

**SETTING UP A HOME STUDIO**

# AUDIO

THE EQUIPMENT AUTHORITY

DECEMBER 1999

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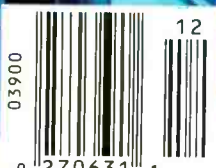
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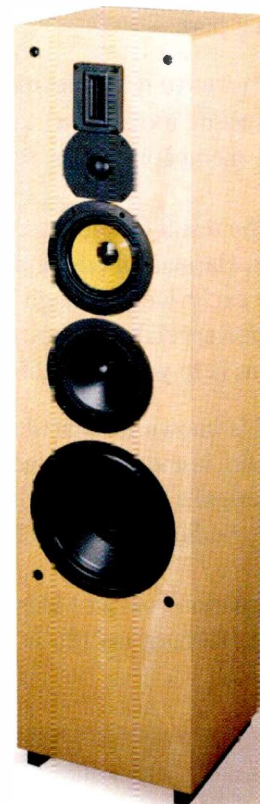
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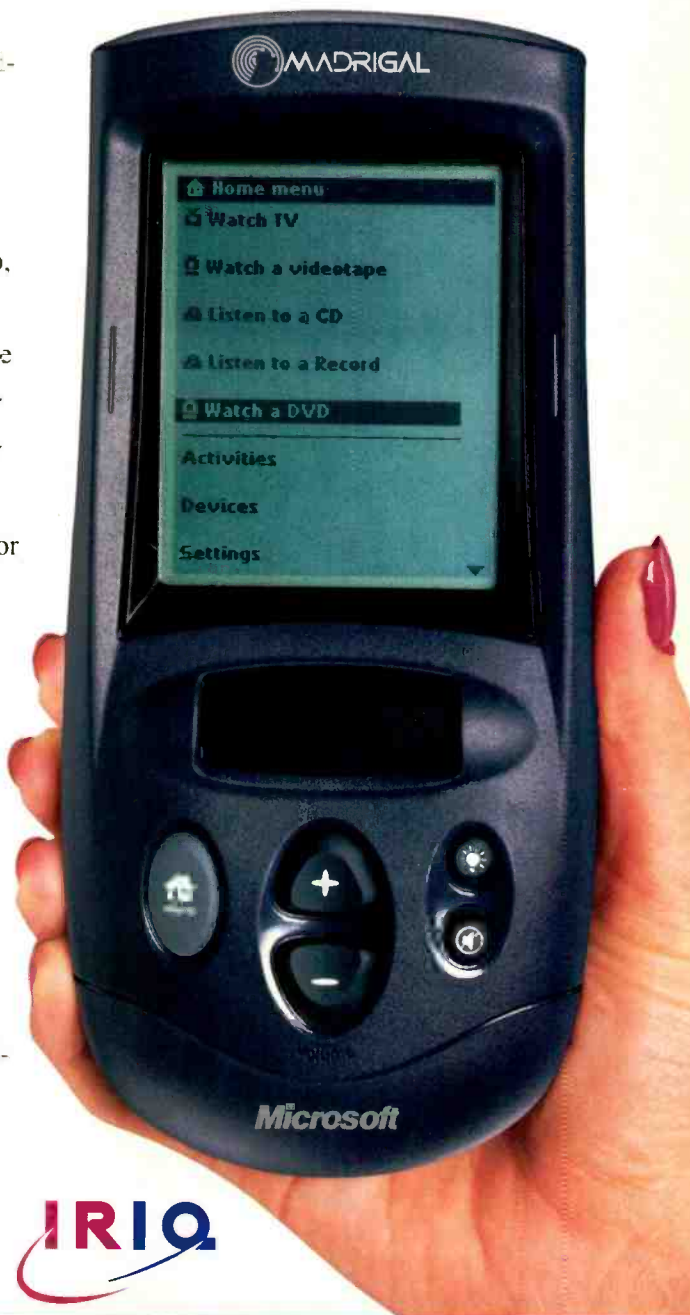
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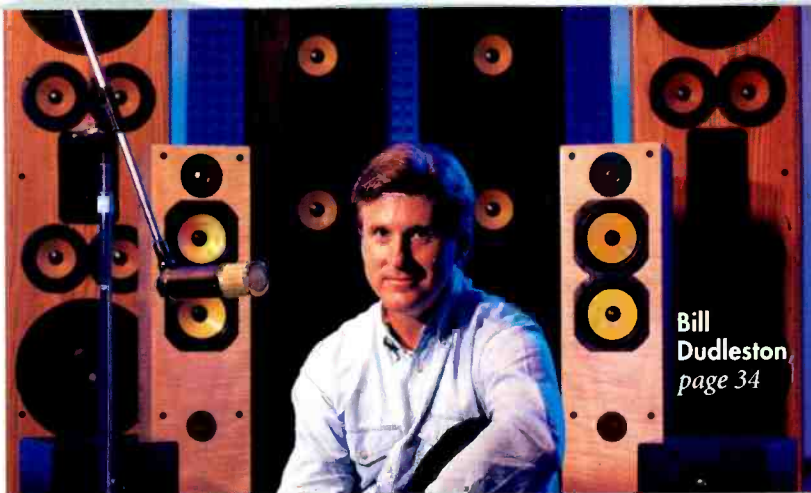
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# AUDIO

THE EQUIPMENT AUTHORITY



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Audio Publishing, Editorial, and Advertising Offices,  
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**E**ver have a relative so relentlessly annoying that you hated to see him coming? That's the way I feel about DTS. I don't have space to recount everything that has pushed me to this state of dyspeptitude, but I do want to talk about the most immediate cause, which is DTS's stand with respect to DVD-Audio.

I am about to leave for Japan to attend a technical seminar on the DVD-Audio specification, which is now essentially complete. The good news is that the DVD Forum's Working Group 4 (WG-4) has polished away some of the flaws in its original proposal. Most important among the improvements is adoption of a lossless compression scheme, which is necessary to achieve adequate playing time and flexibility with five or six channels of high-data-rate PCM. (It seems likely that many producers will want to go with 96-kHz/24-bit coding on all channels.) WG-4 has chosen Meridian Lossless Packing (MLP) for this chore.

And that's where the plot thickens. I have in hand a copy of a letter dated September 10 from DTS CEO Dan Slusser to WG-4 chairman Bike Suzuki (of JVC). I can't convey the full flavor of the letter without quoting all of it, but it contains phrases like "injunctive relief" and "appropriate treble damages." The key sentence is near the end: "We have no desire to participate in litigation; however, if it becomes our only option, I would then have no other real choice." Translation: Buy our kibble, or we'll shoot your dog. My favorite part: The letter signs off with "Best personal regards." Charmed, I'm sure.

DTS wants to be part of the mandatory standard (like PCM and Dolby Digital are in DVD-Video), not an optional coding format (like it is in DVD-Video). In DVD-speak, the "mandatory standard" defines those things that all hardware for the format must support. For example, all DVD-Video players must be able to play PCM and Dolby Digital soundtracks, but they are not required to handle DTS soundtracks. Apparently DTS is desperate to avoid the same fate on DVD-Audio.

The company has made a couple of arguments to support its position. The primary one is that unless its lossy compression system is used, there will not be room on a single-sided, single-layer DVD-Audio disc for both a five- or six-channel version of the program and a dedicated two-channel version, forcing producers to rely on DVD-Audio's automated mixdown feature for two-channel output. Of course, DTS has

a distinguished history of questionable and even manifestly erroneous statements regarding matters in which it is hard to believe the company doesn't have access to correct information (what studios plan to use its system on DVD-Video, for example). But this claim is particularly amazing, since the main point of adopting a lossless compression system like MLP is to make possible exactly what DTS is saying it rules out. These DTS guys are supposed to be data-compression experts. If I can figure out in five minutes on the back of an envelope that what they're saying is wrong, why can't they?

The second argument is just brazenly preposterous: that DTS would afford DVD-Audio full backward compatibility with the existing DVD-Video format. DTS is an *optional* audio coding system for DVD-Video. No current DVD-Video player (or any contemplated, as far as I know) can deliver analog audio output from a DTS soundtrack, many cannot even recognize a DTS data stream and deliver it to their digital outputs, and many surround processors and receivers lack DTS decoding capability.

The irony is that there really is a way to ensure complete backward compatibility of DVD-Audio discs with DVD-Video players, which is to include a Dolby Digital version of the contents along with the PCM tracks. (Like DTS, Dolby Digital is an optional coding format for DVD-Audio.) With MLP lossless compression for the PCM, it usually would be possible to include three complete versions of the program on a single DVD-Audio layer: multichannel PCM, two-channel PCM, and multichannel Dolby Digital. And as I noted in the October issue, Dolby Digital is capable of audio quality extremely close or identical to that of CD-standard PCM.

As a consumer format, DTS has always suffered from providing too little compression for applications that need audio data reduction (such as DVD-Video) while doing more than is necessary for most applications that are less strapped for bandwidth (such as DVD-Audio). It's clear from DTS's strong-arm tactics on DVD-Audio that audiophiles and manufacturers should stop putting up with the company's guff. Earth to DTS: Get out of the way!

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**Thank You, Mr. Canby**

Like Robert Coddington ("Letters," July), I was saddened to read of Edward Tatnall Canby's death. Being some 50-odd years Canby's junior, I do not share Coddington's recollection of the era of 10-kHz frequency response and 5% THD, which so many "Audio ETC" columns brought to life. Yet it was always Canby's writing I would enjoy most in each issue of *Audio*.

An audiophile for as long as I can remember, and a reader of your magazine for close to 20 years, I have learned much—and much that the reminiscent tales of Canby's lifelong experience in the world of music and audio engineering has put into perspective. It is the knowledge of the state of high fidelity of yesteryear that allows me to fully appreciate the miraculous advances in technology we've enjoyed these past two decades.

I, too, have missed Canby's writing since 1996, and through the beginning of this year checked each issue of *Audio* for his name on the Contributing Editors' list, hoping for one more "Audio ETC" column. When it disappeared, I knew a fixture in the industry had been lost.

Thank you, Edward Tatnall Canby, for the many years of teaching, entertaining, informing, and inspiring—for sharing your life's work and passion with us all.

*John Stockinger*  
Salt Lake City, Utah

**Compression Confession**

I just read Corey Greenberg's "Front Row" column regarding FMR Audio's Really Nice Compressor (September), and it sounds like a real treat. Greenberg also mentioned the Alesis brand of compressors, of which I own one, and how they lack transparency. I haven't noticed that but have had no other unit to compare it to.

My main point, however, is to share my reason for having this compressor, which has nothing to do with making recordings. I have hooked it up between my cable box and home theater audio system to tame the annoying levels of TV commercials and to

allow me to watch movies without disturbing the neighbors. The Alesis is really great for this application. It's out of the signal path for VCR and DVD playback, so I can really get the blockbuster impact I want when watching from those sources, and it can easily be bypassed when watching pay-per-view or premium-channel movies. But the compressor makes regular TV so much more watchable that, for around \$100, you'd be hard pressed to find something that improves your quality of life as much. And don't think about using the built-in compression on the new digital cable boxes—it's really bad.

*Agim Perolli*  
via e-mail

**Discount Recording**

I have found that the new Sony CD players read CD-RWs, including one player I bought for under \$160. My Pioneer CD player reads them, too, but it does not have a digital output, which is why I bought the Sony.

I have also found that some CD audio recorders can record computer CD-Rs, which cost several dollars less than audio CD-R discs. Just put an audio CD-R in first, let the recorder read it, then pull the drawer out manually and swap in the computer disc. However, such discs must be completed and finalized before you eject them, as you will not be able to add further material or create the table of contents after they're ejected.

*Reggie Higgins*  
via e-mail

**Sensible Guy**

I first started reading *Stereophile* in 1968, and later *The Absolute Sound*, while concurrently subscribing to *Audio*, *Gramophone*, *High Fidelity*, and *Stereo Review*. It's reassuring to see that, after 30 years, some things never change: The audio liberals, who hear night-and-day differences in the most trivial places, and the audio conservatives, who seemingly possess neither ears nor equipment to hear differences anywhere, are still fighting it out tooth and nail. I wouldn't have it any other way.

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About a year ago, I wrote an article for *The Sensible Sound* suggesting that no two things in life are perfectly identical and that maybe, just maybe, there were a few people in the world who could actually discern minute differences in amps and cables, even if I couldn't. For my efforts, I was roundly chastised by one of my more conservative staff brethren, who publicly accused me of "ignorance." So keep up the good work, *Audio*. In spite of the hi-fi bigots in both camps, I'm convinced that the vast majority of high-fidelity enthusiasts are still reason-

ably open-minded (and open-eared) and appreciate being presented both sides of an issue.

*John J. Puccio  
Martinez, Cal.*

### Sound Delivery

When, as a youngster, I played my trumpet and flügelhorn in a Stax-Volt style R&B band, the club scene was dominated by speakers with huge cone drivers and huge horns. Timbral credibility wasn't the issue; in-your-face excitement was the important thing.

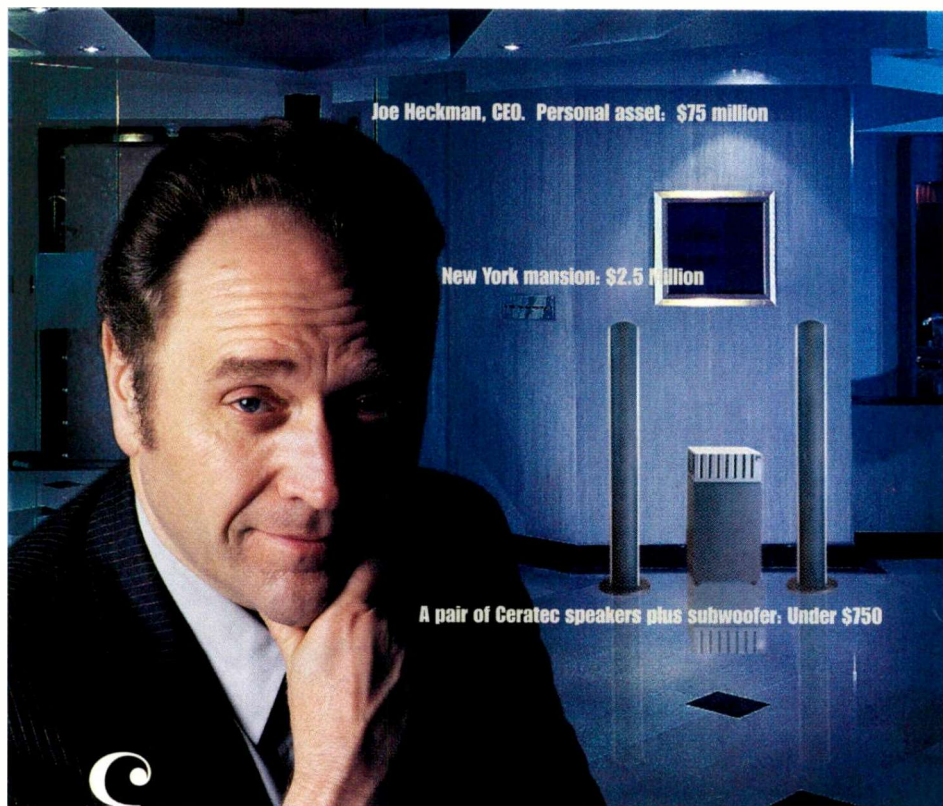
In the comfort of my living room, however, I like to play small-ensemble acoustic music, usually be-bop or classical. Timbral accuracy is extremely important, and for the most part, my system delivers it. That system comprises a Linn Sondek/Ekos/Arkiv record player, a Sony CDP-D500 Compact Disc player with matching PCM-R500 DAT recorder, Balanced Audio Technology VK-P10 (phono) and Audio Research LS5MKII (line) preamplifiers, a pair of Aragon Palladium II amplifiers, and a pair of B&W 801 Matrix Series 3 loudspeakers. The speakers are situated 3 feet out from the wall, nearly 4 feet in from the side walls, and roughly 7 feet apart—square, with no toe-in. My speaker wire is not exotic—just garden-variety Monster Cable right off the spool. All of the XLR-terminated interconnects are just generic, from a pro audio shop. The RCA-terminated cables from tonearm to phono stage, on the other hand, are designer-brand (Cardas) footage.

But if bar patrons hear dance music through sound reinforcement, then doesn't that kind of music really sound like a club's sound system? Recording engineers don't labor to put that sound on tape, so should bar-music aficionados seek to get some of that sound from their own equipment? Are JBL 4430s really better rock 'n' roll speakers than, say, Matrix 801s? Can DSP make 801s sound like 4430s?

*Sonny Bonomo  
Rye Beach, N.H.*

*Editor's Reply:* Here's a case where there actually are alternate realities. If your reality is the sound of the instruments themselves, as they'd sound in a recording studio, concert hall, or your living room, then the 801s are a better bet. But if the reality you want to re-create is that of the bar environment, you'll need to change the speakers or their sound. Offhand, I know of no DSP component that can make your 801s sound like 4430s, but a plain old equalizer could probably accomplish much of what you seem to want.

One catch: I don't know the 4430s, but I have heard lots of rock speakers that produce tons of upper bass, possibly more than the 801s can deliver (though not as much low bass as you can get from 801s). If your EQ makes your 801s sound pained, supplement them with another bass speaker—a bass-guitar amp, perhaps?—I.B.



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### Sequential Turn-On

**Q** *Is there a correct sequence for turning the components in an audio system on and off? What possible harm can occur if this is not performed correctly?*—Ben Chiaro, New York, N.Y.

**A** Your amp should usually be the last component you turn on and the first you turn off. That way, any noises your other components make when they're turned on or off will not be amplified and fed to your loudspeakers. These noises are frequently annoying and, in rare instances, can damage speakers. Many power amplifiers also produce transient pulses, which come through the speakers as thumps. Although annoying to some, they will not damage the speakers. In any case, I encounter less and less gear that generates turn-on or turn-off pulses.

### Audio Adjectives

**Q** *What is meant when reviewers use words like "dark," "light," "bright," "sweet," or "sour" to describe a component's sound?*—E. Bringas, Makati, Philippines

**A** Describing the way a component or speaker sounds is not a science, and thus we find ourselves using a specialized vocabulary to convey our thoughts to a person who has not heard the product for himself. Hence, to understand terms such as "light" and "dark," try imagining what the reviewer might be visualizing when he uses those words. (It's why such reviewing is called subjective.)

Nevertheless, if you polled audio reviewers, I think there would probably be a consensus that terms like light, dark, and bright suggest a deviation from flat, smooth frequency response. For example, if the sound is "light" (as in "lightweight," perhaps), chances are that it is not rich in bass but has rather smooth highs. By contrast, "dark" sound is likely to be somewhat bassy, with dull or rolled-off treble. "Bright," on the other hand, usually implies somewhat emphasized upper midrange and high frequencies, almost, but not quite, to the point of harshness. Really exaggerated highs are sometimes labeled "tizzy" or "zippy."

As for "sweet" or "sour," well, it's difficult to tell you for sure what these terms connote. "Sweet" perhaps suggests a very open and smooth overall sound. And "sour"? If I read that, I'd conclude that the sound had a harsh quality.

Each of us hears or interprets sounds in a unique way, despite the fact that we're all equipped with the same hearing mechanism. Were this not so, we would likely have fewer makes and models of speakers. Even reviewers differ in their opinions of what sounds good or bad.

### Adding Anti-Skating Compensation to a Tonearm

**Q** *I recently bought an old turntable whose arm has no anti-skating compensation. How can I add this feature?*—Donald O'Brien, New Bedford, Mass.

**A** If the tonearm's tendency to skate inward, toward the record label, is not too great and if your cartridge does not have high compliance, you may not need to add anti-skating compensation. You can determine the amount of drift by placing the tonearm on a blank vinyl disc while the platter is turning. If the tonearm remains at the center of the disc or drifts *very* slowly inward, it doesn't require anti-skating force. Making and adding anti-skating compensation isn't too difficult, but a blank disc is indispensable for testing and setting the correct counterforce. You might find one at a local disc-cutting studio (though there aren't many of those), or you could use one of those old, flexible, plastic promotional discs that were bound into magazines years ago. One side is usually unrecorded and will work fine when placed atop a regular disc. Alternatively, careful inspection of record bins at garage sales

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.

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might turn up an old test record (Shure's *Audio Obstacle Course*, for example) with a blank band or tests for calibrating anti-skating force.

To add anti-skating to your tonearm, make a small bracket just high enough to parallel the arm. Attach a piece of piano wire to this bracket, and align it parallel to the arm's direction of motion. Next, tie a piece of thin monofilament fishing line to the tonearm, just forward of its pivot point. Make certain that the arm's position cannot change. Tie a small weight—a smallish lead shot or sinker from a tackle shop will do nicely—to the other end of the line. The line passes over the piano wire and the weight will tend to pull the tonearm outward, thereby compensating for its tendency to drift inward. Adjust the line's length so that when the arm reaches the innermost grooves at the center of the record, the weight doesn't touch the piano wire. Similarly, when the arm is at the disc's outer edge, the weight shouldn't rest on the turntable base.

If the weight overcompensates, use a lighter weight; if it doesn't compensate enough, use a heavier one. You also can slide the string toward the arm pivot if the compensation is too great or slide the string away from it if the force is insufficient. I wrapped the line around my tonearm a couple of times and then put a layer of sealing tape around the arm where the line is attached.

Adjust the anti-skating force by moving the tonearm across the surface of the blank disc while the turntable is running. Stop at various diameters and note which way the arm drifts. It is unlikely you will entirely compensate for skating at every point on the disc, but you will find a setting where there is minimal drift over much of the record's surface.

## Running an Audio System Without a Power Line

**Q** *My cabin is far from power lines. It does, however, have a solar panel that charges a bank of 12-volt batteries that can power a 3-kilowatt inverter that gives me standard 117-volt AC. I also have a 4-kilowatt AC generator.*

*Should I install a DC sound system run from the 12-volt battery bank? Or an AC sound system powered either by the inverter*

*or by the generator? I already own an AC system, but inverters are inefficient and produce spiky, noisy output rather than clean AC sine waves. Although a DC system would be more efficient and not suffer from the inverter's "hash," I would have to buy one from scratch, and I'm not aware of any 12-volt turntables.—Dwayne Kelley, Springfield, Va.*

**A** There's plenty of excellent 12-volt audio equipment made for cars these days, including CD players and powerful amplifiers. And you can use those amps to drive any home speakers you like except self-powered models or electrostatics. You might also be able to find a phono preamplifier with an external power supply (or one constructed as a module for installation in a line-stage preamp) that can run from 12-volt DC.

The problem is the turntable. I don't know of any 12-volt models, either, so you'll probably need an AC model with servomotor speed control. That's necessary because generator speeds tend to vary with the load they're feeding, and inverters, though more stable, don't necessarily run at precisely 60 Hz.

You may also want a small inverter, such as those used to power laptop computers in cars, to drive the turntable when you're not running other AC devices. A 3-kilowatt inverter draws a lot of current, even when it's only driving a low-power device, and generators gobble fuel and make noise.

If you use AC-powered gear, get a surge suppressor to protect your equipment against power spikes that will occur when your inverter and generator start up or wind down or when any other appliances on the same line kick in.

I live in an area that is subject to power outages that can last for days if a good storm hits. I solved the problem by installing a 7.5-kilowatt generator that runs on the same propane supply that heats my house. Generators of this size can be made with really good governors that keep speed fluctuations to a minimum despite changing loads. These generators are designed to produce very clean waveforms and make little noise. I prefer generators made by Onan or Generac, although they're more expensive than the brands you will find in builders' supply stores. I have no fear of using any of my computer, music, and audio gear when this generator is on line **A**

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# WHAT'S NEW

## Dahlquist Home Theater Speakers



The Acoustix System One home theater system contains four DDA-1T tower speakers, two in front and two for surround duties. Each has three long-throw 3-inch drivers and a 1-inch silk-dome tweeter. The system's DDA-1C center-channel speaker has four 3-inch woofers and a 1-inch tweeter, and the PDQ-100.SUB subwoofer uses an 8-inch driver powered by an internal 100-watt MOS-FET amp with auto on/off and a soft-clip circuit. Price: \$1,999.95 per system. (Dahlquist, c/o Audiosphere Technologies, 905/474-1843)



## BIG PAGODA CD STORAGE CHEST

Big Pagoda says the design of its ZenBox CD chest was inspired by the traditional Chinese apothecary cabinet. Hand-lacquered in red, bronze, blue, or white, the chest holds as many as 120 CDs in its four drawers. Price: \$295; with legs, \$340. (Big Pagoda, 415/563-8727)

All of the Special Edition Signature Series speakers are shielded (except the 1010-SE sub) and use the same 1-inch dome tweeter and 6½-inch aluminum-cone woofer—the latter said to enhance performance because of its large piston area. The 661-SE (at left in photo) is a two-way, mid-sized monitor with two woofers; its

## RBH SOUND A/V SPEAKERS



response is rated at 45 Hz to 20 kHz, ±3 dB; the 61-SE mini-monitor (photo center, top) has the same specs but just one woofer. The 1061-SE

three-way tower (at right in photo) has response rated at 24 Hz to 20 kHz, ±3 dB, while the 1010-SE powered sub (photo center, bottom) is rated at 24 to 180 Hz, ±3 dB. Prices: 661-SE, \$1,079 per pair; 61-SE, \$699 per pair; 1061-SE, \$1,919 per pair; 1010-SE, \$1,159 each. (RBH Sound, 800/543-2205)



## ROTEL TURNTABLE

Operating at 33⅓ and 45 rpm, Rotel's RP955 turntable has a 3-pound turntable belt-driven by a servo-controlled motor. The tonearm turns on needle-point ball-race bearings, with a high-viscosity oil bath to damp vibrations; a high-compliance moving-magnet cartridge

with elliptical stylus is mounted in the arm's integral die-cast headshell. Further vibration damping is provided by isolating feet and a record mat compounded of felt and rubber. A hinged dust cover is included. Price: \$599.90. (Rotel, 800/370-3741)



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KEN KESSLER

# HIGH HOPES, HIGH TIMES FOR HIGH END



Illustration: Marina Sagona

It's out of character, I know, but I feel a bit Pollyanna-ish this month because the sun is out, the sky is blue, and I've just returned from the most upbeat hi-fi show I've attended in a decade. After months of nuthin' but Bill 'n' Monica, terrorist attacks on embassies, an IRA massacre, the further decline of Asia's economies, and other end-of-millennium misery, who'd have expected an upturn in the fortunes of high-end audio?

It was TAG McLaren Audio's world launch that helped make the show such a success. Before I say why, I must disclose that I've helped the company with its newsletters, manuals, and catalogs and written some CD liner notes for it as well. Further, the show that restored my

faith in the audio future was sponsored by *Hi-Fi News*, the magazine that I work for. But ignoring TAG McLaren's launch because I wrote some copy for them would be as stupid as ignoring all introductions of new transistor amps because I am thought to be blatantly prejudiced in favor of tubes. (Still, if you find my prose too boosterish, just add a kilo of salt.)

The focus of the Hi-Fi Show at Heathrow Airport, which is open to the public, is solely audio and home theater. (It doesn't attract high-roller

exhibitors like computer game companies, mobile phone makers, or car stereo manufacturers.) And although this is where TAG McLaren Audio made its debut, it behaved the way companies the size of Sony and Panasonic do at massive trade shows like CES: confidently and with style. For starters, the sheer size of its exhibit booth, and its prime position behind the registration desk at the hotel where the show was held, made TMA unavoidable. And the company seemed to rattle almost everybody's cage by building a multimedia booth worthy of a major international brand—even though its initial line is purist audio.

Trading on its auto-racing fame, TMA placed its latest Formula One car in front of the booth and brought in such guests of honor as legendary driver John Watson and current F1 pilot David Coulthard. To explain to Americans what this means to Europeans (America seeming to have abandoned Formula One for good), Coulthard appearing and signing autographs at a U.K. hi-fi show would be like Michael or Mario Andretti or Richard Petty or any Unser showing up at a U.S. event. Fortunately, TMA backed up the glitz (in-wall TVs running interviews with the design team, display cases full of prototypes, separate hospitality and listening rooms, slick point-of-sale promotional materials, and a souvenir stand worthy of a rock gig) with

**TAG McLAREN'S  
AUDIO DEBUT  
PULLED IN VISITORS  
WHO'D NORMALLY SKIP  
HI-FI SHOWS.**

actual demonstrations conducted by audio designers, not just salesmen. TAG McLaren's major contribution to the event was pulling in a

whole bunch of people who otherwise would never go near a hi-fi show. TMA attracted a crowd of motor-racing fans who, having made the trip, figured, "What the heck, I'm here, so I may as well check out the rest of this stuff."

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**Amid much speculation, Quad unveiled its new 99 series of electronics.**

And that means much-needed new blood for the whole industry.

Meanwhile, down the hall was another momentous event, the return of Quad. After much speculation, Managing Director Stan Curtis made good on his promises and showed the new 99 series of electronics and preproduction samples of new electrostatic speakers. The middle model is what we've all dreamed about: a Quad ESL63 updated to address every criticism of the original. The new version, the 988, has a truly rigid frame, improved electronics, and better dynamics. The great news? The price has actually *dropped*—by 25%. And because Quad has its own U.S. distribution network, you guys will get the benefits, too. (I got in line for a review for *Audio*, but the company is not sure which electrostatic to send first, the 988 or the taller 989 with two midrange panels and four bass panels. It's dangerous to make promises, though it looks like you'll be reading about one of these systems in about three months. Just bear with me—and Quad—in case it takes a bit longer.)

Another "talk of the show" item was the second in Sonus Faber's Homage series, that trio of delicious speakers designed to honor the great violin makers of Cremona. The Guarneri's follow-up (unveiled in London *before* the main Italian show) is the floor-standing Amati. As gorgeous as its predecessor, this beauty arrived finished in some luscious, tomato-red wood, and it sounded, with Audio Research electronics, like angels singing. If the U.K. price is around £10,000, expect its American

price to be something in the region of \$16,000 to \$20,000 per pair. Whatever Sumiko asks Stateside for the Amati, I can assure you of one thing: There will be a waiting list.

Although not new to American readers, 96-kHz/24-bit recording, the latest DVD shenanigans, and Sony/Philips' dual-layer Super Audio CD all generated buzz. Without wishing to predict anything about the future of Super Audio CD or of DVD itself (a fiasco so far in the U.K., with fewer than 40 titles available in Region 2), it looks as though the 96-kHz/24-bit format is succeeding, despite its origin among smaller audiophile companies. Its leading proponents, Michael Hobson of Classic Records and David and Norm Chesky of Chesky Records, flew in from the U.S. to support it. They were overjoyed to see that British specialist brands had risen to the occasion by introducing a bunch of affordable 96-kHz/24-bit D/A converters.

And I do mean "affordable." Musical Fidelity's 24K, in the company's X series, and new models from Creek and Alchemist come in at less than \$680 (\$350, in Alchemist's case). Amusingly, the main worry voiced by one manufacturer was that owners of the many DVD players made before mid-1998 that can't pass 96-kHz/24-bit signals may blame their D/A converters rather than their DVD players.

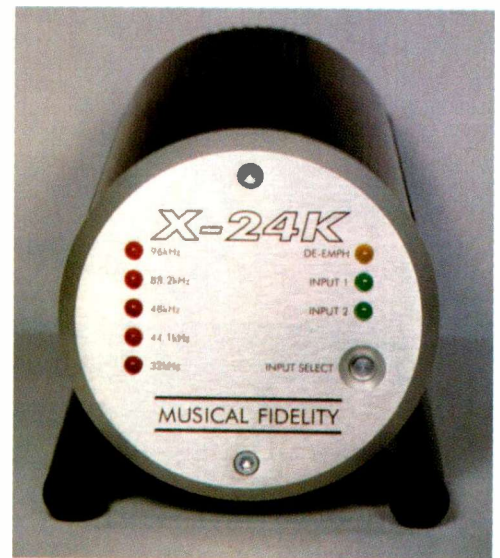
SOTA reappeared with an all-new record-spinner, the Millennia Vacuum turntable, a break from the classic SOTAs of yore and evocative of current VPIs. What's so unusual about SOTA launching a new product in the U.K., not the U.S., is that the company had a negligible presence here in its previous guise. One might suppose that this is a measure of the esteem in which the Heathrow show is held, especially since other U.S. companies introduced products

**Musical Fidelity joins the 96-kHz/24-bit party with its X-24K D/A converter.**

ahead or on the heels of home launches. Among them were Revel, unveiling new speakers (including a floor-stander), and I noticed a new Mark Levinson 96-kHz/24-bit D/A converter. Chesky Records turned up with consumer-ready versions of four 96-kHz/24-bit DVD titles, and Totem, of Canada, brought along the Forest floor-standing speaker. There were Italian, French, Japanese, and German launches as well.

But this was, first and foremost, a British affair, and for many, home-grown Arcam stole the show with that least coveted of sources: radio. The company received a lot of mainstream media attention for the Alpha 10, the world's first commercially available tuner for terrestrial (as opposed to satellite) digital radio. It can be used only in Europe so far (I gather that the U.S. will be using a different mode of digital transmission), but don't think you're the only ones who'll find this tuner solely of academic interest: I, who live a mere 60 miles from London, won't be able to enjoy it either. (Then again, stereo television has been available for the better part of a decade here, yet my local transmitter still carries BBC TV programs only in mono.) Ever since I left the U.S., where variety makes radio worthwhile, I've never given a damn about it, though I have to admit that Arcam's demo was convincing. I loved the digital readout, which provides the song and performer information that most DJs neglect to deliver. The sound was described as "near-CD quality," but I can't wait to try it out side-by-side with a conventional FM feed.

Too bad I'll have to do it in another part of the country. . . A



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Gayle Martin Sanders  
founder/president



E L E C T R O S T A T I C

## I DREAM OF GINA



**A** friend of mine turned me on to a scary-then-funny-then-scary-again Web site, [www.RealDoll.com](http://www.RealDoll.com). It's put up by a company that makes \$5,000 female love dolls that are to the average sex-shop blow-up toy what Kobe beef is to Steak-um. From the photos, you'd swear these high-dollar rubber duckies were the real thing, but the best part of the site is the Q&A page. Actual question: "Do you have any rejects or used models I can buy for cheap?" Answer: "Good God, no, we do not."

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RealDolls are available in five different models: Leah, Stacy, Celine, Julie, and Nika. But when it comes to getting my PC jollies, there's only one gal for me, and her name is Gina. Gina by Echo, that is. She may not have stainless-steel ball joints and lifelike latex skin, but she sounds better than all the RealDolls put together. Because Gina is a \$500 high-

end PC sound card—a *multichannel* sound card, that is. And she's designed to turn your PC into a pro-quality, 20-bit, eight-track digital studio.

The concept of recording on a PC hard disk isn't new. Digital audio is, after all, simply a string of 1s and 0s, just like any other data in your computer, so it makes perfect sense to ditch the magnetic taped-based recording system of such popular eight-track semipro decks as Tascam's DA-38 and Alesis's ADAT and simply record the digital data stream right onto your computer's hard drive as an audio .WAV file. Sooner or later, nearly all digital recordings wind up on a hard drive for editing and mastering anyway, so why not lay your audio down that way in the first place and leave it there until you are ready to burn it onto a CD or DVD?

Well, because until very recently, all of the "home-studio-inna-box" PC cards really blew. Yes, you could do multitrack recording on your computer with them, but their low-grade audio circuitry, cheap A/D and D/A conversion chips, and lousy "mixing console" software prevented them from being taken seriously by anyone except MIDI keyboard geeks looking to trade robo-renditions of "Hit Me with Your Best Shot" back and forth on the Net. So project studios and pros on the cheap stuck with their Tascams and ADATs, cursing the occasional mulched tape and random mechanical glitch but accepting them as almost a ritual sacrifice in order to get true CD-quality, multichannel recording capability for their two grand plus change.

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ingly vacant niche. The company has become sort of the NAD of the project-studio scene—great-sounding products, low prices, a loyal friend to budget-minded recordists of all stripes. Event has a full line of mikes, preamps, and monitor speakers, but its money shots are the Layla, Darla, and Gina multichannel sound cards.

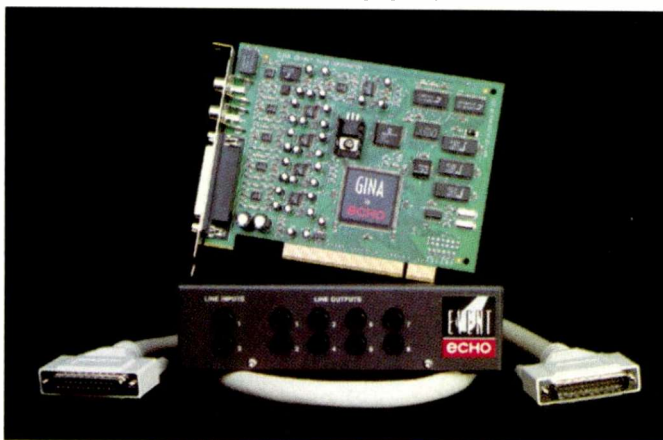
Think of them as the Three Bears: The \$1,000 Layla is the full-bore, feature-choked flagship, the \$350 Darla is the stripped-down budget model, and the \$500 Gina is ju-u-ust right for us monkeys in the middle. Papa Bear Layla's got balanced connections and can record ten tracks at once while playing back twelve, Baby Bear Darla's got unbalanced RCAs and can record two tracks while playing back eight, and Momma Gina's got unbalanced quarter-inch phone jacks and can record four tracks while playing back ten—perfect for a project-studio schlub like me who records one instrument at a time, layering tracks till the result sounds like a full band.

I installed Gina in a new Dell Dimension PC, a \$2k desktop job specifically configured for project-studio work while also allowing such essential workaday functions as checking out the RealDoll Web site. It's a 350-MHz Pentium II rig running Windows 95, with 128 megs of RAM, a 16-gig IBM hard drive, and a Yamaha CDR-400t CD-R drive to burn CDs of my final stereo mixes. Event claims that Gina will run on any Pentium PC with 16 megs of RAM, but believe me, you want to go for the gusto here: I tried running the card in an old Gateway Pentium 100 with 64 MB of RAM and a 2-gig drive, and I'm here to tell you that multitrack digital recording eats up enough processing power and hard-drive space to warrant the extra muscle.

I auditioned Gina with the rest of my project studio, which consists of a Mackie 1604-VLZ mixer (used mainly for its excellent mike preamps and EQ), FMR Audio's RNC compressor ("Front Row," September), and various mikes (including Audio-Technica's AT-4050 multipattern and AT-4033 cardioid condensers, Electro-Voice's 635A omni dynamic, and a pair of vintage RCA BK11 figure-eight ribbons). I monitor with an NAD 116 stereo preamp driving a

pair of Paradigm Reference Active/20 powered monitors, augmented below 85 Hz by Paradigm's PDR-12 subwoofer. All mike and line-level cabling is by Canare.

Installing Gina was so easy and bug-free, I kept thinking something must be wrong. After wrestling over the years with the settings and quirks of upscale ISA sound cards, like Digital Audio Labs' CardD+, it was a pleasure to just pop my PC's case,



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20-BIT, EIGHT-TRACK  
DIGITAL STUDIO.**

stick Gina in an unused PCI slot, and then let Win 95's plug'n'play mojo install Gina's drivers from the supplied floppy and auto-configure everything so it worked flawlessly from the get-go. Gamers might want to keep their cheap'n'cheezy PC sound cards alongside Gina for maximum blast, but nobody who's serious about PC-based recording should be playing *Psycho Dry Cleaner IV* on his recording rig anyway.

Gina comes with an input/output box that's linked to the card and sits atop your PC, giving you access to two analog inputs and eight analog outputs—all of which are unbalanced phone plugs, like you'd find on an electric guitar's cord. This is actually the connector most commonly found on studio patch cables, but don't worry if all you've got lying around is a bunch of old hi-fi interconnects: Just slap some Radio Shack RCA-to-phone-plug adaptors on the cable ends, as I've done in a pinch, and you're good to go.

That's the hardware side in a nutshell, but we're only halfway to studioville. Bundled with your Gina is a CD-ROM that includes CoolEdit Pro, one of the best and easiest to use multitrack recording and mixing programs on the market. (The supplied version is a special "Lite" edition, which is all I've ever needed, but you can upgrade to Syntrillium's full version for a nominal fee.) You also get the Gina "console," a pop-up window that lets you adjust Gina's input and output levels for the best sound quality and S/N, and a cool little bargraph meter that lights green for input levels well within the usable range, yellow as you approach the analog input's 20-bit ceiling (the digital stuff is all 24-bit), and red if you overshoot into digital overload. Your ears will tell you this without your looking at the meter, but it's still nice to have.

Event says Gina can record four simultaneous tracks, and that's true, but she can record only two analog signals at once. The other two tracks must already be digital and be fed to her S/P DIF input. That's fine if you've got an external A/D; most of us don't, however. You can do as I did and use a DAT deck as an A/D by putting it into record/pause mode and taking its digital output as your signal source—but really, you'd be surprised at how rarely you'll need to record more than two analog tracks at a time. (And if you do, Layla's there, for another \$500.)

The main reason I love Gina so much is her sound quality. The 20-bit Crystal A/D and D/A chips Event uses make Gina (as well as Layla and Darla, which have the same converters) extraordinarily transparent, easily the best PC audio card I've heard. Gina's utterly clean A/D/A signal path is obviously a boon to studio recordists, though I also got great use out of Gina by transferring LPs to CD-R via her audiophile-grade A/D section. Let me tell you, the transfers sound so close to the output of my McCormack phono stage that I'm not sure I can reliably hear a difference. Now I've got homemade travel CDs of two of my most treasured LPs, Duke Ellington's *Indigos* and James "Blood" Ulmer's *Black Rock*, both of which are so much better than their commercial





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CD versions it's silly. I've been disappointed over the years by the mediocre A/D sections in many consumer digital surround processors and A/V receivers, most of which add an etched, slightly grainy coloration to analog sources. But I didn't hear any problems when running analog audio through Gina's A/D stage. Even if you never plan to do any multitrack recording, you might think about picking up Gina just to do audiophile-grade LP to CD-R transfers. She's that good.

As for multitrack recording, the combination of Gina, CoolEdit Pro, and my new Dell PC is one of the best, easiest to use, and most stunningly transparent rigs I've ever had the pleasure of using and is certainly the finest recorder I've ever had in my home to use on a whim. Whether I was layering multiple tracks of close-miked Leslie'd guitars along with distant room mikes for some "Van Gelder" ambience or running my turntable and phono stage through the A/D section for exquisite-sounding CD-R transfers, Gina so exceeded my wildest expectations of what a \$500 sound card could

**I'M AMAZED  
THAT I CAN STICK  
A \$500 SOUND CARD  
IN MY PC AND GET  
PRO STUDIO SOUND.**

do that I find my admiration for her growing the longer I live with her. If I could teach her to laugh at my jokes and whip up Bananas Foster on Sunday mornings, I would gladly seal off my front door and become a shut-in.

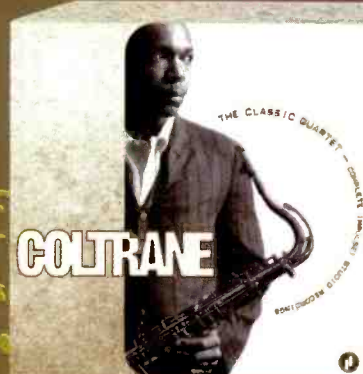
Having come of age during the analog Tascam Portastudio '80s, I'm amazed that you can stick a \$500 sound card into a PC and suddenly be elbow to elbow with the best pro studios on the planet. Event's Gina is a true breakthrough product, and I can't recommend her too highly. If you're contemplating buying one of the \$2k digital eight-track decks, you should definitely wangle an audition of a Gina in a good, fast PC before you spend a dime. I, for one, can't imagine my project studio without her now. In a world of quirky, buggy PC recording cards, she's a real doll. A

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by Ken Kantor

# SETTING UP

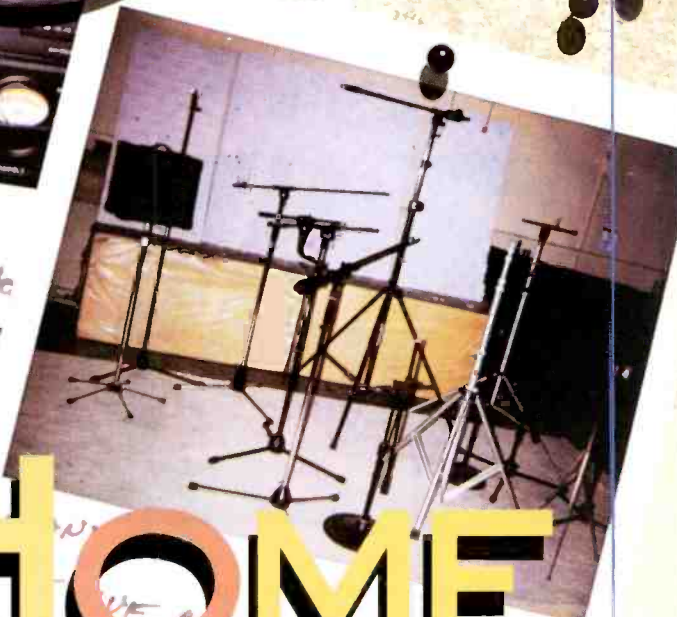
MIXING STATION

MASTER	COPY	DIGITAL	ANALOG
18	60	120	180
16	90	120	180

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KANTOR  
CLOSEUP OF OUTLETS



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SOME GUITAR AMPS

# A HOME STUDIO



KANTOR  
THE COMPUTER

Photograph: ©1998, David Hamsley

can't think of too many things I've learned to do in my adult life that are more fun than recording music. What started 20 years ago as a modest investment in a semiprofessional cassette recorder and an inexpensive mike has grown into a rig capable of capturing live music to a pretty high standard. Like its hi-fi counterparts, an amateur recording system can range from a small briefcase worth of equipment up to an obsessive, purpose-built room that rivals the sonics of anything on earth. Either way, the CD-Rs you can make yourself have all the potential of the CDs that come from a commercial source. Just about any level of investment has the potential to yield great results; whether you get them or not depends more on your experience, knowledge, and skill than any other factor. Record for free at home, and you officially have a home studio. Pretty impressive, huh? Record in the office (or work for spare change or beer), and you graduate to the even more official project studio category. Same difference. You are almost ready to compete with Abbey Road, at a total cost that's probably less than a single one of that studio's better microphones.

Getting involved with recording is a natural symptom of serious audiophilia and nothing to be afraid of. (Can you imagine a photography buff who

ogy, and learning how to turn knobs you are actually supposed to use. Whatever the reason, crossing over to the other side of the CD is an experience few people ever come back from.

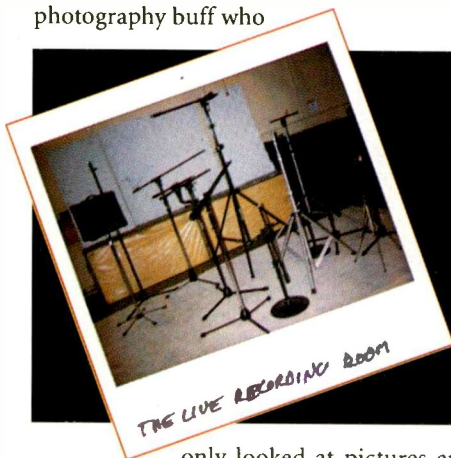
In the good old days, home recording meant wandering around with a battery-operated tape deck harvesting natural and unnatural sounds. Has-been string quartets and wannabe rock acts, lawns being mowed, glass breaking, and birds chirping—all were fair game. But things evolved very rapidly, and gear today allows a great deal of flexibility in sound manipulation, especially once a computer is involved. The typical home studio production goes through the same steps as a professional release might: tracking, overdubbing, mixing, editing, and mastering—or, as I call it, T.O.M.E.M.

## TRACKING

Tracking is the business of capturing sound in the first place, laying down the original tracks from which your overdubs, mixes, and edits will be made. A track is one channel of information, and it extends over the recording's entire length. Each track may contain a single instrument or voice, a whole roomful of sound, or anything in between. Anything whose level you might want to change after the initial recording is made will ideally have its own track, so you

able, and two or three technician/operators to manage them all, amateur studios typically range from two to eight or sixteen tracks. After that, it starts to get expensive. Each track can be an input on a DAT, MD, or multichannel tape deck, or tracks can be recorded directly onto a computer's hard drive or a stand-alone hard-drive recording system. (You wouldn't want to record on CD-R or even CD-RW at this stage, because it gives you no editing flexibility. That should be a final, not an interim, step.) As projects become more complex, different tracks may wind up on different recorders, all waiting for mixdown.

Superficially, tracking is a straightforward process of positioning microphones (or plugging in electronic instruments), setting levels, and rolling tape. In some situations, multiple takes are feasible; in others you are in the hands of fate. To the beginner, tracking can seem like the easy part of the process. It's fun, and it doesn't require much skill for you to get something reasonably decent on tape. In reality, it's probably the single most important step. If the essence of the original sound is not properly and subtly understood, no amount of clever processing will disguise this well enough to satisfy the discriminating audiophile. And if the performance isn't right, attempting to "fix it in the mix" will prove to be a nightmare.



**M**aking and manipulating sound of your own is a thrill, whether or not you choose to torture others with it.

only looked at pictures and never took any?) Many people find that it's the creative side of recording that is the most appealing. The process of making and manipulating sound of your own is unquestionably a thrill, whether or not you decide it is good enough to torture others with. You might just want to bring your audiophile quest for perfect reproduction to the next level, gaining further control of the process, interacting with advanced technol-

can adjust it in isolation. Most professionals tend to record original tracks very purely, one microphone or instrument per track, and save equalization and other processing for the mixing stage, when tracks may be heard together. Still, some things do get special treatment, and it is not unusual to see gentle compression used on a lead vocal when it is first laid down.

Whereas a big studio will have dozens—or even hundreds—of empty tracks avail-

Tracking is the underpinning of all that will come later, and learning how to really listen to instruments and their interaction with microphones is required. This is even more important when capturing live acoustic music, because retakes, overdubs, and remixes are often not a possibility. Use your ears, move your head around, move the mikes around; do test tracks, and listen carefully to them. Spend as much time as you possibly can.



**T**ypical project studio mikes (clockwise from top left): Audio-Technica ATM25 dynamic, Audio-Technica AT4041 small-diaphragm condenser, and AKG C414B-ULS and Audio-Technica AT4050 large-diaphragm condensers



## OVERDUBBING

Overdubbing is very similar to tracking, except that new sounds are recorded in sync with earlier tracks as they're played back. There are a lot of good reasons for overdubbing—and at least one bad reason. Obviously, it's not done when recording, say, a live choral performance. But you'll have to do it if you need to turn your lone voice into a singing group (The Rolling Clones?). It's also useful for adding special effects or fixing some inevitable mistakes (as when you discover a bad verse in an otherwise good take and the singer insists on redoing just that part again). The bad reason is to try fixing a bad take; it's better to rehearse the music and redo the take from scratch. This stage is a little more relaxing than tracking, since you can remake overdubs until you get them right or run out of time. But the basic recording studio rule of

capturing the original sound correctly still applies.

Using good headphones becomes important during overdubbing, since the musician recording the new track needs to hear what he's playing along with yet not have it picked up by the microphone. This is not an issue if you are overdubbing via a direct feed from an instrument instead of through a mike, but it is an issue otherwise.

Doing overdubbing by yourself takes a lot of practice. It is not a natural way to play, and getting a good feel on your instrument while staying in time with a tape and operating the gear is demanding.

## MIXING

Mixing is self-explanatory: Once you have all your original and overdubbed tracks, it's time to set them up on a computer screen or mixing board and blend

them into a stereo (or surround) mix. For a simple, or purist, recording, almost nothing need be done to the tracks. More often, however, a lot of work must be done getting the balance right from moment to moment, figuring out how to get everyone properly heard, and concealing minor problems.

Mixing is the time when the tone of individual tracks might be corrected by using an equalizer, either one built in to the mixing board or patched into the signal path. Mixing is also the time for other kinds of processing, such as adjusting dynamic range or applying artificial reverb, panning, and special effects. In mixing, you can really take the time to listen carefully and try many different adjustments and settings. At the end of the mixing session, you'll have a stereo tape or computer sound file that should be getting pretty close to the desired result.



**W**ith more tracks, you get more knobs: (clockwise from top left): Tascam DA-38 digital eight-track recorder, Fostex FD-4 four-track recorder, Tascam TM-D1000 digital mixer, and Mackie C1604VLZ analog mixer

## EDITING

Editing, which goes hand in hand with mixing and overlaps it, is the task of identifying and tossing out the bad takes, cutting the good takes to length, and putting songs in the desired order. Cutting, pasting, fading in, and fading out replace sonic effects as the tools in play. Once you get your chops as an editor, you might find yourself assembling a song from different pieces of several takes: "I liked how I sang 'I' and 'get' on take 3 and 'can't' on take 1, and can we overdub 'no' again, please?" It's called "comping" (compiling), and therein lies madness if you aren't careful. It's better to try for one good take.

## MASTERING

Let's say you want to put three songs on a CD-R, but when you listen to your test mix, they don't seem to go together right. The first song sounds good, but the second has more bass and is much louder. The third song starts okay but gets too soft to hear in your car. And when you check how all of them sound in different environments

and on different systems (crucial for obtaining a sound you can live with), things often change. Songs that sounded wonderful through your studio monitors may seem much brighter through the tabletop stereos some of your listeners may use.

This is mastering time, when you make those final finishing touches to levels, tonality, and dynamics. Here's where you give your work a coherent feel. In the pro world, mastering is a secret art practiced by esteemed golden ears. It is rarely done by the engineer at the main recording studio; rather, the tape is usually sent out to a mastering house. Why? To obtain additional expertise (a good thing), and so the lead engineer can point the finger at someone else if the client complains (a bad thing). In home studios, we do our own mastering, thank you very much. And to avoid screwing things up, we won't do anything more than itsy-bitsy tweaks of tone controls and level. Believe me, 1 dB goes a long way.

The final step is to transfer your master to a CD-R. In the past year or two, this has become affordable, with CD recorders in

the \$500 to \$1,000 range and CD-RW drives for PCs at about \$300.

## SELECTING EQUIPMENT

There are infinite strategies for starting a home studio and many, many products targeted at that market. What differentiates setups, besides price, is how flexible and expandable they are and how easily each T.O.M.E.M. step can be accomplished. It can get really confusing, especially if you are not sure about what kind of recording projects you'll be doing. So just consider your options, and spend a few hours playing around in a good music store. You'll soon gravitate toward one approach or another—more or fewer buttons, more or fewer options, easy to use or complicated. Finding a good dealer is essential, since I can't cover all the little details, such as what kind of microphone plug fits into what mixer or how to set all those knobs. (How come you're not getting any sound? How should I know?)

I'll outline three multitrack system types, from simple to sophisticated, that can deliv-



er stellar sound to put onto your own CDs. My suggestions are by no means the only ways to go and won't cover every base. On the other hand, you can get an idea of the costs involved and begin to figure out where you want to start. First, though, I'll review a few concepts that apply to all studios.

Unless you want to do nothing but Yanni and Depeche Mode covers, you'll need some microphones. And the more important reproduction accuracy is to you, the more better-quality mikes you'll need. Deciding which microphones to buy is difficult, because there's a lot of advertising BS around and a product-of-the-week mentality reigns. I suggest staying away from really cheap and really expensive stuff and avoiding the latest craze. The classic mikes have been on the market for years, and if that cool new piece your dealer has is so good, you can probably buy it next year for less. If you stick to between \$150 and \$800 per microphone and stay with the major brands, you should do well. (These prices, and all that follow, are ballpark estimates.)

A lot depends on what you want to record, but for a serious beginner's most basic chores, I recommend four mikes: one large-diaphragm condenser (the AKG C3000, CAD Equitek E200, and Audio-Technica AT4033 are good choices here), two identical small-diaphragm condensers (try a pair of Crown CM-700s, Shure SM81s, or Audio-Technica AT4041s), and one good dynamic mike (the Shure SM57,

You have to learn your mikes: Some characteristics won't be apparent from spec sheets, such as subtle colorations in off-axis pickup.

Obviously, your monitor speakers are also critical, because you will use them to make countless decisions about mike placement, equalization and processing, and mix levels. Ideally, the studio monitors should be as transparent, accurate, and neutral as the best speakers you expect your work to be heard on. They need not be huge, however, since you will probably be sitting pretty close to them. Don't be afraid to use high-performance consumer speakers, which often sound much better than similarly priced "pro" monitors. Just be sure that the speakers sound good when you're close to them and that they can handle the power it takes to monitor a guitar track near its original level. I find that self-powered speakers (such as the NHTPro M00, Event 20/20bas, Mackie HR824, and Paradigm Reference Active/20) are very convenient.

Headphones are also important tools, for assisting in mike placement and for overdubbing. (Sony's MDR-7506, AKG's K240M, and Sennheiser's HD580 are good 'phones for these jobs.) Ideally, you should have two different types, one pair of closed-ear and one pair of open-ear headphones, to give you fresh perspectives on your mix. Add in mike stands—not to mention cables for the mikes, mixer, and monitors—and your indispensable extras come to anywhere between \$250 and \$1,000. So with

the obvious creative uses, they can help your recordings sound more realistic. A tasteful touch of reverb, for example, can substitute for some of the natural reverberation your mikes didn't quite capture. Equalization can be used to compensate for the subjective trade-offs between tonality and, say, stereo imaging that you make when choosing microphone placements. And adding a touch of dynamic compression is a widely accepted way to increase the realism of recorded vocals and percussion.

All of the systems detailed below include very basic effects (so I've largely excluded effects boxes from my budget figures). Take time to play around with these built-in effects and see what they can do before you even think about buying anything more. Chances are good, however, that you'll want to add a decent compressor and maybe a reverb unit as time goes on.

### SYSTEM #1: TURNKEY TUNES

If you really want to minimize wiring and setup headaches, there are a number of digital "studio-in-a-box" products on the market that use internal hard drives and built-in mixers, such as Fostex's four-track FD-4 or eight-track units by Korg (D8) and Roland (VS-880). Just add mikes and monitors, and away you go. These all-in-ones run about \$500 to \$1,500, plus \$500 for CD burning capability. I recommend spending the extra \$500, not just for pro-

**T**racking is the underpinning of what comes later, so spend as much time as possible getting it right.



Audio-Technica ATM25, or Sennheiser MD 421 will fill this bill). The total should set you back about \$1,000 to \$1,400.

As time goes by, you may want still more microphones, for complex projects and more controllable sound. With a variety of mikes, you can pick the one whose directional and frequency characteristics give you just the effect you need for each situation.

the microphones, monitors, and CD recorder included, you're looking at about \$1,500 to \$4,500 when it's time to go shopping. Could you do it for a lot less? Yes. Lose a mike or two, get just one set of 'phones, and mix on recycled hi-fi speakers. Should you? Only if you have to.

Finally, consider effects. Love them or hate them, you have to have some. Besides

reducing audio CDs but also to allow you to back up each project and remove it from the system when you finish a session or project.

Your total cost for a system based on this option is between about \$1,500 and \$6,000, including all the extras (mikes, monitors, and such)—not cheap, but not bad for a comprehensive system that can handle a wide range of tasks. Upgrades to consider

**M**onitor through good stuff, such as AKG's K240M headphones and Mackie's HR824 powered speakers.



would be additional microphones, some dedicated mike preamps, and various effects boxes.

### SYSTEM #2: MIX MASTER

The next option would be to computerize, performing all tracking and editing on the computer screen. This is a very potent upgrade, one that gives you vast power to easily manipulate sound and music. But beware! You'd better be a gearhead. Computer recording is still in its infancy, and you can't expect to plug everything together and be up and running the first day. You will be spending a lot of time on the phone with your computer-savvy friends and various tech-support people. But once you are there, look out!

You will need an external analog mixing board to preamplify your mikes before they go to the computer. (Good mixers for this purpose are the Spirit Folio SX and the Mackie CR1604VLZ.) This board can also

be used for mixing itself, although many people who learn to mix on a computer screen swear by that. I'd budget about \$500 here.

Even though a computer can handle compression, I also recommend a basic external compressor to tame highly dynamic signals before they hit the A/D converter. With extra cables and plug adaptors, expect to pay about \$1,000.

Don't skimp on the computer; it should be fast, a 200-MHz Pentium II or better. Equally important is having a big, really fast hard drive. The faster, the better, and Ultra SCSI-2 is the way to go if you can. Don't

forget to include a CD burner and, of course, an eight-input sound card.

I've budgeted \$3,000 for the basic computer system. Plan on spending another \$1,000 for the sound card, which will come with basic editing software. That should even leave you a bit for more advanced software (such as CakeWalk Pro Audio, SAW-Pro, CoolEdit Pro, and SoundForge).

So now we have \$5,000 or so for the computer, sound card, mixer, and compressor and \$1,500 to \$4,000 for the mikes, monitors, and other indispensable extras, totaling about \$7,000 to \$12,000. There's plenty more you might want, but I really needn't mention it at this stage. Get this far, and you'll be so hooked that you'll be telling *me* what *I* should buy next.

### SYSTEM #3: TAPE ME UP!

Building on system #2, we upgrade the mixer to digital and supplement the computer with a multitrack digital tape deck

(often called modular digital multitracks, or MDMs). These decks record on videocassette—VHS in ADAT systems such as the Alesis LX20, 8mm in the Tascam DA-38 and similar recorders.

Using an MDM really puts us in a different league. In the first place, it gives us almost two hours of uninterrupted multitrack recording, far more than home computers can hold. (With alternate takes, a 15- or 20-minute project can fill up a 9-gig hard drive, fast.) So there's less need to worry about running out of room during multiple takes. It also lets us switch from one job to another simply by swapping tapes. And forget about having a computer crash wipe out a take or a whole project!

By combining the flexibility and editing capabilities of hard-disk recording with the storage capacity and reliability of tape, you'll get a studio system that can tackle very complex situations. Further, as your sophistication grows, you'll find it's not that hard to sync digital tape with a computer editing setup and have them operate as one seamless whole.

With the Tascam TM-D1000 and Yamaha's PM 01 and 01v, affordable digital mixers are really starting to come into their own. The features and sound quality that you can get in a home studio these days are amazing. Besides automated faders that record your mix adjustments and can replay them for listening and further adjustment, better digital boards contain dozens of useful signal processors, including equalizers, compressors, and reverbs. This eliminates the need for outboard gear in many situations. Once you digitize the mike signal going into the board, it stays digital for effects processing, editing, mixing, and mastering.

The basic cost of going this route is about \$2,000 for the tape deck and \$1,500 for the mixer (a net cost of \$300 to \$900, since it eliminates the need for an analog mixer)—about \$2,000 to \$3,000 more than system #2. Now the sky is the limit. Some high-end mike preamps? Eight more digital tracks? Synchronization and automation of mixer, computer, and MDM? Some prestige tube-powered microphones? Twenty-four-bit converters? How about that new room-simulation software? Sound absorption for your whole garage?

Better sell some tunes!

A

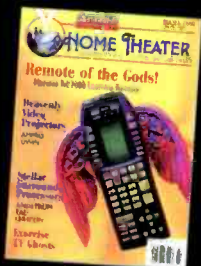


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Ron Goldberg,  
*E-Town*, June 1997

"...the DC-1's sound quality was little short of stunning. No component I've heard can provide the depth of DSP ambience processing (and extraction), user-customization, and flexibility of the DC-1."

Daniel Kumin, *Video*,  
January 1998



"The DC-1 did a better job of serving both music and soundtracks than any surround processor I've experienced to date."

J. Gordon Holt,  
*Stereophile Guide to Home Theater*,  
Winter 1996

"The surround steering has the sort of drive-by-wire precision that even Ferrari can't match. The DC-1 is one of the nearest things the home entertainment industry has to being a classic."

*Home Entertainment*, April 1997

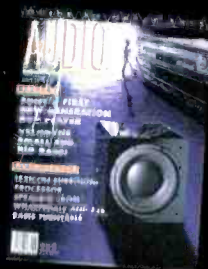


"The best digital surround processor to date at any price."

David Frangioni, *EQ*,  
May 1998

"The Lexicon DC-1 clearly competes with the finest and most costly processors available, despite its comparatively modest price... It has the best ergonomics and real-world features of any A/V preamp/processor I have encountered."

Anthony H. Cordesman, *Audio*, June 1998



"Looking for the most advanced digital processing you can buy? This [DC-1] is it, no contest."

*Home Theater Buyer's Guide*, Winter 1996-97

"The DC-1 produces staggering audio. It's easy to set up and it delivers every conceivable (and inconceivable) surround mode – both for home cinema and music. If you are a connoisseur of home cinema, then look no further."

Bob Tomalski, *Home Cinema Choice*,  
June 1997



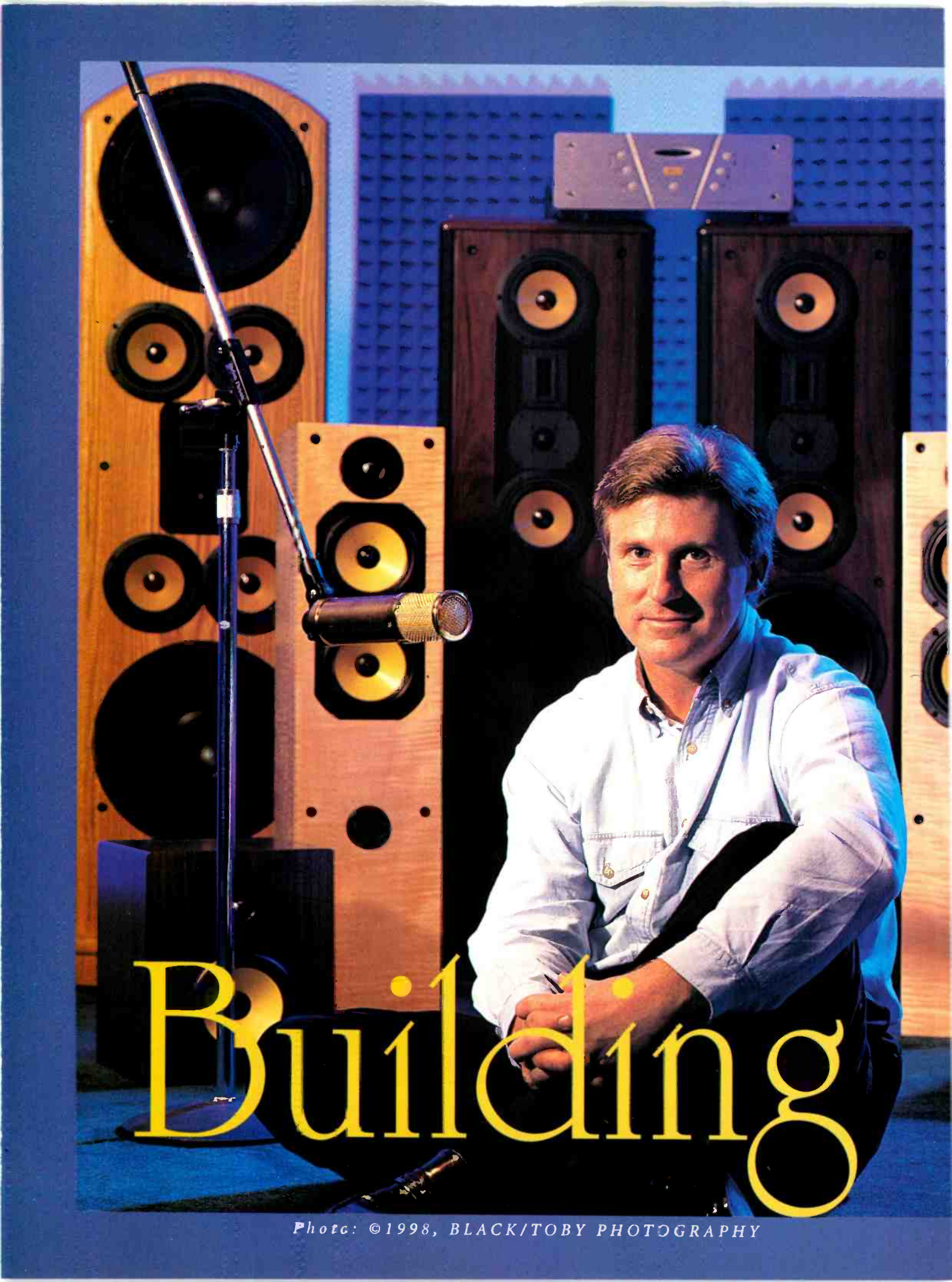
# "EIGHT THUMBS UP!"

The DC-1 Digital Controller



A Harman International Company



A man with short brown hair, wearing a white button-down shirt, is sitting in a recording studio. He is surrounded by several large, multi-driver speakers. A vintage-style microphone is mounted on a stand in front of him. The background features blue acoustic foam panels. The word "Building" is written in a large, yellow, serif font across the bottom of the image.

# Building

Photo: ©1998, BLACK/TOBY PHOTOGRAPHY

by Tom Nousaine

# Bill Dudleston

**I** first met Bill Dudleston in 1985. He and his partner, Jake Albright, drove to Chicago to pick up a pair of loudspeakers that I had reviewed. The speakers, now evolved into the Legacy Classic, sounded quite good, but what distinguished them from the competition was their furniture-grade finish. It was first-class, unlike anything I had seen to that point. And Dudleston, an outspoken engineer in his late 20s, struck me with his enthusiasm and candor.

Since then, Legacy's line has expanded to 12 models and the company has grown into a major player in the high-end speaker market by pioneering direct marketing and sales. In the process, Legacy has developed a fanatical following among customers, thanks to the quality of its goods as well as to an extraordinary level of customer service that is several layers deep

TN

*How did you become interested in audio?*

I really can't remember ever not being involved in audio. My first memories in audio were of taking my grandmother's stereo apart and putting it back together again or messing around with the phasing of a Capehart phonograph. When I was 12, I built a working radio, hand-wound tuner and all, from directions in a science book.

My heart was always in audio, and my passion developed naturally. As a teenager I had three or four open-reel tape recorders. I would record anything I could. My first Akai recorder had sound-on-sound, which, of course, had delay between the tracks. So I mixed down

things with slap echo like Sam Phillips and Elvis.

*How about your training?*

My degree is in chemical engineering, which requires an understanding of fluid flow and thermodynamics, plus an appreciation for mechanical and electrical engineering, in addition to chemistry. I think this background gave me an edge in acoustical modeling of polar patterns and in understanding phenomena such as mutual coupling.

Many models don't treat sound as an expanding wave front but more like bullets bouncing around the room. If you drop a rock off a bridge, you can see an expanding wave.



# a Legacy

## THE AUDIO INTERVIEW

Sound works more like that. The fields overlap nicely, and the chemistry really helped with diaphragm technologies, surround adhesives, and the like.

*What did you do after college?*

I worked for a few years as a process engineer during the energy crunch. My job was to fine-tune chemical processes to decrease energy consumption. After that I supervised a digital research lab for an agrionics company, where I created calibration algorithms by using linear regression methods.

But these jobs just weren't emotionally gratifying. I was working eight to ten hours a day in the lab and then coming home and modeling loudspeakers. I also built a lot of furniture and did a lot of woodworking.

Woodworking is a tedious process that requires a lot of planning, patience, and manual labor. Just like scientific research. Starting a loudspeaker company put all the things I loved in life together for me.

*It sure seems like you have done an excellent job of blending the art of constructing fine furniture with designing good-sounding loudspeakers.*

Almost all of my designs begin with acoustical parameters, leading to a certain driver layout or baffle width. From there you have to conceal your work and encase it in something you would want to bring into your home. When I think back about designing the Whisper system, I remember the concept percolated for about 15 years. I had to get my head together on what I wanted to do with the directivity; another six months was spent on optimizing the radiation pattern (using Speak software at that time).

But the final cosmetics were the biggest challenge—making the loudspeaker look

like something you would want in your home. Initially the Whisper looked like two surfboards stuck in the sand, one behind the other.

The finished speaker looks like a monument or something. The front grille is shaped as a gemstone emerald cut to convince a woman it's something she would want in her home. The Whisper is our most popular model among women. They actually encourage their husbands to buy them, if you can believe that. I actually had one guy in California, a decorator, who bought one just to look at it. He didn't even want an amplifier.

*When did you start professionally in the audio business?*



*The Legacy line in '86; the company now makes a dozen different models.*

That's a tough one. I've recorded everything from sound effects and ceremonies to classical performances. I was around 20 years old before I did anything that was commercially viable.

*How did you first get involved in building loudspeakers?*

It was an economic thing. In high school I always made things for myself. I built my first bicycle. I built my first radio. At that time there was a loudspeaker I was rather fond of, the Dahlquist DQ-10. It was a touch inefficient and didn't go too low, but I liked what it did right.

But I couldn't justify spending that kind of money with college coming up, so I built my own. They were my first serious speakers, and I ended up winning a science award for them.

*Were they just copies of the DQ-10?*

No. The design was influenced strongly by the DQ-10, but I used different drivers and wound up doing things differently. This was all before *Speaker Builder* magazine was available. Amazingly, back in the '70s there was little information available at the local library, and you couldn't pull anything down from the Web, so there was a lot of cut-and-try going on.

Later, my more serious designs came for a different reason. I always felt I could build a better speaker than I could buy at any reasonable price. Didn't you feel that way, too? *Things aren't the same for an amateur now. I used to feel confident I could make speakers better than I could buy. It's difficult to do that today except with really big subwoofers. But how did you get into speakers as a business?*

Something really reached me at the University of Illinois. We fit parameters of ideal gases to predict the behavior of a specific gas. It wasn't until my fifth year that I realized you have to use a polynomial far more complex than we were using—and one fitting a lot more parameters—to even approximate the behavior of real gases.

That taught me a lot about the oversimplification of Thiele-Small parameters. I remember having my Sharp pocket calculator and using handbook values to crunch numbers, only to find the measured response of real speakers varied wildly from the calculations because we didn't consider many influences that occur with loudspeakers, like box loss, room gain, and floor bounce.

I really didn't start building loudspeakers as a business. My interest just kept taking me that way. I didn't build a loudspeaker to sell it. But whenever I built a loudspeaker system, somebody would want it. Then I would build another one. Eventually I just quit my job and started my own business.

*With your partner, Jake?*

At the time my father-in-law, Jake Albricht, was a just-retired contractor who had been very successful. He was a very good partner who saved me lots of steps in the business practice. It was 1983 when I really started looking at the business side of things, forecasting and so forth. When it's just your own engineering time and your own labor, you can neglect what the real costs are. The advantage you have when you start that small is that you can do many variations on a product. In fact, during the first two years, most



# TARTING A LOUDSPEAKER COMPANY PUT ALL THE THINGS I LOVED IN LIFE TOGETHER FOR ME. ■

of the improvements resulted from solving vendor and supply problems. When you receive 15 variations of a woofer, pretty soon you get to know that design. That taught me the importance of reliable suppliers.

## *What was your first product?*

The Legacy-1, a speaker that has become the Classic in our current line. It's a floor-standing tower about 42 inches tall. We did enough things right on that speaker that it stood up well over time and through several design iterations.

*In 1985, that speaker leaned backward. I was impressed with your candor when I asked whether that was a time-alignment trick.*

Yes. I remember that. The back tilt was because there were so many drivers on the face that the speaker would tend to fall forward unless small feet were added to tip it back. I actually optimized the crossover phasing for that tilt.

## *How many did you sell that first year?*

We sold about 20 pairs. Because of the amount of time it took to build them, that was probably a good thing. But there was enough financial activity for me to quit my job.

In the beginning I had to decide between getting more test equipment and buying parts in greater volume. I had an agreement with my wife that there would be no borrowed money. So I spent a couple of months installing car stereos to use up parts so I could buy larger batches of parts and keep my test equipment, too.

*So you made a foray into car stereo. Didn't you also have a retail outlet?*

Absolutely. My first building and wood shop actually had a four-car installation bay. It's a test bay now, but then things were a lot cruder. One of my first products was a cabinet for hatchbacks, the Road Roller. Ironically, Loyd Jevy of MTX used to summer in Springfield, Illinois, and hang out at the same Icy Root Beer I did. He has since pulped that fuzzy box thing in the backs of

cars into a multimillion-dollar business. That's something I would not want to compete in today, that's for sure. I think I put \$300 worth of parts in the first box. It was internally amplified, too.

*The company was originally called Reel to Real Designs. Where did that name come from?*

Reel to Real was more studio-influenced: I was doing a lot of live recordings at the time. That was the shingle we operated under then, but the product line has always been called Legacy.

One of the things I am very proud of is our involvement with the Stradivari Violin Society, a nonprofit organization that is dedicated to the preservation of the world's finest instruments. The Society uses Whispers as its reference system.

I have also built loudspeakers for studio purposes. In fact, our Focus developed out of requests from recording studios. They already had their high-level systems and wanted a loudspeaker that would play at 130 dB but at the same time retain the tonal and imaging characteristics of our Classic. So we made a much more dynamic loudspeaker, the Focus. It will do 115 dB at 20 Hz.

*At 1 meter?*

Yeah, it really will. With three 12-inch woofers per side, it should.

*How many speakers did you sell last year?*

In the thousands, yet we are still production-limited. I won't say it's a problem; in a way it's actually a blessing. For more than 10 years we have had a waiting list, just like one would wait for a Steinway piano or Stradivarius or another handcrafted product. But we are proud to say that most of the time the wait is under six weeks and typically about four.

*What do you mean when you say "handcrafted"?*

Until 1995 everything was entirely done by hand: hand-plunge-routed, hand-sanded,

To this day the only thing automated is baffles-plunging, using a CNC router. Anything that involves veneers, crossover manufacturing, or tuning of the product is done by hand. Lots of labor. Our Whisper cabinet alone requires 138 man-hours.

*Is there something more to it than just the quality of the finish?*

Automation can, of course, provide comparable tolerances and accuracy, if not better. The real benefit of the hand labor is the selectivity of it. For example, if you are laying out veneer on a pattern or selecting hardwood to brace the uprights, you can select out the knots and hand-cut it, making sure the left speaker will look like the right.

From a consumer's standpoint, the benefits of handcrafting will definitely be in the product's finish. There are seven steps of hand-rubbing and polishing the cabinetry. It's definitely the slow point in the process. In most companies this would be the area where people would try to get the wheels to

turn faster, but that's not our formula. Just like a number of companies that have survived for a long time, such as McIntosh, we appreciate why we are in our

**Built with the pros in mind, the Focus speaker can put out 115 dB SPL at 20 Hz.**



niche. We just continue to do things the way that has proven successful.

*Are you ever nutty about it? I once heard of a company that refused a large order because it didn't think a piano-black finish would do justice to its speaker.*

Remember, I started this business to satisfy myself; that's as straightforward as I can put it. But over the years I've learned the value of relationships with customers. If there is a Legacy difference, it's that we listen to the customers' needs. For example, recently we had a customer who said he wanted our Focus speaker on a Whisper-style oval base. Our cabinet shop handcrafted it for him. We have had quite a few people with requests like that. While we try to be realistic about it, we don't like to use the word "no" when it comes to customers.

*So, if I were to buy Legacy speakers, I would have a good chance of getting a pair that is unique or unusual in some way?*

It definitely can be done. There's a little longer wait on something like that. We've done things like curly maple

*A back view of Legacy's Whisper reveals the dipole's rear-firing passive radiator.*



WE'RE REALISTIC, BUT WE DON'T LIKE TO USE THE WORD "NO" WHEN IT COMES TO OUR CUSTOMERS. ■

for customers. In fact, we've added curly maple as a new custom finish this year.

The added cost to the company is higher than you would expect when you factor in the space required to lay out and store the custom materials. But the real cost is in what other companies consider a break of efficiency: Could you have built four that day instead of two?

*Speaking of how your company differs from others, tell me about your distribution system.*

I think there are a lot of myths about it. I see a company advertising that it was the first direct-marketing company in the speaker business. We weren't the first, and we started three or four years before that company.

What I can tell you is that direct marketing would, at first, appear illogical in selling speakers. Who's going to buy something he can't hear? We swam upstream and still do. In the early years we offered free shipping to the customer; we were willing to bet you would like our loudspeaker better. Our early ads said: "Go find your favorite loudspeaker or even the best speaker you can find anywhere, and we will ship you ours. If you don't like it, send it back."

We were able to achieve a 98% success rate doing that. Direct marketing wasn't something we happened into. Direct marketing was what allowed us to build a better speaker, by investing more in its construction.

At the time we started, there were 450 loudspeaker manufacturers. If we were going to make any noise we had to have a demonstrably better product—not just in audio terms but in furniture terms and in customer service. Customer service is one thing that separates us from the pack.

*Can you be more specific about what customer service means to you?*

Customer service is following up after the sale, answering questions before the sale,

giving advice in areas where you might say that there's nothing in it for Legacy except establishing a good reputation. The biggest difference is what happens when someone calls us about a possible loudspeaker or audio system purchase. We can take him through a show-and-tell sheet, which is a room diagram, construct a model of his room on a screen or a sheet, or send a form to fax back. We'll discuss speaker placement in the room and what widths and heights are required. For example, when someone buys an on-wall speaker he often doesn't know the height of the wall over the doorway. We'll go through all the details. Basically, more than anything else, it's about personalizing and understanding individual needs.

This may seem like a stretch, but we've had people say "I want to buy a pair of Classics, but I have a problem. My left speaker is going to have to sit on a hearth, so I need 4 inches cut off it." I have actually adjusted crossovers and retuned the cabinet to compensate for that 4-inch difference in height.

*At what cost?*

It's on the order of \$150 for a modification like that. We are in a field that has perhaps the world's most persnickety customer. Not only are there a variety of "religious" beliefs going in, like tubes versus solid state, but we also have subjective coloration preferences and a host of other considerations. The secret of customer service and dealing with individuals is listening. It's important to get them to relax. You have to listen to what their needs are.

*Have you ever had dealers?*

In the early years we experimented with dealers, but there is an implied value in going to a dealer. Remember, this business was started by a guy who longed for that one-on-one customer contact. In the early years, I saw dealers more as a barrier because the customer always came back to us with questions anyway.



On the distribution side, direct marketing seemed to offer many strong advantages in terms of customization of the product. It would have been impractical for a retailer to inventory 12 products in eight different finishes. But we have worked with a number of installers who bring us their customers' needs. This year we are looking to add a few more installers. In recent years our line has expanded so broadly that very little customization is required.

**How do you test or tune your speakers?**

Tuning is quite an involved process. One reason is that we use multiway crossovers. For example, if you are building two-ways, you can grade woofers and tweeters, batch them together, and off you go. When you're going with a four-way, things get a bit stickier. We also grade and batch raw drivers by impedance curves and so forth. But in final production, we null the first speaker in a pair against a "mother" [a reference unit] and then match the second speaker to the first. It's an intensive process; we spend 45 minutes to an hour on every pair just manually testing and tuning.

**That's different from driver selection, isn't it?**

Driver selection is done earlier. It's a culling process of rejecting drivers we find unacceptable, even if they conform to the manufacturing spec.

But grading drivers alone won't get you there, because of the overlapping and underlapping going on with three-, four-, and five-way designs. To get those speakers pinned down so that their polar patterns are all tilted and phased properly is difficult. Anyone who has looked at driver impedance curves knows how reactive drivers are, and to use steep slopes and lock these drivers in is not an easy thing to do.

By the way, we batch our woofers by  $f_s$  [free-air resonance frequency]. Midrange drivers are checked acoustically as well as electrically. We reject about 15% of the midrange drivers after coming from the highest-quality vendors we can find. We test them with frequency sweeps and by listening to complex tones, like piano and voices, for high-order harmonics.

**Doesn't failing your listening tests mean that the driver will fail the frequency response test?**

You can find drivers with normal-looking response and impedance specs, but when playing music their voice-coil leads may be a little too short or the voice coil may rub.

**How about tuning the finished product?**



That's where I was going earlier. First we check all the switches and controls, making sure all the binding posts are tight and everything is operating properly. Then the tuning begins. We place the speakers side by side, aimed in toward a microphone at 1 meter, while inverting the polarity on one speaker. We remove the crossover from each enclosure and match the two loudspeakers by adjusting the crossover to get the deepest acoustic null we can. What's beautiful about this technique is that the difference plot we get indicates any errors precisely.

There are five to twelve attachment points in every speaker where we can trim values. We typically change a choke or a capacitor or tweak resistor values before the

speakers are ready to go out as matched pairs.

**When you find errors, which speaker do you fix?**

The final pair must be qualified against the mother, so we fix the one that deviates from the mother. But there are times when you can't tune the errors out. Because our tolerances are very tight, it's sometimes better to replace drivers. It's particularly touchy in the midrange; the top and bottom seldom require any bending.

**Let's change gears. Do you consider yourself high-end?**

To me, high-end is high-performance audio, and I certainly consider Legacy products to be very high-performance. And we are not inexpensive.

As far as fitting into the chemistry of the high end, well, the high-end audio industry is a bit bizarre, to say the least. There are some incredible products being sold out there, and right next to them is some guy selling magic rocks and glow-in-the-dark interconnects. That part I don't see our company fitting into. We tend to be a lot more practical and hope we have our feet planted a bit more firmly on the ground.

I can't fault the industry for its style. The biggest problem is its reluctance to move forward when real technology is available. Our industry now is paying a price for not being as progressive as the computer industry in the late '80s and early '90s. The consumer could have been benefiting more from DSP, digital crossovers, higher-efficiency amplifiers, and so forth. For that part of the high-end industry, I am saddened.

But the consumer is the boss. Between the Home theater push, which is a healthy thing, and the push in computer technology, high-end audio is waking up. A lot of manufacturers are scrambling to build much better products. That's a good thing. **It seems like much of the high end is trapped in two-channel.**

There is a certain magic that occurs in the two-channel demonstration where you synthesize a phantom center image from a mono feed. That is a wonderful phenome-

**It took a year's worth of prototypes before Dudleyston began to really understand the Whisper.**

non—hence the success of stereo. Multi-channel doesn't have to be seen as a detraction from stereo, however. You can always go back to two-channel.

One thing I've found is that the advantage of adding a center channel is difficult to talk about to a customer until it's been demonstrated. For example, if I take our Marquis center channel—which is timbre-matched to the Whisper—I can convince a centered listener that he has heard the same thing twice when I switch the Marquis on and off. You don't notice anything until you move a few feet off center.

Then consider the history of stereo perspectives and listening angles. The first stereo most people owned had speakers attached to a portable phonograph and spaced only 24 inches apart. But if you think about Blumlein's stereo and ORTF recordings, I think the maximum listening angle is 55° off the nose's axis. That makes a total 110° included angle. Back in those days, wider speaker spreads were very desirable.

But an audiophile today often places his speakers 5 feet apart and sits 10 feet away, trying to maintain a strong center image. There's not much benefit in adding a center speaker in a situation like that. When you add a center speaker, you can and should spread the others farther apart.

*Speaking of angles, you've done some interesting work on directivity control. How did you get started on that?*

Directivity control is not something that came to me quickly. I had to be hammered over the head for 25 years before I understood the need for it.

I think back about my early analog system and how we would buy phono cartridges with 20 or 25 dB of separation at 1 kHz and amplifiers with 80 dB of separa-

tion. We think of channel separation as if it were significant at the front end of the system. But the minute we get to the speaker, we stop talking about it. The same is true for signal-to-noise ratio.

If your phono cartridge picked up ghosts as it tracked along, as can occur with multipath in FM radio, it would seem unacceptable. But when you listen to a loudspeaker system, you get the original program material that was recorded plus your room's imprint on it.

Eventually I realized that we need to improve the signal-to-noise ratio of the overall system: more signal, less room. The goal should be to hear the recording hall's rever-



*Dudleston with the Stradivari Society's Geoffrey Bushi (left) and master builder Tetsuo Matsuda*

berment, not your own. We have to understand that what we pick up at each ear is purely two-dimensional—amplitude modulated over time. The mixing is all done by the brain.

Let me illustrate. Cover one ear, and listen to someone speak. Everything sounds too reverberant. Then remove your hand, and it all snaps back to normal. That's because the brain is able to correlate and lock onto the information common at both ears.

A good loudspeaker setup should leave you with a you-are-there perspective, not they-are-here. We need to minimize the influence of the room. In the Legacy product line you will see that as the speakers become more complex, they are getting larger and have more piston area. This lowers distortion and improves directivity control. Our Focus has a strong midrange null in its output toward the floor, to minimize floor-

bounce effects, and the Whisper takes the concept to the next level by doing it horizontally as well.

The Whisper system has the narrowest wideband directivity of any speaker I know of today. It's desirable to keep the radiation angle close to 45°, so that we can keep the left more left and the right more right. This was readily achieved at high frequencies by orienting our ribbon driver sideways and loading the dome into a foam throat. But as the frequency drops, we have to work a different trick. At 1 kHz the wavelength is 10 times longer than at 10 kHz, so it's a different ball game. Trying to wave-guide that and avoid the problems of a horn meant using different tools.

*Different tools?*

We built an array of five identical cone drivers: one in the center, two above, and two below. Then we worked with the spread to optimize the radiation angle both vertically and horizontally. Ultimately we set up a dividing network so we could hear the four outer drivers, the one in the center, or all five. What we discovered wasn't what we expected. First of all, four drivers were far more precise than a single one, because they formed a larger source that behaved somewhat like a parabolic antenna in reverse, to give a stronger focus.

The thing that was most bizarre was that the perceived loudness was greater for the four drivers than for one, even when the levels were matched. The ear can lock onto the four more readily than the one. That is because we are constantly trying to use our two ears to maximize the signal-to-noise ratio. Reduced reverberant energy is perceived as an increase in signal-to-noise ratio.

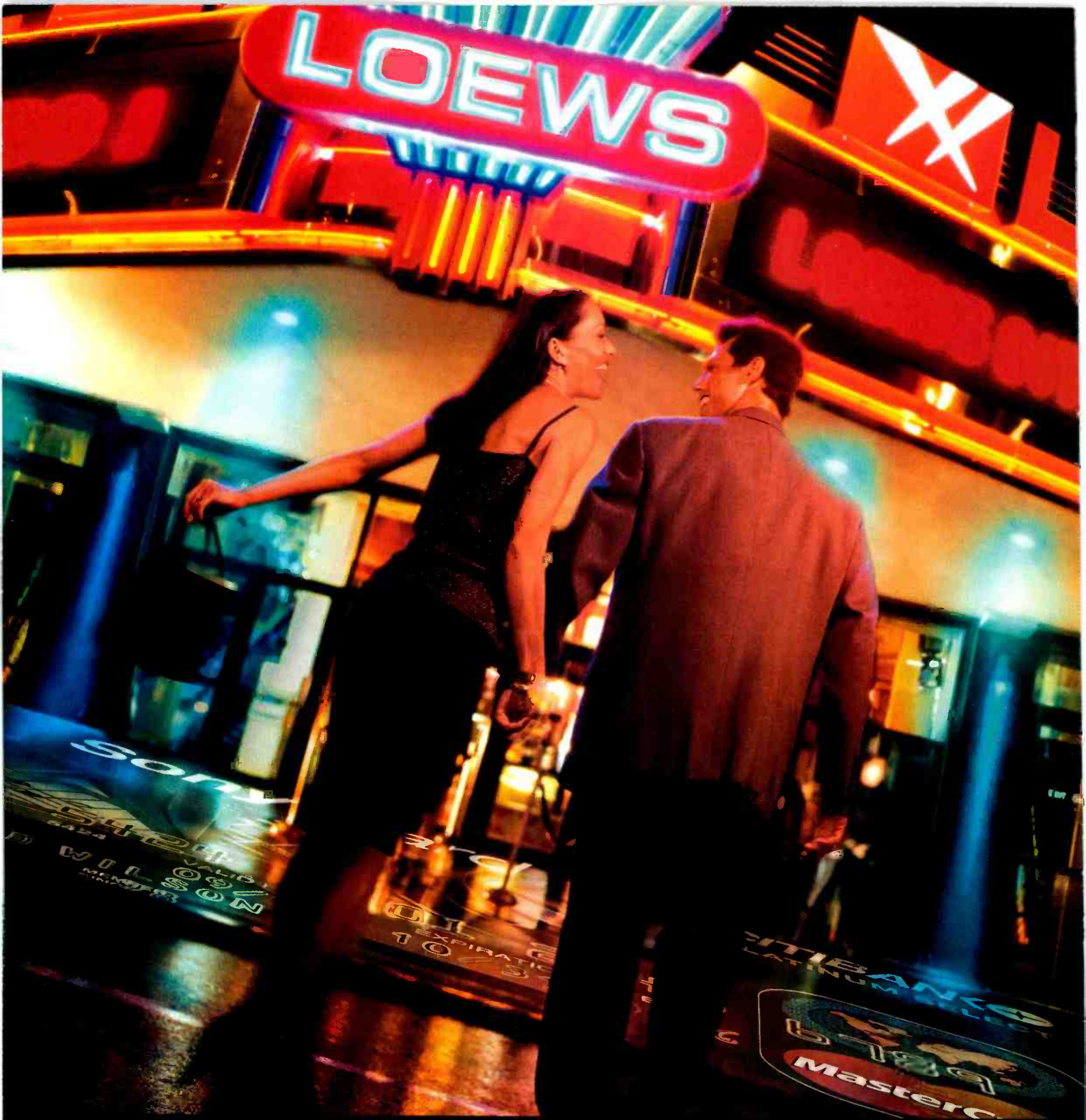
We understood this phenomenon better when we noticed that from an adjacent room the sound was noticeably softer when four drivers were playing. The relative amount of reverberant energy had dropped.

*What approach did you take in the Whisper's woofer section?*

The bass section was the real holdup. I had built a woofer-behind-the-woofer dipole prototype around 1991/92, so I could feed them the same signal but play with the phasing and frequency shaping to peek away at the rear radiation—a synthetic dipole, if you will. I also experimented with the physical spacing. What I learned is that

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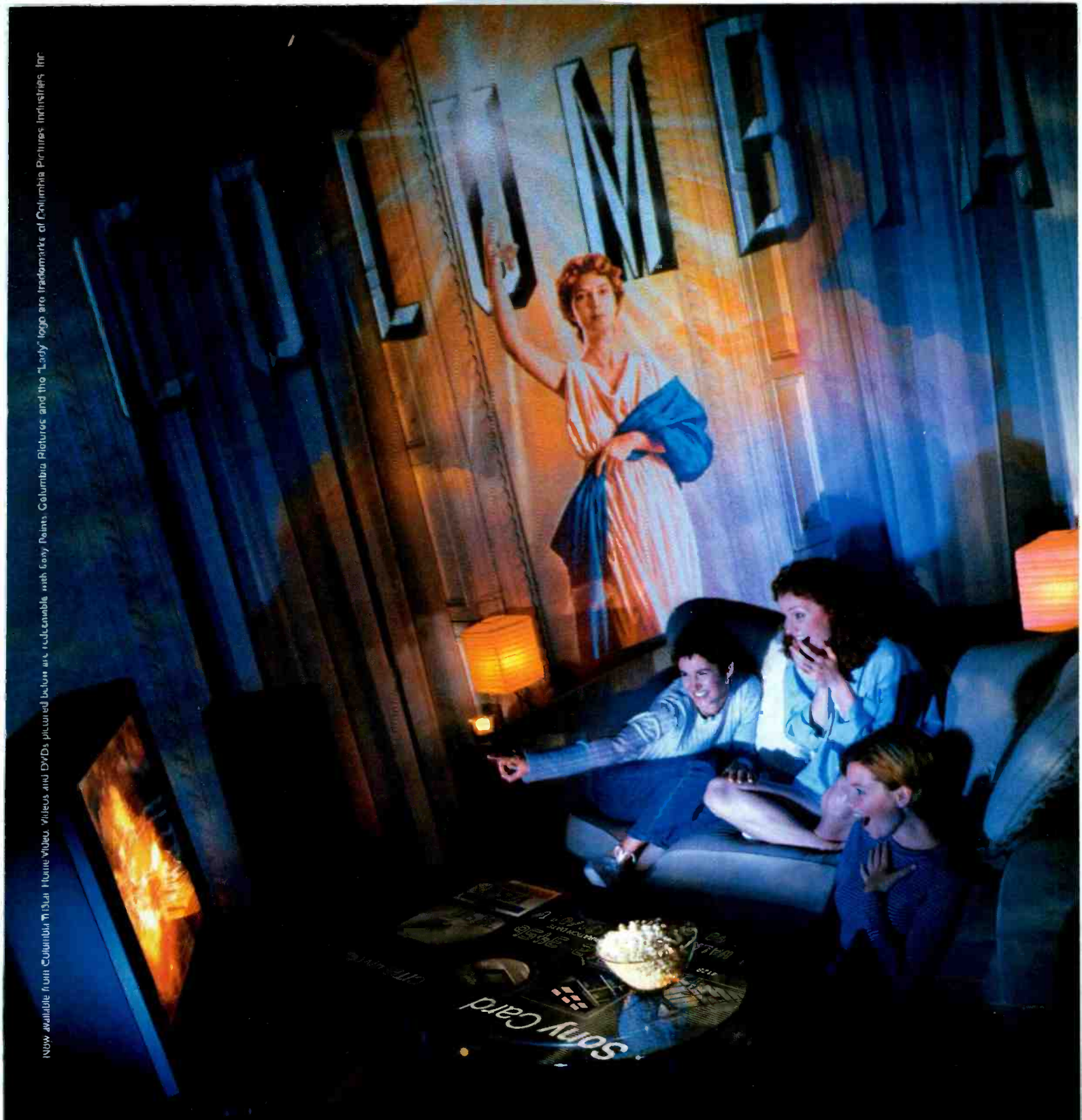


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## IRECT MARKETING ALLOWED US TO BUILD A BETTER SPEAKER, BY INVESTING MORE TIME IN ITS CONSTRUCTION.

a dipole has some pretty desirable characteristics, with one strong exception: the low-frequency rolloff rate.

The ultimate downside to the dipole, however, was that it still engaged the room to some degree at low frequencies. My goal became to squash the figure-8 pattern into something that looked more like an infinity symbol, to steer more intensity front and rear, creating a tighter pattern.

A bell went off in my head. I remembered a paper by Harry Olsen, from back in 1972, I believe. When I first read it I had wondered why anyone would ever want to do this. Why would anyone want to build a high-directivity low-frequency cannon? But here I was searching for one.

I built the design but found there are some things in the paper that don't seem to work. It took about a year of building Whisper prototypes before I began to have an idea of what was really happening with it. Olsen was trying to tell us something there. *The Whisper is not a second-order gradient design, then?*

I prefer the term "differentia"; I would like to reserve "gradient" for microphones, where it really has meaning. I have built prototypes with as many as six woofers front to back. What works for two works even better with more drivers. But there's no free lunch. There's a power penalty. For every 3 dB of power in your budget, you are getting only 1.3 dB of it back in on-axis radiation; the rest is lost creating the strong nulls to the sides.

*What's the speaker's low-frequency bandwidth?*

It's extraordinary, with adequate piston area—quite usable down to the resonant frequency of the driver itself and with good directivity control. Overall, it's a pretty sensitive system, but the rolloff at very low frequencies is pretty sharp, too. The Whisper system also has six poles of electronic equalization with adjustable bass damping. So the system has a 22-Hz low-frequency

cutoff, but it's adjustable. If you use a subwoofer, you will be better off moving that upward to 38 to 40 Hz. You'll still get all the directivity-control benefits, and when you drop below 40 Hz you are talking room pressurization anyway. You don't need directivity control down there, where reflections are in-phase; you just want to fill the bucket.

*Do you see a change in the way people approach audio today?*

Yes. For test marketing, I watch my daughter's habits. Though 11, she is already a teenager today—a girl on the go. You have to be able to take your stuff from room to room and floor to floor, and you gotta be able to show your buddies. It's information-swapping.

And one of the most frequent questions I get from people is: "What are the trade-offs when you go from a two-channel to a multichannel system?"

*Hey, there are no trade-offs!*

Exactly, but one of the main questions is what's best for surround speakers: bipole, dipole, cardioid, or a conventional monopole? (I hate that term, "monopole.") The answer is that 12 monopoles wrapped around you would work just fine. But given that we don't have 10 to 12 surround speakers, I think we can arrive at a darn good compromise by using two to four tips.

*I don't care what kind of surround you get—just get it. Not having surround is the compromise.*

I just saw *Armageddon*; the amount of hard steering going on is—well, there are things that are clearly localizable in the surrounds. Things can be typed, but many of those things can add to the naturalness in audio reproduction. With music, I love having the crowd to the sides and rear instead of behind the performers, where two-channel puts them.

I've had a multichannel system as far back as 1975. Anyone who has experienced

immersion just can't live without it. It takes your walls out. It takes the room away. That also ties into the value of high directivity in the front planes. With surround, you can get the immersion effect without compromising clarity.

*A while back, Legacy merged with Allen Organ. How did that come about?*

As we became more and more successful, my partner began working his way out of the business. I have always been interested in customer contact but, frankly, never the financial side.

Finally, at 75 years of age Jake told me he was ready to retire, and I had to make a decision. One option was to sell the business outright, but my heart was still in it. I felt that Legacy had grown to a point where we were ready for the next step. Jake's retirement just underscored that.

So I began looking for a technology partner. *The Wall Street Journal* had just published a column on Legacy and our level of

customer service—a "come to the cornfields of Illinois and find out how customer service is really done, the old-fashioned way" kind of thing. That article triggered a re-

*The Classic is a direct descendent of the Legacy-1, the company's very first product.*



sponse from a musical instrument manufacturer, the Allen Organ Company, a company I probably would not have considered otherwise. They invited me to visit, and I was absolutely blown away.

I had pictured a stodgy old church organ company. I get out there, and I see 15 channels of DSP and 15 channels of amplification with digitally adjustable acoustics. I'm not talking about just delay or reverb, I'm talking interplay between the channels. They could synthesize an entire environment! I later discovered that Allen had pioneered DSP for music applications, working with Rockwell around 1970. And its plant is not far from Morristown, New Jersey, where Bell Labs invented PCM 50 years ago.

I also hadn't known that I was going to meet three generations of Dutch craftsmen there who could help with the manufacture of our product. Now all the rosewood on a Whisper baffle is laid up at Allen. Some Focus pieces are made up at Allen, too. And by combining laboratory facilities, we have become even more rigorous in our methods.

Working through Allen's network of musical instrument dealers, we now have audition sites for our products in many parts of the country. Pilot sites in Dallas and Atlanta, for example, offer multiple showrooms dedicated to demonstrating Legacy products. The people who run these sites are musicians, and they have well-trained technicians on staff. It all fits together pretty naturally.

**Are products sold in those showrooms?**

Yes. They have inventory, and they can provide any of our custom finishes.

**The Impulse, Legacy's 200-watt/channel integrated amp**

**Is the pricing different?**

Same prices—and no extra markups.



## HIGH-END AUDIO IS WAKING UP, SCRAMBLING TO BUILD MUCH BETTER PRODUCTS.

**What about listening rooms? What are your thoughts?**

The biggest improvements we will see over the next quarter-century will come through the application of DSP. We'll still need speakers with flat power response and properly oriented lobing patterns, but the room transfer function can be broken down into certain frequency bands. Maybe a way of looking at it is to break it down into three parts, the three R's of playback. First, there's a reinforcement zone from DC to 35 to 40 Hz or so, where reflections are in-phase. Then there's the heavily resonant zone, up to about 300 Hz, where rooms typically induce large response swings. Above that, you transition into the reverberant zone. DSP will help us deal with these different room characteristics most intelligently.

We have learned and benefited from the work at SigTech, which shows that it takes tons of power to compensate for a high-Q resonance and that if you try to compensate for high-Q resonances, you just create new errors at different locations.

At the lowest frequencies, we should treat the pressure in that zone as pressure and adjust it accordingly. There is plenty of advantage to more piston area down there, because it lowers distortion and provides a better-damped system. But you are not going to get a "faster" system—30 Hz is 30 Hz. That's cycles per second. If it were faster, it would be a higher frequency. People always talk about woofer speed, but to steal an already coined phrase, "If a woofer were fast, it would be a tweeter."

As we move into the resonant zone, effects become very position-dependent. I'm not sure that folks fully understand the nodal and anti-nodal behavior from floor to ceiling. Even listener height will affect performance.

**How, in your opinion, will multi-channel play out here?**

Discrete channels will afford us more control and better separation. With stereo loudspeaker playback, channel separation in a room is typically less than 2 dB over the frequency range of human speech, compared to about 5 dB in free-field. That's one of the advantages of a center channel that may not be obvious. A center-channel speaker is higher above the floor and farther away from other boundaries than the other channels. You have to love it.

I have come up with a simple system for adjusting rear-channel speakers. I wheel my chair around and equalize while looking at the back wall. This prevents me from overriding the natural head-related transfer function. Try to get things to sound like the front channels when you're facing the other way.

I use the term "fog" or "mist" to describe spatial envelopment. In a good, misty environment, I should feel moisture evenly on my skin no matter where I sit.

We did a rear-channel demonstration in Dallas this year. No processors or anything, just a pair of left and right wall-mounted surround speakers. We demonstrated them operating in-phase and out-of-phase. Out-of-phase just shoves the walls out. And when you shut one off, you have no problem localizing the sound as left or right.

**One way to avoid surround localization is to make sure the speakers are above the plane of your ears.**

Absolutely. When you do that you are also creating support slightly behind you, in what I call the "bald spot" area. I am also working on a new system that detects diagonal conditions to gate an overhead speaker to enhance flyover effects and provide better continuity.

You've seen lights with a parabolic shade that flood the room with light. I've built quite a few speakers like that and fired them at the ceiling to "illuminate" the room with acoustic ambience. That idea may turn into a new product as well.



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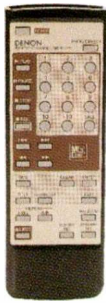
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Despite MiniDisc's admirable and sophisticated technology, it has not yet taken the consumer market by storm, at least in this country. The format is, however, getting extensive professional use in broadcast studios, for presentations, and in other areas where its fast random track access, easy and versatile editing, long-term storage integrity, and high-quality sound are appreciated.

In the few years since MiniDisc (MD) was introduced, its ATRAC data-reduction system has been improved significantly, and its sound quality is now quite good—so good, some say, that MD copies of CDs are almost indistinguishable from the originals. And MD's editing flexibility is far greater than recordable CD or even DAT can offer. MD recorders can divide, resequence, and recombine recorded tracks. Even track deletion works differently from tape, as MD automatically skips erased tracks in playback and can make long recordings on space freed up by erasing short tracks that were not originally adjacent to each other. Disc and track titles can be encoded on the discs, to be read on any MD player's display. Recording time per disc is normally 74 minutes, same as on CD—but you can double that time by recording each track separately, in mono.

Unlike companies whose MD products consist only of portables or tabletop stereos, Denon offers serious MiniDisc equipment, including professional units and the full-featured DMD-1000 under review. Like most MD recorders, it has a built-in sampling-rate converter that enables direct digital recording from sources with sampling rates of 32 or 48 kHz as well as the 44.1-kHz sampling rate of MiniDisc and CD.

Five pushbuttons near the upper right corner of the DMD-1000's front panel control the main transport functions (eject,

## EQUIPMENT PROFILE

BASCOM H. KING

# DENON DMD-1000 MINIDISC RECORDER



play, stop, pause, and record), much like a tape deck's controls. Just below these buttons are four more that, like most of the controls at this end of the panel, are for editing. These four buttons handle manual fast forward and reverse shuttling and two editing functions, "Edit" and "Enter." Farther down the panel are two knobs and four small pushbuttons. One knob adjusts analog input level; the other is a jog dial for finding track beginnings and selecting characters for titles. To enter the character you've selected, you push one of the buttons ("Character"). The other buttons are "Recovery" (which recovers disc space by gathering together pieces of recording space lost in prior editing), "Clear" (for programmed tracks or for titles), and a monitor switch that enables you to hear the input

signal without pressing the 1000's record button.

The Denon's disc drawer is at the top center of the front panel. Beneath it is a fluorescent display, which incorporates level meters. At the top left of the panel are slide switches for timer start and selecting mono or stereo recording mode. The power switch is at the lower left of the panel. To its right is a headphone jack and two rotary controls, one for headphone volume and the other for input selection. Although the DMD-1000 has four inputs (two Toslink optical, one coaxial digital, and one stereo pair of analog jacks), the selector has five positions. That's because it has two settings for analog input, one for use with Analog Track Marking (A.T.M.) and one for use without. This feature automatically adds

**Dimensions:** 17 in. W x 5¼ in. H x 13¾ in. D (43.4 cm x 13.4 cm x 34 cm).

**Weight:** 14.1 lbs. (6.4 kg).

**Price:** \$599.

**Company Address:** 222 New Rd., Parsippany, N.J. 07054; 973/575-7810; [www.del.denon.com](http://www.del.denon.com).

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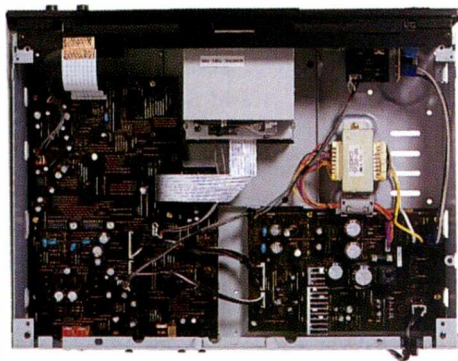


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track numbers whenever the signal you're recording goes silent for 1½ seconds or more. Toslink optical and analog stereo outputs are provided on the rear panel.

The DMD-1000's D/A is the same Advanced Super Linear Converter used in Denon CD players. The company says this is a four-DAC circuit that divides the data into two streams, adds positive digital bias to one stream and negative digital bias to



**RESPONSE WITH DIGITAL INPUT AND OUTPUT IS DEAD FLAT, THAT WITH ANALOG CONNECTIONS VERY NEARLY SO.**

the other, and then recombines them in the analog domain. Combining oppositely biased versions of the same signal, Denon says, cancels out any DC components produced by zero-crossing distortion in the DACs and reduces any zero-crossing distortion in the original signal by 50%. Analog input signals are converted to digital by an Enhanced Dual-bit Delta Sigma 20-bit converter, which Denon says is made by Asahi Kaesi and used in several pro recorders from Denon and others. My only comment is that if you thought CD player schematics were complex, you ought to see this MD recorder's!

The DMD-1000's construction is, like that of most Japanese consumer equipment, of reasonably high quality and designed for efficient production. Most of the circuitry is on two boards. The power-supply board looks fairly sophisticated, with numerous IC regulators, heat sinks, and filter capacitors. The main circuit board uses normal and surface-mount components, with the surface-mount parts on the bot-

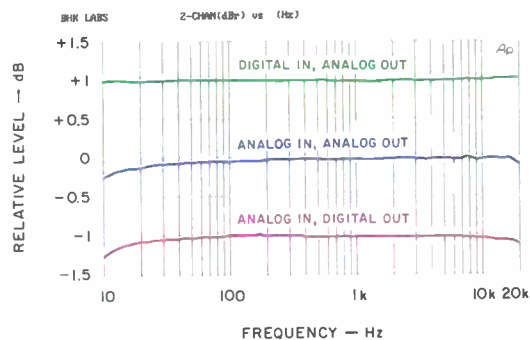
tom of the board and many wire jumpers amid the components on the top side. Most of the front-panel controls and the control microprocessor are interconnected by another, smaller, circuit board. The D/A converter chips are Burr-Brown PCM61PLs.

### Measurements

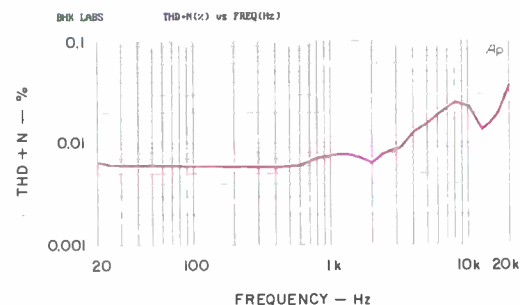
I tested the DMD-1000's frequency response at full modulation in four ways, three of them seen in Fig. 1 (curves separated for clarity). Response with digital input and analog output is almost absolutely flat, indicating that the D/A converter has negligible effect on it. The curve for digital input and output (not shown) was virtually identical. There is, however, some very slight low-frequency rolloff in recordings made via the analog input, presumably from the A/D converter. That converter is also apparently adding an utterly inconsequential touch of high-frequency rolloff, partially counteracted, when I used analog output, by an even more negligible high-frequency rise in the D/A converter's response. (Just about all other graphs here were made with analog input and output.)

Whether I used digital or analog input, a full-scale 1-kHz square wave at the analog output revealed symmetrical ringing, which is characteristic of finite-impulse-response (FIR) digital filters. This was more obvious because the Denon's digital filters don't clip the peaks generated by the ringing; lesser digital filters do. There was no tilt on a 43-Hz square wave, evidence of extended low-frequency response.

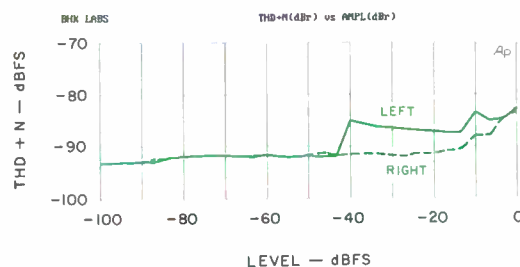
The Denon recorder's total harmonic distortion plus noise (THD + N) is not as low as it is on some good CD players. However, I have seen CD players with similar or higher distortion levels, and the DMD-1000's measurements do include the effects of A/D as well as D/A conversion. Compared to Fig. 2's plot of distortion versus frequency for analog input and output, distortion with digital input and analog output (not shown) was a bit higher. But when



**Fig. 1—Frequency response.**



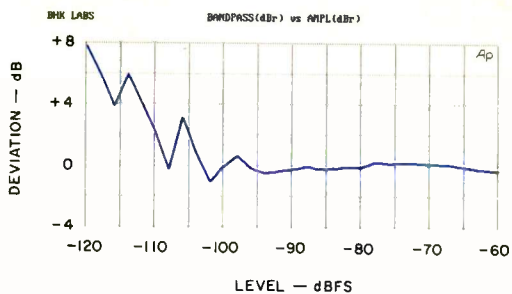
**Fig. 2—THD + N vs. frequency.**



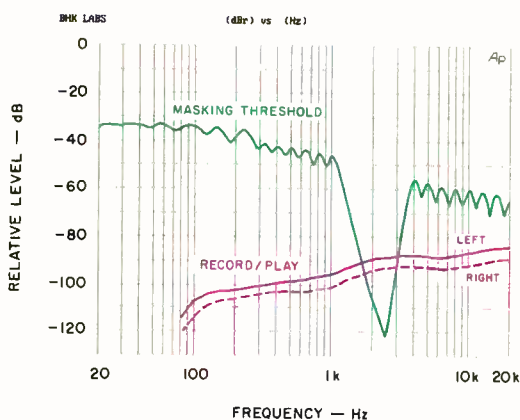
**Fig. 3—THD + N vs. recorded level; see text.**

I measured distortion versus level, results for digital input and analog output were similar to the analog input/output curves in Fig. 3; this suggests that the higher distortion in the left channel is probably a function of the review sample's DAC chips. That conclusion is supported by the fact that distortion at the digital output, which bypasses the DAC, was better than -90 dBFS over almost the entire output range.

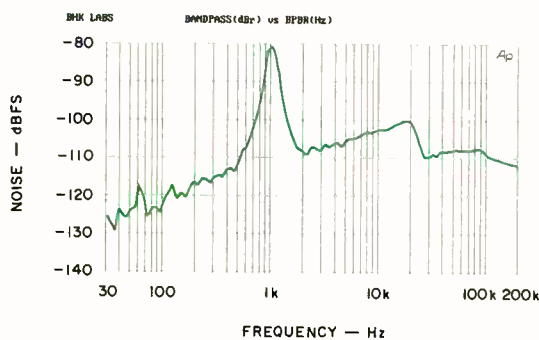
The DMD-1000's deviation from linearity, measured at the analog output, was basically the same for digital or analog input, though only the latter had the series of rather sharp undulations below -96 dBFS seen in Fig. 4. This may be an artifact of the A/D converter.



**Fig. 4—Linearity error with analog input and output.**



**Fig. 5—Multitone noise and distortion test; see text.**



**Fig. 6—Noise analysis.**

A few years ago, Dr. Richard Cabot of Audio Precision devised a series of tests to assess the effects of reduced-bit-rate audio encoding/decoding systems. In one of these tests, the system being assessed is fed a complex signal consisting of equal-amplitude sine waves spaced at third-octave intervals over most of the audio spectrum but with no tones in the range from 1 to 4 kHz. Whatever harmonic distortion components, intermodulation, and noise are caused by nonlinearities in the system will fall into the spaces between the tones. The energy between the test tones is then measured and integrated, and the result is

compared to a masking-threshold curve derived for this test signal. If the integrated distortion is below the masking curve, it is considered to be inaudible.

Figure 5 shows the results of this multitone test for the DMD-1000 made at full modulation, with analog input and output. As in Fig. 3, the left channel does not perform quite as well as the right. The distortion does rise above the masking curve between 1 and 4 kHz, but it is only a few dB greater than the test equipment's measurement threshold. That's quite good performance and indicates that the ATRAC encoding works well.

The noise analysis in Fig. 6 is for a 1-kHz tone at -80 dBFS (not the -60 dBFS used in many of *Audio's* CD player reviews), with analog in and out. The peaks at 60 and 120 Hz are well below -115 dBFS, barely distinguishable from background noise, and the absence of signal harmonics is notable.

With one exception, my noise-related results matched within 0.5 dB or less for both channels, measured at the analog outputs. Worst-case S/N via the analog inputs (which were terminated in 1 kilohm) was 90.7 dB wideband and 96.1 dB A-weighted with the DMD-1000's level control turned up full; with the control at its lowest setting, wideband S/N improved by just under 1 dB and A-weighted S/N by about 1.5 dB.

With digital input, S/N with a -120 dBFS signal was 92.5 dB wideband and 95 dB A-weighted; for "digital silence," S/N improved to 98.2 and 109.7 dB. Dynamic range was 94.2 dB with analog input, 95.7 dB with digital. Only in quantization noise was there a significant difference between channels: With analog input, quantization noise was -86.8 dBFS for the left channel and -90.3 dBFS for the right; with digital input, the results were -87.4 and -91.9 dBFS. This probably stems from the same cause as the slight differences between channels seen in Figs. 3 and 5.

Output voltages for a 1-kHz, fully modulated signal just shy of clipping were 1.902

## ASSOCIATED EQUIPMENT USED

Equipment used in the listening tests for this review consisted of:

**CD Equipment:** PS Audio Lambda Two Special and Sonic Frontiers Transport 3 transports, Sony CDP-707ESD CD player, Panasonic DVD-A310 DVD player, Genesis Technologies Digital Lens anti-jitter device, and Classé Audio DAC-1 and Sonic Frontiers Processor 3 D/A converters

**Phono Equipment:** Kenwood KD-500 turntable, Infinity Black Widow arm, Win Research SMC-10 moving-coil cartridge, and Vendetta Research SCP2-C phono preamp

**Additional Signal Sources:** Nakamichi ST-7 FM tuner, Nakamichi 1000 cassette deck, and Technics 1500 open-reel recorder

**Preamplifiers:** Sonic Frontiers Line-3 and First Sound Reference II passive

**Amplifiers:** Arnoux Seven-B stereo switching amp, Quicksilver Audio M135 mono tube amps, Manley Labs Stingray stereo tube amp, and E.A.R. V20 integrated stereo tube amp

**Loudspeakers:** B&W 801 Matrix Series 3 speakers used as subwoofers with Dunlavy Audio Labs SC-III speakers; Tannoy Churchill speakers

**Cables:** Digital interconnects, Illuminati DX-50 (AES/EBU balanced); analog interconnects, Vampire Wire CCC/II and Tice Audio IC-1A; speaker cables, Kimber Kable BiFocal-XL and Madrigal Audio Laboratories HF2.5C

volts for the left channel and 1.896 volts for the right, each with instrument loading. With an IHF load, output dropped to 1.783 and 1.778 volts. From this data, the impedance at the signal outputs works out to 665 ohms. The analog inputs overload at about 4.1 volts rms, high enough to be no problem with any normal source.

### Use and Listening Tests

The Denon DMD-1000 performed without a hitch. Once I got the hang of it, basic recording and playback were as easy as with



**NO RECORDING MEDIUM,  
NOT EVEN TAPE,  
CAN MATCH MINIDISC'S  
EDITING FLEXIBILITY.**

a cassette deck, though I needed to really study the owner's manual to figure out some of the 1000's extensive editing and labeling features. The manual is well written and quite thorough and detailed, but the control diagram is folded back under the front cover, where it's awkward to refer to when reading the control descriptions several pages later.

To evaluate the DMD-1000's sound, I recorded from various digital and analog sources, then compared my MiniDisc recordings to their original sources. To keep variables to a minimum, I used identical interconnects for all analog connections. Signals from the Denon therefore made two passes through these interconnects, one in recording and the other in playback; this can make a small but sometimes noticeable difference in the sound. (The question does not arise, of course, when you're recording from the digital input.)

The DMD-1000 copied source material very well. With recordings made via the analog input, I did get the impression that the MiniDisc copies didn't quite have the same sense of ease, air, and space as the originals, and vocal sibilants tended to sound a bit smeared compared to my original sources. With recordings made via the Denon's digital input, I heard more of the sources' air and space, though the sound was slightly edgier and a trace harder. Despite these nit-picks, I found the 1000 a very satisfactory recorder and would have no problem listening to music from it. And from the standpoint of convenience, especially quick track access, rotating disc systems such as MD have it all over tape. A

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# SHERBOURN TECHNOLOGIES

## 5/1500

### FIVE-CHANNEL AMP

Sherbourn Technologies is a new outfit, but its principals—Ron Fone on the marketing side and Engne Tang in design—are more experienced than you'd expect in a start-up company.

Fone was president of Acoustic Research (AR) during the time it was owned by Teledyne, then ran Tera (a company that made upscale TV monitors). He went on to become president of McIntosh and then of ADS. Tang was chief engineer for Proton, joined AR while Fone was president, later ran his own design and engineering company, and now has partnered with Fone to develop a line of products under the Sherbourn Technologies banner. The 5/1500, the subject of this review, is the company's first multichannel amplifier.

Or perhaps I should have said the first *four* of those, because the Sherbourn is a modular power amp that is available in four configurations. You can get it as the two-channel 2/600 (\$1,000), the three-channel 3/900 (\$1,300), the four-channel 4/1200 (\$1,600), and the five-channel 5/1500 (\$1,750).

All four versions of the Sherbourn amp should perform identically, as they use identical amplifier modules for each channel. You can upgrade the lesser versions by adding modules, which Sherbourn calls "monoblocks." Each monoblock is a single-channel amplifier with its own heat sink and power supply. The company charges \$400 for a single module, \$700 for a pair, and \$1,000 for three. If you start with a two-channel 2/600 and expand to the full-fledged 5/1500, you'd pay only \$250 more than if you had bought the five-channel model to begin with. That's pretty economical insurance against obsolescence!

**Rated Output:** 200 watts per channel into 8 ohms or 300 watts per channel into 4 ohms, all channels driven.

**Rated THD:** 0.03% from 20 Hz to 20 kHz.

**Rated Dynamic Headroom:** 1.3 dB.

**Dimensions:** 17¾ in. W x 7 in. H x 17¾ in. D (45 cm x 17.7 cm x 45 cm).

**Weight:** 65 lbs. (29.5 kg).

**Price:** \$1,750.

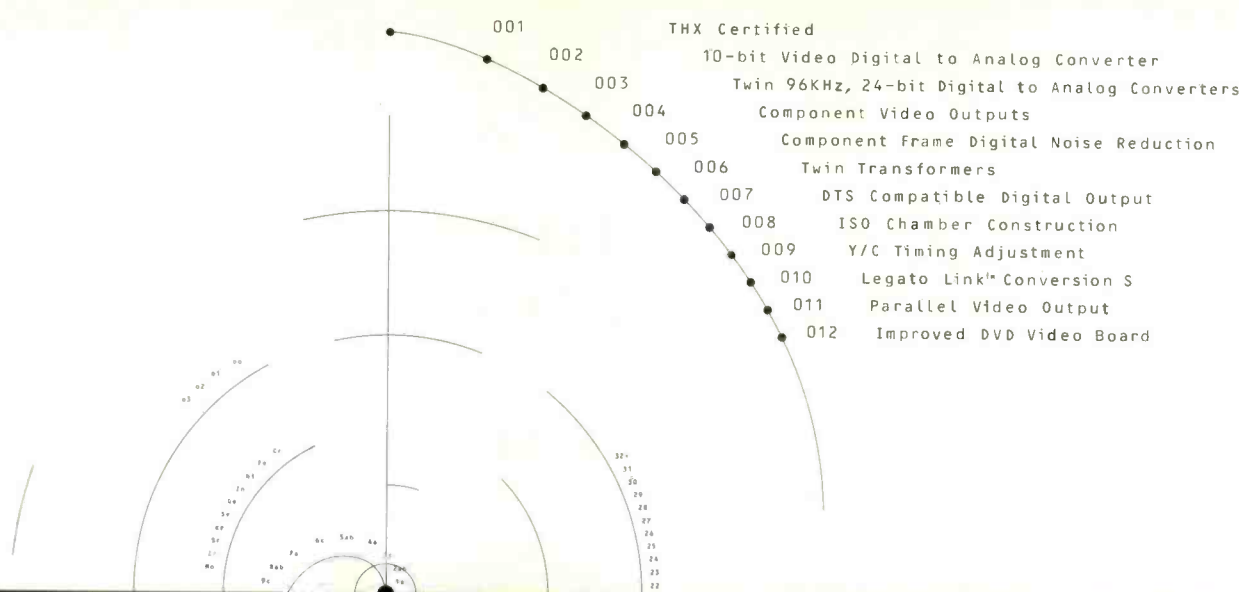
**Company Address:** 15 A St., Burlington, Mass. 01803; 781/270-6536; sherbourn@aol.com.



To simplify the upgrade path, the same five-channel-ready chassis is used for every Sherbourn amplifier. From the outside, a two-channel 2/600 amp looks exactly the same as a five-channel 5/1500. Each has a hefty power button on the left side of its front panel and five blue LEDs across the center. On the back are five high-quality, gold-plated RCA jacks and five pairs of gold-plated, multiway binding posts, even though not all are functional except in the 5/1500. As befits the power rating of each amp module (200 watts into 8 ohms, 300 into 4), the heavy-duty binding posts have oversized wire holes that can accommodate speaker cables as fat as 14-gauge. The posts are mounted on standard ¾-inch centers, so you can use dual or single banana plugs.

Five miniature bat-handle switches toggle soft-clipping circuits on and off for each channel. Small slide switches in the channel-2 and channel-4 chassis areas enable you to bridge channels 1 and 2 and, separately, channels 4 and 5; the amp is then rated to produce a total of 800 watts into 8 ohms or 1,200 watts into 4 ohms (not counting the fifth, unbridged, channel!). In addition to the gold-plated RCA jacks for each channel, there's a multipin DB-25 input connector on the back so that you can use a single cable for all hookups to preamp/processors having similar connections. (Sherbourn doesn't supply a cable.)

The 16-gauge, three-wire AC cord plugs into the usual IEC connector on the back.



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Four bumpers on the rear protect the wiring should you want to rest the potentially heavy chassis on its butt. (The five-channel version weighs 65 pounds.) It might be a good idea, however, to first remove the line cord.

A circuit in the 5/1500 monitors all five channels' inputs, turning all the modules on simultaneously when any one of them is fed a signal and putting them back to sleep when all channels have been idle for a while. A low-voltage trigger input on the back panel overrides the signal-sensing circuit and turns the amplifier on when it is fed an AC or DC signal of 3 to 30 volts; this can be quite useful in custom installations.

**THE LOUDER I PLAYED  
SHERBOURN'S  
FIVE-CHANNEL AMP,  
THE BETTER IT SOUNDED.**

Curiously, the front panel's blue LEDs glow brightly when the amplifier is quiescent but dim rather than brighten as soon as any channel receives a signal. The LEDs extinguish totally when the amp is handling reasonably strong signals. According to Sherbourn, this is to prevent the LEDs' piercing blue light from distracting viewers or listeners in a (presumably) darkened room. I'm told that the LEDs blink if the amplifier is driven into clipping, but that didn't happen with my sample.

With the exception of the chassis, the signal-sensing board, and the AC power cord, each channel is totally independent. Each monoblock module is built in two sections: a main printed-circuit board that carries the audio amplifier and power-supply rectifiers and filters (two 10,000-microfarad capacitors) and a second section that contains a toroidal power transformer, fuse blocks, and power connectors. Each of these sections can be removed, serviced, or replaced individually.

Eight bipolar transistors are used in each amplifier's complementary-symmetry output stage and are said to provide a peak output current of 30 amperes per channel. Each channel has its own heat sink, about 8 inches long and 6 inches high, sprouting

twenty 2-inch fins. As the heat-radiating area is about 500 square inches per channel, Sherbourn finds no reason to use a noisy cooling fan despite the muscular output power that the 5/1500 can deliver.

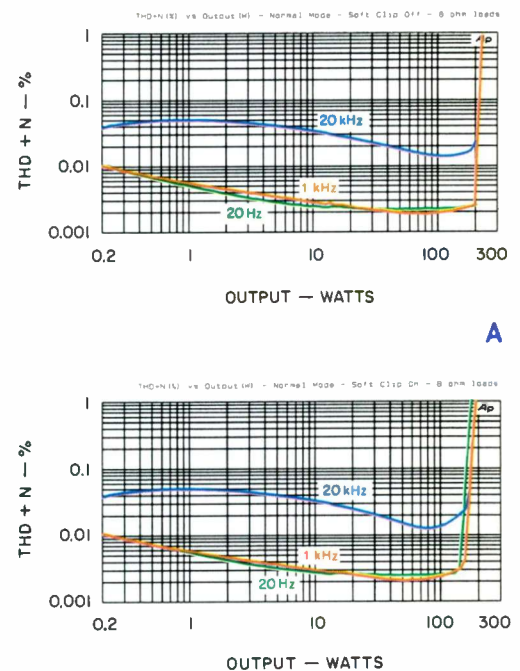
Protection circuitry monitors the operation of each amplifier and turns the affected channel off in a flash if a problem arises, so the power-supply fuses that are mounted on the transformer modules should rarely blow. The Sherbourn amp will fit into a standard rack and is four standard rack-units high (7 inches without feet). If you wish to rack-mount it, there are four screws to accommodate optional mounting ears.

#### Measurements

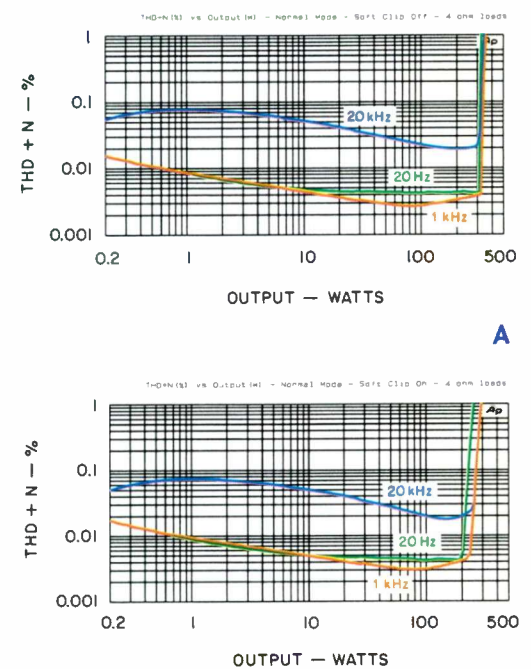
I made the bench tests while maintaining a standard 120-volt AC power supply and used 8- and 4-ohm loads. I focused my attention on channels 1 and 2 and operated them in stereo as well as bridged to mono. Except for the measurements of total harmonic distortion plus noise (THD + N) versus power output, which I made with and without soft clipping, all testing was done with the soft-clipping circuit switched off.

Depending on the test frequency and the load, soft clipping reduced the amp's maximum output power by 0.5 to 1.5 dB. That's really not much of a sacrifice in maximum power output in order to reduce hard clipping at the onset of overload. This isn't to say that clipping distortion is eliminated by the soft-clipping circuit, just that the clipped waveform is more rounded ("soft") than flat-topped, which suggests a lower level of high-order harmonics. (High-order harmonics are thought to be audibly more annoying than low-order harmonics.)

You can see the effect of soft clipping if you compare Fig. 1A with 1B, Fig. 2A with 2B, and Fig. 3A with 3B. Each graph shows THD + N versus power output (in watts) at three frequencies and under different operating conditions. Figure 1 shows the curves

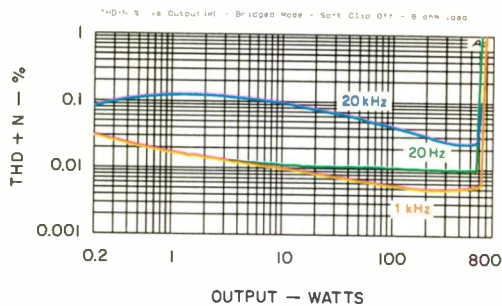


**Fig. 1—THD + N vs. output in stereo mode for 8-ohm loads, soft clipping off (A) and on (B).**

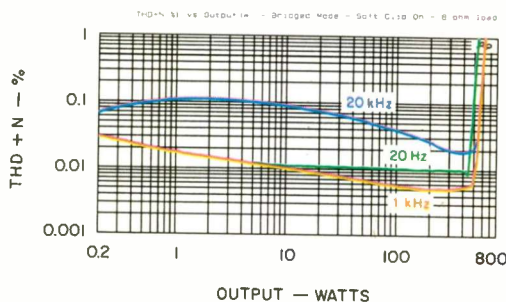


**Fig. 2—THD + N vs. output in stereo mode for 4-ohm loads, soft clipping off (A) and on (B).**

taken with 8-ohm loads and normal (unbridged) operation. Figure 2 reveals the output into 4-ohm loads for normal operation, while the curves in Fig. 3 were taken with the Sherbourn's channels bridged and driving 8-ohm loads.

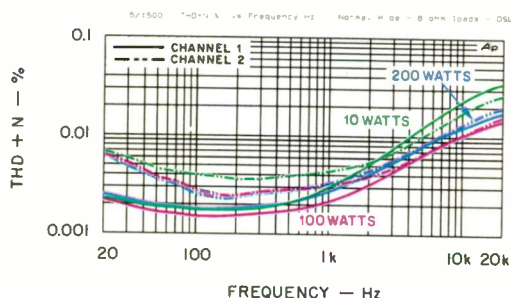


A



B

**Fig. 3—THD + N vs. output in bridged mode for 8-ohm loads, soft clipping off (A) and on (B).**



**Fig. 4—THD + N vs. frequency in stereo mode for 8-ohm loads.**

In each pair of graphs, the “A” set of curves was run with soft clipping off and the “B” set with it switched on. Note that different output scales are used for Figs. 1, 2, and 3. (There is no difference between the scales for the A and B figures of any of the sets.) I adjusted the scale from graph to graph so as to use the most sensitive horizontal scale for each connection and load condition. That makes it easier for you to see the difference between using soft clipping and not using it for various load and operating conditions.

Some general conclusions can be drawn. The 5/1500’s soft-clipping circuit sacrifices more output capability in the deep bass (20 Hz) than at higher frequencies, but it has relatively little deleterious effect on distortion

until you demand close-to-maximum output power from the amp. I think that’s as it should be, so I give the design of the Sherbourn amp kudos in this respect.

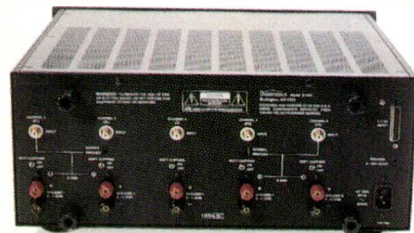
For Figs. 4 and 5, I tested THD + N versus frequency at output levels of 10 watts, 100 watts, and at full rated power with soft clipping off. These curves were taken with the channels operating separately and driving 8- and 4-ohm loads, respectively; the curves in Fig. 6 show THD + N for bridged operation into an 8-ohm load. The Sherbourn 5/1500 easily met its 0.03% distortion specification (see “Measured Data”) at rated power with unbridged operation into either 8- or 4-ohm loads. The company did not provide a distortion specification for bridged operation, so I ran the curves in Fig. 6 at output levels of 10, 100, 400, and 600 watts to cover all bets. It’s apparent that in bridged operation the Sherbourn 5/1500 can deliver 600 watts into 8 ohms with less than 0.0235% distortion at any frequency from 20 Hz to 20 kHz. That’s a *lot* of bang.

Prior to the onset of clipping, crossover distortion is the predominant type, which is rather problematic. Although the underlying cause of crossover distortion is quite different from what provokes clipping distortion, both types generate the same sort of high-order harmonics that Sherbourn tries to avoid with its soft-clipping circuit. As I mentioned previously, high-order harmonics tend to be more annoying than low-order harmonics; therefore, you try to avoid generating them as much as possible. Actually, crossover distortion is usually regarded as more offensive than hard clipping because clipping distortion doesn’t occur until an amplifier is overdriven, whereas crossover distortion exists at all signal levels and, as a percentage, is greater at low output levels than at high levels.

Fortunately, the absolute level of distortion in the 5/1500 is fairly low over much of the frequency range, but the crossover distortion becomes increasingly severe as the

frequency approaches 20 kHz (as seen in Figs. 4, 5, and 6). Distortion measured 0.0352% with unbridged operation at 10 watts into 8 ohms and rose to 0.0515% at 10 watts into 4 ohms (see “Measured Data”). It approached 0.1% at 20 kHz at 10 watts with bridged operation. At the 1-watt level, the distortion, expressed as a percentage, could theoretically increase by a factor of as much as three over these 10-watt readings, although my tests indicated that it rose by a factor of two or less.

With normal, unbridged, operation into 8-ohm loads, dynamic and continuous output power at clipping were virtually the same. This suggests that the output power into 8 ohms is limited by the voltage of the power supply rather than by its current capacity. With normal operation into 4 ohms and with bridged operation into 8 ohms, there was a bit more dynamic power available than continuous power, but the difference was still relatively small (0.5 to 0.7



**THE SHERBOURN 5/1500  
IS VALUE-PACKED,  
WITH LOTS OF WATTS  
FOR THE BUCK  
AND GREAT FLEXIBILITY.**

dB), which implies a pretty “stiff” power supply.

Because the supply is stiff but not regulated, maximum output power will depend on the voltage of your AC power line. This is not at all unusual, and I point it out because, with all channels delivering maximum power, the 5/1500 draws considerable current from the power line. Under this condition, the line voltage at the wall outlet in most homes will likely be well below the 120 volts I used on the test bench. This will limit the total amount of power you can get out of the amplifier (as it would with any other high-power amp).



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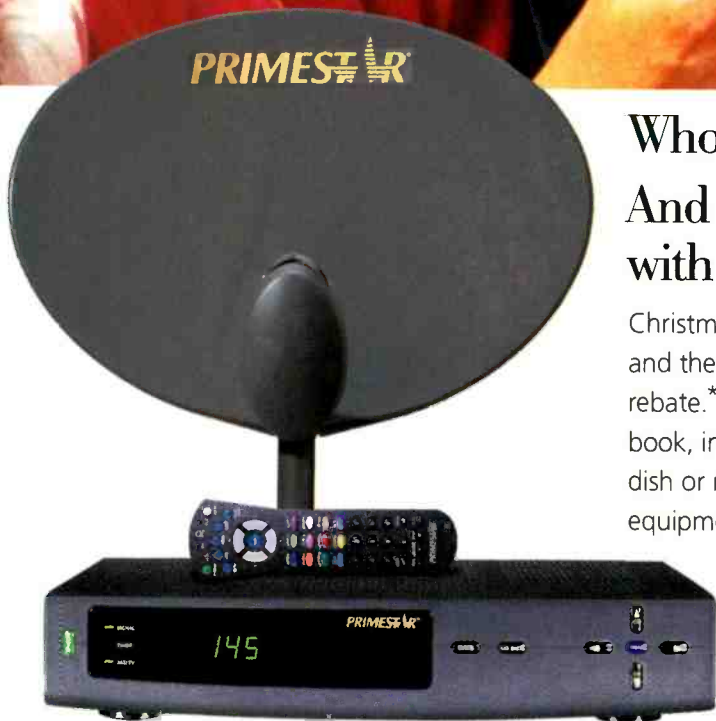
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## MEASURED DATA

### Output Power at Clipping (1% THD at 1 kHz):

8-ohm loads, 230 watts/channel (23.6 dBW); 4-ohm loads, 365 watts/channel (25.6 dBW); bridged mode, 8-ohm load, 735 watts (28.7 dBW).

**Dynamic Output Power:** 8-ohm loads, 240 watts/channel (23.8 dBW); 4-ohm loads, 425 watts/channel (26.3 dBW); 2-ohm loads, 660 watts/channel (28.2 dBW); bridged mode, 8-ohm load, 830 watts (29.2 dBW).

**Dynamic Headroom re Rated Output:** 8-ohm loads, +0.8 dB; 4-ohm loads, +1.5 dB.

**THD + N, 20 Hz to 20 kHz:** 8-ohm loads, less than 0.0205% at rated output and less than 0.0352% at 10 watts; 4-ohm loads, less than 0.0262% at rated output and less than 0.0515% at 10 watts; bridged mode, 8-ohm load, less than 0.026% at 400 watts, less than 0.0235% at 600 watts, and less than 0.0903% at 10 watts.

**Damping Factor re 8-Ohm Loads:** 64.

**Output Impedance:** 128 milliohms at 1 kHz, 134 milliohms at 5 kHz, 143 milliohms at 10 kHz, and 144 milliohms at 20 kHz.

**Frequency Response:** Stereo mode, 20 Hz to 20 kHz, +0, -0.26 dB (-3 dB below 10 Hz and at 87.2 kHz); bridged mode, 20 Hz to 20 kHz, +0, -0.51 dB (-3 dB below 10 Hz and at 74.3 kHz).

**Sensitivity:** Stereo mode, 83.9 mV for 0-dBW (1-watt) output and 1.185 V for rated output; bridged mode, 41.3 mV for 0-dBW output.

**Voltage Gain:** Stereo mode, 30.6 dB; bridged mode, 36.7 dB.

**A-Weighted Noise:** Stereo mode, -91.7 dBW; bridged mode, -83.6 dBW.

**Input Impedance:** 16.3 kilohms.

**Channel Separation, 100 Hz to 10 kHz:** Greater than 81.2 dB.

**Channel Balance:**  $\pm 0.02$  dB.

Figure 7 shows the amp's noise spectra for normal and bridged operation. In all of the curves, there's a fair amount of power-line-related hum at 60 Hz and its odd harmonics (180, 300, and 420 Hz); however, there's relatively little hum at the even harmonics (120 Hz, 240 Hz, etc.). The paucity of components at the even harmonics suggests excellent power-supply filtering, but the odd-harmonic content indicates a fair amount of magnetic leakage from the power transformers, even though they are toroidal.

As Fig. 7 indicates, the noise in bridged operation is about 8 dB higher than when the amp channels operate individually (see also "Measured Data"). Six decibels of the difference can be explained by the higher sensitivity in bridged operation; the other 2 dB are up for grabs. Overall, the noise level is reasonably low for so powerful an amplifier; nevertheless, I'd not object if it were better.

Figure 8 compares the Sherbourn 5/1500 amp's frequency response for normal and bridged operation. As usual, these curves were run at 1-watt output into an 8-ohm load. Note the sensitive vertical scale that I used to reveal the response difference in the two modes of operation. Often there's a substantial treble rolloff in bridged mode, but that's not true of the Sherbourn 5/1500. There's less than 0.1-dB difference in 20-kHz response when bridging two channels of this amp. Most of the difference comes at the low-frequency end, where the response at 20 Hz in bridged mode is down 0.51 dB but only half that much in normal operation.

Input/output phase shift was  $+12.1^\circ$  at 20 Hz and  $-15.4^\circ$  at 20 kHz for unbridged operation, while in bridged mode, it was  $+18.7^\circ$  at 20 Hz and  $-19.4^\circ$  at 20 kHz. Typically, you expect to find more phase shift when two channels are bridged than when they aren't, so I don't think these results are any cause for concern.

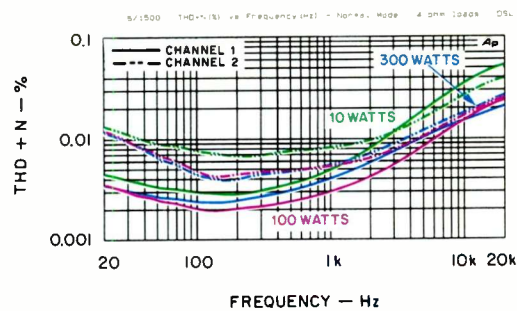


Fig. 5—THD + N vs. frequency in stereo mode for 4-ohm loads.

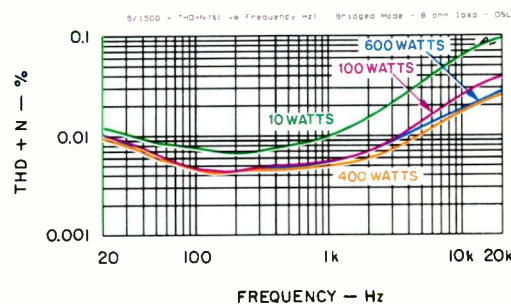


Fig. 6—THD + N vs. frequency in bridged mode for 8-ohm load.

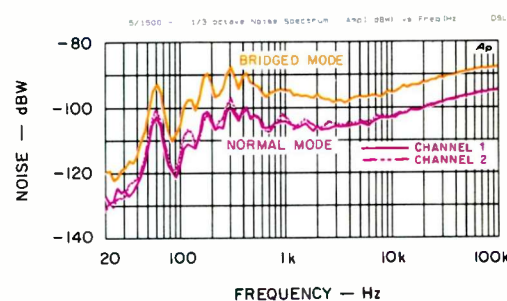


Fig. 7—Noise analysis vs. frequency.

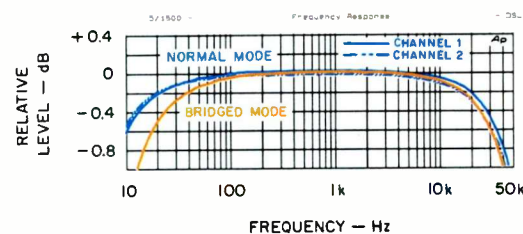


Fig. 8—Frequency response.

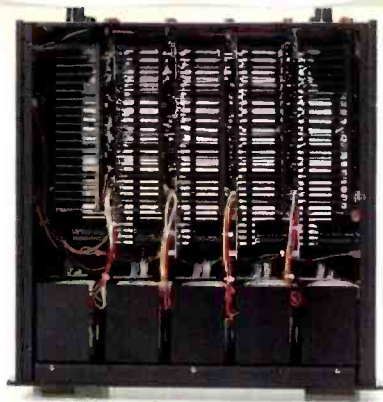
Channel separation was excellent, one of the strong suits of monoblock designs. Channel gains were very well balanced, which is nice to see. Input impedance was lower than specified but higher than is the case with many power amplifiers, so it's fine with me.

One of the Sherbourn 5/1500's best characteristics is its remarkably uniform output

impedance. I'm not sure I've ever seen an output impedance characteristic quite this flat: 125 milliohms at 50 Hz (where damping factor is measured), rising to less than 145 milliohms at 20 kHz! Now, that doesn't translate to the world's highest damping factor—it's only 64—but it doesn't concern me one whit. A damping factor of 64 is high enough for all practical purposes. What is important is that the output impedance be uniform so it doesn't change overall frequency response if you use speakers that have crazy impedance curves of their own. This is one amplifier that meets that criterion in spades!

#### Use and Listening Tests

I prefer to tread lightly rather than heavily with a preproduction sample of a brand-new amplifier from a brand-new company. And the Sherbourn 5/1500 is an amplifier with a lot of potential. My major beef with it (in its present incarnation) is that it sounded a bit confused in the high end, which became fatiguing after a while. I noticed this more in my music-listening room than in my home theater, but I listen more



**YOU CAN UPGRADE  
THE SHERBOURN FROM  
TWO TO FIVE CHANNELS  
BY ADDING  
AMPLIFIER MODULES.**

carefully to music than I do to videos, so I'm not surprised at that. Frankly, I think a slight adjustment in operating bias might do a world of good for this amp and let it capitalize on its strengths—for example, its marvelously uniform output impedance, which bodes extremely well for getting

smooth frequency response from hard-to-drive loudspeakers.

I didn't hear any audible effects from the soft-clipping circuit, which is as it should be. Even when it's on, soft clipping should do nothing until you're about to clip the amp, and that's not likely to happen often when you have this much power per channel at your command. But I don't think I got close to clipping the 5/1500 in the listening room. This amp has lots of drive capability, and the louder I played it, the better it sounded.

Whether or not you ever use the soft-clipping circuit or bridge the amplifier, having these features available is better than not having them. And that underscores the real strengths of this component and the essence of this review: The Sherbourn 5/1500 is a value-packed amplifier! Lots of watts for the buck, great flexibility, easy upgradability, what seem to be top-quality parts (I love the input RCAs and the heavy-duty output posts), and a five-year warranty. In any of its guises, the 5/1500 is a promising launch vehicle for Sherbourn Technologies. A

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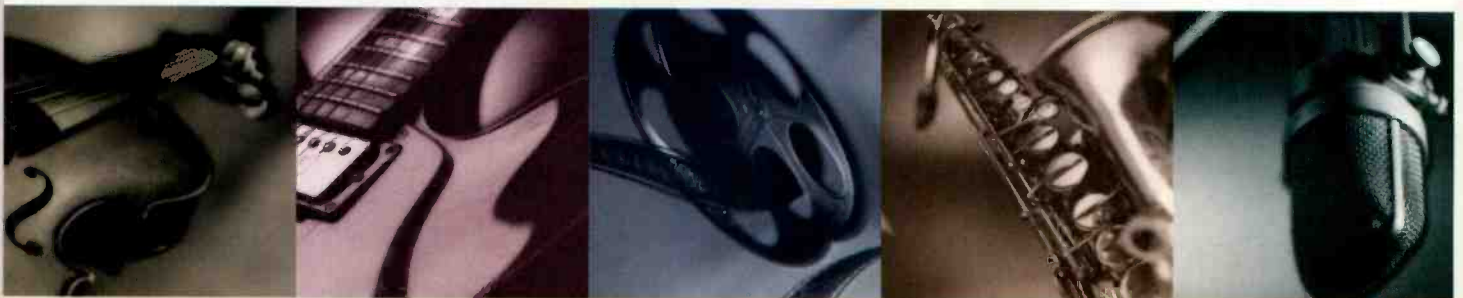
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# ONKYO DV-S501 DVD PLAYER

In Japanese, I'm told, "Onkyo" means "sound" or "acoustics." If so, the company was well named, for it boasts a long and reputable history in sound reproduction. It was also among the first audio companies to embrace the audio aspects of home theater, and the DV-S501 is Onkyo's latest foray into its video aspects. Onkyo bills the S501 as an "audiophile-class DVD/CD player"—perhaps because it has a separate power supply for its analog sections, perhaps because it does not provide internal 5.1-channel Dolby Digital (AC-3) decoding. (I don't understand why any manufacturer includes 5.1-channel Dolby Digital decoding in DVD players when it logically belongs downstream in an A/V receiver, integrated amplifier, or pre-amp/processor.) The player's analog audio output is strictly two-channel: stereo when playing music CDs, Dolby Surround matrix when playing Dolby Digital surround video DVDs. I was pleased to see the analog signals available from a headphone jack with level control. I was also pleased to see both Toslink optical and coaxial digital outputs, so the S501 should be compatible with any Dolby Digital decoder.

The Onkyo DV-S501 provides video in the three primary consumer formats: composite video, S-video, and component (color-difference) video. The component-video jacks are gold-plated, but the others are not. Oh, yes, there's a pair of mini-jacks in back for control links to Onkyo's Remote Interactive A/V receivers and, possibly, other Onkyo components.

Although the DV-S501's rear panel is pretty conventional, its front sports far more controls than most DVD players, many of which require the remote for almost every operation. The S501 can be operated quite well from the front panel, thank you very much, which could prove to be a lifesaver if you're as prone to mislaying remotes as I am. Of course, that panel carries the usual transport controls (bi-



directional skip, pause, stop, play, and open/close), all arrayed to the right of the disc drawer. But it also carries buttons for navigating on-screen menus, a jog/shuttle dial ("Cinema Scan"), and even a button to dim or extinguish the display. When the S501 is in pause mode, the "Cinema Scan" dial enables you to move backward or forward, frame by frame; in play mode, the shuttle ring controls speed and direction.

As well endowed as the DV-S501's front panel is, the 45-button remote is even more so. It replicates all front-panel transport

controls, though buttons handle the "Cinema Scan" functions. You can fast-scan DVDs at two, eight, or 30 times normal speed—forward or backward—by tapping

the remote's "FF" or "FR" key multiple times. (These keys also work with CDs, albeit only at two or eight times normal speed.) To play DVDs at 1/2, 1/8, or 1/16 of normal speed, you use the "Slow" key—but for

forward play only, not reverse. And for frame-by-frame advance on DVDs, you press "Pause/Step" multiple times. The remote's "Title" and "Search" buttons facilitate finding specific portions of a disc; you

**I WAS PARTICULARLY  
IMPRESSED  
BY THE CLEANLINESS  
OF THE DV-S501'S  
VIDEO OUTPUT.**

**Dimensions:** 17½ in. W x 4¾ in. H x 12 in. D (43.5 cm x 12.1 cm x 30.6 cm).

**Weight:** 9.9 lbs. (4.5 kg).

**Price:** \$599.95.

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use the 10-digit keypad to find chapters and tracks by number or by time. Titles, chapters, and tracks can be programmed in whatever order you prefer or set for repeat play, as can any program segments you designate ("A-B" repeat). There's also a "Random" button if you like your video eggs scrambled.

In addition to the usual controls for selecting DVD soundtrack and subtitle language, turning subtitling on or off, and selecting camera angle, the remote has a

**A NOVEL "ZOOM" BUTTON ENLARGES A SELECTABLE PORTION OF THE IMAGE BY A FACTOR OF 4.**

rather novel control: "Zoom," which magnifies a portion of the picture to four times its original area. You can use "Zoom" in normal or slow-motion play, and you can change the area you want to magnify by using directional arrows. (These arrows also are used to navigate through menus.)

The remote's buttons aren't backlit and are all the same size, but their labels are in a legible typeface that stands out well against the background colors differentiating function groups. Some might find the remote garish; I think it's easier to use than the typical unilluminated remote that lacks tactile differentiation. Unlike many other DVD remotes, this one controls only the player itself; it is neither programmable nor pre-programmed for other components.

The DV-S501 can play 3- and 5-inch DVDs and audio CDs but cannot play other optical disc formats, such as Video CD.

#### Measurements

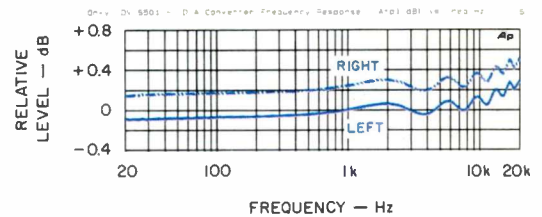
I assessed the DV-S501's audio performance with a CBS CD-1 test disc and its video performance with Lucasfilm THX and Sony test DVDs. There was no point in using the Dolby Labs test DVD, because the S501 does not perform Dolby Digital 5.1 decoding. As I mentioned, that's sensible. And in this case, it's also fortuitous, because the player's digital-to-analog converters aren't quite as good as I expected from an Onkyo product. They're not flat-out awful,

but some test results are reminiscent of those I used to get from CD players years ago. For example, note the filter ripple and the rising high end (+0.27 dB at 20 kHz) in the S501's frequency response (Fig. 1), not to mention a channel imbalance of almost 0.25 dB.

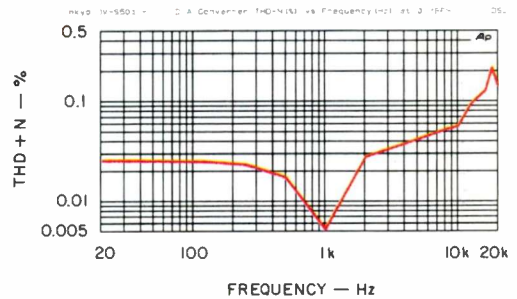
The DV-S501's curve of total harmonic distortion plus noise (THD + N) versus frequency (Fig. 2) also reminds me of yesteryear's converters. Although THD + N is exceedingly low at 1 kHz (hardly more than 0.005%) and reasonably good from 20 Hz to 2 kHz (less than 0.03%), it rises to 0.056% at 10 kHz and, because of "beats" with the sampling frequency, peaks above 0.2% at 18 kHz. (The curve is for both channels, as their performance was too similar to tell apart.)

Thanks to the DV-S501's extremely low midband distortion, the curves for THD + N versus level, which are taken at 1 kHz, are impressive (Fig. 3). Maximum distortion, corresponding to just 0.0052%, occurs at 0 dBFS and drops rapidly below that point. Linearity also is quite good (Fig. 4): Error is essentially nonexistent from 0 to -70 dBFS with undithered signals and to -80 dBFS with dithered data. Worst-case error is 1 dB at -90 dBFS with undithered signals, 0.5 dB at -100 dBFS with dithered. This player also fared well in the fade-to-noise test of linearity error (Fig. 5).

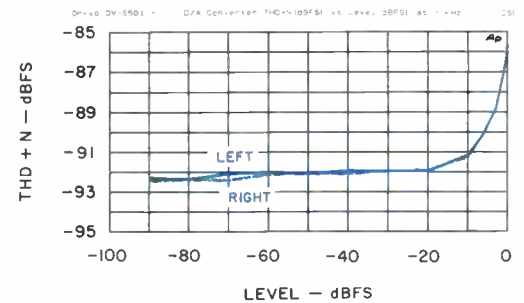
The DV-S501's analog stages are excellent. They are virtually noise-free, as you can see from the third-octave spectrum analysis of digital silence (Fig. 6). In fact, the noise floor proved to be so low that I extended the vertical scale down to -160 dBFS to accommodate the curve. There's a trace of power-supply ripple at 120 Hz, but, at approximately -135 dBFS, it's utterly negligible. These results are reflected in exceptionally good signal-to-noise ratios (see "Measured Data"). The top curve in Fig. 6, an analysis of a -60 dBFS, 1-kHz signal, has some 60-Hz hum; a rise



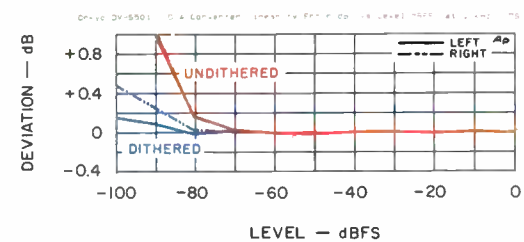
**Fig. 1—Frequency response.**



**Fig. 2—THD + N vs. frequency.**



**Fig. 3—THD + N vs. level.**



**Fig. 4—Linearity error.**

in background noise above 30 kHz suggests a modest degree of noise shaping. Using the same -60 dBFS signal, I determined that the S501's dynamic range was good, if not earthshaking.

There's certainly room for improvement in the Onkyo's quantization noise (-72.3 dBFS), which characterizes the perform-





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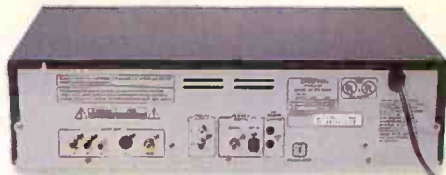
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to a fare-thee-well. Dolby Digital tracks sounded superb, but that was because of the decoder I used, Enlightened Audio Designs' TheaterMaster Ovation (which I reviewed in last month's issue). I'm sure every serious audio/videophile will use an external Dolby Digital decoder with the S501 rather than listen to the Dolby Surround mix from the player's analog outputs. Therefore, I see no point in discussing the Onkyo's sound any further.

Its video performance is, however, worth discussing. It was excellent except for the chroma differential gain and phase errors, which were noticeable only in yellows and greens on test patterns and not on regular DVDs. I was particularly impressed with the cleanliness of the luminance and chrominance information. Snow (luminance noise) and color shifts and blotches (chroma amplitude and phase noise) were hard to discern, even on test signals. Whether this was due to the DV-S501's 10-bit video DACs or not is moot; the results are what count, and they were superb.

Horizontal resolution was also impressive. The narrowest portion of the Snell &



**THE ONKYO DV-S501'S  
ANALOG STAGES  
ARE EXCELLENT, ITS S/N  
EXCEPTIONALLY LOW.**

Wilcox test-pattern wedge (corresponding to a video frequency of 5.5 MHz) was clearly resolved, as was the 5.75-MHz grid on the same pattern. I have little doubt that the DV-S501 can deliver far more than 460 lines (the visual equivalent of a 5.75-MHz video signal); you'll just need good program material and a good monitor to see it.

The controls worked well and logically. Slow-motion, freeze-frame, and high-speed operation were perfect. The DV-S501 found fully encoded "I" frames reliably, never get-

ting hung up on "P" or "B" frames that don't contain enough information to create a stable picture on their own. However, as I've stated in the past, the DVD format does not allow smooth slow motion or smooth scanning; DVD supports only frame-by-frame motion, at an accelerated or a retarded rate. But at least the picture doesn't "tear" when you use these special effects, as it does with videotape!

I'm somewhat in a quandary as to what overall rating the Onkyo DV-S501 deserves. The test results are not as impressive as those from a number of other DVD players I've tested, but in many applications, the poorer numbers don't count. Who cares if the S501 doesn't have the most exotic audio D/A converters if you use a downstream decoder and aren't using those DACs at all? And except for the chroma differential gain/phase error (which I didn't notice when watching commercial DVDs), the pictures this player delivers are really very satisfactory. On the positive side, this is a player that can be operated from its front panel and whose remote, though not illuminated, is easy to use. Check it out for yourself. **A**

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AURICLE

ANTHONY H. CORDESMAN

## THIEL CS7.2 SPEAKER

have only one niggling objection to this speaker from Thiel: It should not have as bland a name as 7.2. Its predecessor, the CS7, was an outstanding performer, but the CS7.2 is *much* better. Its sound is sweeter, cleaner, and more dynamic. Most important, the CS7.2 delivers a warmth and natural sweetness in the midrange that I have not heard from previous Thiel designs (although the CS6 comes close). Moreover, it does so without losing any upper-midrange or treble detail.

Somehow, I suspect, most audiophiles are going to forgive Thiel for not choosing a name for the CS7.2 that is as dramatic as the improvement it brings in sound quality. The 7.2 will quickly generate audiophile buzz and a reputation for being a reference monitor whose sound truly deserves attention.

I have used Thiel speakers in my reference systems for years, but the CS7.2 is a breakthrough. It projects one of the most realistic soundstages I have heard. In fact, the 7.2 presents the best of both worlds in high-end dynamic designs. Although it may not be as physically large and complex as some of its competitors, it provides much of the deep bass extension and power of the biggest models. Yet it supplies a level of point-source sound that few large three- and four-way monitors can approach. Its imaging and coherence equal that of the finest small monitors.

However, the CS7.2 is priced at the reference level: \$13,500 per pair. But unlike many speakers in this sphere of price and sonic performance, it needs only one amplifier per speaker, and you can achieve excellent results even when using just a single set of cables.



Visually, too, the 7.2 is a loudspeaker you can live with. As with most Thiels, the woodwork is impeccable and the styling restrained. Numerous curves and soft edges enable it to blend in with both modern and classic furniture. And you needn't remove the grille cloth to get the best sound. Moreover, the 7.2's narrow profile and curved front make its height (55 inches) and size (14 inches wide x 19 inches deep) relatively easy on the eyes. At 168 pounds, the 7.2 is, admittedly, not a speaker you casually move around, but it's easy enough to position until it's spiked.

The Thiel's enclosure is extremely heavy for its size. Its internally

braced walls are made of 1-inch-thick fiberboard. Spikes, or "stabilizer pins," anchor the CS7.2 to the floor. All of these features are said to reduce cabinet vibration, energy storage, and coloration. The 7.2 uses the familiar Thiel sloping front baffle to achieve proper phase alignment. Rather than being made of reinforced concrete, like the CS7's, the 7.2's baffle is cast from a composite material of 80% mineral and 20% polyester, not to enhance sound quality but to better resist cracking. The baffle is as much as 2½ inches thick, has a mass of 60 pounds, and is shaped to reduce cabinet-edge and driver-cavity diffraction.

Photo: © 1998, Bill Kouirinis Studio

Company Address: 1026 Nandino Blvd., Lexington, Ky. 40511; 606/254-9427; [www.thielaudio.com](http://www.thielaudio.com); [mail@thielaudio.com](mailto:mail@thielaudio.com).

As for technical features, the CS7.2 places the same emphasis on improved time, phase, and step response as its predecessor. Phase response is specified at  $\pm 10^\circ$ , Thiel's step-response graph is exceptionally smooth, and time error at frequencies above 300 Hz is claimed to be less than 0.5 millisecond. This may help explain the CS7.2's combination of apparent speed, integration, and driver-to-driver coherence. Certainly, the CS7.2 rivals the best electrostatics and ribbons I have heard in these respects, and it is coherent over a much wider listening area than any electrostatic I have auditioned to date. But do bear in

mind that you need to be at least 7 feet away from the 7.2 to hear it at its best.

The CS7.2 has new drivers (it's a four-way system) and a new crossover, all built by Thiel. (Of the earlier CS7's drivers, Thiel made only the woofer.) I suspect that much of the CS7.2's improved sound quality is due to its new 1-inch dome tweeter and 3-inch upper-midrange driver. (There is also a 6½-inch lower-midrange driver.) The tweeter is mounted coaxially in the upper midrange, using a unique configuration of a radially magnetized, ring-shaped neodymium magnet about four times the size of the normal disk-shaped tweeter magnet. The tweeter uses the same basic moving system developed for the Thiel CS6 (which I use as one of my references). It has a large, rolled rubber suspension, a short aluminum voice coil, and a long magnetic gap to provide high output and low distortion. The voice-coil former is made of Kapton to eliminate eddy-current distortion, and a copper pole sleeve is used to reduce distortion from inductance. All are engineering tricks that Thiel has adapted from its woofer designs and represent a major change relative to past Thiel tweeters.

The CS7.2's 3-inch upper-midrange driver has the same type of three-layer diaphragm as the CS6; it comprises two aluminum layers with a thick polystyrene layer between them. (The diaphragm is heavier than usual, but Thiel compensates by using a larger magnet.) This aluminum sandwich is said to provide exceptional stiffness and

to move cone resonances well beyond the driver's operating range; that reduces the potential for resonance-induced coloration or a loss of clarity from stored energy. It also enables the outer aluminum layer to be shaped optimally for mounting the tweeter, circumventing a problem of many coax designs, in which the tweeter's response is adversely affected by its placement in the neck of a larger cone.

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THE 7.2s HAVE AS MUCH  
RESOLVING POWER  
AS ANY RIBBON OR  
ELECTROSTATIC DRIVER.**

wave responses of the most advanced dynamic speakers are typically superior to those of ribbon and electrostatic units.

The technical features also reflect Thiel's concern with two basic design challenges that confront a lot of the competition. Many audiophiles have found that metal drivers sound hard and tend to ring; consequently, a number of top speaker designers I know prefer to use silk-dome tweeters. In the older CS7, for example, Thiel overcame this hurdle by ensuring that the tweeter resonances occurred outside the driver's operating range and by inserting a notch filter—of the appropriate frequency and Q—into the crossover.

Coaxially mounted tweeters confer certain advantages in terms of soundstage coherence and imaging, but they introduce the potential problem of diffraction from the cone driver. If the tweeter is suspended in *front* of the cone, the diffraction can be significant; if it's mounted in the *throat* of the driver, it suffers from a horn-loading effect imposed by the cone. Thiel, however, largely resolves this quandary by using a very shallow cone that provides a more nearly ideal operating environment for the tweeter. The tweeter's response is not significantly changed by the movement of the smallish, upper-midrange cone because the cone has very little excursion, unlike the large-excursion woofers in older coaxial designs. (Doppler distortion is not relevant because the tweeter does not move with the midrange driver.)

Incidentally, these engineering details should tell you that there is nothing antiquated about dynamic driver technology relative to electrostatic or ribbon drivers. In fact, the step, impulse, and square-

The CS7.2's 12-inch woofer, whose rear output is coupled to a passive radiator below it, doesn't seem to be all that different from that of the CS7. The only improvement Thiel claims for the 7.2's bass is that the speaker has a higher impedance that should enable most amplifiers to reproduce more natural dynamics. The 7.2's impedance curve is smoother than in some past Thiels—with minor dips to 3 ohms at about 3 kHz and from 8 to 10 kHz—so it is relatively easy to drive. I didn't find any amp or speaker cable that presented problems.

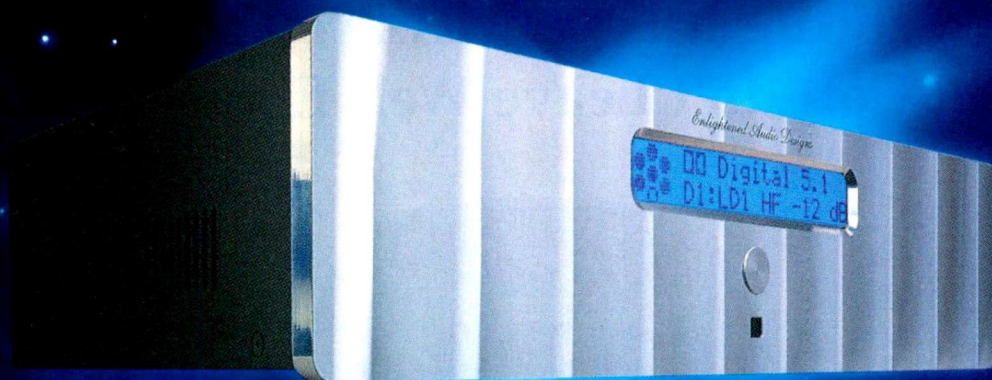
Nevertheless, the change in bass sound is important. The CS7's deep bass was very good, but it never quite had the power and life (or "slam") to match its midrange and treble. By contrast, the CS7.2's bass is powerful and deep. This speaker does an excellent job of reproducing all but the deepest organ pedal tones and synthesizer music. To hear what I mean, try the opening passage of any good recording of "Thus Spake Zarathustra" or Jean Gillou's performance of Bach's Toccata and Fugue in D Minor on *The Great Organ of St. Eustache, Paris* (Dorian DOR 90134).

When compared to other full-range speakers near its size, the CS7.2 does an outstanding job of reproducing two brutally demanding sets of bass test tones: the ½-octave bands of pink noise, from 20 to 200 Hz, on Alan Parsons and Stephen Court's *Sound Check* (Mobile Fidelity SPCD 15) and "Shake, Rattle, and Roll," track 18 on the *Gold Stereo and Surround Sound Set-up Disc* (Chesky Records CHE151).

When a speaker is claimed to have a -3 dB bandwidth of 23 Hz to 20 kHz and a frequency response of 25 Hz to 18 kHz,  $\pm 1.5$  dB, I normally assume it is hyperbole—or true only at a sound level so subdued that it is of little practical value with music. The CS7.2 cannot provide the levels of deep bass output you'd get from a true subwoofer, but it *can* drive a room into vibration at frequencies of 25 to 28 Hz; indeed, the 7.2's deep bass performance is likely to be determined more by the listening room's size and boundaries than by any of its own intrinsic limitations. It also delivered the flattest response I have yet measured using test tones (from 300 to 30 Hz) on track 18 of Chesky's *Gold Stereo and Surround Sound Set-up Disc*. And it did so at SPLs of about 90 dB.

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Track 18, incidentally, is a good starting point for determining room placement and the speaker's distance from your room's front wall. Like many speakers, the CS7.2 should be positioned several feet away from the side walls, although beyond 30° off axis its midrange dispersion is narrow enough to work well in moderately sized listening rooms. Finding the right distance to the front wall, however, is more difficult because the Thiel's bass goes so deep and because room colorations tend to dominate the bass with a speaker this good. Nothing works better for fine-tuning the location of the CS7.2s than listening for the tightest and deepest sound with recordings of organ, bass viol, and cello. Nevertheless, you can get good initial feedback by using an SPL meter and the aforementioned track 18.

I would advise toeing the CS7.2s in so they face the listening position but remain fairly widely separated. If they are properly set up, the 7.2s provide excellent depth and much of the apparent soundstage size and dynamics that I normally associate with large dipole and planar designs. There should be no hole in the middle and only minimal changes in sound with head movements. You should get excellent three-dimensional imaging that is stable and of natural size. In addition, there should be a sweet spot large enough for two or three people—this is a users-friendly speaker. Thiels have always been good in this respect, but the CS7.2 is the best yet.

I'm not implying that the Thiel CS7.2s are particularly hard to position: You can put them in virtually any reasonable location and still get good results. They have superb musical timbre from the low bass to beyond audibility, and you are more likely to hear the impact of room colorations than any inherent colorations in the Thiels.

A properly placed pair of CS7.2s reproduces vocals and individual acoustic instruments in ways that are natural and musically "right." Once you get them placed for proper bass balance, string and piano performance is superb. The CS7.2 really lets you hear the differences between a Stradivarius and a Guarneri or a Steinway and a Bösendorfer. The brass sound is equally good, and woodwinds are lovely. There is remarkably little coloration of baritone or soprano voices; the sibilants in female vocals are particularly natural.

In fact, the CS7.2's upper octaves are so sweet and musical they can seem a bit soft until you start listening to the timbre of acoustic instruments and vocals that contain a lot of upper-midrange and treble energy. Only then do you realize that the new drivers in the CS7.2 have as much resolving power as any ribbon or electrostatic design. For example, try the percussion detail on The Modern Jazz Quartet's *Blues at Carnegie Hall* (Mobile Fidelity UDCD 596) or the JVC XRCD recording of Ernie Watts's *Classic Moods* (JVC XRCD-0054). For that matter, try listening to some of the new Chesky and Classic Records 96-kHz/24-bit recordings with any good D/A converter that has 96-kHz/24-bit playback capability.

The Thiel CS7.2s won't add space or depth to the sound. They are not romantic or euphonic. But with proper setup they are capable of throwing such a convincing soundstage that you should make every effort to follow my directions on placement and spacing. The CS7.2s are never going to produce front-of-the-hall sound; they don't have the right timbre or dynamic contrasts. However, they do provide an excellent illusion of sitting mid-hall, and they convey an outstanding sense of natural acoustic space. Indeed, soundstage width and depth will be as natural as the recording permits. This is one speaker that really shows off the virtues of simple miking and mixing techniques that preserve ambience and acoustic perspective.

In terms of transient response and transparency, the CS7.2 is revealing without losing its musicality. There are some speakers, for example, that convey a great deal of detail and information but sound really musical only with the best audiophile recordings. This is particularly true of models that slightly accentuate the upper midrange in a bid to add more apparent detail. The CS7.2s avoid this flaw and circumvent any ringing of the sort that sometimes affects ribbon and dome tweeters. A good demonstration of the CS7.2's ability to preserve musicality and to resolve the character of individual instruments can be found on the L'Arch-

ibudelli and Smithsonian Chamber Players recording of the Mendelssohn-Gade Octets for Strings (Vivarte SK 48307). These musicians play five Stradivarius instruments, and the special character of Strads comes through quite clearly. Judy Collins' vocal sibilants on *Judith* (Elektra 111) are a particularly demanding test, and they provide another example of the 7.2's ability to reproduce lots of detail yet still preserve musicality.

The CS7.2s clearly reveal the differences between cartridges, CD players and transports, amps and preamps, and cables. I currently use the Kimber Select speaker cables as a reference, but I also use products from AudioQuest, Discovery Cable, Goertz, and Wireworld. Differences between cables really are a matter of nuances and of subtleties in low-level resolution. The CS7.2s still got the best out of my various speaker cables

yet clearly revealed the nuances and sonic differences among them.

I don't mean that the CS7.2s are perfect or that Jim Thiel shouldn't get around to designing the 7.3 several years hence.

**THE THIEL CS7.2  
CAN DRIVE A ROOM  
INTO VIBRATION  
AT FREQUENCIES OF  
25 TO 28 Hz.**

While the CS7.2s are unequivocally great speakers, my wish list might include more power and slam in the bass, subwoofer-like ultra-low bass, greater efficiency, and slightly more dynamic life. (And, as long as I'm asking for the impossible, why not a built-in widescreen projector and automatic digital room correction?)

In the real world, however, the CS7.2s represent a superb mix of design choices that really enhance the musical listening experience. They have few rivals, even at prices up to \$17,000 per pair.

So if you are looking for a reference-quality speaker, you absolutely must audition the CS7.2. And if you think you already know the "Thiel sound," you're wrong. You still need to hear the 7.2. And you needn't worry about falling in love. If you lack the \$13,500 in loose change for a pair of CS7.2s, much of the sound quality I have described can be found in the CS2.3 for \$3,300 a pair or the CS6 for \$7,900 a pair. Indeed, a mix of these Thiels would be one hell of a combination for home theater!

A

## ERGO AMT HEADPHONES



**T**he Heil Air Motion Transformer (AMT), the technology that's at the heart of the Ergo AMT headphones, has been around for decades: It was invented by Oskar Heil and first used in speakers built by ESS in the early '70s. (For more information, see "You Say You Want a Revolution," Ivan Berger's article on unorthodox speaker technology, in the November 1997 issue.) Years ago, I taped an interview with Heil at his home for broadcast on my radio

program, *Audiophile Audition*. He was a charming gentleman, and the single omnidirectional speaker that stood in the middle of his living room had many unusual and superior qualities, including its frequency response, which sounded uniform from anywhere in the room. I never broadcast that interview, however, because when I listened to the tape, I couldn't figure out what Heil was talking about and concluded that most listeners probably wouldn't be able to, either!

The Ergo AMT, from Swiss manufacturer Precide (which also builds speakers that incorporate AMT drivers), is the world's first high-end headphone to use these ingenious transducers. (Two otherwise similar Ergo 'phones have conventional drivers.) The application of AMT technology in a headphone is a natural, as some of the obstacles that prevent full-range speaker reproduction with an AMT driver are circumvented in a headphone. These obstacles are not that different from the problems of achieving full-range audio output from electrostatic speakers.

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The Ergo AMT, from Swiss manufacturer Precide (which also builds speakers that incor-

So what, in simple terms, is the basic idea behind the Ergo AMT 'phones? (The brief owner's pamphlet doesn't even attempt to explain it. But I will.) It begins, like some electrostatic designs, with a rectangular diaphragm to which conductive strips of aluminum foil are bonded. The diaphragm is then folded into many narrow pleats, like a miniature version of a pleated window covering. As the alternating audio signal travels through the conductive strips, they function like voice coils and are attracted to and repelled by magnets on either side, causing the pleats to open and close rapidly. Air is alternately squeezed out and sucked in, like a bellows, instead of being pushed and pulled in the pistonlike manner of a conventional speaker cone. It is said that an AMT driver moves air five times more efficiently, thereby producing greater clarity and sonic detail.

When I unpacked the Ergos, I was surprised to discover that they don't operate from a 'phone jack but, rather, from an amplifier's speaker outputs. The Ergos include a switchbox, enabling connection to an amp's speaker output terminals. The amp signal is needed to power the Ergo AMT's large 4-ohm drivers in what really are mini-speakers for the ears. With my biamped surround system, I didn't have easy access to a full-range speaker-level signal, but I did have an 80-watt amp with level controls. Unfortunately, it caused a low-level, 120-Hz buzz in the extremely sensitive Ergos, even after padding down the amp's output with resistors. Next I tried a 100-watt Marantz integrated amp that powers my surround channels; that solved the problem.

For most of my listening, I alternated between the Marantz amp and a Mesa Tigris integrated tube amp.

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Photo: Michael Groen

Because I couldn't use the stereo headphone jack on the front panel of the Tigris, I connected the Ergo switchbox to the 4-ohm speaker terminals on the Tigris's rear panel.

The Ergo AMTs are much closer to ear-canal 'phones, such as Etymotic's ER-4S, than they are to conventional "crush-the-ear" types. Like the dynamic and electrostatic headphones from Jecklin and the dynamic AKG K1000s, they keep their drivers entirely away from the pinnae (outer ears). This has several advantages. Nothing presses against the head, so many people find that this headphone type provides maximum comfort. Further, because the ridges and valleys of the pinnae are not compressed against the head, their intrinsic ability to supply directional cues is fully retained. Additionally, open drivers produce some leakage, with signals from each ear going around the head to the opposite ear; this is like the mixing of left and right signals, or interchannel crosstalk, that occurs when you listen to speakers. The effect is a liability with loudspeakers, because it narrows the soundstage. But it's an asset with the Ergos, as it alleviates one of the most annoying aspects of headphone listening: the sense that half the band is jammed in your left ear while the other half is in the right.

With binaural source material, having the drivers away from your head is particularly advantageous. Because the natural shape of your pinnae is retained, the Ergos supply a more accurate localization than headphones that press the ears against the head. With stereo recordings, the leakage of one channel's signal into the opposite ear inhibits the illusion that sounds are occurring inside your head rather than outside it.

Weighing 20 ounces (580 grams), the Ergos feel heavier and heftier than most other headphones. They also have the widest headband of any 'phones, being nearly the same width—3½ inches—as the rectangular driver housings. But the headband features a thick foam pad to soften the weight of the 'phones on your head. Two narrow foam pieces at the back of each driver housing prevent the Ergo AMTs from falling off your head as you bend forward. No sliding adjustment of the drivers on the headband is necessary; they are so large that they will line up with most people's ear canals just

fine. Without the usual adjustments, the overall design is sturdier and less subject to resonances.

When I compared the Ergo AMTs to non-AMT Ergo and Jecklin 'phones, they shared a common sonic characteristic: very natural distancing from the sounds in the source material and a more palpable sense of the acoustic environment in which the music was performed. It is the exact antithesis of the effect of those high-end headphones (especially electrostatic designs) that seem to put an acoustic magnifying glass on the music. Initially, it may seem as though something is missing, but with more relaxed and extended listening, the amazing depth of detail and transparency comes through; few 'phones would be less fatiguing for extended listening sessions.

The Ergos' dynamics are excellent, and transient response is fast. They also share with high-end loudspeakers a hypersensitivity to the slightest fault in ancillary components. If you put your ear close to any loudspeaker with the volume down, you'll normally still hear some buzz or hum, no matter how wonderful the S/N specifications of the amp and your other equipment. When the sensitive Ergos are connected to the same amp's speaker terminals, you'll hear that buzz intensified. (This plagued two of the three circuit modes in the Tigris amp—the tube-tweaker's special. The Tigris has three selectable modes of operation: all-triode, all-pentode, or mixed pentode/triode. But there was little opportunity to explore why there is so much fuss about triode sound when using the Ergo 'phones, because both the triode mode and the hybrid position generated a buzz. Only the all-pentode mode—and a moderate amount of feedback, which is also adjustable!—offered relief and a silent background. This allowed the Ergos to perform at their best.)

I listened to standard stereo and binaural CDs using the Ergo AMT 'phones; in addition, I used my reference headphones (the AKG K1000s) and Grado SR80s. One of my longtime favorite test discs is *Testrecords 1, 2*

& 3 *Selection*, a gold CD on the Opus 3 label (CD 99500). Track 2 is a guitar quartet playing a transcription of a Telemann concerto, and track 3 is a five-piece traditional jazz band performing "Buddy Bolden Blues."

When I listened through the Ergos, the four guitarists seemed farther away and the string overtones were not as prominent as with the Grados. But the Ergo 'phones conveyed a better sense of the church in which the single-mike recording was made, more

**THE ERGO AMT'S  
DYNAMICS  
ARE EXCELLENT, AND  
TRANSIENT RESPONSE  
IS FAST.**

like the ambience rendered by my reference 'phones. In the jazz selection, I noted an even greater sense of hall ambience with the Ergos. Switching from tube amplification to solid-state power brought the

guitarists closer to the listener on the Ergos while making their string noises almost annoying on the Grados. With my AKG K1000 'phones powered by a dedicated AKG Class-A amp (a combination that costs more than twice as much as the \$1,000 Ergos), the similarities in the AKG's and Ergo's off-the-ear drivers showed up in improved naturalness and a reduced tendency for performers in stereo recordings to be split between one ear and the other. The jazz track again had a good feeling of acoustic space on the Ergos, but some of the subtle accompanying sounds—e.g., the musicians moving around and instrument mechanical noises—were missing when compared to the AKGs. Switching to solid-state power only marginally improved this.

I also used a stereo CD of the Gilbert Kaplan Edition of Mahler's Second Symphony with the London Symphony Orchestra (Conifer 75605 51277). The rich, massed string tones at the beginning of the work were reproduced with a good sense of hall ambience when the Ergos were powered by the Mesa Engineering Tigris amp, but I heard more string overtones when I used the Marantz amp; the Marantz also improved the fill between my ears. With this setup, the Ergos acoustically placed me in about the tenth row (orchestra) of the concert hall; the AKGs set me up in the first row, and the Grados put me on the podium! The dynamics were awesome with the

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Ergos, but the AKG 'phones surpassed them in high-end extension and air.

When I auditioned the Ergos with binaural CDs, the out-of-head effects were better than with the on-ear Grados and as impressive as with my reference AKG 'phones. The Ergos, though, made the sound almost too mellow.

When I first tried out the Ergo AMT, I thought it would be ideal for binaural listening. I was right. The first binaural CD I used was *Vox Humana*, with Stefan Palm (Projekt Freies Kunsthhaus LC8139), a pipe organ recording captured live in a cathedral in Aachen, Germany, with the Aachen dummy head binaural microphone. The second binaural disc was *Gershwin to Sousa* (Grado Signature Recordings, no catalog number), a recording of the brass quintet Solid Brass made by Joe Grado with his own spherical semi-binaural mike system. (*Editor's Note:* These two binaural CDs are available from The Binaural Source, Box 1727, Ross, Cal. 94957; 800/934-0442.—A.L.)

On the *Vox Humana* disc, the toccata from Léon Boëllmann's Suite Gothique is a stirring pipe organ demo track, and with both tube and solid-state amps, the Ergo AMT headphones rendered a most believable sense of the cathedral's huge interior space. With the solid-state

amp, the sound seemed more palpable and acquired a slightly stronger high end. The Ergo AMTs' low bass reproduction was almost as good as with the Grado SR80s. (In my opinion, the Grados have the edge in bass response over all other 'phones.) However, the Grados and the reference AKGs revealed more of the subtle overtones of the pipes and their occasional chuffing sounds.

Listening to the Solid Brass CD with the Ergos, I felt that the sense of recording space was overpowering; I got the impression that the quintet had been miked at too great a distance. But with the AKG and the Grado headphones, the balance was better. The Grados yielded the best brass "blat" on attacks, reproduced xylophone transients with great clarity on two Gershwin preludes, and did a fine job with other percussion instruments.

I also listened to solo violin tracks using all three 'phones and both amplifiers. The Grados were too shrill on most, while the Ergos sounded just right when powered by the solid-state amp.

The switchbox is more than just a switcher between loudspeakers and the Ergo AMT headphones: It also contains a simple equalization circuit that the designers feel is needed to make the frequency response more pleasing, rolling off some of the high end for a mellower sound. When I first learned of this, I was concerned; extensive listening did not alter that reaction. So I opened the little black box that says "Made in Switzerland." Inside I found each channel lead was bridged by a large capacitor, a small capacitor, two 5-watt resistors, and a small coil.

After seeing this, I bypassed the switchbox by feeding the signals from the amps directly to the large, six-pin plug on the headphone cable. (Using alligator clips, I soon identified the correct four pins.) *Voilà!* The missing high end! Distinguishing the Ergo AMT 'phones from my reference AKG

**WITH THE ERGO AMTs  
AND BINAURAL CDs,  
OUT-OF-HEAD EFFECTS  
WERE AS GOOD AS WITH  
MY REFERENCE AKGs.**

K1000s now became an extremely difficult task; they sounded almost identical!

Even when I used the tube amps, the über-mellowness I had noticed earlier with the Ergo AMTs had vanished. And

though the highs were still less extended than with the solid-state amp, I felt the sun had come out! I think Precide should add a switch on the box to enable you to bypass the equalization. An alternative approach would be to provide a separate six-pin socket like the one on the box, with pigtailed to hook up directly to a small amp. On the other hand, with certain amps you may not want to disable the equalization in the switchbox after all.

I would like to try the Ergos without the box but with a good Class-A amp of about 50 watts output, which might be a synergistic combination of great potential. So, why didn't I power the Ergo AMTs with the AKG Class-A headphone amp? Because the 4-ohm load might have destroyed the amp, according to AKG's Vienna-based service center.

A

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nuance required a significant  
sound system upgrade.  
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## LINN CLASSIK CD PLAYER/ INTEGRATED AMP



Ever since KLH stopped making an all-in-one hi-fi, “respectable” audio manufacturers have pretty much ignored those who want something a little less complicated than a system of separate components. KLH made a bundle selling a turntable, tuner, and amp in a single enclosure. And for good reason: The KLH Model Twenty-Four had credibility, despite its single-box topology.

Not everyone wants separate components. There’s a potentially huge market of music lovers who want high-quality sound but don’t want the expense of buying separates. Nor do they want to suffer the pitfalls of component matching and installation, not to mention having to sacrifice the yards of shelf space needed. What they want is a painless way to acquire a music-making machine that produces the right noises.

The KLH Twenty-Four (and the portable Model Eleven) gave everyone from impoverished students to space-starved apartment dwellers a compact, all-in-one system of which they didn’t have to be ashamed. In the 30-year interim, we’ve seen the loathsome music centers of the ’70s, the gimmicky mini and micro systems of the ’80s and ’90s, boomboxes with ideas above their station, and assorted other one-shot wonders. But none of them quite had the right stuff. At the other extreme were, and are, adventurous efforts like the Arch, from Marantz, and myriad systems from Bang & Olufsen and

others that either ignore price and size limits or veer too far from the KLH model of no-frills simplicity.

Back in the June issue, in “Mondo Audio,” I discussed the re-birth of combo units and mentioned that I was especially taken with a new product from Linn, a company not known for a populist approach.

**THE CLASSIK HAS ALL  
THE SONIC TRAITS  
THAT SEEM TO ELUDE  
MOST ONE-BOX  
SYSTEMS.**

Linn’s Classik struck me as the nearest any company has yet come to producing a KLH Model Twenty-Four for the ’90s—or, given the date, the next millennium.

To recap for those who missed my column in the June issue, Linn shoe-horned a full-function integrated amp, a CD player, and a clock into a chassis that’s just 3 inches high, 12½ inches wide, and 12¾ inches deep. Blessedly, the basic package doesn’t include speakers, so you have more freedom than was offered by KLH. (However, Linn does make a couple of speakers it would love to

see you connect to the Classik, including a new iteration of the Kan.)

While not including speakers might seem to betray the hi-fi-in-a-box simplicity of the KLH, a bit of flexibility never goes unappreciated—especially in the United States, which is awash with stupendous loudspeaker bargains. And it would be a shame if those who bought the Classik were denied connecting it to something like Magnepan’s SMG c, Martin-Logan’s Aeries i, Sonus Faber’s Concertino, or

**Company Address:** 4540  
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other speakers that ooze elegance. Suffice to say, I tried the Linn Classik with a wide range of speakers, from high-sensitivity minis to watt-hungry Italian two-way boxes to vintage electrostatics, and power wasn't really an issue.

Although so much has been included in a box smaller than most stand-alone CD players, Linn opted for minimalism in designing the Classik's front panel and was able to do so because its remote control is button-filled. In the lower right-hand corner of the front panel are the on/off switch and an LED to indicate power on. Directly above it is the CD tray. Just off center is a ¼-inch headphone jack, Linn bravely assuming that Classik owners would use

grown-ups' headphones instead of something pilfered from a personal CD player. The left-hand third of the panel contains the display, the CD transport buttons, and a standby switch. Below them are pushbuttons for muting, cycling forward or back through the available sources, and lowering or raising volume.

At the rear, Linn has provided gold-plated phono jacks for a tuner, an auxiliary source, tape in and out, and tape monitoring (i.e., one tape deck in record/playback mode and another used just as a source). There are also preamp outputs, so the Classik can serve as a preamp or as a CD player feeding a second preamp. And there's an IEC three-pin socket for the AC cable and two sets of speaker connectors, for running two pairs of speakers or for bi-wiring a single pair.

Although the Classik is fitted with the mandatory-in-Europe CE speaker connectors, this shouldn't be a problem in the U.S.: Linn supplies 16½ feet (5 meters) of cable correctly terminated to satisfy the evil bastards in Brussels. I would imagine that all American Linn dealers can terminate whatever cable lengths you require with the correct plugs. (Further, those of you with a smidgen of global awareness will get a taste of what European audiophiles must suffer because of boneheaded bureaucrats.)

Classik's CD player uses Linn's own pickup and decoding technology. No func-

tion has been omitted because of space considerations; the only thing missing is a digital output. Although the front panel contains just four buttons directly related to player operation—open/close, play/pause, track-select forward, and track-select back—the 56-button remote has (in addition to the basics) controls for search and index functions, display options, intro scan, and repeat, random, and shuffle play. Linn probably could have gotten away with depriving its audience of assorted track read-

outs but chose instead to include the lot: track and index number, elapsed track time, remaining track time, total disc time, and total remaining time.

The Classik's preamp section can ac-

cept four external line-level sources. (What might be nice, given that a tuner from Linn isn't cheap, would be a version of the Classik with its own AM/FM tuning.) The preamp drives an amplifier rated at 75 watts per channel into 4 ohms; the Classik is not aimed at what computer guys would call "power users," so this output should prove adequate for most studies, dens, dorms, and apartments. And if you use the amp section with a multimedia PC, you're unlikely to need more power unless you want to mate it with speakers demanding triple-figure wattage.

Blissfully for both Linn and its dealers, the Classik need not concern itself too much with purely audiophilic matters. Perhaps just as appealing to its target audience are its timer, which will switch the Classik on and off automatically at predetermined times, and its ability to act as one helluva sophisticated alarm clock. Environmentalists will appreciate two signal-sensing standby modes that reduce power consumption when the Classik is on but not playing audio. And it has—are you sitting down?—bass and treble controls, which you may have thought would be as likely to appear on a Linn component as ham in a kosher deli.

On reflection, the simplicity of the Classik is misleading, for it's loaded with features—enough to justify a 58-page owner's manual. In addition to all of the usual CD

programming options, the device provides full control via its remote of a Linn FM tuner, use of the alarm with any of the sources, adjustable volume presetting, adjustable sleep/timer modes, memory storage of volume and balance settings, and CD play on power-up. But where the Classik remembers its *raison d'être* is in its ability to be used without your having to refer to the owner's manual; you can take advantage of its many functions or ignore them, which is as it should be.

I found the Classik to be a delight. The infrared sensor is extremely sensitive, so I didn't have to aim the remote at the unit. All actions took place quickly. The CD tray opened and closed with smooth precision, and the display was easy to read. I'd say the Classik worked in as fuss-free a manner as a microwave oven; it's almost as if high-end masochism never existed.

But it's the sound that separates the Classik from the severely compromised, down-market one-box "stereos" that too many assume are the only alternatives to real hi-fi. Obviously, the choice of speakers was crucial, but the Classik delivered real bass—deep, extended, and well-controlled lower octaves with the requisite weight, power, and slam. Best of all, it could convey this weight and extension at low playback levels. The effect is similar to having a dynamic loudness control, as the Classik could extract the maximum from even Quad 77-10L speakers without my having to crank the volume way up. This in itself was enough to make the Classik sound "big," to convey the authority of separates. But the rest of the spectrum was well served, too.

Linn has never paid much attention to what it believes are American audio fetishes. Three-dimensionality, stage depth, and the like were never deemed as important as such Linntangibles as "pace," "rhythm," and "timing." Worry not: The Classik understands stereo playback, and its sound field is large, well defined, and precise. No, its images are not sculpted to the same degree as those produced by an etched-with-a-scalpel, positioned-with-a-ruler, cost-no-object system of the five-figure-plus variety, but they're convincing enough to make old hands forget Linn's Isobarik speakers.

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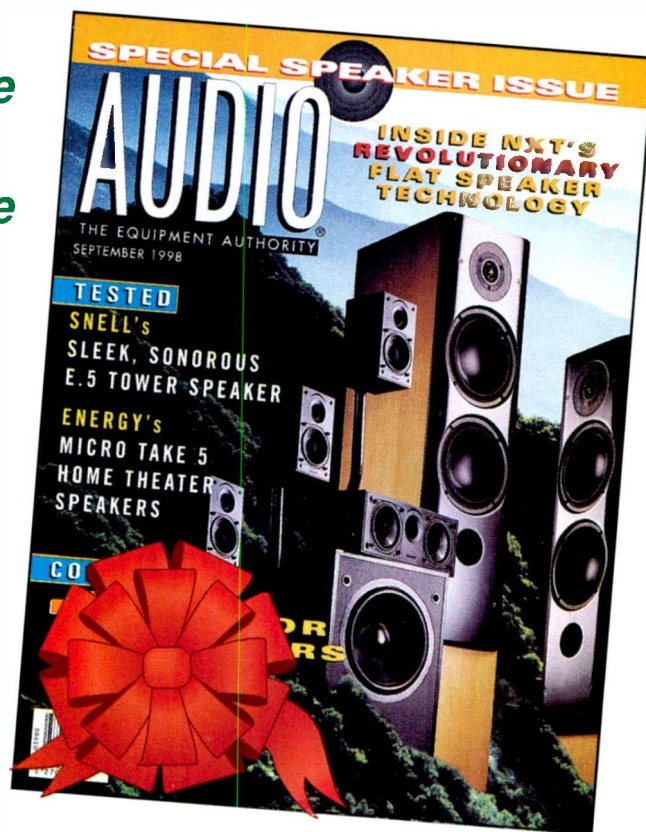
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# JAZZ ~ B L U E S

## R E C O R D I N G S



Martino's personal "soundtrack" ranges widely, from the rock 'n' roll permeating his native Philadelphia in the '50s and '60s—Bobby Darin, Bobby Rydell, Chubby Checker, even Dick Clark and *American Bandstand*—to his tutelage playing in organ trios and touring the "chitlin' circuit" with R&B veteran Willis Jackson while barely in his teens. By the '70s, a decidedly spiritual element—its catalyst being Martino's study of Eastern philosophies and musics—was informing the guitarist's sonic lexicon, and an expansive confluence of sounds and originality elevated him to near mythologi-

cal status. The flip side to Martino's legend is his brush with mortality in the late '70s: A brain aneurysm dissolved his memory of people, places, and things—guitars included—but he made a miraculous recovery.

Everything special about Martino's music, human spirit, strength, and resilience is apparent on three current issues. On *Stone Blue*, his second release for Blue Note, Martino reunites with drummer Kenwood Dennard and keyboardist Delmar Brown from his magnificent 1976 album *Joyous Lake*. Bassist James Genus and tenor saxophonist Eric Alexander are also included here, and the direction is contemporary, with intricate polyrhythmic drumming, six-string electric bass, and electronic keyboards enhanced by otherworldly synth flourishes and space lines. Still, Martino's instrument remains untouched by modernity, steeped in the warmth and bottom of vintage jazz guitar tone. Melodies are subtle throughout, typically played in unison by Martino and Alexander, while Martino's compositions range from slow-burn minor blues to uptempo funk fusion. On the title track, he incorporates sirens and street noise to create an urban soundscape against a sensuous, moody groove and minor blues-based melody. "Never Say Goodbye," dedicated to the late guitarist Michael Hedges, is truly special, with Martino exquisitely whispering a lyrical and hauntingly moody melody against gorgeous synth pads. This is a standout track on an excellent, contempo outing that reinforces the guitarist's present brilliance.

The past, nonetheless, was when Martino's reputation was forged, and New York-based label 32 Jazz has been consistently releasing the guitarist's records from the '70s after acquiring master tapes from their original label, Muse Records. The long-out-of-print *We'll Be Together Again* appears on CD now for the first time ever. This duet between Martino and keyboardist Gil Gold-

Photo: Jimmy Katz



**C**onsidering guitarist Pat Martino's eclectic musical pedigree, it is somewhat surprising that he earned his status as one of jazz's most truly awe-inspiring six-string slingers. Beginning at ground zero, virtuosi jazz musicians seem to immerse themselves not only in the requisite recordings of predecessors who serve as jazz's keystone but also in the entire sonic environment of their lives—from regional music to urban and suburban noises. They then manifest all these influences in their own writing and performances.

**Stone Blue**  
*Pat Martino & Joyous Lake*  
 BLUE NOTE CDP  
 7243 8 53082, 60:02  
 Sound: A, Performance: B+  
 .....

**We'll Be Together Again**  
*Pat Martino*  
 32 JAZZ 32071, 44:03  
 Sound: B+, Performance: A  
 .....

**Willis...with Pat**  
*Willis Jackson  
 and Pat Martino*  
 32 JAZZ 32062, 50:48  
 Sound: B+, Performance: B+

stein (here playing electric piano) relies on the pair's undeniable chemistry and intuition, while Martino's expressive guitar work is in absolutely jaw-droppingly brilliant form.

In the opposite direction is *Willis...with Pat*, a date led by R&B honker Willis Jackson that features Martino. They are accompanied by organist Charlie Earland, drummer Idris Muhammad, and numerous others. Here, Martino works his R&B roots, tempering his wanderlust to something combining rock and blues muscle (string bends and double-stops) with chromaticism, augmented and diminished scales, and all that jazz stuff.

And, reportedly, Martino would like to record with legendary Who guitarist Pete Townshend (whom he's appreciated for years), adding to an aural palette that hardly stops with be-bop licks. *Mike Bieber*

### Return of the Candyman

Charlie Hunter & Pound for Pound  
BLUE NOTE CDP 7243 8 23108, 52:23  
Sound: A, Performance: B+

From the opening downbeat of "Bongo Confront," the syncopated snippet that kicks off this funky collection, guitarist Charlie Hunter and his longtime drumming partner Scott Amendola lock in like a classic funk rhythm section.


## SHEMEKIA COPELAND

**Turn the Heat Up**  
*Shemekia Copeland*  
ALLIGATOR ALCD 4657, 63:01  
Sound: B, Performance: A-

**S**eems like we're always hearing from the son—**fr**om Frank Sinatra, Jr., Julian and Sean Lennon, Ziggy Marley, and Rufus Wainwright. So it's about time we heard from the daughter. Shemekia Copeland, the late Texas bluesman Johnny Clyde Copeland's little girl, just might be the one to jump-start the trend.

Shemekia Copeland's only 19, but her powerful voice—part Koko Taylor, part Etta James, part Aretha Franklin—has already put her at the head of the freshman class. Alligator Records clearly believes in Copeland; it put together a killer band replete with a mighty guest list that includes Joe Louis Walker and Jimmy Vivino's guitars, the Uptown Horns, Brian Mitchell's keyboards, Michael Merritt's bass, and James Wormworth on drums. This tight rockin' outfit never comes close to overshadowing Copeland, whose organic presence precludes any such thing. From smoldering ballads to the fiercest rave-ups, she sounds like she means every word. It must be her genes.

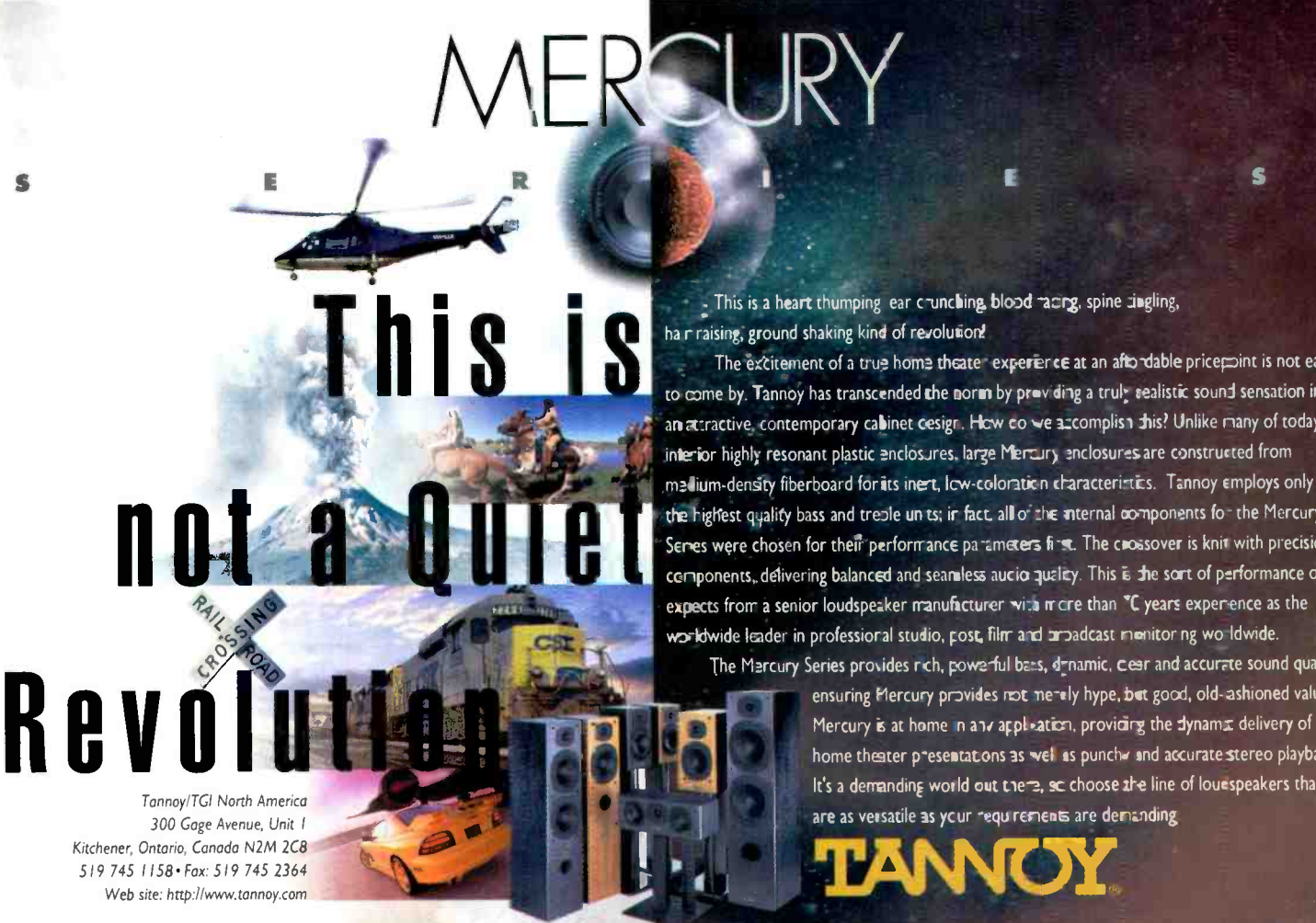
If there's any justice, *Turn the Heat Up* will become a milestone blues record. If it doesn't, it's not Shemekia Copeland's fault. *Steve Guttenberg*



It should be noted that Hunter is both guitarist and bassist in this full-sounding quartet, performing both functions on an extraordinary custom-made, eight-string instrument that covers the full range. Imagine if Joe Pass had been heavily influenced by James Brown, and you might get the picture.

Hunter has created quite a stir on the jazz scene since his 1995 Blue Note debut album, *bing, bing, bing!*, which most definitely was not a Crosby tribute. He had a fertile period with a two-horn quartet, which yielded *Ready...Set...Shango!* and last year's Bob Marley tribute, *Natty Dread*. With *Return of*

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the *Candyman*, in which he unveils his new band Pound for Pound, Hunter explores the chemistry between vibraphone and guitar, a combination that has been exploited in the past by Red Norvo with Tal Farlow and by Gary Burton with any number of guitarists (Larry Coryell, Sam Brown, Jerry Hahn, Pat Metheny, John Scofield, Mick Goodrick, Wolfgang Muthspiel). Vibist Stefon Harris is Hunter's alter ego on this album, although that role has been filled by Monte Croft in the guitarist's road band.

The title track is a loose, shuffling second-line rhythm, with funky signatures and shimmering harmonies on top of the insinuating

groove. "Pound for Pound," which recalls Roy Ayers' soul-jazz period with Polydor, allows for some significant stretching by Hunter, Harris, and drummer Amendola. In between the extended compositions, Hunter has also strewn catchy interludes. Running a minute or less, they fade in and out of the mix to create and maintain a funky continuity. The remake of Steve Miller's mega-hit from the '70s, "Fly Like an Eagle," is appropriately geared for the dance floor, while "Turn Me Loose," Hunter's take on a James Brown-



Fela Kuti "good foot" groove, allows for more serious stretching by Harris, a gifted improviser on his vibes.

The crystalline "People" is an ethereal brush ballad highlighting Harris's inherent bluesiness alongside Hunter's floating chordal work. "Shake, Shake It Baby" is a Latin-flavored jam that glides along on the rhythmic hookup between Amendola and percussionist John Santos. The most energized track here is the slamming backbeat number "Dope-a-Licious," on which Hunter unleashes some of his nastiest licks.

"Hungry Bear" is an easy stroll that features the whole band in a relaxed, behind-the-beat frame of mind. Along with "People," it provides the most soothing moments on *Return of the Candyman*. The rest is a testament to Hunter's undying allegiance to the almighty power of groove.

Those afraid of the funk should probably steer clear. Patrons of the dance floor, though, will get knee-deep in it. *Bill Milkowski*

### Heavy Love

Buddy Guy

SILVERTONE JADV 41632, 57:13

Sound: A, Performance: A-

Rock is the blues, but lately the blues sometimes forgets (or doesn't care to) rock. You cannot accuse Buddy Guy of that. *Heavy Love* rocks, from the moment Guy shows blues pup Jonny Lang a thing or three on "Midnight Train" through the kind of solo that makes Eric Clapton worship at the guitarist's feet on "Had a Bad Night."

This is one of the best recorded and arranged blues albums in some time. Guy's acoustic guitar work cuts as clean and sharp as his electric on "Did Someone Make a Fool Out of You." "I Need You Tonight," meanwhile, has sonic and musical depth reminiscent of Steely Dan.

Some of Guy's props to his roots border on fascinating. His soulful reading of Willie Dixon's "I Just Want To Make Love to You" reinvents the song as Stax funk. Similarly, it takes blue steel balls to cover Al Green, but Guy brings extra musical fire to "Are You Lonely for Me Baby" without embarrassing himself on the vocals. His version of Louis Jordan's "Saturday Night Fish Fry" captures the whimsy of the original so well as to seem out of place among the stone-heavy blues. More in tune with the tone of the album, his three lovers (doing Smokey one better) on "I Got a Problem" capture the essence of the blues.

*Alone and Acoustic*, a 1991 album of front-porch blues Guy recorded with the late Junior Wells, might be the best acoustic blues album



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## THE MILES DAVIS QUINTET

### The Complete Studio Recordings, 1965-'68

COLUMBIA 7464-67398, six CDs, 7:21:52  
Sound: A, Performance: A+

Comparing these studio dates from 1965 to 1968 to recordings from concerts only months earlier reveals a drastic change in musical direction for Miles Davis's second great quintet. Trumpeter Davis, saxophonist Wayne Shorter, pianist Herbie Hancock, bassist Ron Carter, and drummer Tony

late 1950s. With the cerebral personnel of this second great quintet, however, the possibilities of personal interaction were explored even further, as they deconstructed forms and then rebuilt them as the moment dictated. The results heard here—the first occasions Davis felt compelled to return to the studio after two years of searching for the proper personnel—are staggering.

The classic *Kind of Blue* album and the recordings in this boxed set comprise the most creative small-group sessions Davis ever produced.

The six CDs contain the LPs *E.S.P.*, *Miles Smiles*, *Sorcerer*, *Nefertiti*, *Filles de Kilimanjaro*, and *Water Babies*. The 56 chronologically arranged tracks include 13 previously unreleased gems (alternate takes, rehearsal takes, even one recording from Davis's personal library). The remastering is a giant step forward compared to any previous issue of this material.

The collection comes in a deluxe, cloth-bound package, similar in design to the Grammy-winning *Miles Davis & Gil Evans: The Complete Columbia Studio Recordings*. It contains a 116-page book of well-written essays, track-by-track annotations, rare photos, and sessionography. *James Fozzi*



Williams began logging studio time in a deliberate attempt to break down the harmonic and rhythmic barriers indigenous to their previous repertoire. Their mission was to explore less encumbered, more original frameworks for improvisation. Davis and his first great quintet with John Coltrane had begun to use modes in lieu of scales as early as the

of this generation. With *Heavy Love* he has now made one of the best electric blues recordings as well. *Hank Bordowitz*

### Panthalassa:

#### The Music of Miles Davis, 1969-1974

COLUMBIA CK 67909, 59:40  
Sound: B+, Performance: B+

Producer Bill Laswell's radical reconstruction and mix translation is a provocative pastiche that draws on material from Davis's controversial electric period of the late '60s and early '70s. A seamless suite of free-flowing groove music from the trumpeter's notorious wah-wah phase, it brings together highlights from three influential albums—*In a Silent Way* (1969), *On the Corner* (1972), and *Get Up With It* (1974). Working from the original eight- and sixteen-track masters, Laswell manipulated the recordings with his own ambient tweakage at the mixing console, a trademark production style that the maverick producer has cultivated over the years with his Axiom and Subharmonic labels.

Comprising four movements, *Panthalassa* shows a connection between Miles's groundbreaking '70s work and various musical movements that emerged years, even decades, later. John McLaughlin's proto-punk guitar skronking and Miles's own wah-wah trumpet on the

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"In a Silent Way/Shhh/Peaceful/It's About That Time" movement provide a link between jazz and Jimi Hendrix while anticipating the fusion movement by some years. The exotic "Black Satin/What If/Agharta Prelude Dub" incorporates Badal Roy's tabla and Khalil Balakrishna's tamboura drone long before the world-beat explosion happened. The groove-heavy "Rated X/Billy Preston" movement (from *On the Corner*), anchored by electric bassist Michael Henderson and drummer Jack DeJohnette, is clearly a precursor to hip-hop and jungle grooves, while the dreamy 13½-minute "He Loved Him Madly" suite (from *Get Up With It*) is perhaps the first ambient-jazz statement (and was cited by ambient guru Brian Eno as a seminal influence).



This all adds up to a real bitch's brew of things to come.

Bill Milkowski

### Queen of All Ears

*The Lounge Lizards*

STRANGE & BEAUTIFUL MUSIC

SB 0015, 59:36

Sound: A-, Performance: A

### Din of Inequity

*The Sex Mob*

COLUMBIA/KNITTING FACTORY

CSK 41146, 54:34

Sound: B, Performance: A-

The real jazz/fake jazz question posed nearly 20 years ago by John Lurie's Lounge Lizards is moot. Now the question is: Does it move you? The current jazz scene is chock-full of competent players, but more often than not they're mere technicians, not musicians. These soulless wonders are too busy mimicking old heroes instead of creating something new.

On *Queen of All Ears*, Lurie's always-mysterious explorations have evolved into film noir vignettes you can easily lose yourself in. "Monsters over Bangkok" offers a cinematic spread that stretches out from Jane Scarpantoni's cello, Michael Blake's bass clarinet, and Lurie's spooky soprano sax intro to set the stage for Steven Bernstein's vaudevillian trumpet; it cajoles, vamps, rasps, does everything but talk. Then the band takes off, blowing through the back alleys of the city. On "Yak," downtowner Lurie applies his acting skills, spinning a hallucinatory yarn about a farmer and his livestock. The Lizards work up a sweat behind him, but it's all just a setup for a punch line. Lurie's a very funny guy, and *Queen of All Ears* is his royal flush.



# FREDDY COLE

## Love Makes the Changes

FANTASY FCD-9681, 55:41

Sound: A, Performance: B+

Vocalist Freddy Cole isn't riding coattails, but heredity is on his side. His virile, throaty baritone, succinct phrasing, and matter-of-fact delivery are somewhat reminiscent of brother Nat. To say it's in the genes would be an oversimplification. Overriding the DNA factor is the fact that as young men both musicians were influenced by the same extraordinary, seminal jazz masters.

Thanks to Freddy's significant recording projects on Fantasy—*Love Makes the Changes* is his fifth—brother Nat is not the only Cole influencing subsequent generations. Wonderfully empathic support from an all-star rhythm section, headed by pianist Cedar Walton, combines with the bluesy interludes of saxophonists Grover Washington, Jr., and Eric Alexander to produce a comfortable, warm blanket surrounding Cole's exquisite vocals.



But from whence does he find these tunes? "On My Way to You," "Wonder Why," "The Right to Love," "A Sinner Kissed an Angel"—this album contains at least nine good reasons for singers of pop and jazz standards to dig a little deeper when compiling set lists. Freddy Cole's latest effort substantiates the notion that a multitude of great, obscure songs are out there just waiting for a well-served second life.

James Rozzi

Bernstein reappears, this time fronting his new band, Sex Mob, on *Din of Inequity*. The Sex Mob's twisted sensibilities jive with the Lizards', but its funkier sound is lighter on its feet, always searching and finding the perfect groove. Check out the ensemble's boisterous noise on Prince's "Sign 'o' the Times"; Bernstein's slide trumpet leaps once again exhilarate,



and also saxophonist Briggan Krauss gives as good as he gets from Bernstein. Sex Mob's daring covers—"Goldfinger," "Live and Let Die," and "House of the Rising Sun"—go places so far out they're back in but also make good on the Mob's promise "to bring the sexy thing back into instrumental music." Hear, hear. *Din of Inequity* should be steaming up hi-fis everywhere pretty soon.

Steve Guttenberg





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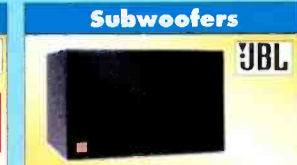
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# DVD REVIEWS

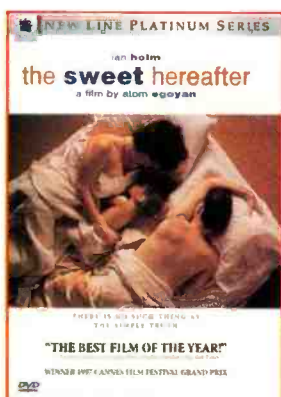
## the sweet hereafter

**The Sweet Hereafter** 1997; R rating; one-sided (feature, 2.35 letterboxed; supplemental material, 1.33:1 full frame); dual layer; English and French Dolby Digital 5.1; English,

French, and Spanish subtitles; closed-captioned; includes interviews, "Before and After The Sweet Hereafter" (a video discussion of the book and film with author Russell Banks and film director Atom Egoyan), trailers; a complete still-frame ver-

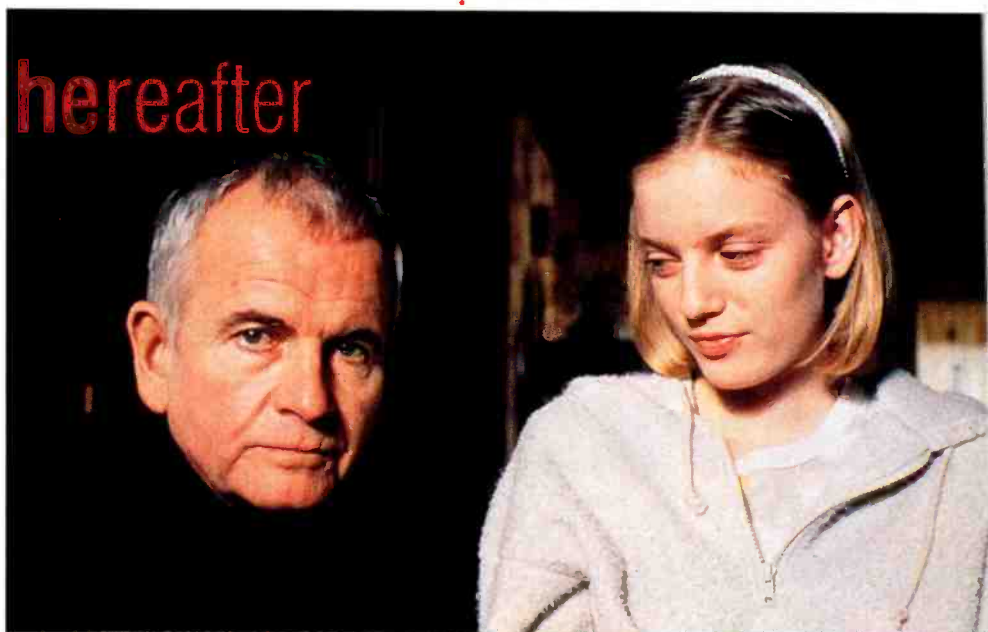
sion of the poem "The Pied Piper of Hamelin," and a full-length commentary track with Banks and Egoyan. NEW LINE N46-54, 116 minutes, \$24.98

Picture: A, Sound: A, Content: A-



**N**ot all films measure up for a second or third viewing, but *The Sweet Hereafter* certainly does. The unusual treatment of time in telling its story, the dreamlike atmosphere, and vivid three-dimensional characterizations reveal fresh nuances each and every time it is viewed.

On the surface, *The Sweet Hereafter* (based on a novel by Russell Banks) is the story of a sly-like-a-fox but personally troubled lawyer (Ian Holm) who arrives in a small town shortly after a school bus accident claims the lives of most of its children. The manipulative outsider wheedles and sells the idea of a huge lawsuit to most of the parents. No matter that there seems to be no one entity or person really at fault, he'll find someone to make a case—to get his percentage.



But as we revisit this tale again and again, we perceive it is about many other things, including loss of innocence, courage, and change. Filmmaker Atom Egoyan has woven into its plot development themes from

of additional information. For example, there's a short documentary discussion with Banks and Egoyan titled "Before and After *The Sweet Hereafter*," an interview with Egoyan from Charlie Rose's PBS show,

## CARPENTERS

**Remembering The Carpenters: The Story of Karen & Richard Carpenter and the Songs That Made Them Famous** 1997; color and black-and-white; Dolby Digital two-channel stereo/mono; includes bonus tracks, discography, still-frame tribute, commercials, and radio spot. MPI DVD7278, 100 minutes, \$24.98

Picture: A-, Sound: A-, Content: A-

**T**his entertaining DVD is a tribute to the highly successful brother-and-sister duo that recorded a string of hits in the 1970s, their career cut tragically short by Karen's death at age 32 in 1983. There's lots of rare footage here, most of it in color, plus connecting interviews conducted in 1997 with Richard Carpenter, Petula Clark, Paul Williams, Burt Bacharach, and others associated with The Carpenters' hits. Everything is integrated in such a way that it all serves as a biographical narrative.

Singular bonuses appear throughout the DVD, including a long segment from a concert given in the Nixon White House (just when the Watergate scandal was beginning to break) and some Japanese soda commercials for a drink called "Pop." The audio and video are excellent, but when all is said and done, what one really remembers are Karen Carpenter's one-of-a-kind, haunting vocals and those great hits "Close to You," "For All We Know," "Rainy Days and Mondays," "Superstar," and the ironically titled "We've Only Just Begun."

The main body of this disc is a biography, with only portions of songs being used to move the story along, in case you are sensitive to that sort of thing. But the bonus section does include complete versions of "(A Place To) Hideaway" and the Bach-Gounod "Ave Maria."

This DVD's quality production honors an act that was class all the way. **R.B.**



Photo: Fine Line (Courtesy Kobal), ©1997 J. Eisen

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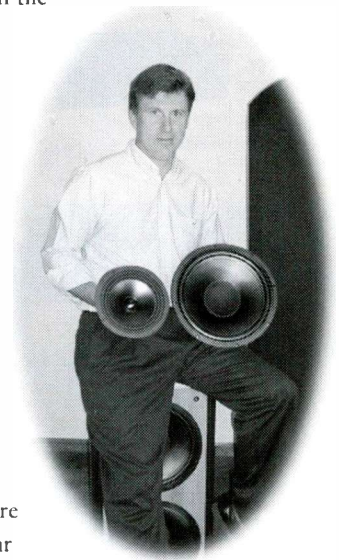
Now some folks will try to convince you that an 8" woofer is faster than a pair of 12". But moving air is a volume velocity issue.

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).

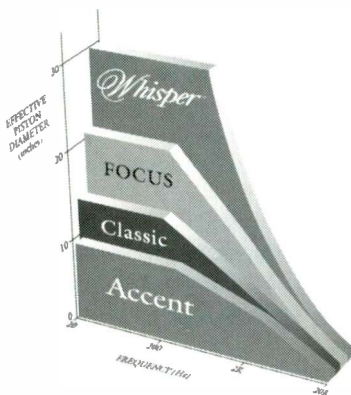
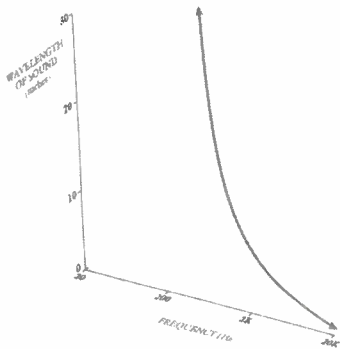
The laws of physics dictate that a loudspeaker's effective radiating diameter should increase proportionally with the wavelength of sound to provide consistently low distortion, broad dynamic range and uniform power distribution.

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and a scene-specific, full-length commentary track with Banks and Egoyan. In this case, the supplementals prove to be valuable tools in understanding the film and the novel on which it is based. They also make a second or third viewing of the movie a much richer, more rewarding experience.

The transfers are first-rate; the bittersweet medieval-folk-inspired music by Mychael Danna comes through particularly well and is available by itself on a "score only" track.

One of the last, but not least, features of this splendid offering is its price, which surely qualifies it as a bargain. *Rad Bennett*

**High Lonesome: The Story of Bluegrass Music** 1991; no rating; color and black-and-white; one-sided; Dolby Digital two-channel stereo and monaural. SHANACHIE 604, 95 minutes, \$24.98  
 Picture: B+, Sound: B+, Content: A-

A winner of prestigious awards from the Chicago and Atlanta film festivals, this is a lively documentary about bluegrass music, which means that it must tell the story of the late Bill Monroe. The origins of acoustic bluegrass are explored, as are the changes that occurred after World War II and a later resurgence that occurred during the hippie/folk



era of the '60s and early '70s. We are treated to rare footage of Monroe and other legendary performers through the years as well as some interviews conducted in 1991. Most important, we get to hear lots of great music with that "high, lonesome" sound. The video and audio are okay, although, of course, they vary quite a bit, depending on the source material that's tapped. It seems, however, that the overall quality should have been slightly better. Perhaps a master that takes full advantage of DVD's extra definition would have helped. Nit-picking, you say? Perhaps, for the program still looks as good as—if not a little better than—the best broadcast, and it sounds quite good. *R.B.*

**Silent Running** 1971; G rating; one-sided (1.85 aspect ratio, letterboxed); Dolby Digital one-channel mono. UNIVERSAL/IMAGE ENTERTAINMENT ID4229USDVD, 90 minutes, \$29.99  
 Picture: A, Sound: B+, Content: A

This intelligent, landmark science fiction film stars Bruce Dern as a botanist tending the last remaining forests of Earth, now housed in pods attached to spaceships orbiting Saturn.

Everything on Earth has become synthetic. Ultimately, an order comes through to explode

the remaining pods. They are no longer cost-effective. Dern refuses, goes ballistic, kills his uncaring crew mates, and hijacks the forest.

The film's special effects are quite good (considering its low budget), Dern's performance is first-rate, and the strong pro-ecology statement comes across well. Peter Schickele (a.k.a. PDQ Bach) composed and conducted the unusual score, and Joan Baez sang two of the soundtrack's songs.

If memory serves, the original vinyl soundtrack album was pressed in green, in keeping with the movie's theme. The score sounds pretty good on this DVD, and the picture is sharp and clear, with good contrast and rich colors. The audio track is true mono; I prefer this for single-channel movies rather than the more common two-channel monaural, which can, and usually does, spill to the surround channels if there are even slight channel anomalies. No trailer or extras are provided beyond scene search. *R.B.*



**Diva** 1981; R rating; one-sided (1.66:1 aspect ratio); French Dolby Digital two-channel mono; English subtitles. FOX LORBER FLV5000, 123 minutes, \$29.98  
 Picture: A-, Sound: B, Content: A-

In this thriller, a young mail carrier illegally tapes a concert by a famous diva who refuses to record. His life, however, gets complicated, and more dangerous, when Taiwanese "businessmen" want to obtain the tape for release. It becomes even more complicated when his tape is accidentally switched with one exposing the chief of police as a racketeer. This clever thriller also explores, if not in total depth, the devotion of a fan to an artist he worships.

The film boosted the career of soprano Wilhelmina Wiggins Fernandez and brought the soprano aria from Alfredo Catalani's opera *La Wally* to ears that might otherwise never have heard it.

Although the quality of the DVD transfer is a little uneven, the many scenes that are breathtaking in detail are good enough to offset the few that are less than perfect. And there's a famous subway chase scene that is pulse-pounding, a real visual treat. The sound is just okay, not up to the video's high standard. It's a shame the original filmmakers didn't spring the bucks for Dolby Stereo. (The DVD's soundtrack is in French, with English subtitles that can be turned on or left off.) *R.B.*



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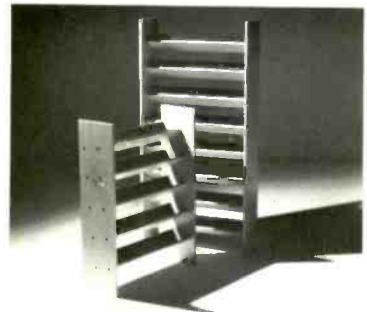
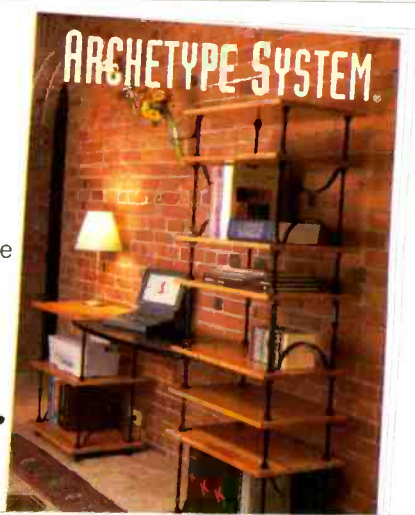


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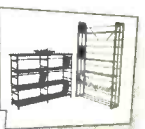
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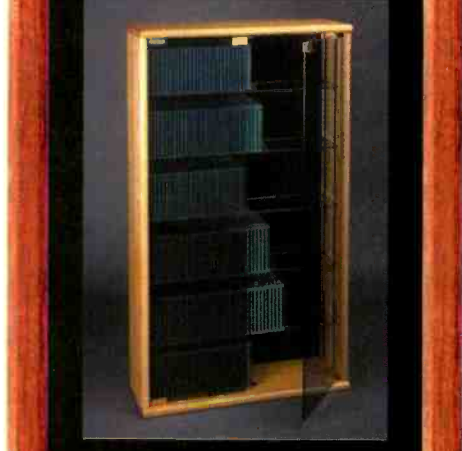


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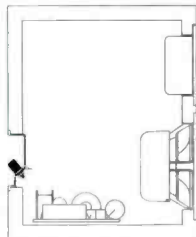
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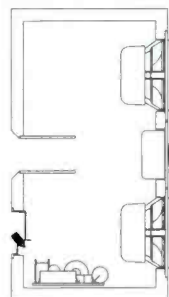


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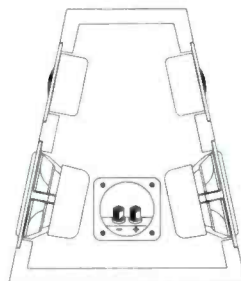


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*Birth of the Boom: Room Acoustics at Low Frequencies*, Tom Nousaine, June, 32.

#### ADDENDA

*Equipment Profile: Infinity Compositions Overture 3 Speaker* (Feb., 42), June, 8.

*Equipment Profile: Z-Systems RDP-1 Digital Preamplifier* (April, 64), June, 9.

*Equipment Profile: Paradigm Reference Servo-15 Powered Subwoofer* (April, 68), Aug., 6.

#### AMPLIFIERS

*Spectrum* (amplifier power ratings), Ivan Berger, July, 16.

*Mondo Audio* (Nagra MPA amplifier), Ken Kessler, Aug., 16.

#### BOOK REVIEWS

*The Home Theater Companion* by Howard Ferstler ("Fast Fore-Word"), Aug., 4.

*Sound for Film and Television* by Tomlinson Holman ("Fast Fore-Word"), Aug., 4.

*The Search for Musical Ecstasy* by Harvey Rosenberg ("Fast Fore-Word"), Aug., 4.

#### CD-R

*Living with CD-R: A User's Guide to CD Recording*, Robert Long, Feb., 24.

*Spectrum* (collecting music royalties on digital recording media), Ivan Berger, July, 18.

#### CAR STEREO

*Spectrum* (coping with road noise; identifying radio stations), Ivan Berger, April, 16.

*Spectrum* (amplifier power ratings), Ivan Berger, July, 16.

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21	Technics	www.technicsusa.com	800-211-7262
5	Thiel	www.thielaudio.com	606-254-9427
43	Toshiba	www.toshiba.com	800-631-3811
91	Uncle's Stereo	www.unclestereo.com	800-978-6253
84	Vandersteen	www.vandersteen.com	209-582-0324
62	Velodyne	www.velodyne.com	408-436-7270
CIV	Winston		

# PlayBack

## SyQuest SyJet Portable Hard Drive

Nowadays, computers can record, edit, and process CD-quality audio with a click of a mouse or a push of a keyboard button. On the downside, hi-fi audio occupies a lot of space on your hard drive, especially if you are using other programs. A low-cost solution is a separate, portable hard drive with removable media, such as SyQuest's compact SyJet.

Priced at \$299 (including connecting cables and one removable cartridge), SyJet provides 1.5 gigabytes of audio storage, equivalent to two hours of CD-quality stereo sound. Extra cartridges are \$79.95 each. You can connect the SyJet to a Macintosh computer via its SCSI port or to an IBM-type PC via a parallel port. Accompanying software enables operation and optimizes the SyJet drive for audio/video recording and playback. An external AC/DC converter powers the unit.

I used the SyJet with my Power Macintosh 7600 computer, Peak 1.65 stereo recording/editing/playback software, and an internal Lucid Technology PCI24 digital audio input/output card. I downloaded CD tracks and made DAT recordings using the SyJet as the storage and playback medium. It worked great. I could store two hours of audio on one cartridge,

then pop in another and store some more. Playback was very clean

GRADE: A-



and of CD quality. (I know several mastering engineers who use SyJet drives during CD editing; the drives are *that* good.)

Admittedly, portable hard drives do not seem as robustly built as fixed hard drives. But the SyQuest seems sturdy enough: It has a hard plastic case and a door to keep potentially harmful dust out of the drive compartment. I did have one unit go bad because of a failed disk that put the drive into a permanent non-read mode; however, a replacement drive has worked fine for more than a year. (SyQuest Technologies: 47071 Bayside Parkway, Fremont, Cal. 94538; 510/226-4000.)

John Gatski

## BDI VENTURA AUDIO+VIDEO EQUIPMENT RACK

Recently, I have found more and more high-quality, attractive A/V equipment racks, BDI's Ventura Audio+Video series being a fine example. Each of the four models in this series is designed around a four-piece hardwood frame that supports as many as six quarter-inch tempered-glass shelves. BDI says the top glass shelf can hold a maximum of 120 pounds; the others hold up to 75 pounds apiece.

I assembled the \$475 cherry-stained maple Ventura 7021 (also available in ebonized ash). It had four shelves, the top one large enough to accommodate a 27-inch TV. BDI did its homework on the Ventura's do-it-yourself design, for I was able to assemble the rack in just 10 minutes, tightening the pieces together via hex-head bolts with the supplied hex-head wrench. The glass shelves slid easily into their slots and held fast. The rack's spine is cut with ample-sized holes, useful for routing cables.

I intentionally piled on a bunch of gear, including a preamp and some heavyweight amps (a McIntosh MC275, a hefty Parasound HCA-2003A, and a Hafler 9505), to see how well the rack held up. No problem. I even tugged it about 3 feet across the floor

with all this gear aboard, a move that has overly flexed and top-

GRADE: A

pled lesser racks. Not the BDI: It held up fine.

BDI equipment racks are currently sold at several retail stores, including Myer-Emco, Harvey Electronics, Magnolia Hi-Fi, and Columbia Audio Video. (BDI: 14101-A Parke Long Court, Chantilly, Va. 20151; 800/428-2881; www.bdiusa.com.)

John Gatski



## BAYGEN FREEPLAY FPR25 AM/FM PORTABLE RADIO

BayGen's Freeplay has one major, possibly unique, virtue that, for many, will outweigh its limitations: It doesn't require AC power or batteries. That's true in sunlight, when the solar cell atop the Freeplay's case directly powers the radio, and even in the dark, where its power source is a spring-wound DC generator. Turn the hefty crank 55 times, and the radio plays. (It's rated to go for an hour per wind, though I got about half that.) In overcast conditions, the solar cell supplements the spring-wound generator, extending play time. (And if all else fails, you can get an AC adaptor.)

Unfortunately, the amplifier in this \$79.95 radio sounds pretty distorted long before reaching its rated "5 watts (max)"; its audibly clean output is so limited that no more than two people can sit close enough to listen comfortably. Through headphones, volume was sufficient and distortion was fairly low, but the highs were muffled.

The Freeplay, which was designed for the African bush, could prove handy if storms often disrupt your AC power. It might also be a good radio to leave at a remote cabin, where AC power is uncertain or nonexistent and there's no place to buy batteries. But, at 11½ x 8 x 8 inches and 5 pounds, it's a bit hefty for backpacking. (BayGen: 80 Amity Rd., Warwick, N.Y. 10990; 800/946-3234.)

GRADE: C+

Ivan Berger



# “Do you really need new speakers?”

Matt Polk, Speaker Specialist

“**M**aybe you don't need new speakers. Maybe you do. Here are some tips on how to know whether or not it's time for a change.

## Do they work right?

The first thing to check is the woofer surround – the rolled edge of the driver. If it's made of compressed foam and more than 5 years old, it may be shot. Are there any holes or tears? Gently touch the surround, if it feels brittle, stiff and ready to crumble, you need new woofers. If the surrounds are rubber they're probably perfect.

The next thing to check is whether all the drivers are making sound. Play the speakers with the grilles off. Lightly touch all the drivers to feel if they're moving. Cup your hand over the tweeter, remove it. Does the sound change? If not, the tweeter is dead. Play a solo piano recording at a moderate loud level. If you hear scratchy sound or a buzz, the midrange or tweeter may be damaged.

If you have any doubts, bring the speakers in to a local audio store and ask them to check them out. Most dealers will be happy to help.

## Are you happy with the sound?

Do they sound great with all the kinds of music you're listening to today? Some speaker companies voice their speakers to sound good with certain types of music (a bad policy in our opinion). If your musical tastes have changed since you bought your current speakers, it might be time for something better. But if you're really happy with the sound – stick with what you've got.

## Do they look good? Do you care?

Do your current speakers look appropriate and fit comfortably in your room? Has your significant other banished them to behind the couch? Don't laugh, I know a household where that happened. Today's speakers are generally smaller and better looking, with better performance than speakers of ten years ago.

## What will you do with the money you save?

If looks and size are not an issue, if everything's working OK and you like the sound, save your dough. Buy some new CDs or a DVD player or some flowers for your partner.



**NEW!** Polk bookshelf speaker models are now at Polk Audio retailers

## Free stuff!

If you're shopping for a home theater system, you're going to find that it's a lot more complicated than buying a pair of speakers. But the rewards are greater, too. Call (800) 627-7655 ext. 101 for your free copy of the *Home Theater Handbook*. It's full of practical, unbiased advice on how to select and get the greatest performance from a home theater system.

## Listen for yourself.

I've been designing award-winning speakers for over 25 years and naturally I think my speakers are terrific. Don't take my word for it. Go to a store and listen to Polk Audio speakers and decide for yourself.

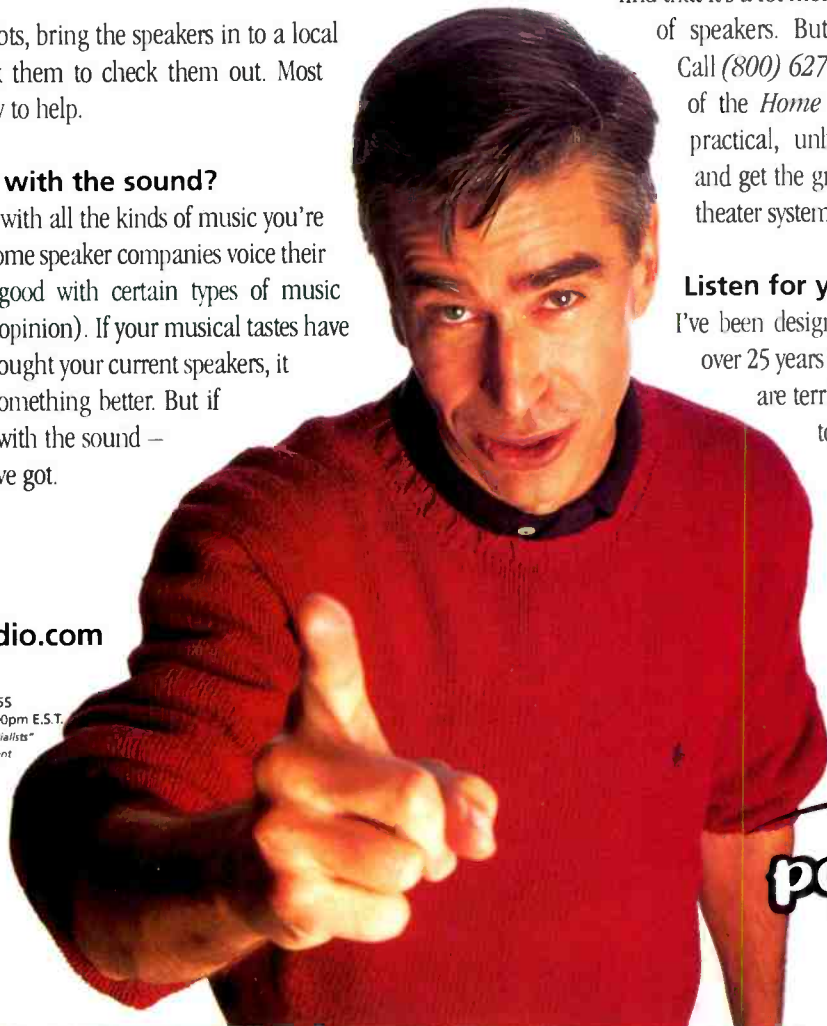
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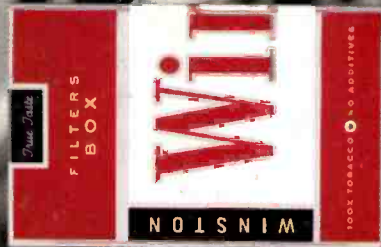
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**raisin' hell,**  
and he called me a quitter.”



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**No Additives.  
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