

AUDIO

WHY **2**
SUBWOOFERS?

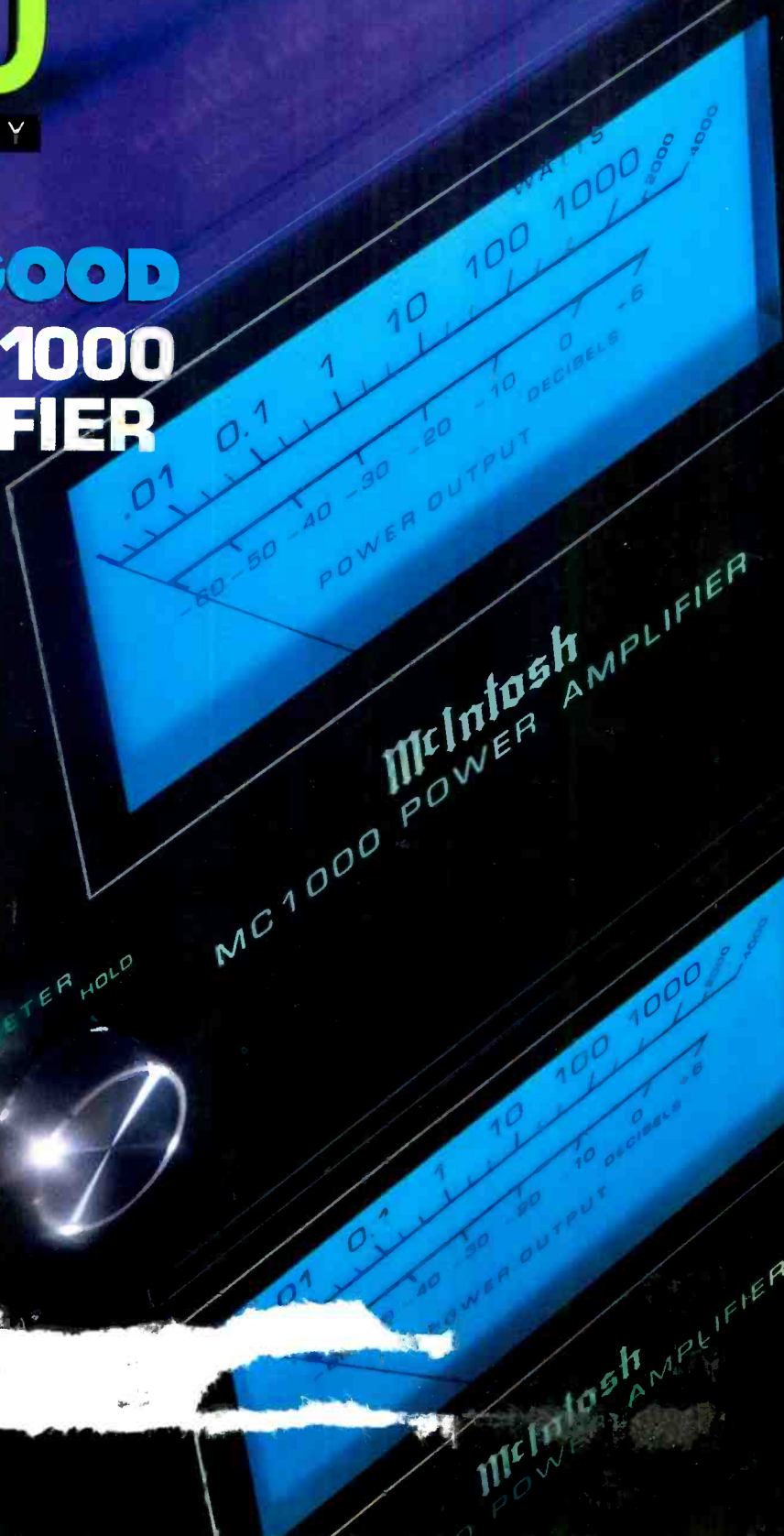
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FEBRUARY 1994

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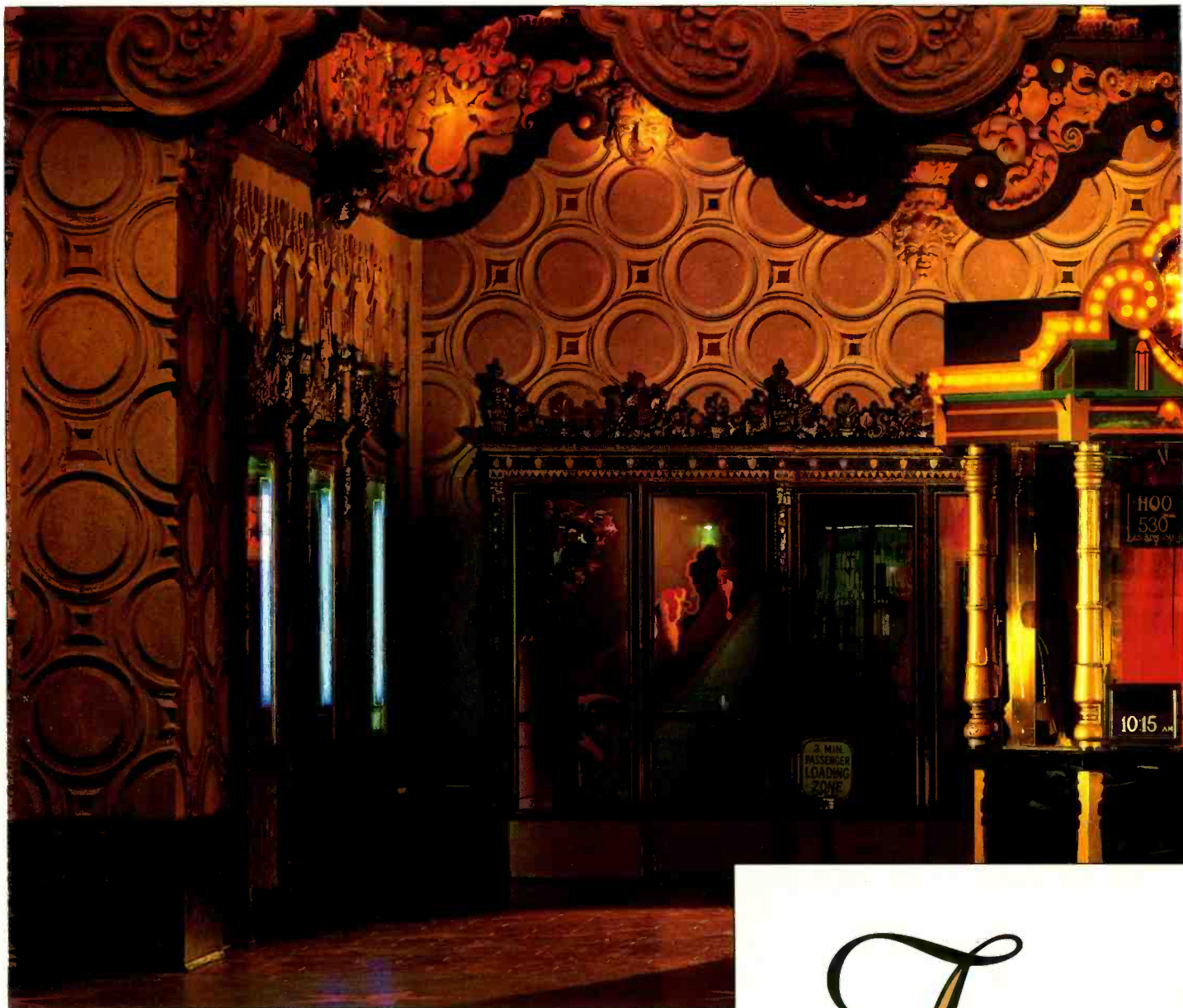
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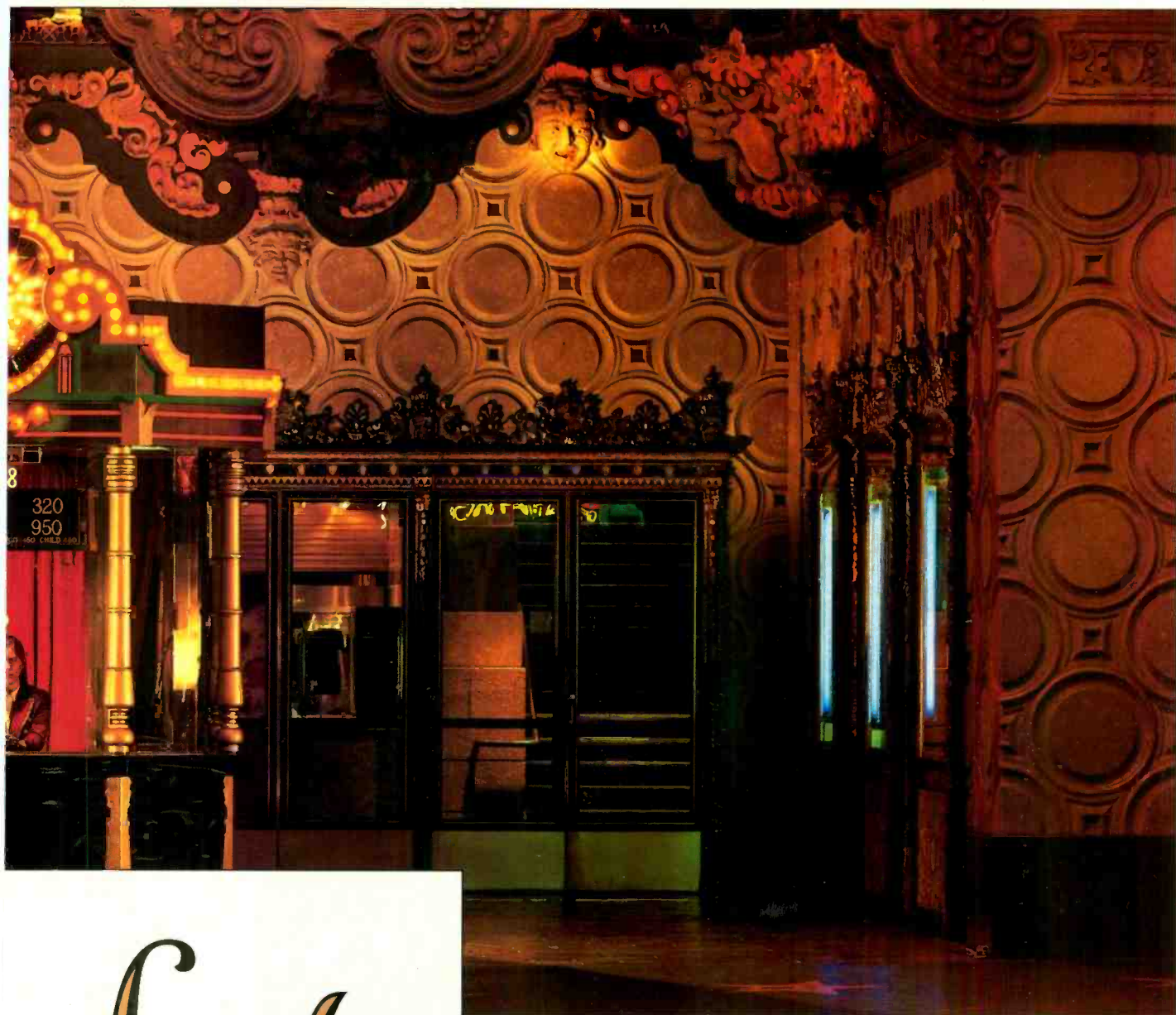
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**THEATER SOUND
FOR YOUR HOME.**

AUDIO



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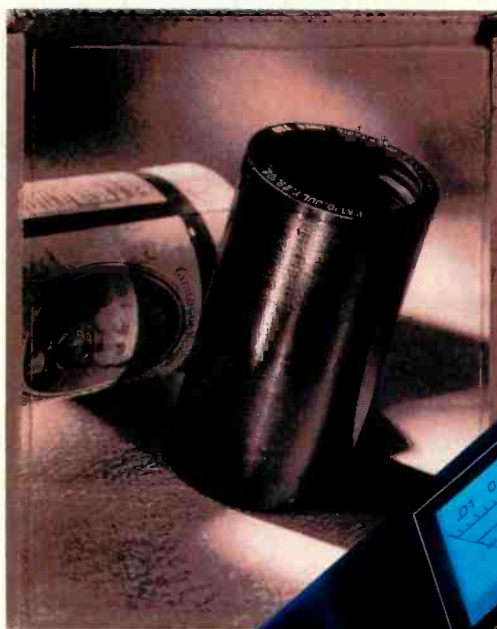
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The Cover Photographer: Bill Kouirinis

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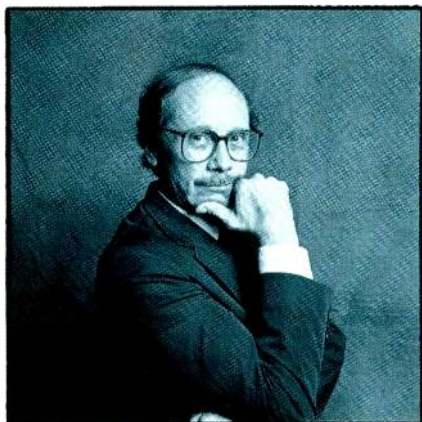
IN THE WALL

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Back in the December issue, I recommended a few CDs that I have been using to test speakers which have come in for potential review. As I mentioned then, such CDs need to have good technical merit so that they exercise some (or, better, many) important parts of the speaker's reproduction—e.g., voice frequencies, low bass, dynamics, loudness. . . . At least as important, these CDs need to be musically pleasant enough that my patience (never mind yours) isn't exercised. The result of having those two qualities is what I think of as a "high reality factor," that is, the CD comes closer and closer to fooling me into thinking that I'm listening to the real thing, and does so for longer and longer periods.

Two key questions here are "How long will the track fool me?" and "Will real sounds, live in the listening room, break the illusion?" Let me answer the first question with another question, "How quick is boredom?" On the second, I'd like to tell you about a set of brass bells from India that I find incredibly effective in shattering sonic illusions, however good the speakers or the signal source.

Space was short in my December column, so a couple of rather decent CDs got left in our overmatter pile (what newspapermen call the Devil's spike; it's where good stories go when there isn't enough editorial guts to savage the ad/edit ratio). To this pair, I'm going to add a few others, and I hope you wind up liking them.

My all-time favorite piano recording is of Bach's English Suites Nos. 2 and 3 by Ivo Pogorelich on Deutsche Grammophon (415 480-2). This man, who must have fingers made of spring steel, sets up one of the most incredibly attention-grabbing musical trains I've ever experienced. It's like a ride on one of the Super Roller Coasters at, say, Busch Gardens. Thanks to Raymond Cooke, formerly of KEF, in England, for suggesting this fine disc. Unhappily, the disc is out of print, so if you find any, buy two—I'll suitably reward you.

Another excellent piano can be found on Reference Recordings' *Mike Garson: The Oxnard Sessions, Volume Two* (RR-53CD). This is jazz and the recording style is different, but never mind that. It is excellent, and you will never get tired of it; at least, I haven't yet.

Ariel Ramirez: Misa Criolla on Philips (420 955-2) has a striking sense of three-dimensionality—from the drum at the back of the church, forward through the chorus, to Jose Carreras, who suddenly appears, singing, in front of you, almost close enough to touch.

There are many fine solo female vocals around on CD these days, but the one I keep coming back to is Sandy Denny singing "Who Knows Where the Time Goes" on Fairport Convention's *Unhalfbricking* (Hannibal/Carthage CGCD 4418). It works on midrange drivers and sometimes on crossovers, while Richard Thompson's wonderful guitar and Denny's beautiful voice give me goose flesh every time.

There're more, but later.

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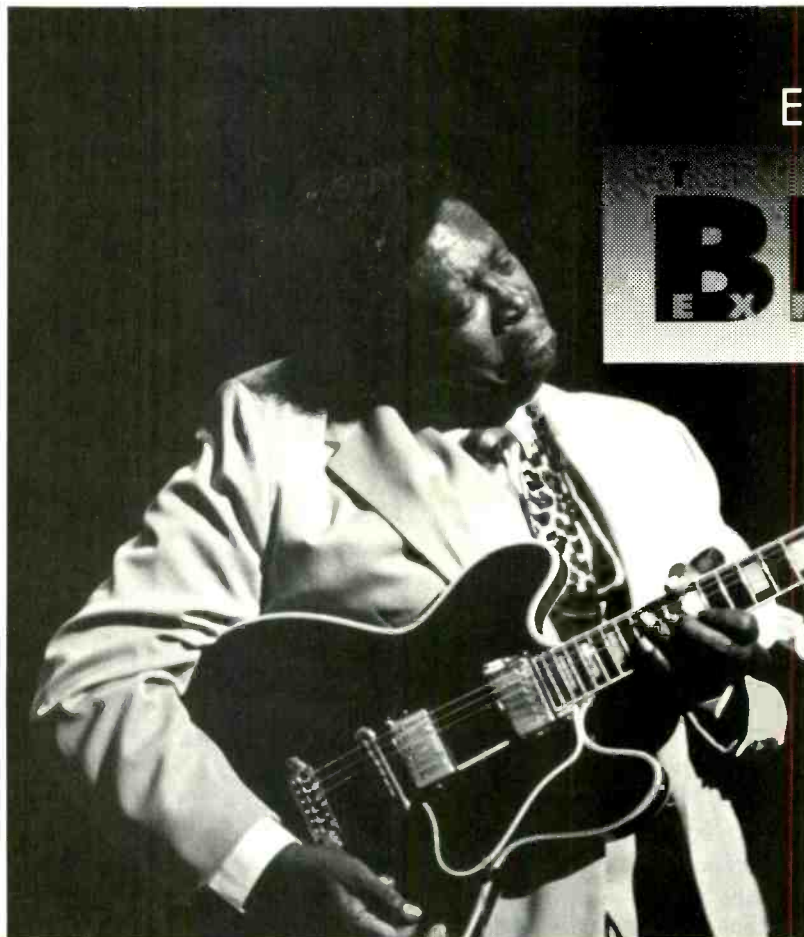
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Classical Chin Music

Dear Editor:

I couldn't quite discern what was bothering Edward Tatnall Canby in his monolog "Orchestrating a Future" ("Audio ETC," July 1993), but I do feel compelled to reply to it. First, the American Symphony Orchestra League is a *management* organization, not a musicians' group, and to judge a musician's sentiments from an ASOL convention is analogous to conferring with a feudal lord to determine the aspirations of his serfs (you can imagine how musicians pronounce "ASOL"!).

Mr. Canby speaks as if "we" are somehow against the hi-fi world. Perhaps he could explain that? I'm baffled. It certainly is true that, for many musicians, however enamored we may be of hi-fi and the recording medium (after all, I do read your magazine!), our hearts are in the live performance. Recordings are a *facsimile* of the living, organic phenomenon of music. Yet despite what might seem to be my purism, I can scarcely imagine a world without recorded music. I am grateful that there are people such as Mr. Canby who push the technical progress of the recording medium to the sophistication we now enjoy. I could wax eternally. Here is a way in which science has changed our lives for the better. But what is Mr. Canby's gripe? He will have a hard time finding musicians averse to making recordings. He would even have difficulty finding musicians who sympathize with the music industry's distrust of Digital Audio Tape.

Mr. Canby also betrays a perplexing naiveté of "classical" music and those who play it. I have devoted my life to the performance of "that" music not because I resist change, not because I care about heritage or tradition, but rather because for me—"that" music is what I am made of. Heritage? Hardly. Mr. Canby has it all wrong. Rather, it is a search for the most profound truth, and whether it is Bach or Chausson or Stravinsky, it is without deference to a time scale. True progress involves deciding whether something new is in fact

better, or just new. I would not deride whatever music Mr. Canby may like. His attempt to ridicule other people's music for what appear to be commercial reasons is hardly clever. I thank him for being a part of the hi-fi revolution but suggest that he learn more about "that" music before pinning it with shallow clichés.

Thomas Suárez,
Violinist
Valley Stream, N.Y.

Author's Reply: Mr. Suárez is reading his own thoughts and assumptions into my article. He asks, "But what is Mr. Canby's gripe?" My express point in comparing two mammoth conventions was that I did *not* have a gripe. Mr. Suárez objects that the American Symphony Orchestra League is a *management* organization, and he implies that musicians do not much like it ("ASOL"!)." Like it or no, the subject of my column was that convention as it stood, and if musicians and management are at odds, then so much the worse.

Mr. Suárez seems to assume that I am no musician and do not understand an artist's deep love for his art. It happens that in this respect I agree with him entirely—being myself a longtime director of *live* classical music as well as a performer. I have as much reverence for *my* music, the great works for voices over past centuries and to the present, as does Mr. Suárez for his own repertory; moreover, I know *his* music as well, though I do not perform it. Is this a "perplexing naiveté"?

Even more absurd is to suggest that I "attempt to ridicule other people's music"! Absurd, considering my lifelong impassioned defense of *any* sort of classical music, *real* music even beyond classical, at the hands of crass commercial interests. Ask the *Audio* management! It might be an ear-opener to hear my curses and swearing when one of our great symphonic organizations advertises itself with brutally mangled bits of *its own music*. This kind of thing happens all too often. So what's the fuss, Mr. Suárez?—E.T.C.

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Dr. Herman Burstein, age 75, whose "Tape Guide" column appeared in *Audio* for more than four decades, died quietly in his sleep last November 6th at his home in Tarpon Springs, Florida.

In addition to writing his monthly column, Dr. Burstein answered hundreds of recording-related queries each year which were sent in response to the "almost free" solicitation at the end of his column. In addition to six books on hi-fi, he also wrote a number of articles that appeared in *Audio*, the most recent, entitled "Impedance, Cables and Treble Loss," in the November 1991 issue. Over the course of his career, he wrote about 200 articles in approximately 10 audio periodicals.

In his professional life, Dr. Burstein taught statistics and economics at Hofstra University's New College, where he was a Teaching Fellow from 1967 until his recent retirement. He earned a B.S. in journalism from Ohio University, where he was on scholarship and graduated *summa cum laude*. After taking an M.A. from Oberlin College, where he was also on scholarship, he earned his Ph.D. in economics from New York University. He was the author of two books, *Attribute Sampling: Tables and Examples* and *Sample-Size Tables for Audit-*

ing and Quality Control, and of several articles on accounting and statistics, as well as 18 computer programs in BASIC for the calculation of various confidence limits and distribution probabilities.

Dr. Burstein's life "improved considerably," according to his son Neil, "when he began his teaching career at Hofstra in 1967, and reached record proportions upon his retirement in 1981. He loved Florida, travelling, playing tennis, writing for *Audio*, and eating Chinese food. Which order is beyond me."

We at the magazine's home office received two warm and revealing letters from Dr. Burstein, discussing his retirement from writing his "Tape Guide" column for *Audio*, and we would like to share portions of them with our readers.

"I have been thinking of resigning from my 'Tape Guide' role for some time—since the day about 30 years ago that I was persuaded to do the column. Why did it take so long? The best explanation is that some things take longer than others. But I'll add a bit.

"Along with the pleasure, there has been work. Relying on the research and writing of others, my own hands-on experience with professional and consumer equip-

ment, a few resource persons, and some reinvention of the wheel, I managed to keep up with tape technology and communicate what I thought I knew. Over and over, I came up hard against the fact that the teacher's first pupil must be the teacher. So often when I undertook to explain something, I found that my understanding was imperfect and had to be rectified. By and large, I believe I coped and was helpful to readers.

"But the technology had changed immensely, what with DAT, MO recordable CD, MiniDisc, LaserDisc, Super Bit Mapping, data compression, etc. I am in my 75th year and don't have the mental energy to keep up. It seems that the column will soon require the knowledge and expository ability of someone like Ken Pohlmann, David Ranada, Len Feldman, or Michael Riggs.

"At such a juncture, one's life tends to pass in review, and I realize that I've had 74-plus lucky years, two fine children, good friendships, good health 'til now, professional success, the joys (and pains) of authorship, extensive travel in the U.S. and Canada, nourishing music, and an awful lot of Chinese food. Certainly one of the most gratifying things has been the 40-year-plus association with *Audio*."

Herman Burstein is survived by his son, Neil, who has two children, Jessica and Matthew; a daughter, Daury, who has a daughter, Morgan, and his close companion, Rosalind Ringer. They—and we—will miss him.

Eugene Pitts

Dr. Burstein with his daughter, Daury, at her graduation from medical school in May 1989.



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Hum? Hmmm...

Q. *I have a buzzing, or humming, in my system. No matter which a.c. outlets my system is connected to, hum comes from all of my loudspeakers. I have reversed the polarity of the wall plugs. I have tried power conditioners. Nothing has helped. I have a good main-channel system, a video system, and an amplified subwoofer, so you see that the hum comes from a lot of loudspeakers. Help!*—Robert Rice, Woodland Hills, Cal.

A. Although I understand that the hum is present in all of your loudspeakers, we do not know for certain if it is the result of power amplifier problems alone or has to do with your preamplifier. Our task, therefore, is to determine just where the hum originates.

To make this determination, first disconnect the preamplifier from the inputs of all power amplifiers. Turn on the equipment as usual, and listen for hum. If the hum is no longer heard, you have eliminated the amps as the source of hum. If, however, hum is still present, it probably has to do with grounding. Most amplifiers are grounded to the house ground via a three-prong wall plug. If you have run an extra ground from an amp to a radiator or water pipe, this will set up a ground loop because of the difference in potential between it and the wall plug's ground. If so, the hum should disappear when you remove the extra ground.

If the hum disappeared when the preamplifiers were connected, chances are that there is nothing wrong with the preamps either but that they have an extra ground connection somewhere. Turn the system off, disconnect all input cables and external grounds, and then turn the system on again; if the hum is gone, the problem is with the components connected to the preamp. See whether any single input cable feeds hum to the preamp; if none does, see what combinations of cables reinstate the hum. (You could have a ground loop between other components in the system.)

Make certain that all signal cables are placed clear of a.c. power cords. And check

that the preamp is not so close to the power amps that it's picking up stray hum voltages from one of the amplifier power transformers.

If your video equipment is connected to cable TV, there may be a ground loop between the cable-drop ground and your house ground. You can isolate the TV cable from the system with an isolated balun, which you will either find commercially or have to construct (see the December 1992 and June 1993 "Audioclinic"). It may suffice to disconnect the cable TV ground; don't cut the cable feed itself, but cut the shield at one end of a short 75-ohm cable and connect that between the feed and your system.

Check the skirts of all interconnecting cables to be sure that they are snug. A somewhat loose connection can result in a small amount of oxidation that will reduce the effectiveness of the ground.

It may be that you have run chassis-to-chassis grounds between preamplifiers and power amplifiers. Disconnect these grounds. Of course, if the equipment is rack-mounted, it won't be possible to disconnect such chassis-to-chassis grounding because it will be produced by the metal rack. You must then disconnect the shield from the preamplifier's output. Ground will be carried via the rack, the system should work well, and the hum should disappear—assuming, of course, that it was caused by the grounding between chassis.

CD with All the Extra Bits

In the June 1993 issue, you said that 16-bit digital recording at 44.1 kHz takes 705,600 bits per second for each channel. Although your basic arithmetic is correct, it could have misled the reader, inasmuch as the question also added "for a CD."

In the basic format you describe, the digital signal would be totally unsuitable for transcribing to a CD. For example, bits have to be added to interrupt long strings of ones (which would cause imperfect tracking) and long strings of zeros (which would saturate the read head)!

It gets even more complex than that. As part of the error-correction process, the audio information is also duplicated, and this, added to the other information on the disc (such as track number and timing), adds up to no less than 4.3218 megabits per second.—Name withheld

Computer-Certified DATs

Q. *Because I could not find blank DAT cassettes in my local audio store, I have been obtaining them from a computer supply company. I get what are called "data-certified" DAT cassettes. These are in 60-meter lengths, which correspond to 120-minute DATs for audio use. I have noticed no difference in audio performance as compared to tapes normally used with DAT machines.*

Recently, computer DAT cassettes have become available in 90-meter lengths—also "data certified." This converts to three hours of recording, and that's great for transferring my 180-minute open-reel tapes to the DAT format. Is this new tape length likely to be inferior to the more common 60-meter length? I have memories of problems with C-120 cassettes because of the thinness of their backings and their reduced coating thickness.—Name withheld

A. The idea of "data-certified" computer tape being housed in DAT cassettes never occurred to me. I am aware that the newer backup systems for hard drives use tape as the backup rather than multiple floppy disks. Computer data is typically backed up daily, which means that the tapes are run daily. If such tapes stand up to the rigorous demands of the computer field, I have to believe that they should be fine for home audio applications, because the tapes won't be used nearly as often.

With 200-megabyte drives becoming quite common, longer lengths of tape have also come along. I have to believe they will be all right for home audio use, given their acceptance in the computer field. Try one or two, giving them some heavy use just to see how they stand up. If they pass your test, go ahead and use them. **A**

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

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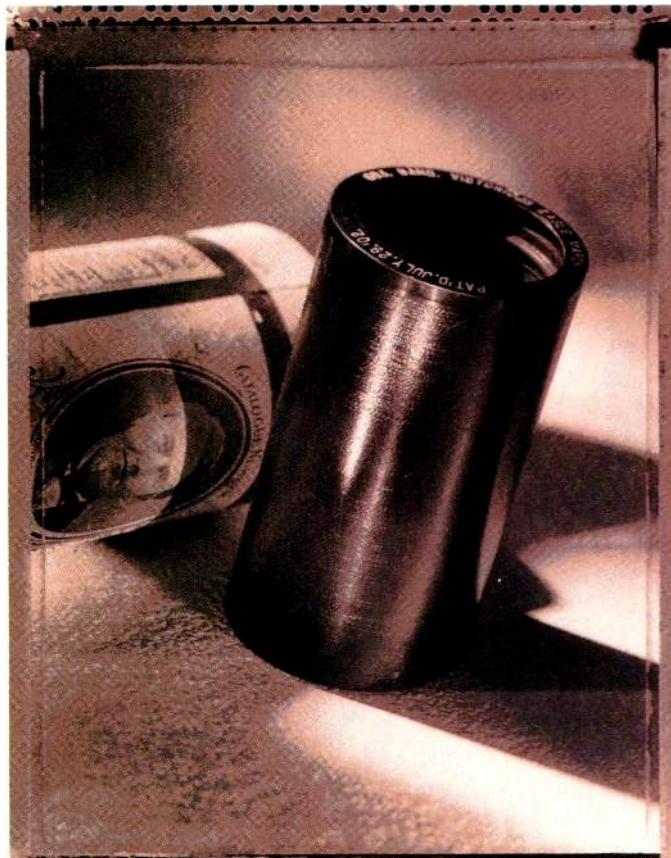
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EDWARD TATNALL CANBY

A NEW SPIN ON BRAHMS



Is the original
Brahms cylinder
lost forever?
Or maybe hiding
in Wisconsin?

As far as I know, Professor of Mathematics Ronald B. Coifman of Yale University has not responded to my challenge in last September's issue: Commercialize ("make available") his Adapted Waveform Analysis version of the celebrated but elusive Brahms cylinder recording of 1889, Brahms himself speaking an introduction and then playing his own music on the piano. Hate to say so, but Prof. Coifman probably does not read our magazine. Though eventually someone will bring it to him. Academic disciplines live in their separate worlds, and ever more so.

Not so our readers. And numerous of my own assorted friends. I am

astonished at how many of these not only know of the recording but have heard it, in one form or another. In a casual conversation at the Canby Singers, where I am now conductor emeritus (hopefully what it says, "through merit"), one of the members casually said, "Oh, I heard that, everybody did, at the Yale music school," which was where she had studied quite some years ago. Then the usual: It was almost unintelligible, terribly noisy, the piano barely audible at all. Then she added something new—Brahms had a high tenor-like voice, sort of nervous. (The introduction, which I still have not heard, includes a greeting to Mr. Edison as well as Brahms' self-identification.) "Well," said I with some

little intensity, "how interesting—but was the recording you heard at Yale *on a cylinder*?" "A what?" she said. I knew then that I wasn't going to get far in that direction. As I say, academic disciplines are isolated. Wrong discipline.

However, my instant thought was playing speed. Excellent chance that the version she heard was playing a bit too fast. Makes the voice not only higher but somewhat hysterical sounding, as many of us know all too well.

Oddly, music, almost any kind, is much less directly affected by slight discrepancies in frequency than speaking voice, so long as the pitch remains steady. Yet a rising or falling pitch is instantly deadly for music, as in any sort of waver or wow. On this score alone, bless the CD! Any direct wow, flutter, or other mechanical unevenness would have to be at the much higher turning speed of the CD, between 600 and 800 rpm—which produces a definite pitched tone, in the low midrange. Have you ever heard such? Not me.

To date, I have now heard of direct auditions of the Brahms in all our older media—78 rpm, LP, actual wax cylinder! Not yet via CD and only by implication from a standard music cassette; people often take a cassette copy for granted and do not bother to mention it. And so confusion merely mounts higher.

One writer, for instance, says he knows he heard a cylinder because of the rapid thumping sound. Well, of course! The original undoubtedly *was* a cylinder. But that thumping would be transferred into *any sort of copy* in a later medium. I doubt if even a Prof. Coifman and Adapted Waveform Analysis could remove all the thumps without an immense and time-consuming effort. He probably did, in his new version.

Then there is AM radio, in the mid-'30s, said to be the source of all the very similar different versions so widely heard today. Full of terrible static and general noise. Yet supposedly a reproduction of the original

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cylinder some 50 years after it was made—it had “turned up.”

This resolves into two factors. First, did that cylinder itself produce all the static(?) and distortion? Maybe. Maybe not. Second, even in the '30s radio station personnel could make a reasonably quiet and accurate “dub” of a cylinder they intended to broadcast, either for the record, so to speak, or possibly for later use. Any static, then, would necessarily occur in an outside recording, probably amateur, and at a considerable distance from the AM station. Or perhaps in a thunderstorm?

An 1889 Edison cylinder, made as a demo for presentation before such as Kaiser Wilhelm of Germany and other notables, would have, fresh and new, produced a fairly impressive sound. Certainly not full of noise, the sound we invariably hear today. Did Brahms make more than one demo? Accurate copying was not possible for years after that date. Even Roland Gelatt has no information on this in his 1954 book, *The Fabulous Phonograph*. It is possible that Brahms made a number of cylinders, all more or less identical but *separately performed*. That, remember, was the way hundreds of commercial cylinders were then made, right up to the end of the century. It would have been normal. Would not at least one of these multiples have survived the demo procedure, for preservation in a reasonably playable state—not the uniformly noisy reproduction we now always hear? Was it one of these that “turned up” in 1935 and was played on the AM air in Germany? It could have sounded much, much better than anything we now inherit. *Did it*—in the station itself?

All in all, the excessive noise and unintelligibility would seem more and more to be an artifact, as they say, of disastrous later transfers rather than the actual sound of a surviving cylinder. Even including the “melt,” or softening, of the wax that is said to have existed in 1935, a “flat” that would indeed have both thumped and altered the pitch. That, at least, makes sense. Decades of storage without moving would perhaps develop that kind of a problem.

I have, since September, thought again of another and reasonable possibility—pantograph copying. This was the *only* way a single cylinder could be copied onto another cylinder—but what a farce! Clum-

sy operating arms, like those used for copying a drawing, activating a tiny stylus on a second cylinder. Yet it was done, definitely. Perhaps, at some point within the next decade or so, the original, or one of the separate originals, was to be copied off by pantograph? Lacking any better way, it could have been done. Lo—a cylinder with Brahms on it. But of atrocious quality.

Could it have been a *pantograph copy* of the original, then, or one of the originals, which after some 50 years turned up in Germany and was grabbed for public broadcast on AM radio? And then taken down off the air somewhere else, as above? The 1935 78-rpm disc seems to be the source of all the Brahms we now hear, in various formats and widely separated locations. This, I think, is as reasonable an explanation as any you will find.

**ACADEMIC DISCIPLINES
SEEM TO LIVE IN
THEIR SEPARATE WORLDS,
AND EVER MORE SO.**

Now for the clincher—but first note that the Yale Adapted Waveform reconstituted version from Prof. Coifman was also made from a 78-rpm disc original. Note that the Yale School of Music had the recording quite some years previously, as per my friend in the Canby Singers—and Prof. Coifman in his work was in touch with the Yale music people. Very likely theirs and Prof. Coifman’s is one and the same disc?

Other sources of the sound, ever so clearly the same noisy version, have come from all over. Mark P. Fishman of Arlington, Mass. remembers hearing it over a Boston FM station, either Harvard’s WHRB or Boston University’s WBUR. More interestingly, he notes that there was an LP version, part of an historical piano recording from the International Piano Library, now the International Piano Archives (IPA). Alas, there was a tragedy—their archival collection was destroyed by fire. Including whatever Brahms they had? I’ll bet it was that same old 78-rpm disc again. It must somehow have been published, in all its hideousness.

So, now, how about this? An actual cylinder in, of all places, Cal Tech in the 1980s. John T. Fourkas, now in the Department of Chemistry at MIT (see what I mean about disciplines?), worked in a chem lab there. I quote his own account:

Our group worked in close association with the Nuclear Magnetic Resonance facility, the administrator of which was a huge Brahms enthusiast. Every spring . . . he would hold a Brahms birthday party, complete with cucumber sandwiches and musical performances with some of his friends. His favorite highlight of the event, however, was pulling out this old cylinder that actually had Brahms speaking on it, and playing it quite a few times. Needless to say, the words were the very ones mentioned in *Scientific American* and in your column. . . .

Now please note this, which followed: “The recording was old and very scratchy *but the words were clearly intelligible, as was the music* [my emphasis]. As I mentioned, I had always assumed . . . that the cylinder was some sort of copy, but perhaps this fellow had the original, unwittingly or not.”

By golly, I think he did! This is clearly *not* the same old noisy and unintelligible version, probably from the 1935 disc, that is so widely distributed. It sounded precisely as an original, old and much played but intact, *would* sound—both words and music intelligible.

As for me, I’m just going to sit and see what happens. Something surely will—Mr. Fourkas adds the following clues as to where that cylinder might now be: “I have lost track of the person who owned this recording, but I can tell you what I know of him. His name is Janes Yesinowski, and he left Cal Tech in 1986 or 1987. . . . As far as I know, he went to the University of Wisconsin to head the NMR [Magnetic Resonance] facility there. He may well still be there, or else the University may know how to find him. Otherwise, I would assume that he could be tracked down through the American Chemical Society.”

Chemical Society! Magnetic Resonance! Again, would Brahms be baffled. Is anybody out there game for a search, particularly you Wisconsin readers? **A**

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BERT WHYTE

At the May 1979 Los Angeles Convention of the Audio Engineering Society, the Department of the Arts of UCLA held a conference on "The Revolution in Home Entertainment," presented in cooperation with the AES and *Audio* magazine. Demonstrations of cutting-edge technology in audio and video were given, and a panel of experts commented on various developments and offered their views on future technological advances. Panelists included colleagues John Earle and the late Richard C. Heyser, wearing his Jet Propulsion Laboratory hat; Emil Torick, Director of the CBS Technology Center; film special-effects engineer John Dykstra, who won an Oscar for his work on

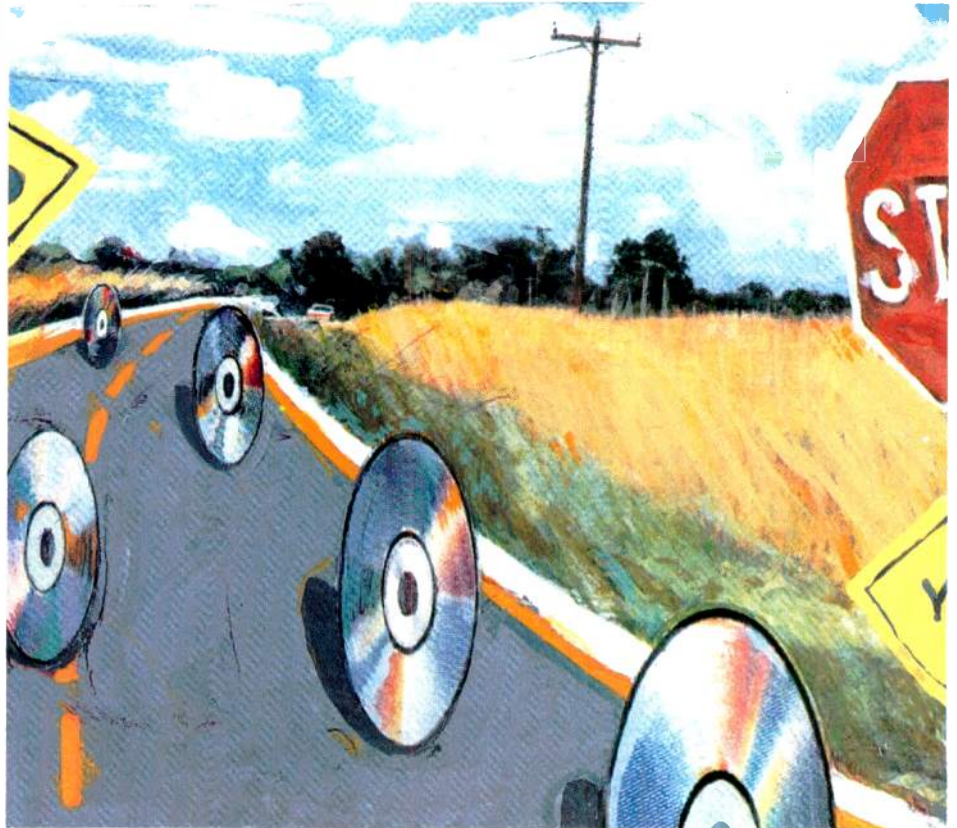
**THE TANTALIZING
PROSPECT OF
A COMPUTER-LINKED
WORLD IS ONLY NOW
EMERGING.**

Star Wars, and yours truly. We envisioned an electronic world linked by computers in every home, with interactive services available for various audio and video entertainment, as well as for communication, education, banking, home shopping and marketing, medical services, and a host of other areas.

In the nearly 15 years since that UCLA conference, much of the futuristic technology postulated by the panelists has become reality. Probably the seminal development has been the introduction of digital technology, not only for audio, but in many other disciplines as well. Notwithstanding the tremendous advances in computers themselves and related computer sciences, the computer-linked electronic world remains a tantalizing, fascinating prospect, one that is just now beginning to emerge.

Illustration: Mary Schuck

GEARING DOWN THE SUPERHIGHWAY



There has been much political tub-thumping about the necessity for establishing an "information superhighway," which would stimulate high-tech, high-wage job opportunities—one of the Clinton Administration's most cherished therapies for the layoffs and restructuring that so sorely afflict a great deal of American industry. The world of high finance is an arcane one indeed, and most people know very little of its intricacies. Recently, though, because of massive media coverage, many people became aware of the high-stakes takeover

battle that has been fought for control of Paramount Communications. The battle has raged for many months—and one of the most aggressive soldiers on the field, Barry Diller of the QVC home shopping network, has fought hard to have his \$11-billion bid accepted by Paramount.

The question comes to mind why some company is willing to pay such an astronomical price for Paramount. The answer became quite clear to me after I happened to see a TV show on cable channel CNBC. The show was a symposium on the

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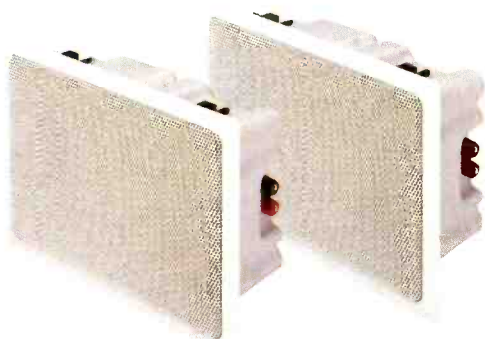


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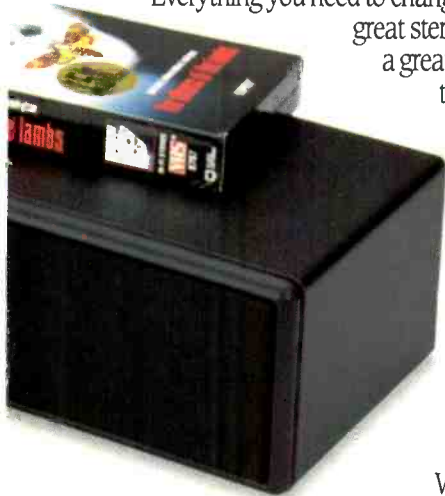
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future of communications, whether by cable or satellite or telephone line. Participating were the top movers and shakers in the world of communications. There was Diller himself, along with the heads of CBS, NBC, ABC, Bell Atlantic, AT&T, Disney, Time Warner, Zenith, and others. There even were VPs of engineering on hand for technical input!

Every aspect of audio and video communications was examined in depth. I looked at and listened to these corporate giants discussing the use of each technology and the synergism of many of them. It was apparent that these people were unanimous in their approval of digital technology as the engine that would drive the devices and communication systems for linking the global electronic network. There was little doubt that these astute executives regard digital technology as a sort of panacea for many of their existing problems—and as a magical force that will lead to a bright and prosperous future.

All of these companies have their own vested interests here. For example, Direct TV, a division of GM Hughes Electronics, is said to be ready to launch its Direct Broadcast Satellite system; the roof-mounted 18-inch dish antenna and satellite receiver, manufactured by Thomson Consumer Electronics under the RCA brand name, will reportedly sell for around \$700. The cable people, principally Tele-Communications, Inc. (TCI), want to digitize their channels, which would lead to the 500-channel system you've undoubtedly heard about. AT&T and Bell Atlantic are involved in a digital networking system using phone lines.

I should note that all of these high-powered executives were very supportive of interactive technology. Of course, it will require the widespread wiring of homes with fiber-optic lines. The ideal would be every home directly wired with fiber optics to ensure interactive capability, but this scenario is very expensive. As an interim alternative, fiber-optic lines could be routed only to high-density areas. As long as a house is within half a mile of a fiber-optic feeder terminal, the house can be connected to it with coaxial cable. Whatever the means of transmission, the insatiable demand for programming to satisfy 500 channels was of prime concern to the pan-

elists from Time Warner and Disney. As major suppliers of programming, these companies and others will profit mightily once the digital transmission highways are established.

High-definition TV was thoroughly discussed by the assembled executives, and there was complete approval of the digital system chosen by the "Grand Alliance" and submitted to the FCC for approval. Although enthusiasm was expressed for HDTV, there was also a consensus that it will be quite a long time before the technology becomes a major factor in the home entertainment market. One person predicted that about 40% of American homes will have HDTV by the year 2000; another thought 20% is more likely.



**WHAT NOBODY DISCUSSES
IS THE ACTUAL COST OF
THIS TECHNO-TOYLAND
AND THE QUESTION OF
HOW WE'LL PAY FOR IT.**

The support for all this new digital communications technology is easy to understand. Most of the executives at the symposium feel they are on the threshold of a communications revolution that will mean enormous profits. Their fondest dream remains the establishment of the in-home computer link to a fiber-optic electronic network. They still envision the full spectrum of interactive services—punching in codes for music choices, video programs with holographic images, and every imaginable "how-to" and educational program.

One of the principal attractions of the interactive computer link is the ability to decentralize business activities, permitting many employees to work at home. Much of the benefit here is the elimination of commuting to an office, thus saving money and reducing pollution.

I personally have not been very enthusiastic about my initial exposure to interactive technology. I used the Kodak Photo CD and Philips CD-I systems and felt that the resolution of the video material was quite marginal. The music they used was fairly clean, but rarely what I would use for a particular subject. The games left me cold.

There are other problems with interactive technology. For example, it certainly would be convenient to have available a central CD library with virtually every title ever made. There would also be the benefits of CD playback through state-of-the-art equipment and delivery of this pristine digital signal through your fiber-optic input. But there would be no need to purchase CDs, and this won't please the record companies; they certainly won't make expensive recordings just to sell a few copies to the central library. An arrangement would have to be worked out for some sort of playback royalty, a "pay-per-play" deal that would keep the record companies in business.

This brave new world of computer-linked home entertainment is unquestionably a most desirable scenario for the not-too-distant future. Still, into this harmonious nirvana I must interject a sour note. Who, pray, is going to pay for this chrome-plated, computer-linked, interactive, digital fiber-optic system? The very designation is intimidating, to say nothing of the actual cost of this new techno-toyland. One practical solution for new homes would be to have the basic equipment installed at the start and paid for within the mortgage. For existing homes, the equipment might be handled by leasing companies or through supplementary mortgages. Matters beyond the basic equipment, such as decor and deluxe frills, would be optional.

One thing we surely want to avoid is being locked in to some government-approved level of performance. This interactive Utopia will fail if there is no freedom of choice. A

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The new JVC XL-MC100 Disc Changer's two-piece design offers limitless placement flexibility, unlike the rack busting dimensions of extra large one-piece units. Just place the XL-MC100's Transport/Storage unit where convenient, while the Controller comfortably fits into your existing setup. The system is packed with JVC's latest cutting-edge technology and features, such as 1-Bit D/A conversion and a wide range of programming functions including instant access to

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IVAN BERGER

LEXCELLENCE



The controls of the Lexus GS 300's stereo system are conveniently placed as well as ergonomically designed. Below, the car itself.

Lexus is not the first car maker to collaborate with an outside audio firm in designing its factory-installed audio systems, but it's the first I know of to collaborate with two such companies. Pioneer provides Lexus' standard system, but a Nakamichi system is available for \$1,900 more. (That price includes a trunk-mounted changer, which costs \$900 if added to the Pioneer system.)

The differences between the two systems' specifications aren't all that

great. The Nakamichi system's 12-inch woofer replaces a 10-inch woofer in the standard system. (Both systems have 4³/₄-inch bass-reflex speakers in all four doors and tweeters in the front door pillars; the Nakamichi tweeters have soft domes, while the standard tweeters have hard ones.) The Nakamichi system has substantially more power: At 0.1% THD, it delivers four 25-watt channels plus 70 watts for the subwoofer, or 170 watts total, versus a differently distributed 74 watts for the standard system. (Interestingly, "maximum" power, presumably at 10% THD, doesn't differ nearly as much between the two systems; it's 225 watts for the standard system versus 280 watts for the Nakamichi.) The Nakamichi system's amps also feature all-discrete circuitry. Naturally, considering this company's reputation for outstanding cassette decks, the premium system's tape transport has a narrow-gap playback

head and automatic head azimuth alignment.

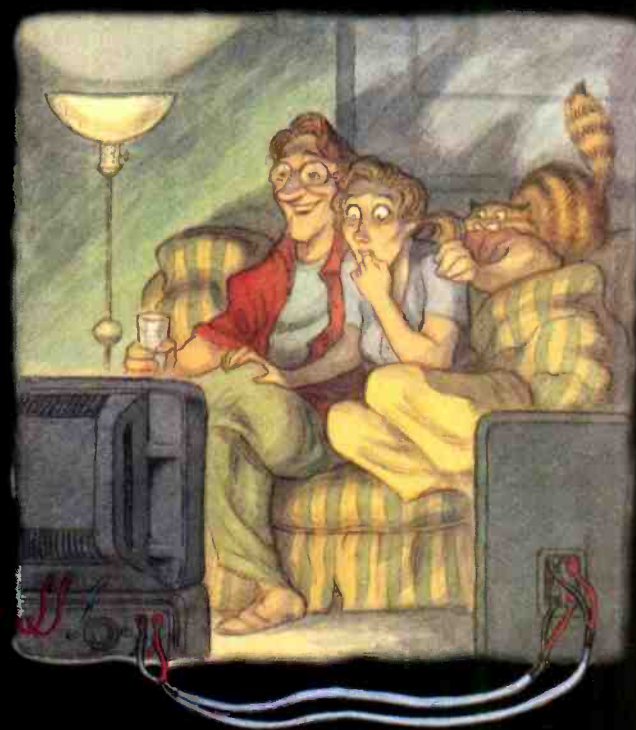
We haven't heard the Pioneer base system, so we can't comment on it, but both *Audio* Editor Gene Pitts and I agree that the Nakamichi system in the new Lexus GS 300 is the best factory-installed system either of us has yet heard—or operated, for that matter. Here's why:

Lexus invoked the car maker's privilege of making the panel twice the standard DIN height. This makes for a very relaxed, spacious layout (especially since only the tape slot is up front; the 12-disc changer is in the trunk). But the controls are more than just spaced well apart; they're good ("No, wonderful," says Gene). For example, the control you use most often, volume, is the largest and most conveniently placed. It's also a knob, still the best choice for fine adjustment in a moving car. And it's not combined with any other functions except on/off. Knobs used less often are the push-in/pop-out type and are grouped along the bottom, with a gap separating the three tone controls from the balance and fader pots. The tone controls have a limited range, so you can't screw up the sound but can make very subtle adjustments.

**THE LEXUS GS 300'S
NAKAMICHI SYSTEM
IS THE BEST
FACTORY STEREO
WE'VE HEARD.**

The tuning controls are also very right. One button toggles between the two six-station FM memory banks; a separate "AM" button lets you switch to that band without having to cycle through the second FM bank. A large up/down rocker is used for manual tuning or, if you hold it down a bit, automatic station seeking. The "Scan" button also switches modes, scanning station presets or, if you hold it down longer, the entire dial. A beep tells





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you when either control's mode changes. The six station presets are on three dual-station rockers—much easier to navigate by feel than the usual six-button row.

In tape and CD modes, the two main rocker switches work similarly to the way they work for radio. "Scan" changes program material by finding tracks instead of stations, and "Tune/Seek" becomes a fast-forward/rewind switch. The large rockers used for radio presets radically change function in tape and CD modes, however. In tape mode, these rockers select tape direction, track, blank skip, automatic repeat, and Dolby B or C noise reduction. (I don't recall any other factory stereos offering Dolby C NR.) In CD mode, they are used to advance to the next disc (alas, no retreat to the prior one!), perform fast forward, select tracks (forward or backward, thank goodness), repeat the current track, or start random track selection.

The tuner and CD sections were terrific performers. (I did not have enough time to really assess the cassette section, but Gene says it was much like the CD player in its sonics.) The tuner brought in AM and FM stations clearly that other car stereos I've tested couldn't bring in at all. I think there's more at work here than just the diversity antenna system. For one thing, the retractable antenna changes its height for reception of AM, high-band FM, or low-band FM signals. The sound on AM was only moderately rolled off, yet there was very little interference; you could easily mistake it for good mono FM through a small speaker—until you heard how good this system's FM is! I liked the fact that the FM radio mutes when there's no signal (handy when you're in a tunnel), though there is a period of noise "fluff" as the signal fades out. I also liked the fact that when I called up a memorized station through scan or manual tuning, the display showed me it was already in a preset. My only quibble was that seek tuning allots a mere 5 seconds to each station, which is far too brief to help in picking stations.

On CD, however, the scan is a more generous 9 seconds per track. Disc-to-disc changing seemed rather slow. I had no other quibbles here, save for the minor ergonomic lapse of having the CD player's repeat function on a different rocker than the tape player's. (This may be one reason



THE NAKAMICHI SYSTEM'S CONTROLS ARE ALL VERY RIGHT, AND THE SOUND IS EVEN MORE SO.

why Gene found it took more time to get used to operating the tape controls without looking at them than it did for the CD controls.) The button that selects CD play can also switch in a compressor for use when you're listening to a disc with a wide dynamic range in noisy traffic. The Lexus is so quiet, however, that I felt no need to use the compressor.

Overall sound was crystal clear in all modes, though with a little bit of top-end roll-off. Side-to-side imaging was excellent, but the soundstage lacked depth. Sound was okay to good on organ, excellent on piano and string bass, and very good on female vocals. (The midrange tone control, rare in factory systems, helped vocals stand out.) Gene, normally bothered by the difference in timbre between cars' rear and front speakers, found no problem here.

Getting back to ergonomics, we found the big buttons and panel allowed large, legible markings that were easy to read by day and night—though operation was so natural that we didn't need to read them for long. The panel illumination only lights the labels for the mode you're in, which makes the panel even clearer by night than by day. At night, the radio and heater are lit less brightly than the other instruments. Only those features that can be used to turn the system on (the tape slot, the mode selection buttons, and the volume knob) remain illuminated when it's turned off. But I don't think Lexus owners will leave it turned off for long.

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The Advantages of

Because I like listening to music of pipe organs and large orchestras, I've always wanted to try a subwoofer in my audio system at home. However, I was curious about the virtues of single-channel versus dual-channel subwoofer systems.

With a single-channel subwoofer, the left- and right-channel subwoofer signals are added (summed vectorially) together to give a monaural signal. This means that the relative *phase*, as well as relative amplitude, of these individual signals affects the result. For example, if sub-bass information in the left and right channels is not in phase, it will be cancelled to some extent in such a system.

Channel summing may be done at different points: At the input of a single-channel subwoofer or subwoofer amp, by two amps driving a dual voice-coil subwoofer, or by two amps and two separate subwoofers in one enclosure. Yet the result is the same—a mono subwoofer. All interchannel phase information, important for stereo, is lost.

For instance, left and right signals of equal loudness but with 180° phase difference (out of phase) would cancel completely and give no output from a single-channel subwoofer. With such a setup, the combined sub-bass loudness would be wrong (less loud than it should be)—at least some of the time—whenever relative phasing was not exactly 0° (signals in phase).

JOHN F. SEHRING

ONE
THUMP OR TWO

Illustration: Danuta Jarecka

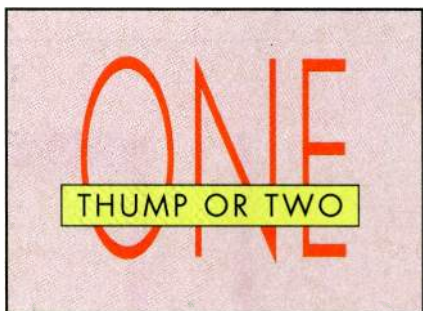
Stereo Subwoofers

To explore this further, I connected the left and right outputs of my subwoofer amplifier to the X and Y inputs of a general-purpose oscilloscope to look at relative phasing between the channels. One subwoofer channel drives the trace in the vertical direction, and the other channel drives the trace in the horizontal direction. This is the classic way to make phase, frequency, and amplitude comparisons using Lissajous patterns. It's like having a single-frequency, dual-channel spectrum analyzer, with the added ability to see phase and frequency relationships between the two channels. (The peak frequency of my sub-bass filter is around 10 Hz, with broad skirts.) The 'scope patterns are fascinating to watch. You can see a multiplicity of phasor (phase, fre-

quency, and amplitude) relationships in the sub-bass frequency range. They are usually complex and vary quickly. On sustained low pitches, the display is sometimes stable enough so that you can estimate phase, amplitude, and/or frequency relationships.

To my surprise, I found lots of randomly out-of-phase, subsonic energy on many CDs, which can only be accurately reproduced by using two separate subwoofer channels. This was particularly noticeable on high-quality recordings of pipe organ and large symphonic works.

The left and right channels are in phase only a minority of the time on some high-quality recordings. Frequently the channels are roughly in phase quadrature (odd multiples of



90°: 90°, 270°, 450°, etc.). At 20 Hz, for instance, a quarter wavelength (90°) of sound is only about 14 feet long. So if two stereo microphones were spaced that distance apart, 20-Hz sound originating from either side would produce a 90° phase shift between channels.

On pipe organ recordings, the pattern sometimes shows what looks like two or more low-frequency pipes, pitched less than 1 Hz apart, beating together. This also could be caused by various room (reverberation) modes of slightly different frequencies beating against each other as they decay [1, 2]. The phasing changes rapidly through a complete 360°. This seems to be associated with that “delicious” randomized pipe organ sound that swirls around in location, amplitude, and timbre. (Remember the Leslie electronic organ’s spinning baffle loudspeaker?)

When stereo subwoofers are fed suitable musical material, localization of very low-frequency sounds is sometimes definitely noticeable. There is sometimes a stereo effect as well, giving a sense of the ambience of the low-frequency reverberant space in which the recording was made. This is, of course, the core of stereo reproduction, not “ping-pong” directional effects. Switching the subwoofer amplifier to monaural causes a decided loss of low-frequency ambience and impact on some recordings.

Sometimes, extremely low-frequency “rumbling” is seen on the ‘scope. It may be caused by acoustic resonances of large halls; these resonances may be excited by air conditioning, pipe organ blowers, the opening or closing of doors, or even vehicle traffic! Structural resonances of large buildings tend to be in the subsonic range,

about 2 to 15 Hz [3], and may couple mechanical energy into acoustic modes. I have noted occasional low-level, random in-phase energy as low as several hertz.

It’s also interesting to listen to the subwoofers alone with the main channels turned off. Now, it is quite true that the location of a single source of low-frequency sound in a room is usually hard to discern. But *two* sources, generating a stereo sound field with complex interchannel phasor re-

change in total loudness and no localizable (unnatural) image—or even an image that wraps around you from behind. At 90° and 270° phasing, the image will clearly reside in the speaker with the leading phase. As the relative phase drifts through a complete 360° cycle, the sound image will smoothly drift from one side, move to the center, go on to the other side, become unlocalizable, and then repeat. The effect can be enhanced by placing the speakers facing close



lationships, is another story. For example, if a low-frequency (say, less than 50-Hz) sine wave is fed to one channel, and the same input—but shifted in phase—is fed to the other, you can definitely note localization effects.

This is easy to demonstrate using two sine-wave audio oscillators as pseudo-stereo sources for the subwoofer channels. Connect one oscillator to each channel. Set the oscillators to almost, but not quite, the same low frequency, at equal amplitude. Use a ‘scope to check the phase difference between them, as before. Because of the slight frequency difference, the oscillators’ relative phase will slowly drift through the 0° to 360° range. If they are set, say, 0.2 Hz apart, it will take 5 seconds (1 divided by 0.2 Hz) for this to happen.

Around 0° (channels in phase), you’ll notice a centered front image, as expected. At exactly 180° (out of phase), you’ll note a

together on a couple of chairs, with your head directly in between.

To briefly describe the basic binaural hearing process, differences in intensity at the ears dominate above about 700 Hz, but differences in *phase* dominate below 700 Hz in localizing sources of sound [4]. Interestingly, the spacing of our ears equals about one-half wavelength (180°) of a sound wave at 700 Hz.

According to Hirata [5], wide separation of speakers is necessary to create “natural spaciousness” below 800 Hz, which is satisfied by subwoofers located in the far corners of a room. This is also the ideal location to get maximum sub-bass loudness. There, the subwoofers are optimally coupled to the room resonant modes that are lowest in frequency [6, 7].

Analysis of room modes can give information on how a room will color a speaker’s reproduction. However, it considers

only one source of sound (monaural) and so ignores the phase relationships between stereo sources. For example, when using two subwoofers located along the width axis, the lowest lateral (width) room mode is much more excited by out-of-phase stereo signals than by in-phase stereo signals [8, 9]. While this may lead to exciting low-frequency reproduction, it is not accurate. An in-phase signal actually suppresses the excitation of this room mode and re-

**WITH OUT-OF-PHASE
SIGNALS, A MONO
SUBWOOFER MAY GIVE
YOU LESS BASS THAN
NO SUBWOOFER AT ALL.**

duces its effect. This illustrates the complex interaction of room modes with a stereo sound field [10].

I tried driving my corner-located subwoofers with out-of-phase signals that were around the frequency of the lowest lateral room mode. (The room is 15.8 feet wide, 19.5 feet deep, and 7.9 feet high.) This produced average levels in my listening room that were about 10 dB higher than in-phase signals! This can detract from image stability and realism.

To reduce this effect, try moving the subwoofers closer together. Locating them along the front wall, centered and separated by a distance of a bit less than one-quarter of the room width, helped considerably in my room.

Here, the subwoofers will excite the fundamental lateral mode much less. This location will help keep the perceived subwoofer level quite constant in most of the

room for most left/right channel phasing. It will also bring the subwoofers closer to typical main speaker locations, which may improve the phase response of the combined system. Surprisingly, this location hardly dilutes the subwoofers' ability to place low-frequency sound images at wide angles using 90° phased signals, i.e., such sound may still seem to come from the now empty corners.

However, we trade away some room gain when moving subwoofers out of the corners. In typical rooms, room gain can provide an increasing low-frequency boost, on the order of about 12 dB per octave below about 30 Hz. As much as 15 dB of boost at very low frequencies may be available. By moving from a corner to a wall/floor boundary, there are only two, instead of

three, close surfaces for sound reinforcement, so we lose about 6 dB of potential low-frequency room gain [11].

There are three further benefits to running stereo subwoofers. Using two subwoofers has the potential for more sub-bass loudness and/or decreased distortion [12]. Because no room is perfectly symmetric in shape and arrangement, two subwoofers, even if symmetrically located, are unlikely to excite exactly the same room resonances. This will tend to smooth out the irregular frequency response effects of room modes [13]. Finally, there is evidence that a loudspeaker's perceived sound quality improves when it is used in a stereo pair rather than as a single loudspeaker [14].

The field is ripe for experimenting right in your own living room. Try it! A

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"NO, YOU DON'T"



ILLUSTRATION: HAL MAYFORTH

Have To Turn It DOWN!"

REBECCA DAY

You've got a teenager. Teenagers like music. They like it loud, but they like it in the privacy of their own space. Yet there are likely other family members around who do not want to hear Pearl Jam cranked to 12 o'clock on the volume dial. How do you let someone blast music without blowing away everybody else?

This question was posed to Armstrong World Industries by *Home* magazine, one of *Audio's* sister publications, which asked the industrial materials company to acoustically treat a room in a show house sponsored by *Home* in Las Vegas. Called the Safe & Sound House, the project was designed to demonstrate how contemporary conveniences—such as audio, security, and automation systems—can be incorporated into a home without detracting from aesthetics or livability.

Armstrong agreed to "soundproof" a room designed for a teenager. The main goal was to absorb sound inside the room—specifically from a stereo system—so that little would get to the rest of the house.

Armstrong used Canopy acoustical ceiling panels, made of a mineral-fiber substrate covered with a porous needle-punch fabric. The panels were suspended from the ceiling grip by about a quarter of an inch to enhance appearance, but the technique had

SOUNDPROOFING THE TEENAGER

an acoustical benefit as well. With a noise-reduction coefficient (NRC) of 0.45, the panels absorb 45% of the sound hitting them, and the airspace between the panels and the ceiling provides additional low-frequency absorption. (The NRC roughly describes the absorption characteristics of a sound absorber. It is the average, to the nearest 0.05, of the sound-absorption coefficients at 250, 500, 1,000, and 2,000 Hz.)

For the walls, Armstrong supplied Soundsoak Scores, panels of mineral-fiber material covered with a gray fabric chosen by interior designer Patricia Stadel to match the room. These panels have an NRC of 0.60 to 0.70 (depending on their mounting), which means they absorb 60% to 70% of the sound hitting them. The panels themselves are 30 inches wide and can be ordered in heights of 6, 7, 8, 9, or 10 feet; the standard "scoring" of the panels creates individual "modules" (or tiles) that are 16 inches high, but custom heights are available from 12 to 60 inches.

Wall treatments are about the last thing people think of when trying to reduce noise. "Most people think of carpets," says

Malcolm MacDougall of Armstrong. "And in commercial applications, they think of acoustical ceilings." Carpeting does absorb some sound, but it's primarily footfalls. The NRC of standard pile carpeting typi-

USING
ACOUSTICAL
PANELS ON ALL
FOUR WALLS,
ALONG WITH AN
ACOUSTICAL-TILE
CEILING, SHOULD
HELP KEEP THE
SOUND IN A
ROOM.

THE MOST YOU CAN EXPECT TO REDUCE THE SOUND LEVEL IN THE ROOM ITSELF IS 8 TO 10 dB, TO A BIT LESS THAN HALF AS LOUD.

cally starts at about 0.25; if you use a 40-ounce underlay of good foam, you can bring it up to as much as 0.55. Add to that an acoustically treated ceiling, and you soak up a decent amount of noise.

That still leaves the walls, however. "Sound travels as much in a horizontal direction as in any other," MacDougall says, "so what we're trying to do . . . is absorb the sound before it reverberates or goes through the wall."

The various series of Soundsoak panels were designed to reduce noise in offices, and the open-office environment has created a particularly strong need to absorb ambient sound. The most troublesome sound in offices is the voice—especially frequencies above 1,000 Hz, which lend intelligibility to conversations. These are the frequencies the Armstrong panels were originally designed to minimize.

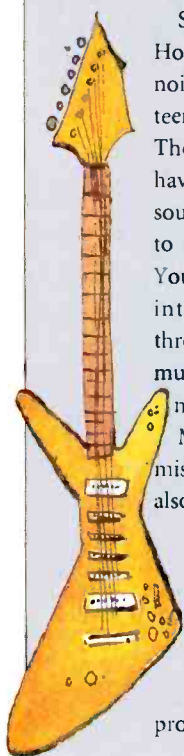
In the case of our teenager blasting music, the wall treatments could do the same trick on the lyrics. It could well be that nothing short of a double wall could completely soundproof the room. Even hiring an acoustical consultant to specify insulation inside a wall is more than most people can afford or are willing to do for sound absorption. Using acoustical panels on all four walls, along with an acoustical-tile ceiling, would help keep the sound in that room.

A viable acoustical-control strategy should effectively solve a problem both in a cost-efficient way and in an aesthetically acceptable fashion. But before a strategy is applied to a particular space, that space has to be assessed. In the home, you take into account the furniture and carpeting in the room you're treating *and* in the adjacent room. Absorptive materials—such as drapes, beds, carpeting, sofas, chairs, and fabric wallhangings—will, of course, provide some absorption in both rooms. You must also consider the construction of the walls, which will determine how much sound leaks into the next space. Heavy walls of brick, plaster, or stone will, of course, block sound better than lighter walls made of gypsum board or drywall.

Even if you treat wall surfaces, there will always be points of leakage—around doors, through the doors themselves, and through heating or air-conditioning ducts. There's not much you can do about this transmission leakage and still fall within the requirements of aesthetic design. If the construction of the room you're treating is in the planning stage, you can make sure the openings for air ducts aren't close together in adjacent rooms, so that the sound doesn't have a straight path from one room to another. You could also have insulation or a sound-blocking material installed before the walls go up.

If you're dealing with an existing room, you make do. The airspace around the door is a problem because you might not want to put in unsightly weatherstripping or similar material around an interior door (see the sidebar, "Block That Guitar Lick," for desperate measures). As for the door

BLOCK THAT GUITAR LICK



Say you live in the Safe & Sound House, and your tolerance for noise is *very* low. You want your teenager to be in audio Siberia. The acoustical wall treatments have done a good job of absorbing sound, but there's more you need to do to complete the isolation. You must also block sound from intruding into your territory through points of leakage, and you must dampen vibrations that cause noise.

Major culprits for sound transmission are door cracks; they're also difficult to treat in an aesthetically acceptable way. In this case, you might be willing to employ sound barriers.

You could run weatherstripping around the door; an alternative would be to use a product like NetWell Noise Con-

trol's dB-Bloc, a 1/8-inch vinyl barrier that you can put on the back of a room's door so that it overlaps the cracks. It sells for \$2.20 per square foot and can be ordered with an adhesive backing. It is available only in black, but you can finish dB-Bloc with latex paint.

A barrier's sound-attenuation effectiveness is measured in terms of its sound-transmission class (STC), a single number representing the reduction in decibels. The STC of dB-Bloc, for example, is 26.

There's still the matter of vibration. NetWell sells a liquid damping compound called DNM (Damping Noise Material) that can be applied to walls, enclosures, and ducts. Selling for \$35 per gallon, DNM adds mass and density to metal surfaces to reduce vibrations and noise.



The teenager's bedroom in the Safe & Sound House featured acoustical panels on both the ceiling and the walls.

itself, you could put in a solid-core door—but you'll still have the airspace around it. You're better off trying to deal with the source of the noise.

Unfortunately, there's no formula for determining an optimum noise-reduction level for a room. People are usually looking to reduce the amount of sound leakage, not to create an anechoic chamber. With acoustical materials, the most you can realistically expect to reduce the sound level *in the room itself* is 8 to 10 dB, or a bit more than half—which can be a lot or a little depending on the sound level in the room. If your teenager cranks up the volume accordingly, you may have no choice but to consider weatherstripping the doors and damping the ducts.

In the Safe & Sound House, Armstrong's approach evidently worked well enough in a not truly real-world situation. According to Keith Lindemann, professional installation specialist for Armstrong, the builder on the project reported a "tremendous amount of positive response about the teen room. They had the stereo playing pretty loudly, but you couldn't hear it outside of that room." A real-world situation would likely provide more of a challenge.

The room itself measured 15 × 16 feet. For that space, the materials would cost roughly \$1,200 for the ceiling panels and \$1,800 for the wall panels. Add another \$1,200 for labor, and you've paid more than \$4,000 to tone down Pearl Jam in the next room. It just may be worth it. **A**

Company Addresses

There's no single approach to controlling noise, and there are quite a few companies that make products to help you do it. Most companies deal primarily with industrial applications, but a few, like Armstrong, are beginning to see there's a market in the residential world as well. Following are some companies that offer various noise-control products, including foams, spray coatings, and fabrics.

Armstrong World Industries
P.O. Box 3001
Lancaster, Pa. 17604
(800) 448-1405

Illbruck
3800 Washington Ave. North
Minneapolis, Minn. 55412
(612) 521-3555

Interior Acoustics
176 Route 206 South
Somerville, N.J. 08876
(800) 221-0580

Kinetics Noise Control
6300 Irelan Pl.
Dublin, Ohio 43017
(614) 889-0480

Linear Products
P.O. Box 902
Cranford, N.J. 07016
(908) 272-2211

MPC
Noise Control Products Div.
835 Canterbury Rd.
Westlake, Ohio 44145
(216) 835-1405

NetWell Noise Control
6125 Blue Circle Dr.
Minnetonka, Minn. 55343
(800) 638-9355

McINTOSH MC 1000 MONO AMPLIFIER



Needless to say, the MC 1000 is McIntosh's top-of-the-line amplifier. The amps weigh in at a hefty 105 pounds each, and their performance specifications are most impressive. For instance, continuous output for a 1.6-ohm load on the 8-ohm tap is just shy of 3 kilowatts! Burst power with a 20-mS tone burst with the same loading is in excess of 4 kW. Total harmonic distortion is rated at less than 0.005% from 250 mW to rated power of 1 kW, from 20 Hz to 20 kHz. Optimum load matching is provided for 2-, 4-, and 8-ohm loads. Balanced or unbalanced inputs can be used.

Front-panel attributes consist of a pair of rack handles, a rotary meter-mode switch

**AS CAN BE SEEN,
THE McINTOSH MC 1000'S
OUTPUT CAPABILITY
IS MOST AWESOME!**

("Watts" for instantaneous readings, "Hold" to display the highest recent peak level), a "Power Guard" light that glows if output distortion is more than 0.3% compared to the input, an on/off switch, and finally, the peak-responding power output meter. This gorgeous blue meter, which dominates the front panel, responds to both output voltage and current so as to indicate actual delivered power in equivalent sine-wave watts.

There is nothing on the rear of the amplifier, as the input and output connections are located on the top, near the rear of the chassis. To the left, as seen from the front, are the input connectors (an RCA phono jack for unbalanced input and a gold-plated XLR connector for balanced input). In the middle section are three pairs of five-way binding posts, one each for 2-, 4-, and 8-ohm loads. These output terminals are in pairs (no common terminals) because the amplifier output is balanced about ground. There are two output winding wires for each output tap. At the right of this panel is an IEC connector for the power cord and a circuit breaker.

The MC 1000 is built on a large chrome chassis somewhat like the ones on which some classic tube amplifiers were built.



remember first seeing these big McIntosh amplifiers at the 1992 Las Vegas CES and saying to myself, "Wow, these amps look neat! A pair of 1,000-watt monsters. Ask, and ye shall receive!" I didn't really ask (at least consciously), but the universe has conspired to get me a pair of MC 1000s to review. When the boxes were delivered and I tried to heft one, I thought that this time I'd really need a forklift to move them, no kidding! But after uncrating the amps, I found I could actually lift them and move them into position for listening.



Behind the front panel is an enclosure that houses the meter circuitry. Farther back are the power transformer and the output autotransformer, with a pair of 52,000- μ F, 100-V main filter capacitors between them. The space behind the two transformers is occupied by eight large heat-sinks for the

SPECS

Power Output: 1,000 watts into 8-, 4-, or 2-ohm loads.

Power Bandwidth: 20 Hz to 20 kHz.
THD: 0.005%, from 250 mW to 1,000 watts.

SMPTE-IM Distortion: 0.005% maximum for instantaneous peak power up to 2,000 watts.

Damping Factor, Wideband: Greater than 200 at 8-ohm output.

IHF Dynamic Headroom: 2.1 dB.

Frequency Response: 20 Hz to 20 kHz, +0, -0.25 dB; -3 dB points, 10 Hz and 100 kHz.

S/N, A-Weighted: Balanced, 90 dB (120 dB below rated output); unbalanced, 85 dB (115 dB below rated output).

Input Sensitivity: 2.5 V.

Input Impedance: 10 kilohms.

Power Guard Operation: Clipping prevented and THD limited to 2% for up to 14 dB of overdrive at 1 kHz.

Power Requirements: 120 V, 50/60 Hz, 12 amperes.

Dimensions: 17 $\frac{1}{4}$ in. W \times 10 $\frac{1}{2}$ in. H including feet, \times 20 $\frac{1}{2}$ in. D including front handles (44.5 cm \times 26.4 cm \times 52.4 cm).

Weight: 105 lbs. (47.6 kg).

Price: \$5,500 each.

Company Address: 2 Chambers St., Binghamton, N.Y. 13903.

For literature, circle No. 90

output stages. Under the chassis we find the main signal circuitry, on a p.c. board near the left front of the amp. Across the chassis from this board is a termination block for the power transformer leads and a small p.c. board for the power turn-on relay and associated control circuitry.

About halfway back is a thick power-distribution p.c. board. This vertically mounted board runs the full width and height of the chassis, and is secured by brackets to the inside top of the chassis and to the bottom plate. This board has eight sockets for connection to the eight heat-sink assemblies. Positive and negative supply voltages, signal drive lines, and output bus connections all go through the eight interconnection sockets and the heat-sink cable plugs. Each half of the bridge output stage has 10 NPN and 10 PNP TO-3 bipolar output transistors. A very beefy output stage, this! Very large secondary wires (estimated 6- to 8-gauge) emanate from the

**I WAS PLEASANTLY
SURPRISED TO FIND
MYSELF PLAYING MY
MUSIC LOUDER THAN
USUAL, AND LIKING IT!**

output autotransformer and connect to the bottom of the output binding posts.

All in all, the MC 1000 has a very good build quality and is sure to keep performing over the long haul, just as its predecessors have done.

Circuit Description

Looking at a block diagram of the MC 1000 (not shown), I could see that balanced input signals enjoy a simpler and more symmetrical signal path than unbalanced signals. Unbalanced inputs pass through an input op-amp that inverts and attenuates the signal and applies this to one side of the balanced input, while the other side of that input is driven by an attenuated version of the unbalanced input. Thus, overall, the amplifier has balanced full bridge topology, with the input balanced whether it's driven with unbalanced or balanced input signals.

Just beyond the point where the unbalanced input circuit couples to each leg of

the balanced input line are series resistors, followed by N-channel muting FETs that shunt each leg to ground during power turn-on. The resistor section of a combination LED and light-dependent resistor (LDR) is connected between the signal legs; it reduces input to the rest of the amplifier circuitry when the Power Guard circuit lights the LED.

The actual power amplifier circuitry starts out with two paths (one for each signal phase) of complementary, dual-differential input stages followed by cascoded complementary second and last-voltage-amplifier (LVA) stages. A bias-spreading regulator is connected between the output collectors of the LVA to bias the output stage into Class-AB operation. Two-transistor sources supply current to each same-sex pair of input transistors. Another source supplies current to a two-diode string in the LVA that helps keep the collector-to-emitter voltage constant during signal excursion in the outer transistors (those closest to the supply rails) of the complementary cascode arrangement. What is said to be a current-limiter circuit (but looks like it is also output-voltage dependent) is connected to the collectors of the LVA to shunt off drive to the output stage if excessive current output is detected.

The output stages are triple Darlington-connected complementary emitter followers. As I previously mentioned, each output-stage half of the bridge consists of 10 pairs of output transistors. All devices in the signal path are discrete bipolar transistors, with the exception of the input-inverting op-amp. Overall negative feedback is taken from each leg of the 8-ohm connections on the output autotransformer back to the inverting input of that output phase's input amplifier.

The output stage's connection to the autotransformer is made to taps somewhere between the 8- and 4-ohm points on the winding. The autotransformer is center-tapped, and the center tap is grounded; this puts a premium on the degree of balance between the two phases of drive to this autotransformer. It also provides a path to ground so that, in the event of an output-stage failure, the d.c. winding resistance of the autotransformer coil will shunt the d.c. to ground, protecting a connected speaker from damage.

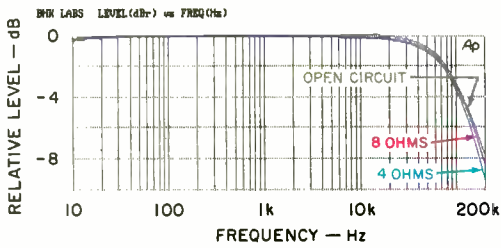


Fig. 1—Frequency response, using unbalanced input.

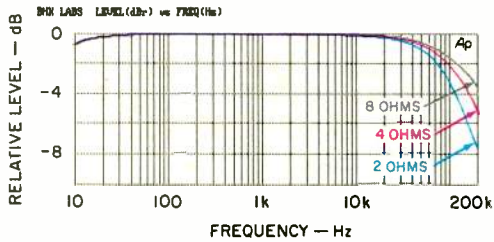


Fig. 2—Same as Fig. 1 but with balanced input.

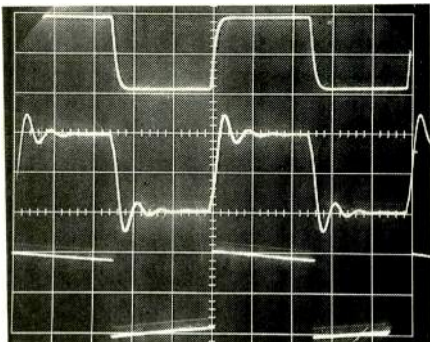


Fig. 3—Square-wave response of (from top) 10 kHz, 8 ohms (20 μ S/div.); 10 kHz, 8 ohms & 2 μ F (20 μ S/div.); 40 Hz, 8 ohms (5 mS/div.; all 5 V/div. on vertical scale).

Power-supply circuitry is more or less conventional. The large toroidal power transformer has two primary and two secondary windings. The main secondary winding is full-wave rectified into positive and negative 89-V supplies, filtered by the two 52,000- μ F, 100-V capacitors. These main supplies directly power the output stages. Front-end dual-differential amplifiers and the LVA stages are decoupled by small series resistors and shunt bypass capacitors. Half-wave rectifiers are driven by

the other, 15.5-V, secondary winding, and the developed positive and negative voltages are regulated down to +12 and -12 V for the meter circuit, Power Guard, and signal op-amps. This winding also powers an a.c. regulator that feeds all the front-panel lamps with a constant voltage. A power-on delay circuit withholds turn-off voltage from the signal-muting FETs until the signal circuitry stabilizes. Temperature-dependent resistors in the primary circuit of the power transformer reduce inrush current. In addition, a turn-on relay's contacts handle the actual switching of the a.c. line current; the front-panel power switch controls the coil current of this relay. Two thermal cutout switches that monitor heat-sink temperature are wired in series with the power switch's relay-control circuitry. Overall a.c. line fusing of the MC 1000 is handled by a 20-ampere circuit breaker.

The power meter's circuitry senses current with a current transformer in the output lead of one of the output phases. One-half of the balanced output is sensed. Both this current signal and the voltage signal are sent to the meter circuit, where they are converted to the logs of their amplitudes. The outputs of the log amplifiers are connected through diodes and summing resistors into the inverting input of a rectifier op-amp. These diodes pass the negative half-cycle of the log amplifier outputs to a rectifier that feeds a two-transistor d.c. amplifier, whose output drives the meter. Negative feedback is taken from the meter amplifier output back to the inverting input of the rectifier op-amp. Unless you remember that you can multiply numbers by adding their logs, it's not obvious how this circuit multiplies voltage and current to get watts. This is not quite a true measure, independent of the phase angle between the voltage and current, but it does indicate some change in output with inductive or capacitive loads. McIntosh adds that the meter is only accurate for loads of 16 ohms or less. Above that point, the meter reads more voltage and less current until, for loads of 32 ohms or more, it reads voltage

alone. This is done so that the meters will not indicate zero power when no load is on the output terminals.

Measurements

I tested two units, Serial Nos. 1686 and 1687. Of the measurements done on the two MC 1000s, most of the data presented here is from No. 1686, as it had slightly higher distortion than its mate. Any other significant differences between the two will be discussed where appropriate.

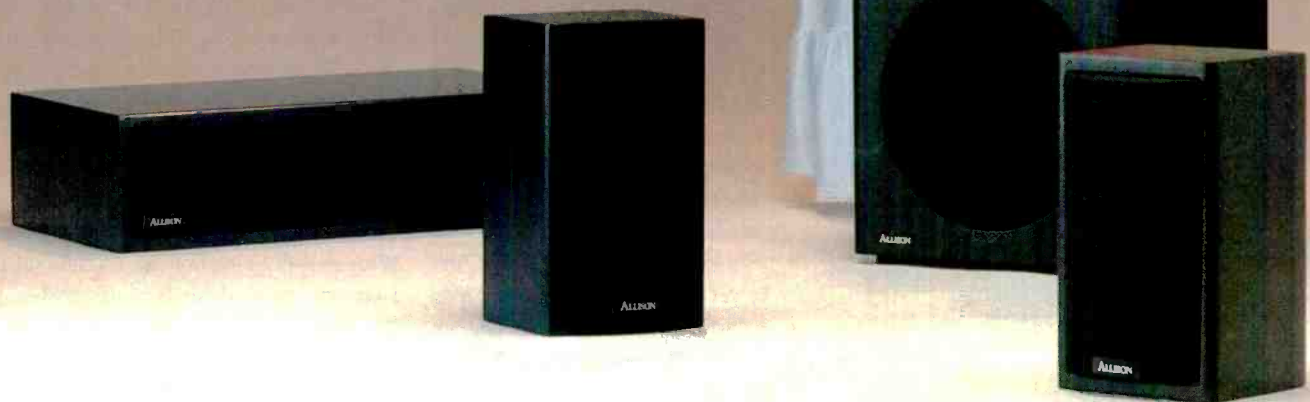
Voltage gain and IHF sensitivity at the 8-ohm outputs were substantially identical for both units. For unbalanced inputs, gain was 31.4 dB and sensitivity was 76.5 mV. Gain for balanced inputs was 31.6 dB, and corresponding sensitivity was 74.6 mV.

As is my custom, I present frequency response at the nominal 1-watt level for open-circuit, 8-ohm, and 4-ohm loading on the 8-ohm autotransformer taps. When frequency response is shown as a function of load, you can get some feeling for how low the output impedance is by seeing how close the curves are to each other. You can also tell how output impedance varies with frequency by comparing the uniformity of the spacing between the curves across the spectrum. For the MC 1000, frequency response was measurably different for the balanced and unbalanced inputs, so both are presented, in Figs. 1 and 2, respectively. Compare the top curves in each figure to see the relative difference in frequency response for the two inputs.

Figure 3 illustrates square-wave response, using the unbalanced input. The top trace is for a 10-kHz signal into 8 ohms, using the 8-ohm output terminals. In the middle trace, a 2- μ F capacitor has been paralleled with the 8-ohm resistive load. The ringing is well controlled here. The bottom trace, a 40-Hz square wave, has noticeable tilt; this is mostly a function of the size of the input coupling capacitors. With the unbalanced input, rise- and fall-time with 8-ohm loading on the 8-ohm taps was about 3.7 μ S.

Turning our attention to distortion, Fig. 4 shows 1-kHz THD + N as a function of power output for 2-, 4-, and 8-ohm loads on the 8-ohm terminals. Also shown is SMPTE-IM distortion into 8 ohms on the 8-ohm output terminals. As can be seen, the output power capability of this amp is

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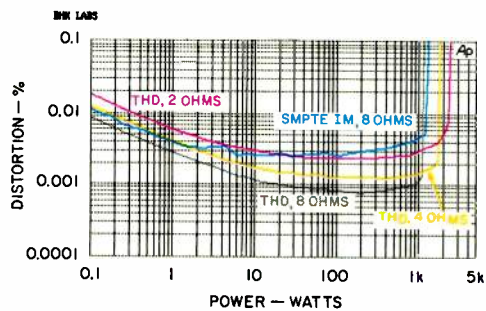


Fig. 4—THD + N and SMPTE IM vs. power.

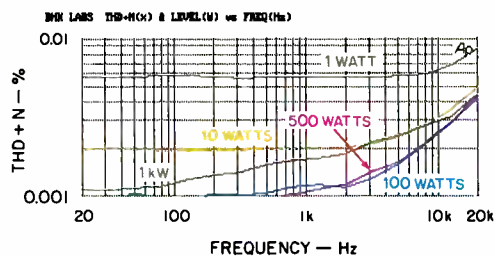


Fig. 5—THD + N vs. frequency.

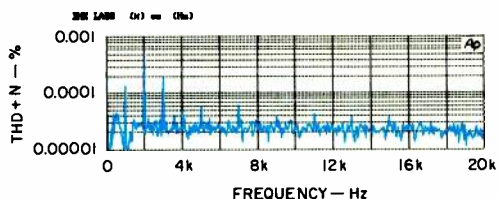


Fig. 6—Spectrum analysis of 1-kHz signal, balanced input.

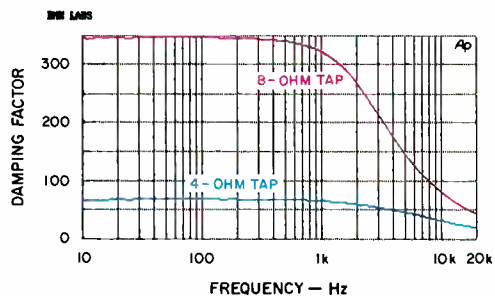


Fig. 7—Damping factor.

Table I—Output noise levels. IHF S/N ratios were 93.8 dB for amp A and 93.0 dB for amp B.

Bandwidth	Output Noise, μ V	
	AMP A	AMP B
Wideband	257.0	247.5
22 Hz to 22 kHz	78.0	93.0
400 Hz to 22 kHz	74.0	80.0
A-Weighted	58.0	63.5

most awesome! In Fig. 5, distortion is plotted as a function of frequency for a range of power levels, with 8-ohm loading on the 8-ohm output terminals. What is interesting here is how the 20-kHz distortion values mostly cluster around 0.005%, which is the MC 1000's spec for harmonic distortion. At 1 watt, I'm afraid it was a bit over 0.005% at 20 kHz; this was verified by a spectrum analysis of distortion residue (not shown), which gave a value of 0.0061% second harmonic. Unit No. 1687's 1-watt, 20-kHz THD was less than 0.005%, as was the THD + N for the other measured power levels. The spectrum of harmonic distortion residue, for a 1-kHz signal at 10 watts out at the 8-ohm taps, is shown in Fig. 6; the balanced input was used here. With the unbalanced input, the noise floor was up about 6 dB, or twice that seen in Fig. 6 (the distortion components were about the same). No doubt about it, however, these amplifiers really do have very low distortion.

To measure the impedance of the MC 1000's balanced output, I had to adapt the method I use to test amplifiers with the usual unbalanced outputs. My Audio Precision test setup generated two signals, 180° out of phase, which I fed through one of my lab amplifiers to get 8-V rms signals of opposite polarity. These signals were then fed through 8-ohm resistors to the 8-ohm terminals of the MC 1000. To check this setup before measuring the MC 1000, I put a 0.1-ohm precision resistor across the lab amp's output terminals, obtaining a flat 100 mV across the resistor at all frequencies. This meant the current being injected into the MC 1000's output from the lab amplifier was 1 ampere, so the resulting voltage, taken balanced across the MC 1000 output terminals, was a direct measure of the output impedance, in ohms. This 1-ampere current was held constant with frequency, as it was regulated by the

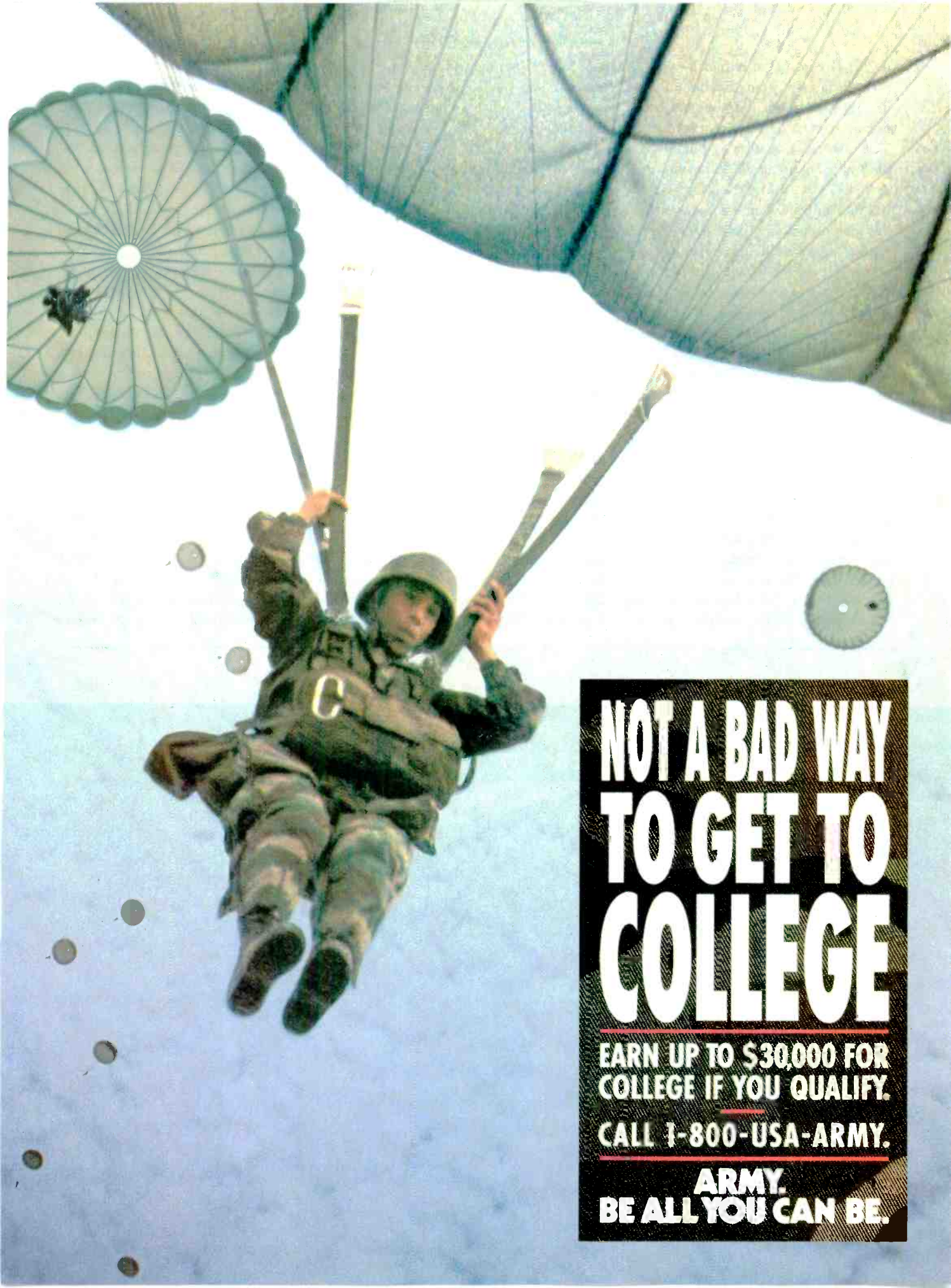
Audio Precision test setup. The resulting damping factor (8 ohms divided by the output impedance) is plotted in Fig. 7.

Also shown in Fig. 7 is the damping factor for the 4-ohm taps. Since the amplifier feedback is taken from the 8-ohm winding taps, that pair of terminals enjoys the greatest reduction in output impedance, due to feedback. As the 4-ohm taps are farther from the 8-ohm ends of the winding, the output impedance is somewhat higher, resulting in the reduced damping factor for the 4-ohm terminals. McIntosh specifies damping factor as being greater than 200, wideband, for the 8-ohm output. I made another measurement on the 8-ohm taps by checking frequency response with open-circuit and 8-ohm loading. By calculating the output impedance from this data, I came up with output impedances of 0.0237 ohm at about 1 kHz and 0.042 ohm at about 20 kHz. This corresponds to damping factors of 337 and 190, respectively. The value of 337 is close to that in Fig. 7, and 190 is close to the 200 claimed by McIntosh. Why the two methods differ, I can't say. If anyone can shed light on this matter, I would greatly appreciate it.

Output noise is listed in Table I for various bandwidths. These units are truly low in noise and would doubtless produce no audible noise even with a high-efficiency horn speaker system.

Things got interesting when I measured dynamic headroom. I have never before seen so much power from an amplifier. With an 8-ohm load on the 8-ohm output, I got an output equivalent to 1,600 watts rms for the 20-ms IHF tone burst, with no sag-off between bursts. This equates to a dynamic headroom of 2.04 dB, close to the McIntosh spec of 2.1 dB. With a 4-ohm load on the 8-ohm taps, the equivalent power output at the beginning of the burst was a whopping 5.3 kW, dropping off to 4.0 kW at the end of the burst period! (The reason for the power dropping off during the burst period is that the power supply drops in voltage over time, because the main filter capacitors can hold up the voltage just so long.)

Steady-state power output at visual onset of clipping (VOOC)—with an 8-ohm load



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on the 8-ohm output terminals—was 1.2 kW, yielding a clipping headroom of 0.8 dB. With a 4-ohm load on the 8-ohm output terminals, steady-state output at VOOC was 1.9 kW. With a 2-ohm load on the 8-ohm output terminals, power output at VOOC was 2.6 kW; the 20-ampere circuit breaker opened after a few seconds at this output power. These output levels were accompanied by some attendant a.c. power-line voltage droop even with the very stiff new a.c. power arrangements in my lab. The a.c. line input at full power into a 2-ohm load dropped down to about 112 V. If you really want to get the watts out of these beasts, separate dedicated a.c. lines for each amplifier are mandatory, as McIntosh says.

I checked the accuracy of the meter by comparing its readings to the amplifier's measured output at levels between 100 mW and 1 kW, with steady-state sine waves as well as with tone bursts. With the steady-state signals, the indications were high by some three to four widths of the meter's needle. With IHF tone-burst signals, the indications were on the low side, by three to four needle widths, up to 1 watt and

were more or less right on above this level. Changing the load on the 8-ohm output from 8 ohms down to 4 ohms generally did the right thing, doubling the reading.

The a.c. line draw at idle was about 1.5 amperes. After really blasting the MC 1000 and getting it hot, the line current went up to about 2 amperes.

Use and Listening Tests

The front-end equipment used in my system during the review period included an Oracle turntable fitted with a Well Tempered Arm and Spectral Audio MCR-1 Select moving-coil pickup; Krell's MD-10, Theta Digital's Data, and CEC's TL 1 CD transports feeding Krell Studio 2 and Theta Digital DS Pro Generation III D/A converters; a Sumo Charlie FM tuner; a Nakamichi 250 cassette deck, and a Technics 1500 open-reel recorder. Preamplifiers used were First Sound's Reference II, a unit from Quicksilver Audio, and a Forssell tube line driver. Other power amplifiers used included a pair of Quicksilver M135s, a Crown Macro Reference, and an Arnoux Seven B digital switching amp. Loudspeakers used were the B & W 801 Matrix Series 3.

One of the first things I experienced with the MC 1000s was the pleasant surprise of finding myself playing music louder than I do with other amps, and liking it! By liking it, I mean not cringing at edginess or irritation present in some of my software but feeling that the music was better served and more realistic by being louder. This is not a matter of power available: I have used other good big amplifiers and, as much as I have otherwise thought they sounded exceedingly fine, I have seldom noted this phenomenon. Boy, these babies PUNCH IT OUT! I did not get their full potential blast, as I don't have separate a.c. lines for each amp. (The a.c. line in my listening room is about 50 or 60 feet of AWG #12 wire.) It's easy to get carried away with playback level on material with a high peak-to-average ratio and use up those kilowatts quickly!

Other sonic attributes—such as space, dimension, resolution, and air—were of a very high caliber with these amps. Operation was flawless. I *really* liked the MC 1000s. Admirers of other cult and tweak power amps, and potential buyers of amps of this caliber, should give a pair of MC 1000s a serious listen. *Bascom H. King*



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PANASONIC RQ-DP7 PORTABLE DCC PLAYER



complement to the Technics unit or, for that matter, any other of the several home DCC decks now available.

The RQ-DP7—which can handle all analog cassette tape types—can operate up to 2½ hours with its built-in rechargeable battery. An included a.c. adaptor/recharger will charge the battery in about an hour and can also be used to run the player where a.c. power is available. The RQ-DP7's scrolling LCD readout can show album titles, song titles, and artists' names even if the text is longer than the 12 characters visible in the display.

When a cassette is loaded, the RQ-DP7 takes up tape slack, determines whether the tape is digital or analog, and sets the appropriate sampling frequency if the tape is a Digital Compact Cassette. As soon as a major control button, such as "Play," is pressed, the unit switches on and begins the

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CAN PLAY ANALOG AS
WELL AS DCC TAPES.**

selected operation. If no button is pressed within four minutes of finishing playback, it switches off automatically to conserve battery power. A three-key remote, located in the cable of the supplied headphones, gives you control of play, fast forward, track skip, rewind, and stop.

In last April's issue, I reported on the performance of the Technics RS-DC10, a home Digital Compact Cassette deck that both records and plays back DCC tapes and also plays back analog cassette tapes. I gave the RS-DC10 high marks, but I wondered when DCC's proponents would come up with a replacement for the ubiquitous cassette portable. After all, DCC is obviously competing for the cassette market, which is heavily oriented toward people on the go. The lack of such a player is nicely remedied by Panasonic's introduction of the RQ-DP7. This new "personal" portable, from



the company that also makes Technics products, can play prerecorded and home-made Digital Compact Cassettes as well as analog cassettes. As such, it is the perfect

Control Layout

Major controls are on the RQ-DP7's top surface. To the left of the display are a sliding latch for the cassette compartment ("Open") plus buttons for "Text Mode," "Text Scroll," and "Counter Mode." Pressing "Text Mode" repeatedly will bring up the album title, the artist's name, and the track title in the display. If any of these exceeds 12 characters, pressing "Text Scroll" will let you read the information in its entirety. Pressing "Counter Mode" switches the display between numbers (the default mode when the unit is first turned on) and text. Pressing it again will successively call up displays of absolute time, track time, total album time, and finally, arbitrary

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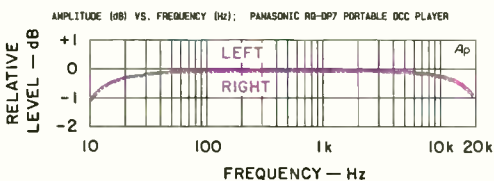
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The Sensible Sound Issue #47

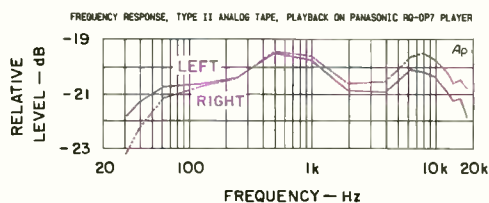
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counter numbers, all accompanied by the current track number. Also to the left of the display area are "Counter Reset" and "Direction" buttons. Pressing the latter will reverse the tape for playback of side A or side B. The side currently playing ("A" or "B") is indicated in the display area, as is the word "Play."

DEVIATION FROM PERFECT LINEARITY WAS LESS THAN 2 dB FOR SIGNALS AT THE -90 dB LEVEL.



A



B

Fig. 1—Frequency response for DCC playback (A) and analog playback (B).

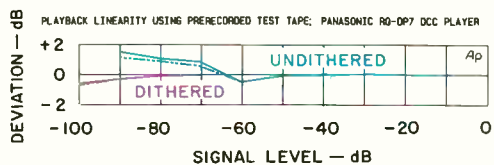


Fig. 2—Deviation from linearity, DCC playback.

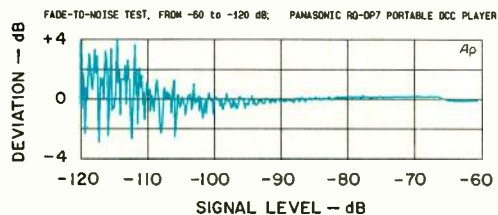


Fig. 3—Fade-to-noise test, DCC.

Controls to the right of the display include buttons for fast forward and rewind, "Stop" (which, when pressed a second time, turns off power to the unit), and "Play" (which also serves to turn on the unit). Buttons for forward skip and reverse skip are used to access given tracks on a cassette. For example, if you are currently playing track 1 and wish to play track 4, you press the button for forward skip three times. The tape will fast-wind, and the display will indicate progress of the search until the desired track is found.

Along the left side of the player are a mini headphone jack and its volume control, a three-position switch for bass boosting, and a Dolby on/off switch for those analog tapes recorded with Dolby B noise reduction. Along the right side of the player are a "Hold" switch, to prevent accidental operation of any controls, and a reverse mode selector. In one position of this selector, the unit plays sides A and B once, then shuts down. In the other position, sides A and B will be repeated eight times before playback stops.

The rear of the RQ-DP7 carries the d.c. terminal used when powering the unit from the a.c. adaptor/charger. Also found here are an optical output jack for digital signals and a mini jack for analog line output. (A cable with a stereo mini plug at one end and standard phono plugs at the other is supplied with the unit.)

Measurements

Since there were no DCC recorders in my lab when I was ready to test the RQ-DP7 player, it was

fortunate that I had previously digitally transcribed all tracks of my CBS CD-1 test Compact Disc to a DCC test tape. This tape enabled me to measure the RQ-DP7's digital performance. Measurements were, however, limited to the 44.1-kHz sampling rate. For analog measurements, I used pre-recorded test tapes from BASF and TDK.

SPECS

Digital Format

Sampling Frequencies: 48 kHz, 44.1 kHz, and 32 kHz.

Number of Quantizing Bits: 16-bit, linear.

Data Processing System: PASC.

DCC Playback

Frequency Response, +0.5, -1.5 dB: With 48-kHz sampling, 20 Hz to 22 kHz; with 44.1-kHz sampling, to 20 kHz; with 32-kHz sampling, to 14.5 kHz.

Dynamic Range: Greater than 90 dB.

S/N: 90 dB or greater, A-weighted.

Wow and Flutter: Below measurable limit.

Analog Cassette Playback

Frequency Response, Dolby NR Off, All Tape Types: 20 Hz to 18 kHz.

General Specifications

Analog Output Level: 1.0 V (50-kilohm load).

Headphone Output Level: 15 mW/channel (16-ohm load).

Digital Output: Optical (available only when a.c. adaptor is used).

Dimensions: 4¾ in. W × 1¾ in. H × 4¾ in. D (12 cm × 3.55 cm × 11.8 cm).

Weight with Battery: 1 lb., 1.3 oz. (0.49 kg).

Power Supply: 5.5 V d.c., 4.1 watts.

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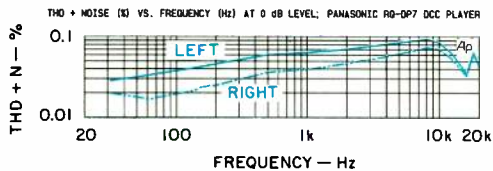


Fig. 4—THD + N vs. frequency, DCC.

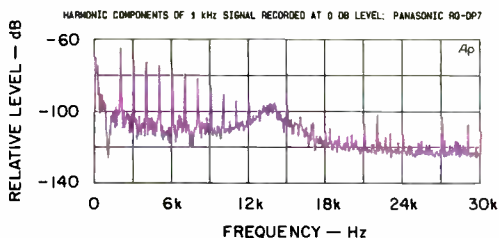


Fig. 5—Spectrum analysis of 1-kHz signal and harmonics at maximum digital level.

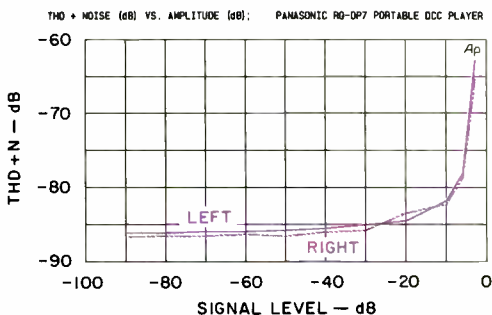


Fig. 6—THD + N vs. signal level, DCC playback.

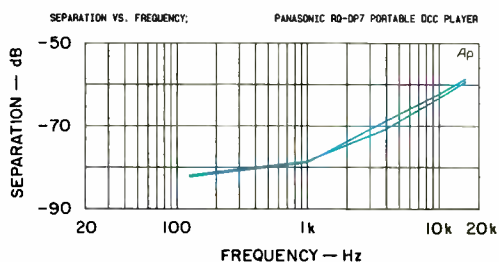


Fig. 7—Channel separation vs. frequency, DCC.

Figure 1A shows frequency response of the RQ-DP7 in digital playback mode. Response is down 0.25 dB at 20 Hz and approximately 1.0 dB at 20 kHz, easily meeting Panasonic's published specification. Figure 1B shows frequency response obtained for analog playback of a calibrated Type II test tape. This cassette contains spot frequencies in the range from 31.5 Hz to 18 kHz; nominal playback level was 20 dB below 250 nWb/m. Although Panasonic does not specify a \pm dB tolerance, Fig. 1B shows that the frequency response is well within the \pm 3 dB limit usually specified for analog cassette decks.

Deviation from perfect linearity for undithered signals, in the range from -10 to -90 dB, is plotted in Fig. 2. Less than 2 dB of linearity error is noted at the -90 dB level. I usually plot linearity deviation from maximum digital recorded level (0 dB), but in this case it was necessary to begin the plot at -10 dB. Some form of nonlinearity, possibly caused by overload at maximum digital output levels, showed up in my sample, as will be seen in my discussion of Fig. 6. As Fig. 2 shows, deviation from perfect linearity is virtually negligible for low-level dithered signals in the range from -70 to -100 dB.

The fade-to-noise test (Fig. 3), using a dithered signal decreasing in amplitude from -60 to -120 dB, not only confirmed the RQ-DP7's excellent low-level linearity but also enabled me to establish its EIA dynamic range, which was approximately 106 dB. Using the EIAJ method of assessing dynamic range, I got 91 dB for the left channel and 91.6 dB for the right.

Figure 4 shows how THD + N varies as a function of frequency in digital playback mode. At 1 kHz, the reading is just under 0.07% for the left channel and 0.042% for the right channel. Somewhat lower figures are noted for bass frequencies, while a slight increase is observed around 10 kHz.

To separate the actual harmonic distortion components from residual noise, I analyzed the playback spectrum of a 1-kHz signal recorded at maximum digital amplitude. Results for the left channel are shown in Fig. 5, where you can see that the major harmonic is at 2 kHz and is some 66 dB below reference level. This corresponds to a distortion level (as opposed to THD + Noise) of 0.05%.

Figure 6 shows THD + N, as a function of signal level, for DCC playback. Notice that at all levels up to about -10 dB, the results are actually much better than the readings quoted in connection with Fig. 4. At approximately -50 dB, in fact, THD + N is 86 dB below reference level, which corresponds to 0.005%! The sudden rise in THD

**THE NEED FOR A
DCC PLAYER FOR PEOPLE
ON THE GO HAS BEEN
NICELY FULFILLED BY
PANASONIC'S RQ-DP7.**

at high signal levels may be due to distortion caused in the player's analog output stages. Of course, even at maximum signal output, THD is lower than 0.1%, which makes it irrelevant from the standpoint of audibility.

Channel separation was plotted for DCC playback at several spot frequencies, and results are shown in Fig. 7. Separation is 78 dB at 1 kHz and decreases to approximately 58 dB at 16 kHz. There is little difference between left-to-right and right-to-left directions.

The RQ-DP7's A-weighted signal-to-noise ratio during DCC playback measured 93.3 dB for the left channel and 93.4 dB for the right, which easily surpasses Panasonic's specification of 90 dB. Spectrum-analysis plots of residual noise versus frequency are shown in Fig. 8A for a "no-signal" DCC track. The curves obtained when the player was powered by the a.c. adaptor/charger have distinct peaks at 60 and 180 Hz. When the player was powered by the rechargeable battery, these "hum" peaks related to the power supply disappear, as might be expected.

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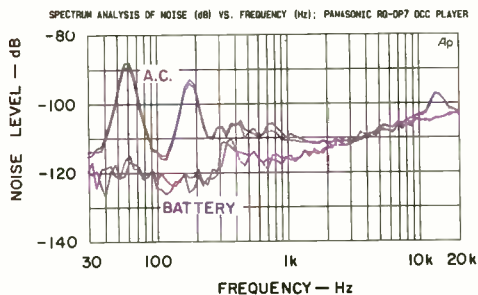
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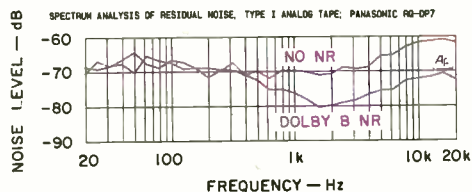
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Fig. 8—Spectrum analysis of residual noise when playing “no-signal” DCC track (A) and analog tape (B).

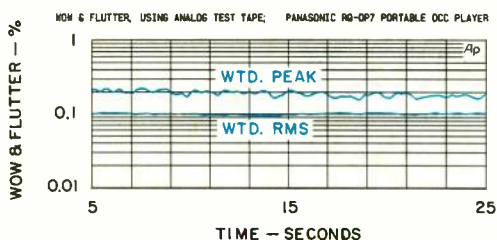


Fig. 9—Wow and flutter, analog playback.

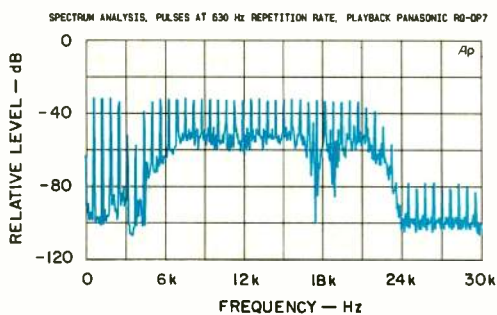


Fig. 10—Spectrum analysis of repeated-pulse PASC test signal.

Figure 8B shows residual noise for playback of a Type I analog “no-signal” tape (recorded with bias only). Without noise reduction, the A-weighted S/N was 55.4 and 53.6 dB for the left and right channels, respectively. With Dolby B NR applied in playback, the curve shows a reduction in high-frequency noise; A-weighted readings were 63.3 and 62.4 dB.

While wow and flutter was indeed below the measurable limit when using the DCC test cassette, that was not the case for analog cassette. Figure 9 shows two levels of wow and flutter. The usual weighted rms (or JIS) wow and flutter, plotted over a period of 25 S, is 0.1%, while the peak-weighted (IEC) level hovers around the 0.2% mark.

For my final lab test, I played back a special signal consisting of a unit pulse having a repetition rate of 630 Hz. This signal helps reveal the effects of the PASC data-reduction scheme employed in the DCC format. An examination of this original signal, when subjected to FFT spectrum analysis, would reveal a uniform noise floor and equally spaced harmonics, of equal amplitude, up to at least 20 kHz. However, when a DCC recording of this signal is played back (Fig. 10), the noise floor above 5 kHz rises by at least 40 dB and harmonics between about 3 and 6 kHz are noticeably attenuated. Whether these results can be correlated to any artifacts noted during musical listening tests remains an open question. Some listeners hear differences, however minor, between a DCC version of music and its CD equivalent; others hear no difference whatever. For its part, Philips, which invented DCC, claims that DCC sound is “equal to CD sound.”

Use and Listening Tests

I was very favorably impressed by the ergonomics of this little portable DCC player. Control but-

tons are very accessible and logically placed. The information shown in the display is easily read and provides all the status data you might want. The three-key remote placed in the headphone cable is a nice touch, though it took me a few minutes to become familiar with its operation. Multiple pushes of the central key are required for some functions. For example, in stop mode a single push initiates play, two pushes initiate fast forwarding, and three

**THE RQ-DP7 HAS
IMPRESSIVE ERGONOMICS,
WITH ALL CONTROLS
ACCESSIBLE AND
LOGICALLY PLACED.**

pushes initiate rewinding. Holding this button down for more than a second turns power off. Similar multiple functions are used in playback mode as well.

I did most of my listening through loudspeakers, using the line output terminal. Although my supply of prerecorded DCC tapes is limited, the few I have sounded just fine when reproduced via the RQ-DP7. Sound quality using the supplied headphones was certainly better than I have ever heard from an analog cassette portable.

My continuing reservation regarding DCC is its lack of “instant access.” Fast forwarding or rewinding a 45-minute DCC cassette (one side) took no less than 120 seconds. As for locating a given track using the skip buttons, the unit took 90 seconds to access a track that was 28 minutes from the beginning of the tape. On the plus side, at no time did the RQ-DP7 mistrack while playing my DCC test tape or any of the prerecorded tapes that I auditioned.

Considering its price, one can hardly say that the RQ-DP7 will be the choice of the youth market eager to replace personal portable analog cassette players with a digital model. Still, there are undoubtedly enough affluent music lovers out there who want to be able to take their music—be it analog or digitally recorded—wherever they go to make the Panasonic RQ-DP7 as successful as it deserves to be.

Leonard Feldman

D R E A M

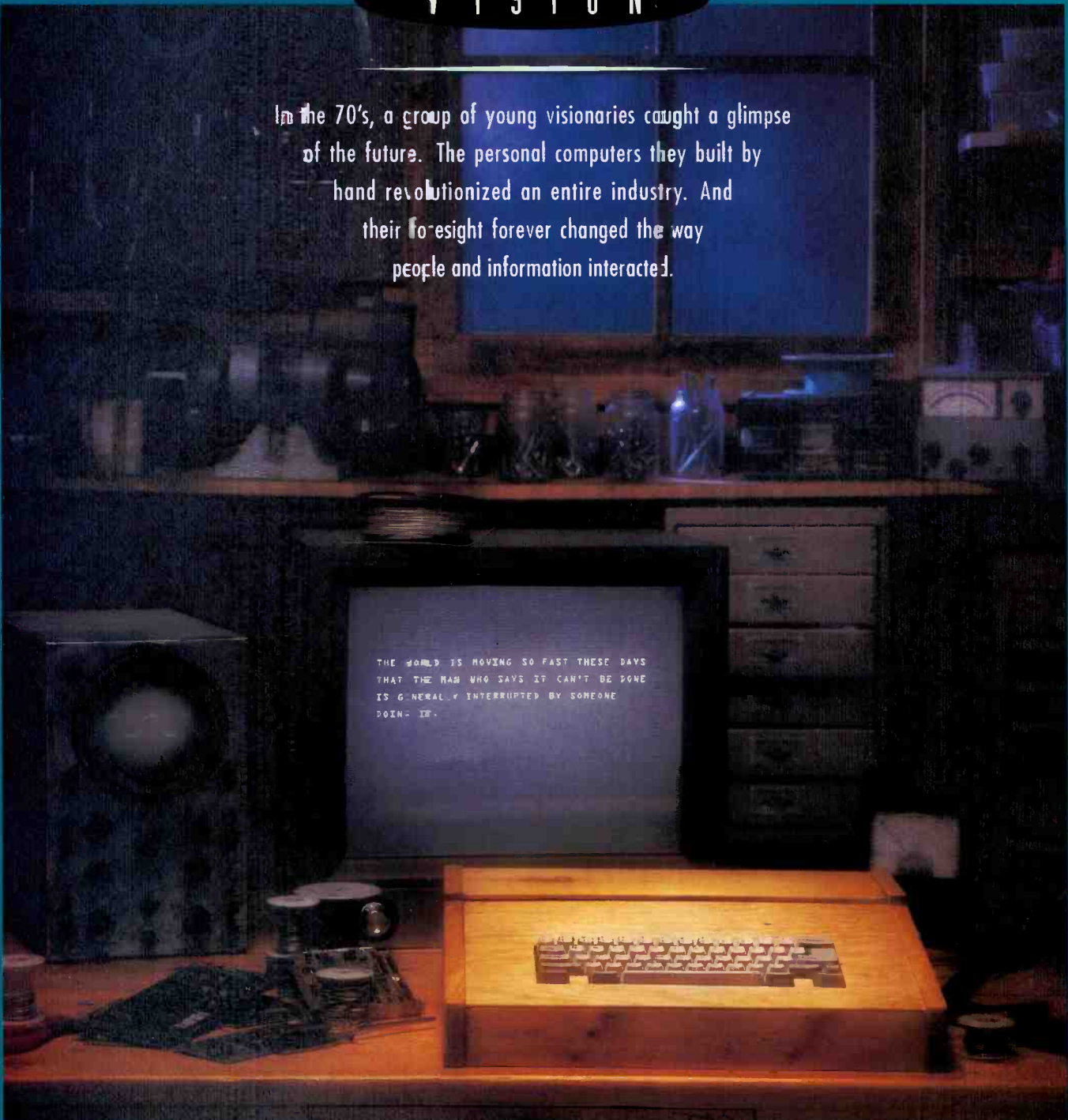
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Whether it's a certain instrument, composer, artist or song, music has the ability to fire the emotions like few other things. And there are always those who take their music and their car audio components a little more seriously. This specific group of demanding car audio enthusiasts is the reason Pioneer researches, engineers and manufactures advanced products under the Premier® nameplate.

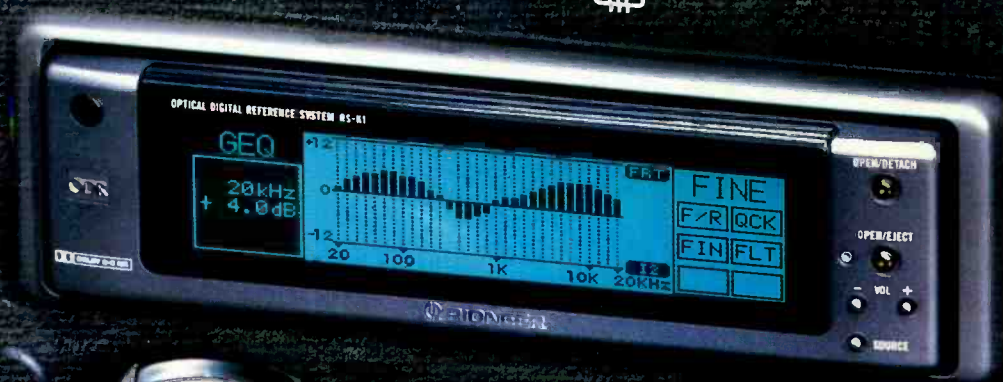
Concurrently, Pioneer knows that any car audio system is only as good as the person installing it. Which is why Pioneer hand-picked a select group of car audio experts across the country to ensure that

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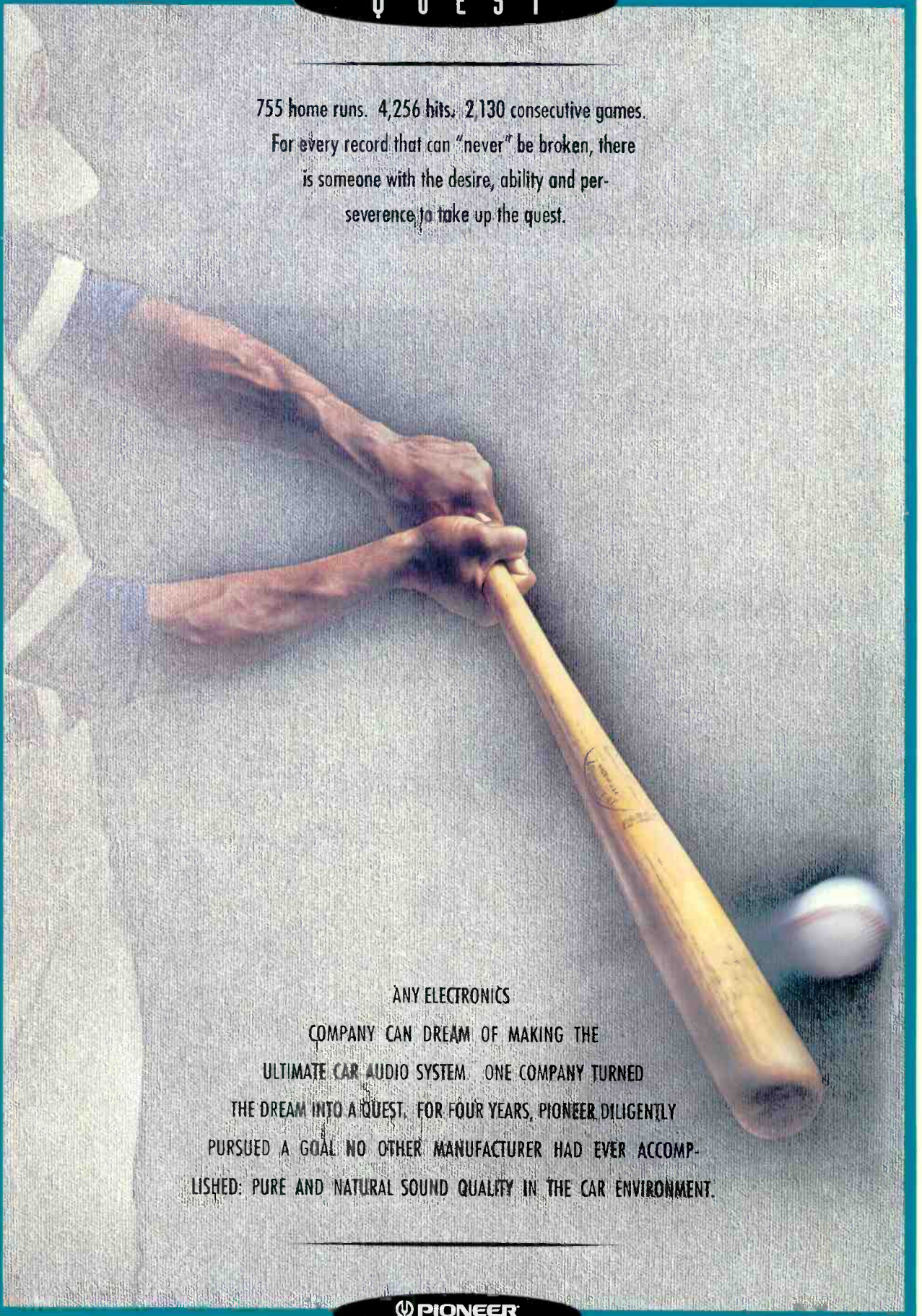


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NHT MODEL 3.3 SPEAKER

Now Hear This (NHT) is primarily known for its mid-priced speakers (such as the Model 2, favorably reviewed in *Audio* in July 1990), and its offerings have done extremely well in the mainstream consumer market. A major departure for NHT, the Model 3.3 is aimed solidly at the esoteric high-end market. In the company's words, the 3.3 represents the "ultimate expression of NHT's technology and capabilities" and is now its flagship system.

The most striking feature of the 3.3 is its elongated shape. Viewed directly from its narrow front, it looks like a slim conventional tower system. Moving off to the side,

**THE NHT 3.3s ARE
WORLD-CLASS SPEAKERS,
AT A LOWER PRICE THAN
YOU MIGHT EXPECT.**

however, reveals that the cabinet is nearly as deep as it is high. It looks more like a rather robust room divider than a loudspeaker!

Yet the deep cabinet serves a very useful purpose in providing an optimal radiation load for the side-mounted woofer, and it optimally positions the front-mounted, higher range drivers. The 3.3 speaker is designed to be located against the rear wall of the listening room. The woofer is mounted on the side of the cabinet, at the bottom rear (facing the center of the room when right and left units are properly set up), and thus effectively "sees" a corner; this maximizes the bass output and decreases distortion. In effect, NHT has precisely determined the location of the woofer in relation to the rear wall, thus eliminating a large variable in any system's low bass response.

The extreme depth of the cabinet also places the higher range drivers farther out into the room, for optimum coverage of the listening area. The front-mounted drivers, operating above 100 Hz on a narrow cabinet, simulate the excellent radiation characteristics and imaging capability of a small stand-mounted mini monitor. The slanted front panel of the 3.3 continues the Focused Image Geometry technology seen



in NHT's other models. This design is said to control radiation patterns, eliminate undesirable side-wall reflections, and provide a "measurably smoother frequency response, assuring tonal neutrality and precise imaging."

The three front-mounted drivers are arranged roughly vertically, with the midrange at the bottom of the three, the midrange at the top, and the tweeter in between. A long, narrow piece of absorptive foam is mounted beside the midrange and tweeter to optimize the system's horizontal radiation pattern. All the cone drivers have their own acoustically sealed enclosures.



SPECS

Type: Four-way, floor-standing, optimal-radiation, closed-box system.

Drivers: 12-in. cone woofer, 6½-in. cone mid-bass, 4-in. cone midrange, and 1-in. dome tweeter.

In-Room Frequency Response at 1 Meter: 23 Hz to 26 kHz, ±2 dB.

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

Crossover Frequencies and Filter Slopes: 100 Hz (12 dB/octave), 320 Hz (12 dB/octave), and 3.5 kHz (18 dB/octave).

Impedance: Nominal, 6 ohms; minimum, 4.3 ohms; maximum, 10.5 ohms; no phase angle over 30°.

Recommended Amplifier Power: 30 to 300 watts per channel; 1,000 watts peak input.

Dimensions: 42 in. H × 7 in. W × 31 in. D (106.7 cm × 17.8 cm × 78.7 cm), not including grille or stabilizers.

Weight: 123 lbs. (55.9 kg) each.

Price: \$4,000 in black satin Interkam laminate; wood veneers available by special order.

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

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The 12-inch woofer, which is made to NHT's specifications by Tonegen, is an ultra-long-throw unit with a large 59-ounce magnet and a die-cast frame. The woofer operates in an acoustic-suspension enclosure of 2.5 cubic feet (70 liters). The 6½-inch long-throw mid-bass driver (also from Tonegen), which takes over at a low 100 Hz and operates up to 320 Hz, is mounted in a 0.35-cubic-foot (10-liter) closed box. The 4-inch cone midrange driver operates from 320 Hz to 3.5 kHz, where the fluid-damped, 1-inch aluminum dome tweeter takes over. Both the midrange driver and the tweeter are manufactured by Seas. All the drivers except the tweeter use high-stiffness polymer cones.

The 3.3's formidable crossover contains 26 components: Nine resistors, seven inductors, and 10 capacitors. Only high-quality, 2%-tolerance parts are used. Inductors with iron-laminate cores are used in the woofer and mid-bass circuits; the rest are air core. Capacitors include low-dissipation, nonpolarized electrolytics and high-voltage Mylar units. All internal connection is done with 14- and 16-gauge stranded wire, and all connections are soldered. The crossover is wired point-to-point on a long, narrow (24 × 4-inch) piece of eighth-inch hardboard mounted on the bottom of the speaker.

The crossover's electrical configuration consists of a second-order low-pass filter on the woofer, a symmetrical fourth-order band-pass filter on the mid-bass, a symmetrical fourth-order bandpass filter with an additional first-order low-pass on the midrange, and a third-order high-pass on the tweeter. Resistive level-matching and impedance-compensating circuits are used on the midrange and tweeter. Bi-wire and biamp capability is supported, with the woofer and its low-pass filter having separate terminals from the rest of the system.

The cabinet construction of the 3.3 is quite impressive. All panels are of at least inch-thick medium-density fiberboard, with comprehensive bracing to minimize wall vibration. Custom floor stabilizers were co-developed for the Model

3.3 with Sumiko, the high-end accessories and phono cartridge company. These stabilizers incorporate thick, ½-inch, machined cross members attached to Sumiko's CounterFeet cones, which contact the floor. The cones can be adjusted to level the speaker or aim it at the listener.

Measurements

Figure 1 displays the 10th-octave-smoothed, on-axis anechoic frequency response of the Model 3.3, with and without its front grille. Also shown is the effect on low-frequency response of placing the 3.3 against or away from the rear wall. Measurements were taken at right angles to the front panel, 2 meters away, at a point halfway between the midrange and tweeter.

The rear wall's effects were simulated, in the ground-plane measurements, by physically placing the opposite-channel speaker behind the speaker under test and facing it to the rear. The woofer of the rear-facing system was then connected in parallel with the front one, to simulate the acoustic output of the rear wall's reinforcement. This essentially simulates the effects of a perfectly reflective, rigid rear wall. The actual reinforcement in a real room may differ significantly because of room charac-

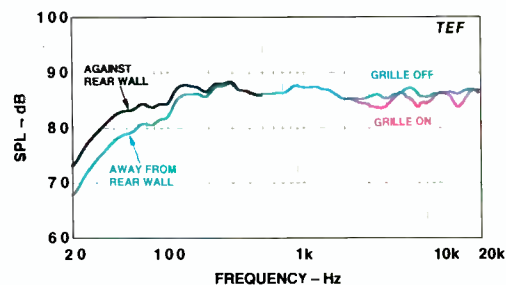


Fig. 1—Anechoic frequency response.

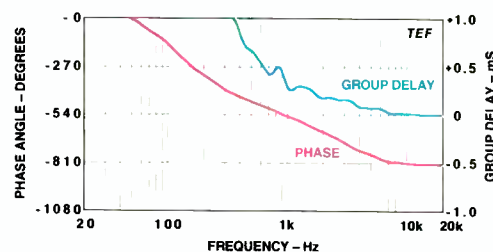


Fig. 2—Phase response and group delay.



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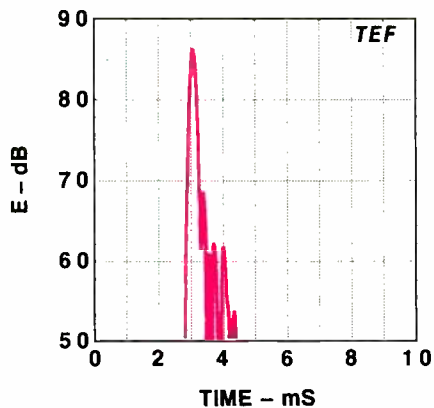


Fig. 3—Energy/time response.

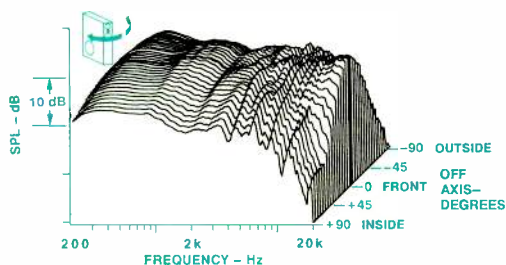


Fig. 4—Horizontal off-axis frequency responses.

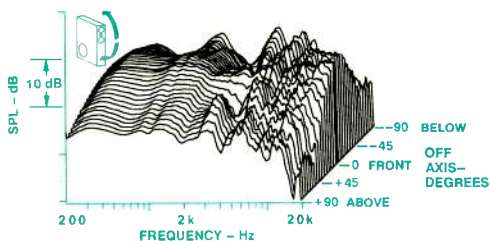


Fig. 5—Vertical off-axis frequency responses.

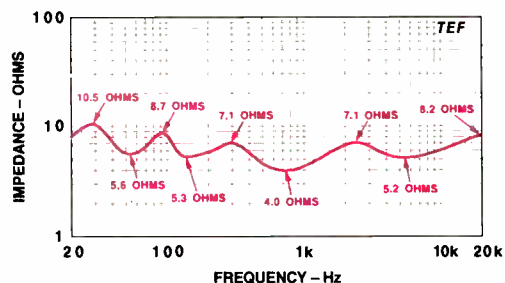


Fig. 6—Impedance.

teristics and reflective properties of the rear wall. With the 3.3 against the rear wall, the overall curve is very flat above 125 Hz, fitting a window of ± 1.5 dB. The curve also fits a respectable window of ± 3 dB from 40 Hz to 20 kHz. Below 60 Hz, the rear wall increases the output by about 6 dB as compared to locations far from the wall. The grille causes moderate reductions in the response, about 2 dB at 3.5, 7, and 15 kHz.

Reversal of the bi-wire connections resulted in a sharp dip in the response at the 100-Hz crossover. This indicates that the acoustic output of the woofer and mid-bass drivers is approximately in phase throughout the lower crossover region (a very desirable condition) with the normal bi-wire connection.

Averaged over the range from 250 Hz to 4 kHz, sensitivity measured 86.3 dB, essentially matching NHT's 87-dB rating. Right/left matching was quite good; the only significant deviation was between 1.8 and 3 kHz, where the left speaker was about 1.3 dB higher than the right.

Figure 2 shows the phase and group-delay responses of the 3.3 with grille on, referenced to the tweeter's arrival time. The phase curve is well behaved and drops a significant 270° between 1 and 20 kHz. The group-delay curve indicates that the woofer lags the tweeter by about 0.2 to 0.4 mS, depending on frequency. This offset is due to a combination of crossover design and offset between the acoustic centers of the drivers.

Figure 3 shows the 3.3's energy/time response. The test parameters accentuate the response from 1 to 10 kHz, which includes the highest crossover region. The main arrival, at 3 mS, is quite compact and is followed by lower level peaks, some 25 dB down, out to about 1 mS after the initial peak.

Figure 4 shows the horizontal "3-D" off-axis responses of the 3.3;

the bold curve in the center of the graph is the on-axis response. Even though the drivers are mounted asymmetrically on the front panel, the inside and outside responses are quite even. The uniformity of the curves indicates excellent horizontal off-axis response and coverage. The dispersion above 10 kHz is quite broad and even.

Figure 5 displays the vertical off-axis "3-D" curves of the 3.3; the bold curve in the center of the graph (front to rear) is on axis. The graph indicates that the response is quite uniform from 5° below the axis to 15° above it. This indicates excellent coverage for seated or standing listeners. The response exhibits a significant dip at the 3.5-kHz crossover for the 10° and 15° downward angles. As with some other systems, locating the tweeter below the midrange greatly improves the response for standing listeners.

The 3.3's impedance versus frequency, from 20 Hz to 20 kHz, is shown in Fig. 6. Although the curve exhibits many peaks and dips due to the system's four-way design, the total impedance range covered is quite narrow. A minimum impedance of 4.0 ohms occurs at 750 Hz, and a maximum of only 10.5 ohms occurs at 29 Hz.

Between 20 Hz and 20 kHz, the curve has a max/min variation of only about 2.6 to 1 (10.5 divided by 4). This relatively low variation, coupled with a minimum impedance of 4 ohms, means that the 3.3 will be only slightly sensitive to cable resistance. Cable series resistance should be limited to a maximum of about 0.075 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, 16-gauge or heavier wire should be used.

Figure 7 shows the rather energetic complex impedance of the 3.3, plotted from 5 Hz to 20 kHz. At least four complete loops are evident. The impedance phase (not shown) reached a maximum angle of only $+28.3^\circ$ (inductive) at 16 Hz and a minimum angle of only -21.4° (capacitive) at 112 Hz. The 3.3 will not be a problem for most amplifiers due to its low phase angles (low reactance) and fairly high minimum impedance.

A high-level sine-wave sweep of the 3.3 revealed no objectionable cabinet vibrations or buzzes, and the cabinet was quite inert and vibration-free. The woofer has a



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9

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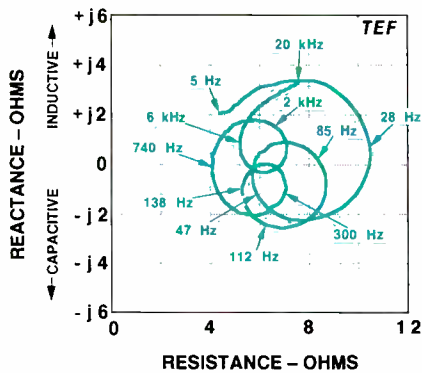


Fig. 7—Complex impedance.

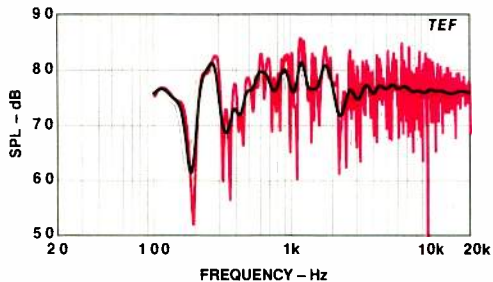


Fig. 8—Three-meter room response.

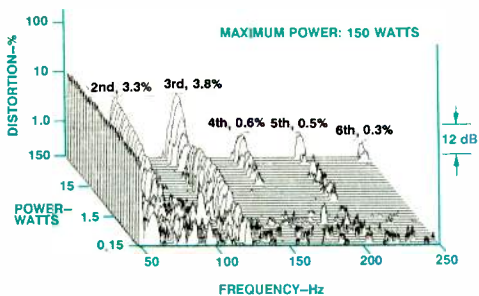


Fig. 9—Harmonic distortion for E_1 (41.2 Hz).

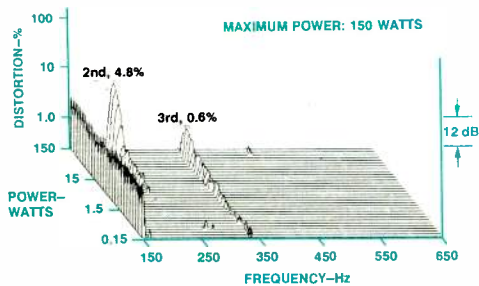


Fig. 10—Harmonic distortion for A_2 (110 Hz).

healthy linear excursion capability of about 0.75-inch, peak to peak. Only low-order harmonic distortion was audible at higher displacement levels. No bad noises were generated when the woofer was overloaded. On sine waves, the 3.3 sounded very clean and effortless at all power levels.

Figure 8 shows the 3-meter room curve, with both raw and sixth-octave smoothed data. The right speaker was in the right-hand stereo position, and the test microphone was placed 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 1.33 watts into the rated 6-ohm impedance. The measurement includes direct sound plus 13 mS of the room's reverberation.

Excluding the dip at about 200 Hz, the averaged curve fits a fairly compact 12-dB window from 100 Hz to 20 kHz. Above 2.5 kHz, the averaged curve is very flat and fits within a tight window only 3 dB wide. A general lift in the response is evident from about 500 Hz to 2 kHz, with an additional peak at 270 Hz.

Figure 9 displays the E_1 (41.2-Hz) bass harmonic distortion over the range of 0.15 to 150 watts. The 3.3 did exceptionally well in this test, with the highest distortion reaching only 3.8% third harmonic at full power. Higher harmonics were quite negligible and reached no higher than 0.6%. The 3.3 sounded quite clean and effortless at all power levels.

The A_2 (110-Hz) bass harmonic distortion data is shown in Fig. 10. The predominant distortion is a fairly low 4.8% second harmonic, with the higher harmonics 0.6% and lower. The A_4 (440-Hz) distortion data (not shown) rose only to the low value of 1.2% second harmonic at full power, with third harmonic at 0.6% and higher harmonics below the noise floor of my measuring gear.

Figure 11 displays the IM distortion created by tones of 440 Hz (A_4) and 41.2 Hz (E_1) of equal level, as a function of power. The IM distortion rises only to the very low level of 1.05% at 150 watts. The lower frequency tone of this test is handled by the woofer, while the midrange essentially handles the higher frequency tone. The speaker sounded very clean through all the distortion tests.

Figure 12 shows the 3.3's short-term peak-power input and output capabilities, as a function of frequency, measured using a 6.5-cycle, third-octave tone burst. The peak input power was calculated by assuming that the measured peak voltage was applied across the rated 6-ohm impedance. The peak acoustic output shown is for performance with the 3.3 placed against the rear wall. The acoustic gain of a typical room actually adds to this value due to reinforcement from the additional walls, the floor, and the ceiling.

The peak input power starts quite high (250 watts at 20 Hz), rises smoothly to 1,200 watts at 100 Hz, dips somewhat at about 130 Hz, rises to 4,100 watts at 300 Hz, and then, following a dip to about 3,000 watts at 450 Hz, attains 6,000 watts at high frequencies. Between 63 and 160 Hz and 315 and 630 Hz, significant triangularization of the acoustic waveform was noted, presumably due to saturation of the crossover's inductor cores. This limitation was the primary cause of the two dips in the input power curve at 130 and 450 Hz.

With room gain, the peak acoustic output starts strongly (107 dB at 20 Hz) and then rises to a plateau of about 118 dB between 50 and 125 Hz. After rising to a peak of 124 dB at 280 Hz, it falls slightly and then rises in the region of 124 or 125 dB at higher frequencies. The bass output of the 3.3 is very strong, in the top 10% of speakers that I have tested.

Use and Listening Tests

My review samples were supplied in the standard black-satin finish and appeared very businesslike. The fit, finish, and workmanship were impressive. However, the 3.3s' appearance did not appeal to my wife, because these speakers don't look like pieces of finely finished wood cabinetry. Their bulky black shape, especially when viewed from the side, contributed a lot to

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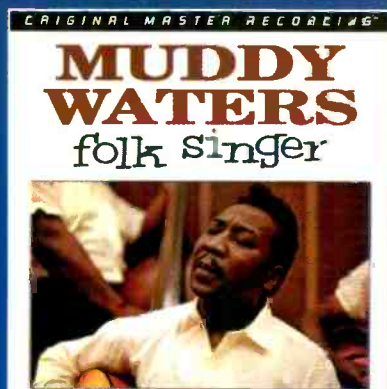
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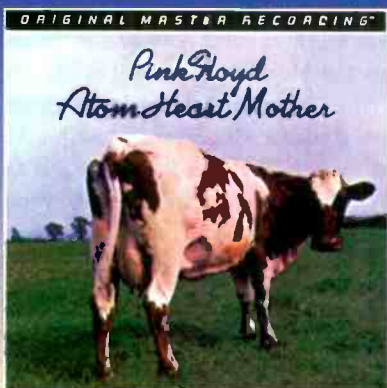


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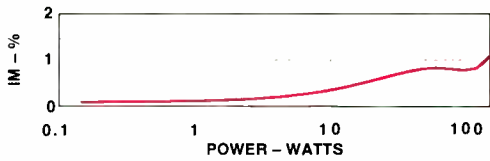


Fig. 11—IM distortion for A₄ (440 Hz) and E₁ (41.2 Hz).

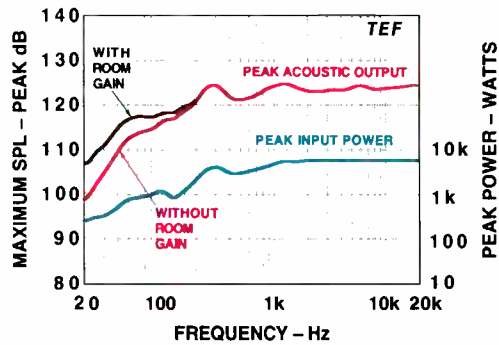


Fig. 12—Maximum peak input power and sound output.

her opinion. I was not as critical and rather liked the massive Spartan black look. The sound of the 3.3s was an entirely different matter: Everyone liked that!

The nine-page owner's manual is well written and covers all relevant topics, including installation, speaker cabling, connections (including bi-wiring), proper positioning, and warranty information. The greatest emphasis is on placement issues, and it is stated that the speakers must be placed very close to the rear wall (within 3 inches of it). The manual further states that the cabinets must be *exactly* parallel (NHT's emphasis) to each other, and that they must be spaced laterally so that the front speaker axes cross just in front of, or directly at, your listening position. NHT recommends adjusting the cone feet to set the speakers' front/back tilt for proper vertical aim.

At 123 pounds apiece, the 3.3s represent fairly formidable hunks to set up and move around in the listening room. Without the cone feet, they can be moved with some difficulty by one person using a rocking motion. However, with the feet attached to the stabilizers, it takes two people to move

them. The stabilizers are definitely required. Without them, the 3.3s can be tipped over sideways without much effort.

I listened to the 3.3s using a Krell KRC preamp driving a Krell KSA-250 power amplifier, which in turn drove the speakers through Straight Wire Maestro cabling. For reference, I used B & W 801 Matrix Series 3 speakers, while Rotel and Onkyo CD players provided source material.

I first set up the 3.3s in my usual listening locations, which placed them a significant distance (about 6 feet) from the rear wall. As this violated NHT's recommendation that the 3.3s be placed very close to the rear wall, I was expecting—and got—a lean, bass-shy sound. The balance was definitely weighted toward the high end. Playing material with lots of low bass, such as the organ version of Mussorgsky's "Pictures at an Exhibition" (Dorian DOR-90117), revealed, however, that the 3.3s could shake the walls readily when the material permitted. There was not a lack of low bass but just a general overall reduction in the bass range as compared to the rest of the spectrum.

Moving the speakers closer to the back wall significantly increased the bass level, but I was not able to move them as close to the wall as they required, because the back wall of my listening room is covered with bookcases that are 16 inches deep. I did some of my listening with the 3.3s positioned directly in front of the bookshelves, but most listening was done with the speakers in my usual locations, farther out in the room and about 8 feet apart. I chose to do this because of my great degree of familiarity with the way speakers sound in these locations—particularly for imaging, coverage, and smoothness, which are mainly mid- and high-frequency effects.

This left me with one major problem, the skewed bass/treble balance at this location. Even located away from the rear wall, these speakers aren't all that bass-shy as compared to many others I have listened to in the same positions. It's just that, compared to such large units as my B & W 801s, the bass is reduced in level.

I chose to compensate for this bass level difference by creating a simple passive circuit (using two 1-kilohm resistors and a single 1- μ F capacitor) that added 6 dB of bass lift to mimic the bass reinforcement provided by the rear wall. (As Fig. 1 showed, that amounts to 3 dB at 100 Hz, 4.8 dB at 50 Hz, and 5.6 dB at 25 Hz.) This circuit was simply inserted in the tape-monitor loop of the preamp. (The Krell preamp, conveniently, has a 6-dB boost switch that just compensated for the loss caused by the passive network at middle to high frequencies. Both the 6-dB gain and tape-loop functions were controlled from the preamp's remote.) With this circuit in place, the 3.3s were restored approximately to their proper bass/treble balance when located well away from the rear wall. Even with this boost, however, the bass from the B & W speakers was still somewhat higher in level than from the 3.3s.

Before you cry foul and ask why I used an equalizer to correct the 3.3s' bass response, realize that I could not place these speakers as per the manufacturer's recommendation, and it doesn't bother me to use simple tone correction if the system can be improved significantly and has the headroom and maximum output capability to handle the boost. (The 3.3s definitely have this capability!) Most of my further listening was done with this correction added and with the speakers placed out in the room, away from the rear wall.

On tracks 6 and 7 of *The Spies' By Way of the World* (Telarc CD-83305), the 3.3s did an excellent job in reproducing the bass impact and high-level transients of the percussion, when played at high levels. On another jazz/rock CD, Kenneth Nash's *Mr. Ears* (Music West Records MWCD-120), the cleanliness of the percussion and vocals came across very well.

On the previously mentioned, very demanding, organ version of "Pictures at an Exhibition," the 3.3s took everything I threw at them and reproduced the high-level pedals cleanly and with great authority. The tracks on *Ein Straussfest, II* (Telarc CD-80314) were reproduced very impressively at high levels, particularly the proverbial Telarc bass drum and the sharp, high-level transients of the sound effects. On more sedate classical material, such as

Continued on page 62

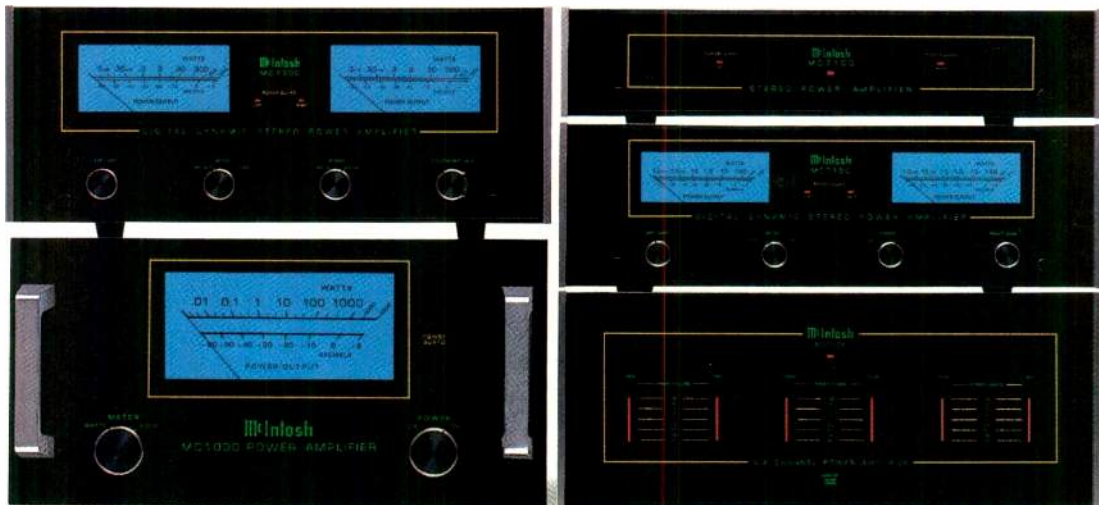
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POLK AUDIO LS 90 SPEAKER



The speaker is not, in my opinion, the most important component in a modern hi-fi system, but it is almost always the most colored component. No CD player, preamp, or amplifier is going to alter the sound of the signal as much as the loudspeaker, or do as much to determine a system's overall strengths and weaknesses. At the same time, good

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speakers are not small and they are not cheap. As a result, most audiophiles have to make severe compromises in the performance of their system when they buy loudspeakers.

The "decorator syndrome" has hit many systems, often resulting in the kind of system that you'd rather see than hear. There is, fortunately, a growing number of full-range speakers that solve the problems of price and decor, and the Polk Audio LS 90 is an excellent example.

The Polk LS 90 speakers are not cheap by mid-fi standards; their price of \$1,699 a pair, however, is cheap by high-end standards. Two lower priced members of the same

**THE LS 90 HAS AN
EXCEPTIONAL ABILITY
TO RESOLVE COMPLEX
DYNAMIC PASSAGES.**

family, the LS 50 and LS 70, are available at \$899 and \$1,199 a pair, respectively. These two models do not have the bass power and dynamic capability of the LS 90, but they do have many of the rest of its performance advantages.

The LS 90 offers considerable value for its price. Its value engineering starts with an extremely well-built cabinet, with good styling and control of resonance and diffraction. The LS 90 is 40 inches high, tall enough so that the tweeter is at ear level while you are in the listening position. The apparent image height is well away from the floor, which is critical to a good soundstage and imaging. This height also allows Polk to use an enclosure large enough to produce bass with a -3 dB point of around 35 Hz, useful response well below that frequency, and very low bass distortion by the standards of smaller enclosures.

The LS 90 has a surprisingly low visual impact on room decor. It is not tall enough to command atten-

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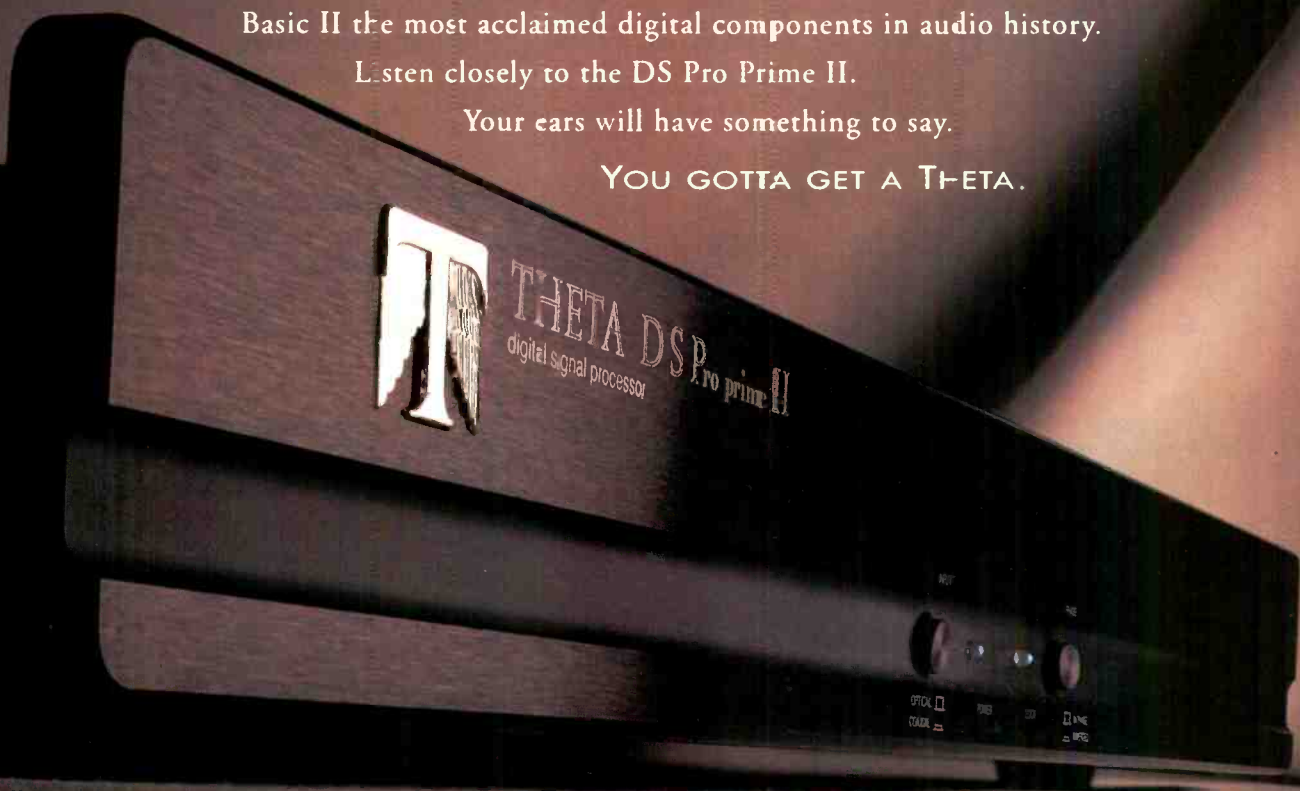
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tion, it is slightly tapered, and the wood finish and grille are both done well enough to qualify as high-quality furniture and are muted enough to be dignified.

The LS 90 is about 12 inches wide and 15 inches deep. The depth conceals the true size of the speaker. A slender cabinet like this can present acoustic problems, but Polk minimizes such a cabinet's tendency to reinforce cavity resonant modes by ensuring that the sides are not parallel. Polk also reduces the formation of standing waves by installing a damping filter across

the middle of the interior, by using rigid bracing, and by using a baffle of 1-inch-thick, medium-density fiberboard cut to tight enough tolerances so that the drivers are press-fitted as well as screwed in. The cabinet is equipped with spikes to allow a firm connection to the floor.

This level of cabinet quality is critical to reducing coloration. While I did not measure the vibration and resonance characteristics of the LS 90, I did remove the bass drivers and tweeter to check fit and construction quality. What I saw was distinctly

superior to the quality of most speakers in the LS 90's price range and of many speakers costing considerably more.

You also get significant advances in driver technology. The LS 90 is the result of considerable research into resonance and distortion, a joint effort of Polk and Johns Hopkins University. Polk reports they made the first use of full-field laser interferometry to take holographic pictures of distortion in loudspeaker drivers while the drivers were in motion. This technique allowed Polk to view the entire moving structure of a driver as a mechanical transmission line, and to make much more precise and rapid predictions of how given driver materials and shapes, magnet structures, and suspensions would perform.

The results of this research, as seen in the LS 90's cone drivers, include a new composite cone material, new surround geometry, and the use of vibration-control caps. In the case of the tweeter, Polk has used a trilaminar dome material, a new voice-coil former, staggered tuning of the internal cavities, and a new approach to acoustic loading of the dome surround. The tweeter has a range that extends above 26 kHz and a very low Q, producing a -3 dB down point of 25 kHz.

Research and technical advances do not always produce advances in sound quality and musicality. In fact, there is a tendency in the high end to become so interested in improving one aspect of sound quality that the others are ignored or given insufficient priority. The LS 50, LS 70, and LS 90 do, however, provide the fastest, most detailed, and most transparent performance of any Polk speakers I have heard to date. They are very competitive in this regard with any other speakers I have heard in their respective price ranges. This is one time where you will clearly and immediately hear the advances technology has made over the last few years.

The LS 90 is a five-driver system. It uses a simplified crossover design with a second-order Butterworth alignment in the high-pass section. This crosses over at 2,500 Hz from the tweeter to a first-order low-pass on the top two drivers. The bottom two drivers are rolled off so that they only contribute at low frequencies. This crossover takes account of the facts that the LS 90's tweeter has a range of nearly 4½

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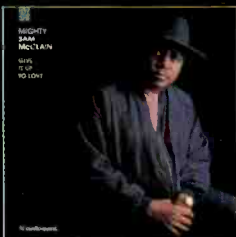


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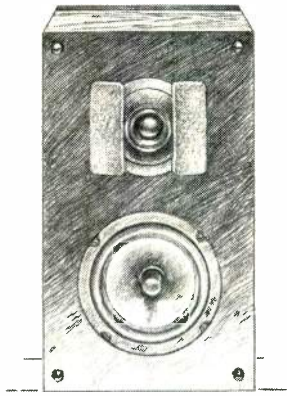
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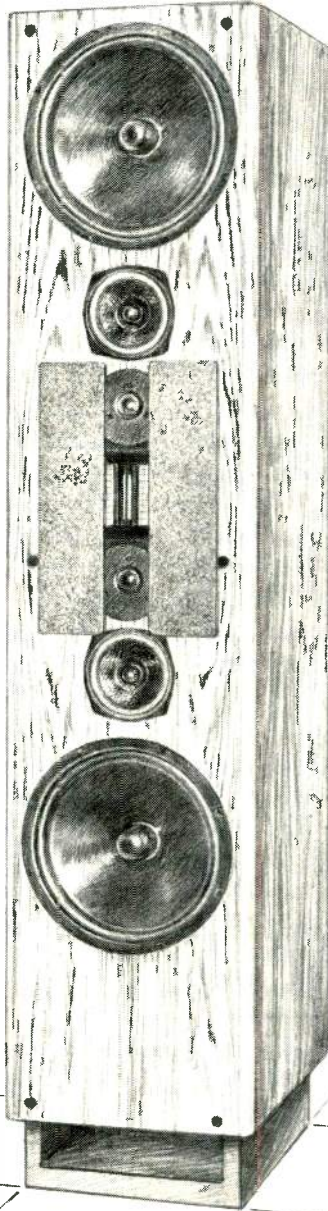
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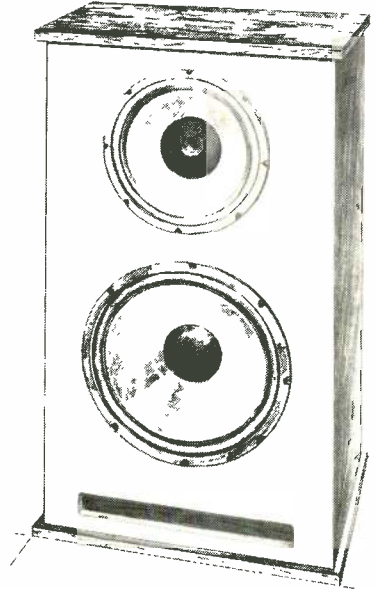
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octaves (from just above 1 kHz up to 26 kHz) and that the four new 6½-inch midrange and bass drivers do not enter their first resonant mode until 1,800 Hz and have smooth response up to 3 kHz. Coupled with a smooth impedance curve, this produces an unusually smooth midrange that is also easy for most amplifiers to drive.

The end result is a full-range speaker with a smooth overall frequency response extending from the mid-bass to beyond the range of hearing. The overall timbre is well chosen. There is a slight downward tilt in response from around 100 Hz to above 20 kHz, a frequency balance well suited to CD and most moving-coil cartridges.

The bass is quick and solid, with good to very good definition. If you pay attention to room placement to get the best response, the LS 90 will perform as well as many speakers having much larger enclosures. It does not have power in the deep bass, but few speakers at this price do, and they lack the quality of the LS 90's midrange.

The strength of a good loudspeaker depends on its midrange, and the LS 90's midrange is exceptionally detailed and exceptionally smooth from around 150 Hz to about 2,500 Hz. There is no suckout in the mid-bass or lower midrange, as is common in smaller speakers, and there also is no excessive warmth. It is a real pleasure to hear the midrange without having to hear either an emphasis of the middle to upper bass (which occurs just before many speakers cut off in low-frequency response) or the kind of false detail that occurs when a speaker emphasizes the upper midrange.

There are some slight irregularities in the upper midrange response, somewhere around 4 to 6 kHz, but it slightly softens the upper midrange. This tends to improve the LS 90's musicality with most CDs. Treble extension is slightly recessed, but the treble still has a great deal of life, speed, and air. No speaker handles this region perfectly, and many do not handle it well. The LS 90 is very musical here.

Soundstage performance is unusual for a speaker in this price range. If you experiment carefully to find the location where you get both the best depth and the maximum width of the stereo image without sacrificing center fill, you will get very good

layering of depth, a natural soundstage width, and an apparent listening position just slightly further back in the hall than it was on the original recording. Imaging is natural rather than spotlighted or too wide.

The Polk LS 90 has an exceptional ability to resolve complex dynamic passages and the softer passages of orchestral and choral music. I suggest listening to your favorite recording of a solo instrument, a recording you know really well, on the LS 90 and then comparing this with the sound of other speakers. The LS 90 will not provide the artificial detail of a speaker that lacks full-range bass response or has an irregular rise in upper midrange output, but it does very well indeed in providing musically natural sound. It can get the detail out of the best Chesky, Dorian, Reference Recordings, Telarc, and Wilson audiophile CDs and records without sacrificing musical pleasure or involvement in the music.

All speakers are a blend of compromises, but the blend in the LS 90 has been very well chosen. You get full range without artificial emphasis of either frequency extreme or a sacrifice in midrange quality. The LS 90 is capable of handling high power levels and sudden dynamic shifts in the music without sacrificing transient detail or air or losing resolution in lower passages. The minor response irregularities are carefully adjusted so that they allow the LS 90 to be very musically involving, and well-placed LS 90s give you a very natural and convincing soundstage.

Combined with its relatively low visual profile and easy load on the amplifier, the Polk LS 90 is precisely the kind of full-range speaker that today's buyers need. It offers sound of high-end quality at an affordable price. The LS 90 is also a good example of why buying stereo components should be fun instead of a chore. Comparing the LS 90 or its less expensive siblings to speakers from other manufacturers will show you the range of options available. This experimentation will demonstrate how good modern stereo can be and show you a way to tailor systems to your tastes. It will reveal just how important and different the sound of today's better speakers can be, and may well make you choose the Polk Audio LS 90s.

Anthony H. Cordesman

NHT, continued from page 56

Handel's *Concerti Grossi, Op. 3* (Sony Classical SK 52553), the 3.3s' imaging and soundstage capability was excellent, with a well-balanced and smooth, open sound.

Judging everything other than overall bass level, I felt that the 3.3s sounded quite similar to the 801s on most material. When standing, and not directly facing the speakers, it was difficult to tell which system was playing! In addition, the sensitivity of the 3.3s was essentially the same as the 801s'. The similarity of the 3.3s' sound to the 801s' says a lot about the NHTs' neutral, wide-range, and well-balanced sound.

**THE NHT 3.3's BASS
OUTPUT IS VERY STRONG,
IN THE TOP 10% OF
SPEAKERS I'VE TESTED.**

On third-octave, band-limited pink noise, the 3.3s' clean and fundamental output at 20, 25, and 31.5 Hz equalled that of the B & W reference speakers but without the B & Ws' port whooshing sounds! At higher frequencies, the equality was maintained. If these NHT speakers are properly located against a back wall, their clean, low-frequency output should exceed the B & Ws'. On the stand-up/sit-down test with pink noise, the 3.3s did an excellent job and were the full equal of the B & W speakers. No significant tonality change was evident between the two positions!

The NHT 3.3 speakers worked extremely well for me. Even though I operated them at a disadvantage by not placing them properly against the rear wall, they competed quite well in bass output with the B & W speakers. (Actually, they were slightly better in the very low bass.) Located properly, near the rear wall, the 3.3s should exceed the bass performance of the 801s. No subwoofers needed here!

The 3.3s are prime contenders in the world-class, no-holds-barred speaker tournament. At \$4,000, they even cost significantly less than many other models in this class. If you are looking for speaker systems with high performance and good value for the money, consider the NHT Model 3.3s.

D. B. Keele, Jr.

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MARTIN-LOGAN AERIUS SPEAKER



The Martin-Logan Aeries is not an easy speaker to review. I can easily see how a reviewer could measure or audition it and find all kinds of flaws. I can also see how an audiophile with the wrong amplifier—or one who failed to experiment with room placement—could be very disappointed. Yet with prop-

er setup, the Aeries can be a very successful blend of an electrostatic treble and midrange and a cone woofer. For \$1,995 to \$2,495 a pair—depending on finish and whether the speaker is bi-wired—you can get many of the benefits of far more costly high-end speaker systems.

The Aeries is tall and thin; it is 55 inches high, 10½ inches wide, and 13½ inches deep. The top part is a nearly transparent electrostatic speaker panel about 38 inches high, with a curved diaphragm about 9

inches wide. This panel is curved in a 30° arc to improve dispersion, thereby avoiding the highly directive treble that in other electrostatics severely reduces the width of the listening position and the stability of the stereo image from several listening angles. The panel is a dipole, radiating from the front and back without any damping in the rear. Like some other Martin-Logan speakers, it uses a transparent diaphragm sandwiched between two black metal panels. These panels have so many holes that it is possible to see the rear wall through them. In spite of this apparent fragility, the electrostatic panel is well built and is on a very rigid metal mount. Martin-Logan claims the panel has a frequency response of ± 2 dB from 300 Hz to 20 kHz.

The bottom of the Aeries is a conventional 8-inch cone woofer in a sealed cabinet. Martin-Logan says that this driver has a response of ± 3 dB from 40 to 2,000 Hz. The crossover frequency is 500 Hz, with a slope of 12 dB per octave. The overall response of the Aeries is said to be ± 3 dB from 40 Hz to 20 kHz. The nominal impedance is 4 ohms; actual impedance drops to a little over 2 ohms at 20 kHz.

There are strong arguments for a hybrid design. The main argument



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For literature, circle No. 94

for use of an electrostatic speaker is that it is faster and less distorted than a cone driver. Since electrostatics are virtually always dipole speakers, the argument is also made that they produce a larger and more open soundstage. The main drawback is that even the largest home-sized electrostatic speaker will not reproduce the deepest bass or the widest dynamic range, and that a panel large enough for good mid-bass is too large for good treble. The hybrid character of the Aeries offers the potential to deliver most of the merits of a full-range electrostatic with the bass and power-handling capability of a cone woofer.

I have owned and auditioned a great many electrostatics over the years—going back to a Quad ESL more than 20 years ago. I have enjoyed most of them, but no electrostatic I have ever heard has been decisively cleaner or faster than today's best cone, dome, or ribbon drivers. An electrostatic is only as good as it sounds; it is not superior because of some design principle.

Every electrostatic I have ever used has been difficult to place in a room and required some adjustment of the listening position. Admittedly, all speakers require a great deal of experiment regarding room placement. But electrostatics require particularly careful adjustment in terms of:

- How far the back panel is from the rear wall, and the absorbency of the rear wall surface. This is critical in determining the amount of midrange and treble information radiated from the rear wall. With the Aeries, the distance should be about three to four feet, and you need at least three feet of clearance from the side walls.

- The backward tilt of the electrostatic panel. This is critical to ensure good vertical dispersion and a focused, stable soundstage. Experimentation to find the correct tilt for a given listening position is vital with the Aeries. If you don't find the correct position, treble data might be lost, and the apparent point source might fluctuate between the electrostatic panel and the cone driver (which radiates a substantial amount of midrange information).

- The angling, or "toe in," of the panel toward the listening position. A slight (10° to 15°) toe in, and careful adjustment of the distance between the two speakers to ensure that there is no hole in the center, is absolutely critical to best performance.

- The distance between the speakers and between each speaker and the listening position. With the Aeries, you must find the distance between each speaker and the listener which provides a reasonably wide and stable listening position and good treble response. The listening position must be far enough away from the speaker so that you do not hear discontinuities between the panel and the cone. No matter what you do, you will find that the Aeries is not suited for very close-in, or near-field, listening. It produces a sweet spot at the listening position that is unlikely to be more than two listeners wide.

I should stress that the Martin-Logan Aeries is a remarkable success regarding

**THE AERIES REQUIRES
ADDITIONAL EFFORT IN
PLACEMENT, BUT THAT
EFFORT PAYS OFF IN
EXCEPTIONAL SOUND.**

the speed, power handling, dynamic life, and other performance characteristics of its cone bass unit. In fact, the bass performance of this relatively small structure is a major design achievement. The Aeries is also remarkably successful in the smoothness with which the bass unit blends with the electrostatic panel. Few hybrids, at any price, do as well in integrating these two different technologies.

On the other hand, the hybrid character of the Aeries presents some problems in terms of interaction between the woofer and the electrostatic panel. For example, the woofer will not always give smooth bass response when the electrostatic panel is placed at its optimum distance from the rear wall. I had to substantially rearrange my listening room so that the panel was the right distance from the rear wall yet bass response was still smooth. My initial placement gave me exciting, but "one-note," bass that peaked somewhere around 45 to 48 Hz.

I believe that the manufacturer's recommended power level of 60 to 200 watts per channel is somewhat misleading. I don't know of a tube amp offering less than 100 watts per channel that can really handle the

Aeries' cone driver with the proper mix of speed and control. This speaker needs a transistor amp of this power, and preferably one whose ability to handle complex loads and "control" the woofer is very good. No high-end speaker I know of is all things to all amplifiers, but you need to exercise care in matching the Aeries to an amplifier.

The Aeries is very definitely a speaker whose sum compensates for any weaknesses in its parts. Once I placed it properly and gave it the right power amplifier, the Aeries had almost immediate listener appeal. This was as true for non-audiophiles as for my more "golden-eared" friends. In fact, when I moved it aside to listen to some other speakers for a few days, I found it had mysteriously migrated upstairs into my son's system.

Whatever the theoretical merits of an electrostatic and/or a dipole, the midrange and treble in a well-focused Aeries are exceptionally clean and sweet. This speaker can produce a great deal of insight into the music without becoming analytic. Its sound character is very revealing without being unnatural or surprising.

In practice, I could not achieve ruler-smooth frequency response with the Aeries. The actual balance of midrange and treble delivered at the listening position was very dependent on placement and front-to-back angle. I could never avoid some minor peaks and valleys in the midrange or a slow apparent roll-off above 10 kHz. Nevertheless, the overall frequency response from the lower midrange to the upper limit of my hearing was smooth and very good to excellent.

The Aeries never changed the basic character of instruments and voice. It had an excellent ability to separate the "voices" of individual instruments and groups of instruments, choral voices, and groups of massed strings. Chamber music and small jazz groups were particularly natural, as was classical guitar.

I cannot give Martin-Logan enough praise for the quality of the blend between the electrostatic and the woofer. The choice of bass characteristics and midrange blend between cone and electrostatic is very smooth. There is no loss of upper-bass/lowest-midrange dynamics (as in some all-electrostatic or hybrid speakers), and

there's no excessive warmth. Let me suggest Brahms' cello sonatas (on Dorian DOR-90165) and the first track on Ray Brown's *Moonlight Serenade* (Jeton 123/1) as cases in point.

The cone unit has enough detail and control so that it does not lag behind the electrostatic. Bass speed and detail are very good, much better than in many far more expensive speakers. The Aerius also has very good bass balance. It does not have deep bass, and it starts to roll off sharply somewhere between 45 and 50 Hz, even

with optimal room placement; however, its bass is very "live" and dynamic. I suspect the woofer in the Aerius would measure considerably cleaner than most woofers in similarly sized bass enclosures.

The end result is that the Aerius provides a feeling of surprising bass depth and power that does not seem to "choke" or slow down when the speaker reaches the point where the bass response seems to drop. Having more musical bass is always more important than having deeper bass, and the Aerius really delivers on this score.

The Aerius has very good overall dynamic capability. Its sound is consistently clean, even at comparatively high listening levels. If you think of electrostatics as only doing their best at polite listening levels, forget it. While the Aerius is not a speaker for the rock fan who likes his ears to bleed, it does very well with full orchestral music, opera, big-band jazz, and rational levels of rock music. Reference Recordings has recently done a superb job of showing just how good complex digital dynamics can be with really good speakers; I suggest that you try *Trittico* (RR-52CD) to see just how well the Aerius can do.

The soundstage of the Aerius is dependent on speaker placement. My advice is not to stretch it. Many audiophiles like a relatively wide placement, because it expands the soundstage and provides more left-to-right imaging detail. Yet this placement also exaggerates the soundstage and imaging, sacrifices depth, and tends to cluster the instruments around the speakers. If you keep the left and right speakers close enough together so that there is no hint of a hole in the middle, the Aerius will provide a very good mix of musically natural left-to-right and back-to-front imaging. Depth will be placement-dependent and may be a bit shallow compared to some other dipoles, but it will still be good. The apparent locations of the musicians will be a bit to the rear of what is on the recording, but this is a blessing with 90% of today's CDs.

The Aerius requires additional effort in placement and adjustment, but this effort is rewarded with exceptional performance. I am told by some dealers that audiophiles tend to be turning away from dipoles and opting for smaller speakers. If so, the Aerius demonstrates that this is a shame. Like some competitive dipoles from Apogee Acoustics and Magnepan, the Martin-Logan Aerius offers a great deal of musical enjoyment that is missing in most smaller speakers, and a kind of soundstage and imaging that only dipoles can provide. As for the "wife acceptance factor," I can offer potential buyers two sources of hope. First, the Aerius is very well styled and has considerable visual appeal. Second, every non-audiophile who mentioned its appearance before actually listening to the Aerius in my home was then quick to praise its musical performance. *Anthony H. Cordesman*

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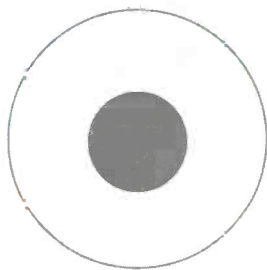
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BIB COMPACT DISC RESTORER POLISH



Most of us have gotten over our original naiveté concerning Compact Discs. The initial claim of co-inventor Philips that here was “perfect sound now and forever” has long since been disproved. The “perfect” part of the claim was disproved with each new generation of CD players, and today we are ever closer to that long-sought perfection.

As for the “now and forever” part of the claim, we soon learned that despite our best efforts, dirt and grime eventually affix themselves to the playing surface of a CD, and scratches, however small, also find their way onto a CD’s surface—often causing annoying skips and pops. This is especially true when

such discs are used in low-cost, mass-produced players whose error-correction capabilities leave something to be desired.

Addressing these problems, Bib Audio/Video Products has introduced Compact Disc Restorer Polish, adding to the long list of care products that this fine English company has been exporting for more than 35 years. Let me emphasize at the outset that Bib’s Restorer Polish is not a cure-all for *every* type of damaged CD. To fix really severe and long scratches or surface areas that have become opaque, the only thing I’ve found is the Memorex Compact Disc Repair and Maintenance Kit, imported from Germany. However, if light scratches are a problem or if discs are loaded with dust, grime, or oily fingerprints, Bib’s Restorer Polish may well be just what you need. A side benefit I noted is that once a CD has been treated with this product, it is largely immune to static buildup, which

attracts dust particles. You are most likely to appreciate this benefit when discs are played in a hostile environment, such as a car, or used in a portable CD player.

The U.S. director of Bib America, Tony Marcon, suggested that I take a ballpoint pen and mark a CD from center to edge, to cause skipping. I used the least expensive CD player available to me but could not duplicate the skipping that Marcon reported. He must have used a really old first-generation CD player; a narrow single-line scratch from center to edge is error-correctable with virtually *any* modern CD player.

When I went a step further and laid down a “ballpoint” scratch in the direction of play (along a track, rather than across it), mistracking occurred at once. Happily, Bib’s Compact Disc Restorer Polish, used in accordance with the supplied brief instructions, was able to polish out this admittedly light surface scratch, enabling me to play the disc through the damaged track without any skipping.

This Bib product comes in three sizes. The 200-application kit, Model C635, is \$6.95; the 400-application C619 is \$12.95, and the 600-application A655 is \$19.95. The latter, which I used, includes a spray applicator, not much larger than a lipstick tube, that dispenses just enough polish for one CD at a time.

**CD RESTORER POLISH
REMOVES LIGHT
SCRATCHES AND REDUCES
STATIC BUILDUP.**

This applicator is packaged in a storage box with a hinged lid, together with an optical-grade polishing cloth. By the way, for those who worry about our environment, the instructions printed inside the storage box contain this statement: “The metered spray is ozone friendly and does *not* contain CFCs.” *Leonard Feldman*

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For literature, circle No. 95



Most loudspeakers touted for "Home Theater" are little more than patched up audio models. That's because most speaker manufacturers don't build their own drivers, the components that produce the sound. Instead, they buy off-the-shelf parts and struggle to reconfigure them for Home Theater.

Celestion's Shield Series was created specifically to suit Home Theater applications, both acoustically and aesthetically. They employ Celestion-designed, magnetically-shielded drivers, integrated into elegant cabinets using proprietary construction technologies.

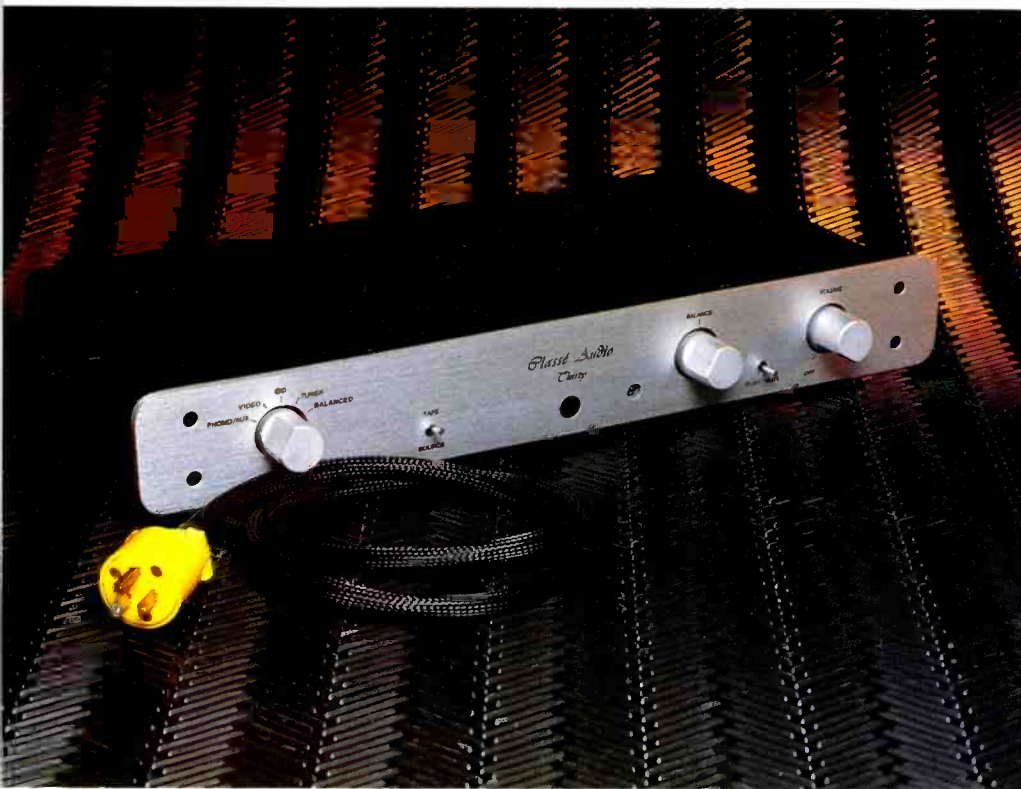
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CLASSÉ AUDIO THIRTY PREAMP



One of the pleasures of being a reviewer is that you get to listen to the best without having to pay for it. One of the curses of being an audiophile is that you keep having to read about equipment you can't afford. The Classé Audio Thirty preamplifier is a cure for that curse. For \$1,195 you get at least 90% of the sound quality of the top-of-the-line Classé Audio DR-6 (which is now called the Model Six and costs \$3,295). In fact, the Thirty comes close in sound quality to preamps costing in excess of \$4,000.

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The Thirty is not a stripped-down line-stage preamp. This solid-state unit has an excellent built-in phono



stage for both moving-magnet and moving-coil cartridges. It has a remote control, balanced inputs and balanced outputs, adjustable moving-coil gain (from 13 to 41 dB), a tape loop, four high-level inputs, and a mute control. All of this is packaged in a slim-line chassis with high-end styling and a high-end feel.

The Classé Audio Thirty also has the internal design features you expect in a high-end product. The phono gain circuit's totally passive RIAA section uses high-grade, precision polypropylene capacitors. It uses the same fine-tuning and layout methods as more expensive Classé Audio preamplifiers.

The switches and potentiometers in the Thirty are the same as those used in the DR-6. The high-level gain stage is balanced, and uses differential voltage amplifiers followed by high-current-gain output stages with low output impedances and high drive capability. The output impedance is less than 1 ohm.

The Thirty uses a motorized mechanical volume potentiometer with a high surface and tension contact area. The power supply has a large, high-current toroidal transformer with dual filtering of more than 30,000 μ F and dual stage regulation.

The Thirty also passes the "lift-the-lid" test. The layout of the p.c. board is excellent, and the board is of excellent quality. High-quality, passive components are used, and the construction quality is outstanding. You look at a finished high-end product, not a preamp whose internal layout looks jury-rigged or warns of cost-limited engineering.

I have to admit to a bias in favor of the Thirty's sound, because I use its more expensive sibling, the DR-6, as one of my two reference preamps. This experience allows me to compare the sound of the Thirty to that of the DR-6 with considerable precision (hundreds of listening hours have that effect) and to comment on the extent to which an affordable high-end product equals the sound of a top-of-the-line unit.

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The Thirty has the same overall balance of sound quality as the DR-6. You get a remarkably realistic musical balance and a great deal of transparency and detail. Some competing preamps offer deeper bass, more open dynamics, and a slightly more precise transient attack, yet few preamps at any price do as good a job of placing you in the performance hall without calling your attention to the fact that you're listening through an electronic device.

There is no significant difference between the Thirty and the DR-6 in terms of timbre and subjective overall frequency response. Both are about as neutral as you can get. The balance between the bass and upper octaves is nearly perfect, and both blend smoothly into the midrange. Voices, strings, and brass are reproduced without any hint of frequency shifts or coloration. You get a rock-solid neutrality that reinforces, rather than dulls, musicality.

The DR-6 has slightly superior deep bass, but the Thirty is no cheat. It will get the best out of any speakers remotely suitable for a preamp of this price, and do so without any significant loss of detail, control, or low-frequency extension.

The Classé Audio Thirty is not quite as neutral and transparent as the DR-6. On the other hand, there is no hint of added warmth or suck-out in the mid-bass, upper bass, and lower midrange. The lower register of strings and piano is very natural, as is deep male voice and naturally recorded acoustic guitar.

The midrange performance of the DR-6 is excellent, and the Thirty's comes very close. It has the same natural musical balance, and most of the ability to provide exceptional transparency and detail. This outstanding midrange performance shows up in recording after recording. I did not hear the Thirty alter the midrange balance and character of any of my reference recordings. It has a neutrality and natural concert-hall midrange quality that strikes precisely the right balance in timbre between the analytic and the romantic.

The Thirty lacks just a touch of the sweetness and air of the DR-6, and does not have the ability of top-of-the-line preamps to resolve low-level detail in the upper midrange and treble. Yet it does not change character going from the midrange to the treble, and it is very natural. It is revealing,

without hardness or overemphasis, and it shares the DR-6's ability to reproduce the upper octaves with excellent musical balance. Upper strings, tenor and soprano voice, and upper octave percussion are all very good. You will find the Thirty far more musically revealing than most competitively priced preamps.

The Classé Audio Thirty has slightly less dynamic energy than the DR-6, and a number of tube preamps near its price range

**FEW PREAMPS, AT ANY
PRICE, DO AS GOOD
A JOB OF PLACING YOU IN
THE PERFORMANCE HALL.**

provide slightly more open and natural musical dynamics, although at the cost of trade-offs in other performance areas. No one, however, is going to feel shortchanged by the Thirty, even when listening to the best 20-bit CDs or most demanding Chesky, Reference Recording, and Wilson CDs. The DR-6 does clearly outperform the Thirty in transient detail and transparency, although the Thirty is still very good in these areas. The sound is transparent, not etched. The Thirty's excellent midrange and upper midrange also provide consistent transparency and detail without any exaggeration of the upper midrange, which is particularly important with CDs and close-miked recordings.

The Thirty's phono stage has audibly lower noise than the top-of-the-line DR-6 when used with low-output moving-coil cartridges (although it does not have quite the same transparency and dynamic detail). Signal-to-noise ratio is absolutely critical to transparency in the phono stage, and here the Thirty does very well indeed. Listening to low-level orchestral passages and the softer passages of piano and string music is a pleasure with this preamp.

The soundstage of the Thirty is slightly narrower and more shallow than that of the DR-6, and the Thirty reveals a bit less ambient detail. In broad terms, you get what is on the recording, with a natural soundstage balance and no tendency to create a gap in the middle or to center the

performance. The soundstage is notably more natural than in many competing pre-amplifiers in the Thirty's price range.

The Classé Audio DR-6 has better defined imaging, but the Thirty does not deprive you of the ability to place the image precisely in depth or in width, a common failing of most mid-fi and some high-end preamps. Imaging is natural in size and is stable. There is little tendency to widen the image and no tendency to give it an exaggerated precision. If you don't criticize the imaging of your favorite concert hall, you won't criticize the imaging of the Thirty.

You can put the Thirty into virtually any system I know of (except those with multiple tape recorders) without interface problems. It suits all but a very few moving-coil cartridges of very low output. Its low impedance allows you to get the best out of long output leads. Its phono grounding minimizes hum, and the Thirty is also well shielded and mechanically quiet.

I am not going to trade in my Classé Audio DR-6 for the Thirty. I enjoy the quest for absolute perfection regardless of the diminishing value per dollar spent. At the same time, the message of this review is that you do not have to sit by and merely read about the high end because you cannot afford this month's star or your favorite manufacturer's top-of-the-line component. The Classé Audio Thirty delivers superb value for the money, and it is scarcely unique. Virtually all leading high-end manufacturers offer sound quality at the bottom of their line that is remarkably close to the sound at the top.

The high end is also an area where taste plays as important a role as money. Anyone with the scratch can go in and buy a lot of expensive components. Only someone who truly cares can blend those components into a system that really suits his personal taste and gets the best out of his listening room. The sport in high-end audio does not consist of having the most money, the most expensive system, or the most-praised components. The sport is in slowly and carefully assembling a mix of components that involves you in the music and re-creates as much of the live listening experience as possible. The Classé Audio Thirty may well help you make an important step toward winning the part of the game that really counts. *Anthony H. Cordesman*

Why won't conventional hi-fi speakers work for Home Theater?



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LETS EVERYONE BE IN
THE "SWEET SPOT."

You need three front speakers - left, right and center - to achieve realistic home theater. A stereo pair would place the dialog in the center (where it belongs) from only one listening position. You can't use conventional hi-fi speakers for the center channel, even shielded models, because their dispersion patterns prohibit raising them too high or laying them on their sides.

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CLASSICAL RECORDINGS

VLADIMIR HOROWITZ



COLUMBIA MASTERWORKS RECORDINGS, 1962 TO 1973

**Horowitz: The Complete Columbia
Masterworks Recordings,
1962 to 1973 (works of
various composers)**

Vladimir Horowitz, piano
SONY CLASSICAL SX13K 53 456
13 CDs; 13:21:01

Vladimir Horowitz was originally described in the 1930s by Sir Neville Cardus as “the greatest pianist alive or dead.” Later Cardus wrote that that “was an understatement, not positive enough about pianists still unborn.” The combination of Horowitz’s piano pyrotechnics with a warm musical tone and sensitivity made him a favorite throughout the world most of his life. His concerts were always sellouts. However, he developed a nervous ailment that occasionally prevented his performing in public, including the 12-year period from 1953 to 1965.

One of the changes Horowitz made in his career toward the end of this absence from the concert stage was to leave his longtime label, RCA Victor, and sign with Columbia Records. This new connection continued

a dozen years and resulted in the recordings reissued in this boxed set and also in Horowitz’s return to the stage with a triumphant Carnegie Hall recital in May 1965. That appearance is captured on Volume III of the set, together with concerts from 1966. The original albums in this collection won 12 of the 25 Grammys that went to Horowitz.

Horowitz paid close attention to the programming and sequencing of each of his LPs, and the new set generally follows his lead. The original 14 LPs now

fit on 13 CDs, beginning with his first studio recordings, an all-Scarlati album, the “Historic Return” to Carnegie Hall, and a 1968 TV appearance. Later volumes are Beethoven, early Romantics, a baroque & classical recital, the Romantic and impressionist era, and late Russian Romantics. There is, rather surprisingly, no booklet of notes for the collection overall, just individual inserts in the nine volumes.

Earlier in his long career, Horowitz was subject to some criticism for being all virtuoso without soul. This may have been due more to his almost inhuman speed and accuracy in frightening passagework rather than to an imbalance with the lyrical side. For examples, listen to some of the Chopin ballades or the Liszt or Rachmaninoff hell-raisers in this set.

I am reminded of Conlon Nan-carrow’s compositions that were punched directly onto piano rolls to achieve accuracy and speed impossible for any human performer in real time.

During the Columbia years, Horowitz’s dazzling execution was balanced by singing melody, rich





harmony, provocative rhythms, and when called for, a very personal sort of intimacy. There are so many pianistic thrills here. Chopin's Introduction & Rondo in E Flat is a knockout, as is the fresh treatment of Schumann's *Kreisleriana*. Scriabin was one of Horowitz's favorites, and masterful performances of the early Chopinesque pieces and the later mystical piano sonatas give the off-beat composer a stature that others seem to miss. Clementi is another composer that Horowitz's treatments brought to the forefront.

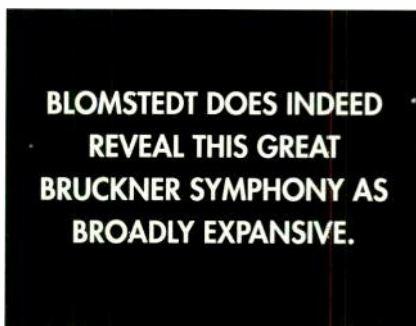
It had been some years since Horowitz's Scarlatti recordings graced my speakers. As I am a stickler for Scarlatti on the harpsichord, Glenn Gould's harpsichordal approach was the only Scarlatti-on-piano that I allowed in my collection. Horowitz demonstrates that that is a very narrow attitude.

Part of Horowitz's magic heard in '94 versus the '60s is due to the substantial increase in clarity of the cleaning-up process used in these CDs. Columbia LPs of the period were not exactly of audiophile quality, and even most digiphobes will admit that difficult-to-record piano sound comes across better in clean and rock-steady digital sonics. Great care was taken in returning to the original three- and four-track analog tapes, and the computer noise-reduction processing appears to let through all the "air" and overtones. It also lets through the noisy built-in ambience of Carnegie Hall and its audiences during the live concerts. (In the '60s, much of that was masked by turntable and groove noises.)

John Sunier

**Bruckner: Symphony No. 6, in A
(Nowak edition);
Wagner: Siegfried Idyll**
San Francisco Symphony, Herbert Blomstedt
LONDON 436 129-2, CD; 77:37

In the United States, Anton Bruckner's humble origins and unpolished speech and clothes would probably have gotten him stamped as a hick, but central European musicians and concertgoers tend to speak of the three great symphonists—Beethoven, Brahms, and Bruckner—in one breath. Wilhelm Furtwängler chose the Bruckner Seventh as the opening work on his first program as the new conductor of the Berlin Philharmonic. In the U.S., Bruckner remains a bit off the beaten musical path, but Herbert Blomstedt in San Francisco continues to do what he can, just



as he so splendidly did with his previous ensemble, the magnificent old Dresden State Orchestra.

The San Franciscans here sound wonderful, substantiating the opinion of a leading Frankfurt critic who, during the orchestra's most recent European tour, placed their performance on the same level as that of the Cleveland Orchestra. This reviewer said that perhaps the world today has no finer orchestra anywhere than the San Francisco Symphony. Decca/London's engineers also exploit to their resonant fullest the new and improved acoustics of the orchestra's home hall; it sounds especially resonant at the end of the third movement.

Symphony No. 6, less frequently performed than most of Bruckner's total of 10 (counting the early effort that became known as his Symphony No. 0), combines this composer's pure simplicity of heart with the noble sublimity of the religious faith so important throughout his life. One hears in it traces of his admiration for Wag-



ner, but on a kind of Apollonian level that also distinguishes it from Bruckner's great champion and disciple, Gustav Mahler. Blomstedt's conception of the work recalls a line Furtwängler once wrote in the margin of one of his Bruckner scores: "I must have the feeling of entering into the boundless." Blomstedt does indeed reveal this great music as boundlessly expansive.

Oddly placed, not at the end but at the beginning, is the *Siegfried Idyll*. The loveliest of birthday presents, Wagner composed it as a surprise for his beloved Cosima for her 33rd birthday (Christmas Eve in 1870). Blomstedt and his orchestra perform it with great gentleness and tenderness.

Paul Moor



**Liszt: The Complete Symphonic Poems
for Two Pianos, Vol. I**

Georgia and Louise Mangos, pianists
CEDILLE CDR 90000 014, CD; 66:32

A moderately sensational but perhaps a bit naive project, this, by the enterprising new Chicago label Cedille and a pair of Chicago-area sisters on piano, the first to perform these works in the two-piano format for maybe a century. Works not "lost" but merely put aside and forgotten, like so much music, whether good or bad. The sisters found them, enthused, and went to work. Did they realize what a herd of musical elephants they had uncovered? Do they yet? No matter; the enthusiasm is there, and the evidence of endless quantities of hard work at the two keyboards is impressive.



The Impatient Lover (Italian Songs by Beethoven, Mozart, Schubert, and Haydn)

Cecilia Bartoli, mezzo-soprano;
András Schiff, piano
LONDON 440 297-2, CD; 67:59

Set Cecilia Bartoli down, if you haven't already, as almost certainly the most extraordinary female singer since the legendary Maria Callas. Still a mere 27 years old, the sole pupil of her own mother (a former singer in the Rome Opera's chorus), Cecilia Bartoli shows every indication of going down in musical history as one of the greatest. She shows rare intelligence not only in her singing but also in the planning of her career; for instance, she has thus far courageously ignored entreaties from all sides to do *Carmen*. The thought of what she might yet develop into boggles the mind.

What a wonderful idea to have Bartoli sing 18 works in Italian, most of them almost unknown, by four of the greatest German and Austrian composers! And to add the final fillip of class that makes this an even finer recording, Decca/London has paired her in Vienna with the young Hungarian virtuoso András Schiff,

who has a flourishing career of his own. His performance of these piano parts never obtrudes but also never lets the auditor forget that no mere accompanist sits at that Bösendorfer concert grand.

Much of this music owes its existence to a colorful figure, the Italian writer Pietro Metastasio (né Pietro Trapassi) in Rome in 1698. He became an important fixture in the aristocratic world of Vienna when he became the official court poet there in 1729. At the height of his Viennese vogue, Metastasio wrote 11 stage works in 10 years. He also provided the poems set in many of these songs, although Schubert connoisseurs will detect in *Mi batte 'l cor* (a.k.a. *Felice arrivo e congedo*) the same powerful song Schubert composed to Johann Wolfgang von Goethe's poem "Willkommen und Abschied."

Both vocally and musically, Bartoli seems incapable of doing almost anything wrong. Her mezzo-soprano range does not preclude either florid *fioritura* or soprano high notes, including a high C sharp. Both from the standpoint of color and emotion, she runs an exceptional gamut, especially in the 20-minute Haydn monodrama concluding this program.

Even though you may not know one song in this recital, this CD will introduce you not only to some beautiful and *recherché* music but also to a splendid team of brilliant young musicians. *Paul Moor*

piano was an orchestra; there was no difference. (As the living room *is* a concert hall, I might suggest.) Much literary noise and a lot of nonsense (as in our own case!), but before recordings, the piano was indeed a universal substitute for hundreds of musicians crammed into a home environment, and so the piano and orchestral versions of much music, including this Liszt, were widely considered as equals, neither one a "transcription" of the other. Interesting.

The tone poems—symphonic poems whatever the format—are indeed mastodons among hundreds of piano-based works from Liszt that include vast quantities of his own music and even more in piano versions (and piano four-hands or two-piano versions) of opera excerpts, song cycles, you-name-it, by numerous other composers—notably Berlioz, Beethoven, and Schubert. Nine-tenths, even more,

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of this enormous catalog is forgotten. Not lost, merely put aside. That's progress, technically speaking. It took these two ladies to revive a particularly large lump of forgotten Liszt, and one must admire them for it.

I will have to add that this is not top Liszt playing. There is a piano magic still achieved by a few older and experienced great pianists (also by much younger geniuses who simply *know*, out of nothing), a magic that is the essence of the piano's immense influence right into our times. Piano magic simply makes the piano do things that are technically impossible! To hear Liszt (not to mention other composers) played with such magic is one of the great musical experiences, as a few of us know.

The performers on this disc, for all their enthusiasm and hard work, simply are not in that class. They approach it every so often, but they also tend to wallow, though far from helpless, in a sea of notes. They do

Georgia and Louise Mangos tackle the complicated scores manfully (or womanfully) and have achieved absolutely perfect coordination, as one piano and pianist; they have found many lyrical moments that are well realized and enjoyable, and their very flexible tempos, constantly changing speed, are of the essence. They are able to make the inevitable Lisztian climaxes roar as loudly as any male fingers might pro-

duce them—piano power is definitely there! What more?

Quite a lot more. First, one must understand that this sort of music was, in the mid-19th century, a subject of feisty and fizzy argument in the entire musical world (i.e., Europe): Was Liszt's piano his orchestra, for uttermost freedom from all artistic restraints, or was the orchestra his piano? Indeed, it was hotly maintained that the

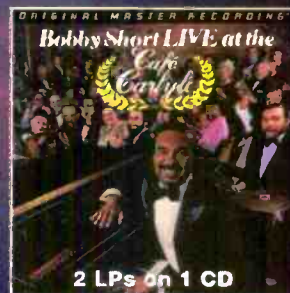
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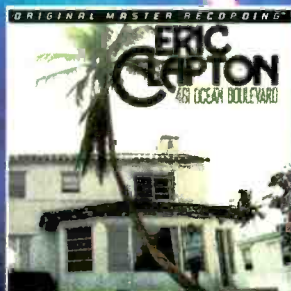
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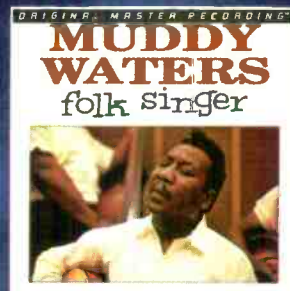
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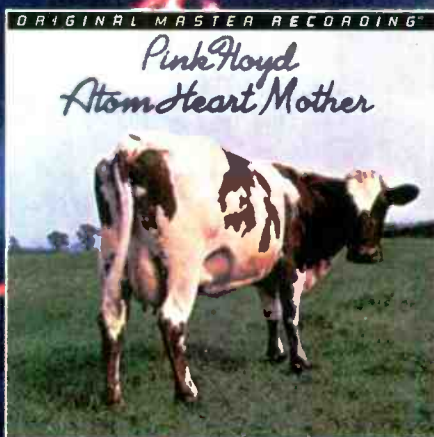
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not really project the superb Lisztian melodies; worse, they play the surrounding enormous ornamentation far too much in the foreground, an utterly common failing. And they really do not keep the enormous sagging weight of these mighty pieces afloat and well-shaped—an almost impossible task! Not to blame. Anyone who has tried the huge Liszt B-Minor Sonata for one piano will know. One or two supreme artists can still play it. All hail the sisters for a brave try—and a good listen.

Edward Tatnall Canby



Ysaÿe: Six Sonatas for Unaccompanied Violin, Op. 27
Gidon Kremer, violin
MOBILE FIDELITY MFCD 921
CD, 54:37

Belgium's legendary violinist Eugène Ysaÿe (1858 to 1931) changed violin playing forever, and in more ways than one: Not until Ysaÿe did a fiddler dare use vibrato—that lateral oscillation of the left hand—except for rare and special effects. Over the years Ysaÿe probably forgot more about playing than most violinists ever

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learn, and that technical knowledge, combined with an authentic gift for composition, is evident in these brilliant little solo sonatas. The sonics rarely rise above the so-so, but the almost superhuman virtuosity of Gidon Kremer more than compensates for it.

Paul Moor

Stravinsky: Piano Music for Two Pianos, Four Hands
Vladimir Ashkenazy and Andrei Gavrilov, pianos
LONDON 4338292, CD; 67:42

Brahms: Souvenir de la Russie (Nos. 2, 3, 4, and 5); Waltzes, Op. 39; Variations on a Theme by Robert Schumann, Op. 23
Viktoria Postnikova and Gennady Rozhdestvensky, one piano, four hands
MOBILE FIDELITY MFCD 920
CD, 46:57

Both these releases evoke a technological age long superseded, when people made their own music at home and when what Germans call *Hausmusik*—music performed at home, particularly on the piano—flourished. These two entrancing CDs show what four brilliant pianists, all beneficiaries of the Moscow Conservatory's glorious piano tradition, can make of wonderful works originally written for that formerly lively delight, the piano duet, whether involving one or two pianos. For sonics, the London disc gets the nod, but the recording of the Brahms works will undoubtedly strike a more sympathetic chord among most listeners.

Paul Moor

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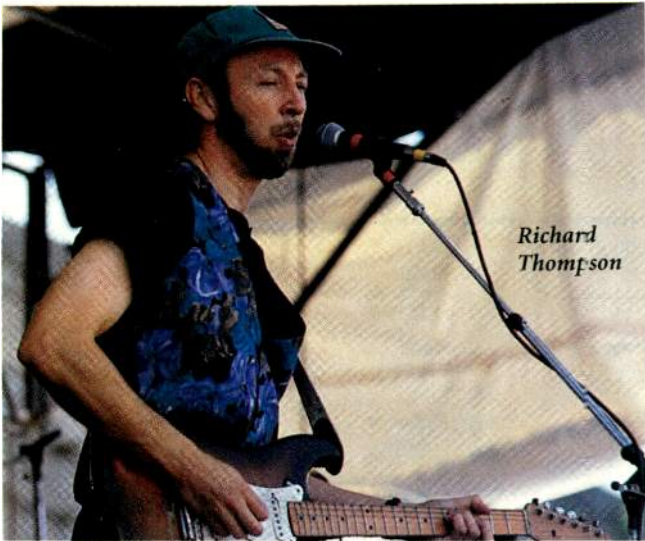
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Mirror Blue

Richard Thompson
CAPITOL CDP 7 81492-2
CD; 55:05
Sound: B+, Performance: B

The World Is a Wonderful Place

Various Artists
GREEN LINNET GLCD 3086
CD; 75:25
Sound: B, Performance: A

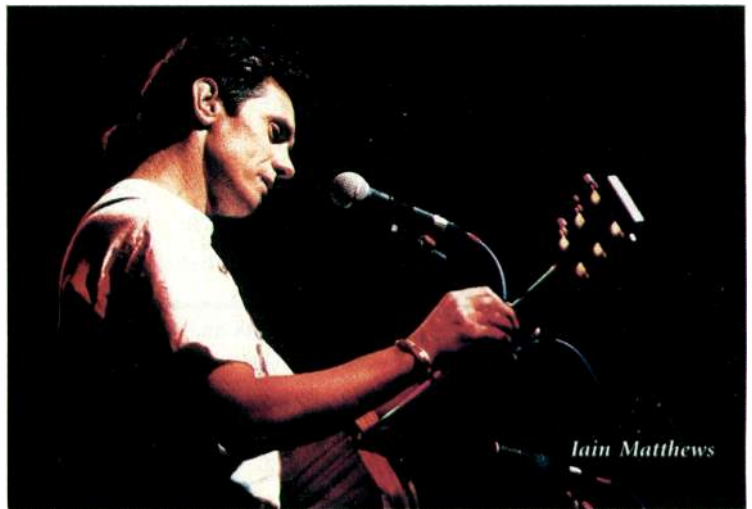
Dark Side of the Room

Plainsong
MESA R2 79065
CD; 48:42
Sound: B, Performance: B-

Skeleton Keys

Iain Matthews
MESA R2 79054
CD; 48:26
Sound: A-, Performance: B

From the very first guitar sounds he made for the nascent Fairport Convention, Richard Thompson has been the most distinctive of artists on several counts. The innovation of his guitar playing incorporates Celtic and Arabic rhythms, modes, and melodies, all played with incredible grace and ease. As a singer, he has a deep, smoky voice that is an unmistakable signature. As a songwriter, he is often brilliant, especially when acting as a storyteller offering glimpses into the dark side of the human psyche.



Iain Matthews

On *Mirror Blue*, Thompson is most successful when his storylines are strong. Excellent examples are "Shane and Dixie," about the most inept bankrobbers ever; "Beeswing," a tenderly played tale of love for a most singular lady; "I Can't Wake Up to Save My Life," an ever scarier tale of a monstrous ex-lover, and "Fast Food," a hilarious account of working for minimum wage at McDonald's.

Mitchell Froom, for the fourth time, is Thompson's producer and keyboardist. His calling card is a combination of bringing clarity and focus to an artist's songs and creating unusual settings with instrumentation. On *Mirror Blue*, such experimentation is heard best with Pete Thomas' quirky non-drum-kit per-

cussion effects, Phil Pickett's array of medieval instruments, and John Kirkpatrick's accordion and concertina, all combined with Thompson's stunning guitar.

That some songs here simply don't work for me is what has held the performance grade to a "B," but a Thompson "B" would be an "A" for most others.

Later this year, Capitol will release a tribute album of Thompson covers titled *Beat the Retreat*, but Green Linnet has beaten them to the punch with *The World Is a Wonderful Place*, mostly performed by British artists such as Tom Robinson, Clive Gregson, Christine Collister, and Boo Hewerdine, with Americans Victoria Williams and Marvin Etzioni also contributing. While much here

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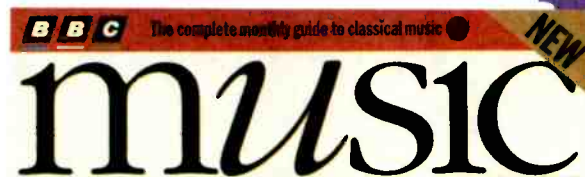
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sounds like the originals, there is real freshness in the performances that frees them from feeling slavish. Highlights include Williams' "Reckless Kind," Ivor Cutler's "Wheely Down," and Plainsong's "From Galway to Graceland."

Plainsong was co-founded by Andy Roberts and Iain Matthews, the latter a co-founder of Fairport with Thompson. After a 20-year hiatus, Plainsong has reconvened, with Mark Griffiths and Julian Dawson completing the band. Their album, *Dark Side of the Room*, is a fine one, with superb musicianship throughout and featuring a wide array of guitar and vocal textures. With at least a co-credit on nine of the 15 selections, Matthews is the principal writer. It's a sweet yet tart listening experience.

Matthews has been exceptionally prolific of late. He also has a new solo album, *Skeleton Keys*, which is one of his best—the first he's ever done entirely of originals. His writing has been stronger, and so, too, his achingly sweet voice. The album was recorded in Matthews' new home town of Austin, Texas, with occasional collaborator Mark Hallman producing and engineering beautifully. Thoughtful and impressive work.

Michael Tearson



Beat the Border

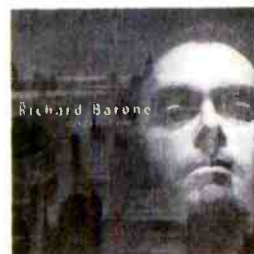
Geoffrey Oryema
REAL WORLD/

CAROLINE CAROL 2333-2, 41:41

Geoffrey Oryema's *Beat the Border* takes the hand-polished voice of the Ugandan refugee and wraps it in an atmospheric haze. Recorded at Peter Gabriel's Real World studio with David Bottrill producing and Brian Eno mixing, the album builds a church of sound around Oryema, who brings his soul-stirring voice into a realm best described as global gospel. Jean-Pierre Alarcen mixes ethereal, siren guitar lines with minimalist African cross-picking, creating a pool of sorts that surrounds traditional instruments and percussion. Then there's the influence of Gabriel's multiculti impressionism on "The River." Oryema's music isn't the African sound of

World Beat but the sound of global soul with one of the rare voices of modern music.

John Diliberto



Clouds Over Eden

Richard Barone
MESA R2 79060, 47:30

On 1987's *Cool Blue Halo*, Richard Barone (formerly with the seminal Hoboken band, The Bongos) was "unplugged" before the idea became a commercial trend. *Clouds Over Eden* combines the subtle strings and acoustic romanticism of *Halo* with the tuneful songwriting of *Primal Dream*, Barone's last effort. Here, his foundation is built from ringing layered guitars and smooth vocal harmonies, and it's on songs like the title track, "Beautiful Human," and the touching "Within These Walls" that his minimal arrangements are most apparent. Yet Bar-

Duets

Frank Sinatra
CAPITOL CDP 7 89611 2
CD; 45:42
Sound: A, Performance: A-

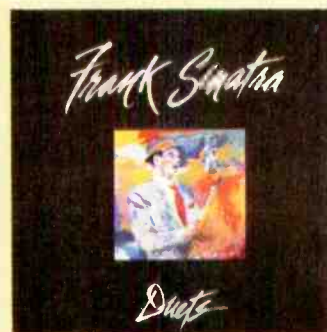
At age 77, Frank Sinatra is occasionally ragged where he used to be casually commanding of tone and fluid of phrase. Still, he gives lyrics the idiomatic American nuance of a fingersnap even when he's short



of pitch or breath—which seldom happens here. His mature voice and canny renditions easily stand up to thrilling contributions from virtuosic Vandross, amazing Aretha, luscious La Streisand, sassy Ms. Minnelli, and U2's Bono, who bodaciously steals "I've Got You Under My Skin."

But Sinatra—no longer a voice, but now a total concept embracing expectation, memory, myth, and corporation—manages to salvage even his lesser couplings with Julio Iglesias and Gloria Estefan. Tony Bennett is wasted on "New York, New York" (guys, how 'bout a duo album?), and French superstar Charles Aznavour isn't well served by "You Make Me Feel So Young." Natalie Cole, Anita Baker, and Carly Simon don't have the panache of the other participants. Kenny G, however, intones his soprano saxophone adequately on "All the Way."

The jaunty and brash big band gives full value to charts by first-call arrangers including Quincy Jones and the late Nelson

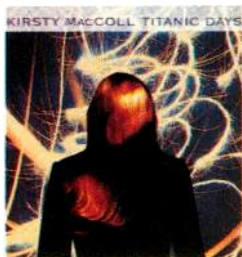


Riddle, and this CD's mix is a gift that keeps on giving. Much has been written of the technical achievement of bringing separate digitally recorded vocal performances together over fiber-optic telephone lines, but as *Duets* entrenches itself as a classic, the feat will be forgotten, as there is no hint of its artificiality. Finally, what we have is Sinatra—defiant, determined, despicable, seductive, wry, and singular, a mass of contradictions that we listen to very closely, fascinated.

Howard Mandel

one isn't stuck in one groove; there's the spontaneous laughter and guitar stomp of "Waiting for the Train" (co-written and performed with Jill Sobule) and the moody "Miss Jean" (co-written with Jules Shear). If Barone can avoid occasional preciousness, he'll deliver his best work.

Tom Ferguson



Titanic Days

Kirsty MacColl

I.R.S. 7243 8 27214 20, 47:30

Kirsty MacColl is the daughter of traditional British folksinger Ewan MacColl, and you hear that tradition in her music. But Kirsty's references are strictly '60s pop, from the "Strawberry Fields Forever" ambiances of "Angel" to the Petula Clark-style pop on "Soho Square." And she isn't retro, not with Steve Lillywhite creating a textured '90s mix on the trancey dream theory of "Just Woke Up." MacColl navigates familiar terrain of love and relationships, but she gives the stories new twists, like the mad woman in "Bad" who's buying a gun and taking up knives, and the rock-flamenco collaboration with Johnny Marr called "Can't Stop Killing You," a title that says it all.

John Dliberto



Modern Life Is Rubbish

Blur

SBK/ERG K2-89442 2 4, 69:39

Blur has thoroughly ingested *Space Oddity*-era David Bowie and the conceptualism of The Kinks' *Village Green Preservation Society* for this thematic album. You can hear it in the overly mannered, nasal sneer of vocalist Damon Albarn and the storyline

structures and occasional vaudeville/show-tune turns of their songs, which rail against the banalities of life. Although lyrically the band isn't revealing much that anybody over 16 hasn't observed, every generation has to go through the phase where the world of mom and dad is seen as boring and trivial. But Blur brings some élan to this rite of passage, with riveting guitar work and more musical variety than on their 1991 debut, *Leisure*.

John Diliberto



Cure for Pain

Morphine

RYKODISC RCD 10262, 37:16

The sophomore effort from Morphine shows this Boston-rooted trio continuing to place emphasis on lower frequency instrumentation: A bastardized "two-string slide" electric bass (fretless, with each string tuned to the same pitch), saxophone (mainly baritone), and percussion. Dubbed "low rock," according to bassist/singer Mark Sandman, the mostly guitarless garage-combo music of *Cure for Pain* is Scotch whiskey-soaked, smoke-filled, lounge-friendly stuff perfect for modern film noir. Dana Colley's saxophones accentuate Sandman's reedy, deep vocals in songs that detail torrid affairs and faded relationship angst. Delightfully underproduced by Paul Q. Kolderie, *Cure for Pain* is wildly original.

Tom Ferguson

The Greatest Living Englishman

Martin Newell/Andy Partridge

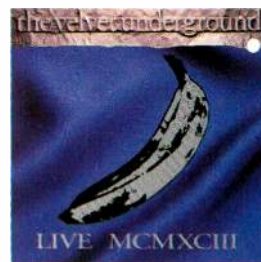
PIPELINE PIPECD002, 46:30

As with a book so good you can't put it down, this album has track after track so inviting you can't wait to see how long these guys can pull off such a wonderful homage to mid-1960s pop. The guys in question are Martin Newell—formerly of London S.S. (which begat The Damned and The Clash), more recently a poet—and

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Andy Partridge, on leave from XTC. The music owes something to XTC's alter ego Dukes of Stratosphear, but the emphasis is off psychedelia and squarely on melodic songwriting. The result actually sounds like peak Colin Moulding, who in XTC plays McCartney to Partridge's Lennon. If Paul himself had made this album, critics would genuflect. It seems like just a walk in the studio for Newell/Partridge, so effortless is their tunesmithing on an album that instantly storms this writer's list of 1993's best. (Pipeline, 119 Engineers Dr., Hicksville, N.Y. 11801.)

Ken Richardson



Live MCMXCIII

The Velvet Underground

SIRE 9 45464-2, 2:09:00

The bittersweet reality of V.U.'s summer '93 reunion tour was that, while it resurrected the chemistry of all their garage-esque glory, the much-hyped experiment ended on a political sour note bearing a dangerous resemblance to the exploits of Spinal Tap. This short-but-sweet party is pretty much over, but at least Lou Reed, John Cale, Maureen Tucker, and Sterling Morrison left us with a live recording from their shows in Paris. At times marginally platitudinal or nostalgic, banality (as when Reed trivializes things with lines like "some people go to Velvet Underground concerts") is offset by unadulterated and terrifying brilliance, such as the incredible drone of "Heroin," which steals this disc, or the equally moving "Coyote." Be glad it happened at all.

Mike Bieber

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Blues Survivor

Joe Louis Walker
VERVE 314 519 063-2
CD; 64:09
Sound: A, Performance: A-

Back Where I Belong

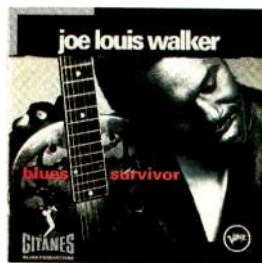
Billy Boy Arnold
ALLIGATOR ALCD 4815
CD; 54:18
Sound: A, Performance: A

Smoke n' Fire

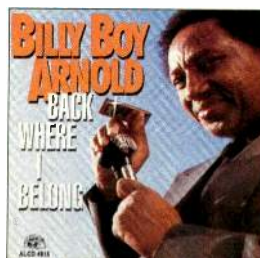
Smokey Wilson
BULLSEYE BLUES CD BB 9534
CD; 48:53
Sound: A, Performance: A-

The blues won't ever die as long as blues people don't let the genre become style-bound by past history. Veterans Joe Louis Walker, Billy Boy Arnold, and Smokey Wilson all honor the basic urban song form by adapting it to their vigorous strengths and refreshing the blues' luster.

On *Blues Survivor*, Walker swings a cutting single-note guitar through an impressive range of jazz, funk, and country-fried settings, and sings

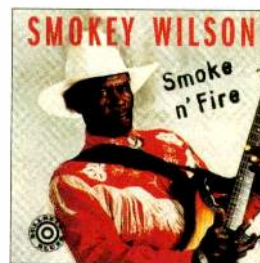


with the genuine soul of Everyman. His talents mostly benefit from contemporary rhythmic syncopations and powerful, near-pop arrangements, though sometimes simplicity would showcase the main attraction better than the full cast hired by producer John Snyder. This includes The Spiritual Corinthians as a backup choir, extra percussionists, Lucky Peterson on organ, and a wailing tenor sax soloist. The overall sound is slick yet substantial; Walker's lyr-



ics range from wry wit to outright wildness, providing a program variety often missing on blues albums.

Harmonica-blowing Chicago blues singer Billy Boy Arnold also offers contrasting melodic hooks and rhythms on *Back Where I Belong*, his first album as a leader in more than 20 years. Liner notes explain that he's held many nonmusi-



cal jobs since his glory days with Bo Diddley. But Arnold's boundless energy and original blend of elements—from mentors Sonny Boy Williamson and Howlin' Wolf and from crossover role models like Chuck Berry—prove he *does* belong on the Alligator roster, fronting a youthful, strong-but-never-intrusive Los Angeles electric band. Arnold excels in rhumba-boogies, quick shuffles, and deliberately mid-tempo drags; he gives his stories entertaining, close-up details, and his harp is recorded with glorious in-your-face presence.

Illustration: Lisa Blackshear

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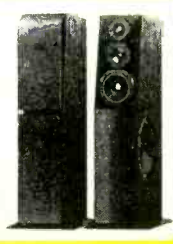
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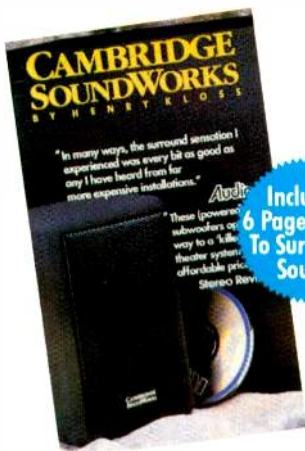
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Smoke n' Fire is guitar-slinger and singer Robert Lee Wilson's debut release, though he looks like no kid. The raunchy howl of his voice and sawtooth roar of his instrument are not what one expects of a West Coast bluesman, but Smokey's experience of Watts, L.A., is entirely credible when he pleads "don't burn down L.A." Nothing in Ron Levy's polished production—neither horns, keyboards, nor guest guitarists—detracts from Wilson's intensity. Indeed, the title track may be the hottest jam of the season, burning until its too-early fade.

Howard Mandel

Blues Preacher

James Blood Ulmer

DIW/COLUMBIA CK 57302, 59:34

Blood returns—very un-harmolodical-ly—to his pre-free-jazz roots with a blend of raucous rock and fluid funk that recalls his early days in pop backup bands. In spite of more conventional rhythms and secondary leads by guitarist Ronnie Drayton, Ulmer remains a different strummer. His idiosyncratic guitar soars and screeches, stunning and floating in a parallel universe, to offer a refreshing take on the basics that's at once familiar, alien, and mind-alteringly fun.

Michael Wright



Nostalgia in Times Square

The Mingus Big Band

DREYFUS 36559-2, 77:59

For the past two years, Fez, the funky basement room of Manhattan's Time Cafe, has hosted what must be New York's longest running jazz act: The Mingus Big Band's weekly workshop. While this disc was recorded in a studio, it still captures the power and virtuosity of this wonderful unit—a behemoth that challenges anyone's concept of a "repertory orchestra." Ronnie Cuber's narration (full of pre-rap hipness) opens *Nostalgia in Times Square* with a suitably cool reminiscence, yet this is no

walk down memory lane. The 20-odd musicians who step in and out of the lineup are a true all-star lot, including Mingus alumni Cuber and trumpeter Jack Walrath, and young guns like saxophonist Craig Handy, trumpeter Ryan Kisor, bassist Mike Formanek, and drummer Marvin "Smitty" Smith. As a unit, they raise the weighty spirit of their namesake: Elegant yet vulgar, full of defiant beauty.

Larry Blumenfeld



Bestial Cluster

Mick Karn

CMP RECORDS CD 1002, 45:07

Mick Karn was the shaven-eyebrowed bassist with Japan, the British group that spawned David Sylvian. But since the band's breakup, Karn has consorted with jazz mutants like Mark Isham and David Torn, musicians attracted to the slinky Middle Eastern belly dance of Karn's bass-lines. It's that sound that emerges on *Bestial Cluster*, a psychedelic fusion produced by Torn and featuring his ethereal guitar loops and Punjabi stick solos. Powered by the rhythm section of Karn's ex-Japan mates Steve Jansen on drums and Richard Barbieri on keyboards, Karn and Torn storm and drift through meditative ballads and metal improvisations. Glen Velez's frame drums create a Middle Eastern dervish, and David Liebman adds a wailing soprano saxophone. It's an almost intentionally ragged disc, but every misguided experiment is countered by an incendiary creation.

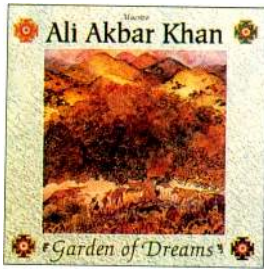
John Diliberto

Garden of Dreams

Ali Akbar Khan

WORLDLY MUSIC 7199-2, 64:39

Ali Akbar Khan was among the first Indian musicians to present his country's classical music to American audiences. Khan's reputation as a composer and performer rests on his evocative interpreta-



tions of traditional ragas and his lyrical and intense musicianship with the sarod (an unfretted, 25-string lute carved from a single block of wood and covered with goat-skin). This album of nine musical variations blends Khan's sarod with an ensemble of Eastern and Western instruments, perhaps a compromise for purists yet helpful for those of us who like some Indian classical music but have short attention spans.

John Sunier



A Song I Thought I Heard Buddy Sing
Jerry Granelli
EVIDENCE ECD 22057, 58:21

With a slow, walking bassline and some clever drum rolls, drummer Jerry Granelli & Company head down turn-of-the-century New Orleans alleyways in search of that towering enigma of jazz, trumpeter Buddy Bolden. Inspired by a haunting novel by Michael Ondaatje, *A Song I Thought I Heard Buddy Sing* seeks to capture Bolden's spirit, as his sound (never recorded) is strictly the stuff of legend.

Though concept pieces are more often than not doomed, this one paints a portrait nearly as powerful and complex as the Romare Bearden painting used on the CD cover. Guided by Granelli's constantly shifting rhythms, altoist Kenny Garrett and trombonist Julian Priester slither in and out of melodies while guitarists Bill Frisell and Robben Ford weave otherworldly textures with their searing blues lines. And Screamin' Jay Hawkins' "I Put a Spell on You" is given a fascinating slow reading.

Larry Blumenfeld



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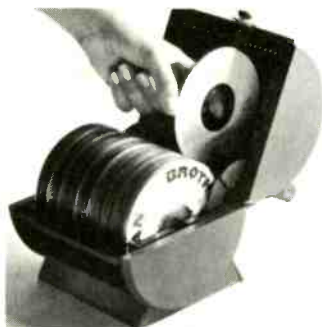
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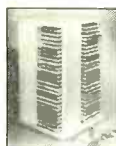
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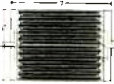
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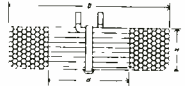
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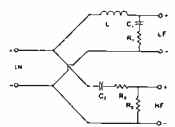
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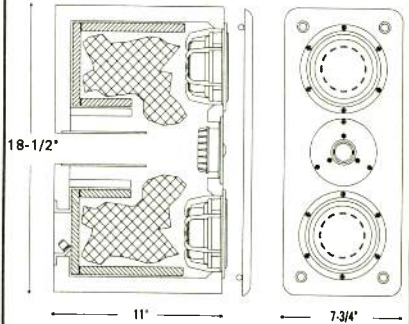
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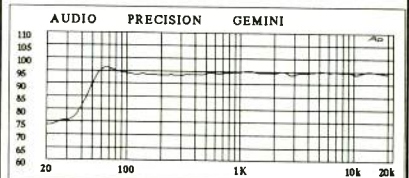
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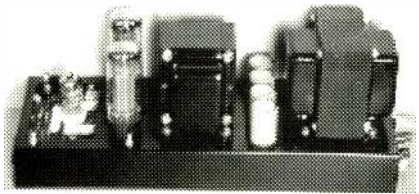
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