to include several people. It's also large enough to provide excellent sound quality yet small enough to fit into most listening rooms or A/V systems. I truly enjoyed my time with the Vandersteen 3As. If you're looking for top-quality but moderately priced high-end speakers, I'm certain you will enjoy them too. A

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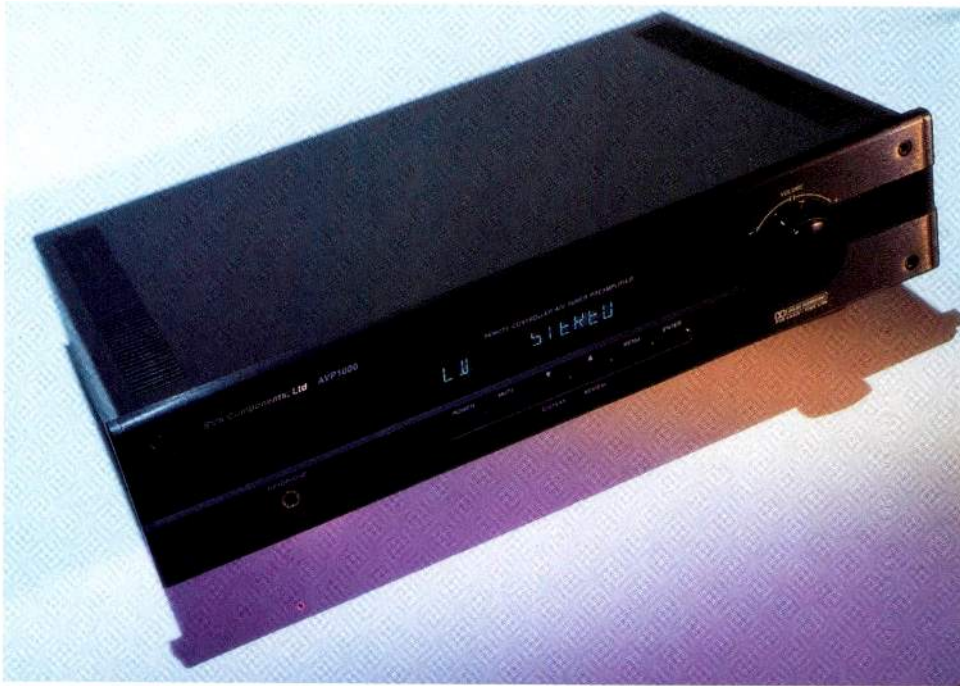
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AURICLE

ANTHONY H. CORDESMAN

B & K COMPONENTS AVP1000 A/V TUNER/PREAMP



Most audio/video preamps follow a common pattern: Although the details of their features and controls may differ, they all use basically straightforward derivations of the analog controls found on stereo preamps and receivers, while adding extra buttons, switches, and lights to the front panel and the remote. This often creates the kind of complexity that invites misadjustment,

confusion, or simply a press of the wrong button. The B & K Components AVP1000 A/V tuner/preamp breaks free from this pattern: It's a fully featured unit governed by an

upgradable microprocessor and offers some truly unique programming and controls.

The AVP1000 sells for \$998 and is one of three preamps in the B & K line; the other two models are the AVP2000 and AVP3000, which do not have tuners but otherwise are similar to the AVP1000. All of these preamps use a learning remote to program a command-driven operating system to the user's needs and tastes.

The very flexible AVP1000 has an AM/FM tuner (with 64 presets and good FM performance), seven audio line inputs, three line-level audio outputs (including balanced XLR outputs), four composite-video in-

puts and outputs, and eight fully configurable A/V presets. You can custom name each input and A/V preset for display on the front panel. There is a jack for most infrared remote-control systems, allowing you to send signals from one room to another.

The central feature of the B & K AVP1000, however, is its microprocessor, which replaces most of the knobs and controls found on typical A/V units. Instead of sporting enough controls to drive the Enterprise up to Warp Four, the AVP1000's front panel is simple, with a large, 16-character display, a single volume control, and six buttons that include "Mute," "Display," and the unit's basic programming controls.

The learning remote is the main method of programming and operating this preamp, enabling you to select virtually all of the features and adjustments in much the same way you enter commands on an IBM-style PC. With the remote, you can adjust volume and balance as well as select A/V and tuner presets, surround modes, in/out switching for the equalizer/processor loop, and filters. You can also enter custom titles, use the built-in test signal for channel balance, and set the level and the time delay of each speaker used in the surround modes. The

learning remote further enables you to mix and match different audio and video features.

Lest my mere mention of programming *anything* become

intimidating, I should explain that the AVP1000 doesn't require you to program it at all. You do not have to begin by wading through the two instruction books (yes, two!). The basic setup is quite intuitive. My son fully connected the unit into my existing system using only the labels on the rear panel.

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However, the real strength of the AVP1000 lies in its microprocessor's ability to provide so many options. If you can handle programming an average VCR and are willing to wade through those two books (which can be confusing because of the sheer amount of information involved, and because one book is for normal preamp operation and the other is for surround operation), the AVP1000 has real advantages. For instance, you can tailor each A/V input or preset to get the precise settings and balance of features you want. This means you do not have to keep adjusting settings for each kind of program or



**THE CENTRAL FEATURE
OF THE AVP1000
IS ITS MICROPROCESSOR,
WHICH REPLACES MOST
TYPICAL A/V CONTROLS.**

signal source; rather, you can create a different group of settings for stereo music, regular TV, Dolby-encoded movies, and so forth.

Accordingly, the AVP1000's value to you will, perforce, depend greatly on your personal judgment of its rather unusual—and probably unique—ergonomics. To enjoy this unit, you need to be willing to memorize command sequences, just as you do with most PC programs. This isn't all that difficult, and the AVP1000 does come with little plastic cue cards to help.

My family was split down the middle. One son, the IBM PC user, loved the AVP1000. He quickly learned how to program it and use the remote. My other son, the Macintosh user, hated it—for the same reason he hates DOS without Windows. I liked the programming features and presets but disliked having to memorize the command sequences. My advice is to carefully

try out the AVP1000 at your dealer—and take all prospective users with you. An A/V system is supposed to be fun. If everyone likes the ergonomics of the unit, great! If not, move on to something else.

Of course, one of the key questions about any A/V preamp is whether it can be used in the stereo mode without having the surround processing degrade the sound. A disturbing number of A/V preamps do degrade the sound of stereo music, falling below the standards of good mid-fi transistor preamps, much less of

high-end models. Such A/V units may offer a host of different signal processing capabilities, but they can't play the music straight and far. Once the initial excitement of hearing the processing tricks wears off, all you're left with is a preamp that induces listening fatigue.

The AVP1000 does its best job of reproducing music in the stereo-only mode, with the processor turned off. This is the "Direct" or "Surround Off" mode, using only the left and right main channels and the subwoofer (if you have one). In this

The best speakers for music are also the best speakers for video sound

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mode, the AVP1000 has a clean sound with a great deal of dynamic energy. The overall timbre is just slightly on the bright side, which makes the apparent listening position seem a bit forward. Deep bass and upper octave extension are very good, and overall transparency and transient response are good—although the AVP1000 is a bit lacking in air and low-level detail compared to the best high-end preamps. The soundstage is very good for the price, with nice imaging and width, though it's just slightly lacking in depth. In short, sound

quality is not up to that of the megabuck units, but it is very good for the money.

The moment you shift to the surround processing modes, performance with music becomes more problematic. There are six different surround modes you can use for stereo music, and one of the great strengths of the AVP1000 is that most of them do not involve extensive signal processing. Instead, they involve choices about the number of loudspeakers that receive a signal and the level of delay applied to the rear speakers. These settings are also adjustable, and you

do not have to live with labelled absurdities like "Jazz" and "Concert Hall," whose processing is unknown and whose sound may reflect the taste of an engineer with solid tin ears.

As a result, playing stereo music through the surround settings of the AVP1000, though scarcely sonic purism, allows you to listen with much less of the "grunge" and loss of clarity and air common to far too many A/V units. The "Stereo-Front-Rear" and "Stereo Hall" modes both do a good job of providing surround effects

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without ruining a good stereo recording. Incidentally, the AVP1000 gives you good performance with music recorded using Dolby Pro Logic. (Delos has issued some particularly good classical CDs with Dolby encoding. While Dolby Pro Logic is generally not up to the transparency of the best stereo CDs or LPs, and there are limits to how well rear-channel information can be recorded, the Delos CDs show that well-recorded surround sound can contribute to music as well as to A/V use.)

To get the best out of the AVP1000, you'll need to carefully experiment with the center-channel level in order to get a smooth, seamless soundstage without either overemphasis or a hole in the middle. You'll also need to search for the optimal level for rear-channel information, one that enhances the feeling of space without smearing or confusing the music. The surround modes can't be used without *some* loss of air and detail, so with really good recordings, I would stick to the "Direct" mode and use the "Stereo-Front-Rear" and "Stereo Hall" modes only as a backup.

In A/V applications, the AVP1000 performs very well. Far too many of the mid-fi

**IN STEREO, THE AVP1000
HAS A CLEAN SOUND
AND A GREAT DEAL
OF DYNAMIC ENERGY.**

and high-end A/V units I audition have digital signal processing circuitry that is noisy (hiss, etc.) at the loud listening levels used for movies, and a few units produce worse effects, such as very low-level high-pitched whines or static breakup. Prolonged listening to the AVP1000 indicated it had very clean Dolby Pro Logic circuitry, and the "Cinema" version of Dolby Pro Logic provides added flexibility with systems using a subwoofer. Overall, the sonic differences between the AVP1000 and other Dolby Pro Logic units in reproducing Dolby-encoded material are relatively minor. I found the transparency and directional information provided by the AVP1000 to be typical of all A/V units with good Dolby Pro Logic chips.

The sound quality of the AVP1000 surpassed that of many Dolby-encoded TV transmissions. Far too often, broadcasters and cable companies seem to alter some aspect of movie-soundtrack information in ways that force you to switch to another processing mode to get the best sound. For example, A&E seems to broadcast all programs with its own special bass equalization, which always sounds unnatural. The *Star Trek* film series, which sometimes has great surround sound effects, usually comes through my local cable service with mediocre sound. Premium cable channels like HBO, Showtime, and Cinemax often fail to properly reproduce the better movie soundtracks. Movies via pay-per-view, satellite dish, LaserDisc, and VHS Hi-Fi are a different story. With these sources, you can usually hear the true quality of the actual soundtrack, as the mishandling by broadcast engineers doesn't interfere.

The original soundtracks can have problems of their own. The vast majority of movie soundtracks treat surround sound as an afterthought, throwing in explosions and random full-scale wars for "drama"; sheer loudness and bass boom are the only

tests for this kind of sound quality. Yet there are notable exceptions, and the AVP1000 does as good a job as any other Dolby Pro Logic unit I have heard in reproducing the forest scenes in *The Last of the Mohicans* and the low-level ambient effects in *Terminator 2* and *Jurassic Park*.

The B & K AVP1000 A/V tuner/preamp is a full-featured, good-sounding unit, offering good value for money. Whether you love it or hate it, however, is likely to be a matter of how you rate its ergonomics. For some users, it will offer a far simpler ap-

proach to controlling an A/V system than the competition, with a host of useful presets that tailor the sound to a given source and application. For other users, it will raise all of the fears they have of VCRs and computers with command-driven systems. The only way to find out which camp you belong to is to test-drive the AVP1000. Be aware, however, that few other units offer significant alternatives to run-of-the-mill audio/video ergonomics. If you are considering breaking away from the herd, you should give the AVP1000 a try. A

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Prometheus—The Myth in Music
(Musical settings by Beethoven, Liszt, Scriabin, and Luigi Nono)

Martha Argerich, piano; vocal soloists and speakers; Berlin Singakademie; Freiburg Soloists Choir; Berlin Philharmonic Orchestra, Claudio Abbado
SONY CLASSICAL SK 53978
CD; DDD; 75:17

Not to be outdone by the pop field, the classical labels are trying a few “concept” albums to bring new ears into their fold. This one is a thoughtful and unique idea spanning over 200 years via four works quite different from one another. The entire concert was taped live in Berlin’s Philharmonie in 1992 and comes on a gold CD.

The Prometheus myth has inspired poets, writers, artists, and musicians for centuries. Poor

Prometheus remains forever chained to that rock, with the eagle picking out his innards because he stole fire from the gods to give to humankind, whom he had originally created out of potter’s clay. Each piece on this CD deals with differing aspects of the Greek myth.

Beethoven used a scenario by Vigano for his lengthy ballet *The Creatures of Prometheus*, which incorporates material he was to reuse in his “Eroica” Variations and Third Symphony. The idea of Prometheus molding mankind both physically (out of clay) and psychically (represented by fire) fascinated the composer. Seven movements were chosen by Abbado for inclusion here.

Franz Liszt’s symphonic poem “Prometheus” began as an overture to a play about Prometheus. Like Liszt himself, Prometheus strides forth as a visionary noted for his

progressive thinking. Scriabin takes Liszt’s idea of harmonies, based on the interval of the fourth, much further in his “Poem of Fire,” honoring Prometheus as the bringer of light. Not only was the work far before its time harmonically, but its score even included a part for a “color keyboard” (that is, a color organ), intended to create an orgy of shimmering lights and color. And it appears to scale ever higher ecstatic orchestral heights during its 19-minute course. Pianist Martha Argerich is the soloist, but this is far from a piano concerto.

Prometheus, the perpetual wanderer, is the focus of contemporary serial master Luigi Nono. Two speakers, a pair of sopranos, an alto, and a tenor join a choir in excerpts from

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The Murray/Lohuis Duo
RAVEN OAR-230, CD; 66:50

Good musicianship carries all before it. This CD disobeys a primary CD law, that specialized “live” recital music does not listen well in the home (or car)—unless for special fans and/or the musicians’ friends and relatives. An unlikely combination here, of a single violin and a late-Romantic church organ (two of them). The music is an organist’s dream in a church-organ world, ranging from Leo Sowerby and Josef Rheinberger to Tadeusz Paciorekiewicz and way stations between. Strangely enough, all this comes forth in a most pleasing way. The violin and organ(s) are remarkably well blended, the interpretations intelligent and musical—though all, of course, are arrangements. You might like it, even the Paciorekiewicz. Excellent miking (Neumann tube) in a difficult venue by one Heinz Pfennig, who, if I read it right, is none other than the violinist here, Robert Murray! The notes say, quite deadpan, he “worked with the artists in every stage of this CD.” He couldn’t do otherwise. *Edward Tatnall Canby*



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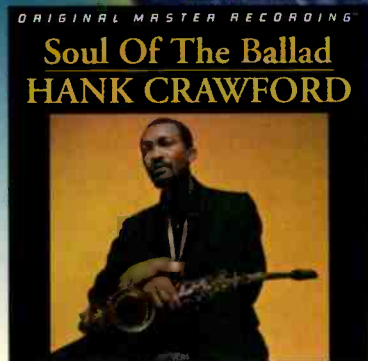
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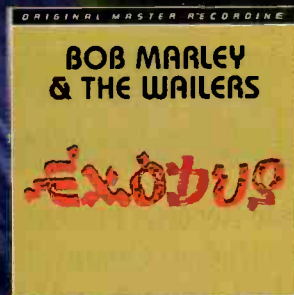
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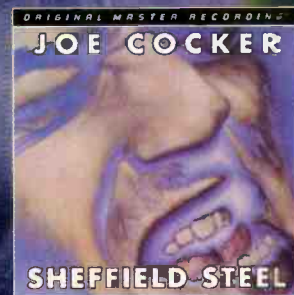
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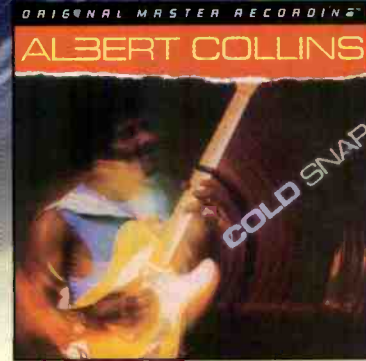
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the 1992 suite, "Prometeo," and a complete libretto is included. Nono adapts Scriabin's ideas about a connection between time and space by using live electronic manipulation. He attempts to create an aural metaphor for wandering—the music seems to circulate timelessly in physical space. The liner notes apologize for how inadequately loudspeaker stereo conveys such information, and suggests listening via headphones. Well, Sony, have you considered Ambisonics, which conveys spatial information beautifully via speakers? Or, if the listener will be wearing headphones anyway, binaural—which does it even better, and without a decoder.

John Suirer

Mozart: The Complete Works for Piano, Four Hands, Vol. 1

Artur Balsam and Genia Raps, piano
ARABESQUE Z6635, CD; DDD; 45:34

In the early days of the LP, Artur Balsam was everywhere. He recorded some 250 works, many for the Concert Hall Society—not to mention the BBC in the Mozart year of 1956. He was often on my own LP player then, and he still performs, impeccably as ever. This is only the first volume of a series, so keep an eye out for more.

Balsam's playing blends perfectly with that of his very much younger colleague here; there

is no way to tell which is which. I suspect that Balsam politely alternates, top and bottom, as is customary in these one-keyboard works. He surely sets the Mozart style, which is wholly of his time and without the slightest self-consciousness; it's just beautifully straightforward.

Four-hand piano is for most listeners an unusual and surprisingly "different" medium from that of the solo piano and, indeed, a much better one on records than on stage, where the cramped proximity of two artists is always clumsy for the eyes. The music was intended for private performance in small spaces.

Balsam, of course, is not of the "fortepiano generation." The instrument used here is the best of the modern sort for the music, a Hamburg Steinway, not to be confused with the very different U.S.A. Steinway. The Hamburg Steinway has a suitably bright tone and a relatively light bass, absolutely right for Mozart. There is one minor problem in its recording here: A loudish resonance in a few of the upper notes.

Included are the F Major Sonata, K 497; the very late Fantasy in F Minor, K 594, and an earlier Sonata in B Flat, K 358—each with three movements.

In 1996, Artur Balsam will be 90. Isn't it amazing how so many pianists can go on and on, retaining finger perfection and adding to it ever greater understanding?

Edward Tatnall Canby

Saint-Saëns, Volume Two

Anthony Roden, tenor; Stephanie Chase, violin; Robert Truman, cello; James O'Donnell, organ; London Philharmonic, Geoffrey Simon
CALA CACD 1016, CD; 78:24

There seems to be some argument as to whether Saint-Saëns composed "as an apple tree produces apples," as quoted in the notes for this record, or as I've always heard it, as a pear tree. Some punctilious musicologist with a large grant could probably track down the composer's French residence and look at the local fruit for clues. Apples or pears, Saint-Saëns did produce vast quantities of easy, elegant, beautifully structured music—if, in the French manner, not particularly profound. Now, with CD, his time has come. "New" Saint-Saëns could keep this series going for decades.

Five works here are for orchestra, one is for violin and cello, and another is the most familiar of all the composer's works, in a rare



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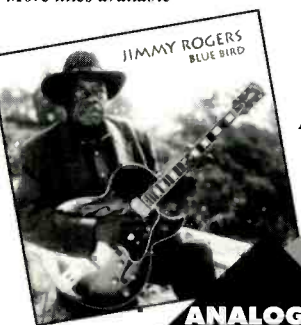
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Chuck Berry. As the musical genre Jimmy pioneered is gaining mass popularity in the nineties, Jimmy's classic guitar work has been heard by millions in television commercials featuring songs such as "Rock Me" by Muddy Waters and "I Ain't Superstitious" by Howlin' Wolf. Jimmy is joined on this album by an all-star group comprised of the legendary pianist Johnnie Johnson who was the backbone of all Chuck Berry's greatest hits, harmonica virtuoso Carey Bell, bassist Dave Myers, drummer Ted Harvey and lead guitarist Jimmy D. Lane.
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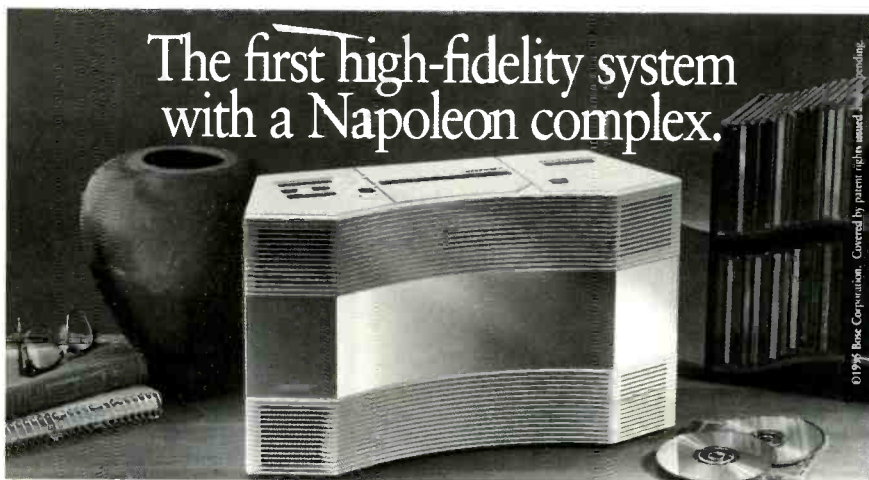
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version for tenor and orchestra—no less than the “Danse Macabre.” It is even more macabre this way than for instruments alone. Another longish work, its first recording too, is an instrumental fantasy on themes from the opera *Samson et Dalila*. The note writer seems to think that was a type of music out of the 19th century; he doesn't remember the endless mid-20th-century Wagnerian fantasies perpetrated by Leopold Stokowski and his imitators! Being French, this fantasy is much less grandiose and, indeed, makes smooth and easy listening, minus voices, the way many people most enjoy opera.

Indeed, this entire long CD is the same—an elegant and mellifluous listening experience, whether familiar music or works never before recorded. But don't count on the Symphony No. 3, “Organ,” for spectacular organ bass. It is there, out of Westminster Cathedral, but modestly and, I might say, correctly, a solo element in a continuous four-part symphony. The work, incidentally, was composed for this very orchestra (or its great-grandparents, who played in 1886) and had its premiere in London before Paris heard it.

Never forget that there is no orchestra better for French music than an English one, easily true for more than a century. Talk about the Chunnel!
Edward Tatnall Canby

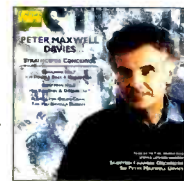
Peter Maxwell Davies: Strathclyde Concertos, No. 7 (For Double Bass and Orchestra) and No. 8 (For Bassoon and Orchestra); “A Spell for Green Corn: The MacDonald Dances”

*Duncan McTier, double bass; Ursula Leveaux, bassoon; Scottish Chamber Orchestra,
Peter Maxwell Davies*

COLLINS CLASSICS 13962, CD; DDD; 66:16

You remember Peter Maxwell Davies—the erstwhile avant-gardist who perpetuates the glorious tradition of British eccentricity by making his home up in Scotland's harshly inhospitable Orkney Islands, about as far as British soil extends toward the North Pole.

Maxwell Davies' current music remains obdurately atonal but sounds no more forbidding than, say, the late music of Alban Berg. These two concertos, Nos. 7 and 8, afford their accomplished executants plenty of opportunity for display—the bull fiddle as a lyrical sort of bass cello, the bassoon as the woodwind section's cutup. The third work, “A Spell for Green Corn,” derives from an ancient Orkney tradition of having a fiddler traverse the fields in early springtime, invoking a plentiful harvest. High marks for both performance and recording. *Paul Moor*



PART ONE – MULTIPLE CHOICE

Wilhelm Stenhammar: The Two Symphonies; The Two Piano Concertos; Two Sentimental Romances for Violin and Orchestra; Serenade for Orchestra; miscellaneous, mostly orchestral works

*Love Derwinger, piano; Cristina Ortiz, piano;
Peter Mattei, baritone; Ulf Wallin, violin;
Gothenburg Concert Hall Choir; Gothenburg
Symphony Orchestra, Neeme Järvi;
Malmö Symphony Orchestra, Paavo Järvi*
BIS CD-714/716
Four CDs; DDD and AAD; 5:08:26

This packed package has only three catalog numbers, but it consists of four CDs (the fourth is a free bonus) plus a comprehensive note booklet. Stenhammar (1871 to 1927) was one of the most significant Swedish composers, a concert pianist, and conductor. Most of his music reflected a Wagnerian model, but his great merit was as a national composer. He absorbed and transmuted authentic folk melodies so that in his scores, they became part of the musical fabric—not just quotations.

This boxed set offers much music to discover, in splendid performances and sonics. Both symphonies are lovely and accessible late Romantic works. Several top conductors have championed the early Symphony No. 1 in F Major. While the shadows of Wagner, Bruckner, and Brahms hover over the work, Stenhammar's simple directness and energy come through. In the Symphony No. 2 in G Minor, he was consciously trying to avoid the Wagnerisms and make his own way in the symphonic world. The giant double fugue of its final movement may remind the listener of Bruckner. These two selections were recorded at live performances in 1982 and '83 (and have a warmer, more musical sound to my ears), but the rest are of recent vintage.

The score of the youthful Piano Concerto No. 1 was only recently discovered in the Library of Congress. Its 46 minutes display a variety of influences (Saint-Saëns, Schumann, and Brahms are quoted in the notes), which gives the piece a conservative ring. But its streak of "Scandinavian, blond Romanticism" recommends it as a welcome alternative to yet another tired Grieg or Tchaikovsky concerto. The Concerto No. 2 is shorter, and its four movements flow as though one.

Stenhammar's Serenade for Orchestra, considered not only his greatest work but by some the greatest Swedish orchestral work ever, is the remaining major item. This essentially national work shows his subtle and ingratiating use of folk-song materials. Sten-

hammar enjoyed travelling to Italy and composing there; hence the liner notes refer to this piece's "southern temperament combined with Nordic dreaminess." Some of the six movements have frenzied and brusque moments; others show the composer's capacity for profound tenderness. The elegant Serenade cannot be accused of aping Wagner, Brahms, or anyone else. *John Sunier*

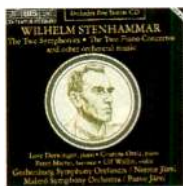
Schubert: Schwanengesang

*Wolfgang Holzmaier, baritone;
Imogen Cooper, piano*
PHILIPS 442 460-2, CD; DDD; 76:55

In the April issue, I compared Thomas Hampson to Dietrich Fischer-Dieskau. Wolfgang Holzmaier's sound and style are actually a lot closer to Fischer-Dieskau's than Hampson's are. A canny understanding of his own limitations lets Holzmaier work comfortably within them, achieving great variety, drama, and expressiveness without ever taking the admittedly exciting sort of vocal risks that Hampson seems to savor. As a result, this is an exceptionally satisfying, well-managed version of the *Schwanengesang*.

Like Peter Schreier's fine account on London, this one pieces out the Heine and Rellstab songs that were published, post-mortem, as Schubert's "Swan Song" ("Schwanengesang") with selected songs to texts by Johann Gabriel Seidl. Unlike Schreier's selection, Holzmaier's isn't limited to those written almost simultaneously with the Heine/Rellstab canon, but the effect is similar: A full CD that seems all of a piece. Holzmaier polished his sequence during a series of live recitals. One unusual element is the repeat of "Die Taubenpost" (one of the Seidl songs), putting it at both ends of the series, followed in the latter case by the Seidl "Wiegenlied" as a sort of encore. Among the Heine/Rellstab songs, too, the order differs from Schreier's, but every singer and editor seems to have his or her own idea of what order makes sense. Certainly Holzmaier's does.

Much as I respect Schreier's intelligence and musicianship, the Philips CD is preferable because of Holzmaier's unforced ease, his security of phrase, and his freshness of voice. The recording was done in the Vienna Konzerthaus and benefits unobtrusively from its acoustics. A minor caveat: Imogen Cooper is a very good accompanist, but she lacks the ultimate delicacy of touch and the responsiveness of phrase exhibited by András Schiff (for Schreier) or Gerald Moore (for Fischer-Dieskau). Still, the singing is what counts most. *Robert Long*



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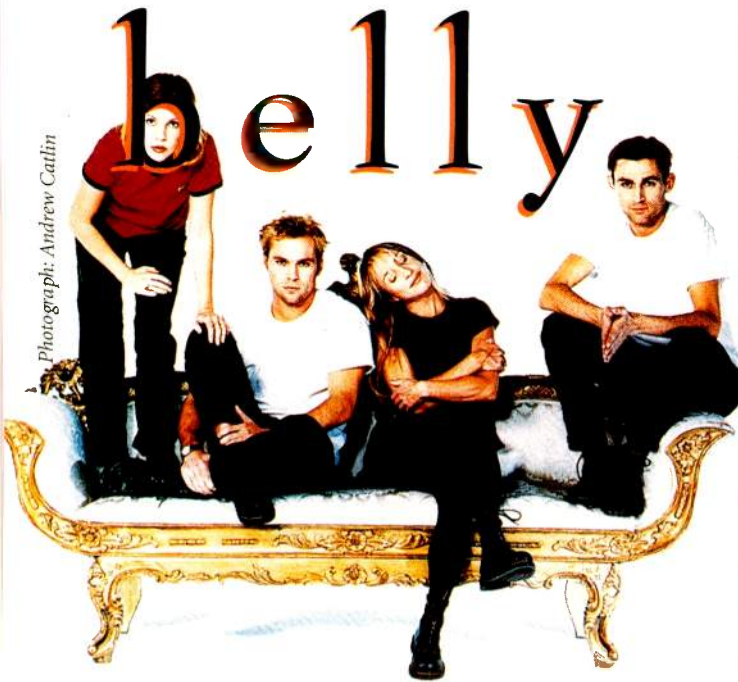
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ANSWERS: 1-E, 2-D, 3-F

ROCK ~ POP RECORDINGS

Photograph: Andrew Catlin



King
Belly

SIRE/REPRISE 9 45833-2, 45:07
Sound: B+, Performance: A-



University

Throwing Muses

SIRE/REPRISE 9 45796-2, 48:40
Sound: B-, Performance: A

belly and Throwing Muses defy one of the paradigms of pop, that when a successful artistic aggregation splits up, the results usually aren't successful. However, when Tanya Donnelly split from the idiosyncratic Throwing Muses—a band led by her stepsister, Kristen Hersh—both parties ultimately thrived, and they have just released their best recordings to date.

In certain respects, Belly continues the formula found on *Star*, its 1993 debut, with plaintive refrains juxtaposed against crushing, anthemic grooves. Donnelly's voice twists and twirls, just at the edge of losing control, over the agitating twin guitars.

Songs like "Puberty," "Untitled and Unsung," and "Seal My Fate" reveal her as still coming of age, wrestling with the endless adolescence of most rock musicians in her themes of spirituality and relationships.

Glyn Johns has found the perfect stage for King. A brilliant producer whose heyday was in the 1960s and '70s recording The Who, The Rolling Stones, and Steve Miller, Johns brings to Belly an atmosphere and a dynamic tension that give these songs a remarkable sense of drama and place.

Meanwhile, back in Throwing Muses, Kristen Hersh has never sounded more assertive. You can hear her influence on Donnelly, but her distinctive twang and growl lend her songs the voice of grizzled experience, as opposed to Donnelly's sideways glance. When Hersh sings "I think I need a little poison" on "Bright Yellow Gun," it's the sound of someone who has been to the edge and occasionally wants to go back.

Hersh seems to be reclaiming her role as a sexual being after a few years of motherhood. There's an aggres-

sive, knowing sensuality and joy that suffuse *University* like a Harley-Davidson cruising down a highway—confident, unassailable. In fact, *University's* layered sound harkens back to psychedelic glory days, with David Narcizo's charging rhythms, Bernard Georges' throbbing trance bass, and a grinding, distended wail of jangled, fuzz, and wah-wah guitars.

While Tanya Donnelly is still seeking truths, Kristen Hersh sounds like she's found them, and her music is all the more authoritative for it. Yet Belly's journey is no less brilliant or intense, and Donnelly is no naif.

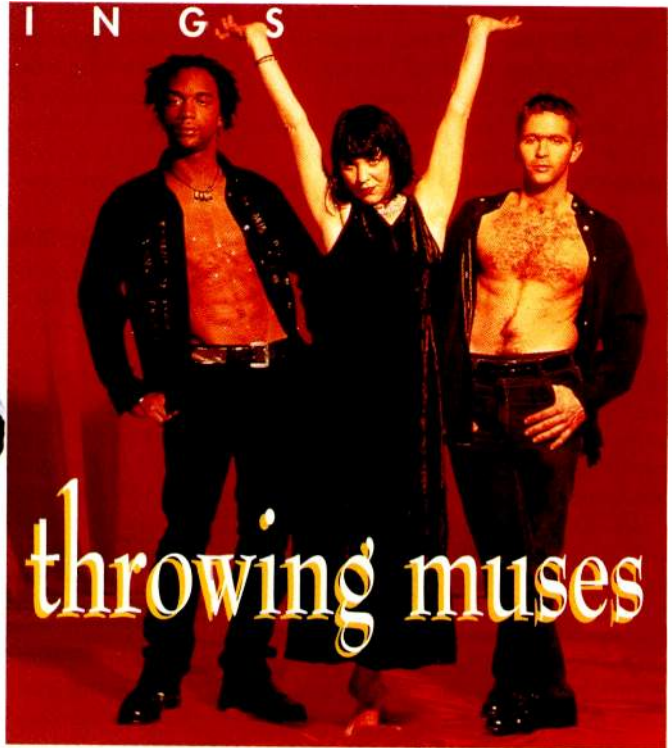
John Diliberto

To Bring You My Love

P J Harvey

ISLAND 314-524 085-2, 42:43
Sound: A-, Performance: A-

Tooling through some early reviews of this album, I imagined glancing to my right and seeing a yellow roadsign that warned: Watch for Rock Critics Falling All Over Themselves. P J Harvey "has ambitions to



Photograph: Steve Gullick

KING CRIMSON



THRAX

VIRGIN V2 4313, 56:39
 Sound: B+, Performance: C+

King Crimson was once the apotheosis of progressive music. Since 1969, the band has evolved, adapted, and mutated until guitarist Robert Fripp, the lone original survivor, supposedly laid it to rest in 1934. But as the '80s wore into the '90s, it became evident that the beast was grumbling.

After half a decade of false starts, King Crimson returns with all its members from the last incarnation—Fripp, guitarist Adrian Belew, drummer Bill Bruford, and bassist Tony Levin—and two new faces, Chapman Stick player Trey Gunn and drummer Pat Mastelotto. Gunn and Mastelotto recently worked with Fripp on his collaboration with David Sylvian, *The First Day*.

Despite the personnel, it's evident from *THRAX*'s first slashing guitar chords that Fripp is looking back even farther, 20 years earlier to the sound of *Red*. Guitars glare and chatter against lurching rhythms, and Fripp even drops in a quick quote from *Red*'s title track. It's as if the band is primed for the Green Day effect, reemerging with an old

sound that a new generation is hearing as if it was brand-new. That's curious, given *The First Day*. That recording also referenced the Crimoid past, but since it utilized techno, hip-hop, and world-beat grooves, it seemed of the moment, with perhaps a toe in the future.

This edition of King Crimson is beset by the same problems as the last one. The earlier group disbanded in acrimony, with Fripp accused of being a control freak while he, in turn, decried the others' lack of discipline and a coherent vision. From the sounds of *THRAX*, those issues haven't been resolved.

On one hand, Fripp conducts aerial bombing runs and tank wars, with guitars ripping at each other like the soundtrack to *Mortal Kombat*. The double-trio approach results in some blistering fretwork between Levin and Gunn and between Fripp and Belew, creating an interweaving of sonic attacks that goes beyond soloing and into an orchestration of chaos. Why two drummers are needed when one of them is Bruford isn't clear, but this is where King Crimson reaches near-euphoric heights of Sturm und Drang, making Metallica seem like John Denver on Prozac.

On the other hand, when Belew sings, it's a completely different band. Borrowing from The Beatles' "Don't Let Me Down" for his "Walking on Air" and The Temptations' "Ball of Confusion" for the R&B-inflected "People," the song side of this band has never seemed more at odds with its instrumental counterpart. It's as if axe murderers had taken up residence next to a sweet, quirky pop tunesmith.

Expectations will continue to run high for the new King Crimson. As Fripp once said about his experience in the last edition of the band, "It's good, so it's not that bad, which makes it worse." *John Diliberto*



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remake rock 'n' roll," said *Rolling Stone*. "This year it's P J Harvey's turn to save rock 'n' roll," said *Musician*. Gee, thanks for the overdrawn Big Pic-

tures. *To Bring You My Love* is far more interesting when you consider its details. The condemned howl of the title track, the cornered drone of "I Think I'm a Mother," the sweet, distant backing harmonies and sick whispers of "Down by the Water": Not since Peter Gabriel's late Genesis and early solo work has an artist manipulated the singing voice so dramatically. Sometimes, there's artificial distortion as well, part of a production strategy that emphasizes the grotesque but still impresses with its variety, most striking in the transition from buzzing, bashing mechanics ("Meet Ze Monsta") to pulsating bass and natural drums ("Working for the Man"). It's a rough spectacle that sounds over-the-top through speakers. With headphones on, nuzzled next to Harvey's asides or surrounded by thrash, you won't care whether she saves rock 'n' roll; you'll just hope she can get out of her own tortured music alive.

Ken Richardson

The Finer Things

Steve Winwood

ISLAND 314-516 860

Four CDs, 5:12:03

Sound: B+, Performance: C- to A+

Although he's recently been the target of critical barbs, there are few survivors of 1960s rock 'n' roll as talented as Steve Winwood. His instrumental expressiveness is undeniable, his voice one of nature's great gifts, and when writing in tandem with a competent lyricist, his work can be of genius caliber. But *The Finer Things* is only a fair compilation of Winwood's vast work, a little short on the rarities and weighted too heavily in favor of his solo work. It feels intended for those who discovered Winwood late in his career, as happened with the Eric Clapton *Crossroads* box.

The only previously unreleased tracks are two live cuts from Blind Faith and an alternate electric take of "Can't Find My Way Home," which is nice to have. Of the balance, the only rarities are two tracks from a blues compilation called *What's Shakin'*—on which Winwood delivers one of his purest and most inspired blues performances, backed by a

Clapton-led session band credited as Eric Clapton and The Powerhouse.

On Winwood's earliest recordings, with The Spencer Davis Group, he's heavily into blues and R&B, with Ray Charles as his presiding guru. When Jimmy Miller took over production chores from future Island Records founder Chris Blackwell, the band's records were transformed with lots of percussion and excitement, forging a style far more distinctive and less singularly derivative.



With the formation of Traffic, Winwood's recording process began to resemble less a recreation of the live experience than a creative outlet unto itself. A few years later, the Blind Faith project with Clapton would show Winwood reverting to use of the studio to recapture live performances.

With the mid-1970s dissolution of Traffic, we arrive at the controversial part of Winwood's career, the solo records, considered by many to be a major disappointment from a

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Wildflowers

Tom Petty

WARNER BROS. 9 45759-2, 62:48

Sound: A, Performance: A-

Let's be upfront about this: *Full Moon Fever* was fine, but *Wildflowers* beats it by a mile. The rally-cry choruses and buffed-up Jeff Lynne sound of *Fever* have been replaced by thoughtful writing and a Rick Rubin production that sharpens each instrument and gives it space. The closest thing to a Heartbreakers song is Tom Petty's collaboration with Mike Campbell on the rousing "You Wreck Me"; more typical of this album is their other track, the regretful duet "Don't

Fade on Me." All remaining songs are written by Petty alone, and it's clear he has crossed a threshold into a new maturity, whether he's offering his sweetest postcard ("Wildflowers") or broadest slowburn ("House in the Woods"), whether he's sketching sentiments in "Crawling Back to You" or completing a sad story in the two-stanza gem "To Find a Friend," a ballad in the purest sense of the term. There are no grand statements here, just well-chosen words complemented by music that delights in the beauty of a country-lane simplicity. **Ken Richardson**

first-rate talent. Winwood nevertheless continued to grow as singer and musician, particularly on *Arc of a Diver*, where he played every instrument. Hopefully, someday, Winwood will find a wordsmith with something more to say than greeting-card sentiments or self-help musings. Nonetheless, at least half of the music on *The Finer Things* is among the best to emerge from Britain in the '60s and '70s. And that's a pretty good track record, folks.

Jon & Sally Tiven

Alien Love Secrets

Steve Vai

RELATIVITY 88561-1245-2, 33:28

Sound: A, Performance: A

Structural Damage

Steve Morse Band

HIGH STREET 72902 10332-2, 43:03

Sound: A+, Performance: A

With *Alien Love Secrets*, his third project for Relativity, guitarist Steve Vai returns to god-like form after the surprisingly underwhelming *Sex & Religion*. The main reason for this triumph is that Vai just shuts up and plays his guitar (to paraphrase his mentor, Frank Zappa). There's no attempt here to compete in the pop



market with vocal tunes and accessible forms. The rampaging leadoff track alone, "Bad Horsie," is enough to blow the gates off Vai's last outing.

Vai's choice of notes over the changes to the affecting metal ballad "Die To Live" is tasty and unexpected. His sense of humor, an element of his work since his Zappa apprenticeship, is very much present on "Ya-Yo Gakk," an edgy rocker built around some melodic fragments sung by Vai's two-year-old son, Julian. And the sheer speed Vai displays on "Juice" is awesome, put across with a nasty attitude.

The intensity peaks on "Kill the Guy with the Ball," a stunning marriage of speed-metal bombast and disciplined unison lines. But the real gem is "The Boy from Seattle," Vai's heartfelt tribute to Jimi Hendrix. The lyrical octave work and buoyant rhythm playing, a less flashy part of Hendrix's repertoire, capture Jimi's spirit in an understated, respectful fashion.

Steve Morse, another perennial poll-winner, has drawn a solid audience for his highly intelligent and ballsy instrumental music. His sixth solo album and first for High Street features his fabled chops in familiar territory: Celtic folk songs, bluegrass breakdowns, raunchy rockers, and heavy-duty guitar



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See Part I of the exam on page 85 and
Part II on page 87.

concertos, with a touch of classical thrown in for good measure. On *Structural Damage*, he delivers all of this with heroic conviction and typically flawless execution.

The sound of this album is superb. Morse's lead lines ring out like church bells, sometimes ping-ponging in the mix for an interesting call-and-response effect. And the layers of acoustic and electric "guitarchitecture," which he builds through meticulous overdubbing, create a tightly woven texture. "Good To Go," with its demanding unison lines with bassist Dave LaRue, has a distinct Dixie Dregs feel to

it, while the lyrical ballad "Dreamland" has a more restrained, jangling quality that recalls vintage Byrds.

There's a kind of classical majesty to "Rally Cry," while "Native Dance" goes for the jugular with tough, jabbing Keith Richards-type riffs. Morse and LaRue, who by now have forged a near telepathic chemistry, perform a beautiful baroque duet for acoustic guitar and bass on "Slice of Time." Then they take it to the stratosphere on the aggressive title track, with Van Romaine's throbbing double bass drums urging them on. *Bill Milkowski*

FAST TRACKS

american highway flower: *dada* (IRS 8 27986 20, 58:48). The dada universe consists of many shadows and light, apparent in pop-ish, hook-driven, harmony-laden songs that convey a message of Gen-X desperation and Limbaugh-esque narcissism. Their accessible melodies and subdued anger nevertheless coexist with a lean but muscular trio sound that's sophisticated and satisfying. **M.W.**

The Test of Time: *Happy & Artie Traum* (Roaring Stream 201, 41:56). Happy and Artie Traum haven't done an album together since the mid-'70s, but on *The Test of Time* they pick up without missing a beat. It's glorious. Players include their Woodstock friends, such as Rick Danko, Richard Crooks, Richard Bell, and Howard Levy. A thoroughly delightful album of organic, living music. (P.O. Box 413, Bearsville, N.Y. 12409.) **M.T.**

If the Phone Don't Ring: *Paul Barrere* (Zoo 72445-11006-2). Little Feat guitarist Paul Barrere plays a mean slide guitar. Unfortunately, it's used only sparingly on this compilation of previously released solo material from the early '80s. Some of this stuff (the disco-fied "Real Lies" and the drum machine on "Rockin' Shoes") feels somewhat dated, but Barrere rocks tough on the Stones-ish "Fool for You" and conjures up a familiar Allman Brothers vibe on "Fortune Cookie." Feat fans still hungry for *Dixie Chicken* may want to pick this one up. **Bill Milkowski**

Squeeze This!: *Those Darn Accordions!* (Flying Fish FF 70627, 42:57). Those Darn Accordions! hail from San Francisco, where their brew of high camp and good-time fun has made them a legend. They are eight accordions with bass and drum accompaniment, and their high-energy album combines great chops with clever material, executed with verve and wit. The album starts with a cover of Grand Funk's "We're an American Band," rewritten as "We're an Accordion Band." There also are covers of Jimi Hendrix's "Fire" and Elvis Costello's "Pump It Up." Originals like "The Story of Lawrence Welk" help make *Squeeze This!* a left-field gem. **M.T.**

Dance Naked: *John Mellencamp* (Mercury 314 522 428-2, 29:30). Major points awarded for the punchy, stripped-down, "cold water on the face" sound and some tight new songs. Major points off for the skimpy playing time at full list price. **M.T.**

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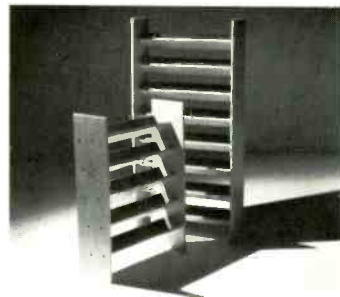


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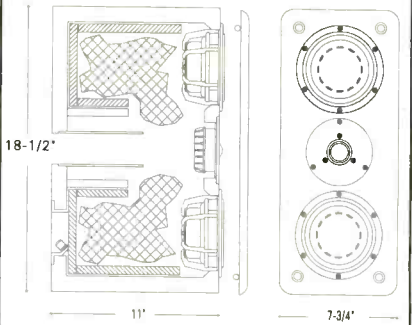
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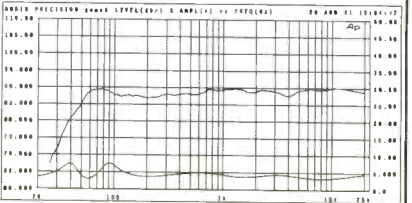
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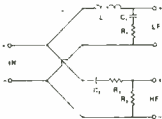
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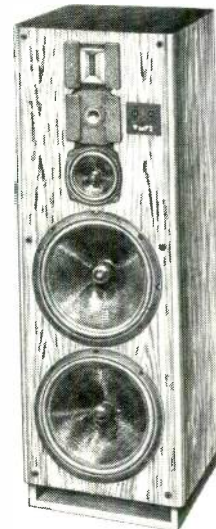
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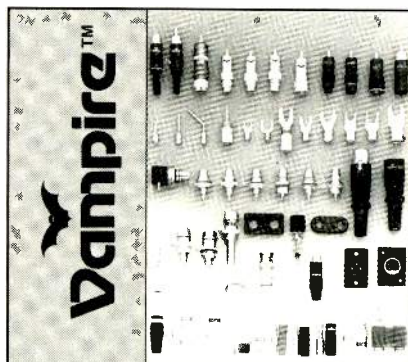
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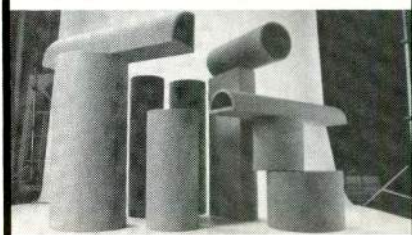
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PlayBack

HAFLER P1500 AMPLIFIER

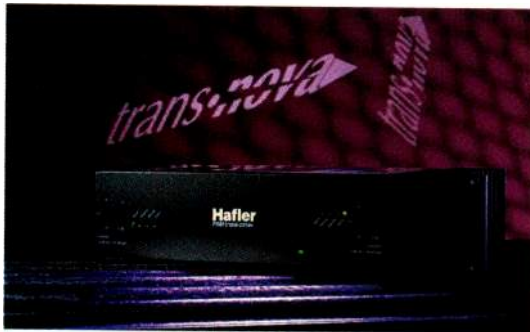
Judging from the impressive 75-watt/channel professional P1500 amp, it is unfortunate that Hafler has backed away from the consumer audio market, concentrating instead on the pro end of the business. The good news, however, is that if you really want a P1500, you can find it at many pro audio outlets. And at \$549, this amp is a bargain, offering Hafler's TransNova solid-state technology, which aims to provide the detail and the lack of harshness of tube amps while maintaining the bass and treble extension of solid-state units. The P1500's sound was very open and detailed, especially with jazz and classical music, and the bass closely rivalled that of my \$2,000 solid-state amp.

Feature-wise, the separate level controls and LEDs are a nice touch. Since the P1500 is a rack-mount pro amp, the rack ears may not be to everyone's liking, and the connectors are ¼-inch and XLR only (adaptor cables with RCA jacks are available, though). Stick-on, nonabrasive feet are supplied, so you can stack the unit on top of other equipment. **John Gatski**

For literature, circle No. 120

"PlayBack" mini-reviews are the result of short, sweet, and sometimes deadly testing by our all-too-experienced editors and writers. These hands-and-ears-only write-ups may look like new product announcements, but the grades and text reflect what the reviewer thought after less than an afternoon's "honeymoon."—E.P.

GRADE: A



GRADE: B+

SUTHERLAND A-1000 MONO AMPLIFIER

Looking much like a scaled-down passenger car in a bullet train, the Sutherland A-1000 mono amp (\$18,000 per pair), at about 10 inches x 5 inches x 26 inches in sleek, sculpted aluminum, makes serious aspirations to the state of the art in solid-state design. Designer Ron Sutherland stressed "tonal balance and effortless dynamics" as top goals in fabricating this statement of industrial and artistic ingenuity. Each amp uses 20 N- and P-channel output MOS-FETs, weighs 90 pounds, and has but one set of binding posts for speaker connection. Inputs are single-ended, RCA-type phono jacks only.

GRADE: A

In listening tests with Wilson Audio Specialties' Watt 3 and Puppy 2 loudspeakers and a Jadis JPL preamp passing the signal into a pair of the Sutherland A-1000s (which promise 400 watts rms into 4 ohms, 200 watts into 8 ohms), a magnificent, minutely detailed panorama of musical events both large and small was displayed, with a seductive hegemony pervading the overall playback experience. For the consideration of the booted and horsed, as it were, Sutherland offers what might be the best amplification available for driving power-hungry speakers. Top-flight source components, definitely recommended.

John Hallenborg

For literature, circle No. 121

AUDIO-TECHNICA ATH-P5 Portable Headphones

I will say right up front that I do not like most of the cheaper headphones that come bundled with Walkman-type gear or are sold separately for about \$30. Usually, they have no bass and are rather thin-sounding. That said, I can recommend the ATH-P5, which retails for \$29.95 and is street-priced under \$20. This small, open-back design may look kind of fragile, with its plastic frame and foam earpads, but the 40-mm-diameter neodymium drivers help make this a nice-sounding headphone. It has respectable bass, good transient response, and smooth midrange—especially with CD portables. The ATH-P5 will, however, overload if you turn up the bass too much. But what do you expect for \$20? The only thing I don't like is the cord, which, at 3½ feet, is too short. Despite the vulnerable look, these 'phones held up quite well in air travel, and since they are an open design, the 100-dB sensitivity came in handy in the noisy jet environment.

John Gatski

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