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SEPTEMBER 1998

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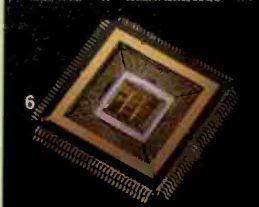
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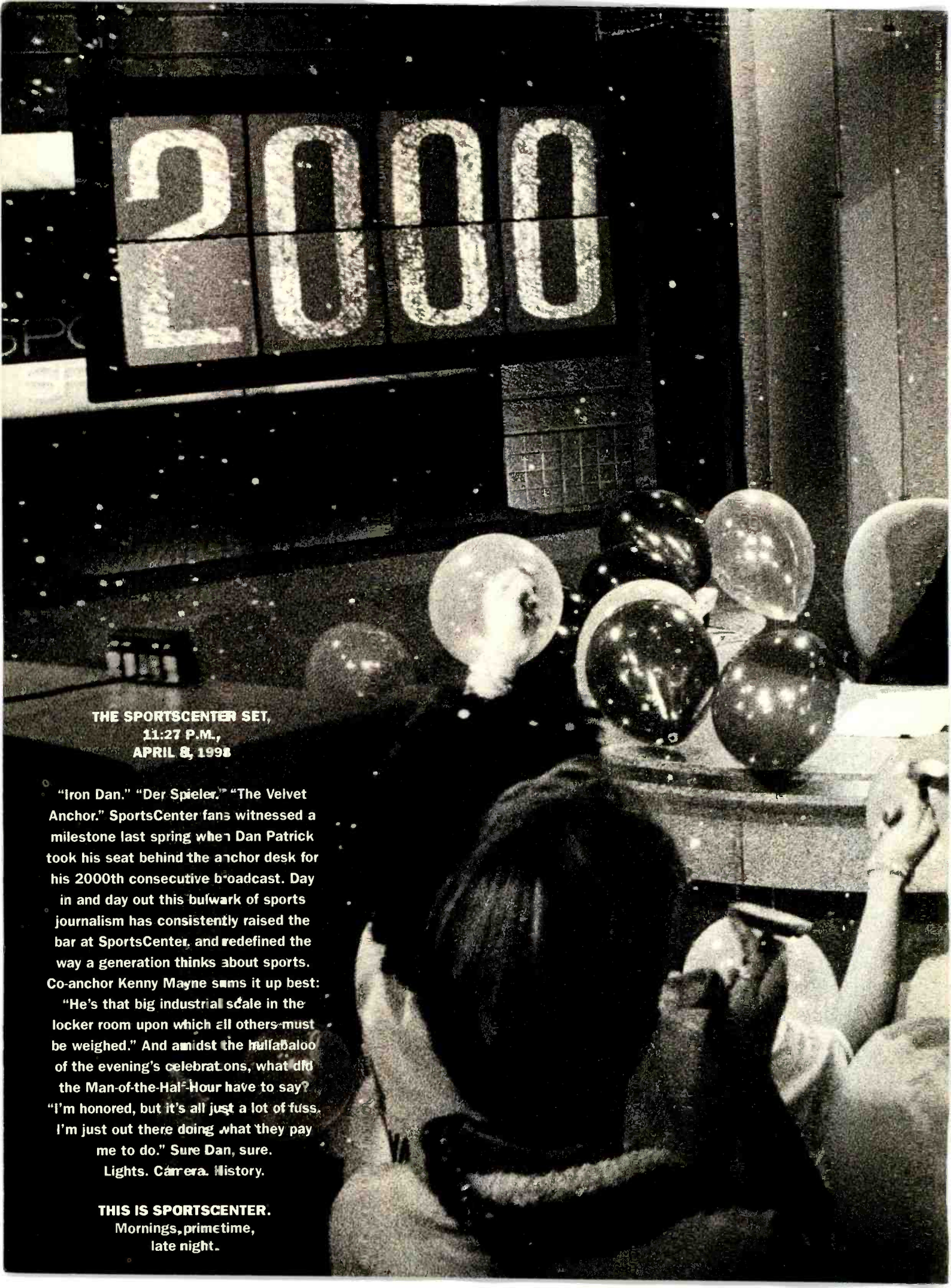
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**THE SPORTSCENTER SET,
11:27 P.M.,
APRIL 8, 1998**

"Iron Dan." "Der Spieler." "The Velvet Anchor." SportsCenter fans witnessed a milestone last spring when Dan Patrick took his seat behind the anchor desk for his 2000th consecutive broadcast. Day in and day out this bulwark of sports journalism has consistently raised the bar at SportsCenter, and redefined the way a generation thinks about sports.

Co-anchor Kenny Mayne sums it up best:

"He's that big industrial scale in the locker room upon which all others must be weighed." And amidst the hullabaloo of the evening's celebrations, what did the Man-of-the-Half-Hour have to say?

"I'm honored, but it's all just a lot of fuss.

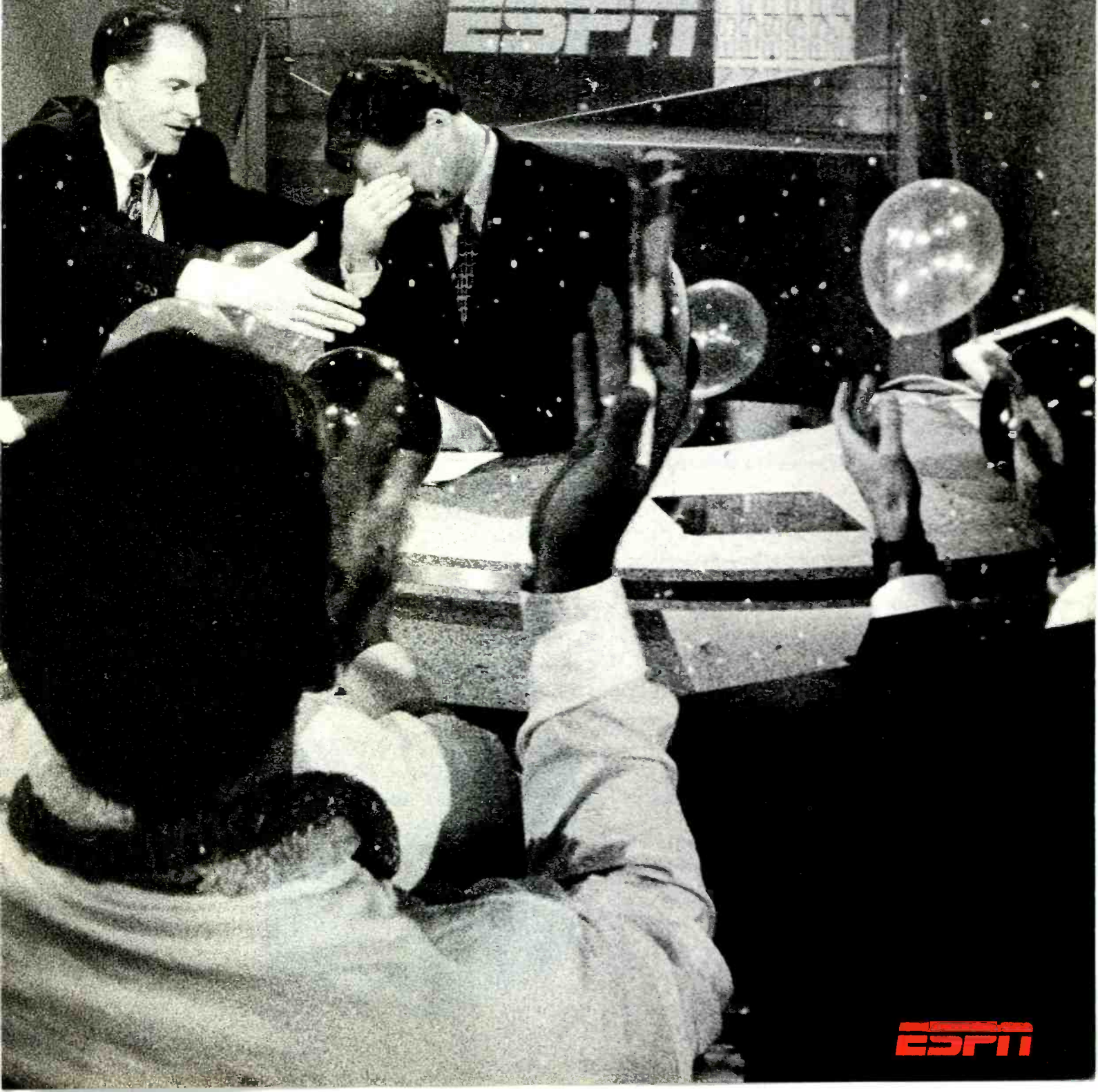
I'm just out there doing what they pay me to do." Sure Dan, sure.

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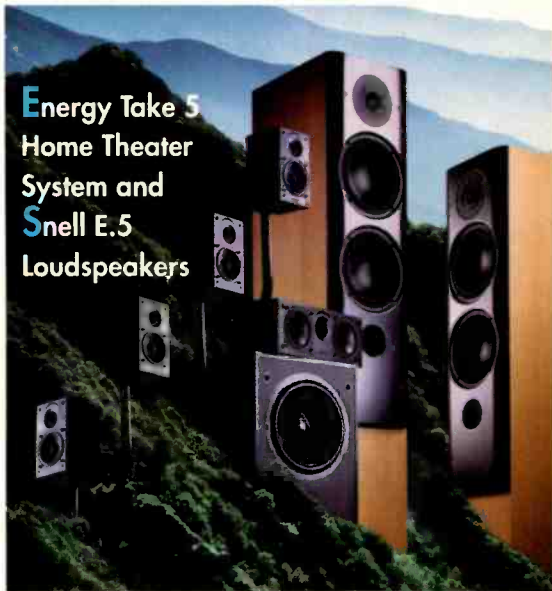
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SPECIAL SPEAKER ISSUE



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Not too long after he left Canada's National Research Council to become vice president of engineering at Harman International (parent of Harman Kardon, JBL, Infinity, and other brands too numerous to mention), Dr. Floyd Toole began talking about building a state-of-the-art facility for designing and evaluating loudspeakers. That was about seven years ago. This year, his dream finally came true.

Located in Harman's expansive Northridge, California, campus, the lab includes two sizable new anechoic chambers, supplementing a smaller one already in place, and a suite specially configured for conducting blind listening comparisons of loudspeakers (or anything else, for that matter). The latter is of particular interest, as it incorporates an automated shuffler that can swap the positions of two pairs of speakers in a matter of seconds, ensuring that listening results are uncontaminated by the effects of speaker placement. This might not seem like a big deal, but Floyd has the data to show that it really is. In some cases, changing the placement alters the sound more than changing the speakers. So if you want accurate comparisons, the speaker and listener locations must remain constant. The shuffler takes care of that.

Sonically transparent but visually opaque curtains deal with the issue of listener bias. Floyd has plenty of data on the significance of that, too, some of which ties in with the speaker-placement question. For example, the extent to which listener ratings vary with changes in speaker position *drops* when listeners can see the speakers; the ratings start following the speaker more and the position less. (See "The Science of Listening," December 1997.)

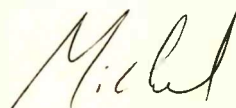
Tests are administered and scored by computer, and there is also a computerized listener-training program, designed to hone subjects' skills in identifying alterations of tonal balance. There's even a special listening station, with its own miniature swapper, for comparing computer speakers. All in all, it's a very

impressive setup—especially that speaker shuffler, which is just plain fun to watch work. More important, however, is the commitment it represents to sound quality as a design goal by one of the biggest speaker companies in the business.

Harman, by the way, is both a licensee and a sub-licensor of NXT's flat-panel speaker technology. This spring, I visited NXT's Cambridge, England, R&D laboratory in an effort to get a better handle on how those panels work. Anybody can make rigid panels generate sound, as witness the various "turn your walls into speakers" gizmos that have been sold over the years, but getting them to generate *good* sound is another matter. NXT has achieved that, and its panels possess a number of other remarkable characteristics as well.

What makes NXT an interesting company, apart from all the different things it can turn into decent loudspeakers, is what it sells, which is quite literally knowledge. It packages and sells an understanding of how to make panels composed of all sorts of materials into loudspeakers having the characteristics specified by their designers. Consequently, the staff is very different from what you'd find at a more typical audio company—lots of mathematicians, materials scientists, a specialist in finite-element analysis, etc.

So, do I understand now how NXT panels work? Better than I did before but not well enough to feel comfortable trying to explain it in any detail to someone else. Which led me to ask NXT's research director, Henry Azima, to do it for me (see "Up Against the Wall," page 34). It is impossible to know yet all the ways in which NXT speakers will be used or the extent to which they will find their way into home audio and A/V applications. But I have no doubt that they have a significant future.



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V A N E S S A O N T H E M A K E .

Vinyl Victorious

While British hi-fi magazines cheerfully cover both digital and analog hardware and software, *Audio* and your kindred magazine *Stereo Review* have conspicuously avoided mentioning the very existence of LPs as an alternative audio format. When you do cover LPs, it's in sarcasm, denigration or, as in the case of Corey Greenberg's column ("Front Row," April) a boorish remark about Dunhill Compact Classic's *Elvis: 24 Karat Hits!* LP reissue.

Why do you guys have such palpable hostility towards an alternative audio format? Such blatant bias is quickly relegating your magazine to tediousness and irrelevancy as new domestic audio magazines rush in to fill the void. According to *HiFi News*, EMI has 16 automatic LP presses running 24 hours a day, and the quality of LP hardware and software has never been better. Your readership will never know about the current LP-only projects by EMI, Telefunken, Alto, King Records, Testament, Classic Records, Simply Vinyl, WEA, and Three Blind Mice; or domestic releases of current hits, such as Bob Dylan's *Time Out of Mind*. Why not? Because *Audio* editors and staff are crouched under the Maxwell Smart-esque "Cone of Silence," hoping it will all go away. It's a wishful, self-fulfilling prophesy that provides a distinct disservice to your clueless readership.

Michael Klewin
Lawrenceville, N.J.

Editor's Reply: Who's the hostile one here? We have not avoided mentioning LPs; some of our writers speak of them frequently (and positively), and so far this year we have reviewed four phono products. That may not seem like a lot, but it is actually well out of proportion to the LP's current share of market, which is tiny and, despite the talk in some circles of a resurgence, essentially stagnant. LP sales dropped like a stone through the late '80s and early '90s, then bounced very slightly at the bottom in the last few years, primarily in the categories of dance and techno music. In 1993, 1.2 million LPs were sold versus 495.4 million

CDs; last year, 2.7 million LPs were sold versus 753.1 million CDs. That works out to percentages of 0.24% and 0.36%, respectively.

I say none of this out of any hostility to the LP, which has been a wonderful music medium. But the introduction of CD ended the LP's long reign as the highest-fidelity home music carrier and eventually its market dominance as well. Those are simply the facts, and we cannot ignore them in producing the magazine.—M.R.

Mix 'n' Match

While Corey Greenberg's "Auricle" (May) on the Adcom Ball remote-controlled home theater system seemed quite positive, I was a little annoyed at his disparagement of older Adcom amps as sounding coarse and edgy, specifically the GFA-555II. When I first installed one in my system I also heard some edginess in the sound as well as a rather bright high end (coarseness?). At the time, I was using Adcom's GFP-555II preamp. Several years later I bought a Hafler preamp, installed it, and *voilà*, the edginess was gone.

In the two years since, I have repeatedly swapped these preamps and always find that the Hafler/Adcom combination gives me smoother and more fatigue-free listening than the Adcom/Adcom pairing. The only shortcoming I can nail down as probably a fault of the amp is a lack of air in the upper treble on some source material. I am so satisfied with the Hafler/Adcom combo that I've postponed my usual five-year replacement plan for these components. As is probably true with most components, proper matching is at least as important to ultimate sound quality as how much you spend, something I'm sure Greenberg does not need to be reminded of.

While I could shell out some big bucks for one of the current crop of super amps like the Lamm M2.1 mono amps, and keep it for 20 years to justify the expenditure, I would rather spend less and get new stuff more often for the same reason that I would rather drive a new Honda than a 10-year-

old Mercedes-Benz. The fact that Honda has been as wildly popular with car buffs as Adcom has been with audiophiles suggests that most people must give at least some weight to the concept of value and that by doing so makes you no less of a car buff or an audiophile.

Ray M Schmidt
via e-mail

Video Panic

Look at the name of your magazine: *Audio*. That is what we subscribers want, not video. So it is with alarm that I see DVD reviews taking up space that could be used for CD reviews. And, on the horizon, I also see a magazine subscription that I will not renew if this trend continues. Stick to audio. Remember *High Fidelity*? It tried to be all things to all people, and it died.

Name withheld
via e-mail

No Divx

May I congratulate you on your continued opposition to Divx, as you expressed in your editorial ("Fast Fore-Word," June). The concept will surely go down as one of the most ill-conceived ideas of the video/digital era.

Also, congratulations on the new DVD review section that appeared in the June issue. It is a welcome addition to your already excellent magazine.

John Burmeij
via e-mail

Hidden Agenda

I have several comments regarding J. Robert Stuart's "Digital Audio for the Future, Part 2," in your April issue. Certainly the article is very informative and I agree with many of Stuart's points regarding audio formats.

However, *Audio*, as its publisher, has a responsibility to enlighten its readers on the inherent differences between a white-paper approach (which purely educates) versus an intrinsic bias to adopt one format over another. Stuart (as you accurately mention in a sidebar) is the technical director for Meridian Audio, which (big surprise) is developing lossless compression schemes. Please don't misinterpret what I say about Meridian. We need the highest level of audio quality we can get!

But your readers should understand that Stuart is using *Audio* as a sounding board to

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champion lossless compression as the definitive audio format for the future. If you think this was made clear by his very last summary paragraph, I can assure you, it was not.

Stuart states: "While it is not appropriate here to go too deeply into the arguments for and against bitstream coding, there are some powerful negatives." I guess what he really means is: "Well, it's okay to go into the negatives, I just don't want to talk about the positives," because the entire balance of the article focuses on the positives of lossless compression.

Again, please do not misconstrue my comments. I think the ARA has some great ideas. I want to see the best-quality audio technologies in use around the world. But I also think debatable issues should not be wrapped in articles called "Digital Audio for the Future." This article is the ARA's version of digital audio for the future. We've got enough confusion regarding audio formats without hidden agendas in your articles.

Mike Newman
Sunnyvale, Cal.

Author's Reply: The article was not prepared as a sounding board for lossless compression. Its origins were in an AES paper that attempted to establish what performance characteristics are required to guarantee transparency in a digital audio channel and to look for the best way to code such a channel. In this process we have operated from the immovable principle that we are seeking the safest and best way to provide high-quality sound.

Pulse-code modulation is the only accepted form of digital audio coding that is well-enough understood to move to the next generation. Techniques like pre-emphasis and lossless compression that build upon that are, to me, little more than common sense and good engineering.

Yes, Meridian Audio has decided to offer a lossless compression algorithm for consideration, but the article is not about that. In the concluding sections, I did not want to go into the many points that I find negative about bitstream coding (which can also be losslessly compressed, by the way). I did not think that it was appropriate in this article. As to the negatives of lossless compression, it is hard to find any.—*J. Robert Stuart, Meridian Audio*

All Things Being Equalized

Three cheers to John Sunier for sticking up for tone controls in his March "Auricle" review of the Musical Fidelity X-TONE. A salesman of high-end equipment recently told me he never uses tone controls. When I informed him that I used an equalizer, I thought he was going to have a heart attack.

I well remember my era of enlightenment. Unable to tame the brightness in some early Mercury Living Presence LPs, I bought my first equalizer, a JVC SEA-10. It didn't take long to realize that the culprit was at 5 kHz. A 6-dB reduction at that point was the solution.

As Sunier argues, equalization lets me match the reproduction to the way I want to listen.

Art Geranios
Chicago, Ill.

Less Auricles, More Articles

As a long-time reader of most A/V magazines (including *Audio*), I have become concerned with the increasing pervasiveness of golden-earism and other backward thinking in the audio world. *Audio* seemed to be improving with the appointment of Michael Riggs as editor. By publishing articles by Floyd Toole and Tom Nousaine on controlled, scientific listening, Riggs has brought some much needed rationality to *Audio*.

But the frequency and absurdity of "Auricle" reviews have continued with such nonsense as high-end CD transports, tube amps, cables, and other components that have no real sound of their own. I needn't explore this further, as others much more qualified than I have shown this to be a waste of time. I will say this, however: I hear these wonderful differences the golden-ears talk about—at least until the levels are matched and I am forced to reliably identify the huge difference, then the difference becomes much smaller and impossible to identify. I am not deaf or absent a love of music (as most golden-ears will suggest); I merely recognize that as human beings we perceive the world around us through rather limited senses and that perception can be easily distorted, confused, and misinterpreted.

I would have written this letter sooner and elaborated on human fallibility and audio myths if only Charles Butler had not beaten me to the punch with his fine letter

in the December 1997 issue. I wanted to thank him for stating the case for real, objective improvements in audio so well, but then I received the March 1998 issue. There I found a rebuttal in the form of a joke from Leland A. Beaman, a shallow, thin, ad-hominem attack on Butler that neither refuted or disproved a single word Butler had to say. I shall point out two things for those to whom it may not be obvious:

1. The statement "Charles Butler is not an audiophile," is an opinion and not a fact, as Beaman states!

2. The term "audiophile" means quite literally one who loves audio. Audio can mean any number of things: a sound, the study of sound, music and its performance, and the reproduction of music. How can Beaman know that Charles Butler is not an audiophile when the word has almost as many meanings as the people who use it! Unless Beaman knows Butler personally, how can he possibly make such an erroneous statement?

Now, I understand that *Audio* is in the business of selling magazines and wants to appeal to the largest possible audience, but there is already enough high-end subjectivist ranting in other publications. I would hope that *Audio* can learn from its past and not cave in to pressures that it include every opinion, no matter how unfounded or ridiculous. Just because a group proclaims that $2 + 2 = 5$ does not make it true, nor is it worth debating once it has been proven false. I'm not suggesting that *Audio* not publish letters such as Beaman's; indeed, printing his lame ad-hominem rebuttal shows how flimsy the arguments of the golden-ears are. Rather, I would like to see more space devoted to real improvements in audio and fewer "Auricles" on components that drain the wallet and strain credulity. The only audio components that have been shown to make clearly audible differences are speakers and room acoustics. Those who believe that every cable has its own sound or that demagnetizing CDs will affect sound quality should read magazines that help feed such irrational beliefs. I would hope that *Audio* can rise above such squabbles and continue to dispense solid advice free of the confusion spread by golden-ear misinformation.

Eric Buschvia
e-mail



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AUDIO CLINIC

JOSEPH GIOVANELLI

Analog Switcher for Digital Sources

Q *Is it okay to use an old analog dbx program selector as a digital input selector to switch between digital sources with coaxial outputs? Would it degrade the digital signal? Obviously, I would use only one side of the stereo pair of input jacks to carry the signal from each digital source component.*—S. Campanile, Laguna Niguel, Cal.

A I think that an analog distribution box should work just fine to route digital signals so long as there are only switches and no electronic circuits in the signal path. The reason I think it will work is that I’ve used garden-variety audio interconnects (patch cords) in my studio to connect two DAT recorders. My cable run was about 10 feet, and I ran into no problems. On reflection, the amount of capacitance present in your audio equipment probably won’t result in a loss of data.

Am I Sunk Without a Sub?

Q *My DVD player has a built-in Dolby Digital surround decoder and even a master volume control. I have no surround preamp, but I do have enough power amps and speakers to give me main, center, and surround channels. However, I lack a subwoofer. What would I lose by doing without one? And what would I give up if I don’t want to bother with a center channel?*—Name withheld.

A If your main front speakers can deliver good bass, you won’t lose all that much. If that’s the case, try running with those channels (and any others whose speakers have good bass) set for “Large” speakers and the others set for “Small.” If you hear bass distortion, though, try setting all channels for “Small” speakers and setting your crossover frequency as low as it can go, to avoid losing too much deep bass. By filtering out the deep bass, the crossover will make it easier for your speakers to reproduce what’s left.

If your main speakers are close together and at the same level as your TV screen, you can probably do without a center speaker altogether. But the farther you spread them,

the more likely you’ll need a center speaker to tie dialog to the screen. Just be sure your decoder is set for the center setup you have.

European Power Considerations

Q *When I move to England soon, I want my 120-volt hi-fi components to work properly. I know I will need a transformer to step down the 220 volts used in England to the American 120-volt standard. How big should the transformer be? If I plug my power-line conditioner into it, will the rest of my components receive the correct voltage? Will the receiver still have enough power to drive my speakers? Will my cassette deck and VCR work properly on 50-Hz power? And will my dual-voltage CD changer adapt automatically to the higher voltage in England?*—Kevin Endsley, Clivis, N.M.

A You will indeed need a step-down transformer to convert the higher U.K. voltage to the 120 volts required by your equipment. (Radio Shack is often a good source for these transformers.)

However, let’s first deal with the components that don’t use motors—receivers, amplifiers, and the like. Each one draws a certain amount of power (measured in watts) from the power line. That figure is usually stamped on a plate or decal on the back of each component or noted in the owner’s manual. If only one step-down transformer is used, it must be capable of handling the sum of the power (in watts) required by each device, as well as providing a safety margin, which should be about 50%. For example, if the total power requirement of all your components adds up to 2,000 watts, you should get a step-down transformer rated at 3,000 watts.

Plug your line conditioner into the 120-volt side of the step-down transformer and

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

connect your components to the conditioner as usual. Neither it nor your components will care where their power comes from, so long as the transformer is husky enough to provide sufficient power. Therefore, its output voltage will be relatively constant regardless of how many devices are operated simultaneously. Your receiver will work fine and drive your speakers as it always has.

You should be aware, too, that because power in England is at 50 Hz rather than the 60-Hz frequency used here, the reactance of power transformers will be less at 50 Hz and your components may run somewhat warmer; in fact, they may even run hot. In most instances, the equipment will operate very well at 50 Hz. But if the transformer in a particular component is running close to maximum, it may burn out when operated at 50 Hz. Check the component's manufacturer to determine if it's okay to run it at 50 Hz.

Power-supply filtering will also be less effective at 50 Hz than at 60 Hz. If there is any tendency for a component's power supply to produce hum, the hum will increase at 50

Hz. However, with modern voltage regulators, this is seldom a problem.

Your CD player will not automatically adjust to the higher voltage in England. Typically, you must set a dual-voltage component to the desired input voltage with a rear-panel switch or an internal selector. It may be under a back plate, so check the owner's manual to discover where it is and how to adjust it.

Of components that use motors (cassette decks, turntables, tape recorders, VCRs, etc.), some older machines used induction or hysteresis-synchronous types, in which case their rotational speed was regulated directly by the power-line frequency. Consequently, a motor intended to operate at 60 Hz would run slower at 50 Hz. To accommodate this, manufacturers offered adapter pulleys for the motor shaft. The increased diameter of the shaft would drive the belt or idler at the proper speed even though the motor was turning more slowly.

Nowadays most motors operate differently. Even where such motors are frequency-dependent, their operating frequency is generated within the equipment rather

than directly from the power line, so unless you own a vintage turntable or tape deck, I don't think you need be concerned by the 50-Hz line frequency.

If you are planning to use your VCR only to play videotapes from the U.S.A for viewing on an American TV you take with you to England, the VCR will work. Otherwise, forget the VCR and the TV: You won't be able to receive, record, or watch British TV, or play rental tapes in England because the British TV standard (PAL) is incompatible with NTSC-standard American TVs and VCRs. Multi-standard VCRs and TVs exist, but they're expensive; alternatively, you could sell or store your American video gear and rent or buy PAL-standard equipment while you're in England.

Good Old Radios

Q *A friend told me his old console radio was better than anything built today. This made me wonder whether or not older really is better. For instance, if I had one, what sort of performance and how much enjoyment might I expect from a crystal set? How good were (are) they?—Name withheld*

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A The methods used to demodulate AM radio signals have not changed over the years. Most AM radios incorporate a diode that rectifies the desired radio-frequency signal, converting it into pulsating DC. (In a crystal set, the galena crystal—a natural, crystalline lead ore that has the property of passing current in only one direction—is the diode, and though they worked, they were not as electrically efficient as modern, germanium diodes are.) The DC pulsations are at the frequency of the radio station being detected, or demodulated. The amplitude, or strength, of these pulsations varies in accordance with the audio frequencies being transmitted. A capacitor then removes the radio-frequency component but leaves the audio-frequency part of the signal.

Crystal sets did not deliver hi-fi sound. The transducer used to hear the radio signal was a pair of headphones, and to have enough sensitivity to reproduce the tiny signal from the crystal set—crystal sets required no power source, except the signal from a long-wire antenna—they had to be high impedance. Their inductance, along with the mass of the diaphragms, made their high-frequency response rather limited, and the diaphragms were so stiff they couldn't move very far, so low-frequency response was zilch. Though the lows and highs were often transmitted, crystal-set owners didn't hear them.

During the crystal-set era in the 1920s, there were few stations to be heard, which is just as well, because crystal sets had very poor selectivity (no wonder people wanted to hear KDKA in Pittsburgh—it was one of the few stations on the air). Often a crystal set could not separate stations even 100 kHz apart, mostly because of its tuning circuits. The antenna length, its capacitance to ground, and a variable inductance were important parts of the tuning system, a combination that did not yield good performance. Additionally, the diode and headphones were connected across the inductance; consequently, their loading resulted in a further lowering of the system Q. That, in turn, decreased selectivity.

So on one hand, the basic crystal set was a very primitive but effective early radio receiver that required no external power and worked well with strong, local signals; on the other hand, it was seriously flawed. As a

boy, I was fascinated with these radios, and I eventually designed a really good one. I used two tuned circuits instead of one, and a ganged tuning capacitor. I adjusted the two circuits to track each other during tuning. Additionally, I used ferrite cores and kept the coupling between the circuits rather loose. This avoided the loading of one circuit by the other. I also used a method of loosely coupling the antenna to the first coil. That helped to improve selectivity, but it decreased the amount of signal available to the diode. And instead of headphones, I substituted a resistor of greater value than that of the headphones. With all these modifications, the signal level was so low that I had to use a microphone preamp to boost the signal to a usable level.

Nevertheless, the selectivity was surprisingly good. I was able to separate most signals in the New York area, and at night I could pick up some distant stations, including KDKA in Pittsburgh.

However, there was a price to pay. Diodes are not linear when a small signal is applied to them. With this set, the strong stations sounded very good indeed. I could still hear highs, even though some sideband cutting took place at the low end of the broadcast band. But weaker signals had an audible amount of distortion.

Amp Makes Popping Noise

Q My tube amp makes a loud, startling popping noise 10 to 20 seconds after it's been turned off. Is this normal aging? If not, what's causing it? Will the noise damage my speakers?—Robert W. Hurley, Montreal, Que., Canada

A The popping sound is not a result of equipment aging. If the pop is only a bit startling, I doubt that speaker damage will occur.

If you hear the pop in both channels, it is likely a power-supply problem; my best guess is that you have a leaky interstage coupling capacitor. (You may be able to determine this by examining the grid voltage on various stages to see how it compares to the values specified in the service manual for your amp.)

It is also significant how much time passes before you hear the noise. The current drawn by the system as tubes cool should reduce operating voltage to a point where, when the pop occurs, it won't drive your

output tubes to a power level sufficient to damage your speakers.

If the noise is from just one speaker, the problem is confined to a capacitor or a tube. I would use a low-powered amplifier as a signal tracer. I would place a DC blocking capacitor at the input of this amp so you can go in on plate and cathode circuits or even some grid circuits without damaging your test amplifier. Be sure that the capacitor is rated to handle the highest possible DC voltage found in your amp. Proceed from the input stage and eventually you will come to a stage where the noise is present. Unfortunately, this may not always be where the noise originates. Negative feedback may provide a path from a later stage back to the one that you have just found containing the "pops" at turn-off.

Intermittent Car Speakers

Q My car stereo's rear speakers cut in and out intermittently. How do I fix this?—
Name withheld

A The cure depends upon the cause, so first you need to find what that is. This is never easy with intermittent problems, because the difficulty is likely to appear and disappear even when you do something irrelevant. Your chances of finding it are better if it's in only one channel, as you'll see below.

If your car stereo's front/rear fader is a knob, lever, or ring, try moving it quickly back and forth over its entire range of travel. If that temporarily causes or cures the problem, take off all knobs and rings on that shaft, squirt in some volume-control cleaner (such as Radio Shack's No. 64-4320), replace the knobs, and turn the controls vigorously back and forth again. If that does not cure the problem, you may need to remove the stereo and have it serviced.

But if the fader has no effect, you must look elsewhere. The wiring is the next most likely culprit, especially if only one channel is involved. First check the wiring at the rear speakers, as that's easiest to get to. If the wires are attached by slip-on terminals, disconnect and reconnect them (with the stereo off), making sure they're firmly seated. Next (with the stereo back on), gently jiggle each wire; if that causes intermittent sound, re-solder the wire to its slip-on terminal or directly to the speaker's terminal.

If the problem isn't there, but is confined to one channel, turn the stereo off, try feed-

ing the left rear speaker's wires to the right rear speaker and vice versa, and turn it on again. If the same speaker is dead, the problem's in that speaker; if the problem has switched channels, then the path to that speaker is at fault.

Now we get to the inaccessible stuff: Check the other end of the speaker cables. If wiggling them changes nothing, try detaching them from your stereo system and momentarily connecting a flashlight battery against the wire to each speaker. You should hear a brief click from the speaker when

you do; if not, the problem is likely to be somewhere in the wiring. If your amps are built into your head unit, then the latter is likely at fault and you should take the car to a car stereo specialist for repair.

If you have external amps, there's one more thing to check: Try swapping *one end* of the cables connecting your head unit to your amp, right for left and left for right. If the problem does not swap channels, then it's probably in your amp. If the problem swaps channels, it's either in your head unit or you have a defective cable. **A**

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WHAT'S NEW



ATLANTIC TECHNOLOGY SPEAKERS

The System 270, a six-piece home theater system, comprises the 273 C, a tiltable center-channel speaker with boundary compensation; the 271 LR left- and right-front speakers

with dual 5¼-inch woofers flanking a silk-dome tweeter; two 274 SR dipole surround speakers; and the 272 PBM, a sealed subwoofer with a built-in 225-watt amp powering a 12-inch driver.

Prices: \$2,396/system; 271 LR, \$599 per pair; 273 C, \$449 each; 274 SR, \$549 per pair; 272 PBM, \$799 each. (Atlantic Technology, 781/762-6300)

ADVENT SUB/SAT SPEAKER SYSTEM



Intended for PC owners who want hi-fi sound and Dolby Pro Logic capability for DVD movie playback, the Powered Partners AV390PL system consists of three pieces: two satellites, each with a 1-inch tweeter and 3-inch Neodymium midrange driver powered by a 15-watt built-in amp, and a slot-loaded

subwoofer with a 6½-inch woofer driven by an internal 40-watt amp. Frequency range is specified as 40 Hz to 20 kHz with amp distortion of less than 1%. Built-in Dolby Virtual Surround Sound is said to deliver a five-channel surround field with just two speakers. Price: \$199. (Advent, 407/333-8900)

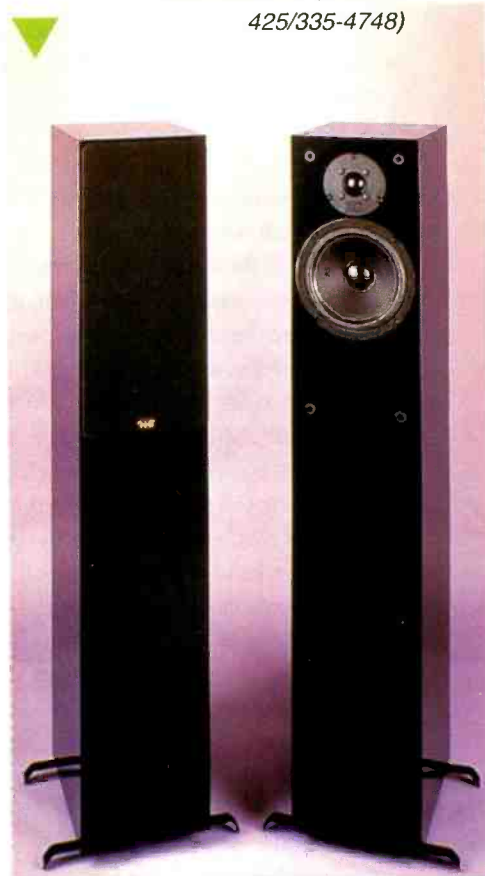
NHT SPEAKER

Intended for stereo or home theater duties, the SuperTwo combines a 1-inch soft-dome tweeter and 6½-inch woofer—the same drivers used in NHT's SuperOne—with a downward-firing, long-throw 6½-inch subwoofer to produce a claimed frequency response of 35 Hz to 25 kHz, ±3 dB. Finished in high-gloss black, the ported, three-way speaker stands 39 inches tall and is 7¼ inches wide. Rated sensitivity is 87 dB (1 watt, 1 meter); the crossover frequencies are at 120 Hz and 2.2 kHz. Price: \$750 per pair. (NHT, 800/648-9993)



Sunfire SUBWOOFER

Bob Carver's True Subwoofer Signature uses the same 2,700-watt tracking downconverter amplifier as its sibling. However, the Signature's frequency response is said to be flat to 16 Hz, and acoustic output has been increased by 6 dB. The Signature is specified to reproduce a frequency range of 16 to 100 Hz at maximum levels as great as 116 dB SPL, all from an enclosure just 13 x 13 x 13 inches. Price: \$2,195. (Sunfire, 425/335-4748)

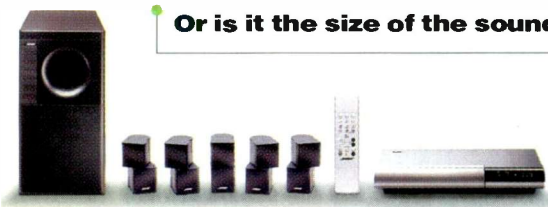


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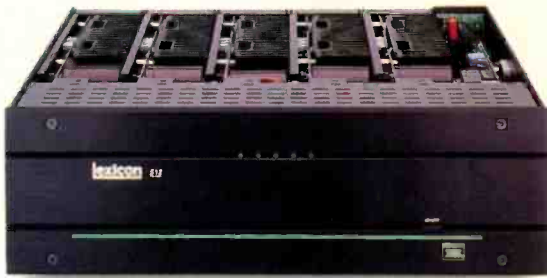
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WHAT'S NEW



Lexicon Five-Channel THX Amplifier

Using modular construction, the NT-512 houses five separate 120-watt (into 8 ohms) amplifiers on individual cards, each with its own power transformer. Claimed to be cleaner than Class-A designs, the NT-512 uses proprietary quad-complementary high-current output stages. The inputs are unbalanced RCA and

balanced via XLR and 1/4-inch ring/tip/sleeve phone jacks. A remote turn-on circuit is provided for custom installations. Price: \$3,995. (Lexicon, 781/280-0300)

HARMAN KARDON A/V RECEIVER

In addition to optical and coaxial digital inputs, the AVR75's Dolby Digital decoder also accepts the RF output signal from AC-3 compatible laserdisc players. The receiver's high-current, ultrawide-bandwidth 5.1-channel amp is rated at 65 watts per channel (into 8 ohms) to all channels.

The AVR75's features include on-screen graphics, Dolby Pro Logic, five A/V inputs (three with S-video jacks), three audio-only inputs, an AM/FM tuner with 30 presets, front-panel A/V jacks, DSP surround modes, and a learning remote. Price: \$1,499. (Harman Kardon, 516/496-3400)



Terk AM Antenna

A passive AM antenna with an adjustable tuning dial, the AM Advantage is said to minimize static and afford clear reception of more AM stations. Designed to enhance local and distant reception of AM frequencies from 530 to 1700 kHz, the Advantage can be placed next to an AM radio



or hard-wired to a hi-fi receiver or tuner. Using the tuning control, you then fine-tune the antenna to the frequency of the desired AM station. The Advantage is a two-tone black and gray loop with a lavender tuning dial. Price: \$49.95. (Terk, 800/942-8375)

AudioControl Car Equalizer/Crossover



Intended for novice car audio buffs—even those who use stock radio/head units—the Three.1 combines sweepable parametric low-bass equalization (12 dB boost and cut) with separate EQ controls at 125 Hz, 800 Hz, and 8 kHz, a 24-dB/octave electronic crossover, a four-channel line stage with 20 dB of gain, and controls for subwoofer level, front-rear fade, and master volume. Also included are balanced differential inputs for lowest noise, plus unbalanced and speaker-level inputs. Half-DIN dimensions enable in-dash or under-dash mounting. Price: \$299. (AudioControl, 425/775-8461)



TECHNICS CD CHANGER

Disc-change time is said never to exceed 11 seconds with the SL-MC6, despite its 110-disc capacity. An optical scanner notes empty slots when the changer is turned on, thus shortening change time. You can organize (and play) stored CDs by musical groups (rock, country, jazz,

etc.), and the discs needn't be in adjacent slots to be assigned to a group. You can also choose custom programs of 32 tracks from among the discs. The changer uses a Mash 1-bit D/A converter. Price: \$229.95. (Technics, 800/222-4213)

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CIRCUIT GENETICS



Living creatures see, hear, smell, feel, and move; so do some electronic gadgets. Living creatures also construct themselves from nutrients and genetic instructions. Electronic gadgets don't... yet. Perhaps they never will. But scientists are seriously looking at the possibilities.

Many of them are, in fact, using nature's own genetic instruction sheet, DNA, and for the same reasons organisms do. The number and arrangement of nucleotide bases in a DNA molecule can carry a lot of information. Its interactions are predictable. And complementary strands can zip themselves together, so that circuit elements attached to each strand will automatically be assembled properly.

About 10 years ago, Ned Seeman (a crystallographer now at New York University) and Bruce Robinson (of the University of Washington in Seattle) proposed a way of using DNA to create self-assembling memory blocks. By their calculations, a 1-cubic-centimeter memory block would be able to store all the information in every book ever written.

At the University of California, Berkeley, Paul Alivisatos and Peter Schultz are attempting to use DNA assembly for microscopic electronic circuits about 10 times smaller than can be created today with photolithography, and do it in a chemist's beaker.

Researchers Erez Braun and Uri Sivan, at the Technion-Israel Institute of Technology in Haifa, have

used DNA as a template to grow silver wires between electrodes too close together for normal wiring techniques. The Technion team uses short DNA strands as anchors that selectively hook longer DNA strands; the longer strands act as templates on which silver ions can be deposited and then reduced to metal. Each DNA template will connect itself only to matching anchors so, by selectively changing the anchor DNA, it should be possible to build up self-assembling nanocircuits.

Another wiring approach, not using DNA, is under development by a team at Yale under Mark Reed, a professor of electrical engineering. Their aim is to develop computer chips whose "wires" are self-assembling strings of molecules. According to Reed, that could lead to devices so tiny that billions of transistors could fit on a single chip, compared to the tens of millions that fit on today's chips.

At Northwestern University, in Evanston, Ill., Chad Mirkin and Robert Letsinger are looking into ways that DNA could be used to create materials having useful electrical or optical properties, such as DNA lattices that would filter out light of undesired wavelengths for use in optical computers.

Meanwhile, at the University of California, San Diego (UCSD), and at a company called Nanotronics, Sadik Esner and colleagues have proposed another design that uses DNA to guide the assembly of optoelectric chip components and temporarily glue otherwise-incompatible circuit elements together until they can be bump-soldered permanently. The UCSD team hopes that different types of DNA would make the chips' components migrate to their proper places and stick there, using electrical fields and electrically charged DNA for extra guidance.

Other researchers are copying another trick of living organisms: evolution. And they're applying it both to computer software and to the hardware on which that software runs.

Illustrations: Beata Szpura



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EDUCATIVE ESCALATION

I spent a couple of hours on a recent Sunday helping educate a teacher. My friend Denise needed speakers, so we went to a store, listened to several, and bought none. Mission partially accomplished.

Denise was just upgrading from a rack system to components. She'd acquired a good receiver and CD player, and speakers would complete the job. Her rack system's speakers were too big for the space available in her new home. And they had problems, such as making Bob Dylan's harmonica cut through your ears like a dental drill. She wanted to buy new speakers right away because I was only available that day to help. I wanted her to get the *right* speakers, whether she got them right away or not. She quoted a tentative budget—\$300 for the pair—and off we went.

There were no audio specialist stores in her immediate vicinity and time was short, so we went to a nearby chain. The salespeople were helpful and courteous, but not too knowledgeable: I heard them discussing the differences between Dolby Surround and Dolby Pro Logic releases of a movie on tape, and they didn't quite know how to use their sound room's speaker selector. But the store had a decent selection of brands (Bose, DCM, JBL Infinity, and Polk) in Denise's price range. We listened first to speakers at \$300 a pair, while I pointed out their obvious defects. (The salesman must have loved me!—though he did like having me raise Denise's sights, and budget, as I went.) Then, pointing out that these bookshelf speakers would necessitate additional spending for stands or wall mounts, I got her to try a few floor-standing models at about \$350 and finally \$400 per pair. She could hear the differences quite plainly, in bass extension and in bass and treble clarity.

Everything in the room seemed boomy, however, whether because the room's acoustics were askew or because the store had put a bit of bass boost into its demo setup (I asked about that and was told no).



Soon, she was happily agreeing that a \$400 pair was both affordable and better-sounding than anything else we'd heard. But neither of us was enchanted by them, possibly because of the boominess, even though they sounded less boomy than the rest.

After we left the store, we went for coffee to discuss what she had learned, and what she should do next. I suggested she spend what was laughingly called her spare time hanging around hi-fi dealers, especially the hi-fi specialist stores, and I gave her the name of one I'd heard of not terribly far from her. I suggested skipping any speaker whose name she'd also seen on TV sets and concentrating on speakers made in English-speaking countries (the U.S., U.K., and Canada—even including Quebec, where English is a least well understood) by companies that specialized in speakers. (I knew this would rule out at least a few good speakers, but not many).

I also told her to listen critically, starting with stuff way above her price range, to calibrate her ears, then listen to the same recordings on speakers that would fit her budget—not that I didn't expect that budget to escalate a bit. I also counseled her not to listen to a lot of speakers at once—two or three per session, maybe, not counting the expensive models used for ear-calibration.

I also said I could proxy-shop for her: that if she found a speaker that seemed right, I'd go to a store near where I live, a thousand miles away, listen to her choices, and alert her to any virtues or bugs she might have missed. Still, when it's time for her to make her final pick, I'll probably go visit her.

"In other words," she summarized, "I should shop for speakers the way I'd shop for a dress to wear at a very important occasion six months off: take my time, visit lots of places, and compare carefully before buying." I agreed. After all, my late wife used to tell me I should shop for clothes more like the way I shopped for speakers.

Software is more malleable than hardware. (In fact, a main cause of computer crashes is inadvertent changes in software code.) So the evolutionary approach began there, with "genetic algorithms." In this technique, a programmer creates several programs loosely designed to accomplish a task, then "mates" the most effective ones by mixing their bit strings, repeating the process for several generations. Genetic algorithms have already proved their worth in designing networks and turbines and in mathematical research.

The next step, making hardware evolve, has already begun, and the results are some-

what wilder. For several years, there have been chips—Field Programmable Gate Arrays (FPGAs)—whose circuitry could be reconfigured at will. Set an FPGA to do a task and, if its logic isn't properly designed for the job, you can tell it to rewire itself some other way. You can even program a computer to handle the job, "breeding" FPGA layouts that seem promising and throwing in some evolutionary randomness to see what happens.

Adrian Thompson, of the University of Sussex in England, has been using this technique to develop a circuit that distinguishes between two tones, a tiny step towards

speech recognition, but to do it without a clock to measure the number of signal peaks against.

Within two weeks—and 500 circuit generations—Thompson's chips could readily tell the tones apart. But how they did it had become a mystery. The FPGAs were using only 32 of their active logic elements, a tiny fraction of the elements a human-designed circuit would have required. Elements that were not tied to the main circuit still took part in the task, perhaps through some form of electromagnetic coupling.

However, circuits that worked on one chip often would not work on another, and

changes in temperature or other environmental factors often affected the operation of the chips. Thompson is trying to get around these problems, again by evolutionary means. By exposing the chips to environmental changes as their circuits are evolving, he hopes to come up with circuits that can do a simple job under any circumstances. Once that's accomplished, the next job will be to make the jobs more complex.

All these ideas are many years away from home audio. But they do offer a glimpse of a potential future, with audio systems that redesign and rebuild themselves to incorporate the features we want and drop the ones we don't, or whose sound will optimize itself to match our rooms, sonic preferences, and tastes in music. A

NEW READER FOR OLD RECORDS

How do you play an old recording whose grooves are made of fragile wax or have been damaged by mechanical styli? Researchers at Switzerland's Federal Institute of Technology in Lausanne (EPFL) have found a way to do it by tracing the groove with a special optical fiber, according to a story in a September 1997 issue of *New Scientist*.

The fiber is a thousand times lighter than a conventional diamond stylus but has a larger diameter in order to ride high in the groove, above areas where the groove walls may have been damaged.

A laser beam is fed down the fiber and reflected back from the fiber's end, which is angled to act as a mirror. As the fiber traces the groove, its motions alter the laser's reflections, which are then read at the fiber's other end and decoded to yield an audio signal and a tracking signal. The latter controls the servomotor that slowly drives the fiber across the recorded surface. This feedback drive system helps the fiber move smoothly even where the groove is damaged and minimizes record wear. At the last reported stage of development, the system could apparently read only vertical modulations, as found on cylinder recordings and "hill-and-dale" discs; most disc records, however, used lateral modulations.

The system is already being employed by the Swiss National Archive, Radio Suisse Romande, and Télévision Suisse Romande, chiefly for historical transcriptions made on wax.

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KEN KESSLER

FATHERLAND FAVORITES



Seeking the reinforcement of national stereotypes isn't the main reason one should attend hi-fi shows off the beaten path. Invariably, no matter how obscure the event, they're loaded with surprises. There's a tendency for most globe-trotting/professional hi-fi spectators to regard the triumvirate of the Consumer Electronics Show (held every January in Las Vegas), the Tokyo Audio Fair, and the autumn show at London's Heathrow Airport as all that one need frequent to stay well informed. And that's probably true.

But, boy, when you bypass the shows in other territories, you lose track of the oddities. Hell, there are tube treasures to be found in Athens,

wild speaker designs in Malaysia, and trick cables in Budapest, so snobbery can cause the less-adventurous to miss something exciting.

Given that the German market is, by quite a margin, the most valuable in Europe, you'd have thought that the Frankfurt show held in May would figure high on every manufacturer's list. And, yes, the show did host a fair number of enthusiastic foreigners with initiative: Straight Wire's peripatetic Stephen Hill was there, as were Jeff Rowland and personnel from AudioQuest, Conrad-Johnson, and other notable American brands. The place was crawling with British and Italian manufacturers' representatives as well. But the press? Aside from the expected Ger-

man contingent, the show might have gone unnoticed abroad.

Which would be tragic, because High End '98 was one of the best hi-fi shows in Europe, if not the world. Without even hinting at stereotypes about Teutonic militarism, I must say it was impossible not to marvel at the planning and organization; the whole event ran like a well-oiled Porsche. (Okay, so the near-anal attention paid to the legitimacy of one's badge to ensure that the entrance fee had been paid was enough over the top to call to mind images of Colonel Klink, but maybe that's the way all shows should be.) Moreover, the show guide is the sort of souvenir that could put your hand luggage into the "excess baggage" category, the exhibitors (unlike their auslander counterparts) had spec sheets and catalogs covering their debut wares instead of excuses and verbal descriptions, and most of the rooms actually possessed good sonic character. But it was the homegrown hardware that made this a feast for the shutterbug.

Two things made this possible. The first is that Germany is large enough to support a manufacturing base that seems healthy even though most of its products never leave the fatherland. Or, if they do, it's on a limited basis. I saw dozens of brands that have little or no presence in other markets even though they deserve wide distribution.

Second, Germany is the last bastion of the vinyl record. Contrary to the beliefs of certain vocal American and British manufacturers and audiophiles, who think that they're the only analog fiends on earth, the German high-end community shows so much enthusiasm for LPs that you'd be forgiven for thinking that you had been transported back in time to 1982. And I'm not just talking about the stalls in the halls where you could actually buy things like accessories and discs. It took only moments to calculate that there were more records on sale than CDs... and that the attendees were buying loads.

Illustration: Marina Sagona

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You name it, it was being offered. Every new audiophile LP, every commercial pressing, used discs, boxed sets—it was black vinyl paradise. And then there were turntables everywhere you looked; I counted at least a dozen new models and shelves full of familiar LP spinners. More to the point, numerous rooms were using records for their demonstrations, including companies that made or imported neither turntables nor arms nor cartridges.

This was one of the key indicators of the German market's unique character. In marked contrast to France, for example, Europe's leading market for home theater, or certain Asian territories where karaoke is taken seriously, Germany is hard-core audiophilia of the old stripe. And just as Germany looks set to be the final stronghold for vinyl, it could also be the last redoubt of two-channel sound. With that in mind, is it any surprise that the Frankfurt show was overrun with tubes and horns?

For those of you who must have stereotypes in order to impose some sense of order on your lives, rest assured that one thing remains unchanged: German audiophiles still love chrome-plated everything. More specifically, there were plenty of cool toys to appeal to the lover of exotica, for the sort of audiophile who shuns the major brands because he values novelty and rarity over peace of mind. Some will reach American shores; others might never leave Stuttgart or Hamburg or Munich.

It was nice to witness, for example, a familiar company, Thorens, one of the most important turntable manufacturers of all time, debut a new *plattenspieler* that breaks away, however slightly, from the norm. The all-new Ambiance—DM6500, including an SME 309 arm—features a tuned acrylic platter and a heavily damped solid timber chassis lined with a top-secret resin-based mix. This black goo hardens while retaining some elasticity, and it's said to dampen the base. A carefully designed and tuned mat rests on top of the platter; remove it, and there's a cork sub-mat (reminiscent of Great Britain's Ringmat) in the pattern of . . . a Star of David! Read into that whatever you like.

Transrotor—one of Germany's longest-surviving high-end turntable manufacturers, once known for a record player that featured a throttle straight out of a Messer-

schmitt—continues to wallow in chrome. It was showing its latest flagship, the Aquila Gold turntable, priced at a heady DM21,000—which I think is around \$12,000. But that does pay for three (count 'em!) motors and real gold plating. Clearaudio, too, showed further refinements of its equally chromed turntables, but the god-send for many might be the prototype of a new, simple model at the low end of the price scale. (And Clearaudio, unlike some of its countrymen, has a U.S. presence.) Audiolabor, on the other hand, eschews the shiny bits altogether, and its gorgeous, long-serving Konstant turntable appeared in updated form and sporting a matte titanium-colored finish. Acoustic Signature's Solid

**THERE WERE PLENTY
OF COOL AUDIO TOYS
TO APPEAL TO
THE LOVER OF EXOTICA.**

One is a massive, bombproof, thread-drive deck weighing 34 kilograms (75 pounds); it sports a 2-inch thick aluminum platter and sells for around DM5,000 (around \$2,747).

Germans have some unusual ideas about speakers, not least a love for the aforementioned horns, and it was a treat to hear the familiar Avantgarde Acoustic horns—normally driven by single-ended triodes at shows around the world—sounding positively luscious with Audiolabor's new range of ultracompact and beautifully made solid-state amps. In one installation, I saw a stack of four monoblock Model 500s with separate power supplies—eight chassis in total—with each amp good for 240 watts into 4 ohms.

Bunzow, a brand completely new to me, showed three models in its Jewelvion line. The treble driver in this line is housed in a faceted, solid chunk of plexiglass shaped just like what Marilyn Monroe called a girl's best friend. My German is limited to clichés from war movies, so I couldn't engage in a conversation about the nonresonant properties of plexiglass, but these guys were taking the use of the material to the extreme. Size-wise? These "diamonds" are around 6 inches in diameter and 5 inches deep and are fit-

ted to little pedestals you can position either on top of an enclosure or on a shelf, or you can even wall-mount them. Of course, these modules are only satellites to which you add woofers, but they do make a sparkling alternative to the little plastic lumps favored by mass-market manufacturers who are on a hide-the-speaker kick. And if women do, as male chauvinist pigs suggest, worship precious stones, then it should be a lot easier getting a pair of Bunzows past the wife than any conventional box.

One unusual design that should do well in the bass-mad U.S.A. is Wavier's Polar dipole subwoofer. It looks like they took the frames from two Quad ESL63s, cut slots down the center so they could fit to form an "X" (when viewed from the top), and fitted a pair of cone woofers that fire in opposite directions.

Another participant, Ear Max, imported in the United States by Hart Huschens, showed a redesigned version of its delightful all-tube, OTL headphone amplifier. No longer so ugly that it looks like an appliance sold in Bedrock, the latest version features Lemo connectors, bigger supply capacitors, a shielded cord, and a German price of just under DM1,000 (approximately \$549). This little gem is already stateside, so call Hart at Audio Advancements—973/633-1151—if you're looking for a headphone amp that can double as a conversation piece.

If further proof were needed, meanwhile, that the Germans still worship chrome, then nothing could convince you more than the massive boomerang-shaped front panel on the Musica Nova prototype amplifier. The Valhalla is a dual-mono solid-stater employing MOSFETs, and I was told that the design allows it to be configured for whatever power rating is required; the show sample delivered 270 watts per channel.

I could, of course, go on and on talking about other designs that—for the most part—would require you either to import them yourselves or to move to Germany, but I won't. Rather, I'd prefer to acknowledge the reason why lots of reporters avoid visiting the lesser-known shows: mouth-watering photos and effusive text can serve only to frustrate readers with limited or no access to such goods.

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COMPRESSION IS YOUR FRIEND

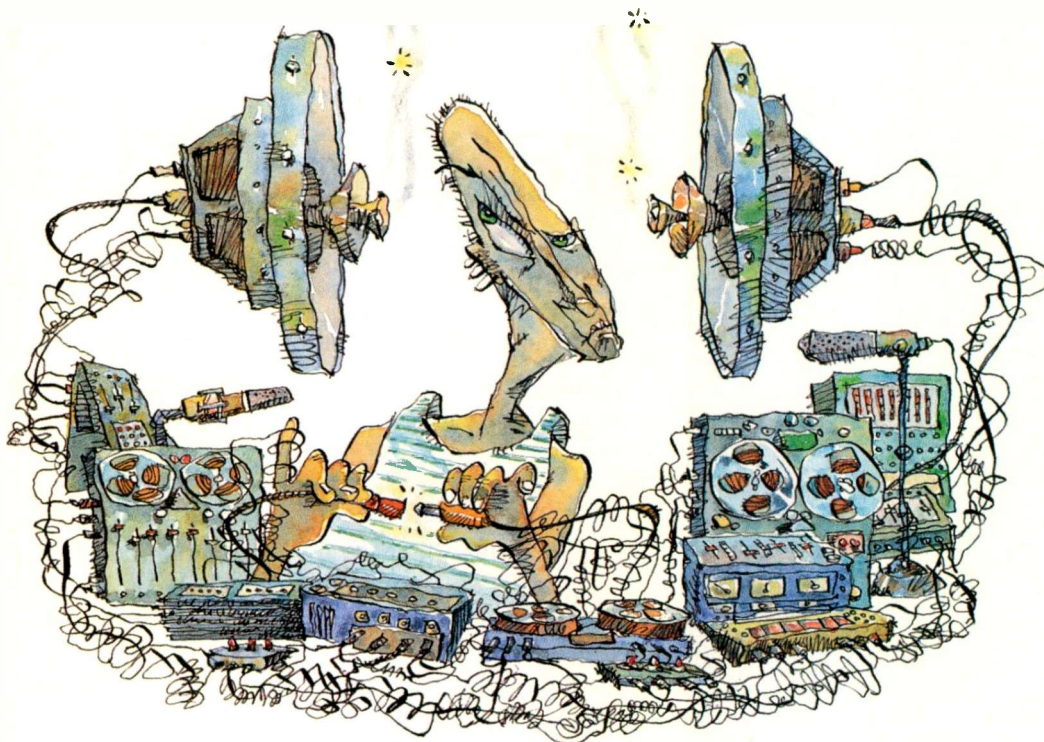


Illustration: Courtney Granner

To fully appreciate why FMR Audio's \$200 Really Nice Compressor is such a monumental breakthrough for the home studio market, it helps to flip through the pages of *TapeOp* (www.teleport.com/~fboa; 503/239-5389), a cool little 'zine that's kind of like the *Sound Practices* of the project-studio scene. Indie studio owner Larry Crane (whose recent credits include engineering work on Elliott Smith's *Either/Or*) fills the pages of his self-published 'zine with a cheerful mix of articles on do-it-yourself recording and interviews with indie-rock Portakids, 20- and 30-somethings who grew up during the Tascam Portastudio four-track cassette revolution of the early 1980s. Once you get past the same, rote "digital sucks, analog rules" broken record

that *Studio Practices* suffers from, *TapeOp*'s chock-fulla-advice interviews radiate the kind of infectious creative vibe that makes you want to grab your Strat, blow the dust off the old Tascam, and give Guided By Voices a run for its money.

Nowadays, Portakids know everything there is to know about recording their own songs, working their Mackie mixers, getting a good guitar sound with a Shure SM57 mike shoved up against the amp and a Radio Shack PZM mike out in the room. They know which Audio-

Technica mikes are the coolest, which old Tascam and Ampex reel-to-reels are worth hunting down, and they know that the best sound to be had from a half-inch eight-track is always with the Dolby/dbx noise reduction turned off and the needles pinning red the whole time.

But even armed with all this arcane recording knowledge, the Portakids still sound like a bunch of rank amateurs when you listen to their indie-label CDs: You can't hear the singers all that well, the drums sound like oatmeal cans, the guitar's either way too dominant or barely audible, and there's never any decent low end. And for some strange reason you can't quite put your finger on, indie CDs almost always sound too quiet on your hi-fi rig, no matter how much you crank the volume. For a generation raised on *Pet Sounds* and *Back in Black*, the Portakids can't seem to record a big-sounding CD to save their lives.

Nine times out of 10, this happens because these kids don't know dick-all about compression. A home-studio geek friend of mine recently spent thousands of dollars on exotic mikes, preamps, and soundproofing trying to get a good sound on his recordings, but it wasn't until he finally turned on and learned how to use his compressor that his stuff sounded anything like what you'd hear from a major-label CD. Fact: You can make better-sounding recordings using el-cheapo Radio Shack highball mikes and a Portastudio than all the guys with 20-bit ADATs and boutique tube mikes, if you've got a good compressor and know how to use it.

At the other end of the spectrum lives another, more *Audio*-relevant fact: Most audiophiles are totally, completely backwards-assed about what makes certain recordings sound good. Hey, I don't expect the average audiophile to know which mike Bill Porter used on Roy Orbison's vocals or what board Humble Pie cut "30 Days in the Hole" with—I'll let the poor bastards on alt.pen-

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The Really Nice Compressor, or RNC, from FMR Audio.

Photo: Max Crace



cil.neck worry about accumulating the sum total of recording-history trivia. But considering that most audiophiles are both passionate music lovers and scarily retentive when it comes to a quote in the third paragraph of a loudspeaker review they read five @\$#% years ago, you'd think they'd expend some of that obsessive audio energy boning up a bit on recording technology before pooh-poohing the whole business as being somehow in cahoots with the Worldwide Conspiracy Of Evil Whose Only Goal Is To Deprive You Of Good Sound.

And just like the project-studio geeks, audiophiles don't know much about compression beyond the oft-repeated dogma that it makes things sound bad. I guess it depends on what you think sounds "good." If you think Cheskys, Dorians, and other purist-miked recordings sound good, and rock records like the Beatles' *Revolver* and AC/DC's *Back in Black* sound bad, bully for you. Me, I think that with very few exceptions—e.g., Kavi Alexander's engineering work on Water Lily Acoustics—most purist CDs recorded without any compression sound wimpy and small, and not very lifelike at all. It's like they're made for weak, timid people who scare easily.

So what *is* a compressor, and why is it so misunderstood by Portakids and audio nuts alike? A compressor is an audio processor that squeezes an audio signal's dynamic range so that the loud peaks are tamed and the quietest sounds are boosted up, until everything pretty much rocks at about the same level. Compressors were used at least as far back as the 1930s, to ensure that AM stations could broadcast music without ei-

ther overmodulating or losing quiet passages in noise and to enable records to be cut without overshooting the groove and ruining the master disc. But studio engineers were quick to grok that compression actually made things sound bigger and louder while simultaneously making it easier to fit the signal onto dynamic-

range-challenged analog formats like LP records and broadcast radio and TV, and easier for typical home playback systems to reproduce at realistic levels without distorting the peaks.

On paper, compression sounds like the worst, absolute last thing anyone would ever want applied to his music recordings. Give up dynamic range? After 50 years of fighting tooth and nail for ever-wider dynamic range audio formats? When real life

**MOST PURIST CDs
RECORDED WITHOUT
COMPRESSION SOUND
WIMPY, AND NOT VERY
LIFELIKE AT ALL.**

has a *huge* dynamic range? I know it sounds backward, and I'll admit that it took me years of actually playing around with compressors to understand this, but compressing a recording's dynamic range actually makes it sound *louder*, and *no* compression makes things sound *quieter*. Except for when you turn your system up to compensate, and an uncompressed kick drum blows your woofers with a cool-sounding crack that's nice and loud for that half a second before the smoke curls out of the dead driver, I'll grant you that.

In fact, one of the main reasons people dig the sound of old tube gear and analog tape machines is because, unlike solid-state electronics and digital recorders, tubes and analog tape naturally and euphonically compress musical peaks when you hit them

hard with a lot of signal. The Rolling Stones' classic *Let It Bleed* is a great example of both tube and analog-tape compression: 'Most every track features overdriven tube guitar amps compressing the guitar signals, which are then recorded onto analog tape at such a purposefully high level that the tape adds still more compression along with its own unique distortion. It makes for great-sounding guitar tracks that automatically sit nice and snug in the mix because of all the naturally-occurring compression.

I'm convinced that the main reason the Portakids diss digital recording and ADATs is because they don't get the same kind of compression from digital recording that they got from their analog-tape Portastudios. Using one of the retro tube mike pre-amps like the Bellari and ART jobs helps somewhat, but if you want to get a big, meaty sound, you really have to get a good compressor.

The problem is, none of the budget compressors you find at Guitar Center (which, by the way, *sucks*), such as the various \$200-to-\$500 boxes from dbx and Alesis, are really good. They've got controls out the yin-yang that let you dial in any kind of compression you'd ever need, but the bottom line is they sound grainy and raspy and wind up mucking up a good track instead of beefing it up. You lose a lot of high treble with these budget boxes, and vocals sound muddy and dead. Up till now, the only really good-sounding compressor under a grand I'd heard was the \$659 ART Pro VLA, which uses classic '60s-style tube and optical limiting circuitry and sounds quite musical though unmistakably, maybe even exaggeratedly, tubey.

But what if you don't *want* that tubey sound fogging up everything you track? What if you want absolutely clean, sonically transparent compression that makes everything sound bigger and louder but otherwise doesn't color the sound at all? Up till now, I'd say good luck: The only solid-state boxes I'd tried that could give you lots of clean compression were professional studio compressors costing upwards of two or three grand. And even a classic box like the Urei LA-4, one of the most legendary and highly-coveted of compressors, can start to sound pretty distorted when you crank the compression up to *Revolver* levels. Asking a budget solid-state compressor to do better

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is like asking a pair of \$30 Sony headphones to sound like top-of-the-line Grados.

A while back I started seeing a buzz on rec.audio.pro about a new, cheap, stereo compressor called the RNC—the Really Nice Compressor. The entire newsgroup was foaming about this \$200 compressor that killed everything under the sun, and even though I've seen this kind of rec.audio.hype play itself out too many times to take seriously, I was intrigued enough to call the designer, FMR Audio's Mark McQuilken.

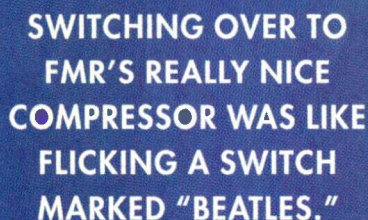
The more I talked to him the more I wanted to hear his little box. For starters, McQuilken lives in Austin, Tex., and used to work as an FM radio engineer, which happens to be what I used to do and where I used to do it. A fortune cookie would say that portends good luck, but it gets even better. McQuilken said he'd always wanted an affordable stereo compressor for recording that sounded as clean and clear at high levels of compression as the \$10,000 multi-band Orban Optimod loudness processors every serious FM station uses (yeah, who wouldn't?!). But when McQuilken told me he likes the cheese relenos plate at Chuy's, well, that's all I needed to hear. Any man who frequents a Mexican restaurant that's also an officially sanctioned Elvis shrine is a man whose compressor deserves a listen.

And after living with the Really Nice Compressor for a month now, all I've got to say is maybe they need to start serving cheese relenos in the Alesis and dbx cafeterias. Because as much as it physically pains me to agree with the rec.audio.peanut.gallery, this little RNC lives up to all the buzz and then some. I've used it to compress everything from miked electric bass and guitar to vocals to stereo program material, and I simply cannot believe how insanely great this little \$200 box sounds. This isn't just a killer \$200 compressor—it's one of the best compressors I've ever heard at any price, and far and away the best you're going to find for under two grand.

The secret, I think, is that McQuilken wisely set out to design a compressor that combined simple, audiophile-grade audio circuitry with as few controls as possible so you practically can't get a bad sound out of it. This is the opposite approach of every other cheap compressor aimed at the project-studio market, all of which offer you five thousand ways to configure the thing—

all of which sound dull, muffled, and lifeless. Instead of facing 20 knobs on the outside and jambox-grade circuitry on the inside, you get five knobs and the same squeaky-clean Analog Devices OP275 op-amps and purist signal path you'll find in the most expensive high-end gear. Like the legendary Orban Optimod FM processor, the RNC uses DSP to control the compression parameters, but the audio signal path is purely, and I do mean *purely*, analog.

The RNC's five knobs—"Threshold," "Ratio," "Attack," "Release," and "Gain"—will be familiar to any studio rat who's ever fiddled with a compressor. "Threshold" determines how early the compressor kicks in: You can set it to just rein in the signal peaks



SWITCHING OVER TO
FMR'S REALLY NICE
COMPRESSOR WAS LIKE
FLICKING A SWITCH
MARKED "BEATLES."

or crank it all the way to squeeze everything from puking Marshall cabinets to mice piddling on cotton balls in the next room. "Ratio" decides just how radical you want the compression to be, from 2:1 (i.e. 2 decibels in, 1 decibel out) for a gentle '50s kind of sound all the way to 25:1—brick-wall city. "Attack" is how fast the RNC clamps down on the signal: fast for a smoother sound, slower for more punch. "Release" relates to how quickly or slowly the compression loosens its grip, while "Gain" makes up for the level difference between the compressed output signal and direct bypass, which is switchable via a button on the front panel. FMR Audio's short, excellent manual makes it easy to understand the relationship between these five knobs, but twiddling them for 10 minutes on some program material will teach you all you need to know about how to make this box sing.

There's another front-panel button, and it's the Really Nice Compressor's secret weapon. In its standard mode, the RNC fulfills the function of a general-purpose compressor for individual tracks. But with a push of a button, the RNC goes into "Super Nice Mode," which is McQuilken's take on a transparent, multi-band, multi-layer Opti-

mod type of compression. While the RNC's normal mode is best for compressing individual instruments and vocals, the Super Nice Mode is expressly designed for situations when you run a finished stereo mix through the RNC as a final processing stage. This is where every cheap compressor I've ever tried falls flat on its wall wart. Try running the stereo output of a CD player through your favorite compressor while playing a familiar CD and see if you don't cringe at the opaque, congested, cruddy sound you hear, no matter how you set the knobs.

Not the RNC; to my amazement, I found I could get away with ungodly amounts of compression without any—*any*—audible distortion or treble loss. Perfect example: I've got a DAT tape of a live blues performance I did several years ago in a medium-sized hall. For years I've wanted to play this tape for people, but I don't, because it sounds like crap. The guy who recorded it believes unwaveringly in the purist approach, even if it doesn't make any sense for a given recording project, so he used a single pair of B & K omni mikes spread a few feet apart and set up a few dozen feet from the stage, plugged straight into a DAT deck. Never mind that you can barely hear the drums, my guitar's way too loud, and the bassist sounds like he's playing his Fender unplugged (years before MTV caught on)—it's *purist!*

So when I got the RNC, the first thing I did was run the output of my Sony DAT deck into the compressor set for Super Nice Mode, and let me tell you, it was like hearing a completely different session, only this time done by a pro. Now everything settled together in a cohesive, tight mix that sounded fat, loud, and lively even at moderate playback levels. Once I burned a CD-R of the RNC-compressed mix, I did a Fredo on the original DAT tape and dismissed it with "You're nothing to me now," in my coldest Michael Corleone.

But the highest praise for the RNC came from my brother Mark, and our friend Archer Prewitt, who together made several critically-acclaimed records on Highball Records as one-half of those indie faves the Coctails. Mark's been recording some tracks for Archer's upcoming solo record at his home studio, so when they complained to me one day that they weren't very happy with the vocal sound they were getting, I

went over to look at their signal chain—bringing along the RNC, of course.

Nothing in Mark's recording setup seemed problematic. He was using a great-sounding mike in the Audio-Technica AT-4033 and printing the output from the Belari tube mike preamp straight onto a Tascam DA-38 digital multitrack. However, he was also using a dbx 166A, a \$329 stereo compressor that's very popular with the Portakids because it's always on sale at Guitar Center (which, by the way, *sucks*). So we took turns feeding the dry vocal track to each of the compressors in turn, monitoring the results on a Mackie mixer, Acurus power amp, and NHT SuperOne speakers.

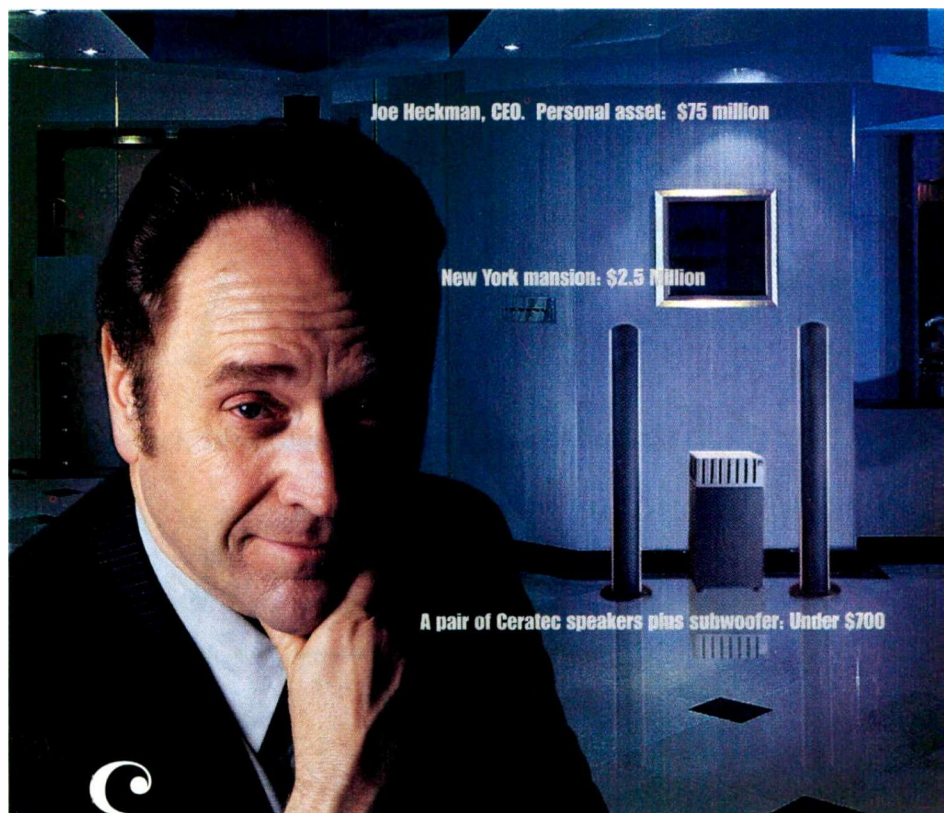
As soon as I swapped out the dbx for the RNC, their eyes bugged out like Cookie Monster's. To be honest, even I was floored by how much better the RNC sounded. Running the vocal track through the dbx added a cold grittiness to the sound, with a thick layer of murky congestion that spelled classic Portakid. Switching over to the RNC was like flicking a switch marked "Beatles"—suddenly Archer's voice was as clear as a bell and as big as a house. His first CD, last year's *In The Sun* (Carrot Top SAKI 015), sounds very good, but his voice didn't sound anywhere as impressive on the CD as it did there in Mark's studio through the RNC. To make a long story short, Mark and Archer wouldn't let me leave with the RNC and wound up spending the next week re-recording all of Archer's vocal tracks with it while the dbx sat over in the corner, turned off, probably for the last time.

Does the RNC have any limitations? Sure it does—it may be a \$200 miracle, but it's not perfect. Portakids live in an unbalanced world, but pros might be bothered by the RNC's lack of balanced inputs and outputs. Also, unlike more expensive stereo compressors, the RNC's two channels are always "stereo-linked," i.e., their processing is internally tied together so that both channels react similarly, to avoid the odd aural effects caused by fully independent compressors processing a stereo signal. Therefore, you can't use the RNC, say, to compress a bass track with one channel while simultaneously compressing a vocal with the other. At any rate, if you need multiple compressors, at just \$200 apiece you can buy two or even three RNCs and still come away cheap. And

I guess in a backwards-compliment kind of way, the RNC's utter clarity and transparency can work against it if what you're after is a colored, more '60s-sounding compression. If that's what you want, the ART tube and Joemeek solid-state compressors will give it to you in spades. Personally, I prefer the transparency of the RNC. To my ears, it's a far better-sounding and more universally usable compressor than either of those boxes, and at less than half their cost.

Ever since the home-studio revolution began, pro-studio owners have snickered

into their Domino's boxes because they knew that no matter how good affordable mikes like the Audio-Technica sound, no matter how inexpensive multitrack digital recording has become, the Portakids were still stuck with lousy-sounding budget compressors. Well, the \$200 Really Nice Compressor changes the whole game. If you're a Portakid, or even a Portagrownup, you should definitely get hold of an RNC or two as soon as possible, because your CDs sound like crap, and now, thanks to Mark McQuilken, you don't have any excuses. A



Entertainment with style

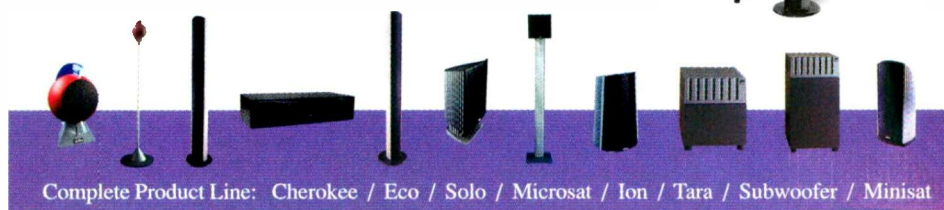
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NXT UP AGAINST THE WALL

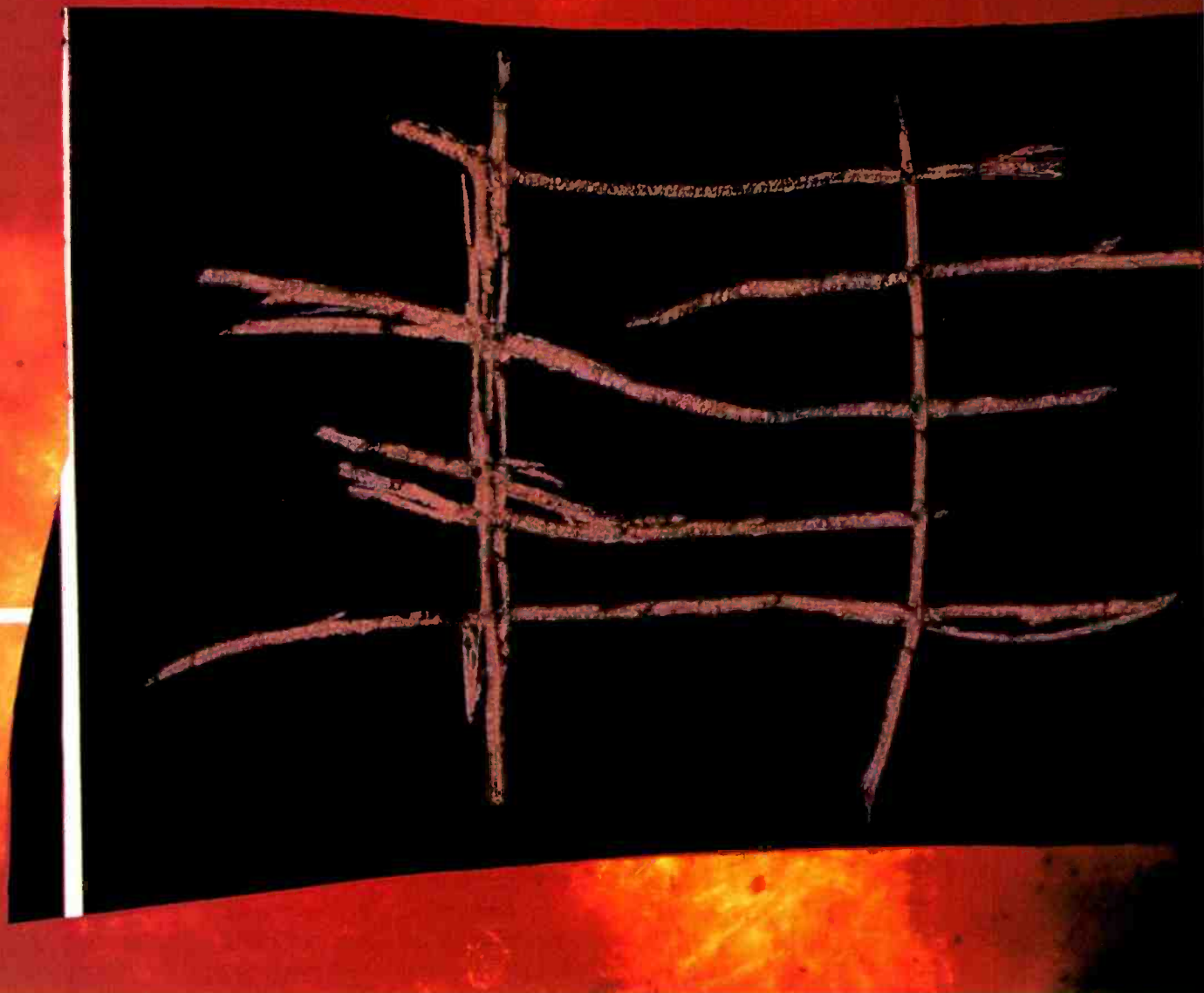
by Henry Azima

Much of the past 40-plus years of loudspeaker development has revolved around identifying, understanding, and then suppressing diaphragm resonances and the colorations and “smear” that result from them. What I am going to describe here is an entirely new approach, which rather than attempting to eliminate diaphragm resonance encourages and exploits it. In so doing, NXT effectively tears up the loudspeaker rule book as we have known it.

Audiophiles and audio professionals are understandably suspicious of an idea that so comprehensively inverts the conventional wisdom. But I hope that by the time I am done, you will understand why we at NXT feel this crazy sounding idea actually brings major benefits to both loudspeaker users and loudspeaker designers.

The first question to address is: Why should we need a new loudspeaker paradigm when so much academic and design effort has been expended on perfecting current technology? To answer that, we need to go back to the basic principles of how con-

HENRY AZIMA IS THE CHIEF TECHNOLOGY OFFICER OF NEW TRANSDUCERS, LTD. (NXT), A U.K.-BASED TECHNOLOGY AND LICENSING COMPANY. AFTER GRADUATING WITH FIRST-CLASS HONORS IN ELECTRONICS AND CONTROL ENGINEERING AND SERVING IN THE NAVY, HE JOINED MISSION ELECTRONICS IN 1980 AS THE COMPANY'S TECHNICAL DIRECTOR. HIS DESIGNS FOR CYRUS ELECTRONICS AND MISSION LOUDSPEAKERS HAVE WON MORE THAN 100 AWARDS, AND HE HOLDS MORE THAN 30 PATENTS IN ELECTROACOUSTICS, MOST RELATING TO THE NXT DISTRIBUTED-MODE LOUDSPEAKER TECHNOLOGY.



ventional loudspeakers operate and identify the fundamental restrictions on performance that they impose.

Conventional loudspeakers, whatever method of transduction they use (electromagnetic, electrostatic, piezoelectric, etc.), aim at achieving pistonic motion of the diaphragm, at least over the lower portion of its operating range. By pistonic I mean that the diaphragm moves as a rigid whole. In acoustic terms, such a loudspeaker is mass-controlled over most of its passband. For a given input voltage, the motor generates a force that is constant with frequency, the di-

aphragm resists with a mass (its own moving mass plus that of the air load), and so,

**NXT'S
NEW APPROACH
TO PANEL
LOUDSPEAKERS**

by Newton's second law of motion ($F=ma$), the acceleration of the diaphragm is con-

stant with frequency. As a corollary, its displacement decreases as the signal frequency rises, at a rate of 12 dB per octave (i.e., it quarters with every doubling of frequency).

At low frequencies, where the wavelength in air is large compared with the diaphragm dimensions, this is just what we want. The real part of the diaphragm's radiation resistance (Fig. 1), into which the driver dissipates acoustic power, increases with frequency at exactly the same rate as the diaphragm's displacement decreases, with the result that acoustic power output is constant.

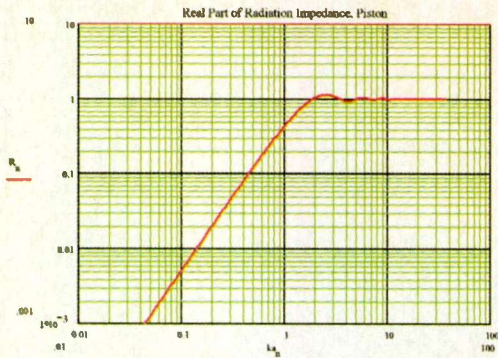


FIG 1—
RADIATION RESISTANCE VS. FREQUENCY FOR WAVELENGTHS LARGER THAN DIAPHRAGM.



FIG 2—
QUASI-RANDOM VIBRATIONS OF NXT DISTRIBUTED-MODE SPEAKER DIAPHRAGM.

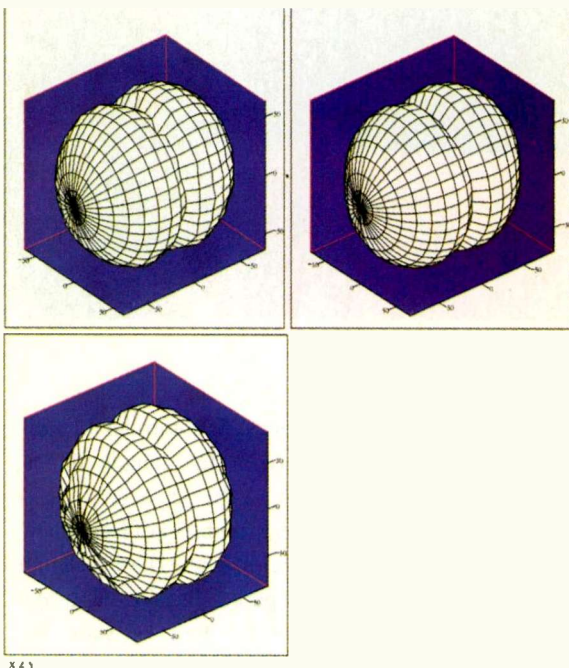


FIG 3—
POLAR RESPONSE OF AN NXT PANEL WITH AN AREA OF 140 SQUARE INCHES AT VARIOUS FREQUENCIES.

As frequency continues to rise, however, and the wavelength in air decreases to the point where it becomes comparable to the diaphragm dimensions, a major change occurs. Instead of continuing to rise, the real part of the radiation resistance reaches a limiting value and essentially becomes a constant for all higher frequencies. Consequently, the diaphragm's acoustic power output now begins to fall at a rate of 12 dB per octave. This doesn't mean that the on-axis pressure response drops off: What usually happens is that the diaphragm's acoustic output becomes restricted to progressively narrower solid angles. In other words, it becomes directional; it begins to beam.

Variation of directivity with frequency is one of the great bugbears of loudspeaker design. If we listened to reproduced sound in anechoic environments, it wouldn't matter: We would hear the diaphragm's on-axis output and nothing else. But conventional listening rooms are far from anechoic, so a loudspeaker's output off the listening axis has a significant effect on what we hear. Because of frequency-dependent directivity, the direct, reflected, and reverberant sounds in a room all have different tonal balances. Even if a conventional loudspeaker were to have an absolutely flat on-axis response and were entirely free of resonance—a tall order—its varying off-axis response would still color the sound and introduce imaging aberrations.

An obvious solution would be to use a diaphragm small enough to force the "knee" in the radiation resistance curve above the audible frequency range. But such a diaphragm would have to undergo enor-

mous, impractical excursions to produce the volume displacements necessary at low frequencies. So loudspeaker designers are typically forced to compromise and deploy multiple drive units of progressively decreasing diaphragm size. Large diaphragms provide the volume displacement necessary to reproduce low frequencies; small diaphragms take over at higher frequencies before the output of the larger units becomes too directional. Even so, the speaker's directivity still varies significantly with

RATHER THAN
ATTEMPTING
TO ELIMINATE
DIAPHRAGM
RESONANCE,
NXT SPEAKERS
ENCOURAGE
AND EXPLOIT IT.

frequency, and the use of crossovers to divide up the frequency range brings with it a host of unwelcome side effects: phase distortion, further disruption of off-axis output, more reactive elements in the loudspeaker load, and sound-quality issues related to capacitor performance and the saturation behavior of inductor cores.

A full-range drive unit, covering the entire audible frequency range with constant directivity, would banish these problems but, for the reasons outlined, simply isn't achievable using conventional techniques. So we appear to have reached an impasse.

ABANDONING THE PISTON

But what if we abandon the concept of piston motion and consider instead a diaphragm vibrating almost randomly across

its surface rather than coherently? Each small area of the panel vibrates, in effect, independently of its neighbors, rather than in the fixed, coordinated fashion of a pistonic diaphragm. Think of it as an array of very small drivers, all radiating different, uncorrelated signals that nonetheless sum to produce the desired output.

Such a randomly vibrating diaphragm behaves quite differently, because power is delivered to the mechanical resistance of the panel, which is constant with frequency. The radiation resistance is now insignificant, because the air close to the panel also moves in a random fashion, reducing the effective air load. As a result, diaphragm dimensions no longer control directivity: You can make the radiating area as large as you want without high-frequency output becoming confined to a narrow solid angle about the forward axis. Such diaphragm behavior clearly opens up the possibility of a full-range driver freed from the familiar restraints and compromises.

Nice trick if you can do it, but how can you make a diaphragm vibrate randomly? Actually you can't, but you can get very close to it by using what we term distributed-mode (DM) operation, on which NXT loudspeakers are based. Essentially, this involves encouraging the diaphragm to produce the maximum number of bending resonances, evenly distributed in frequency. The resulting vibration is so complex that it approximates random motion—it is impossible, for example, to identify the point or points of panel excitation on a snapshot of the panel's motion (Fig. 2). This is enough to free the speaker from the directivity-related problems described above, as is apparent from the three-dimensional polar diagrams of Fig. 3. (For a more detailed description of how NXT panels radiate, see "Distributed-Mode Operation.")

Although the behavior of an NXT panel appears random, the design process is deterministic in a way that conventional loudspeaker design is not. Provided you know a few key parameters—the size and shape of the panel (it can be curved in one or more planes), the position of the exciters (the driving elements), and the bending stiffness, surface density, and internal damping of the panel material—it is possible to predict the acoustic performance with a high de-

gree of accuracy. Speaking as a loudspeaker designer of 20 years' experience, I find this aspect of the NXT technology particularly exciting.

To facilitate the design process, we have developed and continue to refine a software suite called *NXT Designer* (Fig. 4), which all NXT licensees receive, together with training in its use. The software enables speaker engineers to operate at various levels of sophistication, ranging from simple plug-in, cookbook design to more complex, individual analysis of possible design alternatives.

A variety of exciter technologies are appropriate for energizing the panel, including piezoelectric transducers, but today's most preferred option is a moving-coil motor (Fig. 5). This confers three principal advantages. First, it ensures compatibility with conventional amplifiers. In fact, NXT panels with moving-coil exciters present notably benign amplifier loads, being essentially resistive at

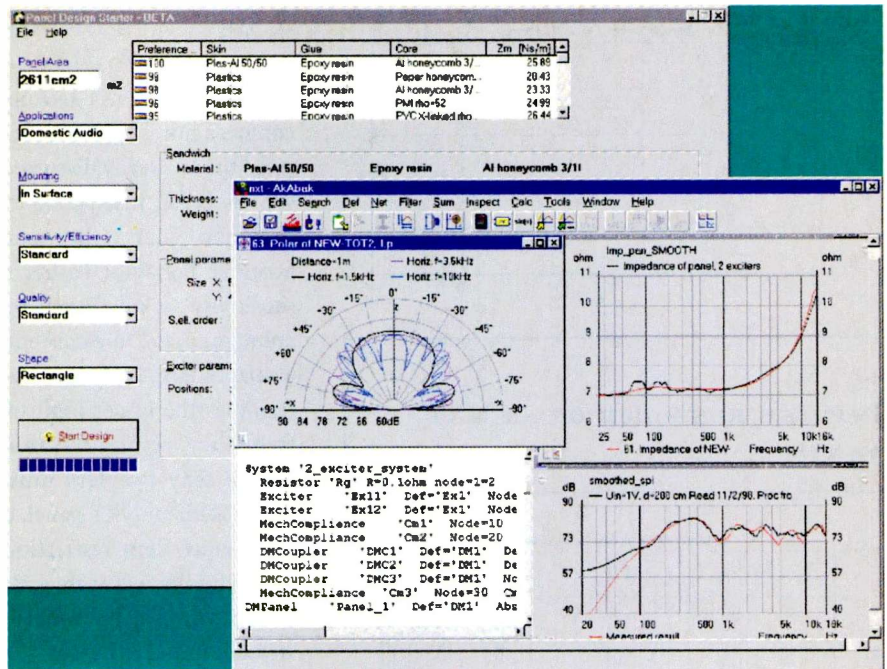


FIG 4—
SAMPLE SCREEN OF *NXT Designer* SOFTWARE.

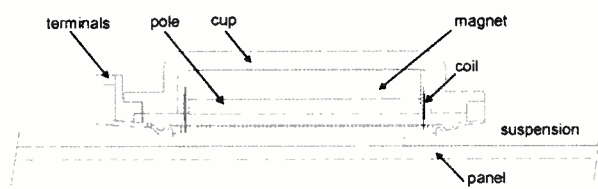


FIG 5—
CROSS-SECTION OF A MOVING-COIL EXCITER FOR NXT PANELS.

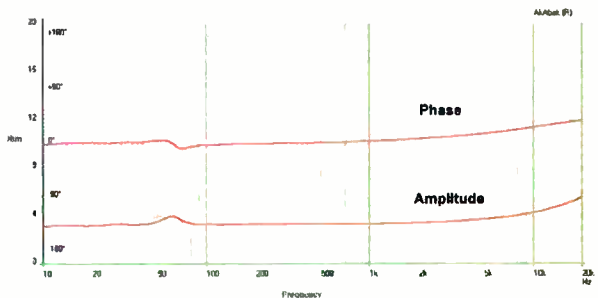


FIG 6—
IMPEDANCE PHASE AND MAGNITUDE OF AN NXT PANEL SPEAKER.

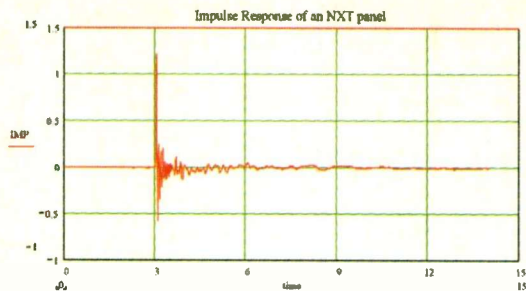


FIG 7—
IMPULSE RESPONSE OF AN NXT PANEL.

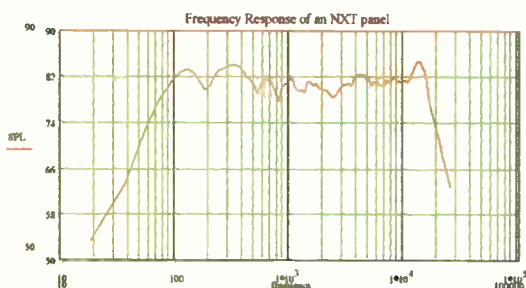


FIG 8—
FREQUENCY RESPONSE OF A TYPICAL NXT PANEL.

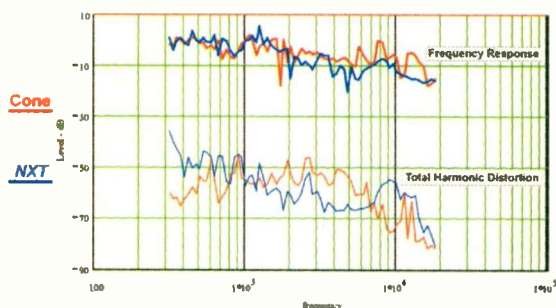


FIG 9—
THD + N OF NXT AND CONE SPEAKERS, PLUS COMPARATIVE FREQUENCY RESPONSES.

low and middle frequencies (Fig. 6). As frequency rises, the inductance of the voice coil becomes significant, the impedance increases, and the load becomes reactive. But nowhere is there low impedance and large phase angle in combination. Second, it permits use of the existing manufacturing base. Third, it enables exploitation of the full bandwidth potential of an NXT panel.

BENEFITS OF THE TECHNOLOGY

We feel that NXT technology confers a number of benefits beyond those already discussed. As well as being insensitive to diaphragm size, the panel's acoustic behavior (other than sensitivity) is unaffected by diaphragm mass. In a conventional diaphragm, moving mass determines the upper limit of the frequency response—another reason why tweeters must be small. With an NXT panel, there is no equivalent restriction, so the technology is truly scalable: You can make the panel large without impairing dispersion or treble response. In fact, performance improves as panel size is increased, because the frequency of the fundamental bending resonance is lowered, which not only extends the bass response but also increases modal density in the middle and high frequencies.

Another unusual characteristic of NXT panels is that in applications where the panel need not be baffled, as in free-standing loudspeakers, the power radiated from the back face sums constructively with the power radiated from the front, rather than canceling. This is because of the complexity of distributed-mode radiation and the uncorrelated phase of the individual radiating elements as seen from the far field. (Terms such as "bipolar" or "statistically bipolar" have been used in the past to explain such complex behavior,

but they do not accurately describe this property of a diffuse direct-radiator.) This eliminates the problems associated with enclosures, which have their own resonances, colorations, and cost penalties.

But the panel itself operates wholly in resonance, which is one of the features of NXT that most concerns audio people conditioned to regard resonance as anathema. Doesn't all this resonance in the panel col-

or the sound unacceptably? The surprising answer is no, it doesn't, because of the highly complex nature of the panel's vibration. An NXT panel's impulse response (Fig. 7) displays a long resonant "tail," which would damn any conventional loudspeaker, but our experience has been that the sound is quite clear and transparent, in keeping with the flat measured frequency response (Fig. 8).

ORIGINS

The potential for complexly vibrating panels to act as loudspeakers emerged serendipitously in the course of research conducted by Dr. Ken Heron of Britain's Defence Evaluation & Research Agency (DERA) into the use of lightweight composites in military aircraft. After discovering that composite panels acted as efficient sound radiators and conducting further research, DERA filed the first patent application for a panel loudspeaker based on this principle in 1991.

DERA itself wasn't best equipped to realize the concept's potential, but Verity Group, parent of Mission Loudspeakers and one of the United Kingdom's largest hi-fi companies, learned of the discovery and took out a license from DERA to develop the technology for commercial use. Research at Verity identified the key operating principle for loudspeaker use, and two years ago the company announced the establishment of a new operating arm—New Transducers, Ltd., a technology company, now known simply as NXT—to develop and license the technology for all types of loudspeaker applications.—H.A.

Another common expectation is that NXT panels will function properly only at high frequencies, where the resonant modes are very densely packed. Acousticians familiar with requirements for diffuseness of room resonances often voice this concern, but the two cases are not equivalent. The velocity of sound in air is independent of frequency, whereas the velocity of bending waves in an NXT panel is frequency-dependent (i.e., bending waves are dispersive.) This works in our favor, making a well-designed NXT panel sufficiently modal for use as a loudspeaker at a frequency only twice that of the panel's fundamental bending resonance. Although NXT panels usually must be combined with conventional woofers to cover the lowest two or three octaves in high-fidelity applications, the necessary crossover is far removed from the ear's most sensitive region, around 3 kHz—precisely where most conventional loudspeakers are forced to cross over between woofer and tweeter.

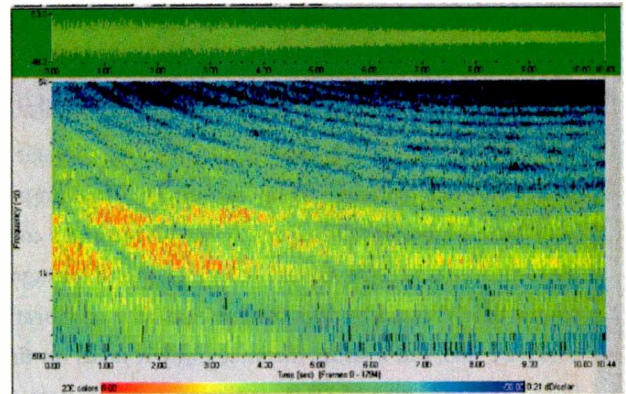
With respect to distortion, NXT panels typically perform as well or better than conventional alternatives (see Fig. 9). This is because, in the frequency range of interest, panel vibrations are very small in amplitude, putting much reduced demand on the coil excursion of the exciter, and well within the panel's linear elastic range.

IMAGING

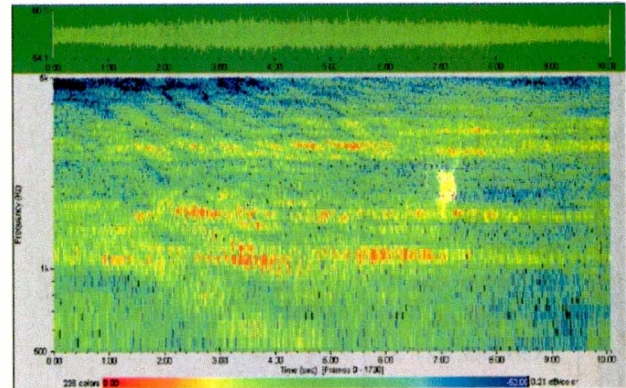
Anyone familiar with the sound of conventional omnidirectional or near-omnidirectional loudspeakers might expect NXT panels to produce a relatively imprecise stereo image. Our experience, however, has been that in typical domestic surroundings imaging is at least as well defined and stable as with conventional directional loudspeakers listened to from the stereo sweet spot, despite the very wide radiation pattern of NXT panels. This appears to be because their diffusivity helps reduce destructive boundary interactions (Fig. 10). And we have found that outside the typically small area of optimum stereo, NXT panels actually deliver superior imaging because of their better off-axis performance and reduced room interaction.

With conventional wide-dispersion loudspeakers, you also tend to hear much more of the room: Standing-wave reso-

FIG 10—
BOUNDARY INTERACTIONS OF CONE AND NXT SPEAKERS, SHOWING AUDIBLE PEAKS AND NULLS OF THE INTERFERENCE PATTERNS.



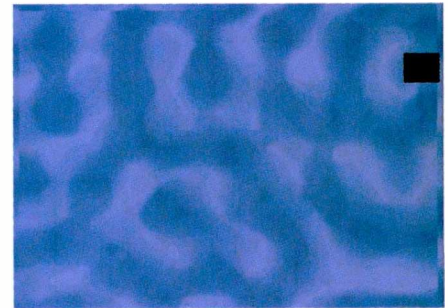
Cone Speaker



NXT Panel



Constant phase contours for DML source at 300 Hz



Constant phase contours for piston source at 300 Hz

FIG 11—
SIMULATED 300-Hz SOUND DISTRIBUTION IN A ROOM FROM NXT PANEL (LEFT) AND CONE SPEAKER (RIGHT), SHOWING LOCATIONS OF STANDING WAVES.

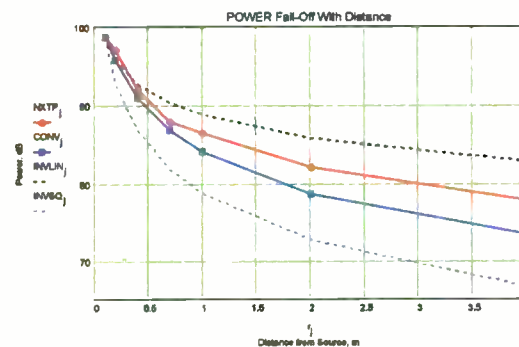


FIG 12—
SOUND POWER LEVEL VS. DISTANCE FROM SPEAKER, MEASURED IN A TYPICAL LISTENING ROOM, FOR AN NXT PANEL AND A CONVENTIONAL TWO-WAY LOUDSPEAKER.

DISTRIBUTED-MODE OPERATION

We refer to NXT panels as distributed-mode loudspeakers, based on their principle of operation. The diaphragm of a distributed-mode loudspeaker (DML) vibrates in a complex pattern over its entire surface. Close to the diaphragm, the sound field created by this complex pattern of vibration is complex also, but a short distance away it takes on the far-field characteristics of DML radiation. This is close to the directivity of a true point source—i.e., approaching omnidirectionality—even when the diaphragm is quite large relative to the radiated wavelength.

FIG. B1—
PATH
LENGTHS
FROM
POINTS ON
AN IDEAL
PISTON TO A
SINGLE
POINT IN
SPACE.

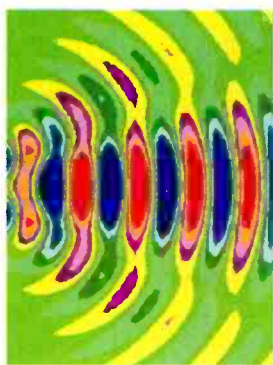
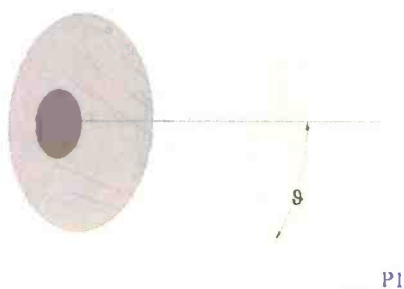


FIG. B2—
SIMULATED
SOUND FIELD
OF AN IDEAL PISTON
WITH AN AREA OF
25 SQUARE
INCHES (160
SQUARE
CENTIMETERS);
NOTE BEAMING.

How is it that a panel vibrating in a complex, quasi-random fashion can radiate sound evenly in all directions, without mutual cancellation? Let us distinguish two extremes of the velocity distribution across a diaphragm surface. At one extreme is the rigid surface in pistonic motion, where the magnitude and phase of the motion is constant across the surface. In this case, directivity depends only on the path length between each small element of the diaphragm and the receiving point (Fig. B1). At radiated wavelengths that are small relative to the diaphragm dimensions, interference takes place between the radiation from different regions of the diaphragm, and this increases in severity off axis. So the

characteristic radiation pattern exhibits strong beaming (Fig. B2).

At the other extreme, in a randomly vibrating panel, diaphragm velocity is randomly distributed with respect to magnitude and phase. The disparity in path length between different areas of the diaphragm and the receiving point is still present, but because there is now no correlation between the source points' outputs, there can be no global interference (Fig. B3). Hence, the radiated sound is dispersed evenly in all directions. Diffuse radiation of high order (Fig. B4) becomes omnidirectional in the far field.

An NXT panel closely approximates a randomly vibrating diaphragm and therefore behaves similarly. Distributed-mode operation thus guarantees consistent output level and undistorted time response in all directions. In other words, all the radiated energy appears to originate from a single point. Despite this, a distributed-mode loudspeaker is able to produce high broadband acoustic power because its diaphragm is not constrained with respect to size. With pistonic diaphragm motion, on the other hand, these characteristics are mutually exclusive.—H.A.

FIG. B3—
PATH
LENGTHS
FROM POINTS
ON A DIFFUSE
DIRECT
RADIATOR TO
A POINT IN
SPACE.

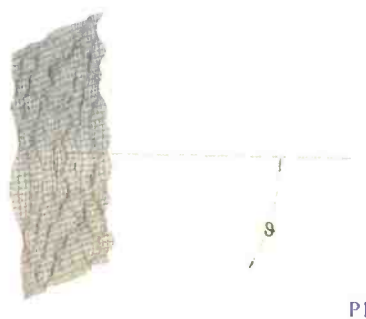
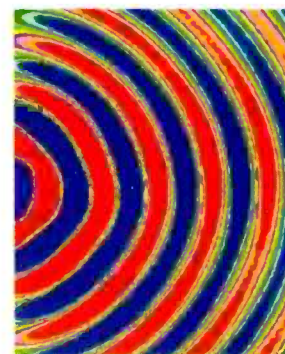


FIG. B4—
SIMULATED
SOUND FIELD
OF A RANDOMLY
VIBRATING
PANEL
MEASURING
 $4\frac{3}{4} \times 5\frac{3}{8}$ IN.
(12 CM X
13.6 CM).



nances are more pronounced, so the tonal balance varies significantly as you change listening position, and interaction with room boundaries is worsened, too, making speaker placement more critical. NXT panels behave quite differently because of the diffuse nature of their radiation: Their sound does not emanate from a fixed, well-defined point in space. This reduces room interaction, and, as a result, the distribution of sound within a room is actually much more even with an NXT panel than with a conventional loudspeaker (Fig. 11). Another contributor to this effect is the slower rate at which the sound-pressure level from an NXT panel falls off with distance relative to conventional speakers (Fig. 12).

We feel that these characteristics make NXT panels particularly well suited to mul-

tichannel home theater systems. In addition to wide dispersion and low visual impact, the inherently diffuse nature of their sound radiation assures the required surround-channel diffusion, so that you aren't conscious of the surround speakers as distinct entities. And with projection television, the viewing screen itself can be a large NXT panel, which ensures perfect locking of voice to picture.

A DIFFERENT DRUMMER

In summary, it is true to say that the design goals for a conventional loudspeaker have to be a compromise. You are trying to deliver acoustical output across a wide bandwidth, yet when the radiated wavelength becomes smaller than the diaphragm width, the loudspeaker's power output be-

gins to fall. Because of this, and the need to provide sufficient volume velocity to reproduce frequencies at the lower extreme of its passband, a conventional driver's power bandwidth is typically limited to four or five octaves. This remains a physical limitation of piston speakers even if we could

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Tashiro, M., G. Bank, and M. Roberts, "A New Flat Panel Loudspeaker for Portable Multimedia," 103rd Convention of the AES, New York, 1997; AES Preprint No. 4527.

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Colloms, M., J. Panzer, V. Gontcharov, and V. Taylor, "Distortion Mechanisms of Distributed Mode (DM) Panel Loudspeakers," 104th Convention of the AES, Amsterdam, 1998; AES Preprint No. 4757.

Mapp, P., and M. Colloms, "Improvements in Intelligibility Through the Use of Diffuse Acoustic Radiators in Sound Distribution," 103rd Convention of the AES, New York, 1997; AES Preprint No. 4634.

Harris, N., S. Flanagan, and M. O. Hawksford, "Stereophonic Localization in the Presence of Boundary Reflections, Comparing Specular and Diffuse Acoustic Radiators," 104th Convention of the AES, Amsterdam, 1998; AES Preprint No. 4684.

Panzer, J., and N. Harris, "Distributed Mode Loudspeaker Simulation Model," 104th Convention of the AES, Amsterdam, 1998; AES Preprint No. 4739.

Azima, H., and N. Harris, "Boundary Interaction of Diffuse Field Distributed-Mode Radiators," 103rd Convention of the AES, New York, 1997; AES Preprint No. 4635.

Bank, G., "The Intrinsic Scalability of the Distributed Mode Loudspeaker (DML)," 104th Convention of the AES, Amsterdam, 1998; AES Preprint No. 4742.

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Mapp, P., and V. Gontcharov, "Evaluation of Diffuse Mode Loudspeakers in Sound Reinforcement and PA Systems," 104th Convention of the AES, Amsterdam, 1998; AES Preprint No. 4758.

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Further information: NXT, Stonehill, Huntingdon PE18 6ED, England; www.flatspeaker.com.

AND WITH
A PROJECTION
TELEVISION,
THE VIEWING
SCREEN ITSELF
CAN BE A LARGE
NXT PANEL.

design and make a perfect piston radiator. Consequently, conventional driver design always embodies trade-offs between bandwidth, directivity, and smoothness of frequency response. In the finest conventional loudspeakers, these engineering compromises are skillfully struck, but they remain compromises.

NXT panels represent a distinct alternative. The modal behavior of the panel makes its output diffuse, and maximizing panel modality ensures a broad passband of greater than eight octaves. As we refine panel materials, exciter locations, boundary conditions, and so forth, we approach the behavior of an ideal randomly vibrating panel whose power output is largely independent of size. Separating output directivity from the panel dimensions releases us from the traditional compromises loudspeaker designers have faced for more than 70 years. Smooth, dense modal behavior confers predictable, deterministic, scalable behavior that, until now, has been an unfulfilled dream.


listening by the yard

7 outdoor speakers

by VAN BERGER

One of my first forays into audio was to bring music out into my backyard: I modified Dad's AM/FM table radio by adding an audio input jack that would accept signals from my turntable's ceramic cartridge. That gave me a two-piece sound system I could carry out to the picnic table in our backyard—I couldn't readily carry out the big 16-inch console TV I normally played the turntable through.

Once I left home for college dorms and city apartments, I had to forgo outdoor sound for lack of an outdoors. But as soon as I had a backyard again, adding audio seemed like a good idea. Now that I've tested seven pairs of outdoor speakers, I still think it is.



The seven speakers are similar in many ways: All are two-way systems with dome tweeters and modest-sized woofers (4- to 6½-inch). All have gold-plated terminals [even more useful in connections exposed to weather than on indoor speakers], and on all but one speaker those terminals were multi-way binding posts. All but two of the speakers have sealed, rather than vented, enclosures. All list their impedances as either 8 ohms or "8-ohm compatible," and their rated sensitivities range from 87 to 91 dB SPL for a 2.83-volt input. Maximum recommended amplifier power ranges from 80 to 150 watts, and minimum recommended power ranges from 5 to 20 watts. But after testing with amps of 13, 20, and 110 watts per channel, I'd say 100 watts is a good minimum. And since the owners' manuals warn more about tweeter damage due to distortion from overloaded amplifiers than about speaker damage from overpowerful ones, it appears that most of their makers tacitly agree with me.

The tested speakers have molded plastic cabinets, are weatherproof (which I verified by leaving them out in one terrific rainstorm, several gentle ones, and summer sunlight), and come with mounting brackets. All are

Photography: JOHN WILKES

7 outdoor speakers

available in white, while many also come in black, and just about all can be painted. They are, at least theoretically, designed for outdoor acoustics—that is, for use in places where the bass is not enhanced by room effects and there are few surfaces to reflect treble and midrange; this does not, however, mean they can't be used indoors, and most are advertised, quite properly, as “indoor/outdoor” models.

For my first series of tests, I placed the speakers on FurnitureWorks stands, about 1 meter above my concrete pool patio, with a picket fence a yard behind them and no other surfaces nearby. Without exception, the bass was a bit on the wimpy side. For these tests, I was seated in the sweet spot, about 8 feet from the speakers, which were 8 feet apart.

But these speakers aren't really intended for such placement. The brackets that come with them are all designed for mounting on flat surfaces, and the manuals all recommend placing them against one or even two large surfaces. There's a reason: When I placed the speakers against a wall, the bass perked up and the sound sometimes became more balanced. For these

feet of listening area) when you have large spaces to cover, to get even sound without excessive loudness anywhere; that's a good idea with any speakers.

I made a few discoveries during my trials: Don't expect great stereo imaging outdoors unless you're right in the speakers' sweet spot. Don't expect good stereo at a distance unless you place the speakers so far apart that you can barely hear both at once when you stand close to them. And don't believe the old audiophile's tale that you can't use infrared remote controls outdoors because radiation from the sun and warm nearby objects will swamp the signals from the remote. I found that as long as I kept the sun's direct rays from hitting its infrared sensor, my CD player worked fine under remote control.

Speaker Specifics

1 BOSTON ACOUSTICS VOYAGER: This is Boston's largest outdoor model and the most conventional-looking speaker I tested. It has a white Lexan cabinet and a white, powdercoated stainless steel grille. Its bracket is of flat, powdercoated stainless steel, bent into a squared-off “C,” with mounting holes. The speaker swivels within the stand and is locked into position by large knobs. The bracket also functions as a stand if you set the speaker horizontally (as do the brackets of most of the other speakers reviewed here).

The Boston-made drivers are a 5¼-inch woofer with a copolymer cone, a butyl surround, and a shorting ring (to reduce distortion), crossed over at 2.5 kHz to a 1-inch, soft-dome tweeter. (Only Boston included the crossover frequency in its owner's manual.) Rated frequency response is 70 Hz to 20 kHz, and rated sensitivity is 89 dB; the price is \$400 per pair.

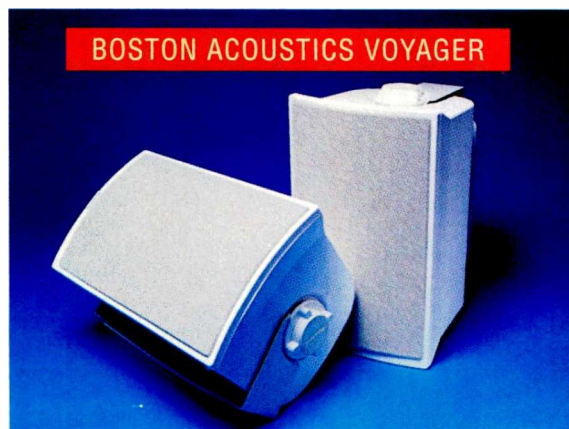
In my first test, the bass on Oscar Peterson's “You Look Good to Me” (see “Listening Selections,” page 48), the piano sounded pretty natural,

Brand	Boston Acoustics	Energy Loudspeakers	Niles Audio	Optimus	Polk Audio	Rock Solid Sounds	Sonance
MODEL	VOYAGER	TEMPEST	OS-20	PRO-LS3	AW/M5	SOLID MONITOR	EC300
Dimensions (with bracket)	10½ x 6¾ x 6½	10 x 7 x 6½	13 x 9½ x 9	11 x 7 x 6	13¼ x 9 x 8¼	9½ x 6¾ x 5½	11 x 8 x 7¼
Weight, lbs.	6.5	6.5	8.5	4.8	9	5.1	8.5
Frequency, Hz	70-20k	65-21k, ±3	68-21k, ±3 (100-10k, ±2)	85-20k	32-25k (50-23k, ±3)	75-20k, ±3	55-20k, ±3
Sensitivity, dB SPL	89	89	91	87	91	90	90
Warranty, yrs.	2	5	2	5	2	5	5

OUTDOORS,
WIDE
DISPERSION
MAKES
A LOT OF
SENSE.

tests, I tried two listening positions, one in the sweet spot and the other about 20 feet away, slightly outboard of the left speaker. In this setting, the surface below the stands was a wood deck.

Either way, the speakers had quite wide dispersion, which makes a lot of sense. Outdoors, you're far more likely to stray from the sweet spot and range far afield, so a good outdoor speaker should allow you to do so without feeling musically deprived. And, with no room walls to muddy the sound with unwanted reflections, there's no need to restrict side response. The only catch is that, if your yard is small, you'll have to be careful not to spill sound into your neighbors' property. The Niles and Optimus manuals recommend using extra speakers (one pair for every 200 to 400 square



the bass went down fairly deep, and brushed cymbals were plainly audible, but the triangles seemed to recede into inaudibility. With an underpowered amp, the plucked bass sounded muffled, as though something were overloading (presumably the amp). I really enjoyed the deep bass on this cut; when I tried placing the speakers on the ground, the string-bass run went a little lower but the upper bass got heavy.

Elisabeth Schwarzkopf sounded natural—crisp, but with the crispness of a starched blouse, not of cut glass. I got plenty of top end without excess and with no prominent resonances. Lou Reed sounded natural, but a bit too gravelly at times. The bass was beefy, loose, and deep. However, until I switched to the 110-watt amp, the bass slaps overloaded the amp and consequently sounded more like crackles.

Next to the Met Opera's regulars, Amanda McBroom is probably the singer I've most often heard live, and I found the Bostons made her sound quite natural, though sometimes with a slight extra edge. The guitar wails on this cut sounded just about right.

On the whole, I thought the Bostons had the best bass of these speakers when stand-mounted out in the open. But when I moved them against a wall, the piano on the Oscar Peterson cut sounded peaky, though it also gained a slight edge, and the same peak showed up on the Schwarzkopf recording. Furthermore, the bass on Lou Reed's "Walk on the Wild Side" now sounded a bit wimpy and the voice slightly overwarm.

2 ENERGY TEMPEST: The Tempest is similar in many ways to the Boston Acoustics Voyager. It, too, has a 5¼-inch woofer, a dome tweeter, and a square-C-shaped bracket with locking knobs. There are noticeable differences, however. Its tweeter has a half-inch dome, and its woofer is, says the owner's manual, "polypropylene . . . made from a unique composite material." The bracket has L-shaped keyhole slots, for easier mounting, and the cabinet has a threaded brass insert to accept an OmniMount bracket. The cabinet, available in white or black, is of mineral-filled polypropylene and is paintable. Two small feet molded into one end help you stand it securely upright. Ho-hum.

But two of the Tempest's features are unique among the speakers I tested. The lesser of the two is a snap-on terminal cover of soft rubber, to reduce weather-induced corrosion of your connecting wires (the terminals are gold-plated). The more interesting one is an indoor/outdoor switch. In its "Outdoor" position, it boosts the low end to compensate for the usual outdoor bass loss and "protects [against] . . . overdrive damage" (the manual does not say how). Its price is \$300 per pair.

In listening, I left the switch at the "Outdoor" position most of the time. On the patio, I heard a reduction in bass (though not a bad one) and a slight increase in clarity with the "Indoor" setting. With the speaker against a wall, the switch position made less difference than it had out in the open.

On "You Look Good to Me," the bowed bass did not seem to go down as far as it did with the Bostons, but it seemed louder;



at times, however, the very lowest bass tones seemed to fuse into a single note. With the speakers against the wall, the piano sounded peaky and the triangles and brushed cymbals seemed to recede into the mix. The Tempests appeared to stress the amp more than the Bostons—on this track's plucked bass notes, I heard some overload and the signal occasionally cut out, though the overload became less apparent and the cutouts stopped when I switched to a more powerful amp. When I switched to the "Indoor" setting, the overload was still apparent.

In my first test, with an underpowered (13 watt/channel) amp, the Schwarzkopf cut sounded very, very natural—a bit crisp on the highs but still with natural warmth. When I switched to a 20-watt/channel JBL amp, the sound grew warmer but seemed to be missing a bit of its top edge; some of that

The Energy Tempest's "Indoor/Outdoor" switch had a mild effect on its bass. A rubber cover snaps into the four holes at the corners of the recess shown to keep rain off the connections.



crispness had apparently been distortion. When I switched to a 110-watt/channel Technics amp, however, there seemed to be more highs again, but cleaner. With the speaker against the wall, the orchestral accompaniment became fuller and richer sounding, and the voice was very nice, with just the right edge and no audible peaks.

"Walk on the Wild Side," on the other hand, sounded best when the speakers were away from a wall. In that location, the bass was very nice, appropriately loose, and the voice was very natural. Against the wall, however, the voice sounded raspy and ethereally thin close up—yet very natural when I moved away—and the bass seemed not so much loose as lackadaisical.

Amanda McBroom's "Dorothy" sounded natural with all speaker and listener positions and with all amps but was missing a bit in the lower register with the underpowered amp.

3 NILES OS-20: This is Niles' largest outdoor speaker. It has the usual swivel bracket with locking knobs, but its cabinet (of glass- and mineral-filled polypropylene) is tapered more than the Boston Acoustics or Energy speakers, to tuck more neatly into corners. The cabinet, which also has small front feet, is available in black or white and is paintable. It has two threaded inserts for OmniMounts, and the bracket has keyhole slots. Cleverly, the terminals are angled 45° to the rear panel, so that when the speaker is upright, rain will run right off the connections, and wire exits are molded into the recess that holds the terminal, so you can mount the speaker flush against a wall. The OS-20 has one of the two largest woofers in this group, a 6½-inch driver with a mica-filled polypropylene cone and butyl rubber suspension; its

1-inch dome tweeter is made from “a composite matrix of elastomers and natural fiber substrates,” according to the manufacturer. The price is \$499 per pair.

Despite the OS-20’s large woofer, I found its bass disappointing. In my patio setting, the descending bass run on “You Look Good to Me” seemed to hit one note it liked and stay there, and the very lowest notes faded out. (Later measurements with pink noise and an AudioControl SA-3052 real-time analyzer showed exactly this effect.) Plucked bass sounded nice and loose without being too prominent. Against a wall, low bass was still not present, but the resonance was no longer noticeable; the bow’s rasp had a slight but not unnatural added edge. Triangles were almost lost in either setup.

Elisabeth Schwarzkopf’s voice was nicely balanced between midrange and treble; I felt that it could have used a hair more top



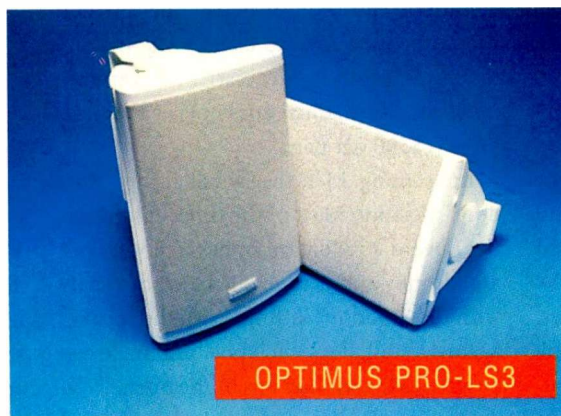
end but that it also lacked an unwanted edge as a result. With the speakers against the wall, there was a slight excess edge and a slight nasality. On the patio, high-frequency resonances were well controlled; against the wall, no treble peaks were audible.

The Lou Reed cut had a nice, loosey-goosey bass but an edgy voice when I listened on the patio; with the speaker against the wall, the voice became more natural, but the bass seemed to lack excitement.

4 OPTIMUS PRO-LS3: Like the Niles, these speakers have small front feet, a tapered cabinet, 45° terminals, and wire exits—but Radio Shack assures me that it and the Niles come from completely different sources. The woofer here is a 5-inch unit with a polypropylene cone, and the tweeter is a ½-inch polypropylene dome. The logo on the grille can be swiveled to look right

when the speaker is mounted horizontally (another feature the Niles shares). It’s also the least expensive speaker in the group, at \$200 per pair.

On the patio, “You Look Good to Me” sounded a trifle canned and midrange-heavy, with no crispness to the piano. Low



bass faded out cleanly rather than causing distortion, and the plucked string bass sounded good. When I moved the speakers against the wall, the piano developed an appropriately percussive sound but also excited an upper-midrange resonance.

Elisabeth Schwarzkopf sounded very pleasant and mature out by the pool—not much crispness, but no unpleasant edge, either. There were a couple of very mild high-frequency resonances, but no obvious ones. With the speakers against the wall, her voice took on a slightly steely quality and a slight nasality, yet the treble/midrange balance was good.

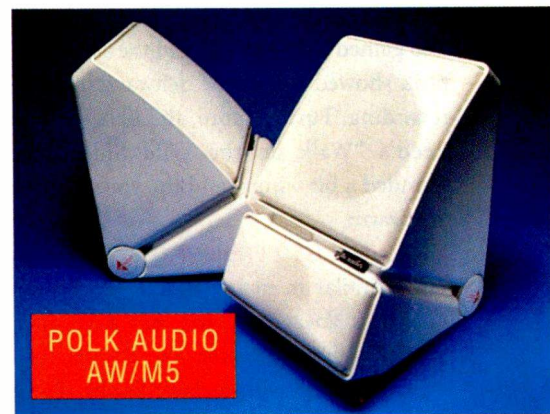
Lou Reed’s voice sounded husky but natural on the pool patio; by the wall he sounded slightly over-sharp when I listened close up but just right when heard at a distance—a phenomenon I ran into with some of the other speakers. In either location, the bass had a pleasant slap and a nice, loose sound, though it did not go down super-low.

Amanda McBroom’s voice sounded natural in both locations but was slightly thinned out when the speakers had no wall behind them.

5 POLK AUDIO AW/M5: This looks rather like Polk’s M5 indoor speaker, but the “AW” version has been modified for all-weather use by plugging the indoor version’s port, adding waterproofing sealants that increase the woofer cone’s mass, and putting a light bulb in series with the tweeter to protect it against overload. (The bulb’s

DC resistance rises as its filament heats, automatically limiting increases in current through the tweeter.) The indoor M5 is available in white or black, whereas the AW version is in white only. It vies with the Rock Solid for the title of most distinctive looking and definitely has the most distinctive shape. Its two grilles are attached to a common front panel. The larger grille covers a 6½-inch composite woofer; the smaller covers a 1-inch tweeter (which uses Polk’s Dynamic Balance anti-breakup technology). The input terminals are spring-loaded, but they’re not the same as the ones you find on inexpensive speakers: They’re gold-plated, and Polk puts a little molded fin between them as a barrier against accidental short-circuits when you insert or withdraw your speaker wires.

The Polk’s bracket/stand is unique. It’s of thick plastic rather than metal but seemed plenty sturdy enough to do its job; it has keyholes for easy mounting (a handy template is printed in the instruction book). Unlike the other speakers’ brackets, which are continuously adjustable, the Polk’s can be adjusted only in 30° increments and is held in place by two locking pins rather than clamped in position by screw knobs. A total of eight positions are available, four with the bracket leaning toward the long



side of the cabinet, four with it leaning toward the short side. If you set the speaker down without its bracket, it will tilt backward; however, by using the bracket/stand instead as a supporting leg, you can either aim it straight forward or tilt it to several angles. The speakers are \$249.95 each, or \$499.90 per pair.

On “You Look Good to Me,” the bass was good and seemed to be present down to 40 Hz (the lowest note on this track), even

with low-powered amps. Placed against the wall, the Polks took on real bass authority, the very low notes fading out smoothly as the frequency fell but never disappearing altogether. The triangles also came through more clearly with this placement, though the piano sounded a bit peaky in the upper middle frequencies.

With the speakers set up on the patio, Elisabeth Schwarzkopf's voice had a faint steeliness on occasional notes and an ever-so-slight sibilance, and her accompanying orchestra had a nice top end. Placing the speakers against the wall gave that orchestra new underpinnings and made her voice sound more mature, with high overtones that faded when I went far away or far off axis. I also detected an upper-mid-frequency resonance, possibly the same one that had affected Oscar Peterson's piano.

Lou Reed's voice was natural, if raspy, with the speakers in the open but became a bit too raspy close up (yet fine at a distance) when the speakers were against the wall. The bass-guitar notes sounded quite distorted when the speakers were on the patio, turning into a nice slap with only occasional distortion crunches when they were against the wall. I could not



The Polk's bracket could be adjusted in 30° increments and doubled as a stand, but only this speaker had spring clips instead of binding posts.

tell whether that was the speaker's fault or the amp's, and I could get rid of the crunch and some excess raspiness by turning the volume down.

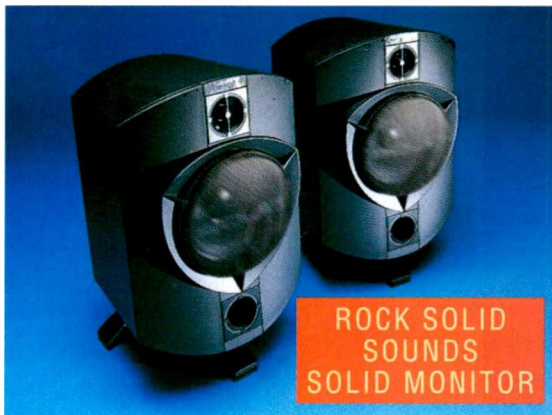
Amanda McBroom sounded like, well, herself in the patio setup and very natural when I listened close up with the speakers by the wall; at a distance from that setup, she sounded a bit nasal.

One final point about the Polks: One of my tests, for all these speakers, was to play pink noise and walk around the yard to check dispersion. With most of the speakers, the pink noise lost a bit of its treble when I moved noticeably off axis and got ragged when I moved very far off. The Polk, however, never got ragged.

6 ROCK SOLID SOUNDS SOLID MONITOR: To my mind, it's the best-looking speaker of the bunch. Its styling was groovy and innovative, with an air of lightness and delicacy. I was disappointed, though, that while its box says it's available "in a wide range of colour variations" and the spec sheet says six tones and colors are available, it's sold only in black, gray, and white versions in the U.S. Because the enclosure's port is not covered by the woofer grille (as the

port on the Sonance is), Rock Solid supplies a small grille you can push into the port to keep bugs out.

The Solid Monitor's stand was totally different from the others', a T-shaped base supporting a vertical rod with a ball tip that fits a socket in the back of the enclosure. The base's upright piece can nestle in grooves radiating from three sides of the socket, for mounting at 90° from whatever surface the base is mounted on or



to, but the ball and socket also let you tilt the speaker to nearly any angle. Rubber feet enable you to set the base on furniture without fear of scratching; for permanent mounting, you can remove the feet to reveal screw holes, then put the feet back to conceal the screws.

This is the smallest speaker of the bunch, with a 4-inch, polypropylene-cone woofer and a 1-inch dome tweeter. A protection circuit turns down the input level when the speaker's safe power-handling limit is reached. This was the only speaker I tested whose terminals were blocked off to prevent the insertion of double-banana plugs, as required by European safety laws. The plastic blocking inserts were, however, easily pried out with a small screwdriver—with longer fingernails, I might not even have needed that. The price is \$149.50 each, or \$299 per pair.

Obedient to what speaker designers call The Iron Law, the Solid Monitors had to trade off low bass capability to get their small size and fairly high sensitivity. But the bass fades out gently, without distortion, and the overall sound is rich, with reasonable, warm bass but not all that much treble. I heard no noticeable peaks on Oscar Peterson's piano or Elisabeth Schwarzkopf's high notes.

Aside from that, Schwarzkopf's voice showed a really tiny amount of nasality and excess warmth when heard on the patio and had no problems with the speakers against the wall except for a slight underabundance of high overtones.

On the patio, Lou Reed's voice sounded a little too bassy, but his vocal rasp seemed just right; his bass-guitar accompaniment lacked



The Rock Solid's pivoting stand allows flexible aiming.

7 outdoor speakers

PLACED BY A WALL, THESE SPEAKERS SOUND MORE BALANCED AND THEIR BASS PERKS UP.

Listening Selections

I listened to a wide variety of music but used the following tracks consistently:

Oscar Peterson, "You Look Good to Me," from *We Get Requests* (Verve 810 047)

Elisabeth Schwarzkopf, "Chambre Separée," from *Elisabeth Schwarzkopf Sings Operetta*, Otto Ackermann, Philharmonia Orchestra & Chorus (Angel CDC-472840)

Lou Reed, "Walk on the Wild Side," from *Transformer* (RCA PCD1-4807)

Amanda McBroom, "Dorothy," from *West of Oz* (Sheffield Lab CD-15)

Company Addresses

Boston Acoustics: 300 Jubilee Dr., Peabody, Mass. 01960; 978/538-5000; info@bostonacoustics.com; www.bostonacoustics.com.

Energy Loudspeakers: 3641 McNicoll Ave., Scarborough, Ont. M1X 1G5, Canada; 416/321-1800; www.energyspeakers.com.

Niles Audio: P.O. Box 160818, Miami, Fla. 33116; 800/289-4434; www.nilesaudio.com.

Optimus: c/o Radio Shack, 1500 One Tandy Ctr., Fort Worth, Tex. 76102.

Polk Audio: 5601 Metro Dr., Baltimore, Md. 21215; 800/377-7655; polkaudiocs@polkaudio.com; www.polkaudio.com.

Rock Solid Sounds: 54 Concord St., North Reading, Mass. 01864; 978/664-3406; 105150.1127@compuserve.com.

Sonance: 961 Calle Negocio, San Clemente, Cal. 92672; 714/492-7777.

Nuisance, who kept me company during these tests, did not approve all my musical selections.



the usual rock heaviness. On the deck by the wall, the bass-guitar slaps sounded very nice. Once again, in that location the voice had a slight extra edge when heard close up but sounded just about right at a distance.

I Liked these speakers quite a bit and found myself thinking, "Now if only they made an outdoor subwoofer to go with these . . ." I also had the urge to take them indoors and try them in my bedroom A/V system (which I'll probably do the instant this piece is finished).

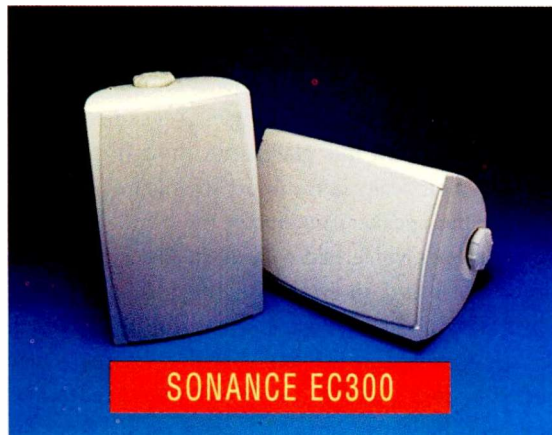
7 SONANCE EC300: This speaker's cabinet looks conventional, but its patented mounting system isn't quite: Instead of a bent-metal bracket with a flat back, the Sonance has a banana-curved bracket that mates with an oval base. The base, which is gasketed, is designed to mount to an electrical wall box, with the wires passing through slots in the base and bracket. The cabinet has the usual side pivots and locking knob for the bracket, but the bracket's own curve also enables you to aim the speaker at right angles to the other pivot plane. The locking knobs are

rubber-coated, and small stick-on rubber feet are supplied, so you can use the EC300s indoors without marring furniture.

The enclosure is vented, but its port is J-shaped so rain will run out rather than puddling inside. The drivers are a 5¼-inch woofer with a carbon-fiber cone and a ¾-inch aluminum-dome tweeter. The price per pair is \$499.

Oscar Peterson's "You Look Good to Me" sounded good. The bass run went down nicely, slowly fading out as it went but not distorting; the triangles were okay and the brushed cymbals very lifelike. There were no notable resonances on the piano.

The Schwarzkopf track sounded nice and natural, the voice mature but not muddy. Out on the patio, there was moderate peakiness in the lower treble but a smooth top; on the deck, there was a very



slight nasality as well as some loss of overtones, but no noticeable peaks.

Lou Reed's voice sounded natural at moderate volume levels and its bass pleasantly rockish. Timbre was relatively stable even when I moved way off axis. But when I turned the volume up to what I'd consider reasonable levels, the voice crackled with distortion—whether the speaker's or the amp's, I couldn't tell—and the bass notes crumpled, while other tones grew somewhat harsh.

Amanda McBroom's "Dorothy," on the other hand, sounded very natural—better, in fact, than on any of the other outdoor speakers. Her warmth and delicacy came through, and I was suddenly very conscious of what she was doing with her voice and diction.

On the whole, the EC300s probably gave me the best sound of all the outdoor speakers I tested.

And in Conclusion

Just for fun, I brought an indoor speaker outside for a few listening comparisons. The speaker I used was the AR M1, a two-way with a 6-inch acoustic-suspension woofer and a ¾-inch dome tweeter, similar in size to the largest outdoor speakers I used. It sold for \$230 a pair back in 1993, the year it was discontinued. Given that it was not designed to operate in such an open environment, I was surprised to find that it actually sounded a bit better overall than the speakers that were. It is not in any way equipped to fend off the elements, however.

I didn't have time to try any of the outdoor speakers indoors, but based on what I heard out on my patio, I doubt that any of them would prove better inside the house than good speakers (like the M1s) of the unweatherproofed persuasion. They all sounded adequate—no more, no less. (Although, in fairness, some of them might actually sound a great deal better indoors; I didn't try it, so I don't know.) But outdoors, where I play music while doing other things, I could live with most of these speakers quite cheerfully. And they, in turn, are all capable of living quite cheerfully outdoors, where speakers like the AR M1 would be decidedly unhappy after the first storm. A

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SNELL E.5 LOUDSPEAKER



Founded in 1976, Snell Acoustics makes high-end speakers that consistently earn very high ratings from users and reviewers alike. After the untimely death of founder Peter Snell, in 1984, the company went through several changes of ownership and management. Even so, under Chief Engineer Kevin Voecks, who joined the company after its founder's death, it turned out many highly-

respected speakers. One of these, the \$19,000 Type A Reference System (an update of Snell's first system, the Type A), is on many a high-end-er's wish list. The company is now a wholly owned subsidiary of Boston Acoustics, and its new president is David Smith, a very capable engineer. Dave, an old friend who worked with me at JBL in the late 1970s and early '80s, has since worked at KEF, McIntosh, and ADS.

Snell's speakers are all magnetically shielded, enabling them to be used in home theaters as well as music systems. The company's current speaker line-up consists of 16 models, ranging from \$300 to \$19,000 each. Snell's product line also includes the THX-certified Music and Cinema Reference System (\$30,000, including main front, center, and surround speakers), high-end speakers for custom installation, and the sophisticated, DSP-based RCS 1000 Room Correction System speaker and room-equalization device (*Audio*, November 1997), which was the last product introduced under Voecks.

The E.5 is the least expensive of Snell's tower speakers. Like all of Snell's towers, it has a rear tweeter, a tradition that goes back to the third version of the original Type A. Snell feels that rear tweeters help flatten the speaker's high-frequency power response and make the sound more spacious. The rear tweeters can be switched off if you don't like the effect or have hard surfaces just behind the speakers.

The E.5 is a two-and-a-half way, floor-standing, vented-box system using two 6½-inch cone woofers, a 1-inch front-mounted dome tweeter, and a 1-inch tweeter in the rear. The front-panel drivers are in a vertical row, with the enclosure port just below them. The upper woofer, actually a woofer/midrange, crosses over to the tweeter at about 2.5 kHz; the other woofer is rolled off at a lower frequency, operating in parallel with the upper woofer is the bass.

Snell makes all its own cabinets. The E.5's cabinet is built quite strongly, of ¾-

Rated Frequency Response: 32 Hz to 20 kHz, ±3 dB.

Rated Sensitivity: 90 dB at 1 meter, 2.83 V rms applied.

Rated Impedance: 4 ohms, nominal; 3 ohms, minimum.

Recommended Amplifier Power: 20 to 250 watts.

Dimensions: 42¾ in. H x 8½ in. W x 11½ in. D (107.6 cm x 21.6 cm x 29.2 cm).

Weight: 46 lbs. (20.9 kg) each.

Price: \$1,400 per pair; available in black oak or European beech veneers.

Company Address: 143 Essex Street, Haverhill, Mass. 01832; 978/373-6114.

Photos: Michael Groen

inch medium-density fiberboard with two internal panel braces (which divide the interior roughly into thirds) for added rigidity. The woofers and front tweeter are mounted to a "platform baffle," a three-layer sandwich of particleboard, laser-cut neoprene rubber $\frac{1}{16}$ -inch thick, and high-density fiberboard for the front panel. Snell says that the constrained-layer damping resulting from this sandwich construction is

SNELL'S REAR TWEETERS ARE MEANT TO FLATTEN TREBLE POWER RESPONSE AND ADD SPACIOUSNESS.

much more effective than surface damping. The front baffle itself is curved to reduce reflections and diffraction, another innovation going back to the Snell Type A. The frameless grille is of perforated metal, with a high percentage of open area to decrease high-frequency attenuation and reflections.

The E.5's long-excursion woofers are custom-manufactured for Snell by Peerless and have shorting rings to reduce second-harmonic distortion. The drivers have molded copolymer cones, butyl rubber surrounds, and inverted dust caps. Both ends of the port tube (which is $2\frac{1}{2}$ inches in diameter and 4 inches long) are flared to reduce wind noise. The front-panel tweeter, made by Vifa, has a 1-inch aluminum dome and PVC surround. The rear tweeter, from Peerless, has a 1-inch fabric dome protected by a fine-mesh screen.

The E.5's crossover drives the woofers through series inductors, which act as first-order (6-dB/octave) low-pass filters; both woofers have series resistor-capacitor impedance-compensation circuits across their terminals. The front tweeter is driven by a second-order (12-dB/octave) high-pass filter via a wire-wound variable power resistor in series with the tweeter; this resistor is used to touch up high-frequency response on the production line to keep all units matched within a close ± 0.5 dB.

This crossover is a very heavy-duty design, using fat, 14-gauge stranded wire, large air-core inductors wound with heavy-gauge wire, and big power resistors ($2\frac{1}{2}$

inches long by $\frac{1}{2}$ -inch square). Those resistors are mounted directly to the finned, cast-aluminum terminal cup, which acts as a heat sink. The terminals are gold-plated five-way binding posts that accept spade lugs as large as $\frac{5}{16}$ inch, banana plugs, or bare wire up to 12 gauge. Bi-wiring and biamping are supported through a pair of removable straps.

Three miniature toggle switches on the terminal cup control low-frequency output ("Normal" or "Boundary"), treble level ("+" or "-"), and rear tweeter output (on or off). The low-frequency switch's "Boundary" setting is used to reduce bass output when the speaker is placed next to large cabinets or video monitors. Otherwise, the close proximity of these boundaries would increase bass output unnaturally.

Measurements

Figure 1 shows the Snell E.5's on-axis anechoic frequency response with the bass and treble level switches in both of their positions. The curves combine ground-plane bass measurements with measurements taken in a large anechoic chamber, with the test microphone 2 meters away on the tweeter's axis. All curves were smoothed with a one-tenth-octave filter.

Except for a dip at 4.8 kHz, the overall curve with both switches flipped up (bass at "Normal," treble at "+"), is fairly smooth and fits within a tight window of about 4 dB from 55 Hz to 20 kHz. Counting the dip, the curve fits a looser, 6.4-dB, window over a wider range, 47 Hz to 20 kHz. Between 60 Hz and 2 kHz, the curve gently rises at about 0.8 dB/octave (2.6 dB/decade), with several minor undulations on the way. The major deviations in the curve occur between 2 and 6 kHz, where the response reaches a minor dip at 2.8 kHz, a slight peak at 3.3 kHz, and the aforementioned dip at 4.8 kHz. From 6 to 20 kHz, the curve is

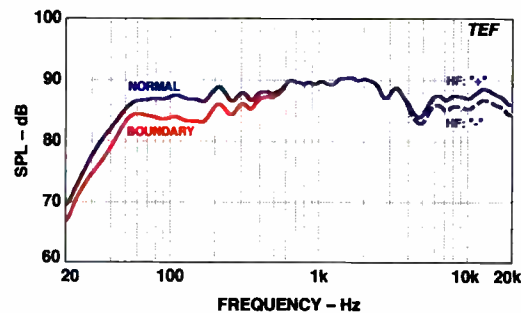


Fig. 1—One-meter, on-axis frequency response.

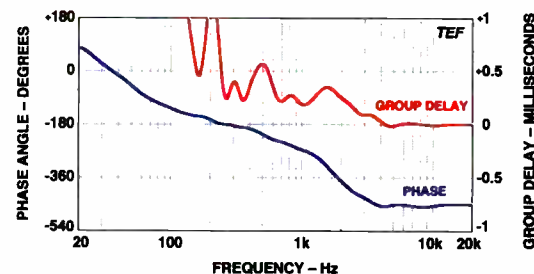


Fig. 2—On-axis phase response and group delay.

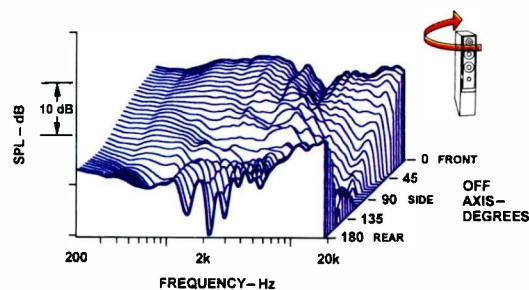


Fig. 3—Horizontal off-axis frequency responses.

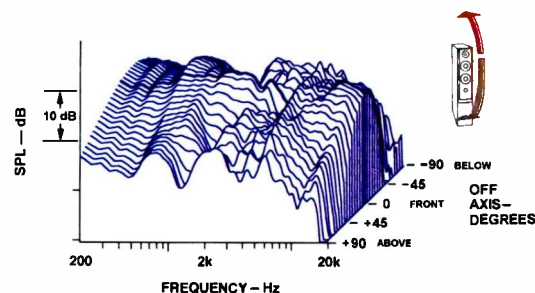
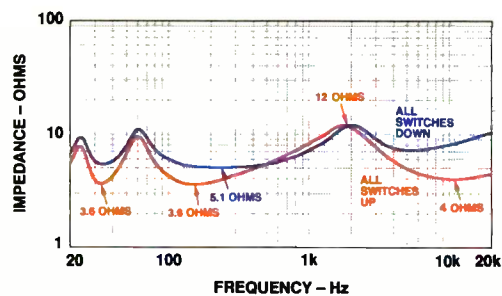
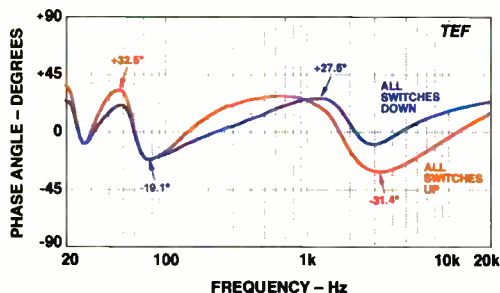


Fig. 4—Vertical off-axis frequency responses.



A



B

Fig. 5—Impedance magnitude (A) and phase (B).

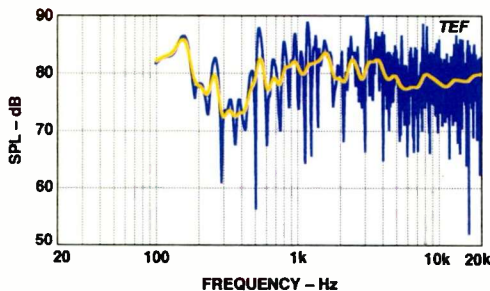


Fig. 6—Three-meter room response.

quite well behaved. Flicking the bass switch down, to “Boundary,” reduces low-frequency level below 500 Hz by about 2 to 3.2 dB; setting the treble switch to “-” reduces level above 4 kHz, with the reduction reaching about 1.5 dB above 7 kHz.

The reason for the 4.8-kHz dip became plain when I ran my usual crossover test by reversing the connections to one crossover section. This produced a deep null at 2.46 kHz, the apparent crossover frequency, with some response reduction between 1.25 and 4 kHz. Between 4 and 6 kHz, however, response actually rose about 3 dB, indicating that the woofers and tweeter were moderately out of phase in this region, causing the dip.

Averaged from 250 Hz to 4 kHz, the Snell E.5’s sensitivity measured a fairly high 88.6 dB. The grille affected the response only

above 7 kHz, where deviations of about ± 12 dB were evident, with a dip at 11 kHz and a peak at 17 kHz. The right and left speakers matched within a close 0.5 dB.

The phase and group-delay responses of the Snell E.5 (Fig. 2), referenced to the tweeter’s arrival time, were measured with all switches up (their normal setting). The phase curve falls continually as frequency increases but levels out in the tweeter’s range, above 4 kHz. This phase behavior, typical of direct-radiator speakers whose drivers are mounted on the same plane, indicates that the woofers’ acoustic output lags behind the tweeter’s. When averaged between 600 Hz and 2.5 kHz, the group-delay curve indicates that the lag amounts to approximately 0.25 millisecond.

Setting all three of the E.5’s switches to their normal positions turns the rear tweeter on. This was of no consequence in Fig. 2, taken in an anechoic chamber that absorbed the rear tweeter’s output. But it plainly affects the E.5’s horizontal off-axis responses (Fig. 3). Within 20° either side of the axis, the curves are very uniform up to 20 kHz. (Interestingly, the 4.8-kHz on-axis dip begins fading out as you get more than 20° off axis, disappearing beyond $\pm 30^\circ$.) The out-

put of the rear tweeter is clearly visible at the front of the graph; above 9 kHz, the front and rear tweeters’ outputs are approximately the same level.

The E.5’s vertical off-axis responses (Fig. 4) are quite uniform except for the two octaves (1.25 to 5 kHz) around the crossover frequency. Here the response remains fairly consistent only within about $\pm 10^\circ$ of the axis (not clearly visible). Farther off axis, deep response dips develop, though they smooth out once you get more than 50° off axis. Between 1.25 and 3 kHz, response above and below the axis is fairly symmetrical, which indicates a properly in-phase crossover. But between 3 and 6 kHz, the response is smoother below the axis rather than on axis and above; the reverse situation would be preferable.

The Snell’s impedance (Fig. 5) is shown with all three rear switches in their normal, up, positions (minimum impedance and greatest load) and with all three switches down (maximum impedance). The impedance magnitude (Fig. 5A) ranges from 3.6 to 12 ohms with all switches up; with all switches down, the minimum impedance rises to 5.1 ohms, while the maximum impedance remains at about 12 ohms. The impedance dip in the bass range at 35 Hz indicates the vented enclosure’s approximate box tuning frequency. Based on the impedance extremes, if the E.5 is operated with all switches up, keeping response ripples from cable-drop effects to within 0.1 dB will require that cable series resistance not exceed about 0.06 ohm (for a run of 10 feet, this corresponds to 14-gauge or heavier, low-inductance cable). With all switches down, the cable requirements are relaxed somewhat to a maximum of 0.1 ohm (16-gauge or heavier cable). Switch position affects the E.5’s impedance phase (Fig. 5B) more noticeably. With all switches up, phase varies from a minimum of about -31° (capacitive) to a maximum of about $+33^\circ$ (inductive).

**CONTRABASS NOTES
SHOWED OFF
THE SNELLS’ SMOOTH,
EXTENDED BASS.**

With all switches down, the phase variation is even smaller, ranging only from -19° to $+28^\circ$. Based on the E.5’s low minimum impedance, two of these speakers should not be driven in parallel from a single amplifier channel. However, its reasonable phase curves show that a single E.5 should be a fairly easy load for any competent amplifier. For all the following tests, I left the E.5’s switches up, their normal position.

The cabinet’s top and side panels vibrated moderately at about 285 Hz during my high-level sine-wave sweep test, but otherwise it was quite rigid, and its front panel was particularly vibration-free. When I rapped it with my knuckle, the front panel sounded quite inert, whereas the side panels sounded more like typical cabinet walls. The woofers have a fairly generous travel

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capability, about 1/2 inch peak to peak, and don't sound harsh when overdriven. Absolutely no dynamic offset was apparent, which is rare.

To measure raw and smoothed 3-meter room response (Fig. 6), I placed the speaker in the right-channel stereo position, aimed at my listening seat, and set the test microphone at ear height (36 inches) at the listening position. The smoothed curve fits a tight, 6.2-dB, window above 500 Hz and a moderately tight, 13.5-dB, window overall. There are no major anomalies, the only significant deviations being an octave-wide dip between 250 and 500 Hz and a peak at 155 Hz.

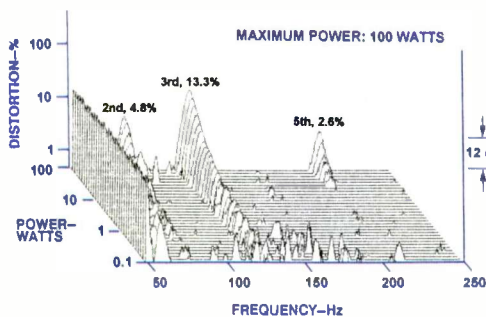


Fig. 7—Harmonic distortion for E_1 (41.2 Hz).

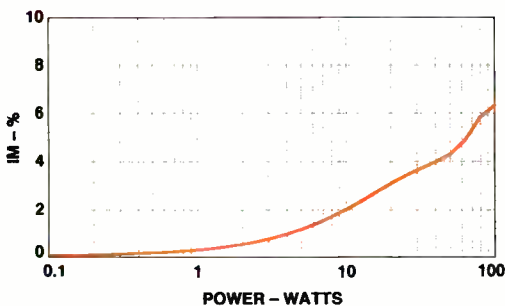


Fig. 8—IM distortion for A_4 (440 Hz) and E_1 (41.2 Hz).

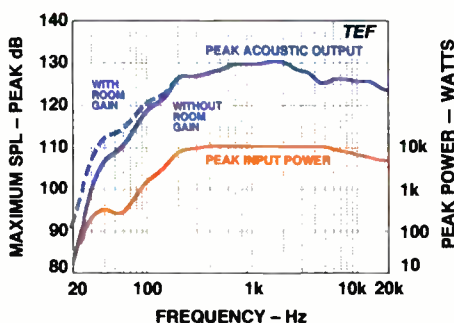


Fig. 9—Maximum peak input power and sound output.

The E.5's E_1 (41.2-Hz) harmonic distortion is shown in Fig. 7. At a maximum power of 100 watts (20 volts rms into the rated 4-ohm load), the second and third harmonics rose to only moderate levels, 4.8% and 13.3%. The only significant higher harmonic was the fifth, at a low 2.6%. At 41 Hz, a 100-watt input to the E.5 generated a healthy 100 dB SPL at 1 meter in a free field. The speaker sounded moderately clean at this level.

The E.5's 110-Hz (A_2) 100-watt bass harmonic distortion consisted of only a low 1.2% second harmonic and 0.6% third; higher harmonics were below the floor of the measurement display. The distortion at 440 Hz (A_4) was similarly low, only 0.6% second and third harmonic. At 110 and 440 Hz, a 100-watt input generated a loud but quite clean-sounding 105 dB SPL at 1 meter in a free field.

Figure 8 shows intermodulation (IM) distortion produced when the Snell E.5 is fed 440-Hz (A_4) and 41.2-Hz (E_1) tones of equal power. The distortion rises gradually and reaches a moderate, though clearly audible, 6.3% at 100 watts.

Figure 10 shows the E.5's short-term peak power input and output (with all switches up). The peak input power starts out low at 20 watts at 20 kHz, then rises quickly to a peak of 300 watts at 40 Hz, near system resonance. After a slight drop, to 230 watts at 55 Hz, the peak power rises quickly and smoothly to 10 kilowatts above 400 Hz, a ± 200 volt swing into the rated 4-ohm load. (Gee, I've found another 10-kilowatt speaker! See "10 Kill-a-What?") Above 5 kHz, the peak power drops gradually to 5 kilowatts at 20 kHz. The power limitation above 5 kHz was due to harsh sound from the rear-firing tweeter; with that tweeter switched off, power handling continued at the 10-kilowatt level all the way out to 20 kHz.

At 20 Hz, the peak acoustic output with room gain starts moderately high, at 90 dB, and rises very quickly through 100 dB at 25 Hz, 110 dB at 36 Hz, and 120 dB at 100

Rear view of the E.5 shows a second tweeter for ambience and high-mounted terminals for easy hookup.



Hz. Above 200 Hz, the peak output remains very loud, 124 to 130 dB SPL.

Use and Listening Tests

The Snell E.5s are available in black oak and beech veneers, the darkest and just about the lightest possible finishes. The beech veneer on the speakers I tested looked very good, and I was quite impressed with the cabinet's design and craftsmanship.

Everything seemed to fit together just right, and the speakers looked equally good with their unusual metal grilles on or off. At 46 pounds each, their weight is hardly excessive, and if you take the grille off so you can get a few fingers into the front port, they're very easy to move around.

Snell's detailed owner's manual covers the E.5 and the matching K.5 Monitor and CR.5 Center Channel speakers. It suggests spacing the speakers so that they form a 45° to 60° included angle as viewed from your listening seat and toeing them in. Snell provides threaded spikes with adjustment nuts to provide stability on carpet, and I used them in my listening tests.

As usual, I used B&W 801 Matrix Series 3 speakers for comparative listening. My auxiliary listening equipment included an Onkyo Integra DX-7711 CD player, a Krell KRC preamp and Crown Macro Reference power amplifier, and Straight Wire Maestro cabling. I listened to the E.5s with standard, single wiring. Hookup was quite easy, as the rear terminals are placed quite accessibly, more than 7 inches above the floor.

For my listening tests, I set the E.5s up in the positions I normally use, about 2 feet from each side wall and 3 feet from the wall behind the speakers. I also tried them less

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than 3 feet from that wall and found it somewhat improved their low-frequency balance.

On *Trampoline* (MCA, MCAD-70018), a recent release by The Mavericks, the Snells' response was lively and well balanced, doing particular justice to the horn section. The acoustic guitar opening on the hit "Dance the Night Away" (track 1) was reproduced with much expression and realism. The Snells could be played quite loud without any dynamic compression of peaks and with only minimal harshness. Their bass was extended and clean, although not quite the equal of the B&Ws playing at the same level. On track 2, the E.5s exhibited some midrange forwardness on Raul Malo's vocals that I found not to my liking.

On classical orchestra, the E.5s performed quite admirably. The strings on David Chesky's *Three Psalms for String Orchestra* (Chesky CD163, a very clean well-done

recording), were handled with great smoothness and realism. The solo cello on track 2 was particularly expressive, and the contrabass notes on that track showed off the Snells' smooth and extended bass.

I definitely liked the way the rear tweeters added high-frequency ambience and air, particularly to the percussive elements of *Trampoline*. At my couch listening position, the rear-tweeter output was fairly subtle, depending on what I listened to, but quite noticeable when switched off. The effects were most apparent when I got up and walked between the speakers and listened from beside or behind them. The effect of the high-frequency level switch was also quite subtle, but placing the bass switch in the "Boundary" position significantly reduced low-frequency output.

I compared the maximum levels available from the B&W and the Snell speakers when reproducing the *Sheffield Track and*

Drum CD (Sheffield Lab CD-14/20). With the level set to the point just before the Crown Macro Reference's Input/Output Comparator lights indicated clipping, the Snells could play significantly louder and cleaner than the B&Ws on the rim shots, by virtue of their higher sensitivity. During my comparative listening I had to attenuate the E.5s by 3 or 4 dB to make their output level match the 801s'.

One particularly good CD that demonstrated the E.5's excellent dynamic range was *For Your Ears Only* by Proteus 7 (Dorian xCD-90258), a mixture of music and potentially speaker-blowing sound effects that's great fun. The horns on track 8 were stunning, and each of the staccato drum beats on track 19 remained distinct.

On country music and rock, the E.5s could be played loudly and cleanly but did not quite have the gut-thumping bass capability of the 801s, which are larger. Even so, the E.5s' handling of organ pedal notes and their low-frequency extension and output will satisfy the pipe-organ crowd.

On the low-frequency third-octave band-limited pink noise test, the Snells generated no usable output at 20 Hz, quite usable output in the 25-Hz band, and good strong output at 32 Hz and up. At 50 Hz and higher, they could play as loud as the B&Ws, although not quite as clean. Port wind noise was quite low. Surprisingly, when the grille was off, I could feel significant port puffs (outward air movements) at my listening position when the speakers played high-level signals between 25 and 40 Hz. With the grille on, I could no longer feel the puffs but could hear noise from the port's output passing through the grille.

With pink noise, the Snells were not as smooth as the B&Ws and added some tonality to midrange and upper-frequency noise signals. The E.5s passed the stand-up/sit-down test quite handily, the upper-midrange tone changing only minimally when I stood up.

The Snell E.5s proved to be excellent all-around performers on a broad selection of recordings. Their good looks, high performance, modest cost, and solid engineering make them prime candidates for any music or home theater system, especially as their output can be adjusted to match a wide variety of situations. Give them serious consideration. A

10-KILL-A-WHAT?

When I enthused about the Snell E.5s' ability to cleanly handle 10-kilowatt peaks, I could almost hear you readers saying: "So what? I'm using a 200-watt amplifier, which is pretty large but is capable of only 400-watt peaks. Why would anyone use an amplifier capable of 10 kilowatts in his home?" But you may, in fact, need an amplifier this large, if you like to listen to the sounds of live instruments in your home at the same levels that they would generate if they were actually there in the room with you.

One very demanding instrument that is quite hard to reproduce at live levels is a pop/rock drum set. Hard-driven rim shots can generate very high peak SPLs. It's going to take either a moderate-sized amplifier with a very efficient speaker (such as a horn-loaded Klipschorn or a commercial concert speaker) or a very powerful amplifier (at least for peaks) and a moderately efficient speaker such as the Snell E.5.

One excellent solo drum recording is found on track 5 of the *Sheffield Track and Drum CD* (Sheffield Lab CD-14/20). The measured crest factor (ratio of peak to average power) of track 5 is a very high 26.9 dB, a power ratio of almost 500 to 1! In oth-

er words, if you play this CD at the highest level that won't quite clip your amplifier on peaks, the amp's average output will be only about 1/500 as high. If your amp clips at 10 kilowatts, its average output will be a pretty respectable 20 watts; but you won't be able to get average power of more than a minuscule 1 watt from a 200-watt amplifier with 400-watt peak capability unless you're willing to get clipping on the peaks. (And most amplifiers have far less headroom than that.) If you do turn up this recording so that the volume is subjectively loud, using a speaker such as the Snell, you will clip your amplifier significantly often.

That's not the whole story, of course. Even with 1 watt, a speaker with the Snell's sensitivity will deliver nearly 90 dB SPL, which is a reasonably loud average listening level. A 100-dB average SPL would require only 10 watts. And a 200-watt amp with realistic headroom could produce perhaps 115 dB SPL on peaks. This is why so many of us manage to live happily with amps of 200 watts or less per channel. But peak sound levels in live music can be higher still, especially if you're sitting near the instruments.—D.B.K.

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EDWARD J. FOSTER

YAMAHA DVD-S700 DVD PLAYER



Things are going our way. “We” being consumers, that is. Yamaha’s second-generation DVD player, the DVD-S700, is not only more competent in several respects than the company’s first-generation DVD-1000 (which I thought quite highly of), but it is also less expensive. I guess I shouldn’t be so surprised; more performance for less money has been the name of the game in this industry through all the years I’ve been involved in it.

The DVD-S700 can play DVDs having DTS and Dolby Digital (AC-3) sound (not to mention audio and Video CDs, of course). It can’t decode DTS, but it can pass a DTS bit stream, via its digital audio outputs; first-generation players like the DVD-1000 could not. To hear DTS soundtracks, you can feed that bit stream to a down-

stream decoder such as the one in Yamaha’s DSP-A1 A/V Amplifier (July 1998 issue).

The DVD-S700 does include an on-board AC-3 decoder that provides analog outputs for all six Dolby Digital channels, including the low-frequency effects (LFE) channel. It also outputs the Dolby Digital soundtrack as a matrixed two-channel analog signal (via a pair of “Mixed 2CH” outputs) for decoding with a Pro Logic surround circuit. The better way to go, of course, is either to use the DVD-S700’s six analog outputs or to hand off the Dolby Digital bit stream directly to an amp or receiver that has its own AC-3 decoder. And since Yamaha’s first DVD player had only optical digital outputs, I’m glad to see that the DVD-S700 has those and coaxial outputs (which I prefer), enabling it to feed digital audio inputs of either type. The new

player also has more video outputs than the earlier model: two composite-video links, a single S-video connector, and a component-video triplet. Component-video monitors are likely to become increasingly popular, now that there’s DVD to supply the signals that make them worthwhile. All of the RCA jacks on the DVD-S700 are gold-plated.

Yamaha gave the DVD-S700 a Dolby Digital decoder with independent speaker-size selection for the center, main, and surround channels (the earlier model assumed that any center and surround speakers were “Small”), which brings its bass-management capability up to snuff. I’m not convinced that Dolby Digital 5.1 decoders should be in DVD players rather than in downstream processors, amps, or receivers; but if there is one in the player, it should do bass management as well as it can be done. The DVD-S700 does just that.

Yamaha also claims better video performance for the DVD-S700. It has new 10-bit video digital-to-analog converters (DACs) that achieve better than 500 lines of horizontal resolution.

THE DVD-S700’S VIDEO PERFORMANCE IS A GOOD MATCH FOR ITS OUTSTANDING AUDIO.

The front panel, however, remains as austere as its predecessor’s. There’s a “Standby/On” switch to the left, the usual transport controls clustered at the right, a centered disc drawer, and a display. Yamaha has made this model’s display more informative than its predecessor’s. There’s now a speaker graphic that indicates which speakers you have set up the decoder for and

Dimensions: 17½ in. W x 3½ in. H x 11½ in. D (43.5 cm x 8.75 cm x 28.4 cm).

Weight: 7.9 lbs. (3.6 kg).

Price: \$799.

Company Address: 6660 Orangethorpe Avenue, Buena Park, Cal. 90620; 714/522-9105; www.yamaha.com.

Photos: Michael Groen

which audio channels are on the disc. (Not all Dolby Digital DVDs are recorded with 5.1-channel sound, as many an unwary buyer has discovered!) Other display legends indicate the presence of 96-kHz and



**IF A DVD PLAYER MUST HAVE
5.1 ANALOG OUTPUT,
IT SHOULD MANAGE BASS
AS NEATLY AS
THE DVD-S700 DOES.**

24-bit audio, which Yamaha's new DACs will handle. And the rotation of a neat disc symbol indicates disc speed and direction.

For the most part though, you would operate the DVD-S700 from its 38-button infrared wireless remote rather than from the panel. The remote is divided into three main areas. The transport controls, at the forward end of the controller (where I like them to be), duplicate the front-panel functions and add bidirectional slow search. In the remote's central area is the ubiquitous four-arrow-with-center-select array used to navigate on-screen menus; it is surrounded by "Title," "Menu," "On Screen," and "Return" buttons to call the menus up. The remaining section holds a numeric keypad and a "Play Mode" button for track selection and programmed or random playback of audio and Video CDs. Repeat playback is available for an entire disc or, on CDs or those DVDs which permit it, a marked portion; you can place up to four markers on suitably encoded DVDs and return to these points later.

Of course, there also are buttons to toggle subtitles, audio soundtrack language, and viewing angle on DVDs that support these features. You select the default languages for audio, subtitling, and on-screen menus by navigating the on-screen menus themselves with the directional arrows. The same goes for setting parental lockout, screen aspect ratio, digital audio output configuration, and so on.

Measurements

I used my new Lucasfilm THX test DVD for virtually all tests of the DVD-S700's AC-3 decoder. My Audio Precision System One seems to lock onto the Lucasfilm disc's frequency sweeps more stably than it does to the corresponding tracks on the Dolby Laboratories test DVD, which made me more confident about the resulting data's accuracy. (Whether this situation will persist with other players remains to be seen.) Then, too, the THX DVD offers a slow 30-point sweep at -10 dBFS that doesn't exist on the Dolby Labs disc. This sweep dwells at each frequency long enough for the System One to measure THD + N, so I've added that measurement to my test roster. I will continue to use the Dolby Labs DVD for the 0-dBFS THD + N measurements, because there is no corresponding test sequence on the Lucasfilm disc. And I will keep using the CBS CD-1 Test CD for audio digital-to-analog converter measurements, because neither the Lucasfilm nor the Dolby Labs DVD provides as comprehensive a test sequence.

The frequency-response curves in Fig. 1 were made at the multi-channel analog outputs, using a Dolby Digital (AC-3) recording. The response of the main and surround channels when set for "Large" or "Small" speakers was essentially identical to the "Center, Large" and "Center, Small" curves shown.

The "Subwoofer" curve shown was measured at the subwoofer output under the same conditions as the "Center, Small" curve, with the bass coming from a center-channel sweep signal; the interactions of these curves clearly shows the handover of bass energy from the center channel to the sub. The short remaining curve shows the subwoofer-output signal from the disc's LFE sweep; the LFE channel's output level drops so abruptly above 120 Hz (as it should) that the

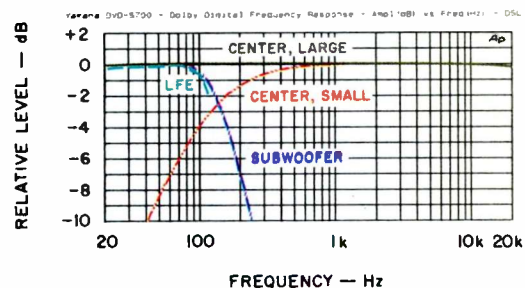


Fig. 1—Frequency response via Dolby Digital (AC-3) surround decoder.

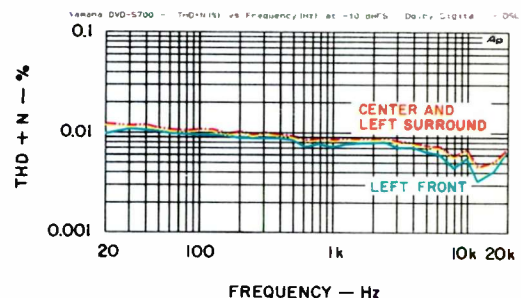


Fig. 2—THD + N vs. frequency at surround outputs.

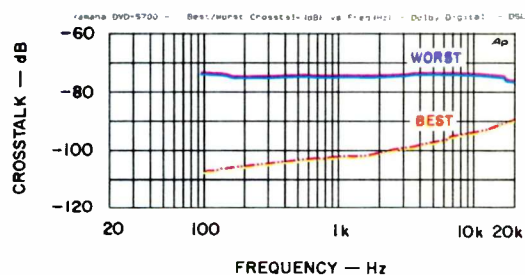


Fig. 3—Crosstalk at surround outputs.

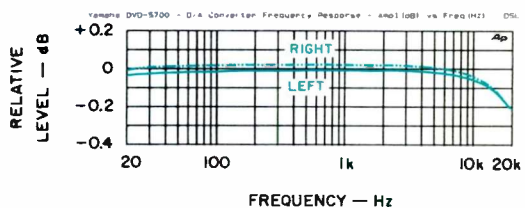


Fig. 4—D/A converter frequency response.

The remote's logical layout puts the buttons you use most where they're easiest to reach.



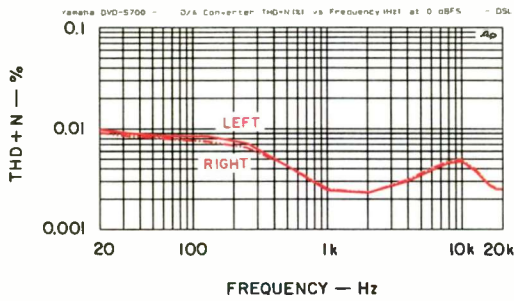


Fig. 5—D/A converter THD + N vs. frequency.

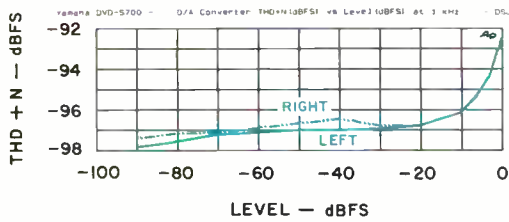


Fig. 6—D/A converter THD + N vs. level.

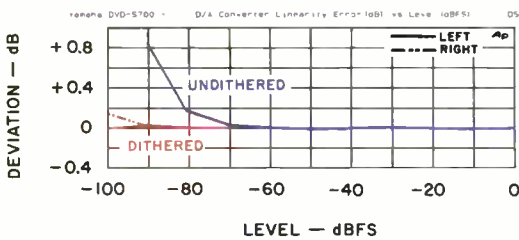


Fig. 7—Linearity error.

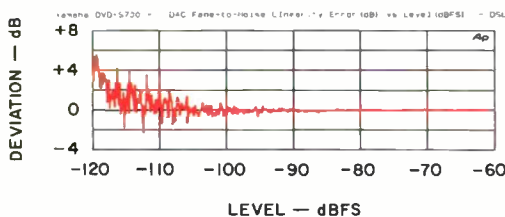


Fig. 8—Fade-to-noise test.

curve is truncated at that point. All these curves indicate that the Yamaha DVD-S700 executes bass management properly. I'd have preferred sharper crossover slopes—say, 12 dB/octave high-pass and 24 dB/octave low-pass rather than 6 and 12 as measured—and a somewhat lower crossover frequency would reduce the probability of the subwoofer calling attention to itself. But I hasten to point out that this crossover meets Dolby Laboratories requirements in

both regards and that it is not alone in these characteristics.

Figure 2 shows THD + N at -10 dBFS when playing a Dolby Digital recording. There are actually three curves in the figure, although only two can be seen because the center and left-surround curves overlay precisely. What's more, the right-front and right-surround curves also overlaid the left-front and surround curves almost exactly. In the midrange and treble, the center is not quite as good, but to an insignificant (and, certainly, inaudible) degree. The differences are enumerated in "Measured Data," together with the LFE channel's distortion at 0 dBFS and 30 Hz. And though the 30-Hz distortion is measurably greater, this should be of no concern whatsoever, given the distortion characteristics of the average subwoofer.

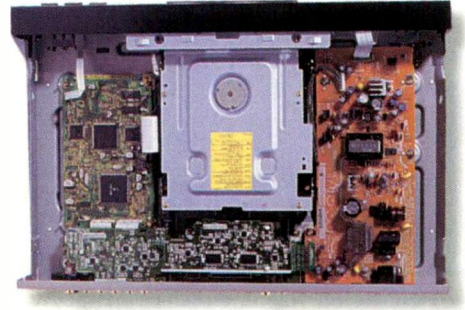
Output levels matched within ± 0.1 dB, which should be more than adequate, and the internal Dolby Digital decoder's channel separation is quite decent. Best- and worst-case channel separation (Fig. 3) occurred, respectively, from the right-surround to right-front curves and from the center to the left-front curves.

I measured the DVD-S700's digital-to-analog converter's performance at the main front outputs, using the CBS CD-1 test disc. The main-channel frequency response curves (Fig. 4) are essentially identical with the center-channel response curve of Fig. 1, although they look different because they're plotted on a far more sensitive vertical scale to show response discrepancies more vividly. As one can see, there's absolutely no filter ripple in the response curve; I attribute this to Yamaha's use of converters that are capable of 24-bit, 96-kHz conversion, even though they're not called upon to deliver that in these tests. There is a slight high-end droop, but I think it would take better than golden ears (platinum?) to hear it.

Those 96-kHz converters' filters may also explain why THD + N at 0 dBFS (Fig. 5) is

worse in the bass region rather than in the treble, which is more usual, in audio DACs. I expect that the high-speed oversampling filters and converters in the DVD-S700 are less subject to cross-modulation with the CD's low (for them!) 44.1-kHz sampling rate.

Yamaha's converters certainly are linear. The THD + N versus level plots of Fig. 6 and the linearity plots of Figs. 7 and 8 attest to that. I've shifted and expanded the vertical scale of Fig. 6 to show the data more



**THE DVD-S700'S
24-BIT, 96-KHZ DACS
MAY EXPLAIN
ITS LOW NOISE AND
DISTORTION.**

clearly; THD + N of -92.4 dBFS at 0 dBFS is exceptionally good, as is worst-case distortion below -10 dBFS from signal levels of -100 dBFS on down! Linearity error is remarkably low on dithered recordings, essentially nonexistent in the right channel and only 0.14 dB at -100 dBFS in the right! The fade-to-noise plot (Fig. 8) also is far better than usual.

Not surprisingly, dynamic range, signal-to-noise ratio, and quantization noise were also excellent. Dynamic range approached 100 dB on an A-weighted basis and 97 dB unweighted. With CCIR weighting, dynamic range was about 10 dB lower than the A-weighted result; but please note that I use true CCIR weighting, not the so-called CCIR-2K weighting that yields more "A-like" numbers.

The DVD-S700's signal-to-noise ratio measured an astounding 128.6 dB, A-weighted, and 119.6 dB, CCIR-weighted, among the best figures I've documented to date. A D/A converter's signal-to-noise ra-



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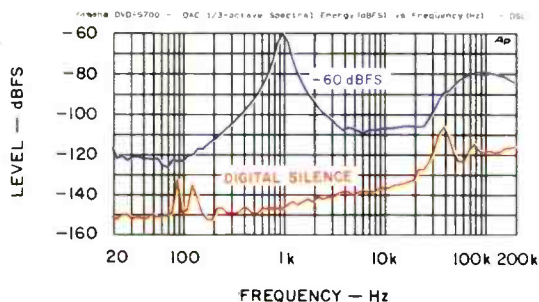


Fig. 9—Noise analysis.

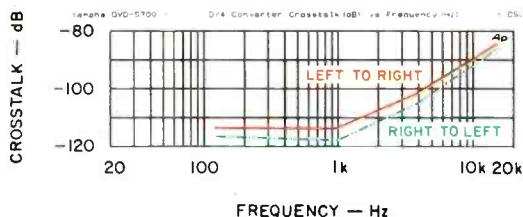


Fig. 10—D/A converter crosstalk.

tio usually doesn't tell much about the converter (other than whether it mutes on "digital silence," which the one in the DVD-S700 obviously does). But it does show how quiet the analog output electronics are, and, in this case, believe me, they're quiet! You can see that in the lower curve of Fig. 9. There's absolutely no 60-Hz hum in the spectrum and the components at 90 and 120 Hz are impressively low. In fact, the bass portion of the noise curve ran off the bottom of the scale I normally use, so I tacked an extra 10 dB of range to the bottom of the graph, just to show what was happening.

The upper curve is the spectrum taken of the -60 dBFS, 1-kHz signal used in measuring dynamic range. Harmonics are notable by their absence, and although the

rise in ultrasonic noise due to noise shaping is apparent, the noise shaping seems less aggressive than usual.

Figure 10, shows left/right crosstalk in the main front channels. The crosstalk is about the same in either direction, and the worst-case figure (-84.3 dB in the frequency range from 125 Hz to 16 kHz) sure seems good to me! As to other measurements,

**THE ANALOG OUTPUTS
REALLY CRY OUT
TO BE USED, SO SUPERB
IS THEIR SOUND.**

output level was just slightly above the 2-volt quasi-standard, channel balance was excellent, and the output impedance was low enough to be of no concern. Fine per-

MEASURED DATA

DVD VIDEO

- Luminance Frequency Response:** +0, -1.6 dB from 0.5 to 4.2 MHz and less than 3.3 dB down at 5.5 MHz.
- Luminance Level:** 105 IRE (+0.4 dB).
- Black-Level Accuracy:** No measurable error.
- Gray-Scale Accuracy:** No measurable error.
- Chrominance Channel Response:** -6 dB or better at 2.75 MHz.
- Chroma-Level Accuracy:** Multipulse method, no measurable error; vectorscope method, 97% to 99%, depending on color.
- Chroma-Phase Accuracy:** Within 2°, depending on color.
- Chroma Differential Gain:** No measurable error.
- Chroma Differential Phase:** No measurable error.
- Chroma-Luma Time Displacement:** No measurable error.
- Overshoot:** On 20- through 60-IRE windows, 0 IRE; on 80- and 100-IRE windows, less than 1 IRE.
- Chroma Burst Level:** 39 IRE peak to peak (-0.1 dB).

Sync Pulse Level: 42 IRE (+0.4 dB).

DOLBY DIGITAL (AC-3) DECODER SECTION

- Channel Balance:** 0.2 dB or better.
- Frequency Response:** Main channels, 20 Hz to 20 kHz, +0, -0.24 dB; center channel, 20 Hz to 20 kHz, +0, -0.2 dB; surround channels, 20 Hz to 20 kHz, +0, -0.2 dB; LFE channel, 20 to 117 Hz, +0, -1.8 dB.
- Subwoofer Crossover:** High pass, -3 dB at 119 Hz and -6 dB at 70 Hz, 6-dB/octave slope; low pass, -3 dB at 145 Hz and -6 dB at 180 Hz, 12-dB/octave slope.
- THD + N at 1 kHz for 0-dBFS Signal:** Main, 0.004%; center, 0.0052%;

- surround, 0.0051%; LFE (at 30 Hz), 0.016%.
- Channel Separation, 100 Hz to 10 kHz:** 72.2 dB or greater.

PCM AUDIO

- Line Output Level:** 2.13 volts.
- Channel Balance:** ±0.015 dB.
- Line Output Impedance:** 1.03 kilohms.
- Frequency Response:** +0, -0.24 dB, 20 Hz to 20 kHz.
- THD + N at 0 dBFS, 20 Hz to 20 kHz:** Less than 0.0192%.
- THD + N at 1 kHz:** Below -92.4 dBFS from 0 to -90 dBFS and below -96.4 dBFS from -30 to -90 dBFS.
- Maximum Linearity Error:** Undithered recording, 0.87 dB from 0 to -90 dBFS; dithered recording, 0.14 dB to -100 dBFS.
- S/N Ratio:** A-weighted, 128.6 dB; CCIR-weighted, 119.6 dB.
- Quantization Noise:** -94.9 dBFS.
- Dynamic Range:** Unweighted, 96.9 dB; A-weighted, 99.5 dB; CCIR-Weighted, 89.5 dB.
- Channel Separation, 125 Hz to 16 kHz:** Greater than 84.3 dB.



Authorized Dealers

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- AR- Custom Audio Video: Little Rock.
- AZ- Jerry's Audio Video: Phoenix, Tucson, Scottsdale• Sound Pro: Flagstaff• Warehouse Electronics: Yuma.
- CA- Access to Music: Larkspur• Accurate AV: S. Lake Tahoe• Ahead Stereo: Los Angeles• Audio Concepts: Long Beach, San Gabriel• Bay Area Audio: San Jose• Boots Camera: Fresno• Christopher Hansen: West LA• Coast Home Ent.: Atascadero• Creative Stereo: Santa Barbara• David Rutledge Audio: Palm Desert• DB Audio: Berkeley• Digital Ear: Justin• Dow Stereo Video: San Diego & Suburbs, La Jolla, El Cajon, Chula Vista, Escondido• Dynamic Entertainment: Danville• Lee's Home Theater: Visalia• Monterey Stereo: Monterey• Paradyme: Sacramento• Performance Audio: San Francisco• Replay Multimedia: Modesto• Shelley's Stereo Video: Santa Monica, Woodland Hills• Systems Design: Redondo Beach• Videotek: Westminster.
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- CT- Al Franklin's: Greenwich• Audio Etc.: Orange• Carstons Stereo/Video: Danbury• Roberts Audio Video: New London• The Sound Room: Westport• Stereo Shop: Hartford.
- DC & Washington Suburbs: Myer-Emco.
- DE- Sound Studio: Wilmington.
- FL- Absolute Sound: Winter Park• Audio Advice of NW Florida: Pensacola• Audio Advisors: West Palm Beach• Audio Center: Deerfield Beach• The Audiohouse: Vero Beach• Cooper for Stereo: Clearwater• Hoyt Stereo: Jacksonville• Palm Audio: Destin• Sound Concepts: Coral Gables• Sound Ideas: Gainesville• Sound Insights: Ft. Pierce• Sound Waves: Lakeland• Stereotypes: Daytona Beach.
- GA- Laser Disc Enterprises: Atlanta• Merit TV: Columbus• Stereo Connections: Valdosta• Stereo Festival: Atlanta.
- HI- Honolulu Home Theater: Honolulu.
- IA- Ultimate Electronics: Cedar Rapids, Des Moines• Archer Audio Video: Ft. Dodge• Audio Video Logic: Des Moines• Audio Visions: Sioux City• Hawkeye Audio: Iowa City, Cedar Falls• Renier's: Dubuque.
- ID- Ultimate Electronics: Boise• Wise Buy: Idaho Falls.
- IL- Absolute Audio: Rockford• United Audio Centers: Chicago & Suburbs• Good Vibes: Champaign• Jon's Home Ctr.: Quincy• Sound Forum: Crystal Lake.
- IN- Classic Stereo: Ft. Wayne, Mishawaka• Kings Great Buys: Evansville• Ovation Audio: Clarksville, Indianapolis, Lafayette.
- KS- Accent Sound: Overland Park• Advance Audio: Wichita• Audio Junction: Junction City, Manhattan.
- KY- Ovation Audio: Lexington, Louisville.
- LA- Alterman Audio: Metairie• Mike's Audio: Baton Rouge• Wright's Sound Gallery: Shreveport.
- MA- Nantucket Sound: Hyannis• Pittsfield Radio: Pittsfield.
- MD- Gramophone: Baltimore, Ellicott City• Myer-Emco: Gaithersburg, Beltsville, Rockville• Sight & Sounds: Easton• Soundscape: Baltimore.
- MI- Contemporary Audio: Okemos• Pecos's (Detroit)• Troy• Classical Jazz Holland• Sound North: Iron Mt. • Stereo Center FRAV: Flint• Court St. Listening Room: Saginaw.
- MN- Audio King: Minneapolis & Suburbs, Rochester, St. Cloud• Audio Designs: Winona.
- MO- Independence AV: Independence• Sound Central: St. Louis.
- MS- Ideal Acoustics: Starkville• McLelland TV: Hattiesburg• Players AV: Ridgeland.
- MT- Rocky M. Hi Fi: Great Falls.
- NC- Audio Video Systems: Charlotte• Audio Visions: Wilmington• Now Audio Video: Durham, Greensboro, Raleigh, Winston Salem• Tri City Electronics: Conover.
- NE- Custom Electronics: Omaha, Lincoln.
- NH- Cookin': Nashua, Manchester, Newington, Salem, S. Nashua.
- NJ- Camera and TV Stop: Medford, Egg Harbor• Monmouth Stereo: Shrewsbury• Woodbridge Stereo: West Caldwell, Woodbridge.
- NM- Ultimate Elect.: Albuquerque• Sound Ideas: Albuquerque.
- NV- Ultimate Elect.: Las Vegas.
- NY- Audio Breakthroughs: Manhasset• Audio Den: Lake Grove• Clark Music: Albany, Syracuse• Stereo Exchange: Manhattan• Hart Elect.: Vestal• Listening Room: Scarsdale• Rowe Camera: Rochester• Speaker Shop: Amherst.
- OH- Absolute Theater: Powell• Audio Craft: Akron, Cleveland, Mayfield Hts., Westlake• Audio Etc.: Dayton• Classic Stereo: Lima• Ohio Valley Audio: Cincinnati• Paragon Sound: Toledo• Stereo Visions: Columbus• Threshold Audio: Heath• Unique Home System: Cincinnati.
- OK- Audio Dimensions: Oklahoma City• Photo World: Stillwater, Shawnee• Ultimate Electronics: Tulsa.
- OR- Bradford's HiFi: Eugene• Kelly's Home Ctr.: Salem• Magnolia HiFi: (Portland) Beaverton, Clackamas• Stereo Plant: Bend.
- PA- Audio Junction: Pittsburgh• Audio Lab: Fairless Hills• Gary's Elect.: State College• GNT Stereo: Lancaster• Hart Elect.: Blakely• Hi Fi House: Abington, Broomall, Camp Hill, Harrisburg• Listening Post: Pittsburgh• Palmer Audio: Allentown• Stereo Shoppe: Selingsgrove, Williamsport• Stereoland: Natrona Heights• The StereoShop: Greensburg.
- RI- Stereo Discount Ctr.: Providence.
- SC- AV Design: Charleston• Custom Theater & Audio: Myrtle Beach• Upstairs Audio: Columbia.
- SD- Audio King: Sioux Falls• Sound Pro: Rapid City.
- TN- College HiFi: Chattanooga• Hi Fi Buys: Nashville• Now Audio Video: Knoxville• Modern Music: Memphis• Sound Room: Johnson City.
- TX- Home Entertainment: Dallas, Houston, Plano• Audio Tech: Temple• Audio Video: College Station• Bunkley's Stereo Systems: Abilene• Bjorn's: San Antonio• High Fidelity: Austin• Krystal Clear: Dallas• Marvin Electronics: Ft. Worth• Sound Quest: El Paso• Sound Systems: Amarillo.
- UT- AudioWorks: Salt Lake City• Crazy Bob's: St. George• Stokes Bros.: Logan• Ultimate Elect.: Layton, Murray, St. George, Salt Lake City, VA• Myer-Emco: Falls Church, Tyson's Corner, Fairfax• Audio Connection: Virginia Beach• Audiotronics: Roanoke• Home Media Store: Richmond.
- WA- Bunch-Finnegan TV: Kennewick• Magnolia HiFi: Seattle & Suburbs, Tacoma, Silverdale, Spokane• Pacific Sight & Sound: Wenatchee.
- WI- Flanner's AV: Milwaukee• Hi-Fi Heaven: Appleton, Green Bay• Sound World: Wausau.
- Puerto Rico- Precision Audio: San Juan.
- Canada- A & B Sound: Calgary, Edmonton, Kelowna, Vancouver & Suburbs, Victoria• Advance Electronics: Winnipeg• Bay Bloor Radio: Toronto• Canadian Sound: Brampton, Ont. • Digital Dynamics: Clearbrook• Harrington Audio: Peterborough, Ont. • Kebecon: Montreal• Lipton's: Newmarket, Ont. • Sound Decisions: Duncan, B.C. • Sound Gallery: Newlandland• Sound Room: Vancouver• Stereoland: Windsor• Treble Clef: Ottawa.
- Mexico- Contact Grupo Volumen: Mexico City.

formance! In fact, better than fine—excellent performance!

For most video measurements I now use the Lucasfilm THX DVD, although I still use the multibursts on Sony's test DVD to measure luminance-channel response. On the Yamaha DVD-S700, that response, which is directly related to horizontal resolution, is quite good. Although there was a small decrease in output at the highest burst frequency (-1.6 dB at 4.2 MHz), the falloff was gradual, amounting to less than 3.3 dB at 5.5 MHz on frequency sweeps.

Luminance-channel gain was slightly high, which explains the 105 IRE (5% high) white-level reading and the equivalently high 42-IRE sync-pulse level (listed in "Measured Data"). This discrepancy is too small to be noticed on a monitor without a direct A/B comparison. Black-level was on the money, and gray-scale accuracy was perfect throughout the entire luminance range. Mid-scale luminance-DAC monotonicity checked out fine, too. There was just a trace of overshoot on the 80- and 100-IRE windows, but it was barely discernible on the monitor.

The chrominance channel performed almost perfectly. Burst level was just the slightest bit low (39 IRE peak-to-peak as against the 40 IRE target), which correlates with the slightly reduced chroma ("saturation") level (97% to 99% of target, depending upon the color). I have to say, however, that these discrepancies are within the accuracy of the measurement system so, for all intents and purposes, there was no documentable error. In fact, using the multi-pulse method, I could document no chroma-level inaccuracy at all. It was the same with chroma-phase ("tint") accuracy. All colors were within 2° of the targets, and that's about as good as you can measure on a vectorscope. There were no measurable chroma-differential gain or phase errors (shifts in color saturation or tint with changes in scene brightness) either. Chrominance-channel response was as good as I've measured, and there was no chrominance/luminance time disparity whatsoever.

Use and Listening

As you might expect from its excellent video test results, the Yamaha DVD-S700 performed superbly in my home theater. Despite a slight rolloff in high-end luminance response, the wedges on my test patterns were as clean and well defined as I have seen. I couldn't detect any edge smearing in color pictures, which goes right along with this player's excellent chrominance-luminance time alignment. Colors, in general, were accurate, well saturated, and free of noise. You really couldn't ask for better. The video is really clean!

Still-frame and slow-motion were as good as I've seen from DVD players. The DVD-S700 seemed to consistently choose I-frames to stop on, so the picture wasn't blurred unless the frame itself was. High-speed scanning was, well, par for the course; DVD players don't really scan smoothly but sort of hop from frame to frame. However, this player hopscoches decently, and you can at least tell where you are as you scan through the movie.

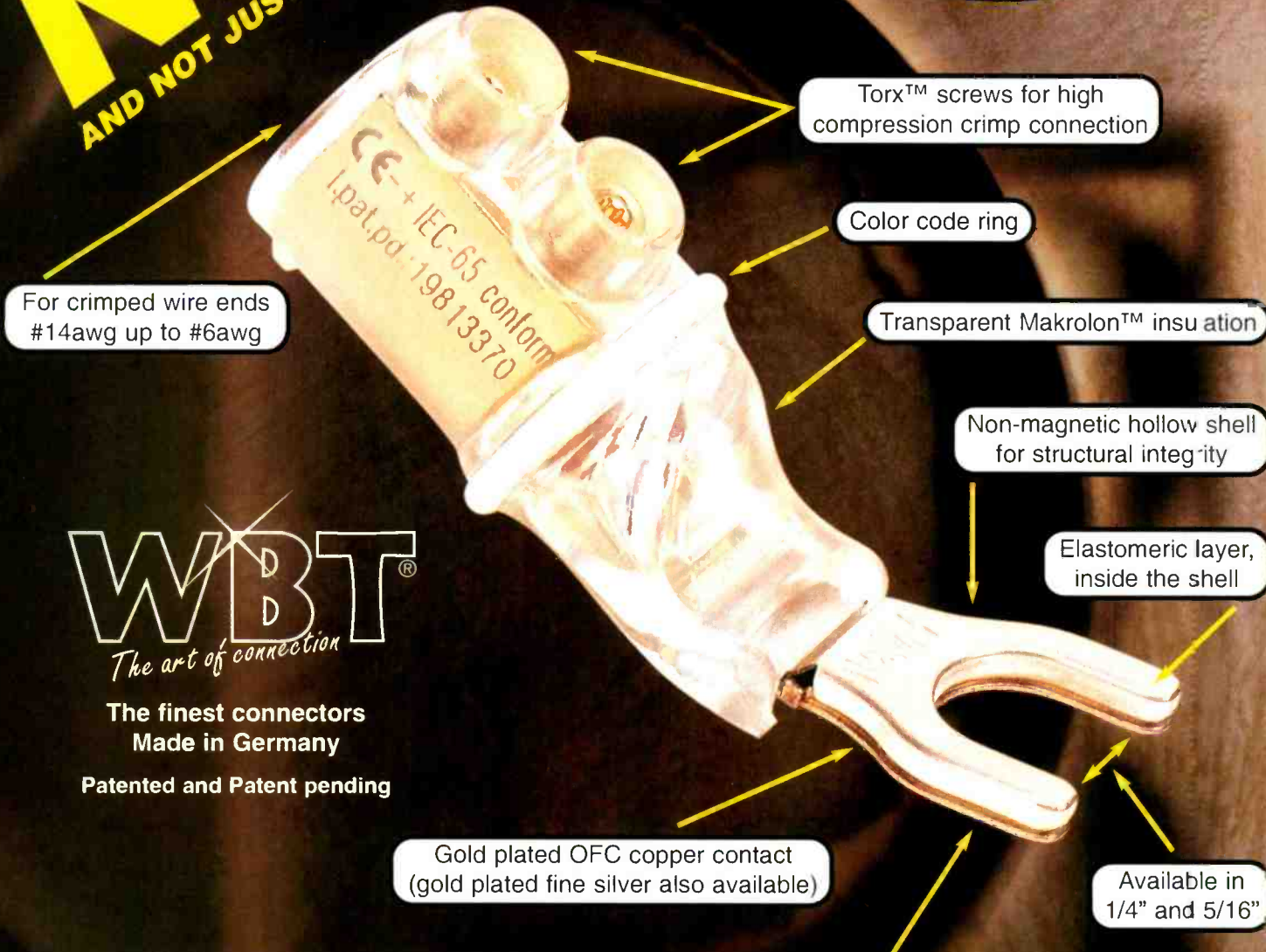
Yamaha's manual is pretty well done. English, French, and Spanish are interleaved throughout the text (which I find less convenient than giving each language its own page (the others share the obverse) and is pretty decent. Yamaha's remote is not illuminated nor are most keys differentiable by touch. But it felt comfortable in my hand, and the legends (mostly white on gray) were legible, given decent lighting.

The sound was really superb! This is one player whose analog outputs really cry out to be used, despite my curmudgeonly contention that AC-3 decoders belong downstream instead of in the player! Yes, I'd like to see sharper crossover slopes and have the crossover point a little lower in frequency. But the Yamaha DVD-S700 does do a good job of bass management, and it doesn't limit your setup options. In addition, its DACs and analog output electronics are clearly state of the art. This is a player that I can readily recommend. For features and audio and video performance, the DVD-S700 ranks among the best out there. **A**

YOU REALLY COULDN'T ASK FOR BETTER VIDEO THAN THE YAMAHA DVD-S700 DELIVERS.

All finer Hi-Fi Dealers can order these products, ask your dealer to install them on all your cables.

NEW!
AND NOT JUST NEW, IT'S THE BEST!
*from every angle**



For crimped wire ends
 #14awg up to #6awg

Torx™ screws for high
 compression crimp connection

Color code ring

Transparent Makrolon™ insu ation

Non-magnetic hollow shell
 for structural integrity

Elastomeric layer,
 inside the shell

Gold plated OFC copper contact
 (gold plated fine silver also available)

Available in
 1/4" and 5/16"

Pressure concentrating "bumps"
 for high power conductivity

WBT®
The art of connection

The finest connectors
 Made in Germany

Patented and Patent pending

WBT Sandwich Spades		
WBT-0660 Cu	1/4" copper	\$20 ea
WBT-0680 Cu	5/16" copper	\$20 ea
WBT-0660 Ag	1/4" silver	\$40 ea
WBT-0680 Ag	5/16" silver	\$40 ea

Installation of the Sandwich Spade is accomplished by the use of a crimped cable end. WBT crimping pliers & crimp sleeves are best for preparing the cable end.

WBT-USA - 2752 South 1900 West - Ogden Utah 84401 - 801-621-1500 - Fax 801-627-6980

www.wbtusa.com

**Even the angle of the Sandwich Spade has been designed for functionality.*

GREAT details 5

Enthusiasts realize the importance of every component in their home entertainment systems—from the finest speakers to the most musically accurate amplifiers. Yet it's the smaller pieces that help fill in the bigger puzzle. In the "Great Details 5" special advertising section you'll find some of the finest examples of critical puzzle-solving pieces—for audio at its finest.

SOUND ALIGNMENT SYSTEMS™

Webb USA DESIGN

"THE MOST INNOVATIVE AND ADVANCED DEVELOPMENT IN SOUND SINCE THE CONE SPEAKER ITSELF".

"For Audiophiles of Any Caliber"

A professional installer's most used tool.

The new SA-S System allows exact laser directional placement of your sound system in home theaters or professional sound development systems. A full complement of SA-S specialized laser alignment tools, accessories and layout/design sheets are available to complete a full certified installation of criteria from pro-installers, O.E.M. and Dealer specifications.

All speakers are directional by design, so "DIRECT THEM!"

Set exact toe/offset if required to any degree or plot and certify layouts for repeatable testing of your home audio/theater or professional sound systems and sonic development.

Endorsed by THX and home theater installers in both professional and home theater arenas, the SA-S System is the most efficient means to certifiably direct and align any audio system for optimum sound performance and listening quality. Use SA-S layout and angle guide reference sheets to perfectly plot, align and make repeatable any sound layout in home theater, commercial installations or any size professional sound systems to fully certify installation to manufacturer's specification or design criteria.



MAG-Alignment Switch

The special (optional) Mag-Alignment Switch allows hands-free use as well as providing a permanent residence for the SA-S System 770 when not in use—a very impressive display component!

BASE PLATE

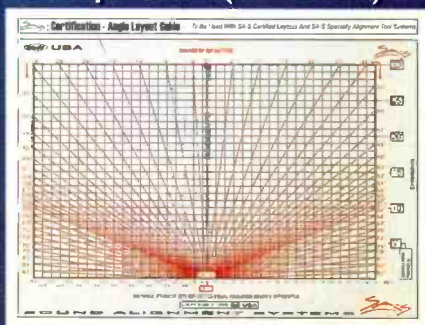
Permanently mounts to speaker housing allowing parallel and flush standoff platform for SA-S System use. (Many high quality systems are equipped with O.E.M. SA-S Base Plates from the factory. Check with your manufacturer.)

1. Pro SA-S 770 Unit.....#1335
(includes upgraded 770 features & technician pro-case)
- 1a. Standard SA-S 770 (not shown)#1330
2. Mag Alignment Switch (includes protective cover).....#364
3. Stackers.....#367
4. Base Plate.....#368
(for use with mag switch)
5. Line Lens.....#381
(shows linear sound profile 360°)
6. Two-Way Lens.....#380
(allows 2-angle layout points)
7. Rotary Base.....375
(allows 360° rotational and plane of reference layout)
8. Technician "Pro" Belt Case.....#393
(also sold separately)
9. Laminated Layout Set.....#1340
(laminated set of 1 angle guide/3 layout plots F.I.C.)

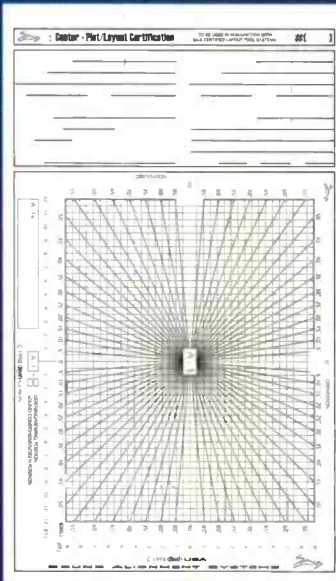
More pro-accessories and full dealer Start Up Kits available for direct dealer status. Please call 310-793-5500 for more information.

ANGLE GUIDE (TOE/OFFSET)

ANGLE GUIDE... allows easy and quick toe or offset layout to be determined to exact degree with SA-S laser alignment tools and accessories.



CENTER LAYOUT PLOT WORK SHEET



Three sheets available:
center (shown), intermediate & frontal. Sold in pads of 25 sheets.
(3 pc. set)#1342

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the world of accessories

GREAT
details
5

“ I predict an immediate worldwide attachment (pun intended)

to these spades.”

Ray Kimber,
Kimber Kable



BUILDING A BETTER SPADE

While loudspeakers and power supplies are justifiable audiophile concerns, little details—including cables and connectors—play an important role in the food chain. Ray Kimber knows all about details...

“A number of years ago, I was frustrated and unhappy with all spade-type connectors,” said Ray Kimber of Kimber Kable. “It was that unhappiness that led to the development, patenting and manufacture of the PostMaster spade connector in the ‘80s.”

The PostMaster has been very popular with audio enthusiasts who focus on the critical details of their systems. Along with their reputation for sonic quality, the PostMaster represented new thinking of how a spade connector should “work”. As with all “new thinking”, Mr.

Kimber added, there was also room for improvement. Enter the WBT Sandwich Spade.



The new WBT Sandwich Spade Connector.

“In January ‘97, we began a business relationship with WBT of Germany, a company renowned for their remarkable connectors. We are delighted with the products and the company,” Mr. Kimber said. “During 1997 I said to Mr. Wolfgang B. Thorner, president of WBT-GmbH, that I’d like to see him reinvent the PostMaster.”

Reinvention turned out to be an understatement. “I predict an immediate worldwide attachment (pun intended) to these spades. They are a technical design knockout and set a new sonic quality standard. They are easily interchangeable with each other and with WBT banana connectors, another key attraction,” said Mr. Kimber. There will be four models: .25- and .33-inch with gold-plated copper contacts and .25 and .33 with gold-plated solid fine silver contacts. As important, they are affordably priced (\$20 each for copper, \$40 each for silver). “The PostMaster will continue to be available but I predict one look or listen will convert you to the WBT Sandwich Spade,” Mr. Kimber said.

Since 1979, Kimber Kable has supplied audio enthusiasts cables ranging from the Silver Streak to the legendary Model 88, The Black Pearl Reference Loudspeaker Cable.

YOUR LAST PHONO CARTRIDGE WILL LAST FOREVER

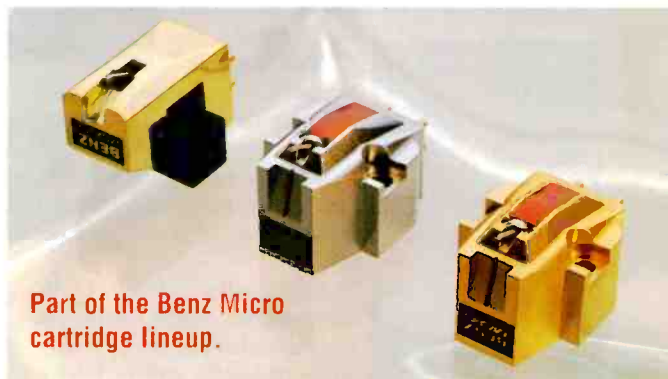
As we reach the Year 2000, those who still enjoy their record collections have justified concerns regarding the choice of the right phono cartridge—and the company that makes them. This is one detail that cannot be overlooked! Benz Micro in Switzerland, a world leader in cartridge manufacturer and design for over 20 years, features a wide range of products, upgrade and re-tip services that will keep you playing records well into the 21st Century.

Located on the Rhine river across from Germany, Ernst Benz started his business in the ‘70s as the leading supplier of diamond styli to American (Shure, Pickering, Empire) and European (Ortofon) cartridge companies. Today Ernst Benz and Albert Lukaschek focus on designing and manufacturing high quality Moving Coil designs in all price ranges. OEM clients for cartridges and internal assemblies include Madrigal, Cardas, van den Hul and Wilson-Benesch.

Benz Micro cartridges are hand built using powerful microscopes and tested at the Swiss factory. Special machines were designed for winding high-purity, ultra-fine copper wire to iron and ruby coils no larger than a 2mm square and attaching diamond styli to laser cut, solid boron rod cantilevers.

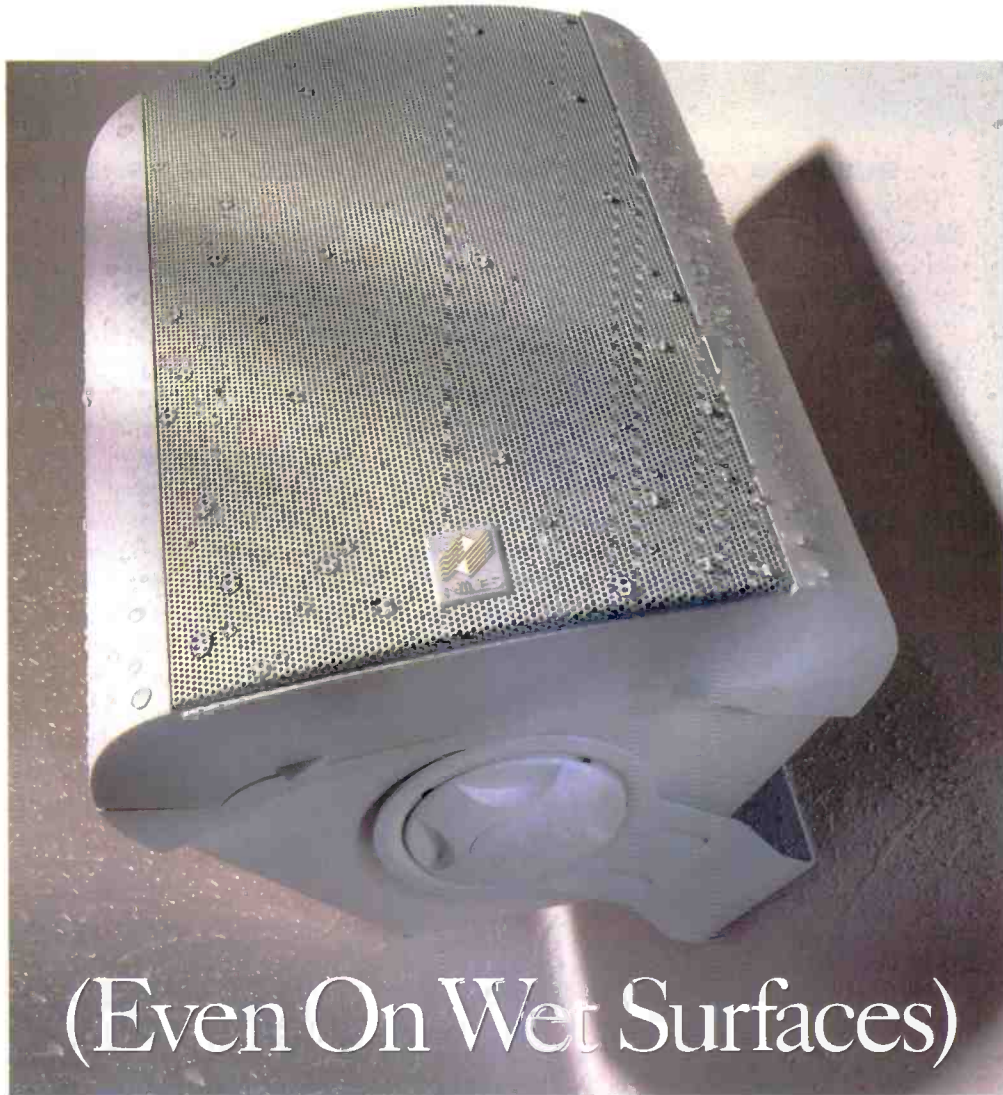
Benz Micro exclusively offers MC designs ranging from \$150-\$3,000. Most are available in low output and high output versions, allowing an ideal interface to MC and MM phono stages. All Benz phono cartridges are distinguished by their flat frequency response, wide channel separation and great trackability. Unlike the MC cartridges of old, Benz Micro cartridges offer optimum performance for a wide variety of tonearms and phono pre-amps. The resolution and spatial reproduction make them ideal for two-channel and surround systems.

The sophistication of the Benz Micro factory and its in-house facilities allows cost effective re-tip service for the Benz line as well as upgrade programs to more



Part of the Benz Micro cartridge lineup.

Corners Beautifully.



Tapered to tuck neatly into corners and under eaves, the OS-10 comes with a clever pivoting bracket that provides endless mounting solutions.



Tough enough for marine applications and beach-front living. Exceeds military anti-corrosion specs (MIL-STD-883D).



ElastoDynamic™ Hybrid Dome Tweeter
Impervious to moisture, Niles' unique tweeter design offers extended frequency response with stunning detail and clarity.

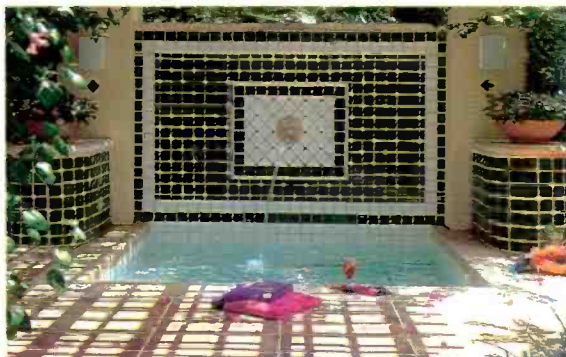
(Even On Wet Surfaces)

Niles' speaker engineers are driven to design the very best. The result is *unparalleled* performance—sonically, visually, and functionally. The Niles OS10 Indoor/Outdoor Loudspeaker will exceed all of your expectations.

Sonically. The OS10 handily outperforms many traditional bookshelf speakers. Much of its superb sonic character comes from its unique tweeter design. Constructed from a composite matrix of elastomers and natural fiber substrates, the **ElastoDynamic™** tweeter yields extended frequency response with stunning detail and clarity. But to be a great speaker, you need great bass. Here the OS10 shows its true horsepower thanks to its injection-molded, polypropylene Woofer cone, supple butyl-rubber surround, and powerful magnet structure.



Visually. The OS10's aerodynamic shape speaks for itself. But what may not be readily apparent speaks just as loudly.



the sun's rays. The grills and brackets are aluminum; the connectors are gold-plated; all the hardware is brass or stainless steel—this speaker will not rust! And Niles guarantees it for two years—that's twice as long as most manufacturers.

For the name and phone number of your nearest authorized Niles dealer call 1-800-BUY-HIFI (1-800-289-4434).

The OS10's tapered enclosure tucks neatly into corners or under eaves, complementing any decor—inside or out. Its clever pivoting bracket (standard equipment on the OS10) gives you endless mounting solutions. Available in white or black, either finish is paintable for a truly custom look.

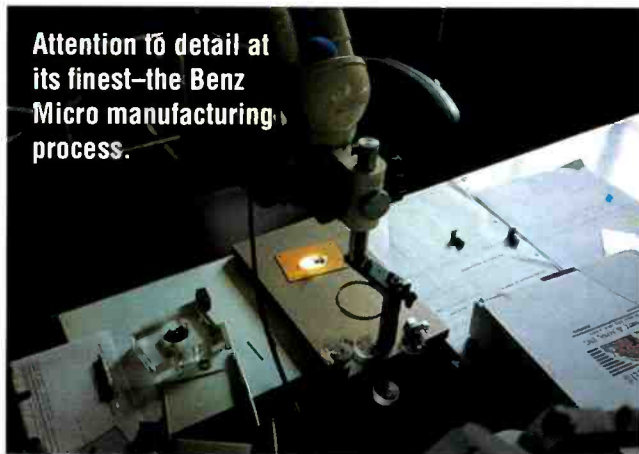
Functionally. We don't take the term "weather-proof" lightly. The OS10 is designed to withstand extreme climates—from Minneapolis to Miami. Its rugged, non-resonant cabinet is totally sealed (insects or moisture can't creep in) and will not fade under



Niles Audio Corporation, Inc.
P.O. Box 160818 Miami, FL 33116
In Canada call Aralex Acoustics, Ltd. (604) 528-8965
Internet: www.nilesaudio.com



Attention to detail at its finest—the Benz Micro manufacturing process.



expensive models. This complements Swiss precision and the very Swiss concept of lifetime ownership. Benz now offers special versions of their cartridges in Mono and with 78 rpm styli, serving the needs of the comprehensive collector.

"As long as music lovers worldwide want to play their cherished collections, we will continue to support them with the finest phono cartridges—no problem," said Albert Lukaschek, designer and Managing Director.

WIRES AND STONES

"Audio enthusiasts search constantly for ways to improve their systems. Shakti electromagnetic stabilizers and on-lines delivers more of the music and less of the noise," said Ben Piazza, inventor of Shakti "Stones." He proudly notes his invention is embraced by recording producers around the world including Paul Baily, Classical Mastering Engineer of Abbey Road Studio, Doug Sax of The Master Lab in LA, Stan Ricker, Phil Taylor of Pink Floyd's Astoria Studio, DCC's Steve Hoffman and many others. "This is not an audio-ophile toy," Mr. Piazza said. "It works."

Shakti electromagnetic stabilizers and on-lines are used on components and cables respectively to absorb electromagnetic interference (EMI) in audio/video systems. Mr. Piazza explains that this U.S. patented technology, which is placed near the component or cable, not plugged in, absorbs and dissipates parasitic noise fields that rob your system of its maximum resolution potential.

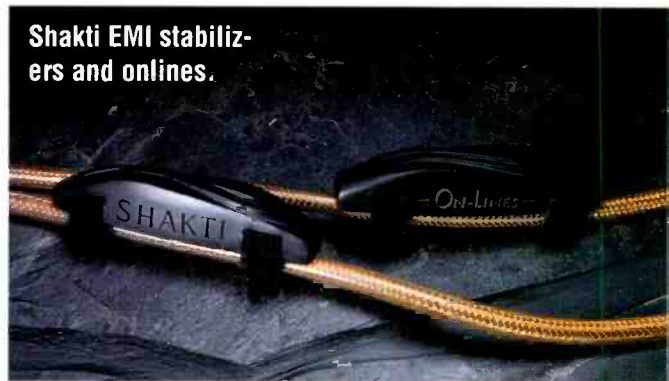
Why Shakti? The name was chosen because it means energy and this technology is an energy conversion device—it converts electromagnetic fields to non-interfering heat, Mr. Piazza explained. Unfortunately, the unusual name combined with a unique high Q radiated field absorption that eliminates the need for connection directly in the signal path, has led some to lump Shakti with tuning devices of questionable scientific credibility. In addition to a white paper, independent lab tests that verify attenuation of EMI are available that clearly show no effect on music signals (hence no tuning effect) but instead a reduction of noise that can improve dynamic contrasts and spatial coherence.

Perhaps the best gauge for judging these products (besides your own ears) is the unprecedented endorse-

ment and use by renowned recording and mastering engineers. This gold stamp of approval is from professionals who work with master tapes. They applaud Shakti as a much-needed EMI "sink" to maintain sonic purity throughout the recording chain. The goal of Shakti technology is to continue that musical purity in home systems as well, Mr. Piazza added.

The scientific principles Shakti's design is based on understood laws relating to the mutual coupling effects of electromagnetic fields. Because Shakti is placed closely to the host component, its abilities to act as an antenna for the ultra high frequencies is profound. Three groups of "antennas," each group covering a separate frequency range, are incorporated into Shakti. The first group is specifically for microwave fields, the second for RFI and the third for lower wavelength external fields around power supplies. And Shaktis are very affordable, starting at \$99.

Shakti EMI stabilizers and onlines.



HOLD THOSE COMPONENTS!

"I've been in the audio business for 26 years and have always felt a need for versatile cabinets that display equipment instead of hiding it," said Karen Sanders. And she knows an encyclopedia's worth of information about form and function since she co-founded Martin-Logan, Ltd over 10 years ago. "Through the use of quoins, Encase's beautiful hardwood cabinets can be rearranged in many ways to fit individual tastes and the environment of the owner—without tools.

"The Encase Block & Quoin system sets a new standard in form and function. A lot of thought, hard work and nurturing have gone into the design and manufacture of these cabinets. They are built for a lifetime of beauty and adaptability, regardless of any changes in technology or in a person's lifestyle."

Besides offering stability and ease of assembly, the patent-pending quoins are recessed between each cabinet, giving them added dimension and a floating texture. Just as important for enthusiasts, the cabinets have dual channels with hook and loop fasteners on the back to secure and hide cords. There are open backs for heat dispersion, to preserve the life of valuable components.

The quoins also add flexibility which is the key to the

“As long as music lovers want to play their cherished record collections, we will support them with the finest phono cartridges—no problem.”

Albert Lukaschek,
Benz Micro



CABINETS THAT ADD, SUBTRACT, MULTIPLY AND DIVIDE.™



If you've ever changed your mind, these are the cabinets for you. The first high quality, expandable system that you customize to meet all your audio, video and computer needs. Make it vertical or horizontal. The Encase™ look is built-in without the built-in cost.

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hides, holds, separates cables*



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divide units without tools*



Desk Bridge
*Easy addition for desk,
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www.Encaseltd.com



The new Encase audio/video cabinets.

Encase system of A/V furniture. They allow you to stack cabinets horizontally or vertically with complete stability, durability and ease. Rearranging is also quick and can be done without tools and allows you to shape the Encase system to your needs. Each Encase System cabinet has a two-inch square cord channel on both backside corners. It keeps all cables neat and hidden from the side and front. And clean cable routing lets you easily reconfigure your system.

For added flexibility, Encase offers a desk bridge that can be used for a big-screen TV or computer. Drawers are available for CDs, tapes and vinyl. Three finishes are available so the furniture can fit anywhere. They include unfinished maple, lacquered maple, and cherry stained lacquered maple.

A GREAT TOOL FOR ENTHUSIASTS

One of the challenges confronting audio enthusiasts is speaker placement—whether it's a stereo pair or six-speaker surround sound system. Now modern technology provides a scientific tool for discriminating listeners. The Sound Alignment-System (SA-S) from Checkpoint Laser Tools is a unique kit that helps deliver peak performance from your loudspeakers.

"Many audio enthusiasts will spend anywhere from several hundred dollars to several thousand dollars on

speakers then 'guesstimate' their proper placement and alignment, never realizing that precision can be achieved so easily and inexpensively," said Checkpoint president, Jim Webb. "For under \$150, the user can invest in a good-to-great speaker system and achieve the kind of sonics the manufacturer intend through proper alignment and placement."

The tool allows you to quickly move from speaker to speaker, locking in the directional sound to your exact listening location. For even greater utility a laser dot gives a good indication of speaker or monitor housing stability under varying load through a simple visual check of the dot's movement.

Exact component placement, degrees offset and directional criteria can be quickly achieved. The SA-S protocol includes angle layout guides, layout ploy sheets, layout design forms and easy-to-follow instructions.

The system includes the 770 SA-S laser tool, a Mag Alignment switch that magnetically attaches to base plates for hands-free operation and a standard alignment switch (nonmagnetic) that provides a flush face to set alignment from any surface of the speaker housing without a base plate or magnetic attachment. Also included are "stackers" that interlock with the standard base plate for stand-off adjustment to clear speaker frames or protrusions. The stackers also bring the base plate flush to the grille, so the SA-S work can be done without removing grilles.

Initially introduced as part of a certification program for custom installers and dealers, the consumer version of the SA-S System, features a specialized alignment laser tool, accessories, procedures and instructions to let you align and directionalize sound systems with pinpoint laser accuracy. The pro version is endorsed by THX and home theater installers for home and commercial use.

"The SA-S system is the most innovative and unique development in the audio world since the cone speaker itself," said Jim Webb, Checkpoint president.

SINGING IN THE RAIN...

"Combining superior components and making them work seamlessly together is one of our driving philosophies," said Al Burdett, VP Marketing, Niles Audio. Niles Audio is well known for excellent loudspeakers—particularly architectural and indoor/outdoor models. They also offer a wide variety of controllers and distribution products for great audio and video anywhere in the home. "People must realize multi-room A/V systems are no longer a rich man's luxury; integrated audio lets you affordably enjoy your favorite music in any part of the home."

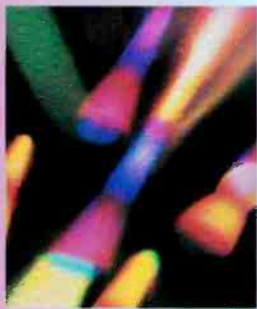
The Niles IntelliPad is a programmable, wall-mounted IR keypad system that provides an LED power status display and one-touch remote control of complex A/V systems. The



The Sound Alignment-System by Checkpoint.

"I've been in the audio business for 26 years and have always felt the need for versatile cabinets that displays equipment instead of hiding it."

Karen Sanders
Encase Block &
Quoin Systems



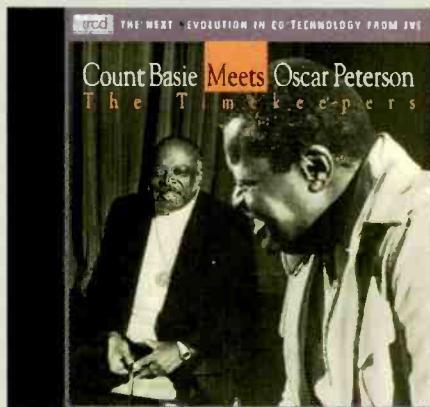
JVC proudly offers three new releases in its xrcd2 series



**SARAH VAUGHAN
CRAZY AND MIXED UP**

Originally released in 1982, this session features the by-then legendary Sarah Vaughan backed by an exceptional quartet featuring Joe Pass on guitar, Roland Hanna on piano, Harold Jones on drums and Andy Simpkins on bass. Notable for having been produced by Vaughan herself, "Crazy and Mixed Up" features eight tracks, each bearing the vocalist's distinctive stamp.

JVCXR-0204-2



**COUNT BASIE MEETS
OSCAR PETERSON
THE TIMEKEEPERS**

This classic recording pairs two stylistically dichotomous piano legends. Count Basie, the master of understatement, and Oscar Peterson, the partisan of power and embellishment, are matched on this project originally recorded in 1978. The resulting collaboration allows each of these two piano greats to find balance in the common denominator of — as the title indicates — the observance and interpretation of time. Also featured on this landmark session are drummer Louis Bellson and John Heard on bass.

JVCXR-0206-2



**TIGER OKOSHI
COLOR OF SOIL**

Trumpeter Tiger Okoshi's homeland of Japan has never been far from his heart. He was visiting in January of 1995 when the devastating Kobe earthquake struck. His reaction to the resulting physical and emotional ordeal has been captured musically on "Color of Soil," his latest release for JVC Music and his first project recorded exclusively as an xrcd. Recorded live directly to two-track and produced by Akira Taguchi, this striking set also features the talents of Kenny Barron on piano, Jay Anderson on bass, Mino Cielu on percussion and Hank Roberts on cello.

JVCXR-0207-2

listen and compare.

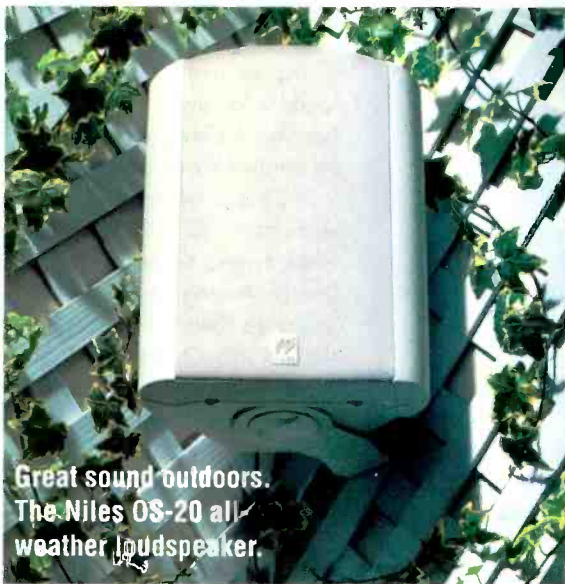
To find out more about xrcd visit our web site at: xrcd@jvcmusic.com

JVC Music 3800 Barham Blvd., Suite 305, Los Angeles, CA 90068 phone: 213.878.0101 facsimile: 213.878.0202



“People who spend thousands on speakers then guesstimate placement and alignment, never realize that precision can be achieved easily and inexpensively.”

Jim Webb,
Checkpoint

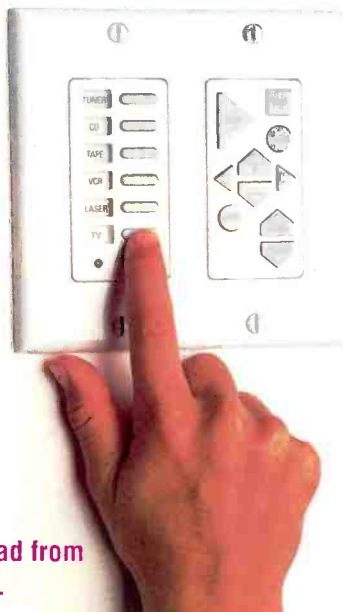


Great sound outdoors. The Niles OS-20 all-weather loudspeaker.

IntelliPad's microprocessor maintains a proper sync between user and component by sensing the on/off power status of the preamp/receiver and issuing the power command only when necessary. The built-in speaker relay mutes all speakers connected to any keypad not used. It offers convenient single-button operation, Burdett noted. And installation is fast and simple. "It's fool proof automation.

"We know people also want to experience great sound outside, that's why we developed the critically acclaimed OS Series of indoor/outdoor speakers," Mr. Burdett said. The new OS-20 is a 6 1/2-inch two-way system coupling Niles ElastoDynamic 1-inch fluid-cooled tweeter with a high-output woofer. The result is a frequency response of 68 Hz-21 kHz with a flat FR (+/- 2 dB between 100Hz and 10 kHz). The efficiency rating is 91 dB with 1 watt @ 1 meter. Beyond specifications, the weather-resistant speakers produce a life-like, accurate sound.

Niles Audio makes highly regarded architectural in-wall speakers. The newest member of the family is the



The IntelliPad from Niles Audio.

AT Advanced Technology lineup. "Our mission was to design loudspeakers that would satisfy the most discriminating audiophile listeners," Mr. Burdett said. The new top-of-the-line AT8700 features an extremely rigid three-layer composite made of aluminum, titanium and urethane. And to guarantee the best imaging, the tweeter and midrange assembly of all AT Series speakers rotate 360 degrees and pivot 30 degrees.

BETTER CD SOUND

Every enthusiast knows great source material—whether it's a compact disc or vinyl—is a critical key to superior sound. One company in the vanguard of this movement is JVC Musical Industries and their widely praised XRCs—Extended Resolution Compact Discs. Simply put: they deliver better sound by enhanced mastering and manufacturing techniques.

"I'm crazy about good sound," said Akira Taguchi, a JVC Music producer. "And I'm always trying to make recordings better. But it not only takes good master recordings but good people manufacturing the discs too." How important was one over the other? "Fifty percent each," Mr. Taguchi noted.

Buyers' Guide

For additional information, please call, write or visit the sites detailed below:

Benz Micro Musical Surroundings
5856 College Ave.
#146
Oakland CA 94618
510 420 0379
www.musicalsurroundings.com

SA-S by Checkpoint Laser Tools
4025 Spencer St.
#304
Torrance CA 90503
310 793 5500
www.checkpoint3d.com

Encase Block & Quoin Systems
P.O. Box C
Lawrence KS 66044
913 331 3400
www.encaseltd.com

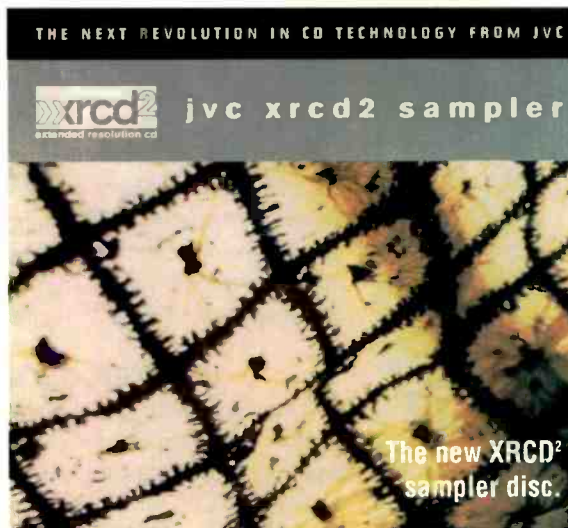
JVC Music
3800 Barham Blvd.
#305
Los Angeles CA 90068
213 878 0101
800 JVC 1386
www.jvcmusic.com

Kimber Kable
2752 S 1900 W
Ogden UT 84401
801 621 5530
www.wbt-usa.com

Niles Audio
PO Box 160818
Miami FL 33116
800 BUY HIFI
(289-4434)
www.nilesaudio.com

Shakti Audio Innovations
2405 Cloy Avenue
Venice CA 90291
310 459 5704
www.shakti-innovations.com





Now, just two years after introducing the audio world to the high-end recordings with XRCDs, the producers and engineers at JVC Music have found a way to further improve their mastering and manufacturing process. The results can be heard on a new series of recordings—XRCD²—which offers clearer definition, more accurate imaging and higher audio quality than any compact disc to date, Mr. Taguchi said. And as with the entire XRCD series, no proprietary chips, processors or CD players are required to hear the improvement.

The primary sonic difference between the original XRCD and XRCD² is the use of a newly designed piece

of equipment, the Digital K2 Regenerator, developed by Toshiharu Kuwaka, the inventor of the original K2 recording.

JVC Music will release an XRCD² sampler featuring tracks from JVC artists such as Carmen Lundy, Ernie Watts, Hiroko Kobuku, The Bill Holman Band and Tiger Okoshi. Among the first XRCD² releases are John Coltrane's "Settin' The Pace" and "Concorde" from the Modern Jazz Quartet. Also due are Sarah Vaughan's "Crazy & Mixed Up," "Count Basie Meets Oscar Peterson: The Timekeepers" and Tiger Okoshi's "Color of Soil."

Currently only one Digital K2 exists, which is used in the mastering and manufacturing steps of the XRCD² process, making it necessary to ship the machine back and forth between the A&M Mastering and the JVC manufacturing plant in Yokohama, Japan. The XRCD process is truly a global effort, combining the talents of U.S.-based producer Akira Taguchi and the engineering expertise of A&M Mastering's Alan Yoshida with the reputation and experience of Shizuo Nomiya and Toshiharu Kuwaoka of JVC's Japanese manufacturing facility.

"Like all audiophiles, we care about music and I'll spend days working on a master," Mr. Taguchi said. "And it's worth every minute when you listen to great music."

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EDWARD M. LONG

SONY MDR-F1 EARPHONES



Sony makes a complete line of earphones, from little ear-bud types to full-sized models, some of which are used by studio recording engineers. I used Sony's MDR-E565 ear buds when preparing an article on absolute polarity ("Upside-Down Sound," July 1996); though very inexpensive, they were good enough to make the effects of polarity reversal audible. So I was eager to evaluate Sony's MDR-F1 full-size earphones, which are near the top of the company's line.

The MDR-F1s are open-air earphones, whose earcups are not completely sealed. This enables outside sounds to reach your ears but reduces the "canned" sound that sealed earcups have often been known to cause. However, open-air earphones that sit right on your ears can be uncomfortable for long-term listening. Models like the MDR-F1, whose earcups completely encircle your ears, are more comfortable but can give the sound a slightly "canned" quality.

When I took the Sony MDR-F1 earphones out of the box, I was struck by their unusual appearance. While the soft, simulated-leather earcushions fit around the outside of your ears, the transducers are cantilevered away from the magnesium-alloy earcushion rings, so that there's nothing but air around them, and are angled about 15° from the cushions. When I put the earphones on, this angle seemed just right, placing the transducers against my ears, as they should be, but exerting no pressure against my ears.

Thanks to this clever design, the MDR-F1s are the most comfortable earphones I have ever worn, even for long-term listening—and they manage that without sounding the least bit "canned." In fact, every member of the listening panel I use in reviews commented on how comfort-

**THE SONY MDR-F1s ARE
THE MOST COMFORTABLE
EARPHONES
I HAVE EVER WORN.**

able the Sony MDR-F1s were. They were especially enthusiastic about the way the Sony adjusted itself to their heads, with no need to fumble with detents as they've had to with other 'phones. This made switching between the Sony MDR-F1 and others used for listening comparisons fast and easy.

Transducer Design: Dynamic, 0.5-cm dome.

Coupling to the Ear: Circumaural (open air).

Rated Frequency Range: 10 Hz to 30 kHz.

Nominal Impedance: 12 ohms at 1 kHz.

Rated Sensitivity: 100 dB/mW.

Rated Power Handling Capability: 700 mW.

Weight (Without Cable): Approx. 7 oz. (200g).

Price: \$299.

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Photos: Michael Groen

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The heart of the MartinLogan product line is our proprietary CLS™—curvilinear line-source—electrostatic technology. This unique assembly consists of an extremely low-mass diaphragm which floats between two perforated metal plates called stators. The application of an electrostatic charge enables the diaphragm to move at a level of accuracy and at distortion levels traditionally associated with only the finest audio electronics. The CLS™ projects a 30 degree phase coherent wave-front producing a wide listening area with minimal room interaction. This ground breaking transducer is unequalled in its ability to reveal previously hidden harmonic detail, the experience of which suspends disbelief.

MartinLogan's electrostatic innovation enables our unique hybrid technology to crossover at a single point, conservatively 2-3 octaves lower than traditional dynamic driver loudspeaker systems—considerably lower than the most fragile audio information. The resulting upper range and low bass spectral components are seamlessly recombined. Each sonic event appears powerfully and brilliantly against a deep and continuous stage extending infinitely in 3 dimensions.

The reQUEST and AERIUSi systems exemplify the exhaustive engineering in electrostatic transducer, dynamic driver, and crossover technology, required to manifest this new standard in reference sound reproduction. Remarkable efficiency, impedance stability, and superior power handling make CLS™ technology appropriate for use with a broad range of amplifiers. Outstanding attention to design and detail along with strict attention to fit and finish have resulted in uncompromised form and function—with surprising affordability.

When you become disenchanted with the ordinary, I invite you to audition MartinLogan CLS™ hybrid electrostatic loudspeaker technology. Experience music as it was performed—experience audio as it was recorded—experience the electrostatic technology.

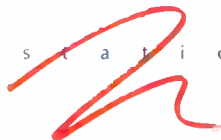


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That ease of adjustment stems largely from the felt-covered, duraluminum headband, which is so flexible that the earcushion rings need no horizontal pivots (though they do pivot 30° vertically)—their position adjusts automatically when you put the earphones on your head. Other aspects of the MDR-F1's construction also contribute to its comfort and appearance. The foam earcushions that encircle your ears have an inside diameter of 2 7/8 inches, which should be adequate for most people, and the simulated leather that covers them is

**SONY'S MDR-F1
EARPHONES ARE ABOUT
AS OPEN AS OPEN-AIR
HEADPHONES CAN GET.**

softer than the felt often used for this purpose. You can remove the earcushions for cleaning. The front of each transducer assembly has a soft pad (which apparently adds some acoustical resistance), covered with silver-colored cloth that matches the F1's overall silver motif. The back of the transducer mounting ring is covered by a black open mesh. The very flexible earphone cord is 11 1/2 feet long and is permanently attached to the left earcup. As usual with Sony's large 'phones, the cord ends in a 1/8-inch stereo miniplug and a screw-on 1/4-inch phone-plug adaptor is provided; both are gold plated.

The earphone diaphragms are made of polyester, 16 micrometers thick, and are designed to allow the high-amplitude excursions necessary to produce deep bass. The voice coils are of oxygen-free copper wire. Neodymium magnets keep the flux density high while keeping the weight low. The manual briefly describes an "Acoustic Bass Lens" that directs the flow of bass energy to the center of the earphone transducer so that more of it will reach your ears.

The manual also discusses the problem of matching the impedance of the earphones to the amplifier that is driving them, especially in the bass range. It says that the MDR-F1s have impedance compensators that overcome this problem but does not describe what they are. The im-

pedance was very uniform with frequency, except for a slight rise in the bass. When I fed the MDR-F1s from a 100-ohm source instead of from an amplifier with low output impedance (less than 0.2 ohm), the level dropped about 17 dB, but the shape of the response curve was essentially the same whether the source impedance was zero or 100 ohms; the only real difference was slightly more extended bass from the 100-ohm source.

The MDR-F1's amplitude-versus-frequency response was very uniform from 100 Hz to 1 kHz, with a gradual rolloff below 100 Hz; it was down about 8 dB at 40 Hz, the low-frequency limit of my test. The response also showed a 2-dB rise from 1 to 2.5 kHz, centered at 2 kHz. Above 2.5 kHz, the response shelved down about 5 dB, with relatively uniform response out to 20 kHz, except for a very narrow 6-dB dip at 8 kHz.

Although Sony claims an output of 100 dB SPL for an input of 1 milliwatt, I measured the sensitivity of the MDR-F1 earphones to be 94.3 dB at 1 milliwatt, 5.7 dB lower than specified. However, the MDR-F1's very low impedance, about 18 ohms, makes them sound louder than earphones with higher impedances, because the MDR-F1s will draw more power from a constant-

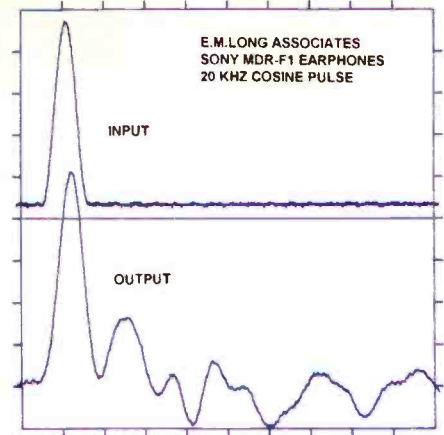


Fig. 1—Cosine-pulse test: input (top) vs. output.

voltage, low-impedance source. (The DC resistance was 17.6 ohms for the left channel and 18.2 ohms for the right.)

The left and right earphones were matched within less than 1 dB up to 2.5 kHz; above 2.5 kHz variations in each earphone's bumps and dips caused slightly larger differences, still never more than 2.5 dB. The reasonably close matching of the left and right channels up to 2.5 kHz should produce an excellent sound field with very stable images through the bass and midrange.

EARPHONE EVALUATION

PARAMETER	RATING	COMMENTS
Overall Sound	Very Good	"Brighter than reference 'phones," and "Similar sense of space"
Bass	Very good	"Very good," "String bass sounds similar," and "Bass very tight"
Midrange	Good	"Trumpet is slightly sharper," and "Brass is brighter"
Treble	Good	"Cymbals are close to reference," and "High sounds are very slightly duller"
Overall Isolation	Low	"No isolation from outside sounds"
Bass	Low	"Rumble and other low sounds are easy to hear"
Midrange	Low	"Conversation is easy"
Treble	Fair	"High-frequency sounds slightly reduced"
Comfort	Excellent	"Excellent comfort," and "More comfortable than other 'phones"
Value	Excellent	"Excellent value for the quality of the sound"

GENERAL COMMENTS: Sound is very precise and detailed during loud passages. Instrument placement is very stable. Sonys are a little brighter than the Stax Omegas. Excellent comfort for long-term listening. Excellent value.

Figure 1, the MDR-F1's response to a positive-going 20-kHz cosine pulse, indicates that it does not invert polarity. The initial part of the output pulse is very similar to that of the input pulse, which confirms that the Sony's high-frequency response is extended, but the output pulse's slow recovery indicates that low-frequency output continues a little longer than it should after the pulse ends.

After completing my measurements, I asked members of a listening panel to compare the sound of the MDR-F1 earphones to the sound of the considerably more expensive Stax Omega earphones and write their impressions while listening to four different musical selections. For a full orchestral recording, I chose Rimsky-Korsakov's "Dance of the Tumblers," performed by the Minnesota Orchestra conducted by Eiji Oue, from the *Tutti!* sampler (Reference Recordings RR-906CD). Panel-member comments were: "bass similar to reference," "bass slightly less deep," "brass brighter than reference," "violins less smooth," "strings brighter," "clarinet more forward," and "similar sense of spaciousness."

The next selection was Carl Maria Von Weber's Variations on a Theme From Silvana, Op. 33, performed by the Chamber Music Society of Lincoln Center, with clarinetist David Shifrin and piano accompaniment by David Golub (Delos DE 3194). This more intimate-sounding recording drew these comments: "clarinet more forward," "clarinet more breathy," "less honky than reference," "piano slightly glassier," "brighter partials on piano tone," and "good room sound, like reference."

The "C-Jam Blues," on *dmp Big Band Salutes Duke Ellington*, dmp CD-520, recorded by Tom Jung, features that big band sound of the '40s, with blaring brass and a solid bass line. Comments were: "bass good but not as deep," "string bass overtones more realistic," "brass slightly more mellow," "trombone better balanced," "clarinet clearer," and "violin slightly smoother."

"Puttin' on the Ritz," with a vocal by Margie Gibson accompanied by Lincoln Mayorga at the piano, from *Say It with Music* (Sheffield Labs CD-36), offers an excellent test for articulation. Comparing the

sound of the MDR-F1 to that of the Stax Omega reference elicited these comments: "voice slightly less articulate," "voice a little less clear," "voice close to reference," "piano overtones slightly less," "string bass less deep," and "cymbals close to reference."

My reaction to the Sony MDR-F1 earphones was generally positive. As I mentioned previously, I found them to be very comfortable; the listening panel members were in total agreement and volunteered positive comments without being asked. These earphones do a fine job reproducing the sound of drums and string bass. I found the midrange a little on the aggressive or forward-sounding side, so I was surprised that the Sonys sounded excellent on the dmp Big Band recording, with its very prominent brass. On the vocal by Margie Gibson, the MDR-F1 earphones had very slightly less articulation than the Stax Omega earphones.

At \$299, the Sony MDR-F1 earphones are an excellent value. But don't take my word for it. Take some familiar CDs and audition them for yourself. I think you'll agree with me. A

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ENERGY TAKE 5 HOME THEATER SPEAKER SYSTEM

Speaker enclosures are all about bass. Whether a box is big or small, ported or sealed, has to do with taming those bottom octaves—by separating the front and back waves so they can't cancel each other out or by manipulating the back wave so it reinforces the front.

Take the grille off most speakers and you'll see that the driver or drivers that handle the

no compelling reason for them to be mounted in the same box as the woofer. Indeed, there have been a number of speakers marketed over the years where the higher-frequency drivers had their own separate enclosures.

Companies such as B&W and Magnat have used this arrangement for years, with the woofer in its own box and the other drivers in theirs. In such cases, the separation often

the idea wasn't new then. The principle behind it is so sensible that it's astonishing that sub/sats remained little more than curiosities for so many years.

The idea is that, although positioning of the high-frequency reproducers is critical for proper imaging, the low bass is almost totally omnidirectional and difficult to locate aurally. That means there is no reason for it to be produced at the same physical spot as the other parts of the spectrum. Since it's very unlikely that the ideal speaker position for the upper frequencies is the same as for the bass, separating them enables you to place each type of speaker in its optimal location.

Another advantage is that the satellites can be quite small and unobtrusive, even though up front and visible (if you can't see them, you won't be able to hear them properly either). And the subwoofer, although much larger, can be tucked out of sight. A plus is that in many rooms you need only one bass reproducer rather than the duplication typical of full-range speakers.

That previously mentioned '70s sub/sat system was designed back then for reproducing

**THE TAKE 5 PROVES YOU
DON'T NEED SPEAKERS
THE SIZE OF FRIGDES
TO GET IMPRESSIVE
HOME THEATER SOUND.**

two-channel stereo, and although its satellites were somewhat smaller than conventional bookshelf speakers, the configuration did require three speakers in the room rather than two. The requirement to add speakers has usually met consumer resistance: The transition from mono to stereo was not always an easy one, and the extra speakers required are often cited as a main reason for the failure of quadraphonic sound.

seems to have been mostly a matter of cosmetics. From a practical point of view they shared one drawback with single-box systems: The enclosures were attached to one another, so the positioning of the combination involved working out a compromise between optimum imaging and good bass

midrange and high frequencies occupy relatively little real estate on the baffle; in fact their backs are usually closed so they are isolated from the interior of the cabinet. Except for convenience and aesthetics, there is

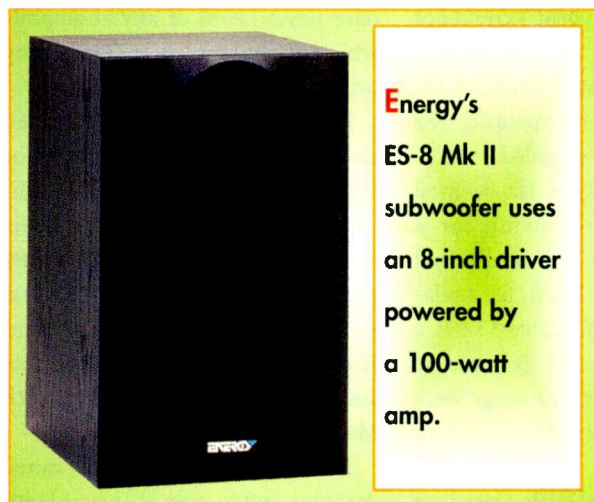
performance. It is rare that one location will be ideal for both.

The solution to that has been with us for decades, however. I encountered my first subwoofer/satellite system some 25 years ago, and I'm sure

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Home theater changed all that. Except for the most exotic (and expensive) systems, there was little hope that anybody would put up with five full-sized speakers in their listening rooms, so the subwoofer/satellite arrangement finally came into its own. The notion of five small speakers dotted around the room, with one woofer to provide bass for all of them, made it all possible.

Even so, many satellites are still fairly large and require a large amount of space to accommodate them. Some, in truth, work quite well as full-range speakers and require the subwoofer only for the lowest sounds, but systems like Energy's Take 5 prove that satellites can be made truly tiny without a serious compromise in audio quality.



The name Take 5 is meant to evoke movie language (I always think of Dave Brubeck, myself), as the system is definitely meant for home theater use. All five speakers are packed in a single carton. They consist of a Take 1 center-channel speaker and four identical Take 2 speakers for front left, front right, and two surround channels. The list price is a very modest \$500 for the set.

The Take 2 front/surround speaker is tiny: just 7 inches tall x 4 inches wide x 5 inches deep. Available in black or white, it's a sturdy fiberboard sealed box with an attractive high-gloss finish and a fabric grille. The drivers are a ¾-inch dome tweeter and a 3½-inch carbon-graphite woofer. Each speaker contains its own high-pass filter, has heavy-duty binding posts, and is supplied with mounting hardware.

The Take 1 center speaker would share the same footprint as the Take 2 if stood on end, but its length is 10 inches to accommodate a second woofer. Otherwise, it dupli-

cates the specifications of the other speakers in the set (except it's available only in black). You can buy the Take 1 separately for \$150, and extra Take 2s can be bought for \$180 a pair to create, say, a seven-channel system.

The response of all the speakers is rated to a low-frequency limit of 140 Hz—not surprising, given their size—so a subwoofer is an absolute necessity. Curiously, there is no dedicated subwoofer for the system, but Energy offers a range of three models appropriate for use with the Take 5 array. The one most commonly used is the ES-8 Mk II, which is sold with the Take 5 system for a total of \$800. Stepping up to the 10-inch ES-10 Mk II adds another \$100, and the 12-inch (ES-12 Mk II) is \$200 above that. I auditioned the system using the 8-inch ES-8 Mk II.

It's a modest-sized ported sub, 16 x 10 x 11 inches, with a black wood-grain cabinet and an integral 100-watt amplifier. The back panel has the usual high- and low-level inputs, an output level control, and a low-pass filter adjustable from 50 to 100 Hz. The claimed frequency response is 29 to 100 Hz, ±3 dB.

I did notice one apparent anomaly: The ES-8 Mk II is recommended for use with the Take 5 array even though its nominal frequency response stops at 100 Hz and the satellite speakers' response reaches to only 140 Hz. In reality, this didn't prove to be a problem as those are only approximate figures: The sub does go somewhat higher and the satellites somewhat lower than specified. There were no obvious holes in the response in any case.

My encounter with the Take 5 and ES-8 Mk II combo was almost entirely subjective, but I did play a few spot frequencies through it just to check the limits, and to confirm that the satellite and subwoofer responses did meet their specifications. In doing so, I discovered that the sub still had lots of output down to about 30 Hz and remained faintly audible at 25 Hz, excellent performance for such a small box.

In fact, the first thing you notice about the combination is the robustness of the bass. This system need apologize to no one when it comes to communicating explo-

sions and crashing vehicles sounds. Because it's necessary to set the low-pass filter at its highest point, there was some localization of sounds at the subwoofer, but that was easily cured by moving it to the front of the room, which I recommend anyone buying this combination do.

That tiny restriction results from the satellites' small size, but that's their main attraction, too. In most rooms they can be almost invisible, and in the rather cramped conditions of my own listening room, their size meant that they could be placed farther apart than many larger satellites, with a corresponding gain in spaciousness.

Perhaps it should come as no surprise that the tonal matching from speaker to speaker was very close indeed, thanks to their being identical (or, in the case of the Take 1 center channel, nearly so). I had only once before listened to a system made up of truly identical speakers in my room and noticed then, as I observed again this time, that there is an indefinable seamlessness about such a setup. That was particularly apparent (and welcome) with Dolby Digital material, where the five full-range channels really benefit from a close speaker match. But it enhanced Pro Logic material as well.

Overall, I was impressed by the neutrality of these little speakers. My early listening was mostly to music, as it often is even with home theater setups, since that gives me a fairly accurate idea of what the speakers are actually doing; movies can be impressive but distracting. Using a number of familiar CDs and doing some informal A/B switching with my usual speakers, I was able to conclude that the Take 5 system was very well behaved. On some selections it did seem to have a slight forward quality in the midrange. But that's perhaps an advantage with movie sound and didn't seriously detract from my enjoyment of music.

With films, the Take 5 really pumped it out. It was possible to forget I was listening to such tiny speakers as the dramas played themselves out around my listening room. The power came from the remarkable little sub, but the satellites never seemed stressed either.

If nothing else, the Energy Take 5 system proves that you don't have to have speakers the size of refrigerators to obtain truly impressive home theater sound. You don't have to break the bank either. **A**

MARTIN-LOGAN CLS IIz SPEAKER

I don't normally evaluate two speakers from one company in close succession, but after reviewing Martin-Logan's reQuest (January 1998), a really good electrostatic-dynamic hybrid, I could not help but wonder how that company's latest full-range electrostatic, the CLS IIz, sounded.

The CLS IIz seemed worth reviewing for a number of additional reasons: It sells for a relatively affordable \$3,995 a pair, a very reasonable price for full-range electrostatics. The all-black version is perhaps the most stylish modern speaker in the American high-end market. Furthermore, the CLS IIz's performance specifications are not all that different from those of the late Quad ESL-63 (for which

Quad plans replacement models soon). The CLS IIz also incorporates significant advances that overcome some of electrostatic speakers' well-known problems while proving that, in the right context, other suspected deficiencies may actually not be problematic at all. For example, many electrostatics require a relatively thick plastic diaphragm that must be coated with a conductive slurry. The CLS IIz uses a lighter diaphragm material, with a vapor-deposited conductive coating only 20 angstroms thick, giving it very low moving mass.

Another common problem of traditional electrostatics is that their large diaphragms can make the upper octaves highly directional, or beamy, causing changes in timbre and soundstage shifts if you move even slightly. Martin-Logan, though, uses curved diaphragms that reduce beaming.

Like all electrostatics, the Martin-Logan has an AC power supply (built into its base) to provide the high-voltage DC that polarizes its diaphragm. In some of these speakers, this voltage has been known to arc. But the CLS IIz's stator element is uniformly coated with insulation rated to withstand 10,000 volts, and I have never heard of any audiophile who encountered a major arcing problem with a Martin-Logan.

Furthermore, I have auditioned electrostatics that were unreliable or whose performance decayed steadily with time, usually amid their manufacturers' denials that any problem existed. However, I had no such problems with my Quads and Acoustats and have never heard of such a problem occurring with Martin-Logans.

Electrostatics tend to have limited damping (often only at their edges), which can cause frequency irregularities. Some that I've auditioned could not handle reasonable power levels; others had acute mismatches between bass and treble energy, often due to the use of separate panels for each part of the audio range.

Finally, practical limits on diaphragm size restrict electrostatics' dynamics and deep-bass response. And the fact that most full-range electrostatics are dipolar, although advantageous in some listening rooms, can seriously impair bass energy and definition in others.

So why do I keep coming back to electrostatics, and why did I seek out

The CLS IIz's transparent diaphragm seems to disappear into the room.

T rue love is built on appreciation, not illusion: And when it comes to electrostatic speakers, I have no illusions at all. I have been fascinated with them since the 1950s and, over the years, have owned a pair of KLH 9s, stacked pairs of the original Quad electrostatics, Acoustats, and then Quad ESL-63s. In fact, I used the ESL-63s as my reference speakers for many years. (On the other hand, I must admit I have always used other speaker types as references and rely primarily on ribbon or dynamic speakers for that purpose.)

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the Martin-Logan CLS IIz? Well, you can't be a true high-end audiophile if you really believe in the laws of physics; hope (credulity) springs eternal. But what counts is that, with the right musical material, electrostatics can sound amazingly lifelike—and that one hell of a lot of real-world music listening takes place under conditions where the advantages of full-range electrostatics outweigh their disadvantages.

For example, electrostatics (even such relatively non-beamy models as the CLS IIz) tend to produce their best sound only within a small "sweet spot." But I don't mind having my listening area restricted if the sound is good enough. All good speakers have sweet spots; besides, how many places can you sit at the same time?

Most of the time, I really don't need the ability to realistically reproduce the full power of a symphony orchestra in my home. Further, I really don't need to hear all the power of a visiting grand opera, Glenn Miller's entire band, or the no-limits output of the power-oriented rock groups that primarily shape the musical taste of my eldest son. (His inheritance now depends on a cunning trust that will pay what he has coming to him only if he listens to four hours of classical music a day.)

There are many times, however, when I truly want to hear as much of the beauty of a piano sonata as possible, when I want to hear a string trio sound as if it were making an actual visit to my listening room, or when I want a great voice singing as he or she might actually sing at home. I want to be able to relax with a small, intimate jazz group or a really good rock or jazz guitar player and have the illusion that the performance is live. I want the pop music voices I have grown up with to sound the way they sound (or sounded) live. I want to clearly hear the differences between instruments of the same type from different makers. I want, in other words, the musical qualities that a good electrostatic can give.

And the Martin-Logan is a good electrostatic. Although it's not completely free of the limitations I've mentioned, it is a more advanced speaker in many ways than the

"great" electrostatics of the past. If you can accept its limits, it is also the cheapest true reference-quality speaker I know of. With the right recordings, it can also create an illusion of being at a live performance that few speakers in its price range can rival.

I am not sure that specifications really describe any speakers, particularly electrostatic dipoles. For the record, however, the CLS IIz is said to have response of 35 Hz to 20 kHz, ± 3 dB, and rated output of 86 dB SPL at 1 watt. Its nominal impedance is 4 ohms, and its 1.5-ohm minimum is at 20 kHz. Its diaphragm measures 24 x 48 inches, which is large enough to provide good frequency response and reasonable power handling.

The CLS IIz is 28 inches wide, 15 inches deep, and 58 inches high (and weighs 85 pounds), making it small enough to live with in typical home listening rooms. And, thanks to its quasi-transparent electrostatic panel, the CLS IIz has an exceptionally light and airy look that makes it seem to vanish into the room.

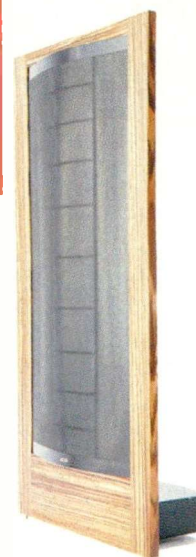
"Transparency" also summarizes the best qualities of the Martin-Logan's sound. With the right music—chamber music, small jazz groups that don't rely too much on deep bass, voice, solo instruments, or guitar—it can be absolutely superb. It is remarkably revealing yet remarkably musical, and its soundstage detail and ambience are excellent. Just as its visual transparency makes it disappear into the room, its sonic transparency seems to make it disappear

into the music. This is a fast, quick speaker with exceptional resolution. Side-by-side comparisons indicated that the CLS IIz does an even better job of resolving low-level detail than the Quad ESL-63 and

that its transparency is more consistent, particularly when playing loud. I cannot say that it's more transparent or faster than the best ribbon, dynamic, and hybrid speakers, but the CLS IIz is truly exceptional at the price and has a truly impressive coherence and musicality.

The CLS IIz also has more upper-octave energy than the Quad ESL-63 or most other electrostatics I have heard. In addition, the

Panel speakers like the IIz have shallow cabinets.



Martin-Logan's upper octaves are flatter, more extended, and—if I may mix my technological metaphors—more "ribbon-like" than the Quad's. This has advantages with really clean recordings that are not miked too close, but it also makes audible every touch of hardness in your signal sources and amplifier. Furthermore, as with any speaker that has an exceptionally flat treble but does not have an equally deep and powerful bass, there's a slight imbalance in the sound.

And while the CLS IIz has slightly faster and more lifelike dynamics than the Quad ESL-63 and other full-range electrostatics I have auditioned, it still has the inherent dynamic limitations of electrostatic panels. It simply will not accurately reproduce the loudest passages of full orchestra, loud jazz, and power rock.

Treble beaming also remains a problem, although the curved surface of the Martin-Logan CLS IIz provides reasonably good dispersion up to 30° off axis, and the problem is less severe than with most competing electrostatics. (The beaming of flat planar electrostatics like the Stax used to drive me nuts, as did the beaming of the tweeter in the original Quad electrostatic, which my wife hated because of the limited listening area in which it sounded its best and because small head movements altered the treble and imaging—not to mention her feeling that it looked like a cheap electric heater and had the visual appeal of a dead dog.) Perhaps because of its unique delay

**SIGNIFICANT ADVANCES
IN THE MARTIN-LOGAN
CLS IIz OVERCOME
SOME BASIC PROBLEMS
OF ELECTROSTATIC.**

circuitry, the Quad ESL-63's upper-frequency directionality was more forgiving than the CLS IIz's residual beaming. But the Quad's upper treble was less clear than the Martin-Logan's and usually sounded slightly rolled off because its dispersion became very narrow in the top octave.

The CLS IIz has good upper bass and acceptable mid-bass, but getting deep bass from full-range electrostatics always seems to present insuperable problems. I have used some extremely large electrostatic panels, at least twice the size of the CLS IIz, but they still were only good down to the edge of the deep bass and relied heavily on unpredictable room-reinforcement effects. What matters is not how low a speaker goes but how low it can go and still play reasonably loud—90 to 105 dB SPL in your listening room. As the Fletcher-Munson and later equal-loudness curves show, deep bass is really audible only if it's loud.

The only way I know to get around these bass and dynamic limitations in the CLS IIz would be to use a dedicated electronic crossover and a subwoofer whose performance characteristics precisely match the Martin-Logan's. The sound I got with some crossovers and subwoofers I had on hand was too colored to be an improvement. There are good reasons for the careful driver matching in hybrid designs like the Martin-Logan reQuest, which become apparent the moment you hear a slight hump or dip at the crossover frequency, phase problems, or deep bass from the woofer that is slower and less well defined than the bass from the electrostatic.

I found the CLS IIz to be relatively compatible with the rest of my system. It may not be the easiest load in the world, but then, some electrostatics I've tried have been such tricky loads that they shut my amps down. Most electrostatics are fairly inefficient, and while the CLS is moderately so, it still sounds slightly less efficient than specified. Nevertheless, every decent transistor amplifier I tried worked well with the CLS, and the strengths of each particular amplifier came through clearly without any exaggeration of their defects.

The CLS IIz proved to be a real joy with the Pass Aleph P preamp and Aleph 1.2 amp, and it got the best out of my Classé and Krell reference amps. Tube amplifiers with more than 100 watts per channel

worked well, and the sound with high-powered Audio Research and VAC amps came close to being magical. Speaker cables, though, may present more problems. The Discovery speaker cables worked very well, and the Kimber Select series provided excellent performance. However, a number of other speaker cables did not do as well, especially those cables I tried that were flat ribbons or had termination boxes.

Speaker placement requires the same degree of care and experimentation you'd devote to setting up any great speaker. You do need to be at least 2 meters from the CLS IIz, and 3 meters would be preferable. Your ears should be at least as high as the bottom of the electrostatic panel and preferably about halfway up it. You should also consider toeing the speakers in by 10° to 15°, but don't try to get absolute maximum treble by aiming the speakers directly at your listening position.

With proper placement, the CLS IIz really comes alive. Voices, strings, piano, woodwinds, brass, percussion detail, and musicality can be superb. With the right material (which, for the CLS, includes most of the musical repertoire), you have the feeling of actually being at a performance, rather than hearing through the equivalent of an acoustic window.

The CLS IIz also did a superb job of meeting the "next room test." Few speakers are good enough to make you feel that the sound really could be coming from a live instrument when you listen through a connecting archway. In that test you may lose all the soundstage detail, but it's quite revealing when it comes to transients, dynamics, timbre, and transparency. And the CLS IIz handled it very well indeed.

In short, this is a reference-quality speaker that can perform real magic with most recordings, despite its trade-offs. It has restricted frequency range and dynamics. It can deliver a superb soundstage, but only into a narrow listening area. It is too revealing to be kind to mediocre recordings, electronics, and players. Yet, nothing I know of in its price range can consistently provide the same mix of beauty and accuracy when reproducing music that live musicians might credibly perform in a home. No audiophile can totally ignore its limits, but the CLS IIz is a superb speaker that raises full-range electrostatics to new heights. A

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JADIS DPL 2 PREAMP



Share a thought for those manufacturers whose catalogs of products range from the insanely priced to the affordable. Why is it that we think of only the ludicrous stuff when such brands are mentioned? Then again, Jadis, for *years*, focused primarily on equipment at or near the top of the pricing tree. So it's hard to feel sorry for this French company if its more

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www.northstarleading.com.

sensibly priced equipment tends to be ignored.

Last year, the company shocked long-time observers by releasing a line called Orchestra, which consisted of a CD player, an integrated tube amp, and a pair of speakers—all for a system price equal to what we used to expect for a single Jadis component. But the Orchestra system wasn't the company's only attempt at releasing products with real-world sticker prices; if anything, the Orchestra—despite its terrific

performance—is regarded as budget-priced rather than full-blown Jadis, and so it appeals to a different sort of customer.

What was missing were models with sane prices that carried full Jadis credibility and status. Well, that's precisely what the DPL 2 line-level preamp is: *proper* Jadis, which just happens to cost a non-horrifying \$3,120 instead of \$6,000 or \$8,000. And it looks, smells, and tastes like a Jadis preamp; therefore it is a Jadis preamp. *Comprenez?*

No, make that *unmistakably* Jadis. It has a black chassis and front panel, plus a gold-plated sub-panel that bears the controls, utilitarianism overriding the aesthetics. But, however tempted I am to describe the DPL 2 as visually challenged, American customers should note that the good guys at Northstar Leading the Way recognized the innate homeliness of the matte-gold face-plate on the original version and took action. Now all DPL 2s shipped to the U.S.A. sport a much nicer finish with genuine gold-plating, knobs included. While not entirely disguising the lack of design sense possessed by whoever scribbled this onto a napkin, the U.S. version at least looks more expensive than its low-rent Euro counterpart.

From left to right, the DPL 2's gilded panel contains the main power on/off toggle switch, a two-color LED indicating on or mute, the volume control, balance control, tape monitor select, source selector, and muting toggle switch. The DPL 2 will handle as many as five line inputs plus tape, the quintet marked as "CD," "Tuner," and "AUX 1/2/3."

Its back offers the usual high-quality gold-plated socketry and appears to be utterly straightforward.

Inside, minimalism prevails. You get the impression that the design

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SOUNDS LIKE
A CONTEMPORARY
PREAMP WITH VINTAGE
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the Orchestra



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brief was to produce a unit worthy of the Jadis name, complete with selected components and high-end performance, but to achieve this goal by cutting the right corners, i.e., using a simple, classic circuit. The trick is in the execution.

Preamplification, for example, is handled by two stalwart double triode tubes, the dependable and plentiful 12AU7A (ECC82) and 12AX7 (ECC83), which are more than merely “up to the task”: ECC82s and ECC83s are remarkably easy to find, especially good ones. Quite clearly, Jadis chose not to curse the DPL 2 with rare or obscure tubes. And unlike some manufacturers, Jadis is not coy about the sources for the tubes it uses. The company is actually on record as saying, “The Chinese brands are suitable in most cases,” but Yugoslavian tubes are used when available.

The classic cathode-follower configuration in which they’re applied enables the retention of a high input impedance, along with a very low output impedance and “an important increase in current.” As a result, the DPL 2 is not terribly fussy about the amplifiers it’s asked to drive, regardless of input impedance or the length of the interconnecting cables.

Probably the most readily identifiable compromise that renders the DPL 2 an “economical Jadis” is the decision to use a printed circuit board to receive output of the power supply and the filtering and restricting the use of point-to-point hardwiring to the source-switching, volume, and balance controls. The power supply consists of a single transformer with two outputs. Once the preamplifier has been switched on, a small relay circuit delays the output to prevent thumps. (But tell me: Do any of you still switch on your preamplifiers *after* you’ve switched on your power amplifiers?)

Jadis’s preferred partner for the DPL 2 is the matching sibling, the DA 5 power amp. The company also states that it works well with the Monotriode 300B power amp, which is as it should be—family ties and all that. But because you’d expect the DPL 2 to mate with its own kind without difficulty, and that the sonics would be complementary, I tried it with several different power amplifier types, including the Audio Research VT100 (push-pull tube amp), the Graaf GM-20 OTL (output-transformerless

tube amp), Musical Fidelity X-A50 (solid-state monoblocks), and assorted vintage tube amps from Radford, Quad, and Dynaco. The source components included the Krell KAV-300cd player and the Basis 2500 package reviewed in the June issue, while speakers consisted of the Quad 77-10L, Quad ESL-63, and New Audio Frontiers Reference One S. Preamps used for reference purposes included the Krell KRC-3 and Graaf WFB Two.

Whether or not there’s such a thing as an identifiable “Jadis sound” is no longer as clear-cut as it was when the company made only cost-no-object products. Now we have to choose between push-pull and single-ended power amps, cheap stuff, expensive stuff, analog, and digital. But given the company’s suggestion that this is simply a

**INSIDE, MINIMALISM
PREVAILS: THE DPL 2
USES A SIMPLE,
CLASSIC CIRCUIT.**

well-executed classic circuit designed to introduce customers to Jadis through an approachable tariff, I assumed it would err toward what I still think of as the reputation-building Jadis sound of yore. For me, such traits would include: transparency that never sounds sterile; a golden, warm mid-band that is free of mush; fat and comfy bass; superlative three-dimensionality and a vast soundstage; and dynamics of the adequate rather than the overwhelming variety.

If that mix suggests a classic tube preamp updated for modern tastes, then you’re right on the mark. And for many, that’s a description of heaven, because plenty of us would kill for the sound of a Golden Age performer without the hassles of nursing an aged component, at the same time wanting something that doesn’t cloud a modern source. This is why McIntosh sold so many C22 reissues, while Marantz shifted a load of re-born Model 7s.

And that’s precisely what the DPL 2 sounds like: either a vintage preamp made modern or a contemporary preamp with vintage tendencies. For some, this could

make it an acquired taste. And that taste is an appreciation of a pre-CD world.

Of the most desirable and coveted Jadis qualities retained in the DPL 2, the cuddly, user-friendly mid-band is, without question, the dominant one. Just what—using such a simple circuit and such overly familiar tubes—makes it possible to keep the sound precisely in between the lush and the lean must be the magic element that makes a product a success or a failure. In this respect, Jadis has dialed in just enough on the Way Back Machine to satisfy a craving for, say, a Dynaco PAS-3 without compromising the precision, detail, and transparency. Conversely, this will never, ever be mistaken for a transistor preamp.

This balance is all it takes to make the mid-band so lifelike and rich, an ideal set of conditions for vocals and non-amplified instruments. What enables the Jadis to rock, though, is enough weight and slam down below, with just enough speed and transient recovery to enable it to cope with the demands of high-energy material. Okay, okay, the DPL 2 is unlikely to be the first choice for a head-banging-only diet, and the Krell, for example, shows just what fast dynamic swings can offer. But the Jadis never sounds sluggish or weedy; it just seems to favor music with delicacy and finesse.

Also clearly a family trait is the enormous soundstage. Man, does this preamp make a big sound. With speakers capable of “disappearing”—the Quad electrostatics perform this party trick with ease—the Jadis simply opens up and fills the area in front of the listener. It’s truly wall-to-wall, with a particularly deep front-to-back capability. However absurd this sounds, the Jadis is one solution for those with small rooms who have to listen in the near field. Whatever the music source, the Jadis appeared to endow the performance with an extra couple of feet of sonic space behind the line of the speakers.

Overall, then, the DPL 2 must be judged a success if its role is to be that of a Jadis preamp for the masses—okay, not quite the masses, but those who can stretch to a bit more than three grand for a preamplifier. As I said before, the DPL 2 looks, smells, and tastes like a Jadis preamp. Oh, and add to that “sounds like a Jadis preamp.” For fans of this Gallic brand, that’s more than enough to guarantee its desirability. **A**

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CLASSICAL RECORDINGS



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**Bach: Goldberg Variations
(Transcription: Rodarmer)**

Kurt Rodarmer, guitar and bass guitar
SONY CLASSICAL SK 60257;
DDD; 73:36

Sound: A, Performance: A+



Bach's sublime "Goldberg Variations" have become a keystone in baroque keyboard literature. Some prefer to hear them in their original harpsichord setting, while others have become converts to piano renditions, notably the famous recordings of Glenn Gould. But the "Goldberg Variations" for guitar? It would seem impossible to take this colossal work for a five-octave harpsichord and place it within the classical guitar's three-and-one-half-octave range. Even if you overcame that problem, the broad chords available on the keyboard (the pianist's hands

can obviously play 10 notes at once) would be unplayable on a guitar's six strings.

Through determination and creativity, Kurt Rodarmer has solved both of these difficulties. To provide a greater range, he worked with guitar maker Richard Schneider to construct a "classical bass guitar" with marvelous-sounding low notes. In order to play all the complex keyboard melodies, Rodarmer skillfully arranged the music for several guitars and overdubbed each part himself.

The result of such arranging could merely have been a clever novelty. Instead, Rodarmer has created a masterpiece. The principle factors were his skill in crafting the transcription and his marked dexterity as a guitarist. Concerning the former, Rodarmer was not content simply to

use all of the original notes and fling them among four guitar parts. He carefully extracted each voice to bring out the linear aspects of every variation. Instead of a recording that sounds like a chordal guitar ensemble, the Rodarmer CD captivates listeners with the clear independence of its disparate melodies.

Yet the greatest merit of this CD is neither the arrangement nor the overdubbing technique; it is that Rodarmer is simply a remarkable guitarist. His sensitivity of touch and nuanced shading remind me of Christopher Parkening, while his huge sound is even reminiscent of the great Andrés Segovia. And Rodarmer's intelligent interpretation of this Bach opus manifests a thorough knowledge of baroque performance

Y O U K A L I

**Cabaret and Art Songs by
Satie, Poulenc, and Weill**

Patricia O'Callaghan, soprano;
Jenny Crober, piano
MARQUIS CLASSICS
77471 81217, CD; 45:06
Sound: A, Performance: A

My ratings for this recording are admittedly useless; style—not sound or performance—is what the CD is about. The clarion passion of Patricia O'Callaghan's presentation plus the interesting and carefully chosen material are what make it work so compellingly. The close-up sound is certainly nothing to sneeze at, and the performance walks a nice line between art song and cabaret; it's precisely what this program of mostly French material demands. The "live" recording (full takes only, sans splices) contributes to the program's tension and focus.

My only complaint is with the program notes and song texts, which are rendered nearly unintelligible by tiny, quirky type and legibility-defying color choices. Marquis (a Canadian affiliate of EMI) can do beautifully creative work in this respect, so why this triumph of affectation over utility?

Robert Long



How Do Your Speakers Measure Up?



Take a look at any speaker manufacturer's lineup. Chances are their "top of the line" offers a lot more piston area than their "starter" models. Why?

With speakers, bigger is better. Unless, of course, you don't care about visceral impact. Or distortion. Or efficiency. Or dynamic contrast.

Now some folks will try to convince you that an 8" woofer is faster than a pair of 12". But moving air is a volume velocity issue.

Relying on an 8" driver to pump up your 2500 cubic foot listening space is like fanning yourself with a guitar pick. Distortion will rise and transient response will be compromised (unless you've recently devised a scheme for miniaturizing a 30-foot wavelength).

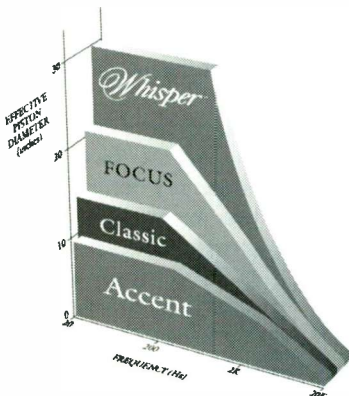
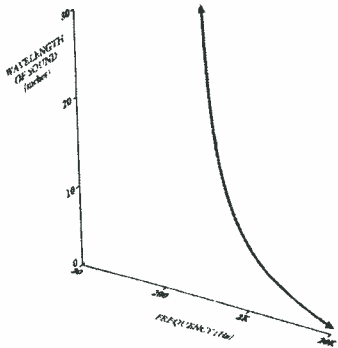
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practice. Furthermore, the miking of the different guitar tracks—sometimes close and brittle, sometimes farther away to enhance the ambience—also indicates careful thought.

Doubtless this CD will raise the eyebrows of many pianists and harpsichord enthusiasts. But if they can suspend their biases and give Kurt Rodarmer a chance, they will find it well worth the hearing.

Patrick Kavanaugh

The Ladye's Delight

The Baltimore Consort

DORIAN DOR-90252; CD; DDD; 63:18

Sound: A, Performance: A

In this entertaining, toe-tapping CD, which transports the group and the listener to Elizabethan England, the Baltimore Consort is in familiar territory, presenting a delightful, lively, down-to-earth program of period tunes and dances, performed with zest, commitment, and virtuoso flair. The recorded sound is intimate, rich, warm, and loaded with detail, capturing perfectly the colorful and varied vocal and instrumental combinations arranged by members of the ensemble. This set, as do most recordings by The Baltimore Consort, defies criticism. What more could one ask.

Rad Bennett



Chopin: Nocturnes, Vol. I (Nos. 1-10)

Ricardo Castro, piano

ARTE NOVA CLASSICS 74321 30494

CD; DDD; 48:58

Sound: B, Performance: B

Chopin: Nocturnes, Vol. II (Nos. 11-21)

Ricardo Castro, piano

ARTE NOVA CLASSICS 74321 54451

CD; DDD; 57:18

Sound: B, Performance: B

There are so many available recordings of Chopin's complete nocturnes, ranging from Artur Rubinstein's late 1930s and mid-1960s performances through a generation of such distinguished pianists as Claudio Arrau, Leopold Godowsky (not quite complete), Alexander Brailowsky, Nadia Reisenberg, Samson François, a middle ground of such interpreters as Vladimir Ashkenazy, Ivan Moravec (whose version, along with Rubinstein's, I regard as benchmarks), Daniel Barenboim, Sergio Fiorentino, Adam Harasiewicz, Fou Ts'ong, Abbey Simon, and a brand new Earl Wild version, to entries by a newer wave of players including Garrick Ohlsson, Idil Biret, Brigitte

Chopin

**24 Preludes, Op. 28;
Andante Spianato et Grande
Polonaise Brillante, Op. 22;
Polonaise-Fantaisie, Op. 61**

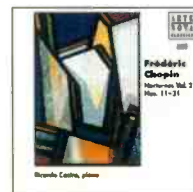
Louis Lortie, piano
CHANDOS CHAN 9597,
CD; DDD; 70:47
Sound: A, Performance: A+

If you like your Chopin dramatic, have I got a CD for you! The richness and élan of Louis Lortie's approach, the extreme dynamics and deft rubato, and the exuberance and rapture all contribute to the smashing emotional impact in this music. Too much, perhaps? I'm sure some will think so, but the performances' very want of restraint is among their virtues. Occasionally the tone is slightly muddy in loud, fast passages, but this seems more a matter of Lortie's pedaling and the prodigious quantity of notes he is playing than of poor mike placement.

Robert Long

Engerer, Elizabeth Leonskaja, Maria Joao Pires, D. Thai Son, David Allen Wehr, and now Ricardo Castro. Not to mention loads of recordings of individual nocturnes, some of them absolute classics, by such luminaries as Dinu Lipatti, Solomon, Sergei Rachmaninoff, Benno Moiseiwitsch, Alfred Cortot, Vladimir Horowitz, and Ignaz Friedman (whose Op. 55, No. 2 is one of the most amazing Chopin discs ever).

What can a relatively unknown pianist (albeit a first-prize winner in the prestigious Leeds Competition in 1993) bring to such an assemblage that might single him out as a name to note? Ricardo Castro—who was born in Brazil in 1964 and studied with, among others, Maria Tipo in Geneva—has, first of all, a technique that is solid without calling attention to itself in these essentially unvirtuosic pieces. The attraction of his playing is, primarily, a gracious tone, and, second, a lack of exaggeration, even where, as in the middle sections of the C-Sharp Minor, Op. 27, No. 1, or the C Minor, Op. 48, No. 1, so many pianists increase tension by bursts of speed and loudness. Castro, sensitive and po-



etic, remains more moderate and balanced than most, and if one at times might desire more intimacy (his beautiful Op. 62, No. 1, very much excepted), more pianissimo to evoke the dreamy atmospheres, a more lulling rhythm (which his Op. 37, No. 2, might use), or more temperament in general, these performances still can be considered as appealing. No, he does not come close to such ravishing examples as Lipatti's Op. 27, No. 2, Cortot's Op. 9, No. 2, or the aforementioned Friedman, but, among recent sets, his is more than a good bet.

The piano sound is warm, marginally fuller in Vol. II (recorded in 1997, a year and a half after Vol. I), though the instrument sounds slightly too bright and colorless in the octave above middle C.

Igor Kipnis

**Beethoven: Sonata No. 14 in C-Sharp Minor, Op. 27, No. 2, "Moonlight";
Franck: Prélude, Choral, et Fugue;
Brahms: Variations on a Theme of Paganini, Op. 35**

Evgeny Kissin, piano
BMG CLASSICS 09026-68910
CD; DDD; 57:24
Sound: A+, Performance: B+/C

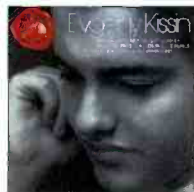
Evgeny Kissin, now 27, has been impressing audiences and critics since his astounding Chopin Concerto performances of 1984, when he was only 12. There is no question of his status as a major pianist, but, having listened with interest to nearly all his recordings, I feel that some elements are less than satisfying.

One of these has to do with projection, for he often sounds as though he has been trained to direct his ample sonorities to the far rafters of a vast auditorium. It isn't just a matter of being overly loud, or even tonally ugly, but rather of a lack of quiet intimacy and inwardness (other than purposefully playing for effect in a subdued manner). The voicing of important melody notes, such as the opening of the "Moonlight," is unsubtle. While there is some excellent playing in the sonata and elsewhere, the Franck in part disappoints for its overbearingly loud sections in both the chorale and fugue. It may be superlative Kissin, but it is too grandly pretentious for Franck's more intimate yet often ecstatic spirituality.

What does excite, however, is the hair-raisingly precise finger work of his performances—the blazingly fast finale of the "Moonlight," for instance, and the pyrotechnical and speedy Brahms variations. But, if you wish to hear the latter sounding more like Brahms (notably in its more tender moments) and less like battering-ram exercises, then you will have to go to the discs made by Arturo Benedetti Michelangeli, Geza Anda, and Wilhelm Backhaus, just to mention a few infinitely more satisfying and idiomatic performances of the past.

What is astoundingly good here, however, is the rich, uncluttered sound of the piano—not surprising, since the recording engineer was Tony Faulkner.

Igor Kipnis



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Ernest Ansermet*

CLASSIC COMPACT DISCS
CSDS 12 CD; AAD; 41:26
Sound: A, Performance: A



Another superb CD resurrection and recreation of a classic London vinyl blueback from the 1950s. Ernest Ansermet had a special feeling for Russian composers; these performances are exquisitely lyrical, but not shy on drama when required.

The recording sounds much the same as the com-

PELLING Pétrouchka of Stravinsky (Classic Compact Discs CSCD 6009) reviewed in May, very close up and loaded with copious detail, but exhibiting exceptionally natural orchestral timbre as well. The recording of the more atmos-



pheric, exotic instruments, including the harp, tam tam, and orchestra bells, has seldom been equalled, and I like the full-bodied sound of the horns, trumpets, and string basses as well.

Having heard more than two dozen recordings of the familiar "Russian Easter" in my lifetime, I still return to this one when I want to know "how it should go."

Rad Bennett

DVD REVIEWS

TITANIC

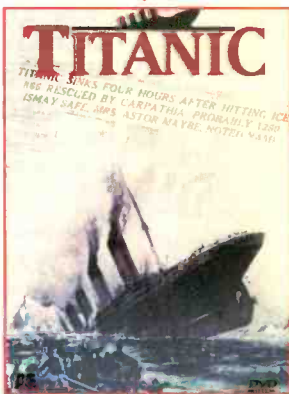
Titanic 1994; color and black-and-white; no rating; one-sided, dual layer; Dolby Digital two-channel stereo/mono. A&E/IMAGE ENTERTAINMENT ID4511ANDVD, 2:32:00, \$39.99

Picture: A, Sound: B+, Content: A

This DVD makes a perfect companion disc to *A Night To Remember*, just released by Criterion in its DVD series (Criterion 7, \$39.98). That film was based on the book by Walter Lord, which was written before the fairly recent discovery of the Titanic's wreckage shed new light on the maritime tragedy. Lord is on hand for this A&E miniseries, too, which uses eyewitness accounts from the few remaining survivors and a montage of still photos accompanied by well-written narration. Also incorporating actors reading from journals and letters, the three-part video history brings the disaster vividly to life without the use of expensive special effects.

Two of the event's primary biographers, Don Lynch and Ken Marschall, are heard on the commentary tracks of the movie as well as on this documentary; and David McCallum, who in the film plays the part of Harold Bride, the surviving radio operator, narrates the documentary.

The "third" section of this A&E presentation extends our knowledge beyond the English movie, covering the aftermath, including the investigations that tried to fix blame for the disaster, and recent discoveries, which find new technology employed in detailed examinations of the ship's ruins.



(This segment is titled Part III; there is no Part-II label as it is combined with Part I in this DVD compilation.)

In another bit of sloppy labeling, the sound is two-channel, not one-channel

mono as is printed on the box as well as the disc's label. Otherwise, the package is immaculate, with a video image much sharper than the original television broadcast. James Cameron's recent, ro-

mantic vision of events might be thrilling and highly enjoyable, but one senses that this A&E presentation is somewhat closer to the real thing.

Rad Bennett



Photo: Gamma Liaison/Hulton Getty

C O P L A N D

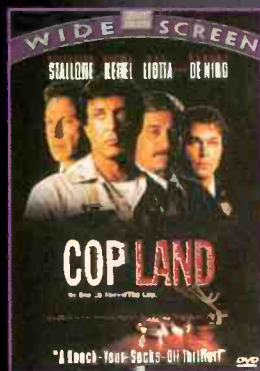
Cop Land 1997; 105 minutes, R rating; one-sided (1.85:1 aspect ratio), English or French Dolby Digital 5.1; English subtitles; includes trailer. MIRAMAX 14257, 1:45:00, \$29.99

Picture: A, Sound: A, Content: B+

A small waterfront town in New Jersey has been dubbed "Cop Land," because most of the officers of a New York City precinct live there, set up in new houses by the mob. Sylvester Stallone, 30 pounds overweight and playing against type, is the sheriff, a man who must finally come to grips with the corruption that is being perpetrated by the very police officers he once held up as heroes. Brilliant for the first two-thirds, with dynamic characterizations by Stallone, Harvey Keitel, and Ray Liotta, the movie runs out of originality and freshness only during

the hackneyed, climatic, *High Noon*-inspired shoot-out.

It's a state-of-the-art DVD with a letterboxed image so clear you'll feel like you have your own movie theater in a



box. And anyone who still thinks that DVD's Dolby Digital sound isn't able to produce adequate bass, should listen to the es-tray-rattling synthesizer subwoofer track and notice the clean, focused bass that graces all the music, both Howard Shore's original soundtrack cues and standard pop recordings.

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The Fabulous Baker Boys 1989, R rating; two-sided (one side 1.85:1 aspect ratio, the other pan and scan); English Dolby Digital two-channel matrix surround; Spanish subtitles; includes theatrical trailer. LIVE ENTERTAINMENT 60485, 1:56:00, \$24.98.
 Picture: A-, Sound: A, Content: B

Though *The Fabulous Baker Boys* is impeccably cast and acted, the skimpy script sometimes works against this likable story of two piano-playing brothers (played by real-life brothers Jeff and Beau Bridges). Their sadly declining duo lounge act is deeply altered when they add a sexy lead singer (Michelle Pfeiffer) to their show.



Since the movie is loaded with great piano playing from Dave Grusin and John F. Hammond, it does serve as a demonstration that carefully recorded movie sound can be just as good as that we'd expect from an audio-only recording. The pianos sound extremely life-like, as do Pfeiffer's vocals, which are unforced, intimate, and natural.

After some slight jitter in the initial five minutes, the video is wonderful. In an unusually informative commentary track from Director of Photography Michael Ballhaus, you can find out exactly how the look of each scene was achieved.

Mozart: Don Giovanni 1989; no rating; one-sided, dual layer; English subtitles; PCM stereo. HOME VISION/IMAGE ENTERTAINMENT ID 4356PUDVD, 2:56:00, \$49.99.
 Picture: B-, Sound: B, Performance: B+

Opera and DVD seem a perfect match, but this initial release of *Don Giovanni* is a most disappointing package. The performance has been on laserdisc before, and this DVD looks no better than that, which wasn't too good for its time. Colors are suspect, the overall picture is murky, and focus is a sometime thing. The audio is about what one would expect from your local PBS station broadcast. Unfortunately, the subtitles are permanent: You can't turn them off, which negates one of DVD's most appealing features for opera and foreign-film fans. The chapter stop for Act II is in the wrong place—after the curtain opens, not before—which cannot be blamed on the source material.

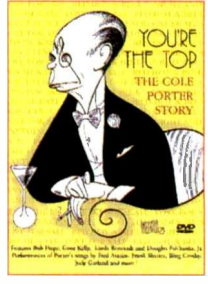
The performance, with Riccardo Muti conducting the Orchestra and Chorus of La Scala Theater in Milan, is pretty good. It features

Thomas Allen as an almost ideal Don Giovanni, Ann Murray an effective Donna Anna, and Susanne Mentzer a most appealing Zerlina.

Let's hope it won't be long before one of the wonderfully shot PolyGram operas, say Solti's *La Traviata*, makes it to DVD and makes full use of the medium's possibilities.

You're The Top: The Cole Porter Story 1990; not rated; black-and-white and color; one-sided; Dolby Digital two-channel stereo and monaural; includes production notes, list of shows and songs, and biography. WINSTAR WHE73005, 56:00, \$19.98
 Picture: A-, Sound: B+, Content: B+

Who'd have thought we'd have programs such as this in the early days of DVD? Originally produced to fill an hour of Public Broadcasting time, *You're The Top: The Cole Porter Story* is an interesting and generally informative, if sometimes superficial, documentary devoted to one of the most influential songwriters ever to hit Broadway, Hollywood, or for that matter, pop music, period. The songs are legendary: "Night and Day," "Anything Goes," "So in Love," "Let's Do It," "You're the Top," "I Get a Kick Out Of You," "Begin the Beguine," and that's only for starters. There are rare photos and clips of Porter and his friends and numerous clips from great movies that used his songs, with such stars as Bing Crosby, Bob Hope, Patricia Morrison, Fred Astaire, Gene Kelly, Judy Garland, Ethel Mer-

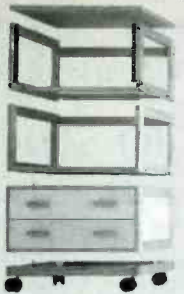


man, Mary Martin, and Alfred Drake performing on screen to fully convey Porter's pithy, pointed lyrics.

But though the program is enjoyable on the surface, there are lots of missed opportunities. Porter's homosexuality is only mentioned; its influence on his life and lyrics is not discussed. The menu of shows and songs is a shambles; it's incomplete, and there are no dates or specific references as to which song goes with which show. Moreover, there are moments during the live action where the on-screen information is misleading, e.g., "Let's Do It, Let's Fall in Love" is identified as being written in 1929, while what we're seeing is the Frank Sinatra and Shirley MacLaine version from the 1960 film *Can-Can*.

The video is as variable as one might expect from material that spans half a century, but when it's good, as in "Brush Up Your Shakespeare" from MGM's *Kiss Me Kate*, or in some of the black and white footage of Fred Astaire, it's very good. Warts and all, this release is a must for lovers of Broadway shows, Hollywood musicals, or just great music.

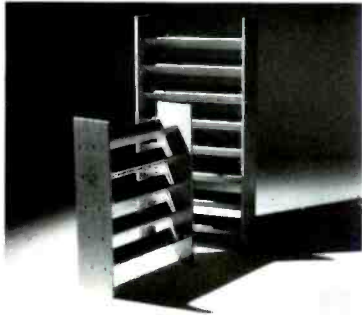
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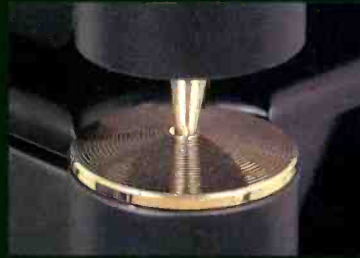
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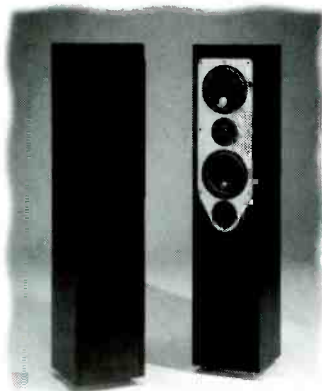
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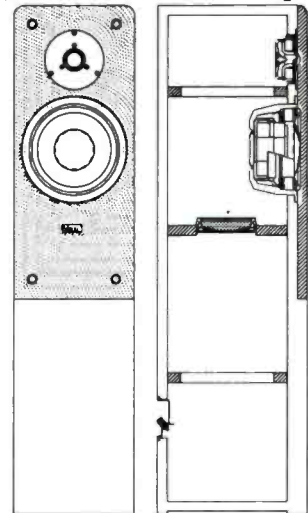
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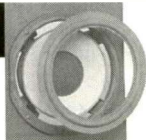
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PlayBack

CLEARAUDIO SIGNATURE PHONO CARTRIDGE

Clearaudio has long produced some of the most dynamic and exciting moving-coil cartridges available, with ever greater smoothness and detail resolution from one generation to the next. The Signature—a \$2,400 cartridge with 24-karat gold coils and wiring, a hollow boron cantilever, and a Trygon II stylus—exemplifies all of these virtues.

I tried the Signature in Wheaton Triplanar and VPI tonearms, where it proved to have all the life and excitement of previous Clearaudios but less of the rise in upper-octave energy (a common problem with moving-coil cartridges) that had made its predecessors a bit bright. The Signature's midrange timbre and detail were excellent, and its bass was deep, well controlled, and powerful. Its frequency response was flat enough to give CD a run for its money, and its soundstage had excellent imaging, depth, and width.

It took 50 hours of play before the Signature's response really smoothed out, however, and

about 100 hours to fully break it in. I could also see that the unusual shape of the Signature cartridge might lead to problems with some headshells and arms, whose wires may be a bit short to reach the cartridge's

pins (which are far forward on its body), and its wide

head might bump against some record clamps when your tonearm tracks into a record's run-out grooves. As with all moving-coil cartridges I have tested in recent years, including far more expensive ones, tracking was good but scarcely outstanding. Even so, I consider the Signature to be of reference quality. (Clearaudio, c/o Discovery Cable: P.O. Box 420496, Summerland Key, Fla. 33042; 305/744-9903.)

Anthony H. Cordesman



GRADE: A

With well-recorded jazz and other acoustic music, I was impressed by their accuracy, smoothness, and low-end kick. The high-end response was far more extended than that of many professional near-field monitors, giving my percussion CDs a realistic sheen. My only caveat is that you'll need adaptors for RCA plugs—the HR824 has only XLR and ¼-inch phone input jacks. After just a few days with the Mackie HR824, the words "best buy" came to mind. (Mackie Designs: 16220 Wood Red Rd. NE, Woodinville, Wash. 98072; 800/898-3211.)

John Gatski

FURNITUREWORKS 300AH SPEAKER STANDS

FurnitureWorks' 300AH stands can be adjusted to hold speakers 24 to 42 inches off the floor; the latter is just high enough for my surround speakers. The base measures 12 x 10 inches, and the platform is 6½ x 6½ inches, so those speakers better not be too large.

At moderate extensions of a yard or so on solid, dead-flat surfaces, the stands are quite stable with loads of up to at least 11 pounds. They become less stable, of course, as you extend them farther and when you place them on an uneven surface or, worse, on thick carpet. Threaded spikes, though, are supplied to improve stability on carpet or to couple the stands more rigidly to wood floors. The brass acorn nuts that cap the spikes' threaded ends leave 1⅞ inches of each spike protruding. If you want blunt feet, make your own, as reversing the spikes leaves their points dangerously exposed. Felt pads are provided for unspiked use on easily scratched floors. Each top platform has one screw hole, but no mounting brackets are provided.

Generous-sized holes in the angled center post enable you to feed wires internally but prevent filling the box-section shaft with sand for damping. However, although the stands clang a little when rapped, I heard no audible resonances, even when the speakers they carried were playing loudly.

The black powdercoat finish is attractive and (as I found when testing outdoor speakers) weatherproof. Even the setscrews didn't freeze in place. The FurnitureWorks stands are sturdy, good-sized, well thought out, and—at \$99 per pair—inexpensive. (FurnitureWorks: 8201 South 48th St., Phoenix, Ariz. 85044; 602/829-8000; hdqrs@omnimount.com; www.omnimount.com.)

Ivan Berger

GRADE: A-



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—*Home Theater, USA*

Definitive's revolutionary BP2000, BP2002 and BP2004 combine our incredible bipolar technology with dual built-in high-powered subwoofers (BP2000: 15"/300 watts/\$1499 ea., BP2002: 12"/125 watts/\$999 ea., BP2004: 10"/125 watts/\$749) for extraordinary sound quality beyond anything you've ever heard.

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See our dealer list on page 63

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—*HiFi Review, Hong Kong*

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Audio Video Magazine, #87

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Widescreen Review • Issue #27



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for center channel \$2,400*

*FOCUS
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October 3rd & 4th

Oakland, California • 4231 Park Blvd. (Oakland Hills) • J. Nelson & Co.
October 17th & 18th

Atlanta, Georgia • 3315 Chamblee-Dunwoody Rd. • Legacy Audio of Atlanta
November 14th & 15th

All show times are Saturday 12 pm - 6pm, Sunday 11 am - 4 pm unless otherwise noted

1998 Show Schedule

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