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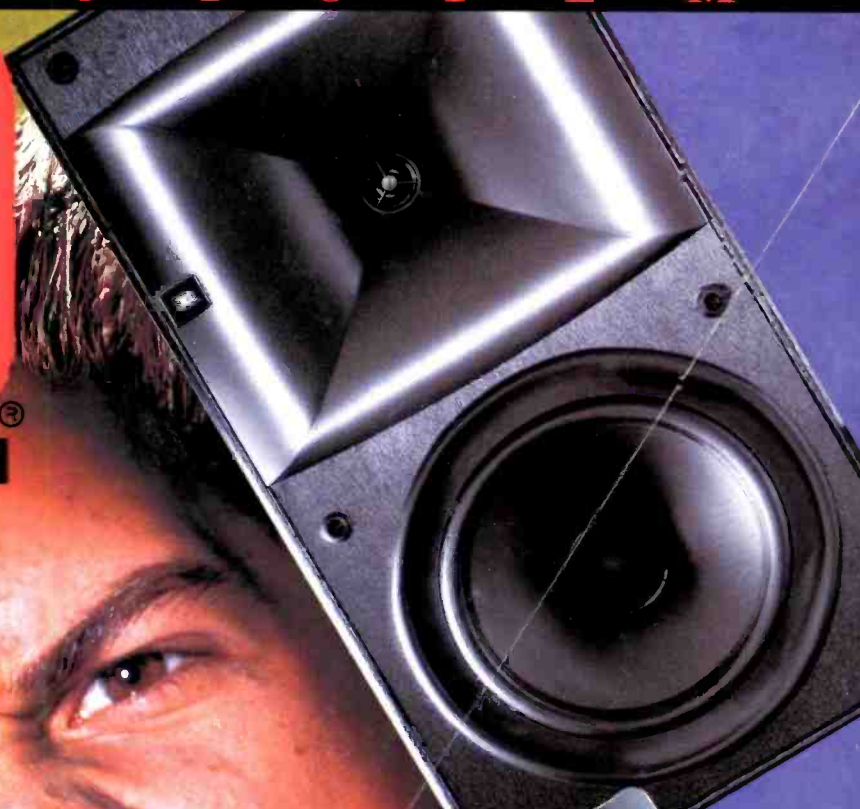
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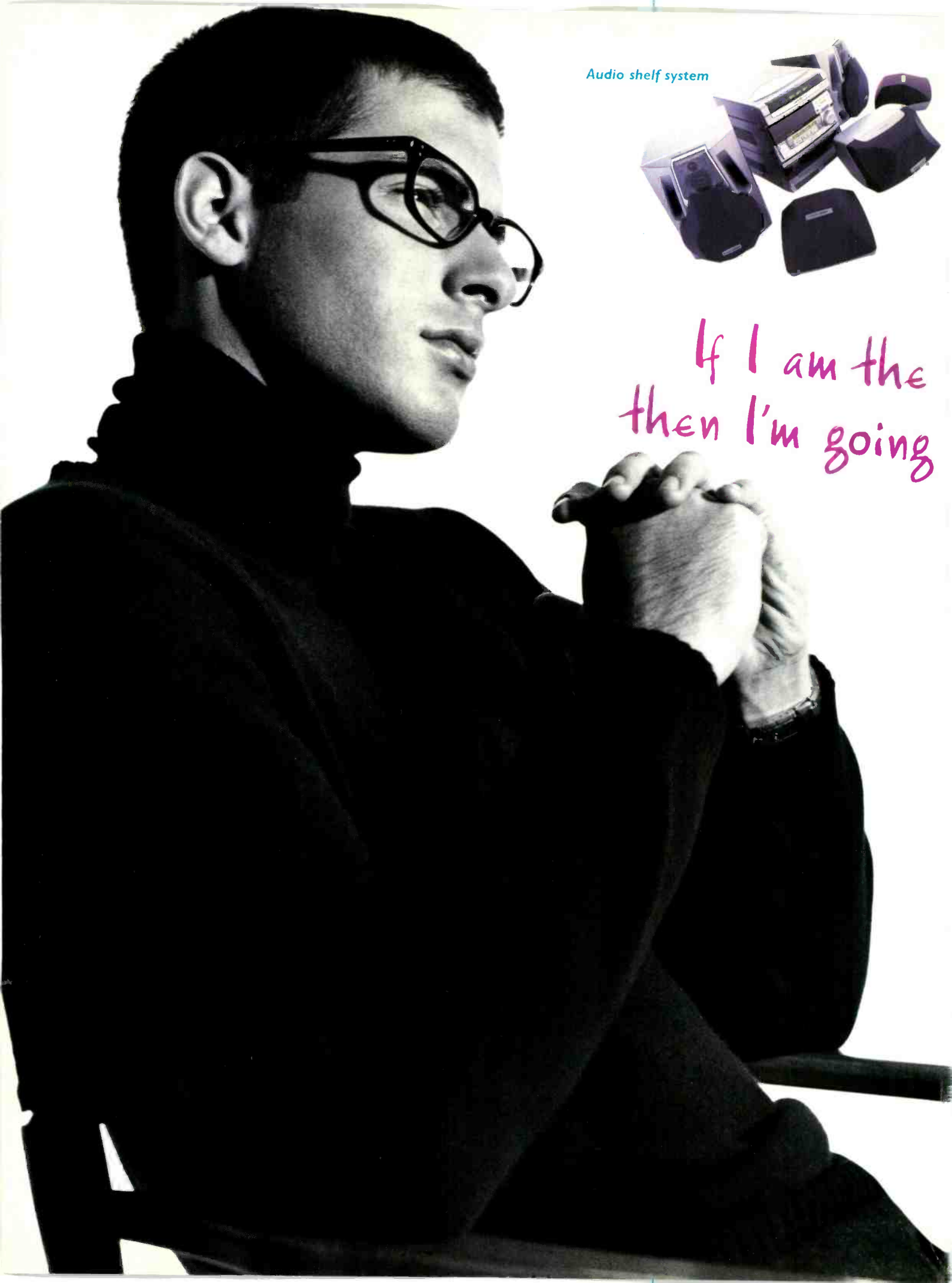
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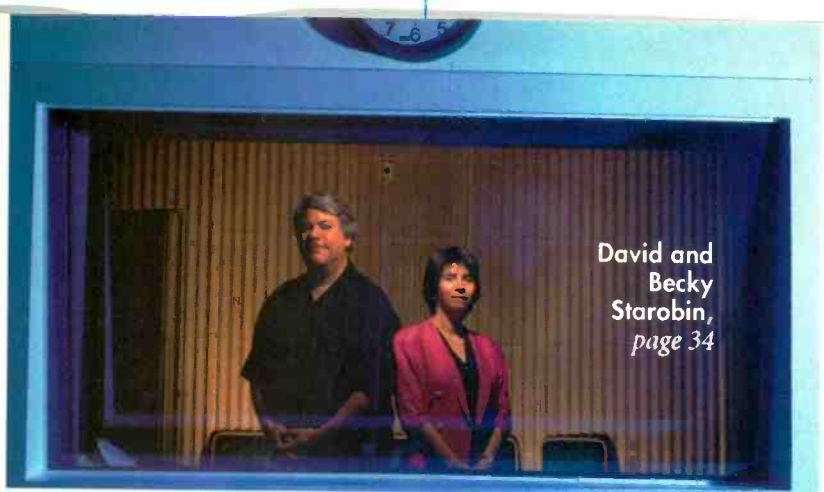


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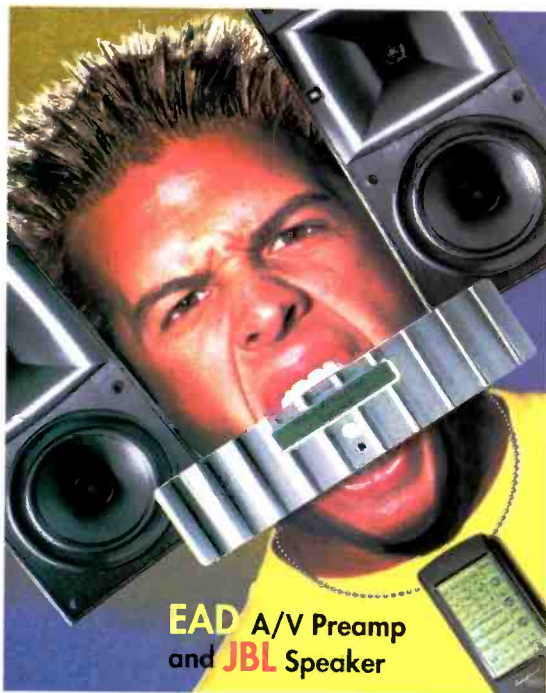
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# AUDIO

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David and  
Becky  
Starobin,  
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EAD A/V Preamp  
and JBL Speaker

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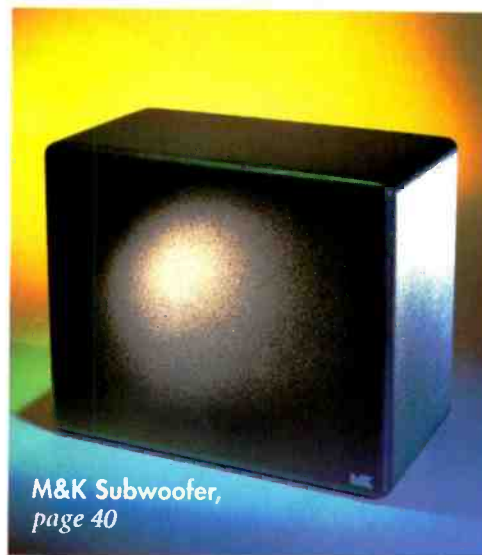
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**T**his month's article on the IEEE-1394 digital interface, by Mark Bridgwater of Digital Harmony, opens a window on a future in which our audio and audio/video systems are drastically simpler to install and operate than most of today's. This is something I look forward to with great relish.

We live in the present, however, and there remains the problem of how to tame our existing, less solicitous systems. The primary approach has been through the use of ever more sophisticated universal remote controls, exemplified in the current generation by the likes of the Marantz RC2000 and, my own personal favorite, the Rotel RR-990. (The EAD TheaterMaster A/V preamps reviewed in this issue come with a customized version of the Rotel remote.) These are still far from perfect, however.

To me, the perfect remote is something more like the Lexicon 700T. Like the Rotel, it has a touchscreen whose displayed controls and their layout change according to what you are doing. But it is much more flexible. On the Lexicon, you (or, more commonly, your dealer) can literally create whatever screens you want and store them for later use. Lexicon provides dealers with a computer program to facilitate the design process. The user interface is built up on the computer and then downloaded to the remote. You can even have different screen trees for different members of the family on the same remote, selectable at the touch of an icon. It's a bit bulky and quite expensive, but if you can afford it, I consider it the one to own.

The good news is that a large measure of the 700T's functionality will soon be available in smaller and much more affordable remotes from Philips, Marantz,

and Harman, all priced in the \$400 range. The Philips Pronto is essentially a smaller but more complete and configurable take on the Rotel. It has an RS-232 serial port, however, and could be made fully programmable somewhat in the manner of the Lexicon if Philips chose to create and distribute the necessary software.

The Marantz RC5000 and Harman remotes, on the other hand, already have software available for that purpose. They can be made to work pretty much any way you like. At first blush, the one that seems most interesting to me is the Harman unit. Developed in conjunction with Microsoft, it will be available under the Harman Kardon and Madrigal brands (the Madrigal differentiated primarily by somewhat more capable setup software). You can set up control buttons, screens, macros, and so forth pretty much any way you want, either via the remote itself or, less awkwardly, on a Windows-based computer. And it has this nifty thumbwheel that can be used for various purposes; by default, it functions as a channel selector.

These are, of course, just first impressions. You never know for sure about such things until you actually try them out. And I doubt that any of them will be quite as capable as that mother of all remotes, the Lexicon 700T. Still, I'm excited at the prospect of something a lot cheaper that is at least in the ballpark. You can expect reviews of all in the months to come.



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### Inquiring Aussie Wants To Know

I find your magazine very informative and great reading. I have just bought a pair of Sansui Q-55 amplifiers and intend to restore them. I'm writing to see if any *Audio* readers have information on these amps—owner's manual, circuit diagrams, modifications, etc.

*Ed Robinson  
Gawler, South Australia*

*Editor's Note:* Send your information on the Q-55 to *Audio*, and we'll forward it Down Under.—S.V.C..

### Audiophile? Ha!

I thought I'd heard the limits of snobbery, pretentiousness, and pomposity. Then I read "The Doctor Is In" ("Letters," July). Well, it has forced me to readjust my scale.

Dr. Barney Vincelette thinks that all modern music lacks artistry. Sadly, he just hasn't been listening. And if you don't listen, you can't really call yourself an audiophile, can you?

His umbrella dismissal of disco, pop, rap, and rock as "written for the least critical mind" and substituting "loudness for artistry" reveals his ignorance.

I am a classical music aficionado who listens to Mozart and Brahms—right along with Radiohead and Blues Traveler. After some listening and education, the good doctor may realize that there are many excellent "artistic" bands today (even if they don't meet his particular taste), just as surely as there were decidedly uninspired classical pieces written 200 years ago.

However, I don't believe Dr. Vincelette is the slightest bit interested in receiving an education, even though he is pompous enough to include a mention of his graduate school attendance (as if he were afraid we might miss the "Dr." before his name). No, I think he will be perfectly satisfied with his own close-minded approach, content to bash modern music, something he does not listen to or know anything about. I assume that includes just about everything but classical and Gregorian chant, since most

everything else is modern. There are none so deaf as those who will not hear.

Most reprehensible, though, is Vincelette's claim that those who listen to the aforementioned musical genres are "not important enough to consider in defining transparent sound reproduction." Wow! I wonder if he'd consider anyone who came into his office wearing a Dave Matthews Band T-shirt undeserving of medical attention!

The advancement of the technology necessary to provide Dr. Vincelette with the transparent sound reproduction he desires relies on modern music. As a student of electrical engineering (who's probably spent much more time in the physics library than he), I can tell you that the advancement of sound reproduction technology will rely on me, and others like me, who listen to this musical "astrology." Believe me, anyone who pursues higher education in the hopes of designing audio equipment—rather than a field with vastly greater earning potential—is dedicated to sound quality.

I hope that people so narrow-minded are rare. The rest of us, meanwhile, can crank up our loud-but-transparent sound-reproduction systems and dance the night (and day) away.

*Zachary Cox  
via e-mail*

### Measure for Measure

This is the first time I'm writing to *Audio*, but I had to do it because I'm feeling shocked and insulted by Barney Vincelette's letter published in the July issue.

I'm 39 years old, and I am a doctor, just like Vincelette. I never got drunk and I have never taken any drugs in my life. I have around 2,500 LPs and CDs, most of them rock and jazz but also classical and other kinds, and I don't need to listen to them at 120 dB to take great pleasure from all that music.

What Vincelette does not know and does not understand (or probably does not want to understand) is that there is excellent and awful rock, jazz, and classical music. I do not like rock or jazz or classical. I like *some* rock, *some* jazz, and *some* classical music. And, be-

lieve me, there is rock that is better than some classical pieces, just as there are classical pieces that are better than some rock.

The only intention Vincelette had when he wrote his letter was to tell everybody through your magazine that, because he is a wealthy man and because he listens only to classical music, he has a critical mind and those who are different from him do not.

Unfortunately, what he really showed us was that he is nothing but a snob, an intolerant and arrogant person who dares to classify other people who do not share his musical tastes as drunk or on drugs.

By the way, I wonder how he still has time to appreciate his beloved music played live when he seems to be so busy measuring sound pressure levels during concerts.

*Paulo Cravo Roxo  
Coimbra, Portugal*

### Foam Sweet Foam

In Don Keele's April "Equipment Profile" of the Paradigm Reference Servo-15 subwoofer, he says it has a "multilayer surround" but doesn't say what material is used.

This is really crucial to know. I have a subwoofer with a foam surround. It rotted in two years, and the manufacturer would not replace it. The specialty shop did, but then the unit malfunctioned. I ended up having to replace the driver assembly at a cost of \$300, and I guess I'll have to do it again two years from now.

It's obvious that knowing what driver surrounds are made of—and how long they can be expected to last—should be a major criterion in a decision about which loudspeakers or subwoofer to buy, yet reviewers seldom mention it. Ditto for warranty periods.

*Agustín Manzano  
San Juan, P.R.*

*Editor's Reply:* Scott Bagby, Paradigm's chief engineer, says the surround of the Servo-15 subwoofer's driver consists of two layers of polyether foam optimized for use under humid conditions. Bagby notes that the best defense against deterioration of foam surrounds in the tropics is an offensive one: Use an air-conditioner or a dehumidifier. It's true that fungus and tiny insects may gradually digest some foam surrounds in certain tropical environments (it's also impossible to estimate how long foam sur-

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YEARS OF ATTENTION TO DETAIL

rounds will last because of the wide variability in tropical weather) and that a rubber surround is preferable for use in such conditions. However, Bagby adds that in the case of the Servo-15, the criterion for choosing the surround material was stiffness: When a rubber surround was tried, the vacuum created by a large outward excursion of the driver cone sucked the rubber surround back into the enclosure. (The Servo-15 is a sealed system.) Only the two-layer polyether foam delivered the combination of stiffness and low mass Paradigm required.—A.L.

### Awesome Review...One Question

Bob Gulla's Santana reviews in the July issue's "Rock/Pop" section were great. Being a '60s and '70s kind of guy, I thought the reviews were very exciting. They did leave me with one question, however: Are the gold disc *Santana* and *Abraxas* versions equal to or better than the remastered versions?

Larry Block  
via e-mail

*Editor's Reply:* In terms of sound quality, the new issues are at least as good as, if not better than, the Super Bit Mapped Master-sound series released a few years back, also on Legacy. Remastering techniques developed since then helped ensure this result. Now you can get the same sound without paying top dollar for those gold-plated discs. And don't be forgettin' those bonus tracks!—D.H.

### Listen and Learn

"The Science of Listening," by Ian G. Masters (December 1997), is a good article, worth the price of the issue, at least. It raises a question to me: Why isn't there a comprehensive, and comprehensible, course, available to the public, that teaches *how to listen*? I am referring to something briefer and more direct than the typical hit-or-miss experience of reading an article here and there and the hodgepodge of test discs, all from competing sources. If participants in test programs can be given "crash courses" in what to listen for, why can't everyone?

Moving right along, who says there are no such things as leprechauns? Mike McLean ("The Audio Interview," November and December 1997), formerly of Mo-

town, certainly seems to qualify; way back in the past, he used his magic to fulfill the wishes of Berry Gordy. A brief listening session, by me, preceded by a longer rummaging session, proved the truth of all he says. Excellent story!

John P. Thomas  
Nome, Alaska

### Sound Insight

Michael Klewin's complaint and your response ("Vinyl Victorious," September "Letters") are both right! My concern, as the grandson of Emile Berliner—inventor of the microphone, gramophone, and the method of mass-producing unlimited quantities of perfect copies of a single disc master recording—is not whether *Audio* is devoting sufficient attention to vinyl records and their associated hardware. Rather, it is that, as Klewin would infer and I would totally agree, the resurgence of vinyl product, particularly in Europe (as is to be expected) indicates people at last realize that the analog disc produces more life-like sound than today's Compact Discs.

The CD does incorporate many characteristics of my grandfather's discs of 1887: They're recorded single-face on the bottom, feature a center hole, start at the inside, and are grooved—albeit they are not mass-produced continuously on presses. It is undisputed, however, that the limitations of 16-bit/44.1-kHz are quite apparent and noticeable and must be overcome if we are ever going to reach the point where every artist can say, "This sounds exactly like me." It remains to be seen whether 24-bit/96-kHz DVD-Audio will be the breakthrough that everyone's hoping for.

While we're at it, in the Special Advertising Section of the same issue, a manufacturer uses the phrase, "those who still enjoy their record collection." Doesn't he realize that CDs are "records"? And isn't he aware of the many similarities between CDs and (other) records?

Oliver Berliner  
*Gramophone Songs & Sounds*  
Beverly Hills, Cal.

*Editor's Reply:* I disagree on three counts. First, I think it is an overstatement to refer to a tiny rise in LP sales as a resurgence. My characterization of it as a "bounce at the bottom" seems more apt. Second, it appears to have been fueled more by demand from dance-club DJs than by any growing belief

in vinyl's sonic superiority. And finally, I would dispute that vinyl actually has any such advantage. Indeed, I would say exactly the opposite. A few years after CD came out, I happened to talk to mastering engineer Bob Ludwig about the old format versus the new, and his comment was that with CD you could get back exactly what you put in, whereas this was usually impossible with LP. I also recall doing bypass comparisons, on a very good system, of straight LP playback versus the same signal after a cycle of A/D and D/A conversion through a Sony PCM-F1 PCM adaptor operating in 16-bit, 44.1-kHz mode. Provided levels were adjusted properly, I could not hear any difference between the raw and processed versions of the signal. And the F1 was hardly a state-of-the-art device, even then. Whatever sonic deficiencies CD-standard digital audio may have, they are very, very small.—M.R.

### Going Too Far?

Corey Greenberg's July "Front Row" piece, "Hum Job," contains the extremely offensive euphemism "mofo." In addition to the questionable taste of this and other articles with disturbing titles, how can you possibly justify the use of this gutter language in your magazine? This is truly a shameful choice on your part.

Janice Mancuso  
*Reference Recordings*  
Pacifica, Cal.

*Editor's Reply:* We apologize for any offense. None was intended.—M.R.

### Standing Tall

For readers who are do-it-yourself enthusiasts, I'd like to recommend an indoor FM antenna that I recently constructed in one evening for less than \$10! And though it stands 7½ feet tall, it takes up only 1 square foot of floor space.

This easy-to-build antenna is called a J-Pole ("end-fed half-wave antenna"), and its parts and construction are fully described in Richard Kaufman's book, *Enhanced Sound for the Audiophile* (Tab Books, 1988), which I found at my local public library.

I have tried nearly all the amplified and unamplified indoor FM antennas available, and this simple, unamplified J-Pole antenna beats them all.

Ken Massey  
Indianapolis, Ind.

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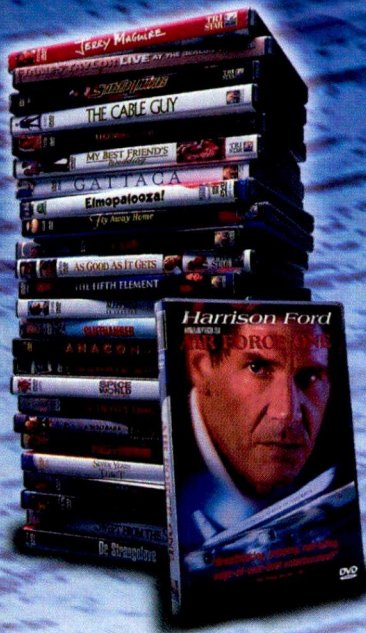
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## AUDIO CLINIC

JOSEPH GIOVANELLI

### Doubling Crossovers

**Q** My receiver has a subwoofer output with a crossover fixed at 90 Hz; my powered subwoofer has a crossover that's adjustable from 80 to 125 Hz. Which should I use? And what happens if I use them both?—Ben Shepherd, Fanwood, N.J.

**A** If you have a choice, the one in the subwoofer sounds like the better bet, because you can adjust it to get exactly the right transition between your sub and your satellites. However, you may not have a choice. Unless you're going to feed the sub from your receiver's speaker outputs (which bypass the receiver's crossover), you'll need a line-level output whose output varies with your volume control settings; you may also need that output to combine all your receiver's channels into one signal. Usually, only the subwoofer output fills the bill—and not all receivers can be set up to feed full-range signals to that output. So you'll use the receiver's crossover, willy-nilly.

If you use the subwoofer's crossover, too, the frequencies at the top of the sub's range will be rolled off faster. If both crossovers are at 90 Hz, their slopes will add; e.g., if one is at 6 dB/octave and the other is 12 dB/octave, you'll get an 18-dB/octave slope. If the two are set to different frequencies, the rolloff will start at one slope, then steepen when the second crossover kicks in. Stacking crossovers also increases phase shift, which may or may not cause audible problems.

In any case, no harm is done by trying. Experiment with one crossover and with both, and with different settings of your subwoofer's crossover-frequency, polarity, and level controls. The sound may be better with one crossover operating, or with both.

### “Digital-Ready” Inputs? Huh?

**Q** Lately, I've seen many receivers and other components with six “digital-ready” inputs for analog signals from DVD/decoder units. Are these regular, AUX preamp inputs that do nothing to the input signals

but allow you to adjust the volume level and adjust bass and treble? Or do they do something else?—Paul L. Hargitt, Jr., Indianapolis, Ind.

**A** The inputs you mention are probably labeled “Dolby Digital ready.” They are intended to accept the analog output from a Dolby Digital (AC-3) or DTS surround decoder, which can be a stand-alone unit or built into a DVD player.

You'll usually find this feature on components that have Dolby Pro Logic or other matrix decoders built in. It enables you to play decoded Dolby Digital signals through the same component that plays your stereo or matrix-surround signals, using just one master volume control for all sources.

### Euler Numbers and Speaker Cones

**Q** I have a book that mentions the “Euler number,” the ratio between rigidity and mass. I know that a loudspeaker cone needs low mass (for low inertia that enables it to accurately follow a signal) and rigidity (to avoid distortion caused by cone breakup). My book lists the Euler numbers for various materials: Wood, graphite, and some composites have very high Euler numbers; metals have the lowest, and plastics fall in between. Given this, why haven't I seen wood or composite speaker drivers? Some expensive loudspeakers even use metal for their cones.—Ernest Swallow, San Juan, P. R.

**A** As a former speaker manufacturer, I would be reluctant to make a cone from wood because it's hygroscopic. Adding varnish or other sealers to stop the cone from absorbing water would add mass, though it might also make the cone more rigid. It's not practical to make speaker cones from graphite, either. Many speak-

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](mailto: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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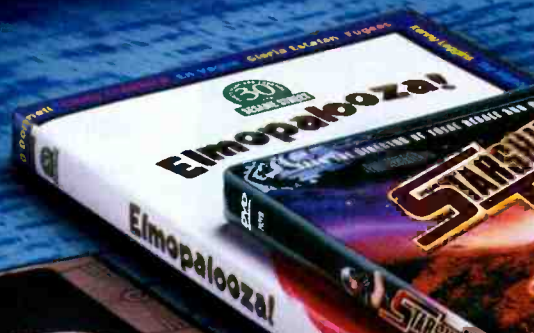
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ers do, however, have composite cones. Some composite cones incorporate carbon fiber, which I assume has an Euler number at least as high as graphite's; carbon fiber may become more widely used as its cost drops.

As you may gather from what I've said so far, the mass-rigidity ratio is not the only factor affecting driver-material selection. A driver designer must also take into account durability, ease of fabrication, cost, and the availability of adhesives that will stick to the material in question—to name just a few factors that come to mind.

### Distributing Satellite Music

**Q** Our new satellite dish delivers 31 channels of digital stereo music from DirecTV, which we would like to hear throughout the house. It's now fed by coax cable, along with the video, to the tuners in several VCRs. But we're also considering either feeding the audio signal from the satellite receiver's line output to a very low-powered FM transmitter (Ramsey kit FM-25, with 25-milliwatt output) on a vacant channel or wiring the house with stereo cable to distrib-

ute that signal to audio systems in each room. What are the pros and cons of each approach, especially as far as audio quality is concerned? What are the distance limitations on distributing line-level audio?—John K. Major, Tulsa, Okla.

**A** Your present arrangement, using VCRs, is a reasonably good one. If you do not get too much interference from the mixing of the picture with the audio, it should give you lower noise than using an FM transmitter would.

Assuming that the output impedance of the satellite receiver is 100 ohms or so, it is possible to distribute the music around your home via coaxial cable. Limit each cable run to about 50 feet, and use cable with the lowest possible capacitance per foot, even though well-shielded low-capacitance cable can be expensive.

I have seen some audio-distribution preamplifiers that feed a single signal source into a group of output stages, each feeding a single audio system. Such a preamp can be placed near the satellite receiver; with the short cable run needed for that hookup, cable capacitance will be so low that highs will

not be affected even if the output impedance of the satellite receiver is 1 kilohm or higher.

This arrangement has the further advantage that you won't have all of the cables paralleled across a single output, so it minimizes capacitance. Otherwise each cable's capacitance will add to that of the others. That will limit the length of cable you can use and the number of cables that can feed your various audio gear.

### Setting Multiple Volume Controls

**Q** I run the audio output of my stereo VCR through my TV to a stereo amp that feeds my speakers. This allows me to use the TV remote to adjust the volume and mute the audio. Will I get better sound from setting the TV's volume low and the amp's high, or vice versa?—Vic Lonning, Wichita, Kans.

**A** For maximum convenience (which I realize is not what you asked about), you're best off leaving the stereo amp's volume set wherever it works best for your other sources and making all your adjustments via the TV.



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For best sound, however, turn down the volume on the TV set and turn your receiver's volume up until you begin hearing background hiss. Then turn it down until this hiss disappears, and note the setting of that control so you can get back to it if it's ever changed. Now adjust the volume of the TV set to suit your listening preference.

### What Do You Do When a Speaker Maker Fails?

**Q** *One of my speakers has a dead tweeter. When I called the speaker's manufacturer about a replacement, I learned that its phone had been disconnected. Does this mean the company is out of existence? And if so, how can I get my tweeter replaced? I love these loudspeakers and hate to think I'll have to scrap them.—Larry Hemmerich, Dayton, Ohio*

**A** The company may be out of business, or it may simply have moved. If you can't locate the company and it made its own drivers, you're probably out of luck. But if the company bought these drivers from an outside manufacturer (as many companies do), you may still be able to get them—especially if your tweeters were off-the-shelf models.

Your first step will be to remove the tweeter; be very careful when doing this, as it may be glued in place, and you want to avoid splintering the cabinet's front panel.

If your tweeter has gone silent, try this test: Detach *one* of the wires going to the tweeter (making sure that wire does not drop back into the cabinet), and momentarily connect an AA battery across the tweeter's terminals. If you hear a click, your tweeter is working and the failure is really in the crossover capacitor or elsewhere in the crossover or wiring.

If that test produces no click, or if your problem was that the tweeter was distorting, you will need a replacement. Copy down any information printed on the tweeter's back. If you're really lucky, this will give you the driver's manufacturer and model number. In addition, note your speaker system's model number and, if you know it, the approximate date that it was manufactured.

I do not have a list of makers of OEM (original equipment manufacturer) drivers, but there are some companies who may have what you need. You might try


Madisound (608/831-3433) or Parts Express (800/338-0531). If they cannot help directly, ask if they know who can. You might also check out the replacement-driver checklist at [www.Madisound.com/replace/html](http://www.Madisound.com/replace/html).

If you find a replacement tweeter, be sure each wire from your crossover is connected to the same terminal on the new tweeter as it was on the old one. There is one additional pitfall to watch out for: Manufacturers change their drivers over time, and a tweeter that's touted as an exact replacement

might not be a perfect match. If so, its most likely difference will be greater sensitivity, which means your speaker will have excessive treble with the new tweeter in place. Should that happen, try putting an L-pad or T-pad between the crossover and the tweeter and using that to lower the tweeter's level until it blends in with the rest of the speaker system.

You might also consider placing an ad in our Classified section, asking if anyone has the part or will sell you a system that still has a working tweeter. **A**

one bell, one whistle,



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# WHAT'S NEW



## Sony Portable MiniDisc Player

At 3¼ x 3¼ inches, the tiny MZ-E35 is barely larger than a MiniDisc, and its 4-ounce weight ensures portability. A stick-style remote with LCD on the headphone cord shows song and disc titles and player functions. One AA battery

provides up to eight hours of playback time and powers the 40-second anti-shock memory buffer for virtually skip-free playback. Frequency response is specified at 20 Hz to 20 kHz, ±3 dB. Price: \$399.95. (Sony, 800/222-7669)



## Yamaha Home Theater System

Speakers, amps, and a surround decoder are packaged together in Yamaha's CinemaStation AV-S7. Built into the center-channel speaker is a surround processor with Dolby Pro Logic decoding, Yamaha's Cinema DSP, and three other hi-fi DSP modes. Surround modes and relative levels for each channel are controlled by a supplied remote. The compact subwoofer incorporates an 8-inch driver, a 40-watt bass amplifier with Yamaha's Active Servo Technology, and five 25-watt amplifiers to drive the other speakers. The center and four main/surround speakers are shielded; mounting bases are supplied for the main speakers, while wall mounts are provided for the surround speakers. Price: \$599. (Yamaha, 714/522-9105)

## PIONEER CD Changer

No larger than Pioneer's own 100-CD changers, the PD-F1007 holds 301 discs and features 10 custom filing modes, a 50-track best-selection memory, and CD titling to help you keep track of them all. A second 301-disc changer can be operated from the first unit's controls. The DAC is Pioneer's 1-bit Direct Linear Conversion processor. Price: \$349. (Pioneer, 800/746-6337)



## SOUND ALIGNMENT SYSTEMS LASER ALIGNMENT TOOL

Developed for exacting audiophiles and pro installers, the SA-S 770 has a built-in laser that enables pinpoint directional placement and leveling of stereo and home theater speakers. Set atop a speaker on its rotary base or affixed to the front baffle, the 770's laser is turned on and aimed at a listening seat or area. By watching the position of the laser dot and moving the speaker, the user can achieve optimum speaker placement. A variety of lenses and accessories are available. Prices: \$149.95; R2-D1 tabletop rotary base, \$129.95. (SA-S, c/o Checkpoint Laser Tools, 310/793-5500)



## Legacy Audio Integrated Amp

The Legacy Audio Impulse integrated amplifier is rated at 200 watts per channel into 8 ohms and 350 watts per channel into 4 ohms, both at less than 0.035% distortion. Listeners without subwoofers can trim bass output with

a low-frequency contour control, which appears on the remote together with a volume control and signal selector. The amp is available with black or silver faceplates. Price: \$3,150. (Legacy Audio, 217/544-3178)

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# WHAT'S NEW

## FOSTEX FLAT SPEAKER



Fostex's SH501F speaker, less than 1½ inches thick, is designed to hang on walls. The two-way speaker has a 5-inch bass-reflex woofer and a 1-inch dome tweeter; its rated

frequency range is 80 Hz to 20 kHz, and its nominal impedance is 4 ohms. The speaker is available only from Fostex directly. Price: \$399 per pair. (Fostex, 800/936-7839)

## MEADOWLARK AUDIO SPEAKER

Meadowlark Audio's Heron now comes in two versions. Both are time-coherent designs using dual 7-inch woofers with transmission-line bass loading, a 4-inch Audax midrange, and a ¾-inch Scan-Speak soft-dome tweeter. Rated sensitivity is 90.5 dB. Bass extension is given as -3 dB at 25 Hz. All crossover components are housed in an isolated

sub-chamber; the woofer circuit consists of one inductor, to provide a relatively nonreactive load for single-ended tube amps. Resilient materials decouple the front baffle from the cabinet and the drivers. Standard finishes are ebony, ash, rosewood, mahogany, and cherry. The speaker stands 44 inches high and weighs 93 pounds. The new Hotrod version uses upgraded Vifa woofers, premium crossover components and wiring, and silver solder. Prices: Heron, \$4,200 per pair; Hotrod Heron, \$5,000 per pair. (Meadowlark Audio, 760/598-3763)



## POLK AUDIO HOME THEATER SPEAKERS

The Polk RT5000 home theater system consists of two RT3000p main speakers with integrated active woofers, a CS1000p center speaker with powered woofers built in, and two f/x1000 surround speakers. Each RT3000p includes a mid/high module with two 6½-inch drivers and a 1-inch dome tweeter, resting atop a powered woofer module with two 8-inch drivers. The CS1000p

uses the same midrange and treble drivers as the RT3000p plus two 6½-inch woofers. The f/x1000s have a 6½-inch cone and a 1-inch dome on each of two baffles angled 45° apart; the driver arrays can be switched to bipolar or dipolar radiation. Prices: RT5000 system, \$6,000; RT3000p, \$3,600 per pair; CS1000p, \$1,200 each; f/x1000, \$1,200 per pair. (Polk Audio, 800/377-7655)

## WESTLAKE AUDIO CENTER-CHANNEL SPEAKER

Although designed as a center-channel speaker, the Lc265.1 can also be used—horizontally or vertically positioned—for main or surround speakers, according to Westlake Audio. A three-way

multiple listeners. Rated frequency response is 48 Hz to 18 kHz, ±3 dB, nominal impedance is 4 ohms, and the 42-pound speaker is 8½ inches high, 22 inches wide, and 25 inches deep. The system is



speaker, the Lc265.1 uses dual 6-inch ported woofers and a 5-inch midrange with coaxial 1-inch dome tweeter; the coaxial placement is said to broaden the dispersion to accommodate

magnetically shielded, and the cabinet is finished in a satin walnut veneer. A foam "speaker muff" is optional. Price: \$1,875 each. (Westlake Audio, 805/499-3686)

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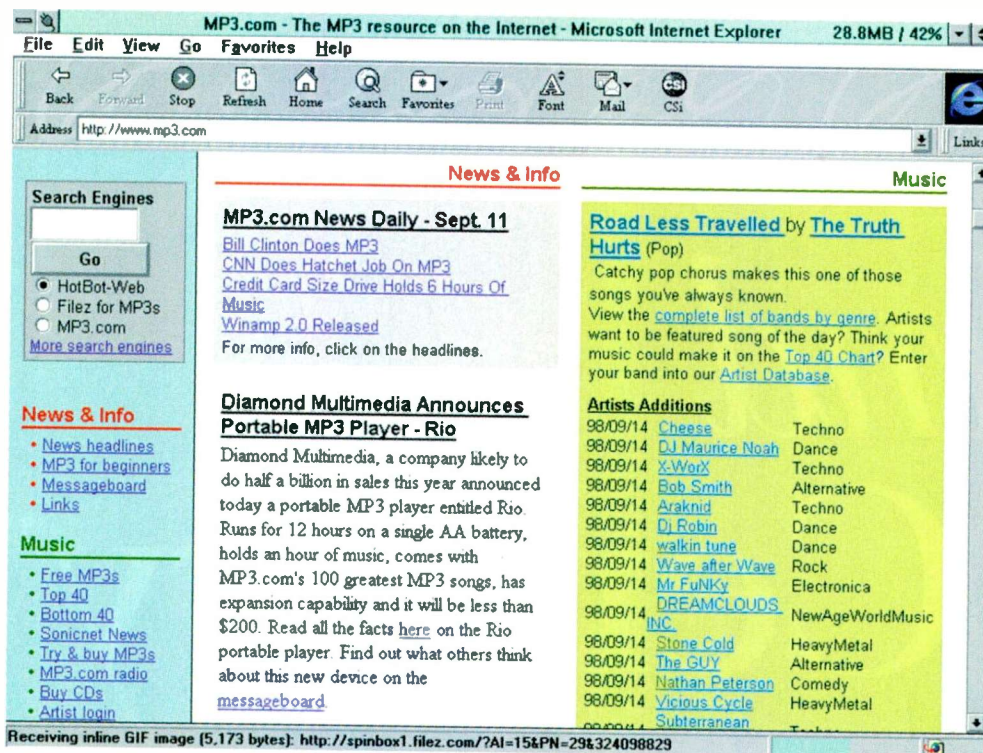
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# MP3: A NEW AUDIO POWER— BUT WHOSE?



Like some other compression systems (such as Sony's ATRAC, used in MiniDisc), MPEG audio and video call only for standard decoders, leaving the door open for encoder improvements—created, in MPEG's case, by software providers. Thus, while any decoder that conforms to the specs can play back MPEG audio and video, the quality of the MPEG encoders can vary. This creates competition among encoder vendors to deliver the highest quality sound.

The encoding schemes mentioned so far—MP3, AC-3, and ATRAC—are all “lossy” compression schemes, which throw some data away when compressing audio signals. But they base their data-discarding decisions on a psychoacoustical understanding of which sounds listeners are most and least able to hear. Sounds unlikely to be heard are removed permanently, drastically reducing the amount of data in the signal without, if all goes well, drastically affecting the quality of the sound. Uncompressed CD audio, for example, requires a data rate of more than 1,410 kilobits per second (kbps), whereas typical data rates for MPEG-2 audio range from as low as 32 to 256 kbps and beyond. Up to a point, at least, the higher the data rate, the better the audio quality is likely to be. Above 128 kbps, MP3's less complex sibling, MP2, is considered by some to sound better than MP3; at lower bit rates, MP3 is generally considered superior.

For news on MP3, many fans turn to MP3.com's Web site and that of MP3Car.

Typically, new audio technology is driven by manufacturers and marketers, not by consumers. But in digital audio, personal computers are shifting the balance of power. A consumer underground of techies and musicians is growing up around MP3 audio, which is mainly used now for music distribution via the Internet. Software for playing, re-

coding, and managing MP3 audio on computers is freely available and evolving with remarkable speed, and portable MP3 players are beginning to appear.

Just what is MP3? It's short for MPEG-2, Layer III, an audio compression standard developed by the Motion Picture Experts Group to provide hi-fi audio accompaniment for video in compact digital form. Digital satellite systems and DVD use MPEG encoding for their video, as will high-definition TV (HDTV), though Dolby Digital (AC-3) compression is the standard for DVD and HDTV sound.

**THE MP3 FORMAT HAS BECOME A DE FACTO STANDARD FOR EXCHANGING HI-FI AUDIO ON PCs.**

Since its initial development for video soundtracks, MPEG audio compression has taken on a life of its own, chiefly because of personal computers and the Internet. Compressing audio signals makes it possible to download them in far less time and store them in reasonably small amounts of memory and disk space. The most common MP3 en-



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I own a Personal Computer (1)  I own a PC with a CD-ROM (2)  I plan to buy a PC with a CD-ROM (3)

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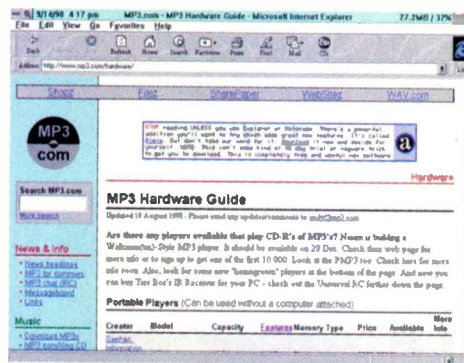
coding uses a data rate of 128 kbps, reducing the amount of audio data enough for a dozen CDs' worth of music to be stored on a single recordable CD (CD-R). Within the last year, the average home computer has gained enough processing horsepower to encode MP3 audio in reasonable amounts of time. Today's high-performance machines, such as the Power Mac G3, can even encode the computationally intensive MP3 format in real time.

With the easy availability of software that can encode and decode MP3 audio, the MP3 format has become a de facto standard for exchanging high-fidelity audio on personal computers. One recent survey revealed that MP3 files were among the files most often searched for on the Internet. Thousands of Web sites carry them, ranging from the offerings of struggling rock bands seeking exposure, through public-domain recordings, to recordings that infringe on copyrights (more on the copyright problem later). Similarly, music fans and music pirates alike distribute recordings on MP3-encoded CD-Rs.

For now, MP3 playback is far less convenient than playing regular audio CDs, as most MP3 users must play these recordings on their computers. Despite its growing popularity, MP3 has not yet been embraced by mainstream consumer audio manufacturers. However, some technically sophisticated consumers are creating MP3 hardware for their own use, and some small electronics companies do have products to offer. (*Editor's Note:* The EAD TheaterMaster and Meridian 861 processors reviewed in this issue can decode other common MPEG audio formats but not MP3.)

The popular [www.mp3.com/hardware](http://www.mp3.com/hardware) Web site lists a Saehan MPMAN portable player ([www.nordicdms.com/mpman](http://www.nordicdms.com/mpman)), available now, that downloads MP3 files from a computer's parallel port and stores them in up to 64 megabytes (MB) of flash RAM (a memory type that retains its contents even when its power is switched off). However, the MPMAN costs \$299 to \$499—definitely on the pricey side, considering that it holds only about an hour's worth of music at most and must be reconnected to a computer for fresh selections to be loaded. Diamond Multimedia, a major maker of computer peripherals, has just announced a similar portable, the Rio (\$199.95 plus \$50

per half hour's worth of flash RAM), which can be loaded from CD as well as from PC. At least two other portables are under development for playing back MP3 recordings



**MP3 ENABLES  
12 CDs' WORTH OF MUSIC  
TO BE STORED  
ON A SINGLE CD-R.**

per half hour's worth of flash RAM), which can be loaded from CD as well as from PC. At least two other portables are under development for playing back MP3 recordings on CD. Naiam ([www.naiam.com/](http://www.naiam.com/)) has announced a \$299 portable that can play CD-R discs. And the mp3.com site lists a forthcoming \$175 player, by an undisclosed company, that will play rewritable CDs (CD-RWs) as well as CD-Rs. Sonifex, a U.K.-based company ([www.sonifex.co.uk](http://www.sonifex.co.uk)), has a \$3,650 hand-held MP2 machine designed for professional field recording on compact, removable hard disks or flash-memory cards that plug into notebook computers' PCMCIA slots. The mp3.com site also lists player projects using computer hard drives and Zip disks. But until such hardware becomes available for purchase, it's up to inventive individuals to create their own. That's especially true for mobile music: The MP3Car site ([www.mp3car.com](http://www.mp3car.com)) carries information about music fans who have outfitted their cars with computers and home-built LCD displays that enable them to play back MP3 audio—though, so far, there are almost no commercial products.

But what about the music? It's legal to make MP3 copies for your own use of recordings you already own and to download music that's in the public domain or whose copyright owners permit it. However, many of the MP3 files on the Web are there illegally, whether posted by record pirates who do so for commercial gain or by

music lovers naively sharing favorite cuts without realizing that copyright is involved.

Record companies now routinely ferret out Web sites containing copyrighted material, but it's a never-ending task. The growing popularity of MP3 also makes it an increasingly viable distribution format for music piracy. For example, the Recording Industry Association of America (RIAA) was involved in a raid earlier this year on a Texas man who was selling a \$40 collection of 26 Beatles CDs on a single MP3-encoded CD-R.

The 1992 Audio Home Recording Act mandates the Serial Copy Management System, which limits the ability to make digital copies with consumer audio equipment. But MP3 sidesteps this requirement, because the encoding from CD into MP3 is done on personal computers, and those aren't subject to the law. To offset any loss of record-industry revenue caused by home recording, the Act also mandates that a percentage of the price of blank digital audio media, such as audio CD-Rs and Mini-Discs, be distributed to record companies and artists. However, there's no such revenue from MP3 copies that are just stored on users' hard disks.

As a result, MP3 has been vilified by many in the music industry as audio evil incarnate, to the point where musicians seeking exposure for their work via MP3 have been strongly discouraged by their record companies. However, the MP3 crackdown is mainly focused on those seeking to profit from piracy, and such larceny is entirely independent of whether CDs are copied in their original format or in MP3.

The popularity of MP3 is all the more impressive in view of the technical sophistication needed to find, download, and use the collection of software required to encode and play back MP3 audio. The format still has a ways to go before it becomes mainstream. But since it's freely available, it's the first audio technology to become popular before the large consumer electronics manufacturers exploit and market it. Now that audio is predominantly digital, personal computers have become testing grounds for new audio applications. If consumer audio manufacturers aren't careful, MP3 may well become the first audio standard to succeed before they notice it. *Stephan Somogyi*





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## GADGETS GALORE



**H**ad the alleged launch of Region 2 DVD not been an utter mess, this month's "Mondo Audio" would have been a progress report. I keep you informed on these matters so you'll know how the Third World lives and will appreciate life in America and stop bitching about how expensive everything is, when in fact you're paying less than \$2 for a gallon of gas and way less than \$60 for a pair of Levis. And because this month's column is being written

while the dust has yet to settle on terrorist targets in the Sudan and Afghanistan, those of you with any sense at all won't be getting on airplanes headed toward Yank-friendly countries for the foreseeable future, so your foreign news will have to be second-hand.

**THE REGION 2  
DVD FORMAT  
HAS BEEN CURSED  
WITH GLITCHES  
AND BLUNDERS.**

Tellingly, one wag described the so-called Spring 1998 Region 2 DVD Launch a "false start." Or, more precisely, one of many. What now seems to be the hoped-for cure is a big autumn rollout, starting with the Hi-Fi Show at London's Heathrow Airport for the high-end slant on DVD, followed within weeks by Live '98 (also in London) for the mass-market, no-brainer angle, then by TOP Audio in Milan, and at the annual bash in Athens for the continental thrust.

Suffice to say that the Region 2 DVD catalog is still tiny, the discs inconsistent, and the actual operation an afterthought. The format has been cursed with glitches and blunders, allied to a marketing push that in terms of quality, if not scale, makes the Edsel launch seem like that of Windows 95. You'd suffer apoplexy if you read how the mainstream press is handling it. Misinformation? It's been redefined and is now practiced to Olympic standards by newspapers and magazines throughout Great Britain. (Remember: The U.K. is known for promoting CDs as something onto which you could smear jam, inflict scratches, and dance the cha-cha yet still play perfectly.)

For example: Some cretin at Polygram, whose testicles should be dusted with powdered, pre-war nitrate film stock, okayed the release of *The Usual Suspects* in 4:3 format. I saw it in the U.S. at a friend's home in glorious Region 1 widescreen, so I don't wanna hear that "it won't fit on a DVD." What does this tell us?

That the moron assumed that DVD's first wave of buyers would be non-critical, non-videophiles? A mere phone call to any retailer could have told him that the first machines went to the same people who struggled with laserdisc because they love movies, who read all the film

Illustration: Francis Blake




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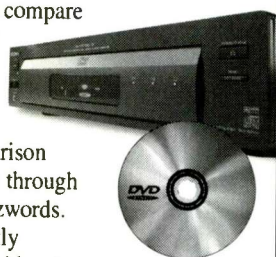
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## CRUTCHFIELD

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magazines, and who most assuredly loathe pan-and-scan. If this festering pile of feces were so intent on issuing *The Usual Suspects* in 4:3, why didn't someone point out to him that one of DVD's strengths is its ability to offer both formats on one disc? I'd brandish my Region 1 copy of *The Exorcist* in front of him to show how it's done, but it would probably be confiscated: *The Exorcist* was banned in the U.K. decades ago, as was *A Clockwork Orange*. But that's another story.

So, inspired by this bonehead's portrayal of home entertainment consumers as fools to whom anything can be sold, I chose to amuse myself this month by checking out what else is happening in The Real World, away from specialist magazines and knowledgeable retailers. I mean, if truncated/adulterated versions of recent cinematic smashes are good enough to feed to what British vendors call "the punters" (you know, the sort of yokels who get taken at three-card monte on street corners in major cities around the world), what else do they suffer while we wallow in kilowatt-megabuck sonic/visual ecstasy?

When it comes to buying gadgets, Americans can mail-order from Sharper Image and enjoy mall-based bliss from the likes of Brookstone. In the U.K., what fell out of my favorite car magazine was a catalog from Innovations, with the subtitle, "Tomorrow's Products Today." And while I admit to purchasing the odd mail-order notion—like a set of wooden slats that saved me the cost of replacing a sofa with a broken spring, a garlic peeler, and a vegetable drainer—I always stop short of succumbing to the lure of items I know I'd never use. You know the drill: "Painless Nose Hair Trimmer!" "Your Eyeglasses Will Never Slip Again!" "Incontinence? A Thing of the Past!" "80 Feet of Washing Line Indoors!"

What amazed me was the number of items costing more than the odd ten bucks. I had always thought of these mail-order catalogs as a replacement for that semi-lamented retail genre, the five-and-dime. Whither Woolworth's? Whither Kresge's? But Sharper Image proved that you could

get people to spend serious money through the mail, in a way linking the traditional catalogs of the sort produced by Sears & Roebuck or the specialized catalogs of the L.L. Bean ilk with what will forever change the way we shop: the Internet. The latter made mail order modern and even cool for a certain sad sort; Sharper Image stopped it from being dowdy. Every time I even consider buying something by mail that I could find in a store, I feel like John-Boy Walton. Sharper Image is, on the other hand, great for Boys' Toys.

But back to the Innovations catalog. Mixed in with the gadgets admittedly more credible than the stuff you used to see in comic books ("X-Ray Glasses! Amaze Your Friends!") are some mainstream products from recognizable brands and some genuinely useful items that you just wouldn't find down at the mall (e.g., my sofa-saver). What dazzled me, though, was the profusion of audio- and video-related notions, all marketed with just enough savvy to seduce the mainstream consumer, if not the audiophile.

Some of the offers are plainly practical, like a video rewinder/cleaner for \$48, which

I'D ALWAYS THOUGHT OF MAIL-ORDER CATALOGS AS A REPLACEMENT FOR THE OLD FIVE-AND-DIME.

looks like an oversized personal cassette player and promises to extend the life of your VCR by reducing wear and tear. Instead of rewinding your tapes in the player, take 'em out and rewind 'em in this handy machine.

Apparently, it cleans the tape, too, removing "harmful dust and oxidized deposits." And it reminded me how lucky I am not to live in the tropics, where every VCR user has to worry about mold.

Below the listing for the video rewinder/cleaner, there's an entry for a Bose micro system, Bose seeming to prefer mail order to any other form of retailing in the U.K. Other items hawked by Innovations include a "personal amplifier," which strikes me as an interim step before one admits to needing a hearing aid. It consists of a teensy, credit-card-sized module containing a condenser microphone and a set of in-the-ear headphones, and it's supposed to improve conditions for "anyone who has trouble hearing conversations, films, plays,

concerts, or the TV." Which begs the question: Is it needed when the source of the sound has its own volume control? I mean, why not just turn up the TV if there's no one else around?

While I'm almost tempted to purchase the "High Performance Mini Aerial for TV and FM" (approximately the size of a cellular phone and only \$25) or the "Mahogany Effect Video Library," I have to offer a Tip of the Kessler Yarmulke to what, on reflection, seems a covert method of

**A "PERSONAL AMPLIFIER" STRIKES ME AS BEING AN INTERIM STEP BEFORE ONE ADMITS TO NEEDING A HEARING AID.**

turning innocent civilians into audiophiles. Promoting vinyl in a mail-order catalog alongside the "Cordless Flashing Door Chime" and "The Ultimate Take-Anywhere Chair"? There's gotta be a hi-fi crazy working somewhere in the Innovations offices.

Bush is an electronics brand probably unknown to most Americans, but it once was the byword for radios, TVs, and the like in the U.K. Lo and behold, complete with a rave endorsement from *What Hi-Fi* magazine, Innovations offers the Bush Mini Turntable for only £59, or \$95. With the tag line, "Rich Vinyl Sound from Your Mini System," the blurb goes on to say that "many people have replaced their stereo with a space-saving mini-system, often based around a CD player or cassette deck; the Bush Mini Turntable—'Awarded Five Stars By *What Hi-Fi Magazine!*'—will add LP playback to your mini-system."

And whaddaya know? The copy includes this exact phrase: "Well, whatever the hi-fi manufacturers would have us believe, those precious vinyl recordings still sound great." The implications of this are (he said, thinking wishfully) that thousands of Innovations customers, which must outnumber hi-fi magazine readers by 10 to 1, will suddenly revolt against CD, go back to LPs, and all will be well in the U.K.

Because, Lord knows, they're certainly not being seduced by DVD. A

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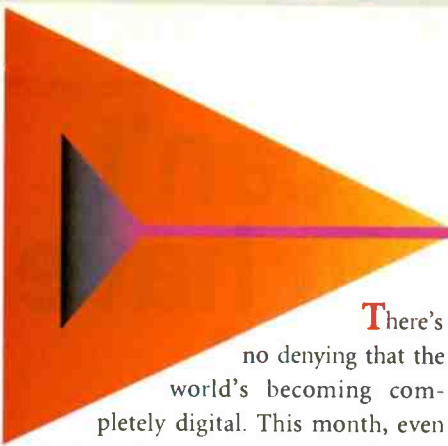
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**T**here's no denying that the world's becoming completely digital. This month, even television, the last major bastion of analog technology in home entertainment, will start talking the language of ones and zeroes.

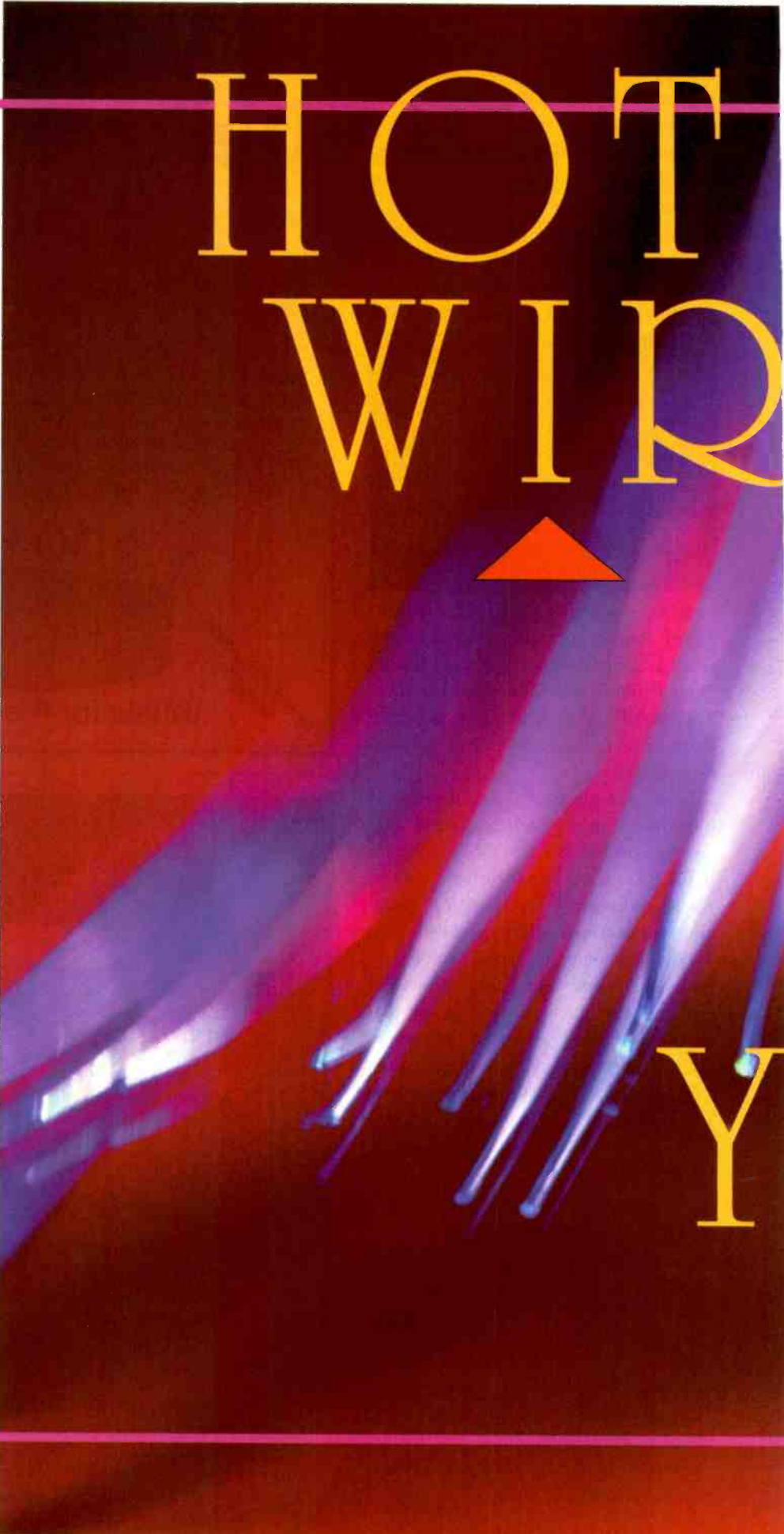
Although most of the attention has been on performance benefits, the transition from analog to digital also creates an opportunity to establish a new and better way of interconnecting system components—one that will both centralize and simplify control. Ideally, components should communicate with each other and the user in a way that makes their operation intuitive. For example, you should be able to make one command to your system to play a certain CD or watch a particular channel, rather than having to issue separate commands to each component involved in the process.

We are, in fact, on the verge of having just such capability. A new digital interface known as IEEE 1394 (called FireWire by Apple Computer) can provide the wide-bandwidth, multichannel serial connection needed for modern A/V components. Not only can it transport all the digital audio and video data around the system, but it can also establish a true peer-to-peer network among system components, eliminating the need for a central control computer.

#### **THE MOTHER OF INVENTION**

**T**here are two main reasons for wanting a new digital interface. First, no method

MARK BRIDGWATER IS VICE PRESIDENT OF DIGITAL HARMONY TECHNOLOGIES, A SEATTLE-BASED DEVELOPER OF IEEE-1394-BASED TECHNOLOGY. HE IS A MEMBER OF THE CONSUMER ELECTRONICS MANUFACTURERS ASSOCIATION AND THE AUDIO ENGINEERING SOCIETY.



# HOT WIRE



ING

OUR  
HI-FI



*by Mark Bridgwater*

currently exists for routing bandwidth-hogging digital video (which will become the norm over the next decade), and the existing S/P DIF (Sony/Philips digital interface) audio connection is inadequate for wide-bandwidth multichannel sources such as DVD-Audio. Second, current interconnection

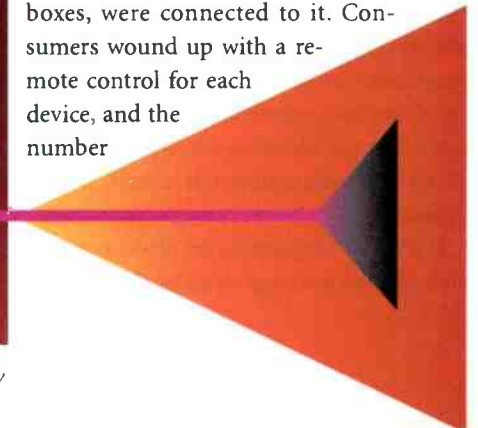
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HOW THE  
IEEE-1394  
DIGITAL  
INTERFACE  
WILL  
CHANGE  
YOUR LIFE

---

methods have evolved into a complex mess of unidirectional, single-purpose cables.

**I**t's easy to see how we got to this point. The TV was a stand-alone product for many years, until VCRs, and then cable boxes, were connected to it. Consumers wound up with a remote control for each device, and the number





# H O T - W I R I N G

of owner's manual pages and cable-company tech-support calls devoted just to hooking up these three components became a harbingering of the nightmare to come. Things were beginning to get out of hand.

Stereo audio connections were soon added to TVs and VCRs, raising the ante on hookup confusion again. Consumers who figured it out went on to what we've come to call home theater, raising connection and control complexity another order of magnitude. Meanwhile, the delivery media were increasingly becoming digital rather than analog.

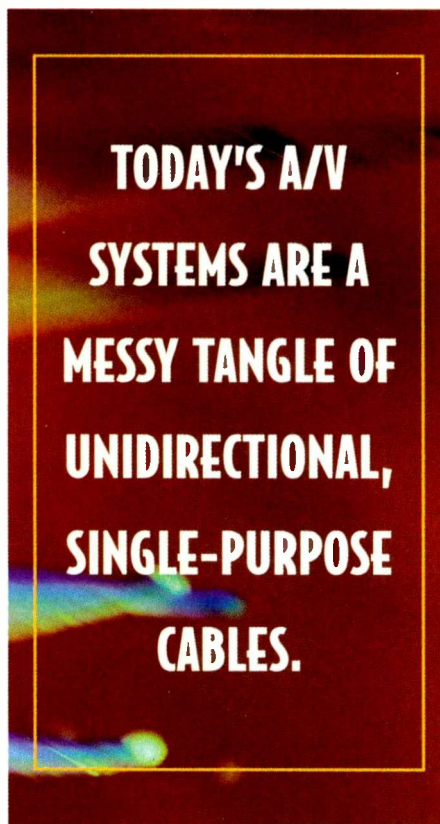
So it's time to design a true system, from the ground up—one that offers solutions to today's problems and new functionality not possible in the predominantly analog world of the past. Given the rapid pace of change, it should include some level of future-proofing. The solution also needs to be so compelling that people will be able to justify the cost of integrating this connectivity and control into their systems. And, finally, it is essential that consumers retain the widest choice when buying components, based on personal preferences and budget, yet be assured there will be no problems hooking up a variety of manufacturers' products.

## THE IEEE-1394 SOLUTION

The IEEE-1394 interface is an excellent starting point. This international standard establishes the basic data connection at the physical and link layer (that is, how components are connected and how data is transmitted electrically across that connection). Several standards-setting bodies are close to establishing common transaction and application criteria, and a consortium of manufacturers has agreed on a Home Audio Video Interoperability (HAVi) architecture—a paper specification rather than an actual implementation, but a start, nonetheless.

With that foundation in place, companies are now working on using the new in-

terface to create seamlessly connected systems of devices. Bidirectional transmission of real-time digital audio and video at rates of 400 megabits per second, together with the "handshake" nature of asynchronous command protocols, pose some serious engineering challenges. And, for the first time,



issues related to what goes on between the components of a system must be addressed, cutting across traditional competitive lines between manufacturers. Problems involved in connecting to such outside sources as the Internet or to nontraditional A/V products, such as personal computers, must also be solved. Consequently, the system architecture is beyond the ability of any one device or manufacturer to create. This is new ground for everybody.

Fortunately, "all digital" means "mostly software," introducing the possibility of creating solutions that can be upgraded and modified to keep pace with future needs: Traditional hardware modularity is being replaced by future-friendly software modu-

larity. This is a significant change that manufacturers have to understand when designing products that must behave correctly in a connected system.

It is also important not to misunderstand what has come to be called "convergence"; don't be misled into thinking it means "converging everything into one box." We've already seen many failed attempts to marry the PC and the TV—expensive mistakes that can be avoided with robust interconnectivity. The whole point of truly interconnected devices is that each box performs a specific function, yet collectively they provide all the needed functionality for the consumer. You merely command the system to perform a function and the components' intelligence enables them to communicate the necessary commands to each device to make it happen. How much switching goes on will be invisible to you, greatly simplifying your experience.

This goal raises some interesting questions regarding system architecture, however. Which device handles diagnostics, setup, and configuration? Manufacturers don't want to be tech-support calls, so can we embed this intelligence in each device? How do we create a neutral platform for a wide range of control devices that will accommodate the budgets and personal tastes of millions of consumers?

## WHERE WE STAND TODAY

We're closer than you probably think. Manufacturers are taking a more cooperative stance than ever before. This is evident in the issuance of the HAVi specification, which is supported by eight large consumer electronics manufacturers: Sony, Philips, Thomson, Toshiba, Sharp, Grundig, Hitachi, and Matsushita. Audio/video streaming standards, such as IEC 61883, are being expanded, and the efforts of the 1394 Trade Association are making actual device production feasible. The Copy Protection Technical Working Group (CPTWG) is nearing finalization of video copy-protection encryption that will make feasible digital video output from devices such as DVD



# YOUR HI-FI

players and digital set-top boxes. My company, Digital Harmony Technologies, is developing a system level specification and chip implementation that builds on all of the open standards, remains consistent with industry specifications such as HAVi, and provides manufacturers with a complete and independent chip solution to IEEE-1394 connectivity.

Some challenges do remain. Although the CPTWG has involved Hollywood attorneys from the beginning (to avoid the sort of delays created when the nearly complete DVD standard was presented to them), the encryption issue must be fully resolved before any copyrighted digital video content will be allowed on the 1394 bus. Also, the physical characteristics of the IEEE-1394 bus create jitter and node delays during data pass-through that can cause unacceptable synchronization problems, especially with multichannel audio. Again, various companies are developing solutions so that individual product manufacturers do not have to deal with these complex problems or create multiple, incompatible system implementations.

In the beginning, the IEEE-1394 interface was plagued with a 4.5-meter limitation on distance between nodes (connection points). This problem was addressed early on, however, and companies such as Sony and NEC have now originated long-distance solutions using CAT5 cabling and optical fiber. At Comdex 1997, Sony demonstrated a prototype 50-meter solution using CAT5 wire. And at the end of this year, NEC will begin selling its TermBoy 1394 Long Distance transceiver, enabling plastic optical-fiber connections over distances of up to 50 meters. Leviton Telcom is creating a wall-plate connector using the NEC technology and will use it to support links spanning up to a kilometer via glass optical fiber. Production will commence once the 1394b (long distance) specification is complete this year. Although the optical cables offer tremendous bandwidth, the hardware at each end will dictate how much data can be transmitted over a given distance.

Once digital components are available that incorporate a common, interoperable IEEE-1394 system bus, people will be able to assemble systems of truly compatible products, perhaps as early as the third quarter of next year. This should enable a single, intuitive graphical interface to operate the system as a whole, with no need for individual controls on each device and multiple remotes. At the same time, you should remain free to choose whichever manufacturers' products you want and be assured that you can take it out of the box, plug it in,

ucts and manufacturers. Multiple implementations, even of a basically well-defined standard like IEEE-1394, could open the door to potentially severe interoperability problems. Digital is unforgiving. Where in the analog world you might just get reduced performance, in the digital world you would more likely get nothing at all.

This is actually the situation that prevails among the handful of products now available with IEEE-1394 interfaces. The first use of IEEE-1394 has been in DV (digital video) camcorders, to provide a means of dumping large amounts of video data into a computer for editing. It is thus a limited-purpose application that uses IEEE-1394 strictly as a data pipe, disregarding its multiple audio, video, and control capabilities. Currently about forty 1394-equipped digital camcorder models are on the market, and there is little or no compatibility between brands. Plugging a Sony DV camcorder into a JVC D-VHS deck will produce nothing, because each manufacturer implements the standards differently. These variations grow exponentially as you create unique audio/video systems comprising many components. This is exactly the situation we want to—and have the opportunity to—avoid.

The solution is to create a consistent software layer within each individual system component that will serve as a sort of "translation gateway" to and from the 1394 bus. This will enable diverse components to communicate with one another, and with you, in a common language, regardless of how each component executes commands internally.

The urgency of the task is evident from the rate at which manufacturers are developing audio and video products that include 1394 capability. Yamaha, for instance, has incorporated its audio streaming technology, called mLAN, in a CD player and amplifier that were demonstrated at this year's Consumer Electronics Show. A large array of 1394-enabled products, from com-

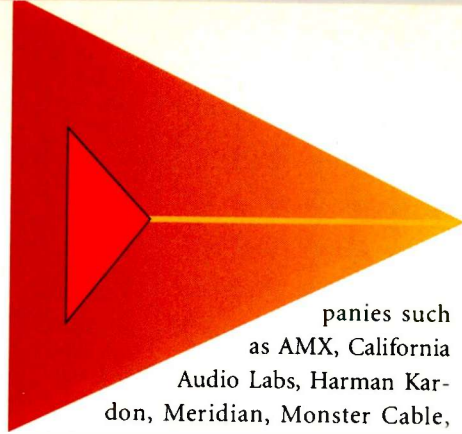


**MANUFACTURERS  
ARE LEARNING  
THAT NO  
SINGLE COMPANY  
CAN CREATE  
THE SYSTEM  
ARCHITECTURE.**

connect it to your system with one standard cable, and have it operate perfectly with your other components. You will not have to adapt to the new component in your system, because your system will do the adapting for you.

#### **PROBLEMS TO BE RESOLVED**

It is important, however, that a common implementation of the system standard be established and maintained across all prod-



panies such as AMX, California Audio Labs, Harman Kardon, Meridian, Monster Cable, Philips, and Sony, will be shown in the 1394 Pavilion that Digital Harmony will sponsor at the January 1999 CES. Another group of consumer electronics companies will have a similar display in the 1394 Trade Association's exhibit at Comdex this month. The OpenCable initiative, backed by this country's major cable TV operators, has dictated that digital set-top boxes must include an IEEE-1394 connection. These boxes will begin to show up next year, as digital broadcasts commence. Clearly, it's not a matter of "if," but "when."

Real 1394-enabled products will start hitting shelves late next year and should proliferate significantly the year after. Kohners In-Stat consulting group estimates that more than 150 million 1394-enabled consumer electronics and computer products will be sold in the year 2000 and more than 400 million the following year.

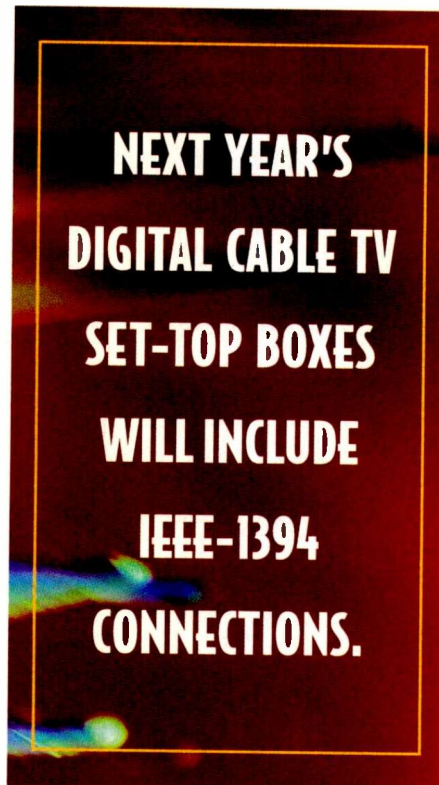
Although the low-level IEEE-1394 protocols—the only ones required for the most basic functionality—are well established, much of the middle level is still not completely defined, and the upper, or system-level, protocols are nonexistent. Again, if you're going to create a networked system, you have to have all of these pieces fully defined and in place. This gap is being closed with the issuance of the HAVi specification, which is an attempt at defining the middle level of the protocol stack. But even though it was created by eight large consumer electronics firms, it remains to be seen if a similar cooperative effort can be maintained when the paper spec starts being turned into hardware. No doubt, the long-running competitiveness among these companies will have to undergo an abrupt and unprecedented course change.

For instance, who will certify compatibility of finished products? Manufacturers loathe this type of testing, but they do not want to endure providing the level of technical support currently forced on computer

companies by product incompatibilities. And competing companies will be reluctant to allow anyone but a neutral, independent lab to police the standard.

### THE PAYOFF

Once all the standards are settled and all the devices are connected, then what? Well, like other technologies, IEEE-1394's sustainability will depend on a well-thought-out design. As we dissolve the complexity of today's entertainment systems, we need to integrate the new forms of entertainment appearing now and in the near future. While connections to the Internet have been attempted from the living room, the



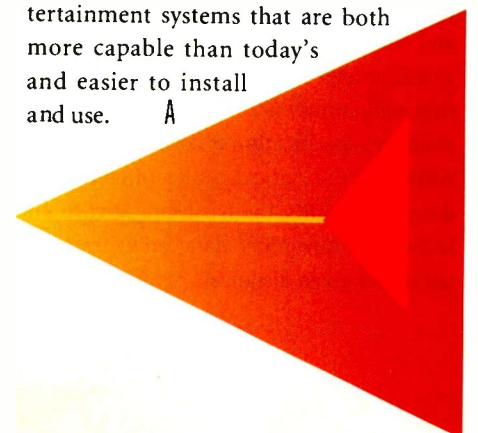
experience will be limited until this vast resource is truly integrated into our entertainment systems. It will have to be seamless and offer more than marginal value. Audio and video product designers need to throw away old paradigms in favor of using this seamless connectivity to create compelling combinations.

Specific examples would be tapping into music Web pages to learn about an artist, checking concert tour dates, or simply downloading the track information and cover art to a control program for a system's CD changer. For instance, Microsoft's Windows 98 Plus Pack already enables a

computer to locate Web-based CD track information when a new CD is played, without user intervention. Internet content could also augment just about any television broadcast, from sports to soap operas. PC games are already multiplayer-compatible and lend themselves well to a family viewing area with a larger screen and better sound. Audio/video product planners need to look beyond the traditional features that have differentiated products and find ways to assimilate the barrage of digital data aimed squarely at their customers' households.

The heart of these new integrated systems will be an intuitive graphical interface. Personal preference will dictate many variations of this single point of control, but the winning combinations will enable users to make commands to their systems based on what they want to do rather than on what steps the components in the system need to do to make it happen. The system architecture should also enable a method of updating this interface as new devices are added; consumers should not be stuck with controllers that cannot recognize new devices as the system grows. Clearly, this is not a trivial matter, and addressing it must be an integral part of a complete 1394-based system architecture. It is also important that the setup, configuration, and diagnostic functions made available by smart components be easily accessible through each system's control component. These system-level issues are the ones being addressed by Digital Harmony, to ensure there is a common platform and no repetition of the integration nightmares that plague current high-technology A/V systems.

We are indeed in the midst of a digital revolution, which for some could be a painful process of switching from the old to the new. But with the IEEE-1394 interface and intelligent design, it should be possible to minimize the discomfort of the transition while developing new digital home entertainment systems that are both more capable than today's and easier to install and use. A



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# DAVID *&* BECK

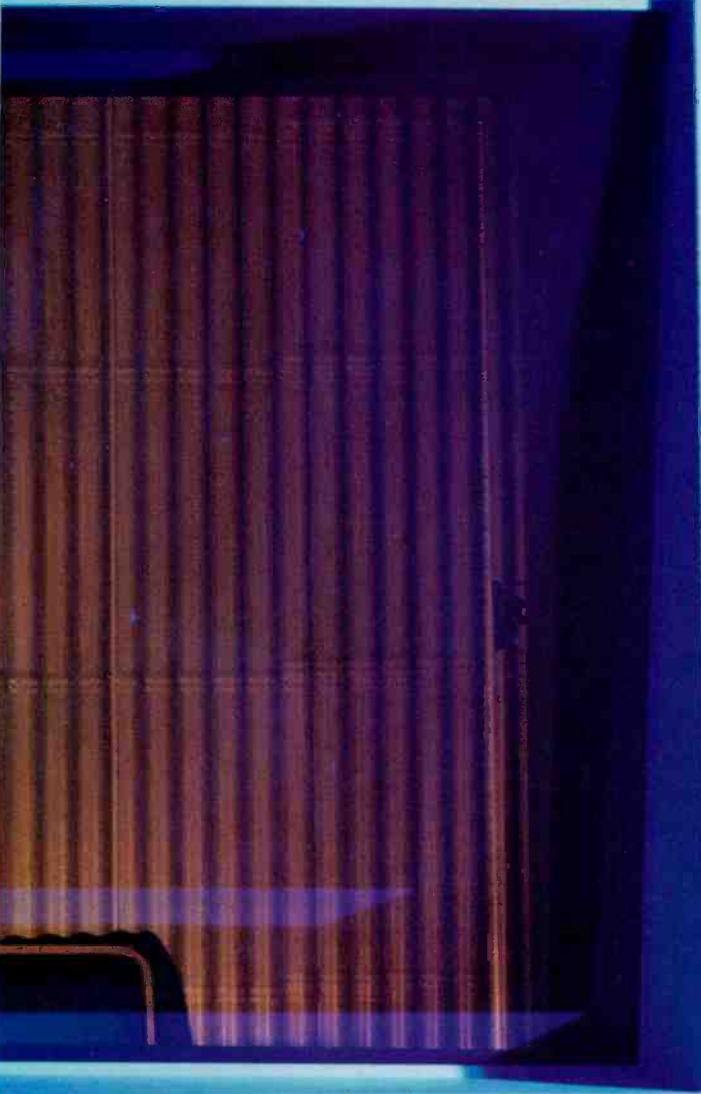


## *a* BRIDGE *to the*

PHOTOGRAPHY: ©1998, ROBERT LEWIS

by DAVID LANDER

## Y STAROBIN



If classical music lives on after the millennium, David and Becky Starobin will have to accept their share of the credit. Husband and wife, they constitute a formidable ensemble that is active on several fronts.

David Starobin, 47, is an acclaimed guitarist, known for his virtuosity, and a teacher who currently chairs the guitar department at the Manhattan School of Music. He's also a champion of new music who has already had some 250 pieces (solo, chamber, and concerto) written for him by composers as eminent as Elliott Carter, George Crumb, and Lukas Foss.

To propagate this music, the Starobins, who met when they were students at the Peabody Conservatory and married in 1975, operate Bridge, their own independent record label, which they founded in 1981.

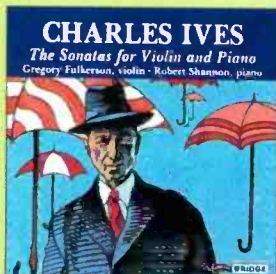
Becky Starobin, a violinist who previously taught at Manhattan's Third Street Music School and New York University, manages the company, whose releases continually win critical plaudits both here and abroad. Earlier this year, for example, the premiere recording of Crumb's "Quest,"—a delicate work for guitar, soprano saxophone, and percussion written at David's request—won a Cannes Classical Award as Best CD by a Living Composer.

In addition to spotlighting contemporary artists and compositions, the Starobins' record company is also a bridge to great performances of the past. In 1995, they signed a 20-year contract with the Library of Congress, which authorizes them to restore and issue recordings of concerts held in its Coolidge Auditorium. These performances, archived over the last six decades, include a wealth of material featuring the legendary Budapest String Quartet as well as other stellar artists, including violinist Nathan Milstein, soprano Leontyne Price, and pianist Leon Fleisher. None had previously been released. **D.L.**

21<sup>st</sup> CENTURY



There's  
always  
been good  
and bad  
music.  
Our job is  
to be art  
evaluators.



David, you feel that recordings are especially important for classical guitarists. Why?

D.S.: Recordings make it possible for people to hear what the player is doing. The kind of intimate expression we concentrate on in our practice rooms very often doesn't come across in a large concert hall. But through a pair of speakers, a guitar sounds as big as a piano, and you can hear expressivity that you can't hear in a live venue. I've gone to hear great guitarists play in very large halls, and I've gone away completely dumbfounded as to why anybody would pay money for the experience. But recordings have given the guitar a kind of presence. They've been able to focus listeners on the music so they're not straining just to hear the broad outline of the piece. In many concert venues, you don't really hear enough of the expressive detail. Recordings for guitar give a kind of microscopic view of what's going on.

**Is there a major issue you confront when recording the guitar?**

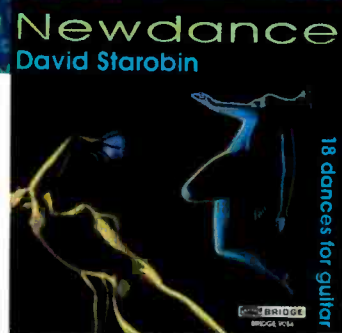
D.S.: The big performance issue since the guitar came into being as a six-string classical instrument, which was basically about 1800, is the attack. Do we play with nails? Do we play with flesh? That issue transfers to recording in a very profound way because the material that activates the string—be it flesh, nail, or quill—produces a very specific kind of sound. The microphones you choose and their placement relate to that. When I listen to the recorded sounds after I've played, that's what I'm judging. Am I hearing the instrument, or am I hearing what's making the sound? I want to hear the instrument. I don't want to hear my nails.

**Do you have a favorite kind of space for recording?**

D.S.: I think the guitar is an instrument that does best in an acoustical environment with a reverberation decay of two seconds or more. The instrument tends to really speak and sing in an environment like that.



Becky and David at the board of Master Sound Studio, and (right) his latest guitar recording, *Newdance*.



Small churches are a recording venue where I've gotten fine results. The problem there is the noise factor.

B.S.: Outside noise. Digital recording limited our ability to use those kinds of environments.

D.S.: That's my biggest complaint with digital recording. All of those wonderful churches—and there were a bunch of them in New York—that for years and years were used to make some of the most beautiful recordings became impossible to record in when the noise floor dropped. You heard everything: Mozart and the taxis.

**Do you have any particular feelings about digital recording?**

D.S.: My favorite records happen to be analog, but I think that has to do with the way music is played, not the recordings themselves. I guess most of my feelings about this have been brought on by our work with the Budapest String Quartet. As you know, for the last three or four years, we've been honored to be charged with going through all the recordings in the Library of

Congress's concert archive and choosing which ones to restore and release. We've now heard all of the Budapest's Beethoven and all of their Mozart. Aside from the fact that they were wonderful technically, their playing has a connection to some indefinable artistry of the past. I don't know what it is exactly. I don't know whether it's some kind of Old World empathy, a proximity in time to when some of the music was written, or a different kind of training. But there's something that separates the kind of music-making they engage in from most of what I've heard. I've tried to analyze it, but there's something I can't put my finger on.

**The Budapest was the quartet-in-residence at the Library of Congress from 1940 through 1962 and played nearly 500 concerts there. What are some of the identifiable things you're hearing when you listen to these performances?**

**D.S.:** The kind of blend the musicians achieved was so much more detailed. The way they breathed and phrased together. The interpretations they built had so much more in the way of pre-planned spontaneity. Now that seems like an oxymoron, but, in fact, if you listen to multiple performances, you hear they were working within certain parameters. There are obviously certain ideas they firmly believed in, certain tempi and phrasings that they had agreed on. There's an overall outline to the music-making that's firmly thought out and pre-established. And yet, from performance to performance, there's a kind of listening to each other, a kind of breathing with each other that makes for great spontaneity. We all try to do that now. It's not that we don't try to do it, but we've lost the technique. It's disappeared.

**Becky, as the bowed-string player, what do you think?**

**B.S.:** Sometimes I think it's the leader, Joe Roisman, his elegant but earthy quality. But that's too simple, because all of them play together with a focus and an intuitive interaction. I think it has something to do with an intangible love of each other's music-making that creates itself in different ways each time they play.

**At different times, Alexander Schneider, Jac Gorodetzky, and Edgar Ortenberg all played second violin with the quartet. When the second violinist changed, did it alter the ensemble playing?**

**B.S.:** Yes. Definitely. There's a very different way Roisman interacts. There's more of an aggressive tussle with Schneider and Roisman together and more re-

fined playing with Gorodetzky. With Ortenberg, Roisman was sometimes more expansive.

**What got the Library of Congress project started?**

**B.S.:** Before Jan DeGaetani died, she and her husband, oboist Philip West, talked with us about the idea of releasing concert performances, particularly, whenever possible, things she hadn't recorded commercially. [Bridge produced DeGaetani's last CD, a remarkably poignant recording made while she was suffering with leukemia, as well as several other discs showcasing her well-known mezzo-soprano voice.] Jan and Phil suggested a number of performances they both thought we should consider. That led us to a concert given at the Library of Congress in honor of Aaron Copland's 81st birthday. Jan sang, and Leo Smit played piano. Copland was there; he gave an intermission interview. We approached the library about releasing this, and they went along. I think they were extremely pleased with the final result, and I continued to talk to them about other possibilities. That was the genesis of the project. There were a number of companies trying to get the right to release the material. We were tremendously honored that they trusted us.

**Your contract with the Library of Congress runs for 20 years. Can you foresee the approximate number of releases that will result?**

**B.S.:** I don't foresee it now. I would say—and this is a rough guess—they'll represent just under half our output.

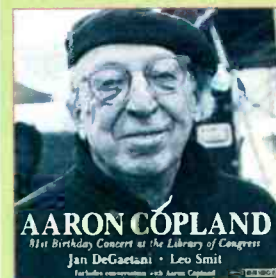
**The first title in your "Great Performances from the Library of Congress" series appeared in early 1996 and featured the Budapest, along with George Szell at the piano, playing Brahms and Schubert quintets. There are currently 10 volumes—a couple are multiple-CD sets—six of which feature the Budapest alone or with a fifth performer.**

**What Budapest String Quartet material will you be releasing next? And what else is forthcoming from the archive?**

**B.S.:** The middle quartets of Beethoven have all been chosen. They've been transferred from acetate, so they're very close. And I have my eye on some vocal releases. Set Svanholm is one I want to get

out. He was a Swedish heldentenor who performed quite often with Kirsten Flagstad.

**The Library of Congress began recording its concerts on acetates in the late '30s, and these were later transferred to tape. From 1950, the concerts were recorded directly onto tape. How good are these different recordings? Do they sound the way you expected?**



I am trying to show people that music can move in all sorts of directions.





The life of  
a musician  
is about  
seeking  
the highest  
level you  
can in  
every way.



**B.S.:** I don't think we had any idea what to expect when we started listening, so it was an adventure. And it varies. What we found, among other things, was that some of the engineers were just glorious about the way they placed microphones. At this point, there are certain periods we know to look for, because we're looking for these unknown engineers. They're anonymous in almost every case.

*If you have both an acetate and a tape transfer of a concert at your disposal, do you always work with the acetate?*

**D.S.:** So far. The engineers—Adam Abeshouse, who is chief engineer, and Silas Brown, his associate—and I have devised different strategies for dealing with different problems. And we get all sorts of problems: There's the standard tick problem, surface noise, and equalization problems.

**B.S.:** There's some ambient noise, but, in general, I would say that the audiences were extremely respectful of what they were hearing. You can hear flu season occasionally.

**D.S.:** In some cases, we opted to go the very expensive and incredibly time-consuming route of redrawing wave forms by hand for each tick or pop. With the Beethoven late quartets, two of the three discs were from acetates, and we did that kind of redrawing. There are approximately two hours of music on those discs, and Adam and Silas spent 150 hours redrawing on each one—300 hours redrawing waveforms—apart from other work, such as equalization. We've fallen in love with the Budapest, and we would feel guilty if we had done anything less.

**B.S.:** We feel that we owe it to them and the other performers.

*In addition to the Library of Congress restorations, the Bridge catalog includes more than 70 other titles. What are some of your personal favorites?*

**B.S.:** One of my favorites is "Fauré" [*The Complete Music for Cello and Piano* (Bridge 9038)] played by Steve Doane and Barry Snyder. They're players with tremendous heart and warmth. The French seem to recognize it, because they gave it an award, the Diapason D'Or. I'm proud of that, because the French are not known for giving performers of other nationalities awards for playing French music. Another is Charles Ives' violin sonatas [*The Sonatas for Violin*



*The Starobins accept the 1998 Cannes Classical Award for Best CD by a Living Composer for George Crumb's (center) "Quest."*

and Piano (Bridge 9024 A/B)] with Gregory Fulker-son and Robert Shannon, which I think shows those pieces in a wonderful and accessible way, with great virtuosity and connection of line. David loves *The Complete Music for Piano* [Bridge 9027 A/B] by Joaquin Rodrigo, which is a two-disc set.

**D.S.:** To this day, I think one of our most exciting releases is our second: Jan DeGaetani and Gilbert Kalish doing George Crumb's "Apparition" and a series of Ives songs [Bridge 9006]. I was amazed that they agreed to do this record for Bridge in 1982 when we had one LP out, which was a solo recording of mine. Those two great artists had faith in me as a producer. They were making records for Nonesuch in those years.

**B.S.:** I think they had faith in you as a musician.

**D.S.:** Well, they didn't have to do that, and they did. At that point, when they agreed to make that record, we looked at each other and said, "This is something we could do as a lifetime occupation." It involves people we admire and music we admire. That's what the life of a musician is about. It's about seeking the highest level that you can in every way.

**B.S.:** It's being able to share.

*You share in a lot of ways, not only with listeners but with contemporary composers, people who have chosen one of the most difficult career paths imaginable. You continually urge them to write pieces for guitar by offering them your own money or finding funding for them elsewhere. Then David performs the compositions—in concert and perhaps on a recording.*



*Commissioning is an extremely significant aspect of the work you both do. Say a bit about it.*

**D.S.:** I've always had an interest in contemporary music, and that naturally led to friendships with composers. Friendships with composers led to requests for pieces, and very often a composer would say, "I need some money to write a piece." So we would either scrounge up some money ourselves or we would apply to some organization that was giving grants. The pieces started being written right after I graduated from Peabody in 1974, and it hasn't stopped. That's a mission I gave myself. I said, "This is something that I have to do."

The instrument was somewhat narrow in its repertoire focus, especially 25 years ago when I began doing this. My own tastes were much broader. That meant finding people who were willing to indulge me and write for the instrument. I'm not averse to transcription. It's just that I looked around me, and there were all these incredible composers writing music for other instruments. The New York metropolitan area just happens to be the best pocket of compositional talent in the world. It reminds me of the way people remembered the Paris of the '20s.

*Much of the music you savor is by such avant-garde composers as Charles Ives, Elliott Carter, George Crumb, and others. Many listeners find these composers difficult, and you yourselves have agreed their work appeals to just a segment of the very small segment of people who listen to classical music. Are the others missing something? Is it yet another case of rejecting, because of unfamiliarity, music that will ultimately become part of the basic repertoire?*

**D.S.:** There's good music, and there's bad music—always has been. Our job is to be art evaluators, to look at music and say: "This, to us, is worthwhile. It's music we should support in any way we can." Essentially, there are certain received values that I believe have to do with the classical music continuum—hundreds of years of music. We judge our music based on this received history and what makes sense in context with the past.

*Unfortunately, as school music programs disappear, fewer and fewer people are learning that history.*

*They'll never have a context in which to place a piece of classical music.*

**D.S.:** American schools gave up the mission that was driven by a generation of European immigrants, who came to this country with music as an integral part of what they felt culture was about. The schools have removed the serious music programs in so many cases. When I play concerts now, it's as much about education as entertainment. If I'm playing contemporary music, I'll gear my programs to make people open their ears to different things, not shut down and become antagonistic because they're faced with something new that they can't immediately comprehend. That means playing shorter works. It means mixing styles more so you don't present huge chunks of unfamiliar language, which I did a lot of in the beginning. My concert programs have now taken on a completely different character. I'm trying to get across to people that music can move in all sorts of different directions, and if we can develop a



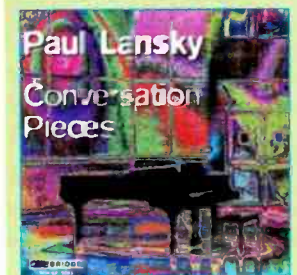
certain kind of freedom with our ears, we can go in many of those directions and really become excited by it.

*Should a record company perform the same function?*

**B.S.:** We hope that ours does.

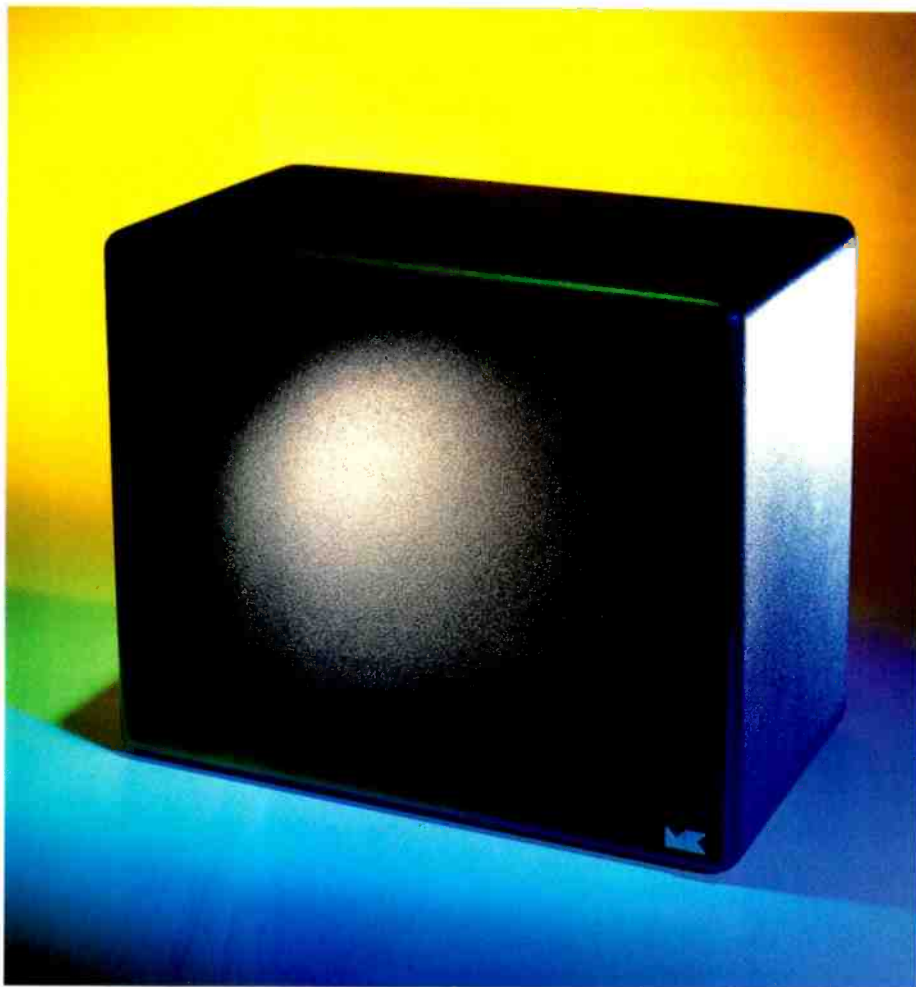


Classical music was an integral part of what European immigrants felt culture was about.



D. B. KEELE, JR.

## M&K MX-700 POWERED SUBWOOFER



**M**iller & Kreisel's (M&K's) MX-700 subwoofer has two identical drivers, one facing out of the sealed enclosure and the other facing in. They are connected in parallel, but the connections to one driver are reversed so that the output from its front will be in phase with the output from the rear of the other. That makes the M&K a push-pull design, a trait more commonly found in amplifiers than in speakers. Push-pull design minimizes even-order distortion components (e.g., the second, fourth, and sixth harmonics). Furthermore, using two drivers doubles efficiency

and raises acoustic output by 6 dB, quadrupling acoustic output power. However, it also cuts bass unless the box volume is doubled. And adding a second driver in parallel halves impedance, doubling the power draw from the amp. That may not sound like a gain in efficiency, but since the doubled power input is accompanied by quadrupled acoustic output, it is.

The MX-700's two long-excursion, 8-inch drivers are mounted to the bottom of the enclosure. M&K says in the owner's manual that the MX-700 will perform perfectly well sitting directly on the floor, its bass coupled to the room via a large slot in

the back of the cabinet. However, frequency response and the push-pull design's distortion reduction are best when the sub is raised an inch to an inch and a half above the floor by its reversible spiked feet. The cabinet has a small footprint, about 1½ square feet; its effective internal volume is only about two-thirds of a cubic foot. Because it is relatively small and its drivers are magnetically shielded, the MX-700 can be placed virtually anywhere, though it's designed to deliver its flattest frequency response and highest output when placed directly against a wall or in a corner. (Don't worry that the rear slot will be covered, because the amplifier's heat sink keeps the cabinet a good 2 inches from the wall.)

**THE M&K MX-700  
PERFORMED VERY WELL,  
ESPECIALLY ON ROCK AND  
JAZZ AND ON  
MOVIE SOUNDTRACKS.**

The built-in amplifier is rated at 200 watts, continuous—very continuous, according to M&K, which says it can deliver that power for at least 5 or 10 minutes. To prevent amplifier clipping and audible driver distress when the MX-700 is operated at high levels, the amplifier has what M&K calls an Active Headroom Maximizer. This equalized limiter/compressor circuit reduces the amp's drive when the input is high so that the subwoofer's maximum excursion and the amp's clipping point are not exceeded. Unlike conventional limiters, says M&K, the Active Headroom Maximizer has a variable threshold to preserve some signal dynamics even after limiting begins. The heart of the amplifier is a single IC

**Rated In-Room Frequency Response:**

20 to 200 Hz, ±2 dB.

**Dimensions:** 14½ in. H x 17½ in. W x 12⅞ in. D (36.8 cm x 44.5 cm x 30.8 cm).

**Weight:** 41 lbs. (18.6 kg).

**Price:** \$1,395.

**Company Address:** 10392 Jefferson Blvd., Culver City, Cal. 90232; 310/204-2854; [www.mksound.com](http://www.mksound.com).

Photos: Michael Groen

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module wired to a small circuit board and attached to a large heat sink on the MX-700's rear panel. The power supply is on the outside of the enclosure. A red LED glows whenever power is applied.

The MX-700's rear panel holds most of the controls you'd expect: knobs for bass level and low-pass filter frequency, switches to bypass the low-pass filter and to invert polarity. The bass level control is clearly calibrated from -6 to +9 dB in 3-dB steps; it is at its 0-dB ("Reference") position when pointing straight up. The frequency control for the low-pass filter has calibrations at 50, 60, 75, 100, and 125 Hz. There are, however, fewer jacks and terminals than you'll find on most subwoofers: only a pair of gold-plated RCA jacks for the line-level summing inputs. There are no speaker-level connections and no high-pass outputs for satellites. This, in conjunction with the filter bypass switch, makes sense, because the MX-700 is designed primarily for use with A/V receivers or preamps that have crossovers of their own.

#### Measurements

Figure 1 shows the MX-700's on-axis frequency response at each of the low-pass frequency control's calibrations and with the filter bypassed. (The SPLs are equivalent to 1-meter measurements taken in anechoic space, although the curves combine ground-plane and near-field measurements.) Changing the filter frequency changes output level somewhat, especially at the lower settings, but you can compensate by adjusting the 700's bass level control. With the filter bypassed, the sub's response rolls off gently to about 400 Hz and a bit more steeply above that point (my measurements stopped at 500 Hz). The filter calibrations are not strictly accurate, a bit high at the lowest two settings and a bit low at the rest, making the adjustment range narrower than the calibrations would suggest. The exact passband frequencies for each of the settings are listed in Table I.

Figure 2 shows harmonic distortion for levels (including room gain) from 70 dB SPL to the point where the MX-700's limiter cuts in. (This point varies with frequency, because the limiter is equalized and because it tracks the power supply.) The distortion percentages are the ratios between the power of the fundamental and

the first 10 harmonics—not precisely the same as total harmonic distortion, which would include the 11th and higher harmonics, but very close. At and above 40 Hz, the 700's high output (106 to 112 dB) and low distortion (8% or less) are quite impressive. Maximum output is attained at 63 Hz, where the distortion is only 2.7% at a loud 112 dB SPL. At 32 Hz and below, distortion is much higher, 16% to 25%, while maximum output falls (it's 98 dB SPL at 32 Hz and 90 dB SPL at 20 Hz).

The measurements in Fig. 2 were made with my microphone equidistant from the M&K's two drivers, to take advantage of the push-pull design's distortion-reducing effects. With the sound coming from the front of one woofer and the back of the other, the drivers' individual even-order distortion products tend to cancel when their outputs are combined, as they are when they reach our ears. But in close-up measurements, this cancellation occurs only if the mike is equidistant from both drivers.

The MX-700 sounded impressively loud at 40 Hz and above and quite loud down to 30 Hz, but it was quieter at lower frequencies. The limiter worked very well, keeping the woofers' excursions to about 0.55 inch, peak to peak, at which point distortion was audible but not too objectionable. At 30 Hz and below, the woofers' maximum excursions decreased, presumably because of amplifier power limitations. No dynamic offset was evident at any frequency or level. Maximum excursion occurred at 42 Hz, decreasing smoothly as frequency decreased so as to prevent overload by high-level infrasonic signals. When the M&K was energized with high-level sine waves, its cabinet was quite vibration-free.

Once the threshold of the limiter was reached, input

could be raised more than 20 dB without increasing distortion—and without raising output level much, of course. However, at 30 Hz and below, the subwoofer's distortion took a sudden jump once the input level rose 25 dB above the threshold, an extreme overload that should rarely occur in normal operation.

The MX-700's short-term peak sound output (Fig. 3) is constrained by the limiter.



**LIKE MANY AMPLIFIERS,  
THE MX-700 SUBWOOFER  
OPERATES IN PUSH-PULL  
TO REDUCE DISTORTION.**

(Above 32 Hz, a tone-burst test signal sounded quite clean and powerful, even at input levels above the limiting point.) With room gain, the maximum output at 20 Hz is 99 dB SPL, a just usable level at this frequency. Maximum output then rises fairly quickly, passing through 105 dB at 25 Hz and 110 dB at 40 Hz. Output is highest (113 dB) between 63 and 80 Hz, then decreases somewhat (to 108 dB) at 200 Hz.

#### Use and Listening Tests

The M&K MX-700's cabinet is a wide, thick slab instead of the usual cube. Its rounded edges and unbroken surfaces (ex-

**Table I**—Crossover passbands (-3 dB limits).

Filter Setting	Lower Limit	Upper Limit
50 Hz	36 Hz	66 Hz
60 Hz	36 Hz	67 Hz
75 Hz	38 Hz	77 Hz
100 Hz	39 Hz	86 Hz
125 Hz	40 Hz	112 Hz
Bypass	40 Hz	172 Hz

cept for the rear) give it a sleek look. It feels quite heavy for its size.

The owner's manual exhaustively covers every aspect of subwoofer use. There's even a detailed, three-page checklist for home theater setup that emphasizes Dolby Digital (AC-3) 5.1-channel applications. The MX-700 is designed to be placed against a wall or in a corner, and the manual recommends that the corner be the one nearest your lis-

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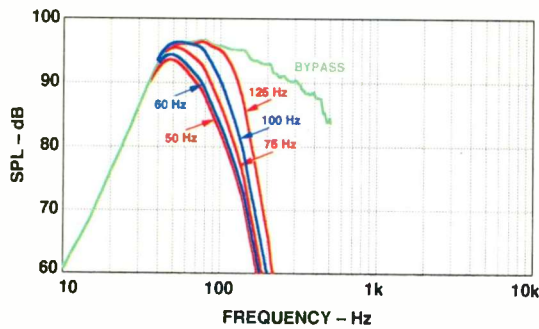


Fig. 1—Frequency response for all crossover settings.

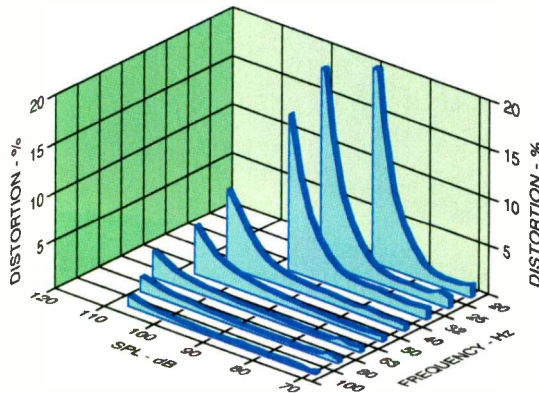


Fig. 2—Harmonic distortion vs. SPL and frequency.

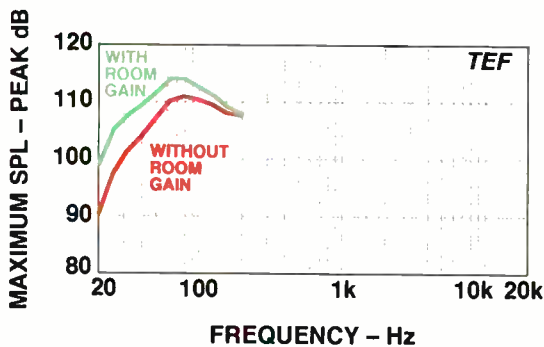


Fig. 3—Maximum peak sound output.

tening position that has no doors or open windows adjacent to it.

I set up the MX-700 in the right front corner of my home theater, near the video screen, which is where I often place subwoofers I'm reviewing. I used the Paradigm Reference Servo-15, a similarly priced but larger subwoofer (*Audio*, April 1998), for comparison. Both the MX-700 and the Servo-15 were driven through a line-level switcher from the Paradigm X-30 electronic crossover/controller, which was in turn

connected to a Pioneer VSX-99 A/V receiver's subwoofer output. My other speakers were KEFs: Reference Series 4s for the main speakers, a Model 200C in the center channel, and Model 2s for surround. For video, I used a Pioneer CLD-99 laserdisc player and a Pioneer PRO-98 rear-projection TV.

There wasn't enough room in my usual subwoofer corner to position the MX-700 upright, so I put it on its left side (with its bottom 1½ inches from the right wall and its rear panel facing the wall behind the TV), which also enabled it to fit nicely behind the right front KEF speaker. The Paradigm subwoofer was immediately to the left of the M&K, facing it diagonally. I was aware that this positioning would give a slight advantage to the MX-700 because its woofers were closer to the corner.

Figuring there was a low-pass filter in the receiver's subwoofer output (Pioneer's manual does not say), I initially set the MX-700 to "Bypass" but found that it had much too much upper bass. I then switched its crossover in and set it to about 100 Hz; this made it sound pretty much like the Servo-15, whose external crossover was set to 120 Hz.

I listened first to rock, country, and jazz, playing the music loud to properly exercise the subwoofers. I did most of my listening with Dolby Pro Logic processing turned on; the sound was very realistic, particularly the

recordings of live jazz and heavy-metal rock that had high bass levels.

Both subwoofers played loudly and cleanly. Up to the point where both of their limiter circuits were working, the M&K MX-700 was as loud and clean as the Paradigm Reference Servo-15. Beyond that point, it could play slightly louder than the Servo-15, although this might have been because of placement differences. (I could not verify that, as the Paradigm Reference sub would not fit behind the KEF speaker.)



**THE LIMITER IS DESIGNED TO REDUCE OVERLOAD DISTORTION WITHOUT SQUASHING SIGNAL DYNAMICS.**

On music having high levels of deep bass, the Servo-15 was the winner. On third-octave band-limited noise, the MX-700 matched the Servo-15 down to 40 Hz; below that, its usable output rolled off with frequency. At 32 Hz, the Servo-15 had a slight edge. At 25 Hz, the MX-700 still had some usable output, although it was distorted. At 20 Hz, the MX-700 generated audible distortion but no usable fundamental, while the Servo-15 was still loud enough to vibrate everything in the room. Despite its performance on the lowest-frequency noise bands, the MX-700 delivered extremely good bass from organist Jean Guillou's very demanding CD of Mussorgsky's *Pictures at an Exhibition* (Dorian Recordings DOR-90117).

On movie laserdiscs, I could not tell the difference between the M&K and Paradigm subs. With *Terminator 2: Judgment Day*, the sound was particularly good during the A-bomb sequence in chapter 1 and the future-war sequence just before the opening credits. And the MX-700 did not let me down on the rock soundtrack, special effects, and jet flyover sequences in *Top Gun*.

Overall, the M&K MX-700 was an excellent performer on a broad range of bass material. It proved to be particularly good on soundtracks and on pop, rock, jazz, and country music. Its shape and relative compactness made it much easier to position than larger, cube-shaped subwoofers. With a price tag of \$1,395, it's not the least expensive sub around, but its sleek looks, high performance, and convenient size demand that it be seriously considered for any bass application. **A**



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# BEL CANTO DESIGN SET 40 SINGLE-ENDED TUBE AMP



In recent years, there has been a resurgence of vacuum-tube power amps with single-ended output stages, commonly called SET (single-ended tube) amps. In these designs, the entire signal is handled by a single output tube—or several tubes in parallel—instead of being split between paired tubes or banks of tubes, as in push-pull amps. Technically, SET amps have higher distortion and lower efficiency, damping factor, and output power than push-pull amps, and their output transformers are more difficult to design. But, say proponents, there is something about the sound of SET amplifiers (with

speakers of suitable efficiency) that makes the music seem more palpable, present, and believable. The SET 40 amp is rather large and, at 70 pounds, heavy. Toward the rear of the chassis, behind the tubes, is a metal enclosure that houses the power and output transformers. This enclosure and the chassis are finished in an attractive charcoal-gray, fine-crinkle paint. Five stacked gold rings surround the large, type 845 output tubes, which are favorites of mine. Their thoriated-tungsten filaments glow a warm-your-heart yellow; the effect of this glow, viewed through the gold decorative rings, is stunning.

On the rear of the chassis are a pair of high-quality RCA input connectors, two pairs of all-metal, five-way speaker binding posts, a toggle switch for speaker imped-

ance selection, the line fuse and IEC power-cord connector, and a rocker switch for power on/off.

A large, thick, well-made circuit board, occupying most of the chassis interior, holds all the amp's components except the main power transformer and output transformers. Wiring is neat, and the construction is excellent. Many high-quality parts are in evidence, including Nichicon Muse electrolytic bypass capacitors, Solen polypropylene-film bypass capacitors, a pair of main coupling capacitors made for Bel Canto, metal-film resistors, and white ce-

ramic sockets (the best kind) for the 845 tubes. Tubes typically last about 1,000 hours in this amp, according to Bel Canto, which sells replacements for \$50 each.

Measurements

The SET 40's frequency response is shown in Fig. 1 for open-circuit, 4-, and 8-ohm loads and for the NHT simulated-speaker dummy load. (For this and all other tests, the rear-panel toggle switch was set for 8-ohm loads unless otherwise noted.) The response aberrations above the audio

**BEL CANTO'S SET 40  
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THAN MOST OTHER  
SINGLE-ENDED  
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**Rated Distortion:** Less than 0.1% at 1 watt out and 1 kHz, predominantly second harmonic.

**Rated S/N:** 96 dB, A-weighted, re 1 watt out.

**Rated Bandwidth:** 6 Hz to 35 kHz, +0, -3 dB.

**Dimensions:** 19½ in. W x 11 in. H x 15 in. D (49.6 cm x 28 cm x 38.1 cm).

**Weight:** 70 lbs. (31.8 kg).

**Price:** \$4,100.

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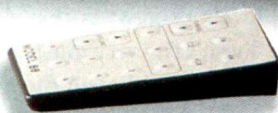
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## ASSOCIATED EQUIPMENT USED

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

**CD Equipment:** PS Audio Lambda Two Special and modified Sonic Frontiers SFT-1 CD transports, Sony CDP-X77ES CD and Panasonic DVD-A310 DVD players, 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 SCP-2C phono preamp

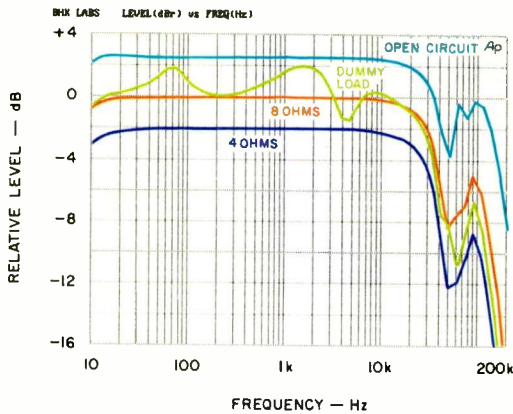
**Additional Signal Sources:** Nakamichi ST-7 FM tuner, Nakamichi 1000 cassette deck, and Technics 1500 open-reel recorder

**Preamplifiers:** Sonic Frontiers Line-3, Dynaco PAS-2, and First Sound Reference II passive

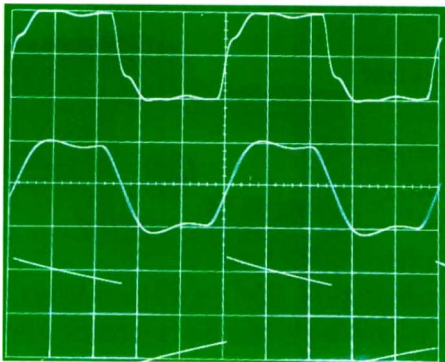
**Amplifiers:** Arnoux Seven-B stereo switching amplifier, Quicksilver Audio M135 mono tube amps, Audio Note Conqueror single-ended stereo tube amp, and Sumo Polaris stereo solid-state amp

**Loudspeakers:** B&W 801 Matrix Series 3s used alone and as subwoofers with Dunlavy Audio Labs SC-III speakers, and Lowther PM5A drivers in modified Lowther Club Medallion II cabinets

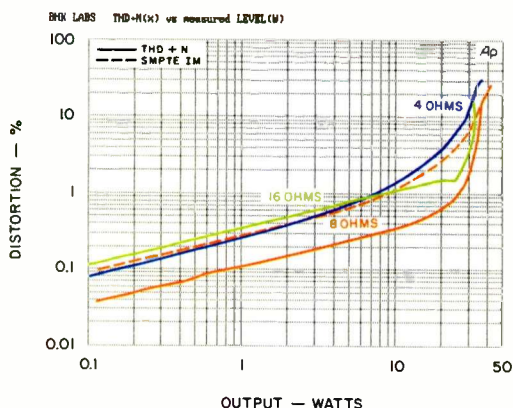
**Cables:** Digital interconnects, Illuminati DX-50 (AES/EBU balanced); analog interconnects, Tara Labs Master, Audio Note AN-Vx, and Music and Sound (unbalanced); speaker cables, Transparent Cable MusicWave Reference, Jena Labs Speakeasy Twin Three, and Madrigal Audio Laboratories HF2.5C



**Fig. 1—Frequency response as a function of loading with 8-ohm output setting.**



**Fig. 2—Square-wave response for 10 kHz into 8 ohms (top), 10 kHz into 8 ohms paralleled by 2  $\mu$ f (middle), and 40 Hz into 8 ohms (bottom).**



**Fig. 3—THD + N at 1 kHz and SMPTE-IM distortion vs. power output, with 8-ohm output setting.**

range are caused by the output transformers; it is notoriously difficult to make good ones for SET amps. From these curves, I deduced that the output impedance was

about 2.8 ohms, which could cause audible response aberrations, such as those seen in the curve for the dummy load, with many speakers. The high-frequency aberrations in the 8-ohm frequency response curve also affect the amplifier's square-wave performance (Fig. 2), causing the irregularities in the trace for a 10-kHz square wave into 8 ohms. The trace made with a 2-microfarad capacitor added to the load looks smoother, because the capacitor narrows the bandwidth, rolling off some upper frequencies. The 40-Hz trace has more tilt than you get from most modern push-pull tube amps, likely caused by the output transformers' low-frequency rolloff. Rise and fall times for an output of +5 volts into 8-ohm loads were about 11 microseconds.

A graph of distortion versus power output for various loads (Fig. 3) bears out my conjecture that the SET 40's rated power into 8 ohms is reached at 1 kHz with about 10% distortion. The output transformers' turns ratio and the load consequently reflected to the output tubes clearly make distortion lowest with loads that match the output impedance setting. Using 4- or 16-ohm loads on the 8-ohm tap does not appreciably change output power but does raise distortion. Overall, the Bel Canto's load tolerance is very good.

What's commendable about the curves for the SET 40's THD + N versus frequency at several power levels (Fig. 4) is that distortion doesn't rise very much at high frequencies, although there's a more noticeable distortion increase in the low bass. For further insight into the amp's distortion characteristics, I've plotted THD + N versus output for low bass frequencies (Fig. 5A) and for the treble range (Fig. 5B). In the bass, distortion decreases as frequency increases until, by 60 Hz, the curve begins to look like the 1-kHz mid-frequency curve in Fig. 5B. This increase in distortion near the frequency extremes means that

the available maximum power output at, say, 10% distortion decreases at very high or very low frequencies. Judging from Fig. 5, I would say the SET 40 is good for about 30 watts from 30 or 40 Hz to 10 kHz, which covers most of the essential audio range.

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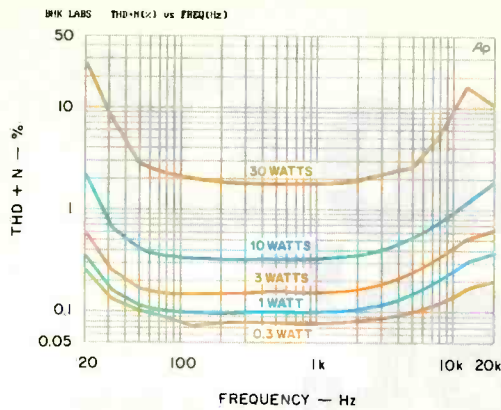
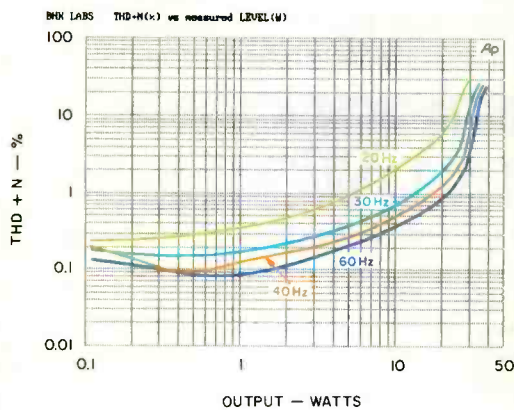
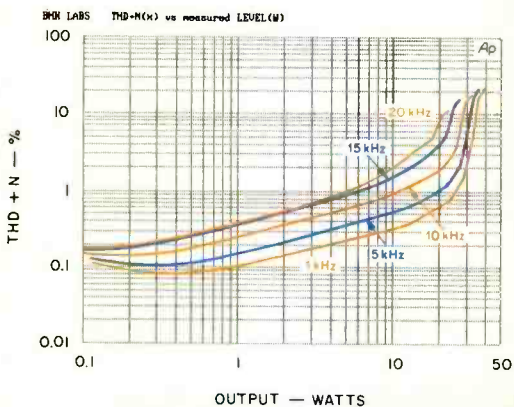


Fig. 4—THD + N vs. frequency.



A



B

Fig. 5—THD + N vs. power output for low (A) and high (B) frequencies.

The spectral characteristics of the Bel Canto amp's distortion are good. Analyzing the distortion residue of a 10-watt signal at 1 kHz (Fig. 6) reveals that the second and third harmonics are dominant and that the higher harmonics roll off quite rapidly. Both characteristics are common and desirable attributes of SET designs.

I was able to verify my deduction that the Bel Canto SET 40's output impedance was 2.8 ohms at the 8-ohm setting when I tested

A basic advantage of SET circuitry is its simplicity. The signal circuitry of Bel Canto's SET 40, for example, consists simply of an input stage driving an output stage.

The SET 40's input stage has two 12AX7 dual-triode tubes in an unusual arrangement; its designer, John Stronczer, describes this circuit as a shunt-regulated, push-pull cathode follower, though it also resembles a mu follower. The input signal goes to the first tube's two cathodes, which are tied together (as are its two grids). A bypassed cathode resistor, tied to ground, provides self-biasing.

One plate of this first dual-triode tube is directly connected to both of the second tube's grids and is tied to one of its cathodes through a cathode-bias resistor. The other cathode is also biased via a resistor, but from the first tube's remaining plate (The second tube's plates are connected to a 600-volt supply.) Output is taken from this other cathode and is RC-coupled to the type 845 output tube's grid via a pair of custom-made, 0.16-microfarad coupling capacitors and 400-kilohm grid resistor. If you don't count the intervening grid resistor, the output is taken from the first tube via the cathode of the half that does not drive the second

tube's grids; this makes the circuit a sort of paralleled mu follower.

The 845 output tube is operated as a Class-A stage with cathode bias. Cathode bias (another name for self-bias) enables the use of higher grid resistances, such as the 400-kilohm grid resistor employed here. This provides a super-easy load for the input stage to drive, up to the point where current begins to flow in the output tube's grid, at levels of about 30 watts or more per channel.

A directly heated tube such as the 845 doesn't have a cathode per se, so a point in the filament supply is used as the cathode connection. A floating 10-volt DC supply provides the required 3 amperes of filament current. That's 30 watts for the filament power for each output tube! An arrangement of several resistors and bypass capacitors forms the equivalent of a capacitor-bypassed, self-biasing cathode resistor. One end of the output transformer's primary winding is connected to the plate of the 845; the other end goes to a 1,200-volt supply. The operating point for the tube is right at its maximum plate dissipation of 100 watts, with a plate current of 100 milliamperes and a plate-to-filament voltage slightly in excess of 1,000 volts. One of the great advantages

of the amp's damping factor. It was about 2.8 over most of the frequency range, falling to about 2.3 at 10 Hz and 2.4 at 20 kHz. With the 4-ohm output setting, damping dropped slightly to about 2.6 at middle frequencies, with a similar falloff at the frequency extremes. Note, however, that the output impedance at this setting is about 1.5 ohms, so a speaker's impedance variations will cause less voltage variation with this setting than it would if the 8-ohm setting were used.

Another respect in which the SET 40 performs best in the midrange is interchannel crosstalk (Fig. 7), which virtually nulls out at some midrange frequency. This is unusual.

The Bel Canto amp's output at the beginning of an IHF tone burst (full amplitude for 20 milliseconds followed by a 480-millisecond period with the level 20 dB

lower) was about  $\pm 24$  volts. This yields a dynamic power figure of about 36 watts, or  $-0.12$  dB relative to the amp's 37-watt power rating. At the end of the burst, the output diminished to about 22 peak volts on the sine wave's positive half-cycle, whereas the negative half-cycle held up at about 23.5 peak volts. The 22-volt output at the end of the burst is equivalent to about 30 watts; when I checked the SET 40's steady-state clipping behavior on an oscilloscope, the positive half-cycle clipped first, at about 30 watts output. This yielded a clipping headroom of  $-0.91$  dB.

Output in the left channel was 1.19 millivolts wideband, 1.16 millivolts from 22 Hz to 22 kHz, 69.9 microvolts from 400 Hz to 22 kHz, and 167.6 microvolts with A-weighting. For the right channel, these readings were, respectively, 1 millivolt, 0.91 millivolt, 59.2 microvolts, and 146 microvolts. Voltage gain with the 8-ohm output

## HIGHLIGHTS

of the 845 tube is that it can be run for many thousands of hours at maximum plate dissipation. Normally, the theoretical efficiency of a single-ended output stage operating in Class A1 (no grid current flowing at the peak of the signal swing) is 25% of the standing plate dissipation. This would be about 25 watts under the operating conditions in the SET 40. As detailed in the "Measurements" section of this review, the amp produces a little more than this (about 30 watts per channel) because the input stage can deliver a little grid current on the positive-going signal peaks.

There are secondary taps on the output transformer to match 4- and 8-ohm loads. A switch on the back panel selects which tap is connected to the hot (positive) output binding post. The low (negative) output post is connected to the low side of the output transformer's secondary. There is no overall feedback loop in the SET 40. In fact, the only feedback in the whole amplifier is in the cathode-follower action of the input stage's second tube.

The high-voltage power supply starts out with a full-wave rectifier bridge feeding a capacitor-input filter. The capacitor is made up of three 220-microfarad, 450-

volt units in series, each paralleled by a 270-kilohm resistor to ensure that all three capacitors share the voltage equally. Next in each channel comes a series filter choke, followed by an output filter capacitor that is identical to the input-capacitor stack. The 1,200-volt supply for each channel's output stage is taken from that channel's output filter capacitor. Each of these supplies also feeds a regulator circuit; this circuit consists of several power resistors in series feeding three 200-volt Zener diodes in series to produce 600-volt regulated supplies for each channel's input stage.

Separate secondary windings on the power transformer feed filament supplies for each channel's 845 output tube. Each of these supplies consists of a full-wave bridge rectifier and two 22,000-microfarad, 16-volt filter capacitors separated by a 0.2-ohm series filter resistor. Two more secondary windings feed full-wave rectifiers and capacitor-input filters for the input tubes' heaters. The supply that feeds the second input tubes is biased up to 300 volts by a divider connected to the 600-volt supplies, to keep these tubes' heater-to-cathode-voltages within proper limits. All in all, this is a very interesting (but simple) circuit. *B.H.K.*

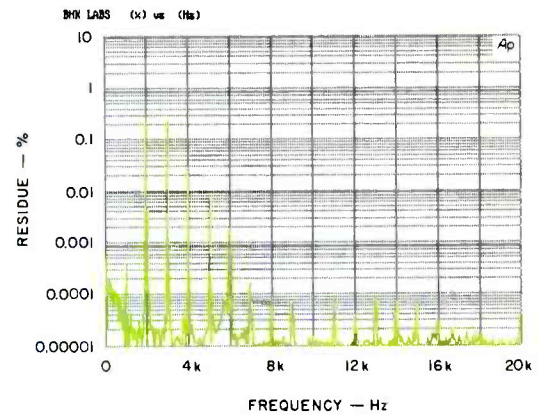
setting and 8-ohm loads was 21.15 dB in the left channel and 20.62 dB in the right. This corresponds to IHF sensitivity figures of 277.8 and 263.4 millivolts, respectively, for 1-watt output into 8 ohms. The SET 40's current draw from the AC line was about 4.4 amperes at idle and remained essentially constant over most of its power output range.

### Use and Listening Tests

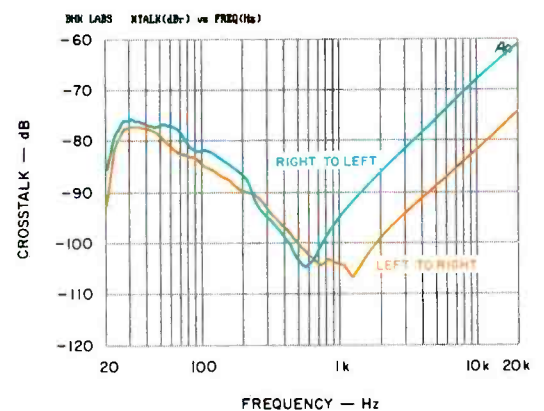
I first used the Bel Canto SET 40 to feed a pair of B&W 801 Matrix Series 3 speakers. It sounded pretty good, driving the B&Ws to quite satisfactory levels on most of the music I played. When I checked with a 'scope across the outputs of the SET 40 to make sure it wasn't clipping, the output voltages I observed corresponded to about 25 or 30 watts at the loudest levels. I used the B&W speakers with the amp at several points during my listening sessions, and the combination sounded quite good.

After I measured the amplifier, I paired it up with Dunlavy SC-III speakers, augmenting their bass below 50 Hz by using the 801s as subwoofers placed against the back wall and behind the main speakers. (The electronic crossover I designed and built for this has a special input circuit that can be driven from the output of the main system amplifier so that the low bass will take on the qualities of that amplifier.)

John Stronczer, the Bel Canto amp's designer, told me the SET 40 should first be broken in a bit and would then sound better. Well, the SET 40 must have broken in nicely—it sounded terrific on the SC-IIIs. Detail, space, dimension, resolution, and tonal honesty were of high order. The bass was very good—reasonably tight and powerful and not at all "tubey" or loose-sounding. The amp drove the SC-IIIs (whose rated sensitivity is 91 dB SPL) to higher levels than I cared to hear on most material.



**Fig. 6—Harmonic-distortion residue for a 1-kHz signal at an output of 10 watts into 8 ohms.**



**Fig. 7—Interchannel crosstalk.**

It was therefore no surprise that the SET 40 worked extremely well with Lowther speakers, which have even higher sensitivity (102 dB SPL). When I played CDs on a Panasonic DVD-A310, connected to the SET 40 via a First Sound passive preamp, I got some of the best sound I've yet heard from the Lowthers. With my ear right at these sensitive speakers, I could just detect some hum from the amp.

I have only two minor complaints about the SET 40. First, I think the metal enclosure behind the tubes gets too hot. Second, when the amp is warming up, there are sometimes a few snaps and pops in its output, which is mildly disconcerting when you're using high-sensitivity speakers.

All in all, however, I think the SET 40 is an excellent-sounding amplifier, and its price is especially reasonable for an amp built in the United States. I heartily recommend giving one a listen. *A*

EDWARD J. FOSTER

# EAD THEATERMASTER ENCORE AND OVATION A/V PREAMPS

**W**hen I first tested an EAD TheaterMaster preamp (*Audio*, March 1996), I called it "one of the most remarkable... audio products to have entered my lab, my listening room, or my viewing room... [and] one of the most user-unfriendly." Since then, Enlightened Audio Designs (EAD) has gone back to the drawing board, and the new TheaterMasters are as remarkable as their predecessor, can be used by mere mortals, and cost less. Even the current \$6,495 Signature version is about \$500 less than the model I tested two years ago, and the Encore and Ovation versions I recently tested are priced at \$2,995 and \$4,495, respectively.

The TheaterMasters are software-driven, so they can be updated by swapping EPROMs (electronically programmable read-only memories) that contain their program instructions. Their modular construction also enables them to be upgraded after purchase. This usually involves returning your TheaterMaster to EAD, but I was able to upgrade an Encore to an Ovation myself (which I do not recommend doing).

All current EAD TheaterMasters understand Dolby Digital (AC-3) and DTS 5.1-channel bit streams, automatically identifying and decoding each. They can also decode MPEG-1 digital audio (used on Video CDs) and MPEG-2 (which may be used on European DVDs) and can extract matrix surround

signals from them. You must, however, designate a specific input to use for MPEG (EAD also suggests doing this for DTS), using an internal DIP switch for permanent



assignments or temporarily assigning these inputs by means of external controls.

Encore and Ovation TheaterMasters have six digital audio inputs (four coaxial, one Toslink, and one ST glass optical) and three analog inputs (the Signature version has six); analog signals are digitized immediately and processed digitally thereafter. Since some components have only

Toslink outputs and ST sources are comparatively rare, EAD's input lineup could restrict your choice of digital program sources. The Encore and Ovation also han-

dle six video sources, three composite-video and three S-video. Neither model switches component video, which is rather a shame, considering the high-end home theaters these preamp/processors will be used in. My review sample's RCA jacks were all gold-plated, well insulated, and of superior quality.

The TheaterMasters' audio and video inputs are independent, so you can, for example, set your system up to associate digital audio input "D1" with the "S1" S-video input for your DVD player, the "A1" analog

audio input with the "C1" composite-video input for your VCR, and so on.

If you need more video inputs, EAD offers SwitchMaster, a professional-grade, 150-MHz video switcher that mates with any TheaterMaster (and is required with the Signature). Although it doesn't have component-video connections, the current

**EAD HAS MADE  
ITS THEATERMASTERS  
BETTER, CHEAPER,  
AND EASIER TO USE.**

**Dimensions:** 17 in. W x 4 in. H x 11 in.

D (43.2 cm x 10.2 cm x 27.9 cm).

**Weight:** 20 lbs. (9.1 kg).

**Prices:** Encore version, \$2,995; Ovation version, \$4,495.

**Company Address:** 402 North B St.,  
Fairfield, Iowa 52556; 515/472-4312;  
www.eadcorp.com.

Photos: Michael Groen

version provides six composite- and six S-video inputs. A two-line digital comb filter separates colors, enabling the SwitchMaster to provide S-video output from a composite-video input. This filter is said to minimize such NTSC cross-color artifacts as hanging dots and dot crawl without loss of picture detail. The SwitchMaster also features a circuit that is said to enhance vertical detail.

For bass management, fourth-order (24-dB/octave) digital crossover filters are provided by one of the TheaterMaster's two Zoran high-speed digital signal processors. (The other Zoran chip handles Dolby Digital, MPEG-2, and Dolby Pro Logic decoding, among other things.) The processor

**MODULAR CONSTRUCTION  
AND SOFTWARE IN EPROM  
MAKE THEATERMASTERS  
UPDATABLE  
AND UPGRADABLE.**

gives this setup unusual flexibility: You can route bass to the subwoofer (or to the left and right front speakers, if no subwoofer is used), with the option of removing the corresponding signals from the source channel. As the owner's manual points out, stripping bass from speakers that can handle low-bass power (even if they can't reproduce the low bass frequencies) is a mixed bag, since the crossover introduces phase shifts that could affect imaging. In EAD's view, it's often better to leave bass energy in the main channels (even while routing it to the subwoofer) if you can adjust the high-pass filter's crossover frequency to match the main speakers' natural rolloff. (Just be careful not to end up with too much bass when following this advice!) Thankfully, the crossover point can be adjusted in 10 steps, from 50 to 250 Hz, although all active crossovers use the same frequency (that is, you can't set different crossover points for different channels).

All this hardly exhausts the goody list. Every TheaterMaster also features EAD's CINEQ five-channel cinema equalization, "to tame overly bright soundtracks and musical recordings." Unlike Home THX's re-equalization and timbre-matching, the

MEASURED DATA				
HIGH-PASS CROSSOVER FREQUENCY				
	ENCORE		OVATION	
Nominal	-3 dB	-6 dB	-3 dB	-6 dB
50 Hz	69 Hz	60 Hz	50 Hz	44 Hz
65 Hz	89 Hz	78 Hz	65 Hz	56 Hz
80 Hz	110 Hz	96 Hz	80 Hz	70 Hz
90 Hz	124 Hz	108 Hz	90 Hz	78 Hz
100 Hz	137 Hz	120 Hz	100 Hz	87 Hz
110 Hz	151 Hz	132 Hz	110 Hz	96 Hz
125 Hz	172 Hz	150 Hz	125 Hz	109 Hz
150 Hz	206 Hz	180 Hz	150 Hz	131 Hz
200 Hz	275 Hz	240 Hz	200 Hz	174 Hz
250 Hz	344 Hz	300 Hz	250 Hz	218 Hz

LOW-PASS CROSSOVER FREQUENCY				
	ENCORE		OVATION	
Nominal	-3 dB	-6 dB	-3 dB	-6 dB
50 Hz	69 Hz	79 Hz	50 Hz	57 Hz
65 Hz	89 Hz	102 Hz	65 Hz	74 Hz
80 Hz	110 Hz	126 Hz	80 Hz	92 Hz
90 Hz	124 Hz	142 Hz	90 Hz	103 Hz
100 Hz	137 Hz	158 Hz	100 Hz	115 Hz
110 Hz	151 Hz	173 Hz	110 Hz	126 Hz
125 Hz	172 Hz	197 Hz	125 Hz	143 Hz
150 Hz	206 Hz	236 Hz	150 Hz	172 Hz
200 Hz	275 Hz	315 Hz	200 Hz	230 Hz
250 Hz	344 Hz	394 Hz	250 Hz	287 Hz

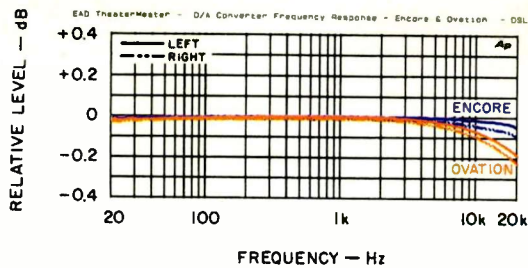
CINEQ contour is applied identically to all five channels. TheaterMasters also feature "Auto Setup," a software-driven procedure that automatically balances speaker levels, checks relative speaker placement, and adjusts individual channel delays.

The cryptic status LEDs that I complained about in the original TheaterMaster have been replaced by an electroluminescent liquid-crystal display (LCD) with intuitive legends that are large enough to see. (This is important, as TheaterMasters do not generate on-screen displays. However, a \$500 ScreenMaster accessory box, not yet available, will add on-screen display and additional connections for recording.)

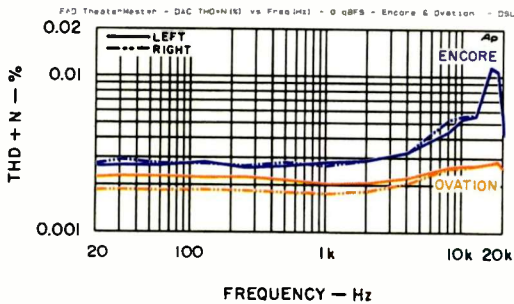
TheaterMasters can be controlled through an RS-232 interface for integration into advanced home automation and home theater systems. We plebeians, however, will usually operate them from EAD's new remote control, a sophisticated LCD touch-screen device that has eight different screen "pages" (quite a change from the original

TheaterMaster's rudimentary remote). The new remote operates the SwitchMaster as well as the TheaterMaster, is programmable for up to six different sources and multiple 10-step macros, and is the only control for the TheaterMaster (and, I presume, the SwitchMaster).

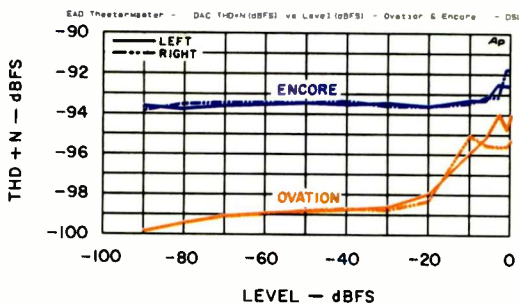
Two of the remote's "pages" are for setting up and operating the TheaterMaster. The other six (nominally designated "DSS," "CD," "LD," "VCR," "TV," and "DVD") each operate a signal source and are programmed in the normal learning-remote fashion by copying commands from each component's own remote. Bringing up any of these pages remaps the remote's display screen with control "buttons" for the device you picked. Touching a selection pad continuously for 2 seconds toggles between simple and full sets of device controls. For example, the simpler CD screen page does not offer the programming and track-selection keys of the full version—just play, stop, pause, skip, and scan. You can also delete specific controls from the page.



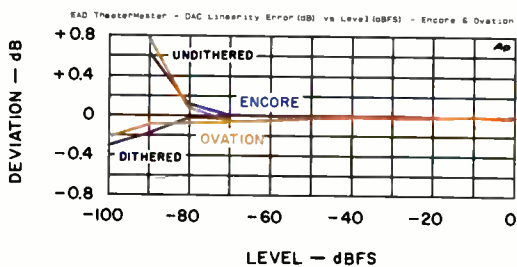
**Fig. 1—Frequency response, D/A converter section.**



**Fig. 2—THD + N vs. frequency, D/A converter.**



**Fig. 3—THD + N vs. level, D/A converter.**



**Fig. 4—Linearity error.**

The main TheaterMaster page contains the usual processor controls: volume, source selection, mode (surround, matrix, mono, and stereo), CINEQ, “LateNight,” muting, raising or lowering your projection screen (there’s a 12-volt output to activate its mo-

tor), and the like. Another page handles such setup tasks as speaker-size selection, crossover adjustment, “Auto Setup,” and “Auto Delay.” (You can manually adjust speaker levels and channel delays if you don’t trust “Auto Setup” or just want to do a little tweaking.) If you disable the surround speakers, the TheaterMaster shifts to Dolby 3 Stereo mode, folding surround information into the front channels. If you disable the center-channel speaker, you have “phantom” operation and the center info is rerouted to the left and right front speakers.

The remote is strictly an input device. To see what the TheaterMaster is doing, you must look at its front-panel LCD. For bass management, it indicates whether bass is being removed from a channel and whether that channel’s bass is being routed to the subwoofer (or to the main speakers if the subwoofer is defeated). In other modes, the display shows the distance (in meters) equivalent to the delay times in use, which analog channels’  $-6$  dB input attenuators are set, the crossover frequency, and even internal temperature. The audio/video links and labels can also be displayed.

Another display mode presents output levels for each channel in bar-graph form, from  $-90$  to  $0$  dB in seventeen  $6$ -dB steps. It can show absolute levels, unaffected by your volume setting, or relative levels as set by the volume controls. According to EAD, this bar graph is a calibrated VU meter.

Yet another display mode shows operating conditions, including volume setting in decibels, whether CINEQ is engaged, and which audio and video inputs are active.

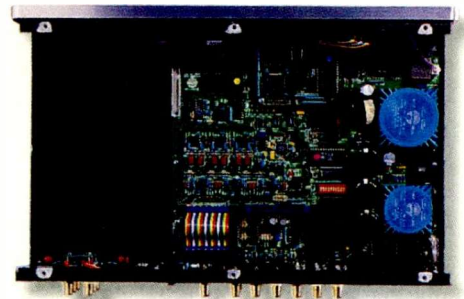
A flowerlike arrangement at the far left of the TheaterMaster’s display shows, by the number and disposition of its six petals, which operating mode (stereo, Dolby Pro Logic, 5.1-channel, etc.) is in use, while the flower’s center shows if the subwoofer channel is active. It’s a neat pictorial display of what’s going on, easily seen from across the room and useful

for checking whether your DVD player is delivering a true 5.1-channel soundtrack.

All this applies to the “entry-level” Encore. What do you get if you plunk down another \$1,500 for the Ovation? The changes relate more to performance than features, though the Ovation adds HDCD decoding and balanced outputs for the left and right front channels.

HDCD, however, presumes the use of full-range stereo speakers. Thus, the Ovation prevents you from rolling off the main channels’ bass in stereo and matrix modes and from using CINEQ. But you can override these prohibitions (with an internal DIP switch that can be poked from outside) if you don’t have full-range main speakers or if you want CINEQ to tame overbright soundtracks when you’re playing movies in stereo.

The Ovation’s balanced outputs function as such only when the surround channels are not used, i.e., in stereo operation, because the



**UPGRADING FROM ENCORE TO OVATION GETS YOU HDCD, BALANCED OUTPUTS, AND IMPROVED PERFORMANCE.**

surround-channel DACs are used to drive the inverted output of the balanced line. In theory, using separate DACs to drive the two halves of the line improves signal-to-noise ratio and dynamic range by 3 dB. It’s another example of EAD preferring to accomplish whatever it can in the digital domain.

The Ovation adjusts volume in  $0.2$ -dB steps instead of the Encore’s  $1$ -dB increments. And instead of the Encore’s multi-channel, one-bit Crystal Semiconductor DACs, the Ovation has six Burr-Brown PCM1702 20-bit ladder DACs.



# “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.



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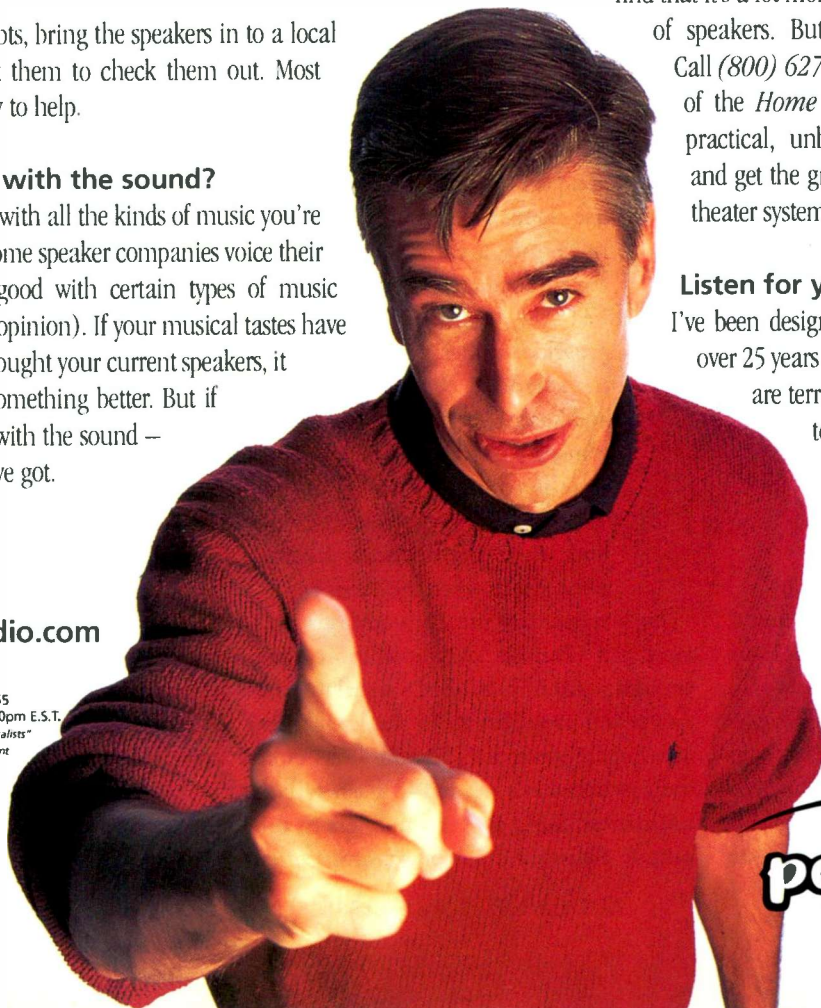
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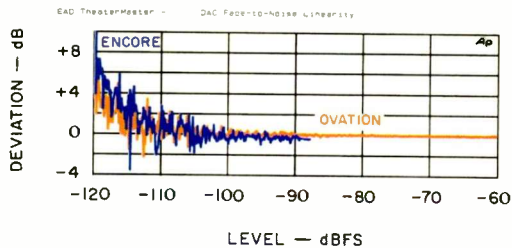


Fig. 5—Fade-to-noise test.

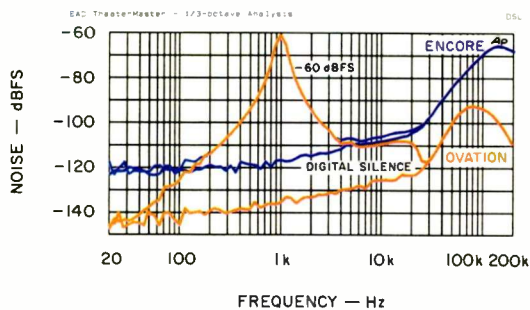


Fig. 6—Noise analysis, D/A converter.

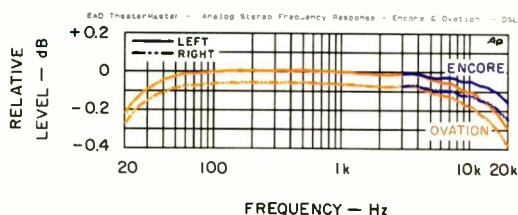


Fig. 7—Frequency response, analog stereo input and output.

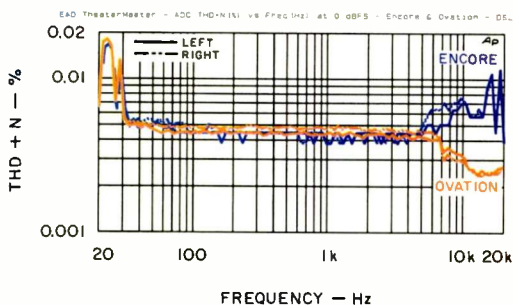


Fig. 8—THD + N vs. frequency, A/D converter section.

The Ovation also features EAD's Digital Flywheel relocking circuit and AccuLinear analog circuitry. The Digital Flywheel, a dual-time-constant phase-locked loop, uses two voltage-controlled crystal oscillators to reduce high-frequency jitter by "up to a thousandfold," according to EAD. AccuLinear circuitry, which incorporates "discrete

components within a single chip wafer to provide greater speed and accuracy than either discrete or conventional integrated designs can provide," is also said to reduce "transient distortion. . . a principal cause of harshness, glare, and stridency commonly associated with CD sound." Got that?

### Measurements

I started my lab tests by spending a week taking data on the Encore, including performance of its D/A and A/D converters, PCM-stereo output, analog input and output, and Dolby Pro Logic and AC-3 decoders. The Ovation upgrade mainly involves the DACs, reconstruction filters, and output stage, so I had expected to redo just the D/A and PCM-stereo measurements. However, because the upgrade also involves new EPROMs for the CPU and one of the Zoran DSP chips, I said to hell with it, might as well do the whole thing over!

To save space, I've presented test results of both the Encore and the Ovation in "Measured Data" and combined graphs where possible. I made all Ovation main-channel measurements via the balanced outputs on the assumption that if you paid extra for them, you would use them. I did this even though these outputs are not truly balanced under certain conditions, i.e., the negative terminal is grounded rather than driven when the surround channels are active and need their DACs. The change is transparent to the user; EAD's software is configured to deliver the same level from the balanced outputs when the surround channels are in use as when they aren't.

Both versions of the TheaterMaster, Encore and Ovation, delivered more than enough signal from a 0-dBFS signal to drive any power amplifier to its full capability. The Encore's output (4.09 volts) was more than twice what's needed to push typical unbalanced-input power amplifiers to full output. Balanced-input power amps often

require additional drive, and the Ovation's 7.5-volt output more than sufficed. Stereo output levels matched within the limits of experimental error. Output impedance was low on both models, and there was more than adequate current to drive long interconnecting cables.

Figure 1 compares frequency response of the two models' D/A converters in stereo mode, using a 16-bit PCM source. No filter ripple is evident in any of the curves, but the very sensitive vertical scale that I used reveals that the Ovation's response rolls off



a bit more at the high end than the Encore's. I suspect this is not caused by any difference between the Crystal and Burr-Brown DACs but by the digital filters that precede them. I've found response drops similar to the Ovation's in every component I've measured that decodes HDCD. I'm forced to conclude that the rolloff is in the Pacific Microsonics digital filter used in all HDCD systems. I'll lose no sleep over a loss of 0.2 dB at 20 kHz, but I'd be remiss if I didn't report it.

As for THD + N, while the Encore's Crystal DAC is nothing to sneeze at—the results are typical of many good systems—the Ovation's Burr-Brown 20-bit DACs are absolutely superb. In Fig. 2, distortion versus frequency, the Encore's peak (just over 0.01% in the region of 16 to 18 kHz) is virtually absent from the Ovation's curves, which stay below 0.003% from 20 Hz to 20 kHz! In Fig. 3 (THD + N of a 1-kHz signal as a function of level), the Encore's converters come close to the theoretical performance of an ideal 16-bit system—but the Ovation's converters actually better them, with THD + N below -98 dBFS from -20 to -90 dBFS. The Crystal DACs in the Encore deserve high marks; they suffer only in comparison to the superb performance of the Ovation's Burr-Browns.

With the Ovation's DACs trouncing the Encore's in THD + N versus level, you



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## Who Says You Have To Live With Your Mistakes?



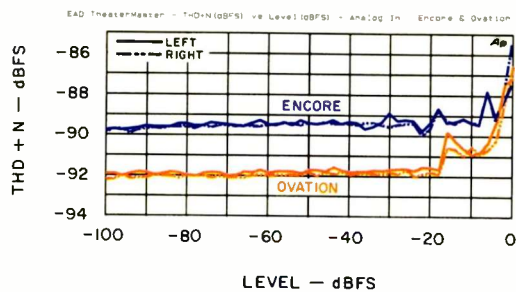
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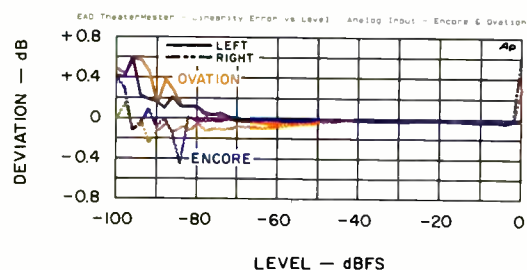
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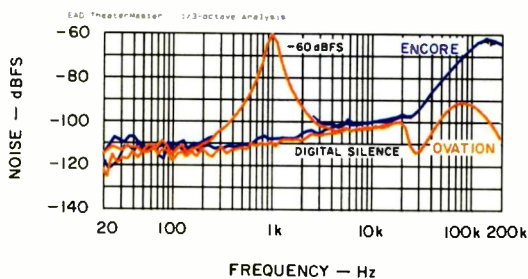




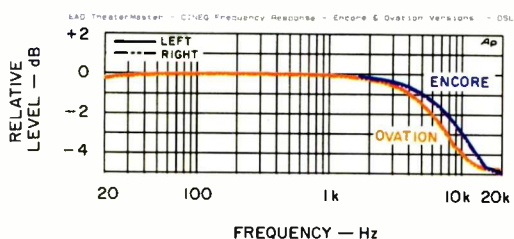
**Fig. 9—THD + N vs. level, A/D converter.**



**Fig. 10—Linearity error, A/D converter.**



**Fig. 11—Noise analysis, analog input and output.**



**Fig. 12—Frequency response, CINEQ engaged.**

might expect to find a similar difference in linearity, but there's virtually no difference at all (Fig. 4). Thus, the difference in THD + N is apparently due more to a difference in noise than in distortion (linearity), as you'd expect from the types of DACs involved. (A 20-bit ladder DAC should have a low noise floor, though it won't necessarily have better linearity than a 16- or 18-bit device. Linearity errors are more probable in multibit

ladder devices than in 1-bit DACs anyway.) The difference between the Ovation's performance and the Encore's is again small in the fade-to-noise test (Fig. 5). Although this plot is made with a tracking filter, noise does creep in at very low levels, which probably accounts for the minute differences seen.

The Ovation's noise floor is, in fact, approximately 10 dB lower than the Encore's, as is plainly apparent in the two DACs' third-octave noise spectra (Fig. 6) and in the results for signal-to-noise ratio given in "Measured Data." With "silent" signals, both versions' noise spectra in the audio band are "white," with no sign of coherent noise components that would call attention to themselves. This kind of noise is even quieter than it seems, and both TheaterMasters are first-rate in this respect even if the Ovation does seem to beat the pants off the Encore.

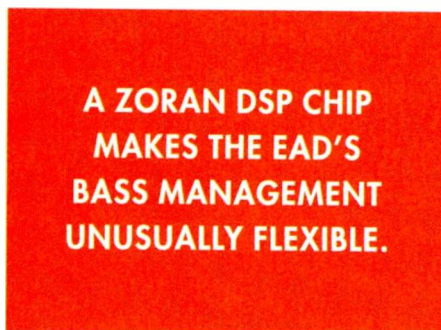
From the shapes of the spectra in Fig. 6, it's clear that both converters use noise shaping, though more aggressively in the Crystal 1-bit DAC than in the Burr-Brown multibit converter. Note also how the noise floor flattens below 100 Hz on the Encore but keeps falling on the Ovation. Although I can't be certain, I suspect that this may be related to the latter's Digital Flywheel reclocking circuit. The Encore's quantization noise was really quite impressively low, so the Ovation's—2.2 dB better—is all the more remarkable.

What little difference there was in dynamic range favored the Encore slightly, which surprised me enough to make me recheck the Ovation. (I couldn't recheck the Encore once I'd converted it to an Ovation.) Chalk one up for the Crystal Semiconductor 1-bit DAC. The Encore's channel separation proved to be slightly better than the Ovation's, too, but only in one direction.

After completing the DAC tests, I assessed how well the Encore and Ovation handled analog stereo signals. Both versions use the same A/D converters, so you'd ex-

pect identical test data, which is what I got for input impedance (9.05 kilohms, kinda low), channel balance (a remarkably good  $\pm 0.03$  dB), and input clipping level. The input clipping level without attenuation (2.12 volts) was high enough to handle relatively hot sources without clipping and without unduly sacrificing S/N; with the 6-dB attenuator switched in (4.23 volts, which is precisely 6 dB higher), either TheaterMaster should be able to tame even super-hot sources.

In most respects, differences in the Encore's and Ovation's ability to handle analog audio relate to the differences in D/A converter performance mentioned above. For example, the differences between the DACs' responses seen in Fig. 1 account for virtually all the differences between the Encore and Ovation curves in Fig. 7, which include the DACs' effects plus those of the A/D converters, analog input electronics, and anti-aliasing filters. There's a trace of



anti-aliasing filter ripple, but, at a few hundredths of a decibel, it's barely discernible on the graph and certainly inaudible.

My measurements of THD + N versus frequency made with analog signals (Fig. 8) reveal smaller differences between the Encore and Ovation than were seen for digital signals in Fig. 2. That's because the noise and distortion added by the A/D converter (which is the same chip in both versions) swamp the differences between the Crystal and Burr-Brown DACs between 20 Hz and 5 kHz. Above 5 kHz, the THD + N of the ADC apparently diminishes, and DAC noise and distortion predominate, letting us begin to see the superiority of the Ovation's DAC. But both models' perform-



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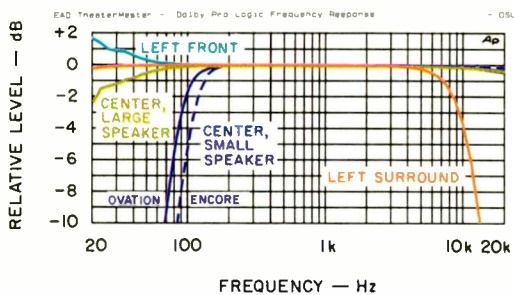
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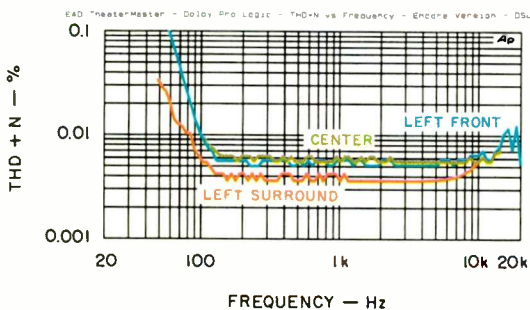


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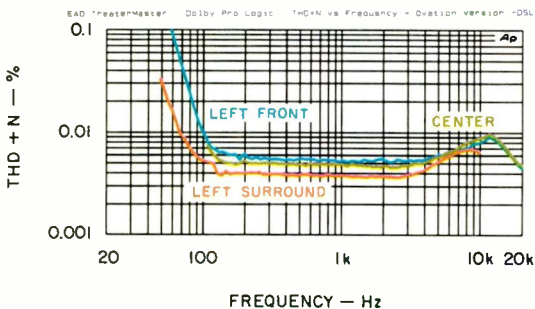
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**Fig. 13—Frequency response, Dolby Pro Logic mode.**



**A**



**B**

**Fig. 14—THD + N vs. frequency, Dolby Pro Logic mode, for Encore (A) and Ovation (B).**

ance—THD + N of less than 0.005% over the majority of the audible range, from analog input to analog output—is excellent.

There's also less difference between the Encore's and Ovation's THD + N versus level using analog input (Fig. 9) than was seen for digital input (Fig. 3); however, it's rather surprising to find any difference at all! The same A/D converter was used for both sets of curves in Fig. 9, so its distortion and noise must be rather modest; otherwise, they would swamp the difference between the DACs at all levels, not just from 0 to -4 dBFS. At lower input levels, the analog input electronics, anti-aliasing filter, and A/D converter together contribute little more noise and distortion than the Encore

DAC alone. That's a pretty impressive feat.

Figure 10 demonstrates that the A/D converter is pretty linear, too. Ignoring the right channel's kick-up in nonlinearity at 0 dBFS (undoubtedly due to incipient overload), you'll find relatively little difference between Fig. 4, the linearity of the D/A converter, and Fig. 10. This suggests that the A/D converter EAD uses is at least as linear as either of the D/A converters, which is remarkable.

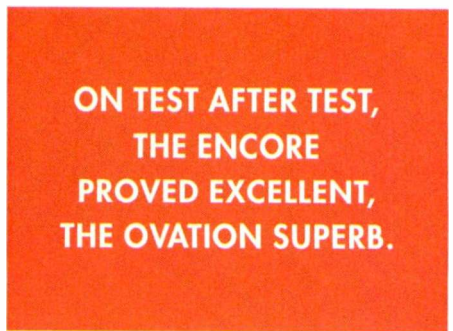
The spectral analyses in Fig. 11 indicate that there's relatively little difference between the Encore's and the Ovation's noise except in the ultrasonic region, where the difference in DAC noise shaping shows up. The digital silence spectra are "white," free of hum-related artifacts, and appear to bottom out on analog preamp and A/D converter thermal noise. When it comes to noise, that's as good as it can get! The Ovation did manage to post slightly better weighted S/N ratios (undoubtedly because of its quieter DACs), but by less than 2 dB. And once more, the Ovation beat the Encore in quantization noise, while the Encore turned the tables in dynamic range (presumably because of its 1-bit DAC topology) and channel separation.

The Encore's and Ovation's response curves with CINEQ (Fig. 12) differ. This surprised me. The effect is more like Home THX re-equalization with the Ovation than with the Encore, although neither adheres perfectly to the THX curve. In any event, EAD applies CINEQ identically to all channels, whereas Lucasfilm specifies different equalizations for front and surround channels.

Figure 13 plots frequency response of the Ovation in Dolby Pro Logic mode and response of the Encore's center channel when set for a "Small" speaker (formerly called "normal"). Although I made both "Center, Small Speaker" curves using the default crossover setting of 80 Hz, the Encore and Ovation do not roll off at the same frequency. The Ovation's crossover frequencies all

corresponded exactly to whatever was selected in setup, whereas the Encore's were about 37.6% high (see data on page 53).

The Encore and Ovation have the same steep, 24-dB/octave rolloff in their "Center, Small" curves. Such a steep high-pass slope is unusual. More common practice is to use a sharp slope for the low-pass filter (as both TheaterMasters do) and a gentler high-pass slope; this is done on the assumption that the high-pass filter will be aligned with the satellite speakers' natural rolloff, adding 12 dB per octave or more to the high-pass effect. In practice, however, the filter and the speaker's rolloff are not always aligned. And

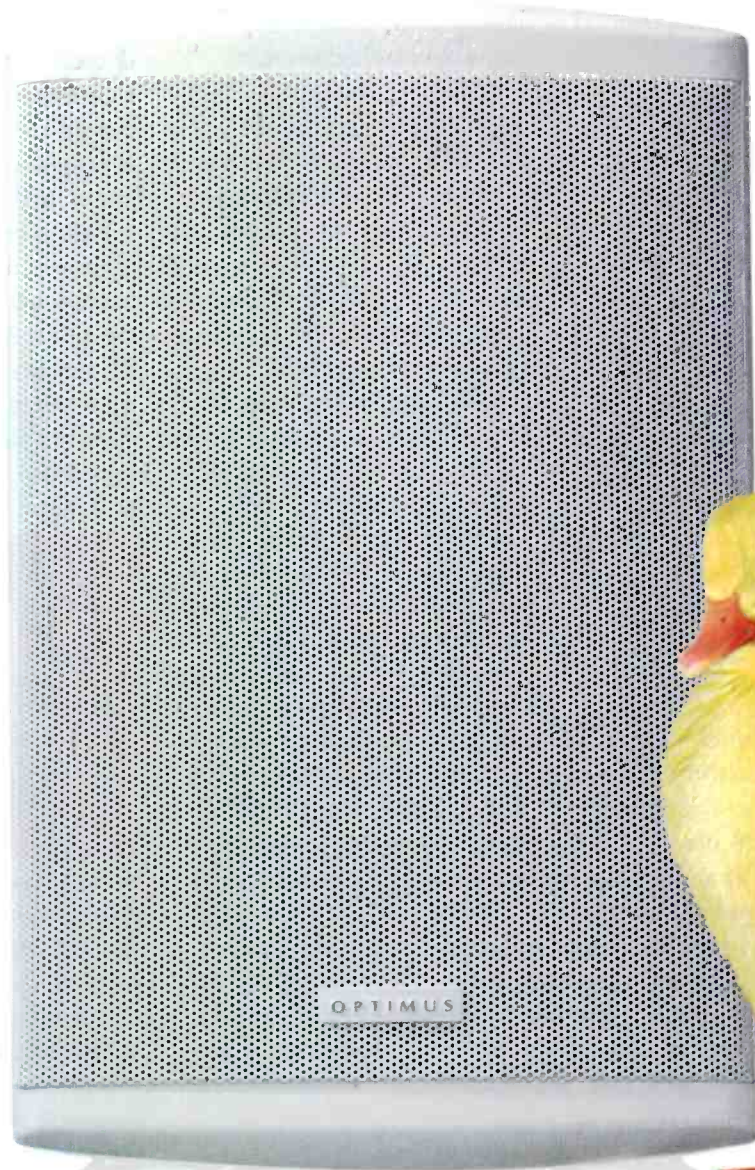


you could argue that it's better to roll off faster, so there's some logic to EAD's stance.

In Fig. 13, although the surround channel's treble rolls off sharply (which is nice), the rolloff begins at a higher frequency than usual, its -3 dB points closer to 10 kHz than to the 7 kHz specified by Dolby Laboratories. The boost in bass response in the left front channel (and corresponding drop in the center channel with large-speaker operation) is probably an artifact of the test method and should be ignored.

The bass signals a subwoofer channel receives from other channels are usually well below the reference level for the LFE (low-frequency effects) channel, as per Dolby Laboratories' recommendations. The TheaterMasters' redirected bass, however, was at about the same level as the LFE signal, a matter of potential concern. One reason Dolby Labs recommends lower redirected-bass levels is to optimize bass balance when energy from multiple channels and the LFE channel is summed and fed to a common subwoofer. Another is to prevent DAC overload in the subwoofer channel (the summation is invariably performed in the digital domain). In fact, the TheaterMaster's subwoofer-channel DAC did overload on one of my test DVD's signals, which sums all channels' bass with the LFE at a signal level

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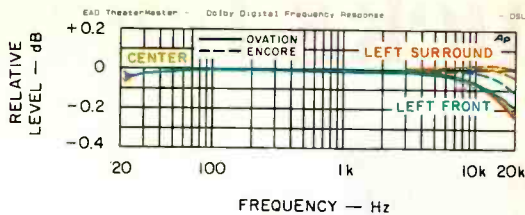
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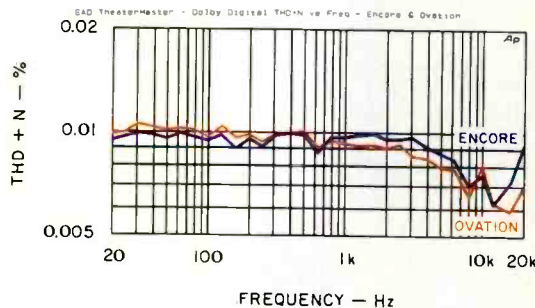


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**Fig. 15—Frequency response, Dolby Digital (AC-3) mode.**



**Fig. 16—THD + N vs. frequency, Dolby Digital mode.**

of  $-3$  dBFS apiece. However, when the front-channel bass was not redirected to the subwoofer, the DAC was clean at  $-3$  dBFS and just barely clipped (about 2% distortion) at 0 dBFS. On the other hand, it's highly unlikely that the same bass tones would simultaneously be found, in phase, at the 0-dBFS level in all channels (including the LFE); I'd say you're safe if you don't route front-channel bass to the subwoofer.

As the plots in Figs. 14A and 14B indicate, noise and distortion are unusually low for Dolby Pro Logic operation. The Ovation is slightly better than the Encore in this respect, thanks to its superior DACs, but both models are really first-rate. (The Ovation's distortion results in "Measured Data" are for higher output voltages because its balanced outputs provide twice the level the Encore's unbalanced jacks do.) The Encore had lower A-weighted noise in the front channels, but the Ovation took the honors in the surround channels. (Please note that I've changed this portion of "Measured Data" to report noise in dBV, decibels relative to 1 volt; this makes the data look 6 dB "better" than S/N ratios I've measured against a 0.5-volt reference.)

With Pro Logic operation, there was essentially no difference in steady-state channel separation between the Encore and Ovation, which suggests that it was gov-

erned by the Dolby processor and not by the analog output circuitry. Pro Logic channel separation in excess of 52 dB (worst case) earns high marks for both units.

Frequency response in Dolby Digital mode is shown in Fig. 15. (The front left and right channels matched so well that there was no point plotting both; this was also the case for the two surround channels. I used a very sensitive scale to emphasize the minuscule differences that occurred.) Again, there's slightly more treble drop in the Ovation curves but not enough to get excited about.

The TheaterMasters both have low THD + N in Dolby Digital mode (Fig. 16)—great performance, in my book. The Ovation's superior DACs produce slightly less high-frequency trash. (I used the right front channel for this

graph, but the left front and the surround channels had essentially the same characteristics. The signal level was  $-10$  dBFS.)

The Ovation's crosstalk in Dolby Digital mode was, technically, better than the Encore's, but I dare anyone to hear the difference. Channel balance was essentially perfect with either model, and THD + N (measured at 0 dBFS and 1 kHz) was effectively the same—and completely negligible—on both.

#### Use and Listening Tests

Once I clipped jumpers to make the Encore-to-Ovation upgrade, there was no easy way to go back; my use and listening tests were thus exclusively on the Ovation. Yes, I could have used the Encore before making the upgrade, but I'm confident it would have sounded so good that I wouldn't have been able to hear differences without an A/B comparison.

It's clear from the owner's manual that EAD prefers you use identical speakers in all channels. This would rule out dipole surrounds, and EAD does warn that the TheaterMasters' automatic delay adjustment may not work with dipole surrounds. When the sound field is diffuse and the listening position is in the null, the system may lock onto a room reflection and think that's the speaker. Even though I had di-

pole surrounds in my home theater when I reviewed the Ovation, I thought I'd give the automatic system a crack anyway. I haven't been impressed with the accuracy of these automatic deals in the past, so I wasn't expecting much. I was convinced that I'd end up doing the setup manually after the auto system had finished making a fool of itself.

Well, shiver me timbers, EAD's automatic setup really works! I held the supplied test microphone just in front of me and facing up (as directed), hit "Auto Setup" on the remote's setup menu, and the Ovation did its thing, channel by channel. Satisfied in about a minute or so with what it had accomplished in setting levels, the Ovation went into automatic delay mode. (Level ad-

**DESPITE EAD'S WARNING, MY DIPOLE SURROUNDS CAUSED NO PROBLEMS WITH AUTOMATIC SETUP.**

justment is done with band-limited noise, whereas auto delay uses a series of sharp "cracks.") Pretty soon the Ovation was satisfied with the accuracy it thought it had achieved (it indicates if it thinks it screwed up) and quit making noises.

Dipoles or no, the Ovation set delays very accurately. When it was finished, I checked the speaker-distance display against the known placement of my speakers, and the adjustment was dead-on. When I manually checked levels with a sound level meter, the balance was right on, too. I was flabbergasted! One reason for this amazing accuracy may be that the Ovation's test signals run at a higher sound pressure level than that used by some other surround components. Higher-level test signals are easier for an automatic adjustment system to distinguish from room noise.

I have full-range main speaker systems in my home theater, so I defeated the main-channel crossovers and made sure that I didn't route bass from the front left and right speakers to the sub. (No sense taking a risk of overloading the subwoofer output's DAC.) I did reroute bass from the center and surrounds, but because I use rather



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## MEASURED DATA

### D/A CONVERTER SECTION

Output for 0-dBFS Signal: Encore, 4.09 V; Ovation, 7.5 V (balanced).

Channel Balance: Either version, no measurable error.

Output Impedance: Encore, 50 ohms; Ovation, 125 ohms.

Frequency Response, 20 Hz to 20 kHz: Encore, +0, -0.09 dB; Ovation, +0, -0.23 dB.

THD + N at 0 dBFS, 20 Hz to 20 kHz: Encore, less than 0.0116%; Ovation, less than 0.0029%.

THD + N at 1 kHz: Encore, below -91.7 dBFS from 0 to -90 dBFS and below -93.4 dBFS from -30 to -90 dBFS; Ovation, below -93.8 dBFS from 0 to -90 dBFS and below -98.5 dBFS from -30 to -90 dBFS.

Maximum Linearity Error: Undithered signal, 0.77 dB from 0 to -90 dBFS, either version; dithered signal, from 0 to -100 dBFS, 0.29 dB with Encore and 0.22 dB with Ovation.

S/N: A-weighted, 98 dB with Encore and 117.6 dB with Ovation; CCIR-weighted, 89 dB with Encore and 108.4 dB with Ovation.

Quantization Noise: Encore, -93.7 dBFS; Ovation, -95.9 dBFS.

Dynamic Range: Unweighted, 98.5 dB with Encore and 98.4 dB with Ovation; A-weighted, 101.4 dB with Encore and 100.1 dB with Ovation; CCIR-weighted, 92 dB with Encore and 90.3 dB with Ovation.

Channel Separation, 125 Hz to 16 kHz: Encore, greater than 85.1 dB; Ovation, greater than 70.3 dB.

### PREAMP SECTION, STEREO

Input Impedance: Either version, 9.05 kilohms.

Channel Balance: Either version,  $\pm 0.03$  dB.

Input Clipping Level: Either version, 2.12 V with attenuator at 0 dB and 4.23 V with attenuator at -6 dB.

Frequency Response, 20 Hz to 20 kHz: Encore, +0, -0.23 dB (-3 dB at 21.47 kHz); Ovation, +0.01, -0.31 dB (-3 dB at 21.42 kHz).

THD + N at 0 dBFS, 30 Hz to 20 kHz: Encore, less than 0.0116%; Ovation, less than 0.00567%.

THD + N at 1 kHz: Encore, below -85.4 dBFS from 0 to -90 dBFS and below -88.8 dBFS from -30 to -90 dBFS; Ovation, below -86.6 dBFS from 0 to -90 dBFS and below -91.6 dBFS from -30 to -90 dBFS.

Maximum Linearity Error: Encore, 0.44 dB from 0 to -90 dBFS and 0.6 dB from 0 to -100 dBFS; Ovation, 0.39 dB from 0 to -90 dBFS and 0.58 dB from 0 to -100 dBFS.

S/N: A-weighted, 91.8 dB with Encore and 93.7 dB with Ovation; CCIR-weighted, 82.6 dB with Encore and 84.6 dB with Ovation.

Quantization Noise: Encore, -89.3 dBFS; Ovation, -90.8 dBFS.

Dynamic Range: Unweighted, 94.6 dB with Encore and 91.9 dB with Ovation; A-weighted, 97.1 dB with Encore and 94 dB with Ovation; CCIR-weighted, 87.4 dB with Encore and 84.6 dB with Ovation.

Channel Separation, 100 Hz to 20 kHz: Encore, greater than 75.5 dB; Ovation, greater than 68.1 dB.

### DOLBY PRO LOGIC MODE

Maximum Output at 1 kHz: Encore, 2.95 V or higher, all channels; Ovation, 5.41 V or higher, all channels.

Frequency Response, Encore: Main channels, 100 Hz to 20 kHz, +0.06, -0.16 dB; center channel, "Large" speaker mode, 100 Hz to 20 kHz, +0, -0.11 dB; center, "Small" speaker mode, 159 Hz to 20 kHz, +0, -0.23 dB; surround channels, 100 Hz to 7 kHz, +0, -0.7 dB.

Frequency Response, Ovation: Main channels, 100 Hz to 20 kHz, +0.07, -0.28 dB; center channel, "Large" speaker mode, 53 Hz to 20 kHz, +0, -0.37 dB; center, "Small" speaker mode, 125 Hz to 20 kHz, +0, -0.37 dB; surround channels, 20 Hz to 7 kHz, +0, -0.86 dB.

THD + N: Encore, at 2 V out, main and center channels less than 0.013%

from 100 Hz to 20 kHz and surround channels less than 0.007% from 100 Hz to 7 kHz; Ovation, at 4 V out, main and center channels less than 0.0099% from 100 Hz to 20 kHz and surround channels less than 0.0065% from 100 Hz to 7 kHz.

A-Weighted Noise, Encore: Main channels, -83.8 dBV; center channel, "Large" speaker mode, -83 dBV; surround channels, -85.8 dBV.

A-Weighted Noise, Ovation: Main channels, -82.1 dBV; center channel, "Large" speaker mode, -80.7 dBV; surround channels, -89 dBV.

Channel Separation at 1 kHz: Encore, 52 dB or greater; Ovation, 52.9 dB or greater.

DOLBY DIGITAL (AC-3) MODE  
Output Level at 0 dBFS: Encore, 4.08 V; Ovation, 7.48 V.

Channel Balance: Encore,  $\pm 0.03$  dB or better; Ovation,  $\pm 0$  dB.

Frequency Response, Encore: Main channels, 21 Hz to 20 kHz, +0, -0.11 dB; center channel, 21 Hz to 20 kHz, +0.01, -0.05 dB; surround channels, 21 Hz to 20 kHz, +0.03, -0.07 dB; LFE channel, below 20 Hz to 120 Hz,  $\pm 0.08$  dB.

Frequency Response, Ovation: Main channels, 21 Hz to 20 kHz, +0, -0.2 dB; center channel, 21 Hz to 20 kHz, +0, -0.23 dB; surround channels, 21 Hz to 20 kHz, +0, -0.24 dB; LFE channel, below 20 Hz to 120 Hz,  $\pm 0.08$  dB.

THD + N at 1 kHz for 0-dBFS Signal: Encore, 0.0045% or less in main, center, and surround channels and 0.0127% in LFE channel; Ovation, 0.00478% or less in main, center, and surround channels and 0.0127% in LFE channel.

THD + N at -10 dBFS, 20 Hz to 20 kHz: Encore, 0.01% or less in main, center, and surround channels; Ovation, 0.0106% or less in main, center, and surround channels.

Channel Separation, 100 Hz to 10 kHz: Encore, 67.5 dB or greater; Ovation, 69 dB or greater.

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GA- Laser Disc Enterprises: Atlanta • Merril TV: Columbus •  
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HI- Honolulu Home Theater: Honolulu.  
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MO- Independence A/V: Independence • RMS: Springfield •  
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MS- Ideal Acoustics: Starkville • McLelland TV: Hattiesburg •  
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TX- Home Entertainment: Dallas, Houston, Plano • Audio Tech: Temple •  
Audio Video: College Station • Bunkley's Sound Systems: Abilene •  
Bjorn's: San Antonio • High Fidelity: Austin • Krystal Clear: Dallas •  
Marvin Electronics: Ft. Worth • Sound Quest: El Paso • Sound Systems:  
Amarillo.  
UT- Audio Works: Salt Lake City • Stokes Bros.: Logan • Ultimate Elect.:  
Layton, Murray, Orem, Salt Lake City.  
VA- Myer-Emco: Falls Church, Tyson's Corner, Fairfax • Audio Connection:  
Virginia Beach • AudioTronics: Roanoke • Home Media Store: Richmond.  
WA- Bunch-Finnegan TV: Kennewick • Magnolia Hi-Fi: Seattle & Suburbs,  
Tacoma, Silverdale, Spokane • Pacific Sight & Sound: Wenatchee.  
WI- Flanner's A/V: Milwaukee • Hi-Fi Heaven: Appleton, Green Bay •  
Sound World: Wausau.  
Puerto Rico- Precision Audio: San Juan.  
Canada- A & B Sound: Calgary, Edmonton, Kelowna, Vancouver &  
Suburbs, Victoria • Advance Electronics: Winnipeg • Bay Bloor Radio:  
Toronto • Canadian Sound: Brampton, Ont. • Digital Dynamics:  
Clearbrook • Harrington Audio: Peterborough, Ont. • Kebecon:  
Montreal • Lipton's: Newmarket, Ont. • Sound Decisions: Duncan,  
B.C. • Sound Gallery: Newfoundland • Sound Room: Vancouver •  
Stereoland: Windsor • Treble Clef: Ottawa.  
Mexico- Contact Grupo Volumen: Mexico City.

large speakers in those locations too, I set the crossover at 80 Hz.

Although I adjusted subwoofer level by ear, I was never fully satisfied with the bass balance I was able to achieve. There seemed to be too much bass from the center and surrounds relative to the LFE energy. (I admit that I may have been influenced by the lab results that suggested this would occur.) It wouldn't surprise me if some readers found this system had the extra gutsy bass that really turns them on.

Except for a power switch on the back, there are no controls on the TheaterMaster itself, so the remote is essential. And though the new remote is sexy and far better than the one on the original TheaterMaster, I occasionally had trouble using it. My fingers are small, yet I still hit the wrong pad far too often. There can be as many as 28 of these in a space of less than 2¼ x 4¼ inches. The number of pads depends on the page in use, but their size doesn't vary.

At first, I was surprised that the eight pads you use to select the remote's display pages don't function as source selectors. (They are labeled "TheaterMaster TM," "DSS," "CD," and "LD" in one row and "TM-Setup," "VCR," "TV," and "DVD" in the other.) Pressing these pads just redraws the remote's screen to show the controls appropriate for the source and readies the remote to control that source via the codes you've taught it.

To change program sources, you must touch the number you have associated with that source's audio input. For example, if you want to use your DVD player and have designated the third digital audio input (D3) for it, you press "3." The video goes along with the audio because of the associations you made during setup. If you assign the characters "DVD" to whatever audio and video inputs you use for your DVD player, the TheaterMaster's front-panel display will read "DVD" when you select that source. If a program source has analog audio output, you must press the "Analog" pad on the remote's "TheaterMaster TM" page before pressing the numeric key. A number by itself selects a digital audio source and the video associated with it. Forget to press "Analog" before the number, and you'll get a source other than the one you're after.

Part of my frustration with the EAD remote may have resulted from not being

able to see the LCD screen very well. If the ambient light is insufficient to see the legends, the screen is supposed to backlight when you touch the membrane. (The owner's manual doesn't explain this, but I confirmed that that's how it's supposed to work.) On my unit, "insufficient" meant near darkness, so I had to turn up the



**THIS IS ONE TERRIFIC-  
SOUNDING PROCESSOR:  
MARVELOUS DETAIL  
AND SUPERB IMAGING  
...FANTASTIC!**

room lights to see what I was doing or turn them nearly off to get the screen to light. Maybe this was caused by an improper calibration of my sample's light sensor, but I'm not fond of automatic lighting anyway. If you must touch the membrane to get the backlighting to come on and you can't see what you're touching, you may change a setting by the very act of getting the screen to illuminate. I'd rather have a button on the side to light the remote.

With that off my chest, I can turn to the good part. This is one terrific-sounding processor! Except for bass balance, I don't think I have ever heard better sound in my home theater: marvelous detail, superb imaging, wide-range, and quiet—the EAD Ovation is fantastic! The more I listened to it, the more I liked it. Would the Encore have sounded as good? I cannot say for sure, but I bet it would have been pretty close.

Just two requests to EAD: Make the TheaterMasters even easier to use, and give us component-video connections. (I assume you'll correct the Encore's crossover frequencies in the next EPROM.) I wouldn't carp, except that this is such a great product. You're almost there, guys. Go for it! A

# “Definitive’s New Flagship BP3000TL Brings You the Ultimate Listening Experience!”

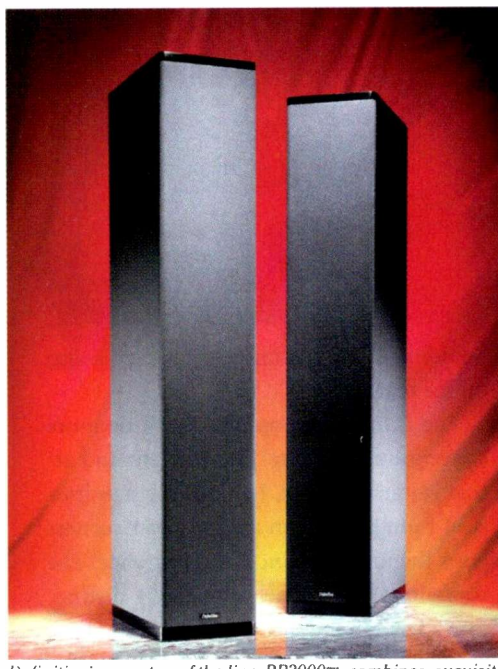
*Our revolutionary bipolar BP3000TLs, with dual built-in 1000-watt powered 18" subwoofers, are the absolute state-of-the-art for music and home theater perfection.*

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# KORA TRIODE 100 SB MONO AMP AND ECLIPSE PREAMP

**K**ora Electronic Concept is based in the Toulouse region of France, that country's answer to Silicon Valley. Maybe it's French styling, but the first time I saw Kora products, I was impressed with their looks as well as their sonic potential.

The Triode 100 SB mono amplifiers, in particular, look refreshingly different and attractive. A projecting front apron holds the main power shutoff and "Standby/Operate" rocker switches. Emerging



from a polished, stainless-steel plate atop the unusually shaped chassis are two rugged Russian 6C33 triodes (which, operating in push-pull, are rated as delivering 80 watts) and three smaller tubes. On the rear of the chassis are balanced and unbalanced input jacks and three very nice metal binding posts for the 8-ohm, 4-ohm, and common speaker connections. A combination fuse

holder and IEC AC line-cord socket is also on the rear.

The Eclipse preamplifier is a little more conventional-looking, but different and attractive nevertheless. Its polished stainless-steel front panel with angled lower corners gives the unit a distinctive appearance. The contents of this panel are equally distinctive: a headphone jack (uncommon on tube

preamps), nine LEDs, and a shiny volume knob, the only operable front-panel control. Power on/off, muting, the tape monitor and external processor loops, and input selection are handled exclusively by the supplied remote, which also operates the motorized volume pot. The three LEDs nearest the volume control indicate muting and activation of the two loops; the six LEDs near the headphone jack show which input is selected. An eleven-position stepped balance control is on the rear panel, an odd place for it.

## AMP

**Rated Power:** 80 watts into 8 or 4 ohms.

**Rated THD:** 0.3% at 70 watts out, 0.07% at 1 watt.

**Rated S/N:** 115 dB.

**Dimensions:** 8 $\frac{3}{4}$  in. H x 15 $\frac{3}{4}$  in. W x 15 $\frac{3}{4}$  in. D (22 cm x 40 cm x 40 cm).

**Weight:** 39.6 lbs. (18 kg).

**Price:** \$10,295 per pair.

## PREAMP

**Dimensions:** Main chassis, 4 $\frac{3}{4}$  in. H x 17 in. W x 12 $\frac{1}{4}$  in. D (12 cm x 43.3 cm x 31 cm); power supply, 4 $\frac{3}{8}$  in. H x 7 $\frac{3}{4}$  in. W x 11 $\frac{3}{8}$  in. D (11 cm x 18.5 cm x 29 cm).

**Weight:** 26.4 lbs. (12 kg).

**Price:** \$5,195.

**Company Address:** c/o OS Services, 4902 Placidia Ave., Toluca Lake, Cal. 91602; 818/760-0692; [www.ossaudio.com](http://www.ossaudio.com).

Also on the rear are inputs for four line-level sources and for MM and MC phono, a tape monitor, and an external processor loop, all unbalanced. Besides its tape and processor outputs, the Eclipse has one balanced and two unbalanced main outputs. One of the two unbalanced outputs, labeled "H," is connected directly to the tube output stage, via a coupling capacitor. The other, labeled "L," is buffered through a simple N-channel MOS-FET circuit. Similar circuits buffer both phases of the balanced output (which uses a male XLR connector). A DB-25 connector accepts a cord from the external power supply. A hybrid unit, the Eclipse uses tubes for its line stage and transistors for its phono preamp and line output buffers.

The construction of the Triode 100 SB amplifiers is unusual, to say the least. The audio circuit board is in the chassis' central

**THE TRIODE 100 SB'S UNUSUAL CHASSIS HOLDS SOME INNOVATIVE CIRCUITRY.**

section, beneath the polished-metal top cover. Each of the three projections from the central section holds a toroidal transformer: the main power and output transformers at the extreme left and right, the transformer for the tube heaters toward the front of the amp. The chassis is made up of two main pieces, a top and bottom. Rubber isolation between them reduces the possibility of vibration from the transformers, which are mounted to the bottom, reaching the tubes. The amplifier rests on two soft rubber feet near the rear of the chassis and a sharp, cone-shaped metal foot near the front.

The Eclipse preamp's interior is practically filled by two circuit boards. The larger board holds all audio circuitry except the input and output jacks and the volume and balance controls. The tubes plug into individual socket pins soldered to the board instead of the usual tube sockets (the Triode 100 SB amp's smaller tubes are also mounted this way). The smaller circuit board, which rests on standoffs behind the front

panel, holds the volume control and its motor-control circuit, the system-control microprocessor, and the headphone driver circuit. A smaller daughter board holds the front panel's indicator LEDs and remote-control sensor. The power-supply enclosure houses a generously sized toroidal power transformer and the supply's other components.

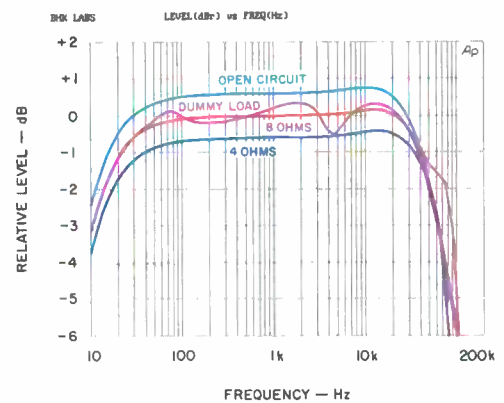
The Eclipse preamp and Triode 100 SB amp use many high-quality parts, and all their wiring is neat and workmanlike.

**Measurements**

Judging from the way the Triode 100 SB amp's frequency response changes with loading (Fig. 1), I'd have thought its output impedance was about 0.56 ohm. However, the damping factor I measured was lower than that impedance would suggest, ranging between 10 and 12 over most of the audio range and decreasing to about 7.7 at 20 kHz, indicating an impedance of 0.67 ohm to 1.04 ohms.

Rise and fall times for  $\pm 5$ -volt output into 8 ohms on the 8-ohm tap were about 4.4 microseconds. The Kora amp's square-wave response (Fig. 2) exhibits some ringing at 10 kHz even with a purely resistive load. When a 2-microfarad capacitance is connected across the load, this ringing becomes rather severe; therefore, electrostatic speakers might not be the best choice for use with this amp. The 40-Hz square wave has more tilt than I like to see; this relates to the rolled-off bass seen in Fig. 1. (Unless otherwise noted, all measurements are for the amp that I designated Amp 1 and were taken with unbalanced input.)

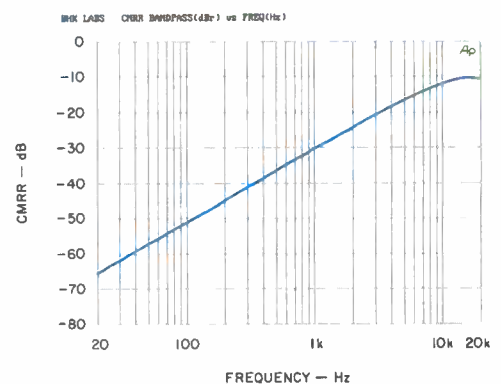
Figure 3 shows the Triode 100 SB's common-mode rejection ratio for the balanced input; results were nearly identical for both units. Over most of the audio range, CMRR decreases at 6 dB per octave as frequency rises and is a mere 10 dB at about 15 kHz, which is not too good. Signals fed through the unbalanced input were not inverted, but



**Fig. 1—Frequency response of Triode 100 SB amp as a function of loading on the 8-ohm tap.**



**Fig. 2—Square-wave response of Triode 100 SB for 10 kHz into 8 ohms load (top), 10 kHz into 8 ohms paralleled by 2  $\mu$ F (middle), and 40 Hz into 8 ohms (bottom); all tests made at 8-ohm tap.**



**Fig. 3—Common-mode rejection ratio for amplifier's balanced input.**

signals fed through the balanced input were, at least when pin 2 carried the positive input phase (the normal U.S. practice). Impedance at 1 kHz was 33.1 kilohms at the unbalanced input and 75.3 kilohms at the balanced input.

The amp's distortion (Fig. 4) is satisfactorily low, and the way distortion varies

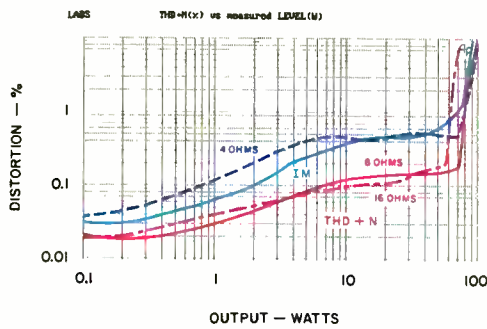


Fig. 4—Amplifier's THD + N at 1 kHz and SMPTE IM distortion vs. power output, at 8-ohm tap.

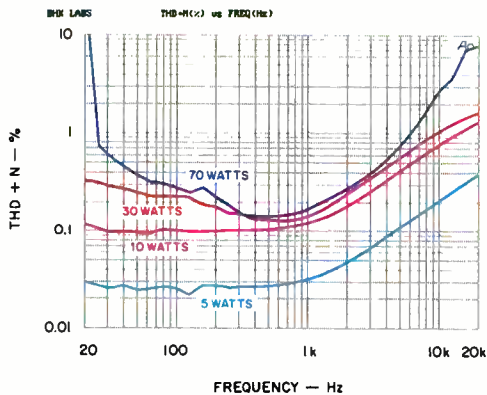


Fig. 5—Amplifier's THD + N vs. frequency, 8-ohm load on 8-ohm tap.

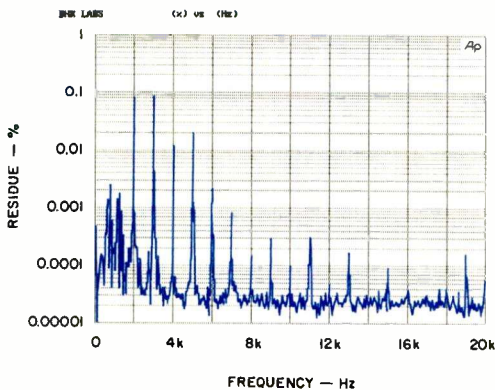


Fig. 6—Spectrum of amp's harmonic-distortion residue.

TABLE I—Noise and input sensitivity, Triode 100 SB amplifiers.

	AMP 1		AMP 2	
	BAL	UNBAL	BAL	UNBAL
IHF S/N, dB	86.7	84.5	88.4	92.1
IHF Sensitivity, mV	171.3	151.9	176.6	150.3
Output Noise, $\mu$ V				
Wideband	406.2	408.1	234.8	214.8
22 Hz to 22 kHz	358.5	270.1	204	134.4
400 Hz to 22 kHz	156.3	228.7	125.5	81.5
A-Weighted	130.2	168.9	107.6	69.7

with loading is typical for tube amplifiers: When the load impedance is twice the tap's designated load (e.g., 16 ohms on the 8-ohm tap), maximum power at low distortion falls; when the impedance is half the tap's rating, power stays the same but distortion rises. The Triode 100 SB's total harmonic distortion plus noise (THD + N) rises with frequency above 1 kHz (Fig. 5), which is typical of most amps. The Kora amp's low-frequency distortion is very good at low to medium output levels; at 70 watts, however, it becomes excessive below 30 Hz. Figure 6 is a spectrum of the amp's harmonic-distortion residue for a 1-kHz signal at an output level of 10 watts into an 8-ohm load on the 8-ohm tap.

Dynamic power attainable at the 8-ohm tap was 63 watts with a 16-ohm load, 90 watts into 8 ohms, and 105 watts with 4-ohm loading. Based on Kora's 80-watt rating for the amp, the Triode 100 SB's dynamic headroom is about 0.5 dB. The output level at which clipping became visible on an oscilloscope (typically about 0.5% to 1% distortion) was about 80 watts, yielding a clipping headroom above rated power of 0 dB. Noise and sensitivity are listed in Table I.

The Triode 100 SBs drew 1.14 amperes from the AC line in stand-by mode and 1.6 amperes in operation. Overall feedback was about 16 dB.

The frequency response of the Eclipse preamplifier's line section is shown in Fig. 7. The direct ("H") output exhibits some peakiness with the IHF load, which is more capacitive than the instrument load. The buffered ("L") output, however, was virtually the same with either load, so only the response with instrument load is plotted. Response at

the balanced outputs is pretty much like the response at the buffered outputs. Frequency response was essentially constant at all volume-control settings.

Rise and fall times at  $\pm 5$ -volt output ranged from 3.2 to 3.8 microseconds with instrument or IHF loading for all but the tape outputs. A 40-Hz square wave had about 12% tilt at the direct outputs with either the instrument or IHF load. At the buffered outputs, there was essentially no tilt with instrument loading and about 6%

I CONSISTENTLY FELT THAT THE ECLIPSE PREAMP SOUNDED VERY GOOD WITH LINE-LEVEL SIGNALS.

tilt with the IHF load. Signals were not inverted except when fed via the MC phono input. Output impedance at 1 kHz was 18 ohms for the buffered outputs, 284 ohms for the direct outputs, 30 ohms for the balanced outputs, and a very high 32.5 kilohms at the tape outputs. The high-level inputs' impedance was about 170 kilohms.

The preamp's THD + N was pretty constant with load and frequency at the balanced outputs and, as you'd expect, was least constant at the direct unbalanced outputs; distortion at the buffered unbalanced outputs (Fig. 8) falls between these extremes. The curves shown are for IHF loading; with instrument loading, there was about as much distortion but it varied less with frequency. Although I've plotted distortion for output levels up to about 8 volts, the maximum level the preamp outputs have to deliver is perhaps 1 to 2 volts, at which levels distortion is quite negligible. In a circuit like the Eclipse's, with an amplifier stage before the volume control (see "Technical Highlights"), the input overload characteristics are of interest. With the line-stage gain set to 0.1, or  $-20$  dB, the line input could accept about 15 volts before clipping—more than enough for any conceivable signal—and its distortion at 2 volts was about 0.09% from 20 Hz to 20 kHz.

As usual, interchannel crosstalk increased with frequency at 6 dB per octave. With the volume control set at  $-20$  dB, left-



## ASSOCIATED EQUIPMENT USED

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

**CD Equipment:** PS Audio Lambda Two Special and modified Sonic Frontiers SFT-1 CD transports, Panasonic DVD-A310 DVD player used for CD play, 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, Dynaco PAS-2, and First Sound Reference II passive

**Amplifiers:** Quicksilver Audio M135 mono tube amps and Bel Canto SET 40 and Audio Note Conqueror single-ended stereo tube amps

**Loudspeakers:** B&W 801 Matrix Series 3s, alone and as subwoofers with Dunlavy Audio Labs SC-III speakers, and Lowther PM5A drivers in modified Lowther Club Medallion II cabinets

**Cables:** Digital interconnects, Illuminati DX-50 (AES/EBU balanced); analog interconnects, Tara Labs Master, Audio Note AN-Vx, and Music and Sound (unbalanced); speaker cables, Transparent Cable MusicWave Reference, Jena Labs Speakeasy Twin Three, and Madrigal Audio Laboratories HF2.5C

to-right crosstalk was below  $-100$  dB at 100 Hz,  $-83$  dB at 1 kHz, and  $-57$  dB at 20 kHz. With volume at  $-6$  dB, crosstalk was about 10 dB lower (surprising, as many preamps' crosstalk is highest at that setting) and was also lower than at full volume. In the right-to-left direction, crosstalk was about 7 dB better. Volume control tracking was quite good, the two channels matching within 0.4 dB down to 60 dB of attenuation.

My review sample of the Eclipse preamp had some excessive but intermittent noise in the first stage of its line amplifier. As a result, noise measurements with the volume turned up fully were higher than they might have been, yielding worst-case A-weighted output noise figures of 245 microvolts from the left (worse) channel's buffered output, 311.8 microvolts from the unbuffered output, and 613.4 microvolts from the balanced output. (The right channel's noise readings were lower: 84.8, 98.7, and 195.7 microvolts, respectively.) This intermittent noise had little effect on the IHF signal-to-noise ratios, which are made at lower volume settings. Left-channel (worst-case) IHF S/N was 79.1 dB at the buffered output, 78.6 at the unbuffered output, and 74.6 dB at the balanced output; right-channel figures were all just over 8 dB better. Worst-case IHF S/N results for the MM and MC phono inputs were 76.4 dB and 68.4 dB, respectively, with no more than 1 dB variation between channels. The phono input readings were taken at the tape outputs. Input sensitivity data is listed in Table II.

The RIAA equalization error of the Eclipse's phono stage (Fig. 9) indicates a rather large drop in level with the IHF load, caused by the phono stage's fairly high output impedance, 6.5 kilohms. There is also, in my opinion, too much bass rolloff. Results shown are for the MM input; those for the MC input were essentially identical except for being about 1 dB further down at 20 Hz.

The overload resistance of phono preamps that use passive interstage RIAA equalization, as the Eclipse's does, is often compromised at high frequencies. Such was the case here. With instrument loading, the preamp could deliver 3 volts at only 3% harmonic distortion at all frequencies up to 3 kHz. But above that frequency, the phono section's input stage began

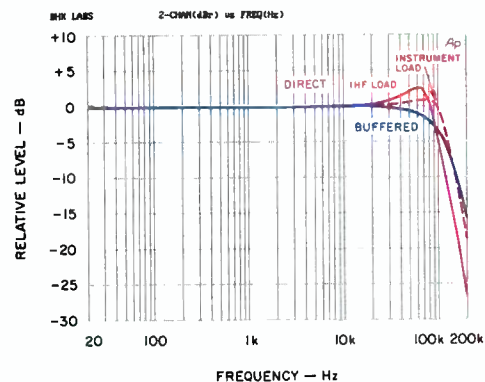


Fig. 7—Frequency response of Eclipse preamp at direct ("H") and buffered ("L") inputs; see text.

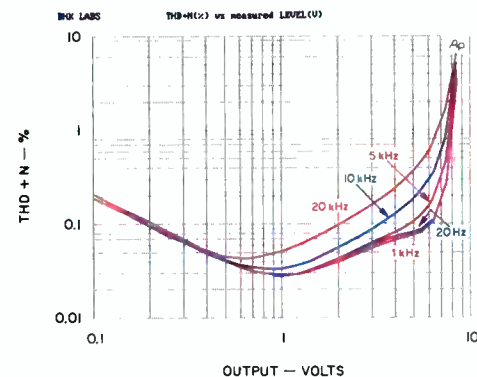


Fig. 8—THD + N vs. load and frequency for preamp's buffered output.

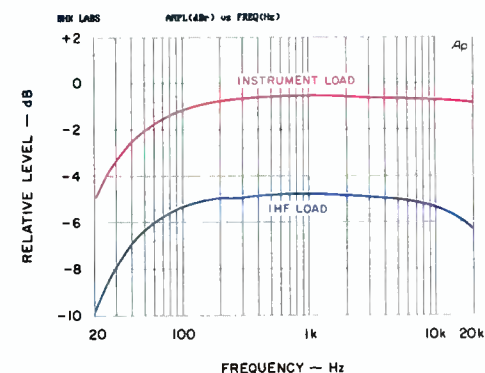


Fig. 9—RIAA equalization error.

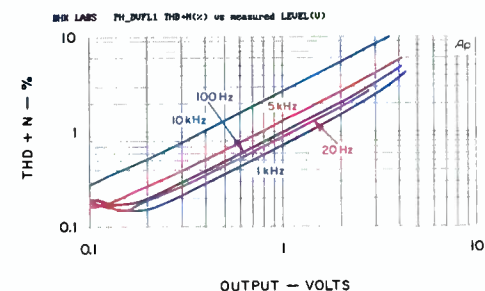


Fig. 10—MM phono section's THD + N.

The first of the Kora Triode 100 SB's three stages, its input stage, is cleverly configured as a four-resistor differential amplifier with gain. The input tube is a 6922 dual triode connected as a differential amplifier, one triode section acting as the noninverting input while the other acts as the inverting input. Voltage dividers made up of two equal-value resistors feed the grids of the noninverting and inverting sides from the positive and negative terminals of the balanced XLR input jack. Unbalanced signals from the phono input jack directly feed the noninverting triode's grid; because this is a differential amp, the two triodes then pass equal-amplitude signals of opposite phase to the second stage.

What's unusual about this circuit is that it develops gain, even though all four resistors of the two voltage dividers are the same value. Usually, in differential amps that produce gain, they aren't—the gain is proportional to the ratio between the input and shunt resistors in each divider. Designers who want reasonably high gain must then choose between using small input resistors that lower the input impedance or large shunt resistors that slow the circuit down.

In the usual topology, the shunt resistor of the voltage divider feeding the inverting tube's grid would connect to the stage's output, providing a feedback path. Kora's clever touch was to add a third voltage divider, at the stage's output, and connect the original feedback resistor to the junction of the new divider's two resistors. (The new divider now provides the feedback.) The stage's (and hence the amp's) gain is determined by the ratio between the resistance connected to the amplifier output and the smaller resistance that shunts to ground through a capacitor. This arrangement provides gain without lowering input impedance or slowing the circuit. It also serves as a new feedback path.

An N-channel J-FET (junction FET) is used as a constant-current source for the 6922's cathodes, which are tied together. The grids are ground-based, via their grid-leak resistors (the shunt resistors of the

first two voltage dividers). As a result, the tubes' grid bias will also be the cathode voltage. This voltage is high enough to properly polarize the J-FET, which is therefore connected to ground rather than to a negative supply. The plate resistor for the 6922's noninverting input side has a fixed value, but the plate resistor for the inverting input side is a rheostat (variable resistor), which can be adjusted to null out distortion or to equalize the voltages on both plates. These plates are capacitor-coupled to the grids of the second stage.

The second stage is another differential amplifier, using a pair of EL84 pentode power tubes. A balance potentiometer is connected between the cathodes of the two tubes; its wiper is connected through a rheostat to a regulated -166-volt supply, as are the EL84s' grid resistors. The screen grids of the tubes are connected to ground, and the cathode voltage is below ground, creating the right balance of voltages for pentode operation. The plate outputs of this second, or driver, stage are capacitor-coupled to the grids of the output tubes through resistors whose purpose is to prevent parasitic oscillation. The 6C33 output tubes have a low amplification factor ( $\mu$ ) and thus require high drive voltages; this drive circuit provides those voltages while keeping distortion low.

The -166-volt supply also provides adjustable negative grid bias for the output tubes. The two tubes' cathodes are linked through a nonpolarized electrolytic capacitor bypassed by a film cap. This being a push-pull stage, the plates of the output tubes are connected to the ends of the output transformer's primary winding. The center tap of this winding is connected to the +300-volt output supply, which is unregulated. Overall negative feedback is taken from the 8-ohm tap of the output transformer's secondary to the inverting side of the input stage.

The Triode 100 SB's main power transformer (another transformer handles the tube heaters) has two secondary windings, one for the positive supply and one for the negative. The unregulated positive supply's

capacitor input filter uses six 470-microfarad, 400-volt capacitors in parallel, whereas the negative supply's filter uses but one of these capacitors. (The unregulated positive supply powers the output stage, so it needs its six capacitors for energy storage. But the load on the unregulated negative supply is constant and much lighter, so a single capacitor is enough.) Because the positive and negative supplies come from different secondary windings, the regulators that follow the positive and negative unregulated supplies can use same-sex (N-channel or P-channel) devices. Each regulator consists of a series resistor feeding a series string of Zener diodes, the output of which feeds the gate of a series pass device (an N-channel MOS-FET power transistor) through an RC low-pass filter.

The Eclipse preamp also has some very unusual circuitry. All signal switching is done with relays, as is common in high-end products. But the selected input signal, rather than going initially through the volume and balance controls (the usual case) passes directly into the first stage of the line amplifier. Like the amp, the preamp uses a 6922 dual triode in its first stage, but each half of the tube handles a different channel. Each of these halves acts as an inverting feedback amplifier, receiving its input signal via its grid. Output and stage feedback are taken from the tube plates. Feedback from the stage output back to the tube grid is through two resistors in series; there is a stepped variable resistor between the junction of these resistors and ground, part of the rear-panel balance control.

The left and right outputs of the first stage feed the two sections of the volume control, whose output then goes to the line amp's second stage. Operated as a common-cathode amplifier, the plate output of the second stage is directly coupled to the grid of the third. These stages each use one 6922 dual triode per channel.

This final stage of the line amp is configured as a split-load phase inverter, with matched cathode and plate resistors. Feedback is taken from the stage's cathode outputs to the second stage's input grids.

These outputs are also capacitor-coupled to the "H" (unbuffered) output. The cathode and plate outputs are fed to the solid-state buffers, one per signal phase, which feed each channel's balanced and buffered unbalanced jacks—a most unusual way to get balanced outputs in a preamp, though it's often used in power amps. (The buffers, incidentally, consist of small TO-92 MOS-FETs configured as source followers.)

The MM phono preamp is a two-stage circuit using an N-channel J109 J-FET for each stage, with RIAA equalization achieved by a passive network between the two stages. A third J-FET serves as the MC pre-preamp stage.

As far as I know, the way the Eclipse is turned on and off is unique. The preamp has three power supplies: one providing +6.3 volts DC for the heaters and +5 volts for the front panel's control circuitry and the volume control's motor-drive circuit, one to supply +200 volts to the tubes, and one to provide +30 volts for the solid-state circuitry. These supplies use Zener-follower regulators, in which the unregulated DC drives a Zener diode through a series resistor, providing a regulated voltage that drives the gate of a MOS-FET.

When the Eclipse's external power supply is plugged into the AC line and its power switch is on, +5 volts is always fed to the control circuitry so the preamp can respond to a turn-on command from the remote control. In this state, before turn-on, the resistors coupling the Zener diodes to the MOS-FETs' gates are shorted to ground through relay contacts. As a result, all supply outputs (except the 5-volt supply to the control circuitry) are at 0 volts. When the turn-on command is received from the remote, the relay is pulled in and all the regulated supplies rise gently to their final voltages. While the audio circuitry is stabilizing, all outputs are muted by relay contacts. The "CD" input light comes on when the circuits have had time to stabilize, but muting remains in effect until you press the "Mute" button on the remote control. *B.H.K.*

**TABLE II—Input sensitivity, Eclipse preamp.**

	IHF SENSITIVITY	
	LEFT	RIGHT
Line Input to Direct Output	70.8 mV	71.2 mV
Line Input to Buffered Output	83.8 mV	84.2 mV
Line Input to Balanced Output	40.3 mV	40.4 mV
Line Input to Tape Output	3.38 V	3.35 V
MM Input to Direct Output	240.3 $\mu$ V	227.9 $\mu$ V
MM Input to Buffered Output	284.4 $\mu$ V	270.1 $\mu$ V
MM Input to Balanced Output	136.9 $\mu$ V	130 $\mu$ V
MM Input to Tape Output	4.26 mV	3.98 mV
MC Input to Direct Output	34.8 $\mu$ V	33 $\mu$ V
MC Input to Buffered Output	41.7 $\mu$ V	40 $\mu$ V
MC Input to Balanced Output	19.9 $\mu$ V	19 $\mu$ V
MC Input to Tape Output	614 $\mu$ V	573 $\mu$ V

to clip, decreasing overload resistance to the point where the 3% distortion level was reached at only about 0.7 volt output at 20 kHz. For the MM inputs, the overload points at 1 kHz were 20 millivolts with instrument loading and 12.5 millivolts with the IHF load; for the MC inputs, the results were 5.5 millivolts and 3.4 millivolts. I find these overload points to be a bit low, and I'd recommend not using cartridges whose output exceeds about 2 millivolts at reference level (3.54-cm/second stylus velocity at 1 kHz) or using the MC inputs with those few MC cartridges whose output exceeds 500 millivolts at reference.

Distortion for the MM input with instrument loading (Fig. 10) is relatively high.

#### Use and Listening Tests

When I initially tried out the Kora Triode 100 SB amps, with B&W 801 speakers, I was struck by their fine sound. When I added the Eclipse preamp to my system, the sound remained very good.

After measuring the Triode 100 SBs, I hooked them up to Lowther speakers, which I had earlier tried with several other amps. With the Triode 100 SBs powering them, I immediately noticed how good the Lowthers sounded. Detail and resolution were of a high order, the presentation had great authority, and the sound was very natural, although a little more forward and aggressive than with some of the other amps I'd used. With these very sensitive (102-dB) speakers, I could hear some buzz from both Kora amps.

I then used the Triode 100 SBs with Dunlavy speakers. With a First Sound Ref-

erence II passive preamp feeding this combination, I was amazed at how good the sound was. Transparency and musical believability were right up there with the best I have heard with these speakers. Substitut-

**I WAS STRUCK BY THE KORA AMPS' SOUND WITH B&W SPEAKERS, AMAZED AT HOW THEY SOUNDED WITH DUNLAVYS.**

ing the Kora Eclipse preamplifier caused a slight loss of transparency and detail, but otherwise the sound was just about as good. Despite the low-bass rolloff in the Triode 100 SBs, bass quality, detail, and power were very good.

While using the Eclipse preamp in my system over a period of time with many other components, I consistently felt that it sounded very good with line-level signals but that its phono reproduction, though still reasonably good, wasn't quite up to the line section's sound quality. I also felt that the preamp's turn-on delay, nearly 3½ minutes, was excessive, and I'd have liked to have the main control functions duplicated on the front panel.

I enjoyed having the opportunity to experience this Kora amp and preamp in my system. I would recommend auditioning them and that you check out some of the company's integrated amplifiers, which should also sound very good and are more affordable. *A*

## JBL HLS610 SPEAKER



I fell asleep again today while fielding a call from a high-end audio manufacturer. This has been happening more and more to me lately, and it usually goes something like this:

(phone rings)

Me: Please. . . I beg you. . . be someone both genuine and true, bearing news of innovation that restores my faith in the high end at a time when the relentless onslaught of mediocre gear is burning me out like a ten-cent glowworm.

Company Address: JBL Consumer Products, 250 Crossways Park Dr., Woodbury, N.Y. 11797; 800/336-4525; [www.jbl.com](http://www.jbl.com).

Manufacturer: Yo, *Corey!* I got somethin' here's gonna *blow you away, guy!* It's *new*, it's *hot*, it's *great*, it's *sexy*. Oh, Jesus, are you gonna fall in love wid dis ting! Yer heart's gonna beat like a goddam *rabbit*, yer gonna be chewin' *Viyagras* like they're frickin' *Flintstones* *chewables*, know what I'm sayin', guy? Yer gonna. . .

Me: Okay, okay, what is it?

Manufacturer: Hold onto yer jock, chief—it's a. . . [fill in the blank with something I already seen a dozen times last year only better, guy].

**JBL HAS INTRODUCED  
A SPEAKER THAT WILL  
STUN ANY AUDIOPHILE  
WHO HAS NEVER TAKEN  
JBL SERIOUSLY.**

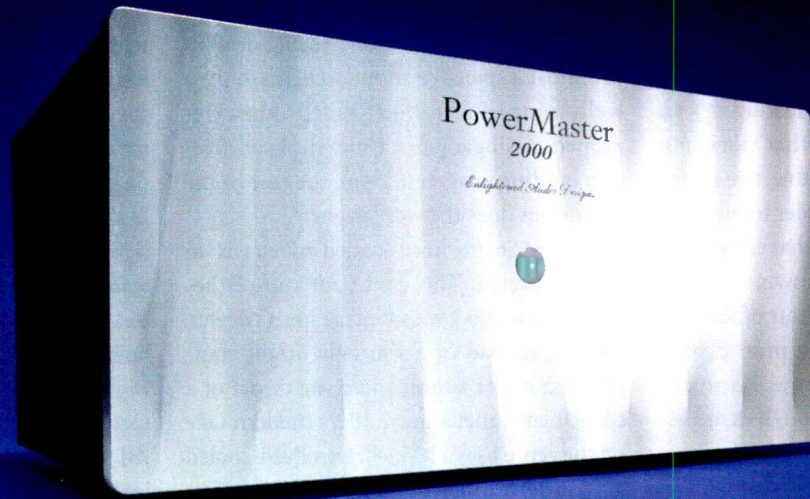
Yet every once in a while, I come across a piece of hi-fi gear that calls attention to itself not only for its basic excellence but also for the wrecking-ball job it does on my mental image of the company. JBL's new HLS610 bookshelf speaker is such a product. Just when I thought JBL had forever consigned itself to a certain position in the loudspeaker food chain as one of the better mass-market brands (though by no means a serious threat to the smaller and more high-performance lines), the company introduces a system that will stun any audiophile who, like me, hasn't taken it seriously as a high-end speaker manufacturer in a long time.

In the case of the HLS610, we have a speaker that isn't, as you might expect from a \$300-per-pair modern-era JBL, merely decent-sounding but hardly competitive with similarly priced models from Paradigm and NHT, the Canadian and American kings, respectively, of high-value, high-end speakers. In fact, the HLS610 is a two-way, horn-loaded speaker that is every bit the equal of—and in some ways, quite a bit superior to—anything these two companies are doing for 300 bucks. The sound I hear from the HLS610 suggests that it's time to take JBL seriously again.

I first heard a pair of HLS610s on a tour of JBL parent company Harman International's new Acoustical Engineering Lab, a kind of large-scale loudspeaker skunkworks in Northridge, California. This multi-million-dollar facility gives JBL's speaker engineers (as well as those of Harman sister brand Infinity) the ability to shape and reshape new designs with a program combining scientific measurement and controlled listening tests designed to zero in on those aspects of loudspeaker performance

Photo: Michael Groen

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that skilled listeners repeatedly prefer. The program—unique, as far as I know, among either high-end or mass-market speaker manufacturers—has its roots in research carried out in the 1980s by Dr. Floyd Toole at Canada's National Research Council, back when Toole had yet to become Harman's vice president of engineering. It's an approach to speaker design that takes into account both objective and subjective methods of judging speakers, in order to push the state of the art past the point that either path has been able to take it on its own.

Throughout my day-long tour of the new labs, I heard all the latest and most expensive JBL and Infinity speakers as Harman's engineers proudly sat me through demo after demo. But I have to tell you, the only time my ears *really* perked up, and I mean perked up like I sat bolt upright and said, "Man, I gotta get a pair of those speakers!" was when, almost as an afterthought, I was given a demo of JBL's new HLS610s. While the demonstrations of the

**THE LITTLE JBLs FILLED  
MY LARGE LIVING ROOM  
WITH IMPRESSIVELY  
CLEAN, LOUD MUSIC.**

high-dollar JBLs and Infinities were driven by expensive Mark Levinson and Proceed electronics, in dedicated listening rooms acoustically treated out the yin-yang and back in again, the HLS610s were sort of casually set up on stands in a much smaller room, hitched up to an older, mid-priced Harman Kardon integrated amp that couldn't have been less audiophile-approved if it were covered with Rush stickers.

But as soon as the HLS610s started singing, I knew they were special. They had that immediately recognizable *rightness* to their sound that seems to elude all but a very few audio designers. That a cheap, simple-looking bookshelf job by JBL, of all companies, had this quality in spades was enough of a shock, but after learning that the HLS610 was wholly designed by a couple of young JBL engineers still in their twenties, I wanted to get them (the speakers, not the young boys) into my listening room to hear what fresh air and new blood sound like.

The HLS610 is the smallest and most inexpensive model in JBL's new HLS (Horn Loaded Speakers? Homeys Love moeSha?)

line of two-way systems that marry bass-reflex polypropylene woofers with horn-loaded tweeters. The bookshelf-sized HLS610 measures 16¼ x 8¼ x 9½ inches and has a fairly solid, 14-pound cabinet that, while not as crypt-of-Dracula dead as the most expensive minis, returns only a well-damped "thunk" when knuckle-rapped. A single pair of nickel-plated five-way binding posts resides on the rear of the cabinet, as does the woofer port.

The HLS610's horn-loaded tweeter is an all-new design. This isn't your run-of-the-mill retro audio geek's vintage horn tweeter, though; instead of a searingly bright compression driver jammed into the throat of a tinny, blatty, metal horn, JBL's modern take on the genre uses a ½-inch, ferrofluid-cooled polycarbonate dome coupled to the listening

room via a shallow, constant-directivity horn made of a non-resonant composite material. Harman's in-house driver factory tailored the horn's shape to the ½-inch dome to pull off a neat series of

tricks designed to turn a fairly undistinguished and ubiquitous driver into a much cleaner, higher-performance tweeter.

The horn-loading significantly increases the tweeter's sensitivity and therefore lowers its distortion—a godsend to this particular tweeter, which has never responded subtly to being hit with a lot of power. But even more important, the constant-directivity horn was designed to flatten the tweeter's off-axis response and match it to the on-axis curve, and also to narrow the driver's dispersion at the bottom of its range to match the dispersion characteristics of the 6½-inch polypropylene woofer at the top of *its* range, thus enabling a more seamless transition through the all-important midrange.

Finally, the horn time-compensates the tweeter to the woofer, which not only pays off in much better measured impulse and phase response but also enabled the JBL design team to simplify the HLS610's crossover to a pair of caps (including a low-distortion Mylar film cap in the series tweeter feed) and an inductor. This is roughly one-third to one-tenth the component count

found in the crossovers of most high-end speakers; it takes an unusually skillful speaker designer to come up with a low-distortion, flat-response system using such a minimalist crossover. (I remember an unintentionally hilarious photo in one of the high-end mags a while back of a noted speaker designer proudly holding aloft the monstrosity of his latest flagship model, a 100-capacitor affair that looked more like a jumbo platter of white tiger prawns than something you'd ever want your audio signal passing through. Being proud of a 100-cap crossover is like being proud that it takes a whole can of Right Guard to make you smell like a human.) It's good to see these younger guys at JBL going the route of clever minimalism instead of following some of their foolish elders who never quite got it right in the high end.

The HLS610's single 6½-inch woofer, is, like the tweeter, that most rare of speaker rarities: a driver designed and built in-house and then redesigned several times during the course of the system's development. One of the dirty secrets in the high-end loudspeaker market is that most manufacturers use stock, off-the-shelf drivers from an outside source. I'll probably get whacked for telling you this, but forget all that crap about "custom" drivers—underneath, it's the exact same woofer or tweeter found in speakers all up and down your dealer's shelf, cranked out by the thousands by widows and kids being barked at by cruel, mustachioed overseers in dimly lit caves. In most cases, the only thing "custom" about a driver is the fifty-cent faceplate with the manufacturer's name branded into the plastic like Mighty Dog.

The HLS610's woofer, on the other hand, was so integral to the design of the finished speaker that when JBL's engineers discovered a frequency response peak caused by a cabinet resonance, they were able to modify the woofer to include a dip at the same frequency, neatly cancelling out the peak as though it had never existed. This in-house, self-supportive minimalism, which stands in stark contrast to the usual high-end approach of throwing as many crossover parts as possible at a driver until it plays ball, is the same approach taken by New Guardians NHT and Paradigm, and it pays off just as audibly for JBL.

# Who pushed in *the* TWEETER ?



No, it's not every audiophile's nightmare; it was designed that way. The revolutionary JMLab/Focal inverted dome tweeter lies at the heart of Focal's international success. It has proven far superior with better coupling and wider dispersion . . . giving you better sound. Manufacturing efficiency has allowed JMLab to offer this technology in their surprisingly affordable Tantal series. The unmatched transient response of these speakers will bring you closer to the live musical event - the trademark of all JMLab products.



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The HLS610's fit and finish is good, and the large-mouth tweeter horn gives the speaker a very clean, modern look (especially with the grilles removed, which is mandatory for getting the best sound out of this system). The HLS610 was designed to sit on a good, solid stand—about 2 feet tall for the best sound (I used a pair of sand-filled, floor-spiked Merrills). For those who prefer a free-standing tower, however, JBL's \$460-per-pair HLS615 features the same driver complement and crossover in a floor-standing cabinet 31¾ inches tall.

Aside from a slightly more extended bottom end, I found the HLS615 to be a sonic doppelgänger to its smaller, less expensive sibling, so when I say something like, "The HLS610 rocks," consider the same thing said for the HLS615.

And the HLS610 *does* rock. Even though it's considerably smoother and more neutral in tonal balance than any other JBL speaker I've heard in years, it does indeed share the family trait of being able to really punch out the rock without falling to pieces, especially when you drive it with a

clean, no-nonsense amp like the Bryston 9B (to be reviewed in an upcoming issue). These little JBLs filled my large living room with impressively clean, impressively loud music, and with less compression and strain than many much larger systems I've auditioned recently.

But you don't really need an amp as powerful as the Bryston to get Rock-Approved levels out of a pair of HLS610s. Even though they're rated just a hair more sensitive than the norm at 88 dB/1 watt/1 meter, I found the JBLs to be a good 4 to 5 dB more sensitive on broadband pink noise than my reference NHT 3.3s, which are rated at 87 dB/1 watt/1 meter. And the HLS610's 8-ohm load is an easy one for an amp to drive, no doubt owing to the simplicity of the crossover; even a cheap little 35-watt, \$350 NAD 314 integrated amp was easily able to drive the JBLs to satisfyingly loud levels.

Think "JBL sound" and you think of something like the classic JBL 4312 studio monitor, with its California mix of ballsy FM disc-jockey midbass and crisp, over-bright highs. I'm happy to report that the HLS610 sounds nothing like that at all. Far from being a bright 'n' bassy rock speaker, the HLS610 falls about midway between my two other favorite bookshelf speakers in the less-than-\$400 range: It's warmer and slightly less clean on top than Paradigm's Mini Monitor, but it's also brighter and more airy in the treble than NHT's Super-One. Because of the narrower throw of the tweeter horn, the JBLs did sound a bit on the bright side when I first set them up firing directly at me, but once I found the right amount of toe-in (you want to aim these speakers so their lines of fire cross a foot or so in front of your nose), the tonal balance fell nicely into place and set the stage for the HLS610's most stunning attribute: its best-of-class imaging capability.

I thought I'd heard the last word in three-dimensional imaging for less than \$400 when I reviewed the NHT SuperOnes and Paradigm Mini Monitors, but properly set up, the JBL HLS610 confers yet another level of accurately decoded stereo imagery. The soundstage thrown by the JBLs was deeper than the NHTs', wider than the Paradigms', and more vividly detailed than either one of them. The sheer amount of recorded detail I heard from the HLS610s

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was a revelation at this price, and it rivaled what I've heard through far more expensive speakers. As much as I've gushed over the SuperOnes and Mini Monitors in print, after hearing all three in my listening room, I think the HLS610 is the better speaker overall. Although it lacks the NHT's lushness and the Paradigm's treble purity, the JBL delivers a clearer and more accurate view of the audio signal. Of the three, it came closest to the sound quality produced by the \$4,300-per-pair NHT 3.3.

The HLS610's bass performance is also excellent for its price class. JBL's young speaker engineers have clearly wrung every last bass note possible out of this 6½-inch ported woofer, and the result is a bookshelf speaker with a tight, extended, and refreshingly unhyped low end. The HLS610 does not fake its bass with extra midbass warmth: It's quite flat all the way down to its 55-Hz cutoff (45 Hz for the floor-standing HLS615), which makes it an easy blend with a good subwoofer. (JBL told me it's introducing a \$300 companion sub for the HLS610, but production hadn't begun as this review was going to press.)

The midrange, too, is a strength of the HLS610. Recorded vocals and instruments came across as extremely natural and uncolored and, because of the JBL's imaging magic, very real in terms of size and depth. If a recording was made with spaced omnidirectional mikes, I heard the amorphous, indistinct imaging this stereo miking tech-

**THE SHEER AMOUNT  
OF RECORDED DETAIL  
I HEARD  
FROM THE HLS610s  
WAS A REVELATION.**

nique is known for; if I played a disc like Ry Cooder and V. M. Bhatt's *A Meeting by the River* (Water Lily Acoustics WLA-CS-29), recorded with a pair of figure-8 mikes in the classic Blumlein configuration, I heard a pair of acoustic guitars hanging there in mid-air in my living room, at just the right size and width and in stunning, see-through clarity.

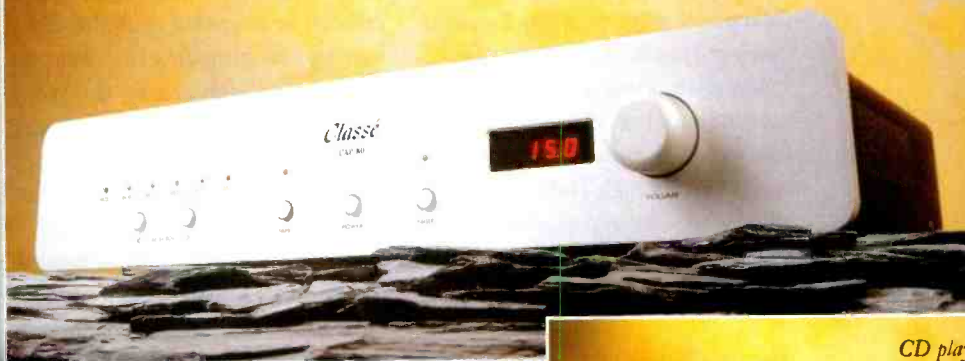
Sometimes, though, dissecting my impressions of a speaker's sound into categories like bass, midrange, and treble does not really read back to me as being a full account of how I feel about the product. I could go on and on about how astonishing its imaging and resolution are, but that's not really why I'm so juiced by this speaker. No, the real reason I consider the HLS610 one of the most important hi-fi products I've reviewed this year is that it signals a return to the high end by JBL, one of the true pioneers in the loudspeaker field. By breaking with its past, by cultivating bright young design talent, by putting its money where its mouth is by erecting a multimillion-dollar facility whose sole purpose is to advance the state of the loudspeaker art, JBL appears to be back with a vengeance as a true player in the high-performance speaker market.

Old dogs aren't supposed to learn new tricks, but that's just what this new speaker is—a new trick. The HLS610 is the best \$300-a-pair speaker I've heard to date and an exciting harbinger of things to come from JBL. A

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# MERIDIAN 861 DIGITAL SURROUND PREAMP



**H**igh-end audio is split between audiophiles who seek the ultimate in stereo quality and those interested in exploring the strengths and limits of surround sound. The first group views surround as a corruption, while the second sees the stereo purists as living in the past.

Meridian is one of the small but growing number of companies that seek to suit both camps. It has managed to marry high-end stereo capability with surround processing that challenges the limits of today's video soundtracks and multichannel music recordings yet can enhance stereo without altering its transparency and soundstage.

The Meridian 861 Reference Digital Surround Controller is a state-of-the-art device that costs from \$9,950 to \$16,000, depending on options. It is packed with technical features and is designed so you can easily upgrade

it to accommodate current and future surround formats.

Like a PC, the 861 is modular, allowing its hardware to be rapidly upgraded or updated by sliding in new circuit boards. Its software, including control and decoding algorithms, can also be upgraded or updated, by feeding new programs (available on floppy, via E-mail, or on the Web) from a PC into its RS-232 port (which is also used for digital control and audio connections to Meridian 800- and 500-series components).

The PC influence can also be seen in the 861's specs, which include processing power said to be in millions of instructions per second (mips). The processor already handles 180 mips, and its architecture can support up to 1,440 mips. This may sound absurdly high by today's standards, but Meridian has demonstrated a digital room-correction upgrade that would require 350 mips

and a DVD-Audio system that would need 500 mips.

Although the Meridian 861 builds on the success of the Meridian 565 (*Audio*, September 1996), still one of the best surround processors extant (Meridian continues to develop and issue updates), it has a completely different architecture and even greater adaptability. It's also more user-friendly. While dealer setup is recommended for the 565 and 861, both are usable right out of the box. But the 861's setup is easier, thanks to excellent software that you load from a PC. Its well-written owner's manual provides excellent guidance for setup and use of the processor, its features, and its remarkable range of adjustments. (Unless you read the manual, you'll never really know what the 861 can do!)

The 861's 24-bit surround processing circuits decode Dolby Pro Logic, Dolby Digital (AC-3), DTS, Ambisonic, and MPEG signals, all with Home THX processing available. The Meridian automatically loads the proper surround processing and does so with an absolute minimum of digital clicks and buzzes, even with DTS.

The D/A and A/D converters are 24-bit delta-sigma types. The processor can accept 48-kHz signals, will soon accept 96-kHz input, and is designed to accommodate an upgrade to 24-bit, 192-kHz conversion. It can also decode the new Meridian Lossless Packing (MLP) system, a true lossless compression scheme that has been selected as the standard system for DVD-Audio. MLP can deliver multichannel audio at high data rates, the rate depending on the number of channels. On DVD-Audio it will deliver as many as eight channels of up to 24-bit data at sampling rates up to 192 kHz, and Meridian is demon-

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strating MLP CDs with 20-bit stereo and with full Ambisonic surround.

The 861 I reviewed had 12 analog inputs, 12 digital inputs, enough analog outputs for surround, and *digital* outputs for two to eight speakers, making it one of the few components designed to feed self-amplified digital speakers. But the 861's modular construction makes it as adaptable (and upgradable) as a computer, so I could have gotten one configured differently—with, for instance, more output channels or a different mix of inputs. Both MM and MC phono inputs are available, too, as are digital and analog tape loops and facilities for feeding and controlling audio and A/V systems in two or more rooms.

The more I read in the 861's manual, the more subtle features I discovered. For example, the bass and surround effects can be fine-tuned to a far greater degree than with many competing processors. You can increase the output of the low-frequency effects (LFE) channel by up to 10 dB, boost the other channels' bass, and set a bass limiter to prevent overload. The 861 can also monitor all its speaker outputs and invoke a psychoacoustically designed limiter to gracefully reduce the signal to all channels before any speaker overloads.

The 861 delivered excellent stereo reproduction and some of the best surround sound I have ever heard. It not only decoded Dolby Digital and DTS as well as possible but also extracted center-, rear-, and side-channel information that added life to even the best stereo recordings while preserving their nuances. It's a truly excellent processor/preamp, one whose sound approaches that of the best stereo preamps around. That's not to say its sound is perfect: Some top-of-the-line Krell, Conrad-Johnson, and Pass two-channel preamps are a tad more transparent or offer slightly better dynamic contrasts and stereo soundstage detail. Likewise, a few stereo D/A converters sound a bit better than the 861. The dCS Elgar D/A converter, for example, is somewhat more transparent. It also has slightly better dynamic contrasts in the 24-bit/96-kHz digital mode, though the Meridian may prove equally good when it is upgraded to play recordings made with this sampling frequency and bit depth.

But I have heard no better surround than the 861 delivered. Its DTS, Dolby Digital,

Dolby Pro Logic, and THX Cinema modes all sounded excellent. The logic steering in Pro Logic and THX modes was as good as I have heard. In the center, side, and rear channels, sound quality seemed to be limited more by the soundtrack itself than by the equipment. If you want to hear the best in surround music, and what a really good processor can do to deliver realistic surround effects with clean stereo recordings, the Meridian 861 is as good as it gets.

The 861's sound quality is enhanced by its flexibility. There's even an adjustment to compensate for lip-synchronization errors that can occur in TV transmission. And the delay controls for the various channels make it easy for you to establish a coherent sound field in your listening room, as does the ability to save changes to factory-preset adjustments and to create your own presets.

The 861 also addresses the reality that people do watch and listen to television, with a TV Logic setting that expands the spatial quality of standard stereo TV signals as well as mono and "Academy" settings for old programs and movies. If you watch old movies, you may find the "Academy" setting to be particularly good.

What I find unique, however, is the sound quality of the 861's music modes. Rather than a selection of synthetic, unnatural-sounding hall modes, the 861 provides a variety of music settings that are designed to get the best possible sound from different types of recordings. For example, the "Music" setting works especially well with old recordings processed in synthetic stereo and for recordings made with spaced omnidirectional microphones. It adds improved center fill and anchors the soundstage in ways that enhance its realism. The "Tri-field" setting seems even better on the 861 than it was in the 565. It works well with good, conventional stereo recordings and with stereo-TV signals that have adequate separation, adding just enough center fill to eliminate any hole-in-the-middle effects, and it can be tweaked to get the best from specific recordings and your speakers.

The "Ambisonic" setting is impressive but of little use to Americans and requires special speaker placement to yield best results. In contrast, the "Super Stereo" and "MusicLogic" processing modes add a surprisingly convincing touch of surround life to multitrack and studio-mixed recordings.

"Super Stereo" works well even with some top-quality audiophile recordings from Chesky, Reference Recordings, and Telarc.

The 861 is the first processor I have heard that really excels with DTS music recordings, thanks in part to a mode that lowers the level of the effects channel by 10 dB to correct for the excessive bass information on some DTS music recordings. Sonically, these are still a very mixed bag, but try *The Big Picture* (Telarc CD-80-437), Bonnie Raitt's *Road Tested* (DTS 1010), The Eagles' *Hell Freezes Over* (DTS 1006), and Tom Jung's production of *dmp Big Band Salutes Duke Ellington* (MAS CD-803).

The Meridian 861 worked fine in my regular home theater system, but I was really fascinated by its operation in an all-Meridian system with self-powered digital speakers (Meridian DSP5500 left and right front speakers, DSP5000 side and rear speakers, a DSP5000C center channel, and an M1500 subwoofer).

I was gratified that the all-Meridian system required just one thin cable per digital speaker. The real magic, however, was in the sound. Excellent as similar Meridian systems had sounded at shows, the one in my home sounded even better. The DSP5500 and DSP5000 were particularly impressive. They were highly transparent, they had very good dynamics and frequency range, and their dispersion is well chosen to provide good focus and soundstage detail without restricting the listening position. Especially striking were the absence of added warmth or a suck-out in the lower midrange and upper bass and the coherent, smooth frequency response and natural timbre.

Let me focus on the DSP5500s in my main channels, which had, thanks to their digital processors, an extraordinary range of practical user adjustments: bass and frequency tilt, room-position correction, phase selection, and a memory for favorite tone settings. This may not suit the purist, but it has immense value in most homes. The speakers deliver very smooth, extended highs and powerful bass down to about 35 Hz. The tweeter, midrange, and two woofers each get 70 watts of amplification, enough to drive them to peak levels greater than 110 dB SPL. (They'll play louder, but normally I don't listen at higher levels.) My only serious reservation was that some of the dynamic contrasts were not totally nat-

ural; sudden, major shifts in level were not reproduced as accurately as they are by a few other top speakers (but those impose trade-offs of their own).

The DSP5000C was a very good center-channel speaker and matched the timbre and imaging of Meridian's main and surround speakers better than most center speakers do. Nevertheless, it is a center-channel speaker, and I found that music sounded better when I substituted one of the DSP5000s from the surround channels.

I also moved the system from my home theater to my main listening room, using the DSP5500s for the main channels again and DSP5000s in the center and surround channels. This setup reproduced even the best classical music recordings superbly. It also did very well in reproducing DTS music recordings and classical Dolby Surround recordings, such as music by Mendelssohn on *Song of Praise* (Delos DE 3112) and the Voices of Ascension in *Beyond Chant* (DE 3168).

What really surprised me, however, was what happened when I started experimenting with my favorite stereo and analog

recordings. I quickly learned to select between the 861's music modes—usually "Trifield," sometimes "Super Stereo"—and to use the remote to balance the settings for a given recording. And once I learned how to adjust center fill without distorting the soundstage and to tweak the rear channels to add a realistic sense of space, the soundstage was consistently better than any I have heard from pure stereo and notably free of the "iron vise" effect that commands you to sit in the sweet spot to get the best sound.

I would advise stereo-only purists to suspend judgment of multichannel sound until they hear this system. Together, the Meridian 861, DSP5500, and DSP5000 demonstrate that sophisticated processing can do wonders for many of the best stereo recordings. That far too many DTS and Dolby Surround recordings sound unnatural because of their producers' ineptness at the recording console shouldn't be an indictment of surround sound. No audiophile should forget that a comparatively limited number of stereo recordings have a realistic soundstage. The Meridian system can make great performances on mediocre

recordings come alive in ways that purist stereo setups cannot approach.

I did, however, find Meridian's M1500 subwoofer merely adequate for LFE-channel use. A Polk SRT subwoofer produced better results, although it was a bit too warm for the rest of the Meridian system. I would strongly suggest trying an REL or Vandersteen subwoofer instead of the M1500, which cannot provide the dynamic contrasts, massive power swings, and room-filling bass needed for home theater.

Used with a conventional mix of amps and speakers, the Meridian 861's sound quality is directly comparable to that of purist A/V preamp/processors like the Krell A+V and Theta Casablanca, and its music modes surpass those of any other processor I've heard. For popular music, the Lexicon DC-1 is competitive and even offers some adjustments that the Meridian 861 does not. But the Meridian's musically realistic enhancement of purist stereo recordings is unequalled. Indeed, the 861's "Music," "Trifield," and "Super Stereo" modes define the performance level that other surround processors must eventually meet. **A**

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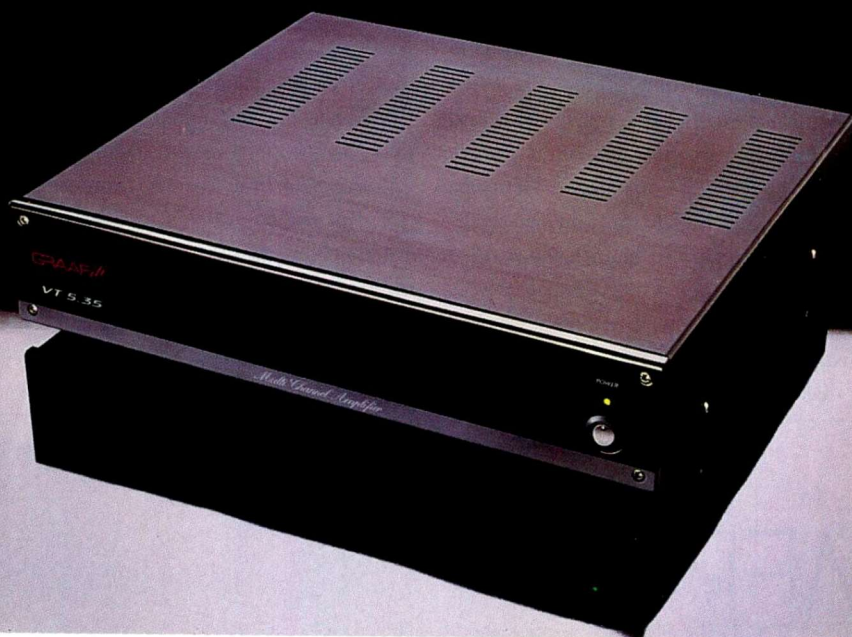
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**TANNOY**

## GRAAFiti VT5.35 FIVE-CHANNEL AMPLIFIER



**Y**ou probably can't get further apart—intellectually, topologically, conceptually, or politically—than output-transformerless (OTL) tube amplifiers and multichannel/home theater equipment. And yet there is at least one brand on the planet that has both breeds in its catalog: GRAAF, of Modena, Italy. With the disappearance of the legendary Futterman OTL amps, this company made its name globally with modern OTL amplifiers—ones that work, that don't burst into flames and take out loudspeaker drivers. But GRAAF

**Company Address:** c/o Sonic Signatures, 20 Marsh Dr., Mill Valley, Cal. 94941; 415/389-1114.

is also sharp enough to know that only the seriously adventurous would even consider owning an output-transformerless tube amplifier. And so the company begat GRAAFiti, a line of push-pull tube amps, affordable all-tube preamps, tube/solid-state hybrids, integrated amplifiers, and other products that don't quite fit the profile of the no-compromise GRAAF brand (whose models, incidentally, all have balanced operation). And since GRAAFiti components also enjoy less elevated pricing and more popular appeal, it seems only fitting that GRAAF would use

**THE ELEGANT GRAAF  
IS OBVIOUSLY  
FROM THE SAME LAND  
AS ARMANI AND ALESSI.**

the GRAAFiti banner for its home theater equipment.

While I've yet to see the company's forthcoming surround processor, I have had the privilege of living with the GRAAFiti VT5.35, a tube/MOS-FET hybrid five-channel amplifier. If you assumed an automotive link in the model number, you were right; the firm's young business director is enamored of BMWs, despite running a company a stone's throw from Ferrari, Lamborghini, and Maserati. But maybe he has the occasional twinge of pro-Italian guilt, for a subdivision of Ferrari (that legendary company's own restoration department) paints GRAAF OTL amplifier chassis in the same spray booth as such delights as the Lamborghini Miura, the ex-Frank Sinatra Dual-Ghia, and enough other pieces of prime Italian metal as to cause heart palpitations amongst *Car and Driver* staffers. You want pedigree? You got it.

In the case of the VT5.35 amp, though, the 5.35 stands for "5 channels, 35 watts apiece." Now, before you start thinking "Wussy Europeans—gimme a kilowatt!" note that the VT5.35 doesn't produce just any ol' 35 watts. This amp behaves like its model number should be 5.100. Each channel's circuit is configured as a complementary pair of MOS-FETs in push-pull mode, driven by a twin-triode 6922 tube (the professional version of the audiophile-approved ECC88), which also provides the re-

quired voltage gain. Able to drive impedances from 4 to 8 ohms, the VT5.35 seems unfazed by even low-impedance or reactive loads; a selection of

speakers that included five Apogee Ribbon Monitors and LCRs, Quad ESL 63s, Quad 77-10Ls, and a pair of (15-ohm) BBC LS3/5As showed no weakening of resolve, no cause for concern.

# How Do Your Speakers Measure Up?



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

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

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

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

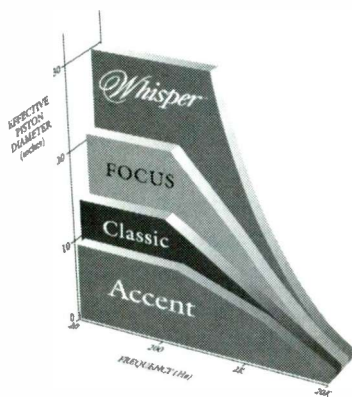
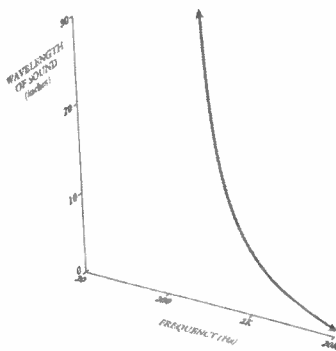
The laws of physics dictate that a loudspeaker's effective radiating diameter should increase proportionally with the wavelength of sound to provide consistently low distortion, broad dynamic range and uniform power distribution.

Study the chart to the side. Note how closely Whisper's effective radiating diameter tracks the wavelength of sound. This provides stable imaging, low distortion and extraordinary dynamic capabilities. This type of chart is very useful in approximating the potential performance level of any loudspeaker design. You may find it helpful to chart the loudspeakers you are currently using on this graph. (We think you'll be in for a surprise!)

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Perhaps because of the audio crowd's fear of errant OTLs, GRAAF is a notoriously cautious company, and reliability seems to be one of its *causes célèbres*; the company acts as though it were trying single-handedly to right all be-tubed wrongs. Indeed, its literature contains the following statement: "One of the parameters decided in the early design stage was that the amplifier should be indestructible even when used in extreme conditions. This was in order to guarantee the highest possible level of reliability in conditions of continuous heavy use."

Thus, part of the recipe is a collection of fast-acting protection circuits that enable the VT5.35 to cope with short-circuits lasting as long as several seconds. The five output stages are fitted to individual, identical, fully modular circuit boards. Open the lid, and the view is almost computerlike, with each module terminating in a strip reminiscent of PC cards. Should a channel fail, this ensures simple replacement. I would even go so far as to suggest that most users could do it themselves, if it didn't void warranties and call down upon us the wrath of consumer protection agencies and other nanny-state, do-gooder scum.

The VT5.35's power supply comprises two transformers followed by three rectifier stages, each with its own stabilizing and filter circuits. All components selected by GRAAF are of the highest quality and designed for heavy-duty use; the company's doing its best to support local industry by buying as many Italian-made parts as possible. Among the ingredients are metal-film and wire-wound resistors, polypropylene capacitors, and toroidal transformers with low magnetic-flux loss. (Italy is rife with electronics specialists.) All connectors are gold-plated, robust, and able to mate with just about any termination your speaker cables might wear. And still they meet the absurd, costly, divisive CE regulations.

(Oh, how lucky you are to have an ocean between you and the Eurocrats of Belgium.)

Simplicity is the order of the day with the VT5.35. The channels are clearly marked "1" through "5," with each module's rear panel containing only the positive (+) and negative (-) speaker terminals and a phono socket. That's it. The gloss-black front

panel wears only an on/off switch. But this near-absence of detail means that the amp is embarrassingly elegant and obviously from the same land as Armani, Alessi, and Panerai.

In my home, setup was simply a case of inserting the VT5.35 into an up-and-running system that contains, variously, an out-of-production Marantz multichannel amp or a combination of Acurus amps. The program source is a Theta Digital

ital Data III CD/laserdisc transport, and I also had a Pioneer DVL-909 DVD/LD combo player during the review period; my current fave processor is the DTS-equipped Lexicon DC-1 ("Auricle," June). Speakers were as listed above, but for most listening I used the Apogees, which scarcely taxed the VT5.35.

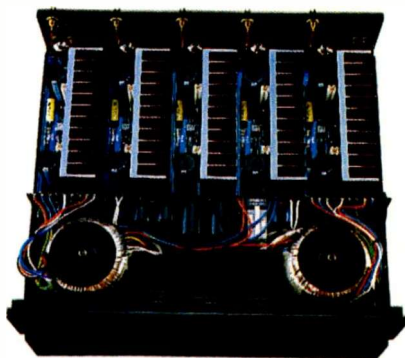
At \$4,650, the VT5.35 is hardly the sort of amplifier that will appeal to those of limited means. It is not, I suspect, going to find its way onto the short lists of people upgrading from sub-\$1,500, all-in-one A/V receivers. Its five-channel nature automatically precludes a film-hating, audio-only audience (which, you'll be surprised to learn, still exists in parts of Europe). On the other hand, it's a great way to set up a biamplified system with a channel left over for a subwoofer. But it should seduce two sorts of consumers. Primary appeal will be to the audiophile who has the space or funds for only one system, which has to accommodate both audio and video. The other type of owner just has to be the purist with a cost-no-object attitude who, for whatever reason, needs a home theater system in another room.

In either case, there's a need or a desire to acquire something suitably high-end but falling well short of the \$10,000-plus range. What GRAAF has done with the VT5.35 is a packaging miracle that lets you have your tiramisu and eat it, too. It's not much bigger than a single component of the international-standard, 17-inch-wide (430-millimeter) persuasion. Its ventilation requirements are minimal. It was designed to avoid all of the concerns that make hair-shirt, living-on-the-edge high-end gear anathema to the casual owner who merely wants to enjoy music and movies.

And yet there are no obvious sonic compromises. Admittedly, some of you are so hidebound by national tastes and prejudices as to argue that anything less than a kilowatt is not worth considering. *Godzilla's* PR army might argue that size matters, but for some, so does finesse. And, amusingly, that's what the VT5.35 brings to a table not overburdened with subtle flavors.

When assessing a home theater component in a pure audio context, it's easy to forget that the average home theater enthusiast, like the typical car stereo devotee, has the sort of appetite best associated with all-you-can-eat buffets, loud shirts, and 42-ounce soft drinks. It's a thud-and-blunder world, where Sly and Arnie set the tone, where explosions matter more than dialog. But, hey, I enjoy wallowing in a Tarantino-choreographed bloodfest as much as the next guy. Alas, many of us have been rendered a tad precious and sniffy—whatever our tastes in movies—because our first love (audio) meant music on its own, when domestic VCRs weren't even a twinkle in Morita's eye. So we want subtlety, even when the subject matter might involve a Bruce Willis-led assault with automatic weapons.

But let us backtrack into audiophilia for a moment. If there has been anything good produced by the single-ended triode brigade, it's a flood of speakers of such high sensitivity that pursuing wattage into high double digits seems like gluttony. And the VT5.35 benefits from this because it can be mated with all manner of speakers that enjoy better than 90-dB-for-1-watt sensitivity. Although GRAAF hasn't so much as whispered the letters S, E, and T, it's quite obvious that the company has been banking on an audience *au fait* with modern, high-efficiency designs.



**THE GRAAF'S SOUND IS VELVETY AND RICH YET STILL HAS PLENTY OF DETAIL AND KICK.**



This kinda rules out any worries about power—or the lack thereof. You have to put it in context: An amp this size—physically and wattwise—wasn't designed to fill a home theater of near-Rialto dimensions, with the images fired at a 120-inch (diagonal) screen. This is what the Italians understand. It's why those teeny Fiats of yore were so blazingly quick, why a teaspoon-sized cup of espresso packs as much kick as a quart of Denny's finest, and why you need only a couple of drops of balsamic vinegar.

But to hell with the oomph; that depends entirely on the sensitivity of your speakers. What the VT5.35 delivers—yes, even for your cinematic pleasure—is a smooth, sweet sound that I didn't fully appreciate until I turned off the pictures or switched to DTS-encoded CDs. There's enough tubey warmth to remind you of the presence of the 6922, although fans of the latest MOS-FETs will tell you they're now as tubelike as we were promised when they first appeared. The sound is velvety and rich yet still has plenty of detail and kick, whether from a drum or a grenade. But where the GRAAFiti VT5.35 really reveals its strength, in either cinema or concert hall mode, is in its solid imaging capability.

Despite five power-amp modules sharing one enclosure and power supply, the VT5.35 betrays no crosstalk or channel bleed. Furthermore, with both Dolby Digital and DTS sources, it provides all-encompassing surround sound, with no holes between channels and no phasey or smeared images. But I must emphasize that this amp was used in a system in a manageable room of 14 x 22 feet, with speakers that are a far cry from Apogee's first amp-busting models.

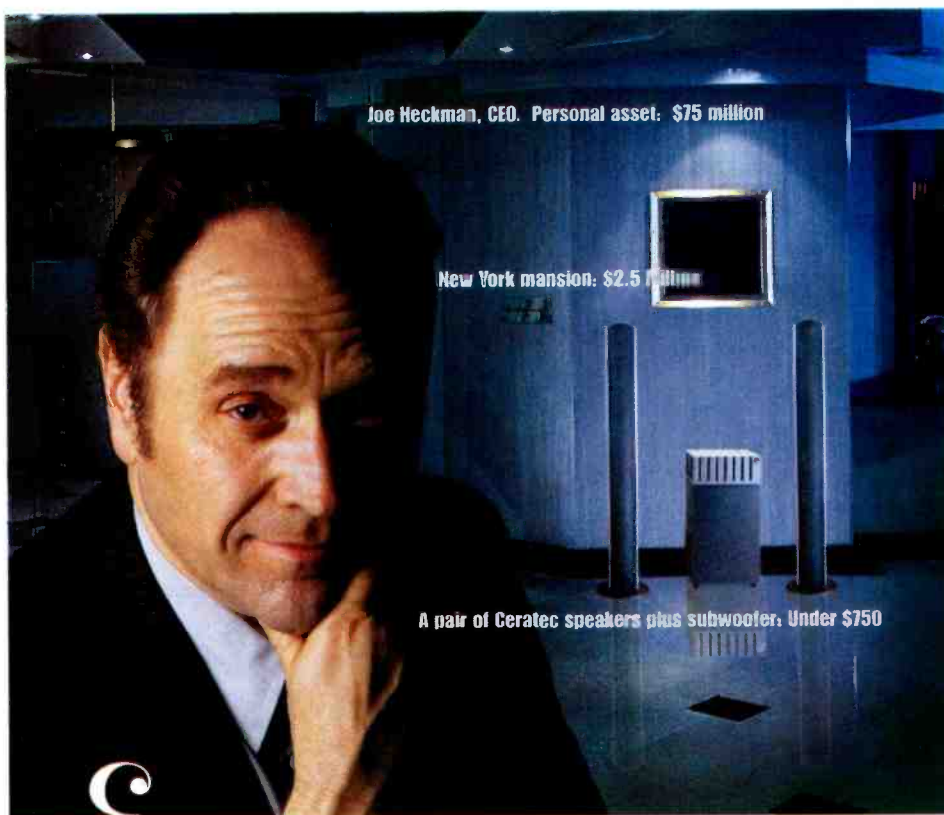
Admittedly, an Italian company making exotic tube amps is the last you'd imagine would be capable of producing a competitive—no, make that utterly desirable—home theater amplifier. But GRAAF recognized and rose to the challenge. The VT5.35 is one honey of a multichannel amplifier. It looks just dandy. It's built totally unlike anything else from Modena, but it embodies the same brio. And if you need a bit of ego polish, you're still entitled to boast that your amp's manufacturer uses Ferrari as a subcontractor. . . .

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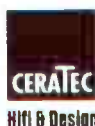


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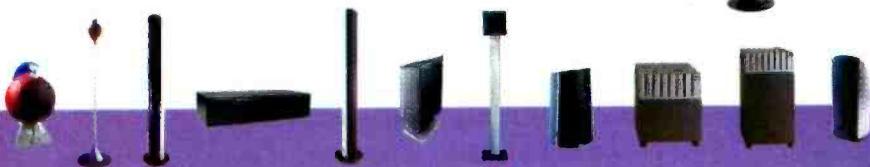
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# CLASSICAL RECORDINGS



**Stravinsky: Firebird Suite; other works by Debussy, Copland, Gershwin, Bartók, Shostakovich, Satie, and Mingus**

Michael Perlowin, pedal steel guitar  
NEWPORT CLASSIC  
NPD 85583; 52:02

Sound: A, Performance: A+

If you're the sort of listener who runs for cover whenever instruments not native to the symphony orchestra are used to perform classical music, start running right now. But if you're a musical libertarian, you should read on.

Pedal steel guitar virtuoso Michael Perlowin begins this endeavor with the premise that his chosen instrument is misunderstood. He views the steel guitar as being "possibly the most interesting instrument ever invented. . . . Technically, it's completely different from any other instrument, and it defies all the rules of physics as to how instruments work." Although the pedal steel is usually identified with country and

western music, Perlowin feels it is unduly confined to that genre. He cites limiting the piano to classical music and the saxophone to jazz as being equally ridiculous situations.

To counter this misunderstanding, Perlowin features the "versatile" steel guitar on such well-known clas-

sical works as Aaron Copland's "Fanfare for the Common Man," Claude Debussy's "Prelude to the Afternoon of a Faun," Igor Stravinsky's *Firebird Suite*, George Gershwin's *Prelude No. 2*, Bela Bartók's *New Year's Song, No. 4*, Debussy's "Le Petit Nègre" and "The Maid with the Flaxen Hair," Eric Satie's *Gymnopédies No. 1*, a Dmitri Shostakovich Polka from the *Golden Age* ballet, and a jazz standard, Charles Mingus's "Good-Bye Pork Pie Hat."

To realize these works, Perlowin skillfully arranged them and overdubbed a warehouse of string instruments—pedal steel, Hawaiian steel, five-string banjo, fretless electric basses, Guild Ashbury rubber string bass, double bass, mandolins, auto-harp, and various acoustic and electric guitars. Most of the percussion was performed live by Perlowin and others. The notable exception to this was the *Firebird Suite*, in which the percussion was sequenced on a computer. Electronic and tape effects are also used.

Open your ears, though, to any of these tracks, and you will be disabused of the idea that the pedal steel should remain solely in country music. (*Editor's note:* Or maybe you won't be.—D.H.) When performed on pedal steel, Copland's "Fanfare

Illustration: © Tomi Nick Cocotos

## TORU TAKEMITSU

**Takemitsu: From me flows what you call Time; Twill by Twilight; Requiem (For String Orchestra)**

Nexus, Pacific Symphony Orchestra;  
Carl St. Clair

SONY CLASSICAL  
SK63044; DDD; 61:51

Sound: A, Performance: A

The late Japanese composer Toru Takemitsu (1930-1996) wrote extensively for the movies as well as the concert hall in a style that resembles Impressionism. The music shimmers, undulates, sparkles, unfolds, and mesmerizes in the way a body of water can hypnotize as it catches and transforms the light it reflects.

There seems to be something quite spiritual and satisfying about each piece on this wonderful CD that comes as close as human beings can to transformation and the source of absolute serenity. The Pacific Symphony sounds as good as any in the world.

This CD conveys the ample warmth and reverberation of Segerstrom Hall at the Orange County Performing Arts Center (Costa Mesa, Cal.) without sacrificing clarity. The instruments of Nexus, the Canadian percussion quintet that joins the orchestra as soloist in "From me flows what you call Time," are recorded extraordinarily. *Rad Bennett*



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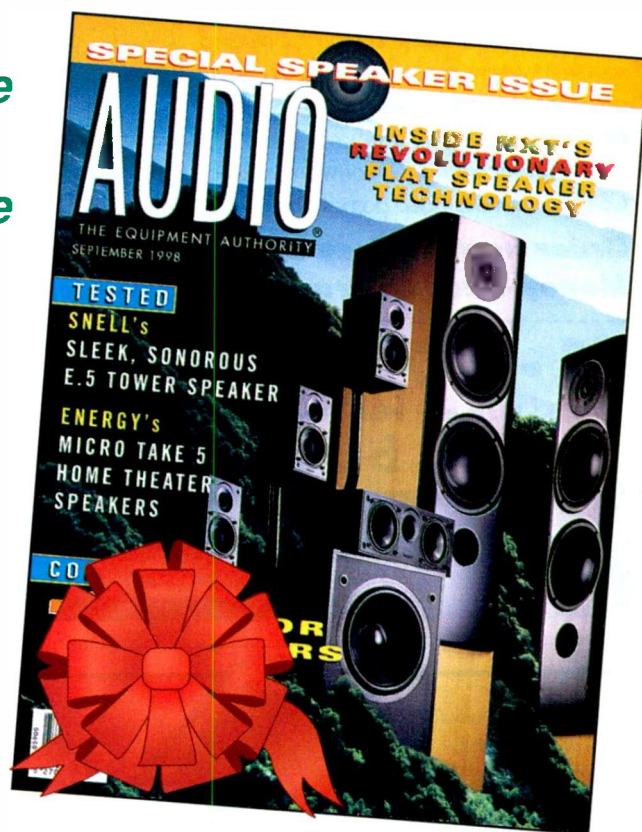
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for the Common Man" now seems better fitted to its title. The full-length "Prelude to the Afternoon of a Faun" is the CD's jaw-dropper: The E-Bow—a battery-powered, hand-held unit that infinitely sustains a string instrument's note with its pulsating magnetic field—carries the melodic line and yields a sound reminiscent of the theremin.

This CD is a classical kick in the pants. Don't miss it if you want to experience a whole different slant on classical or the steel guitar!

John Sunier

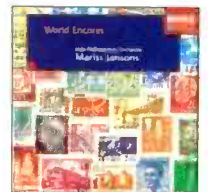
**World Encores (Works by Bernstein, Kim, Alfvén, Tchaikovsky, Dvorák, Sibelius, Elgar, Grieg, Bizet, Bach, Kodály, Mascagni, Villa-Lobos, Toyama, Dinicu, Chapí, J. Strauss, Jr., Gade, and Theodorakis)**

Oslo Philharmonic Orchestra, Mariss Jansons

EMI 56578; DDD; 79:04

Sound: B+, Performance: A

This set is just about what one would expect from one of today's leading conductors and the orchestra he has built into a world-class ensemble. The vital, alert, appealing, and idiomatic performances are generous aural evidence of the international society we've become. Amidst welcome familiar repertory are some remarkable discoveries, such as Toyama's "Dance of Celestais" and "Dance of Men," Alfvén's "Vallflickans Dans," and Theodorakis's Finale from *Zorro Suite*. The only reservation is a bit of reverberant smear that muddies detail in some of the big climaxes. But overall, this is a joyful listening experience.



Rad Bennett

**20th Century French Wind Trios (Works by Françaix, Milhaud, Canteloube, Tansman, Ibert, Pierné, and Auric)**

Chicago Chamber Musicians

(Michael Henoach, oboe; Larry Combs, clarinet; William Buchman, bassoon)

CEDILLE CDR 90000 040

DDD; 78:35

Sound: A, Performance: A

This is terrific stuff if you like chamber music for winds. Darius Milhaud's *Suite After Corrette*, which makes some obeisance to the formalities of the 18th-century French composer Michel Corrette, is a delicious romp that I've long cherished on a 10-inch LP with little hope of finding it on CD. Also included is another Milhaud favorite, the *Pastorale*.

The Pierné of this collection is not Gabriel, but his virtually unknown cousin Paul, who died in 1952, in his late 70s. On the basis of the

present piece—a sort of pastorale with variations—I'd very much like to hear more of his music. Also relatively unknown is Alexandre Tansman's Suite for Wind Trio (though "reed trio" would be a more precise translation of "Trio D'Anches"). It is arguably the least specifically French of this collection (Tansman was born in Poland), but its imaginative use of the three instruments makes it a worthy inclusion. Jacques Ibert's Five Pieces for Trio, which follows, is quintessentially French: witty, beguiling, and imbued with that essential French ingredient, clarity. Then there is "Rustiques" by Joseph Canteloube—yes, he of *Songs of the Auvergne*. Everybody talks about Canteloube's original (non-folk song) works, but few do



anything about them. The Chicago trio is an exception, and the "Rustiques" are much what you'd expect from the folk songs: flavorful and expertly characterized.

That leaves the opening and closing numbers, Jean Françaix's Divertissement and Georges Auric's Trio, respectively. The Divertissement is very diverting indeed, and the Auric is even more so. All told, it is a wonderful collection.

This disc shares three numbers (the Ibert, Françaix, and Canteloube) with a Discovery CD, *Festival of French Music* (DICD 920181), which was available until recently, but the Cedille is worth the price of admission for the Milhaud and Auric alone. Moreover, Cedille's sound is distinctly better: extremely clean and smooth, with a gorgeous, restrained sense of acoustic space around the performers. The decade-old Discovery recording is very forward and therefore very dry, with some peakiness in the pickup.

The Discovery performance presents the wit of some pieces with a little extra pungency and, frequently, at slightly brisker tempos. However, the Chicago group's polished ensemble and legato, as well as its sensitive and graceful phrasing, are more than a match for Discovery's Trio Avena.

Robert Long

## PIER DOMENICO PARADIES

### 12 Harpsichord Sonatas—1754

Enrico Baiano, harpsichord

SYMPHONIA SY 95140

DDD; 77:36

Sound: A, Performance: A+

Neapolitan composer Pier Domenico Paradies' dozen sparkling sonatas show that he was influenced by harpsichord master Domenico Scarlatti as well as the later classic style of Mozart and Haydn. Paradies, who earned his keep as a harpsichord teacher in London, continued Scarlatti's two-part sonata form in these pieces. Also present are plenty of hand-crossings—some of which would be noticed only in a live performance and others of which expand the "orchestration" effects. The inclusion of more lyrical and expressive sections, garnered from the newer



classic approach, gives many of these sonatas a greater variety of moods than Scarlatti's had.

Keyboardist Enrico Baiano is not afraid to use rubato to stress the sentiment inherent in Paradies' slow movements. Yet his fast movements are breathlessly facile, as required in the headlong Scarlattian style.

The sound is exemplary in communicating the delicate nuances of this copy of a 1733 harpsichord. There is not a hint of the twangy metallic clangor that probably inspired Thomas Beecham's quip about skeletons, tin roofs, and copulation, which I needn't repeat here.

John Sunier

### Sowerby: *Symphony No. 2; Concert Overture; Passacaglia, Interlude, and Fugue; All on a Summer's Day*

Chicago Sinfonietta (on *Symphony No. 2*)

and Czech National Symphony Orchestra

(on other works), Paul Freeman

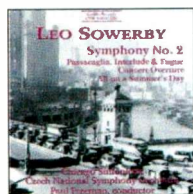
CEDILLE CDR 90000 039; DDD; 60:51

Sound: B+, Performance: A-

According to the extensive notes included with this disc, Leo Sowerby (1895-1968) was the unofficial "composer in residence" for the Chicago Symphony when Frederick Stock was its leader. Since that time, Sowerby's concert music has seldom been performed, though his organ and church compositions are presented fairly often.

Paul Freeman, taking up where Howard Hanson left off, has become a champion of many neglected American composers, Sowerby among them. Although he elicits superb performances from musicians on both sides of the Atlantic, the music itself seems more workmanlike and well crafted than inspired. One has only to compare "All on a Summer's Day" to something like Samuel Barber's Second Essay for Orchestra to be reminded of the difference. Very good sound, with the Czech recording a little warmer and more reverberant than that of the Chicago.

Rad Bennett



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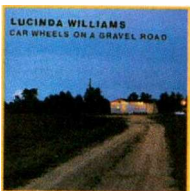
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## Car Wheels on a Gravel Road

Lucinda Williams

MERCURY 314 558 338, 51:50

Sound: A, Performance: A+

## Lucinda Williams

KOCH KOC-CD-8005-2, 59:35

Sound: B, Performance: A+

Lucinda Williams scares the hell out of a lot of people. It's not just that her songs are too close, too honest. Nor is it only the in-your-face realism with which she confronts. And it's not just her unique vocal instrument: all drawl with built-in cracks and bruises. It's all of that and more. Which makes *Car Wheels on a Gravel Road*

a startling and brilliant document, Williams's first since 1992's *Sweet Old World*. A heady brew of anger flavors themes of aching, longing, and loss that course through *Car Wheels*. The songs may appear slight and offhanded at first blush, but additional listening reveals the burnished feel of poetry ripped from the soul, with every syllable and every pause carefully placed to hit hard.

*Car Wheels* sounds as if it were thrown together quickly and casually, but its incubation period belies that notion. Williams started the project from scratch at least twice and went through several producers before winding up with a finished product of deceptive craft and subtlety. And it's the little touches in the

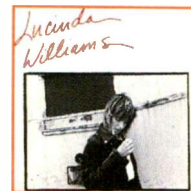
recording that make big differences: Gurf Morlix's electric guitar figure, which sets the plate in the opening "Right in Time," and his sustaining guitar over the faint hint of co-producer Roy Bittan's wafting accordion in "2 Kool 2 Be 4-Gotten"; the barbed-wire harmony voice of co-producer Steve Earle in the title lines of "Concrete and Barbed Wire"; the sound of the slide rubbing against the wooden neck of Charlie Sexton's Dobro in "Lake Charles"; the barely controlled overdrive of four slide guitars careening at once in "Can't Let Go."

Somehow in the midst of all this, *Car Wheels* manages the deft trick of sounding at once sparse and dense, with Williams's voice holding it all together. This music demands unwavering attention: anything less and you might miss something marvelous and unexpected.

The songs run the gamut of expression. There's the tenderness of "Greenville" (featuring Emmylou Harris's gentle harmony) and "Jackson"; the reflective reminiscence of "Metal Firecracker," about a lost biker lover; the sassy "2 Kool 2 Be 4-Gotten," which invokes the ghost of Robert Johnson playing guitar in the shadows of a Rosedale, Miss., juke joint. Then there's the goofy joy of "I Lost It," the anger of "Joy," the regret and loss in "Drunken Angel" and "Lake Charles," and the childhood memories of "Car Wheels on a Gravel Road." Every damned one is a winner.

Now *Car Wheels* didn't ambush me the way *Lucinda Williams* did back in '89. Nothing here jolts me quite like "I Just Wanted To See You So Bad," "Passionate Kisses," or "Changed the Locks" or did then, but never has Williams crafted songs with the depth and resonance she has here. Remarkable work.

Speaking of *Lucinda Williams*, Koch Records has just reissued that disc in a deluxe package with six



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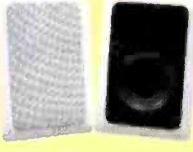
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bonus cuts (five recorded in radio station visits and the sixth a found studio gem from '83). The packaging is sumptuous: a slipcase sleeve, newly added song-by-song notes by Williams, tribute notes—from Patty Loveless, Mary Chapin Carpenter, and Emmylou Harris, who have covered songs from this album—plus liner notes by her father, Miller Williams. *Lucinda Williams* is beautifully conceived and executed, so even if you already have the original, you'll want this reissue. *Michael Tearson*

**Flaming Red**  
Patty Griffin  
A&M 31454 0907, 50:33  
Sound: B+, Performance: A

With no hesitation, Patty Griffin declares her timid persona dead. "Walking in my red shoes/And I get so worn out/And I'm walking in my red shoes/And the soles are torn out," she declares over swirling harmonica and hard-driving honky-tonk guitar on the title track of *Flaming Red*. And her voice now possesses a surprising and welcome edge.

That Griffin should change the tone set so beautifully by her stunning debut, the acoustic-guitar-driven *Living with Ghosts*, is no surprise. Other singer-songwriters, from Suzanne Vega to Michelle Schocked, have successfully changed their musical directions to keep from being pigeon-holed as long-suffering, sentimental, and strictly a woman's artist. Griffin does well to follow their footsteps. On her sophomore effort, she struts ("Flaming Red"), masturbates ("Wiggly Fingers"), teases ("Tony"), and reflects ("Big Daddy") with confidence. A full band offers superb support, changing gears easily from the boozy blues of the swaying "Go Now" to the acoustic country folk of "One Big Love." Griffin's songwriting skills are as strong as ever, her lyrics simple and strong, her attack point-blank. And all the while, she sings in that clear, soaring, unmistakable voice. *Marie Elsie St. Léger*

**Marc Ribot y Los Cubanitos Postizos**  
Marc Ribot  
ATLANTIC 83116, 46:41  
Sound: B, Performance: A-

Marc Ribot's best work bends and twists genres until you can barely spot the bits and pieces of the original tune. A master of recombinant do-re-mi, he has added his six-string spunk to soundtracks, Elvis Costello records, rock and jazz sessions, and commercials. Yet his own wry work defies any rational definition.

With *Marc Ribot y Los Cubanitos Postizos*, Ribot plays the Afro-Cuban big band tunes of

## WILLARD GRANT CONSPIRACY

**Flying Low**  
SLOW RIVER/RKODISC  
SRRCD 35, 74:04  
Sound: A-, Performance: A-

The Eagles sang of a "peaceful, easy feeling" with their mellow, good-time music. Apparently a good number of musicians grew up mesmerized by another side, the peaceful, deeply foreboding feelings of Neil Young's excursions into late-night fare. Think *Tonight's the Night* or *On the Beach*, twist it with the noir atmospherics of the Velvet Underground and Tindersticks, and you're approaching Willard Grant Conspiracy territory.

*Flying Low*, Willard Grant Conspiracy's second album, moves further along the desolate, half-awake dreamscapes of the band's debut, the appropriately titled *3 AM Sunday at Fortune Otto's*. You do not so much listen to the WGC as overhear it. Mournfully plucked acoustic guitars, the somnambulant sawing of stringed instruments, and an anonymous singer who recalls the Gothic terror of Nick Cave create a sound that drifts in and out with slippery precision, as you might expect on a late-night radio station. *Rob O'Connor*



Arsenio Rodriguez, couching these historic Cuban compositions in a rock band setting with the fluency of a jazz musician. The three genres are mixed in a way that could attract (or alienate) a fan of any of those musics. It's no mean feat.

Ribot does this in a variety of ways. "Choserito Plena" has a nearly straight-ahead salsa feel, right down to the horns and clave. Santana-like lead lines and timbales characterize "Postizo," while the same guitar fire and a prominent cowbell propel "Fiesta en el Solar."

*Marc Ribot y Los Cubanitos Postizos* could have worked better on

two counts. It sounds as if it were mixed in a hurry; instruments stick out in places like tent stakes in a paper bag. And most of the vocals, particularly on "La Vida Es Un Sueño," seem so offhand as to detract from the album's overall feel.

The percussion keeps many of the tracks feeling Latin, while the guitar work rocks and arrangements take on an almost surreal feel. "No Me Llores Más" exemplifies this. Sound-





ing similar to early Was (Not Was), Ribot interprets *son Cubano* as played by a demented soul band.

Hank Bordowitz

### Restless on the Farm

Jerry Douglas

SUGAR HILL SHCD-3875, 44:48

Sound: A, Performance: A+

There's something about sidemen. Even when they get the spotlight, they don't mind sharing, which is just what the near-ubiquitous bluegrass slide ace Jerry Douglas does on *Restless on the Farm*, his first solo set in six years. Instead of self-indulgence, he musters a bunch of talented pals to snare sounds that percolate around the fringes of the genre he's come to dominate.

Thus, Douglas's distorted bump-and-grind lap steel growls behind Steve Earle's plaintive, understated reading of Johnny Cash's archetypal "Don't Take Your Guns to Town," while

his piercing Dobro whines nervously to John Cowan's imitation of Johnny Winter's blues rocket on "The TV Doctor." Elsewhere, Celtic-tinged romance accompanies Maura



O'Connell's sturdy vocal strains ("Follow On") and weaves with Douglas's haunting Weissenborn Hawaiian around Russ Barenberg's delicate guitar arpeggios ("Takarasaka"). Even when Douglas does 'grass, it's a shimmering, break-neck pastiche on Don Stover's "Things in Life." A syncopated, contrasting-colored duel between wood body (Douglas) and metal body (Sonny Landreth, with Sam Bush on resonator mandolin tinkling underneath) on "Passing the Bar," an Irish jig cut with banjo master Béla Fleck on "The Ride," some swinging bass solo by Viktor Krauss on Erroll Garner's "Like It Is," and the exotic, tongue-in-cheek belly dance of Douglas's lap-driven "Turkish Taffee" all add up to music that's unpretentiously good.

And, thank goodness, it's beautifully recorded, close up and without annoying reverb, so you can hear the finger English. And it's mixed as if the players were standing 'round the old ribbon mike, like in the old days. Whether or not Jerry Douglas solo makes the farm restless, he's pretty certain to bring up a grin and get the toes of any fine music lover tapping.

Michael Wright

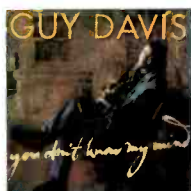
### You Don't Know My Mind

Guy Davis

RED HOUSE RHRCD 113, 48:41

Sound: B, Performance: B

Such artists as Taj Mahal continue to write and perform in the style set by Muddy Waters, Willie Dixon, and Sonny Boy Williamson: an acoustic guitar, the occasional harmonica, and the sweet, raw sounds of deeply felt blues. Like his contemporary, Guy Davis doesn't set out to imitate the greats as much as emulate them, writing songs and setting his modern-day concerns to the twangs and dips that drive him. Racism and other obstacles inform "Best I Can," familial love drives "If You Love Somebody," and the dreams of long ago live on in "If I Could Fly Like an Eagle."



On *You Don't Know My Mind*, Davis reminds us that as it was with our ancestors, family and dreams shape who we are while prejudice and injustice sharpen our anger. Which makes the blues, acoustic or otherwise, as relevant today as when Robert Johnson traveled the back roads of the South. May the voice of Guy Davis continue to ring as truly.

Marie Elsie St. Léger

## RAY DAVIES

The Storyteller

EMI-CAPITOL

7243 4 94168 2 6, 74:04

Sound: B+, Performance: B+

Remember The Byrds' tune "So You Want To Be a Rock 'n' Roll Star"? Well,

here's the genuine article: Ray Davies. In 1995 the famed Kinks frontman put together a one-man show based on his autobiography, *X-Ray*, to entertain audiences

with "the tormented rantings of a sex-crazed rock 'n' roller."

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Still, it's the wry stories that make this disc special, as Davies gives us the most intimate details of his ride on the "money-go-round"—buying his first guitar amp ("8 watts sounds like crap"), forming and naming The Kinks (he hated the name), dealing with managers, and finally making it to the top of the pop charts (with "You Really Got Me"). After summing up his 30-odd years in show biz in 74 minutes, what will Ray Davies do as a second act?

Steve Guttenberg

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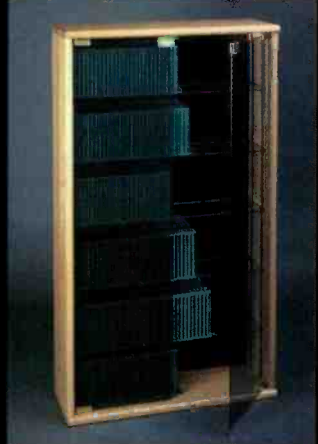
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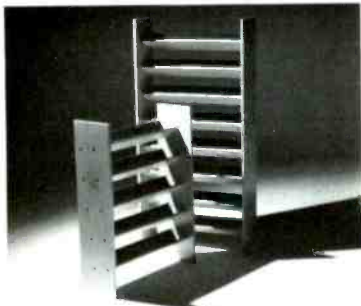
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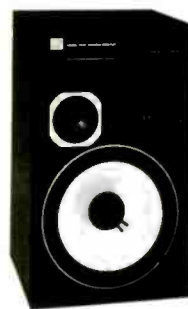
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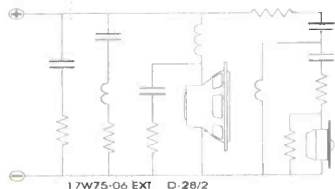
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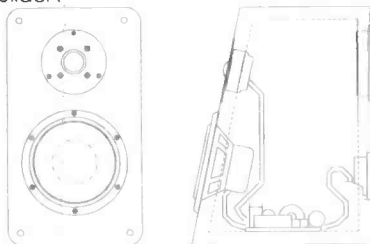
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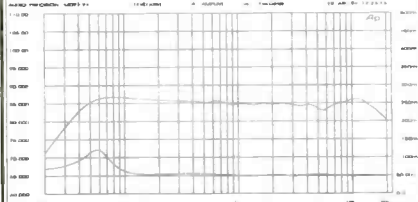


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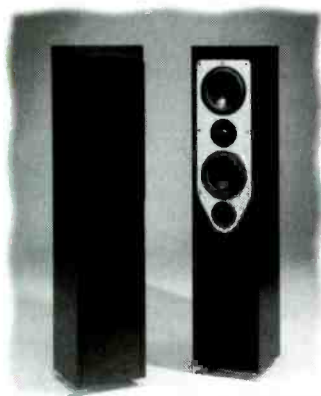


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# PlayBack

## SONY PCM-M1 PORTABLE DAT RECORDER

Though a flop with consumers, the DAT format has become a standard for broadcast and commercial recording and for amateurs who (often surreptitiously) tape live concerts. Sony's professional model, the PCM-M1 (\$999.95), is the company's latest portable, coming on the heels of the Anniversary Edition TCD D-100, the consumer version. (The M1 is available only from pro audio dealers or musical instrument stores with pro audio departments.) Though it lacks the chrome flash and remote control of the D-100, I was attracted to the M1 by its defeatable SCMS copy protection and improved mike preamp. About 25% smaller and lighter (at only 10 ounces) than previous Sony DAT portables, it dispenses with undependable Nicad rechargeable batteries. Instead, a pair of AA-size nickel metal-hydride (NiMH) rechargeables gives 3 hours of recording time. Standard AA batteries may be used in a pinch, but they last half as long. You can select any standard sampling rate—48, 44.1, or 32 kHz (the last in half-speed mode)—and any of the many DAT indexing features.

The M1's mike preamp is the same as that used in Sony's Super Bit Mapping DAT adaptor (SBM-1), and I found it very good. "Peak Hold," on the large backlit display, makes it easy to track maximum lev-

els. Signal-to-noise is specified at 87 dB. On the front of this compact recorder are large, squarish buttons for stop, play, mode, enter, and volume up and down; record and pause are easy-to-see flush round controls. The M1's bottom has four sliders that select sampling rate, level control (manual, AGC, or a mike limiter), mike or line input, and a 20-dB attenuator for the mike input. Both mike and line inputs are stereo mini-jacks—the thickness of this beauty being about equal to the width of a pro XLR plug!

The M1's headphone jack delivered a rich and clean signal to my Grado 'phones when I monitored my own binaural recordings. (Be sure the decidedly nonprofessional AVLS feature on the headphone amp is off.) An AC adaptor and charger are supplied, but the Sony cable for digital dubbing must be obtained separately. (The more versatile SDIOC digital in/out cable from Pro Digital, reviewed on this page in April, is another option.) The M1 with a pair of good mini-mikes (or Sony's \$299.99 ECM MS-957 single-point stereo mike) comprises a very high-quality digital recording system that is hard to beat for portability, fidelity, value, and ease of use. (Sony Business and Professional Products Group: 1 Sony Dr., Park Ridge, N.J. 07656; 201/930-1000; www.sony.com/professional.)

John Sunier

## RCA DRD515 DOLBY DIGITAL DSS RECEIVER

When I hopped aboard the satellite TV bandwagon in 1996, my only wish early on was that DSS offered movies in Dolby Digital (AC-3) 5.1-channel sound. With the RCA DRD515 DSS receiver (\$399), that wish has been granted.

The DRD515 (which is included with a dish, in the \$449 DS5451RB Digital Satellite System) is essentially the same as the previous midrange RCA DSS receiver, with the same functions and features, but has digital audio output (two-channel PCM, derived from the regular DSS MPEG audio signal via the receiver's internal MPEG decoder, or Dolby Digital 5.1) as well as the usual two-channel analog output. Previous DSS receivers—even those with digital outputs—work only with DSS's standard two-channel MPEG audio data.

The RCA's pertinent audio functions include an on-screen setup selection for a digital audio "Auto Detect" mode that locks onto a Dolby Digital signal if it is present. (The "PCM" mode allows only stereo or Dolby Pro Logic surround listening from the MPEG audio.) Depending on programming, the Dolby Digital or PCM modes can also be engaged manually.

Because I already had active DSS accounts with USSB and DirecTV, adding the RCA DRD515 to my existing home theater system was a matter of having the services activate the receiver. I then connected the DRD515 to my Carver DD-5.1 Dolby Digital A/V preamp.

DirecTV recently began transmitting pay-per-view, letterbox-image movies with Dolby Digital 5.1 soundtracks for \$2.99. So I dialed up the slasher who-dunnit flick *Scream 2*. The sound quality was DVD-prime. The bass was deep and full, just as it is on the DVD, and the surround channels were chock-full of the background embellishments that I'm used to hearing on the disc. Ditto for *Starship Troopers*. I could not detect any audible difference between the DSS and DVD Dolby Digital soundtracks.

For comparison, I also bought the simultaneous MPEG-audio version of *Scream 2* and listened to it via both the receiver's digital and analog audio outputs—both decoded to Pro Logic surround. In the three-way comparison, I could definitely hear the difference between the Pro Logic-decoded MPEG and Dolby Digital 5.1 versions.

All in all, I'm very impressed with the RCA DRD515! If you liked DSS before, you'll like it even better now. (RCA: c/o Thomson Consumer Electronics, 10330 North Meridian St., Indianapolis, Ind. 46290; 317/587-4450.)

John Gatski

## Monsoon Multimedia MM-1000 Computer Speakers

Like most good computer speaker systems, the \$229 Monsoon MM-1000 has two desktop satellites connected to an underdesk woofer box that holds its amplifiers and controls. But the satellites are not the usual mini-boxes: They're planar-magnetic dipoles.

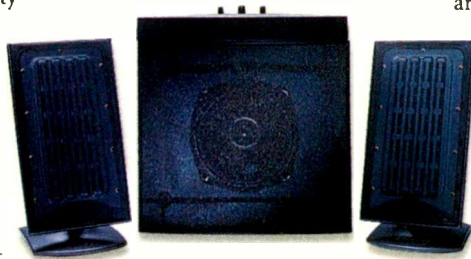
With the woofer's level turned up and its bass boost engaged, alto and lower voices get a bit heavy, but organ pedal tones take on surprising solidity for a system that's rated as 5 dB down at 50 Hz. Orchestral sound stays clean up to levels you'd hear in the back of the concert hall, mushing up a bit as you approach front-row levels. The imaging is not quite "3-D," but when you play a recording with real depth it's still just short of amazing.

Spec-wise, the system has 12.5-watt amps for each of the 4 x 8-inch satellites and 25 watts for the 5¼-inch cone woofer. The 8.2-liter vented woofer enclosure, a 10-inch cube, is tuned to 56 Hz. A short cord on the hefty power supply lets you plug it in where wall warts won't fit. The two line inputs

are active simultaneously, so you can listen to music and your computer at the same time. However, the mini-mouse remote volume and muting controller could use an arrow to show which way is loud, and I'd love to see the bass controls replicated on it. Still, I'm sorry this system had to

go back so soon. (Monsoon Multimedia: 101 Spring St., Suite 230, Little Rock, Ark. 72201; 877/722-8346; www.monsoon-power.com.)

Ivan Berger



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