

AUDIO

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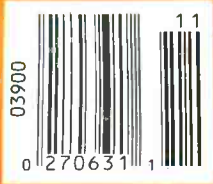
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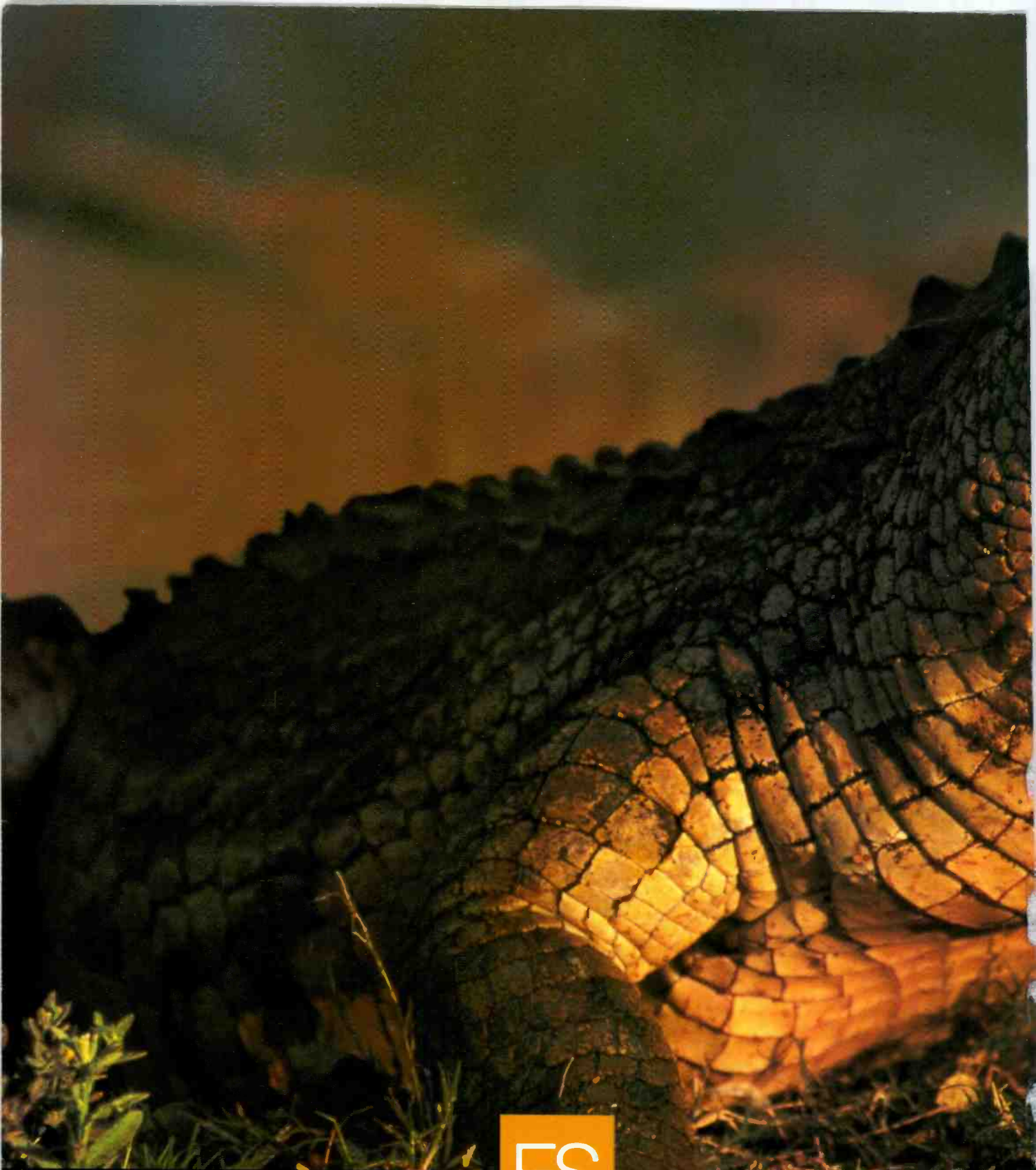
MIRAGE MRM-1 MONITOR Bye-Bye To Bipolar



NOVEMBER

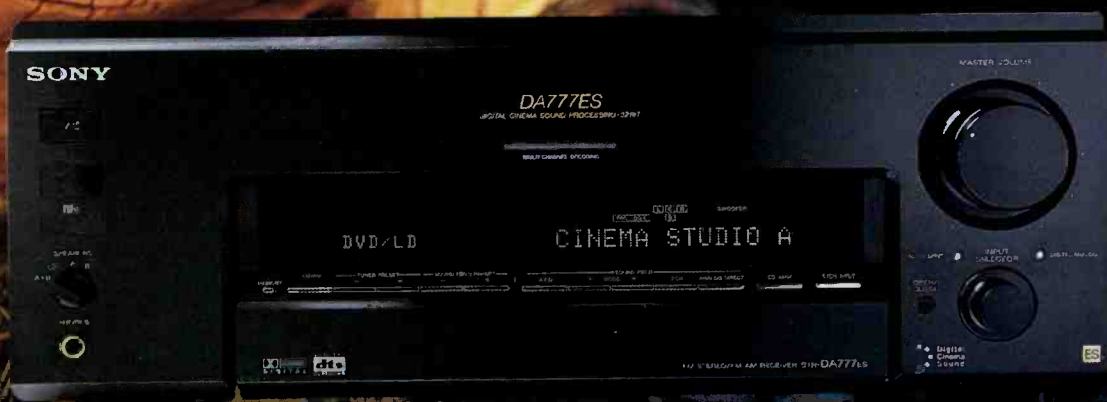
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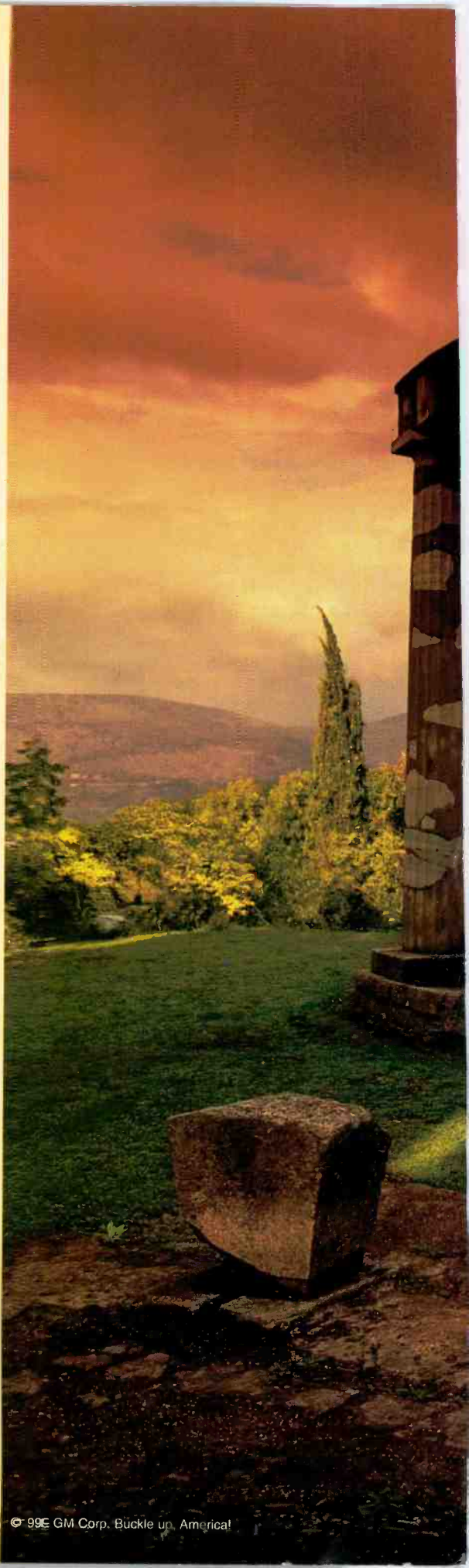
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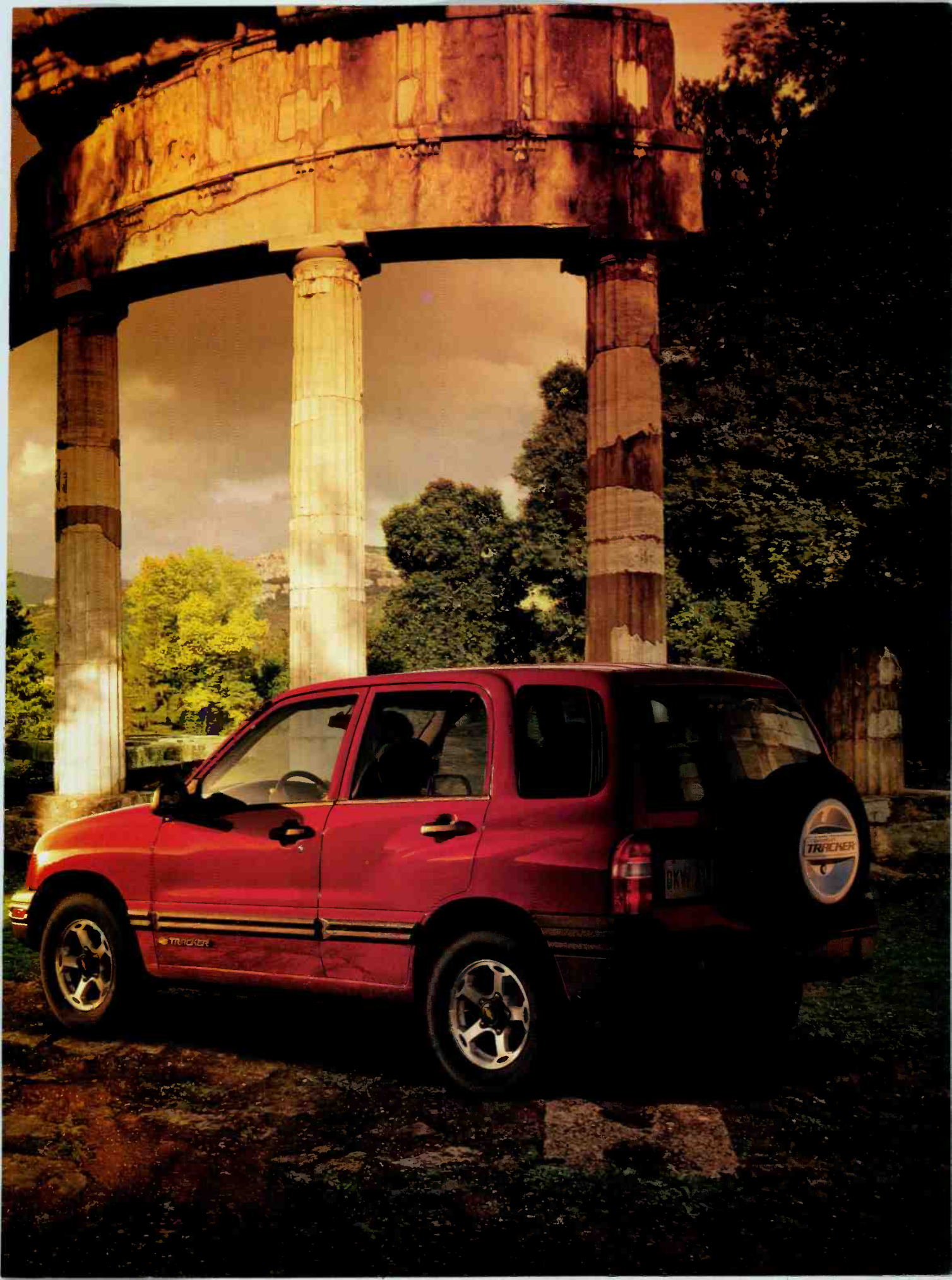
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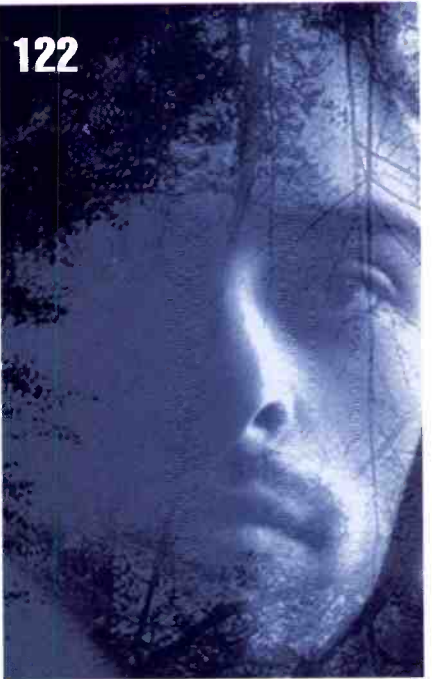
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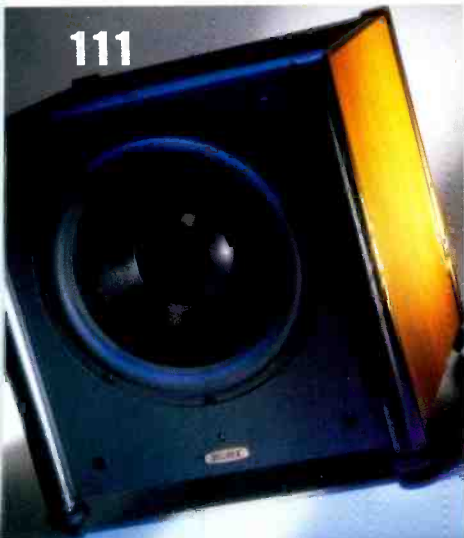
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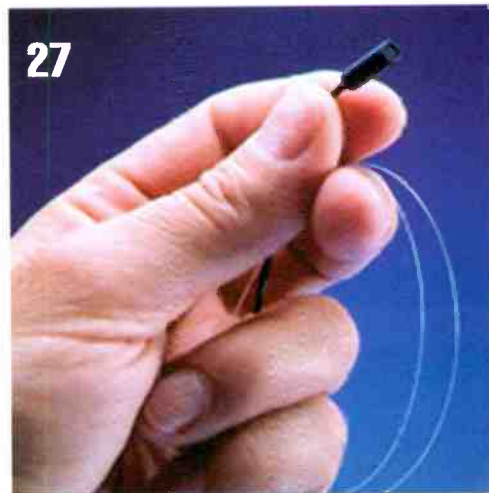
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- 2 The selector wheel** makes IRIQ the ultimate surfing tool. It's used for navigation and to send IR commands. Roll the wheel up or down and the channels change up or down. Click the wheel and change inputs on your TV. In fact, the wheel is both programmable (it doesn't have to change channels) and context-sensitive. When you watch TV it may change channels, when you listen to a CD it may change tracks — send whatever IR commands you want.
- 3 The backlight button** turns the touchscreen backlight on and off.
- 4 The mute key** is both programmable and context-sensitive, as are the volume up/down and selector wheel controls.
- 5 The home menu button** lets you quickly return to the home page from any other.
- 6 As with the selector wheel, the volume up/down buttons** are both programmable and context-sensitive. When watching TV, they may adjust your TV volume and when you listen to the radio, they adjust your audio system's volume.
- 7 The IR receiver** is used to learn IR commands from devices not found in the IRIQ database.

IRIQ comes with a database of IR commands for controlling thousands of audio and video products. New commands may be taught through IRIQ's IR learning port. Control lighting, drapes, whatever IR-controlled device you want.



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Cover Photographer: Bill Kouirinis Studio. Cover Equipment: Meridian 561 surround preamp, NHTPro A-20 speaker system, and Sony SCD-1 Super Audio CD player. Audio Publishing, Editorial, and Advertising Offices: 1633 Broadway, New York, N.Y. 10019. Editorial Email: audiomag@aol.com. Subscription Inquiries: phone, 303/604-1464; fax, 303/604-7455; email, hachette@neodata.com (must include magazine title, your name, and old and new addresses).



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ABOUT OUR CONTRIBUTORS

ED FOSTER has been kicking around audio since hanging out a "Lightning Radio Repair Service" shingle at age 12. After a 10-year stint at CBS Labs managing magnetic, electronic, acoustic, and mechanical research, he launched Diversified Science Laboratories—a state-of-the-art facility that does contract R&D, product evaluation, and testing—in 1976. Over the years, Foster has reviewed thousands of products for *Audio* and other publications, including *Stereo*, *High Fidelity*, *High Performance Review*, *Autotronics*, *Home Theater*, and *Pro Audio Review*. Foster is Deputy Technical Advisor to the U.S. National Committee to the IEC, a Fellow of the Audio Engineering Society, a member of the IEEE, Sigma Xi, and Delta Mu Delta, and is listed in Marquis' *Who's Who in Science & Engineering*, *Who's Who in America*, and *Who's Who in the World*. He lives with a concert pianist who keeps his ears calibrated, happy, and honest.

DON KEELE is Senior Research Engineer at Telex Communications and has worked for a number of audio-related companies in the area of loudspeaker R&D and measurement technology, including Electro-Voice, Klipsch, JBL, and Crown International. A Fellow of the Audio Engineering Society and a regular speaker at industry events, Keele holds three patents on constant-directivity loudspeaker horns, two B.S. degrees in electrical engineering and physics, and an M.S.E.E. degree from Brigham Young University.

He is a past member of the AES Board of Governors and is a past AES Vice President, Central Region USA/Canada.

KEN KESSLER was born in the United States but has lived in the U.K. since 1972. Over the years, his work has appeared in more than a hundred publications in 15 countries, including *Audio*, the British magazine *Hi-Fi News & Record Review*, *Robb Report*, and the late, lamented rock magazines *Fusion* and *Let It Rock*. Kessler's recent projects include the completion of not only his dream listening room but also a self-penned novel. Among his obsessions are record collecting, vintage wristwatches, detective fiction, the blues, and '60s British rock. A goal of his is to see Louis Prima canonized.

DAN KUMIN was originally trained as a "serious" composer but emerged from his Cambridge, Massachusetts, garret one day in the late 1970s to discover that graduate school really didn't pay very well after all. After a stint with amp and preamp manufacturer Apt Corporation, Kumin turned to journalism, writing about consumer and pro audio, video, music, and related topics for such magazines as *Stereo Review's Sound & Vision*, *Spin*, *Pro Audio Review*, and *Audio*. A charter member of The Guitar Club for Men, Kumin is a seriously afflicted vintage-amp junkie and has specified that his rattle-can-black 1964 Stratocaster be buried alongside him.

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In Defense of Marantz

On behalf of myself and the other 10 Marantz PM-17 owners who have contacted *Audio* (and who give this amp the highest rating), we must take exception to Willie Gluckstern's September review. We have discovered that the factory-supplied power cord is a problem, and replacing it does improve performance. To quote the May issue of *What Hi-Fi*, "This amp is warm and weighty and system friendly, a very good amp by any standards." *Don Burner Dayton, Ohio*

Not a Fan of the Vino

I've just read Willie Gluckstern's September review of the Marantz PM-17 integrated amplifier. Too bad he didn't talk about *the amplifier*. Thank god for the pictures! Was this review about wine tasting or about audio equipment? I hate wine.

Dan Rothmann via e-mail

Everybody Loves Corey

I found the July/August issue informative, cogent, and even more enjoyable to read than usual. It took me a while to realize why, but it finally dawned on me that you did not have a column by the annoying, arrogant, holier-than-thou pretender, Corey Greenberg.

Tell you what: If you keep Greenberg out of *Audio*, I won't complain about the two fewer issues per year.

Cal Jonstone Middletown, N.J.

September Song

Thank you for a job well done with your magazine overhaul. The September *Audio* was vastly improved over all previous issues. In fact, I would rate it the very best American hi-fi magazine, and I will definitely subscribe.

The new style of product reviews suits me perfectly. I like short and concise reviews rather than endless essays (or too much boring technical analysis). American hi-fi mags seemed to be unable to keep up with the endless stream of new products that required reviewing. My philosophy is: Review it all! I greatly appreciate that the number of products reviewed per issue of *Audio* has increased. Plus, the addition of

Ken Kessler as a reviewer a few issues back was refreshing. Now that he is joined by some great new writers, your magazine cannot be beaten. Thanks for a job well done!

Chris Wynn via e-mail

He's So Excited

I'm 25 years old and have been reading your magazine for about five years. The new *Audio* looks more professional, and I like the greater number of equipment reviews. I also enjoy the fact that the reviewers come from varied backgrounds, as it helps keep the magazine from becoming monotonous by offering varied tastes and viewpoints. Although I make nowhere near enough money to afford any of the products, my interest in audio keeps me reading your magazine cover-to-cover.

Audio is an exceptional magazine. I looked forward to receiving it each month before, and with the new changes I'm even more excited now.

Scott Weaston via e-mail

The Right Direction

I've been a subscriber off and on for over 10 years. The reason I originally let my subscription lapse was what I considered to be a lack of relevant reviews, so I'm very glad that you've expanded and improved your Reviews section.

I do have a few comments. First, in the review of the Acurus DIA 150, I'm confused why a \$1,500 150-watt amp is compared to A \$300 20-watt amp. Wouldn't a comparison between a similarly priced product or perhaps some modest "separates" have been more useful? Second, I liked the fact that some of your reviewers didn't seem to have a problem *not* recommending a component. I think this is a step in telling manufacturers that we (as consumers) won't put up with a higher-priced product that has no advantages (i.e., the Toshiba SD-9000). Third, why are a third or more of the products that are reviewed related to video? And why in the world was I forced to skip over more than a page of rambles about wine tasting in Willie Gluckstern's review of the Marantz PM-17? I don't care! I'm sure many of your reviewers have other interesting hobbies, but don't waste magazine

space talking about them. And in this review it seems that he was not very taken with the product. Perhaps the SuperTwo/PM-17 was a poor combination; shouldn't this have been checked? After all, the "Test Results" written by Michael Riggs ("Marantz clearly designed the PM-17 to a high performance standard. Nicely done.") contradicted Gluckstern.

Last, the only sections I read are the reviews of equipment and occasionally the tech articles. Feel free to dispense with the few pages of software reviews.

I think you are definitely headed in the right direction.

Brian Bloom via e-mail

Another Satisfied Customer

I just read *Audio* cover-to-cover because I just couldn't put it down. Wow! Nice changes. Keep it up.

Tanvir Hafiz via e-mail

New Blood

Bravo, *Audio*! A short few years ago, I had serious doubts about the future of your magazine. However, with an infusion of "new blood," you seem to be headed in the right direction. Witness the new format: *Audio* has come up with one that is right for its time!

There is a richness in the content in the new issue—something here, something there—and it abounds with reviews and opinions of many varieties and price ranges of hardware. You've captured, in a fashion, much of the "busy-ness" of the Internet yet with clear and concise pictures and text. So, big kudos to the thought that went into this effort.

Ya did good. Keep it up!

Leonard Weldon via e-mail

Editorial License?

I was recently reading *Audio*—I do like a couple of the writers, and it makes good waiting-room fodder—when something struck me in Anthony Cordesman's July/August review of the Hales Transcendence Eight speaker (no undue modesty in Mr. Hales' family when it comes to naming speakers). I noticed the black box with a phrase I assume had been excerpted from



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the text (what are these called, “teasers”?) that stated: “With the Hales, I could hear musical nuances I had never previously heard.” Then I happened to notice Cordesman’s actual text, which read: “I could hear musical nuances in my recordings and in my components to a degree I have rarely heard before.”

My question, then, is the substitution of the word “never” for the word “rarely” now to be considered proper editorial license, because by doing so, the editors impute a statement to the author that he never made. Or is this more an artifact of the current leadership—a “Coreyism,” if you will, the sort of thing you’d expect to see in an ad for the product rather than a review of it.

Sure wish we lawyers could get away with lies and misdirection to that degree in our written work, but we can’t. Is this practice now considered acceptable in the publishing world? Even as a lawyer, I decline to immortalize untruths in writing where they can return to haunt you.

*Bill Spohn
via e-mail*

Editor’s Reply: The substitution was a mistake; we beg forgiveness. The text excerpts are usually called “blurbs” or “pullquotes” in the publishing biz.—M.R.

MP3 Sound-Off

I read Corey Greenberg’s “MP3: What Does it Really Sound Like?” (June) and became very upset.

First and foremost: Except perhaps for reasons of comparison, there is no reason to do a two-step (CD to .WAV, .WAV to MP3) when you can “virtually” go CD to MP3 (CD to memory, memory to MP3, free the memory). Greenberg’s article did not mention this fact. There are plenty of shareware tools available that don’t require the two-step.

Another point of contention is the following statement from Greenberg: “One thing that no one seems to mention when they’re jizzing about MP3 is how long it actually takes to make MP3 files.” Well, the reason is that it does not take that long! It really does take less than the time of the recording. You can do a 30-minute CD in 15 to 20 minutes if you get the right tool; it can also take as much as two hours per song or more if you use the wrong tool. Using a PII-350 with

probably a 40X CD-ROM (ATAPI/IDE), I can “rip” songs (you forgot to mention this term, which is the preferred term for converting CD songs to MP3) in as little as half their playing times by using Xing’s Audio-Catalyst; I have also seen WinDac do this. On my PI-166, with a 32X IDE, I can rip at a rate equal to or double the time of the song (which matches your results), yet it only takes 1 megabit per minute rather than 11 megabits per minute the way you did it (10 megabits per minute for the raw and about 1 megabit per minute for the MP3).

My hope was that an audiophile magazine such as *Audio*—which in this same issue had plenty of spectral analyses and screen shots of ’scope traces—would have information about MP3 quality; you didn’t, even though the title of the article and the cover implied you would. Hell, you could have regurgitated the study done ages ago that is published on the Net—about a before-and-after spectral analysis of the *Star Wars* theme, if I remember correctly.

Greenberg also made a comment about it being a hassle to find and download music. Finding it is extremely easy, the downloading extremely difficult, since most sites are ratio sites or are overloaded with users.

I have been an *Audio* subscriber for many years now and would like to see the magazine continue distributing quality information. But when you do a bad job covering an area I happen to know fairly well, I notice. I agree with your end results; generally I am anti-lossy-compression and believe the JPEG/MPEG groups live to throw away information and leave us with something “good enough.” As a result, video has taken a major step toward low-quality as MPEG has infected everything from DSS to cable to DVD, and DVD by itself has caused the demise of laserdisc. And if the Lucas-style “digital” movie theaters hit the mainstream, then even the big screen will be lossy/crappy low quality. Audiophiles need to take a stand! MP3 is fun and interesting, but quality it lacks.

*David Welch
via e-mail*

MP3 Opinion Unwarranted

I think Corey Greenberg expressed a very uninformed opinion in the June issue about MP3 (“MP3: What Does It Really Sound

Like?”) that could damage his reputation as a reviewer. What Greenberg reviewed was Internet files and not the “true” MP3s record companies would release.

In short, he used the wrong programs and sample rates to do the comparison. The way Greenberg went about it definitely sounds like crap! He should get more information and write a follow-up.

*Chris Soehner
via e-mail*

Speaking Up and Out

I was disappointed with the letters DTS and Meridian wrote to *Audio* (May). The DTS letter was very specific until its own system was mentioned, after which bit rates were curiously omitted. Meanwhile, Meridian’s letter, in reference to the stereo tracks, says, “. . . they are not carried in the same stream but are placed on different areas of the disc.” So, where would that be?

Frankly, I hope this is all rendered moot by recording companies’ choosing to record 5.1-channel data at 48 kHz instead of 96 kHz.

Regarding May’s “Fast Fore-Word,” I am tired of the artifacts on my satellite TV (the most obvious is the faint gray area around objects on black backgrounds on DISH Network), and I certainly don’t want audible watermarking on DVD-Audio. New technology is neither always bad (flimsy plastic chairs and particleboard bookshelves) nor always good (Compact Discs and low-maintenance car engines). But there are plenty of signs that we consumers should let our voices be heard.

My vote is no audio particleboard, thanks very much.

*Wayne Erlfing
Miramar, Fla.*

Editor’s Reply: On DVD-Audio, the multi-channel mix could be placed toward the inside of the disc, with the two-channel version following toward the outside of the disc, for example.—M.R.

Erratum

In Willie Gluckstern’s September review of the Marantz PM-17 integrated amp, he stated that it was priced at “a penny under two grand.” The price of the PM-17 is \$1,200.

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AUDIO CLINIC

JOSEPH GIOVANELLI

Hooking Up Line-Level Subwoofers

Q My receiver has no subwoofer output, though it does have preamp outputs, connected by jumpers to its amplifier inputs. Is there any way I can use the preamp outputs to feed my powered subwoofer's line-level inputs?—Name withheld

A If your subwoofer has stereo line inputs and a built-in crossover with line-level high-pass outputs, the hookup is quite simple. Connect your preamp outputs to the subwoofer's line inputs, then connect the sub's line outputs to your receiver's amplifier inputs.

If your subwoofer has stereo line inputs but lacks high-pass outputs, you can replace the jumpers that connect each channel's preamp and amp sections with Y connectors and feed your subwoofer from the Y connector's extra leg. (With a subwoofer that has only one input, you'd have to make a network that would sum both channels' signals without audibly reducing channel separation.) In setups without high-pass filters, bass will be fed to your satellite speakers as well as to the subwoofer. That may sound like a benefit, but it's not: Most satellites can play louder and cleaner if they don't have to handle bass.

Tape Deck Response Problem

Q My old Radio Shack tape deck's left-channel frequency response is about 45 Hz to 15 kHz; the right channel's rolls off at 10 kHz, making it sound rather muddy by comparison. Cleaning the head helped a bit, but the treble loss was still noticeable, especially on some brands of tapes. Could replacing the head improve both channels' frequency response?—Marcel Giannelia, via e-mail

A A worn head could certainly be causing the right channel's loss of highs, but I think something else is going on.

Inasmuch as some tapes perform better on your deck than others, I believe the bias on its right channel is a tad high. Let's hope it has separate bias trimmers for each channel; you'll need a service manual to find

out. You may be in luck because Radio Shack maintains a good library of service manuals and schematics for various products, even for some gear that it did not manufacture.

Single-Ended and Push-Pull Circuits

Q What does the term "single-ended" mean?—Ray Segura, New Orleans, La.

A "Single-ended" usually refers to an amplifier's output stage. In a single-ended design, the input signal passes through various amplifying and impedance-transforming stages until it reaches the last, or output, stage, which drives the speaker. If the output stage has a single tube or transistor, it is termed single-ended.

The expression single-ended might never have come into use were it not for the development of "push-pull" circuits. In this arrangement, the final, or output, stage may have two devices (transistors or tubes) connected to the speaker. They are not in parallel, however. In a push-pull output stage comprising two devices, the polarity of one of the devices goes positive as the polarity of the other goes negative. Their polarity will change as the cycle of the input signal varies.

An amp is said to be operating in push-pull because of the way the signals act in the two halves of the circuit.

Driving Speakers with Two Different Amps

Q Will I damage my Paradigm Reference Studio/60 speakers if I drive them with two different NAD amps? I intend to bridge both amps and drive the speakers separately. Would there be any significant improvement if, instead, I bi-

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amped my main speakers with these same amps? What problems, if any, might I encounter biamping with two different amps?—Henry F. Uyloan, Los Angeles, Cal.

A No damage will occur using two different power amplifiers to drive your speakers. However, you must consider several factors.

One amp's polarity may be opposite to the other's, i.e., 180°. You can compensate by reversing one speaker's connections.

The two amps may also have different input sensitivities, which means that more

signal will be needed to drive one of the amps to a given volume than the other. If this is the case, adjust the balance control to drive the amplifier with the lesser sensitivity harder. If, for example, the left channel sounds weak and the image shifts to the right, adjust the balance control until you have equal loudness in both channels and the image is centered.

You can biampify your speakers using the two amplifiers. Right off the bat, this will eliminate the channel imbalance. If one amplifier has more output power than the oth-

er, use that amp to drive the woofers in each speaker. The two amps will be operating in stereo rather than in bridged mode, so you will have less power available per channel than in the former setup. Biamping will require a crossover to block low frequencies from the tweeters and high frequencies from the woofers. If the polarity of one amplifier is 180° from the other, you must take this into account when wiring up the treble and bass sections of your speakers. It doesn't matter whether you reverse the tweeters' polarity or the woofers'; just be sure not to reverse the polarity of all of them.

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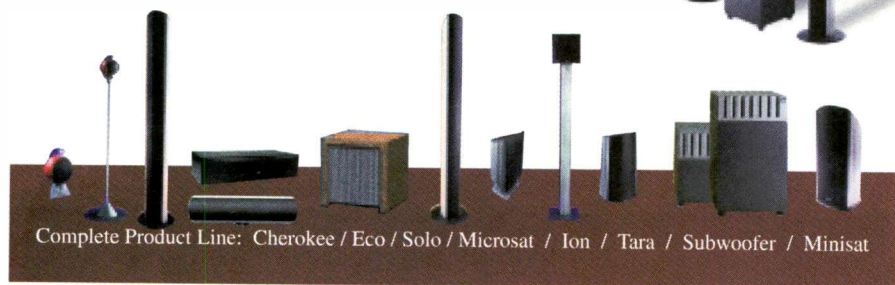
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Back-to-Back Baluns

In the July/August issue, you recommend using two baluns back to back in order to break ground loops ("AC Plugs, Prongs, and Grounds"). Although that's good advice, it should be mentioned that some baluns do not isolate the ground; an ohmmeter check is necessary to determine if the ground has been broken. (Only one of the two baluns need be isolated.) Connect the leads of the ohmmeter between the cable outlet ground and the 75-ohm ground of the balun that connects to your A/V system's VCR or TV. The ohmmeter reading should be infinitely high or something less than 20 ohms.—David Hadaway, via e-mail

Demagnetizer Types

Q Are hand-held demagnetizers better than cassette-type demagnetizers? (I hope not, because I don't see how I could poke a hand-held unit into my car stereo's tape compartment.) Do erase heads and capstans need demagnetizing?—Craig Lawrence, Mountain View, Cal.

A Although the cassette-type demagnetizers I have used produced less magnetic flux than the hand-held types, they did an adequate job. And some machines, especially car stereos, make it almost impossible to insert a hand-held demagnetizer.

I prefer the type that demagnetizes the tape path with an AC signal rather than the kind that carries a tape-like strip magnetized with a series of alternating polarities. (I haven't tried the type with rotating permanent magnets.) Whatever the flux source, the fluctuating magnetic field must gradually weaken until it fades out altogether; otherwise it will leave behind resid-

ual magnetism, which is precisely what you are trying to eliminate. In a properly operating transport, the AC bias tends to demagnetize separate record and erase heads during recording, so they are unlikely to need "degaussing." Combination record/play heads may be similarly protected. Tape guides and the playback head are most likely to become magnetized. I'm not sure that any type of demagnetizer can successfully demagnetize a capstan, but I've seldom found a capstan that needed it.

Signs of magnetization include a noticeable increase in tape hiss. If left untreated, the tapes may suffer an irreversible loss of high frequencies. This loss will be less likely if you use metal-particle (Type IV) tape, whose high coercivity makes it inherently more difficult to erase than other tape types. I tend to let 100 hours or more go by before demagnetizing. (If you wait until hiss builds up or highs are erased, it's too late.) Some manufacturers—Teac among them—have recommended against demagnetization. Part of their reasoning may well be the danger of inadvertently magnetizing parts in the tape path, particularly if one uses the most aggressive hand-held demagnetizers.

No Sub, but More Woofers

Q *I don't want the expense of buying a powered subwoofer. Instead, I'd like to add two 8-inch woofers in a pair of ported cabinets, with a 12-dB crossover to filter out highs above 125 or 150 Hz. I'll use my power amp to drive both woofers in parallel with my current speakers. There might be some imbalance in the output, which might call for an L-pad. Any thoughts on this setup?—John Poulson, Edmonton, Alberta, Canada*

A Choose woofers whose acoustical efficiency is the same as, or just a touch more, than that of your current speakers. Then you won't waste power heating up an L-pad (which you should avoid using, in any case). Another suggestion, though less desirable, is to pick woofers whose output is slightly less than that of your current speakers. Then use an L-pad for the main speakers, which is acceptable here because less power will be wasted heating the pad. (Bass frequencies use a lot of an amplifier's power.)

You should also use a complementary crossover (i.e., a high-pass filter) to remove

the lows from your main speakers. If you don't, upper bass will likely be too muddy or bloated because it will be produced at full level by the main speakers and your new woofers.

The woofer's manufacturer may have recommendations as to the best enclosure type, volume, and port dimensions to use for its drivers.

Upset, Reset

I recently fixed my Soundstream preamp, which I had feared was a goner. One day, af-

ter years of faithful service, all of its LEDs came on, but no signals reached my amp and nothing happened when I pushed any of its buttons.

*The first step in replacing it with another preamp was, of course, to pull its AC cord from the outlet. But it turns out that was the last step, too. As the preamp's LEDs winked out, I remembered that this model was micro-processor-controlled. Perhaps all it needed was to be reset? Sure enough, plugging the AC cord back in a minute later fixed the problem.—Ben Shepherd, Fanwood, N.J. **A***

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Panasonic DVD Player

Said to be the world's smallest portable DVD player with its own 5-inch, 280,000-pixel LCD viewing screen, the DVD-L50 PalmTheater measures only 6 inches by 5½ inches and is just 2 inches thick. Weighing barely more than 2 pounds with its three-hour lithium-ion battery pack, the DVD-L50 also has selectable 16:9 widescreen or 4:3 standard aspect ratios and digital outputs for Dolby Digital and DTS multichannel surround sound. Other features include tiny front-firing speakers, 96-kHz/24-bit audio and 10-bit video D/A converters, and composite and S-video jacks. Price: \$1,099.95. (Panasonic, 800/211-7262)



NAD CD Receiver

Combining a CD player, FM tuner, and amplifier on a chassis no larger than a CD player, the L40 is, says NAD, ideal for realizing hi-fi performance in rooms where full-size component systems are impractical. The L40's

internal amp is said to be capable of 80-watt peaks into 2-ohm loads. Its rated output is 20 watts per channel into 8 ohms, 20 Hz to 20 kHz, at 0.03% THD. Rated S/N is 93 dBW. The L40's other features include 20 FM presets, a 10-button remote, 1-bit D/A converter, and simple, intuitive controls. Price: \$599. (NAD, 800/263-4641)



Klipsch Speakers

The Reference Series comprises three floor-standing models (back row, left to right): the RF-3, RP-3, and RP-5 (the latter two are powered towers); the RC-3 center channel; the RS-3 surround speaker; and the RB-5, a bookshelf speaker. Klipsch says all use 90° by 60° Tractrix-horn-loaded titanium tweeters, copper-colored anodized aluminum-cone woofers, and crossovers made with air-core inductors, film-type capacitors, and bi-wiring capability. Prices: from \$550 per pair (RS-3) to \$2,000 per pair (RP-5). (Klipsch, 800/554-7724)



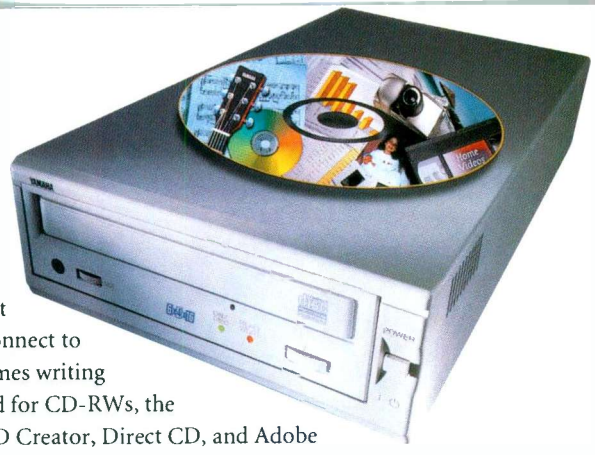


Music-Match PC Software

Jukebox 4.0 software enables PC users to easily create playlists of music from digital audio files recorded in MP3 (downloaded from the Internet), RealAudio, or Windows Media Audio or from CDs. This software also converts MP3 to .WAV files for creating custom CDs, as well as playback through a hi-fi system. Its MP3 encoder is said to be "near-CD quality" and enables recording at various data rates, from 96 to 320 kilobits per second. Other features include multichannel recording, graphic EQ, volume normalization, and line-in recording inputs. Price: \$29.99. (*MusicMatch, 858/385-8360 or www.musicmatch.com*)

Yamaha CD-R/CD-RW External Drive

Able to record an entire 74-minute CD in just 12 minutes, the CRW6416SXZ is designed to connect to a PC or Macintosh computer. Capable of six-times writing speed for CD-Rs and four-times rewriting speed for CD-RWs, the CRW6416SXZ is bundled with Adaptec Easy CD Creator, Direct CD, and Adobe PageMill and Photo Deluxe Business Edition software. CD labeling software, an application tool, and Graphic Corp.'s CD label and jewel-case insert software are included as well. Price: \$499.95. (*Yamaha, 714/522-9000*)



JBL Speaker

Despite its diminutive size (9½ inches tall, 6¼ inches wide, and 4¾ inches deep), the magnetically shielded, ported Northridge Series N24 is said to provide dynamic, room-filling stereo or surround sound. The company says the 75% titanium-composite ¾-inch dome tweeter, set into an elliptical waveguide, delivers identical on- and off-axis treble response, yielding a wider sound field and more precise imaging. The 4-inch woofer has a treated cone to damp resonances. Price: \$199 per pair. (*JBL, 800/336-4525*)



Creative Labs MP3 Digital Recorder

Smaller than a deck of cards and weighing less than 2½ ounces, the Nomad records and plays compressed MP3 music files for one hour with its supplied 32-megabit (MB) flash memory card. An LCD screen scrolls artist names and song titles, and a built-in mike enables two hours of voice recording. A 64-MB version of the Nomad doubles MP3 record/play times to two hours and voice recording to four hours. An FM tuner is also included. Prices: \$169.99, 32-MB version; \$249.99, 64-MB version. (*Creative Labs, 800/998-5227*)



Sonance Center Channel Speaker

The MC uses dual, 5¼-inch, magnetically shielded polypropylene woofers that are

said to reproduce the full impact of Dolby Digital and DTS movie soundtracks,

a 3-inch midrange, and a ¾-inch cloth-dome tweeter. The company says the MC's separate midrange and treble level controls enable it to be acoustically matched to a variety of home theater systems. An integral shelf or set-top cradle enables owners or installers to aim the MC at the listening area. Sensitivity is stated at 90 dB. Price: \$399. (*Sonance, 800/582-7777*)



Parts Express Catalog

A/V enthusiasts with a penchant for rolling their own can order electronic parts and audio-related products for their varied projects through the Parts Express catalog. Included in the 260-page catalog (available free by dialing the 800 number listed or visiting the Web site at www.partsexpress.com) are home theater and home automation aids, raw speaker drivers, CATV parts, alarm systems, test equipment, speaker design software, wire, connectors, and the like. (Parts Express, 800/338-0531)

Polk Home Theater System

Said to use dedicated electronics with circuit topologies comparable to



those found in high-end components, the RM Digital Solution-1 (RMDS-1) was designed for operational simplicity while yielding high sound quality. The RMDS-1 comprises a six-channel, 500-watt power amp, an AM/FM tuner/preamp with built-in

Dolby Digital processor, five timbre-matched satellite speakers, a 10-inch subwoofer, and a remote control with subwoofer level buttons. Active crossovers, active EQ, and bass management have been optimized for the sub and sats, and a single DB-25 cable links the preamp and subwoofer/amp. Additionally, channel balances and delays are factory preset to yield best performance. Price: \$2,699. (Polk, 800/377-7655)

Philips CD/CD-R/CD-RW Portable Player



Among its virtues, the rugged Activ ACT7580 plays not just CDs but also CD-Rs and CD-RWs. With its 25-second Electronic Skip Protection, the 7580 is also said to be 35% smaller and lighter than its competitors. Design features include rubber gaskets, rubberized controls, a non-slip body cover, and a splash-resistant cover that withstands temperatures up to 194° F. Price: \$99. (Philips, 800/531-0039)



Technics DVD-Audio Player

Capable of playing 74 minutes of 96-kHz/24-bit six-channel audio using Meridian Lossless Coding, 6½ hours of CD-quality 44-kHz/16-bit music, or 74 minutes of 192 kHz/24-bit PCM two-channel stereo, the DVD-A10 also handles existing Compact Discs as well as DVD movies with Dolby Digital or DTS multichannel sound. The player is compatible with single- or dual-layer discs in single- or double-sided formats. Using Advanced Virtual Battery Operation, a capacitor supplies DC to the audio circuitry to eliminate power-supply noise. Price: \$1,199.95. (Technics, 800/211-7262)

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Audio Desk Systeme CD Lathe

Just like trimming excess dough from the edge of a pie, the Audio Desk Systeme lathe uses a motorized cutting device made by Reiner Glass in Germany to shave the edge of a CD to a 38° angle, which is said to reduce laser scatter and suppress mechanical jitter. The trim takes about 60 seconds. Simultaneously, the CD edge is treated with black marker, which the company claims improves focus, detail, transparency, and transient attack. Price: \$495.

(Audio Desk Systeme, c/o Ultra Systems, 800/724-3305)



Billy Bags A/V Stand

Supplied in black wrinkle, brushed steel, or desert-sand finish, Billy Bags' Pro-Stands #Pro-41 Entertainment Center with Truss (shown with hanging Audio Duster), at 66 inches tall,

54 inches across, and 21 inches deep, can accommodate a 35-inch TV set. The shelves below the TV are 18½ inches deep. The #Pro-41 is available with casters or isolation tips in black or silver aluminum. Prices: A/V stand, \$2,495; Audio Duster: \$19.95. (Billy Bags Pro-Stands, 805/644-2185)

Definitive Technology Bipolar Speaker

The company says the original BP2002 has been upgraded to the BP2002TL, with a much larger internal MOS-FET amp (250 watts) powering a side-firing 12-inch woofer and a D'Appolito array comprising dual 5¼-inch midrange drivers, each with cast baskets, flanking a 1-inch aluminum-dome tweeter on the front and rear baffles of the speaker. The D'Appolito arrays are said to yield better focus and a more enveloping soundstage. The frequency range is stated at 17 Hz to 30 kHz. Price: \$1,099 each. (Definitive Technology, 410/363-7148)



Snell Acoustics Multi-Pattern Surround Speaker

Switchable between diffuse dipole and direct-radiating patterns, the SR 30mp uses a top-mounted 6½-inch woofer, a pair of matrixed, cross-firing 3½-inch midranges, and three 1-inch aluminum-dome tweeters (two of which are outwardly angled for diffuse operation, while the third is centered for direct radiation). The SR 30mp's two sets of input terminals may also be connected to a 7.1-channel processor's side and rear surround-channel outputs when its mode switch

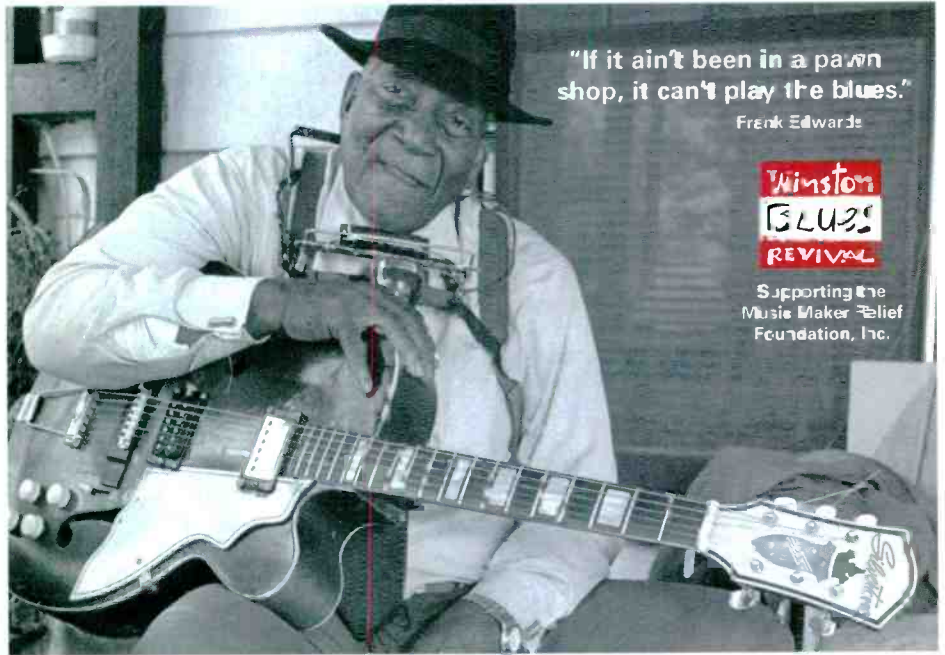
is set to "7.1." Price: \$1,500 per pair. (Snell, 978/373-6114)



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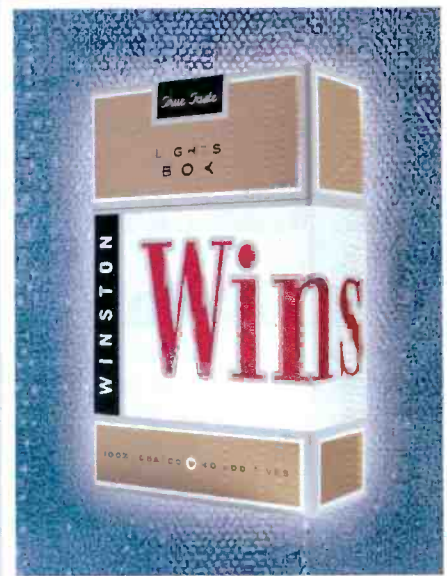
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Parasound AM/FM Tuner

Though only 9½ inches wide, 1¾ inches tall, and 7 inches deep, the diminutive TDQ-150 is said to surpass the performance of most full-size AM/FM tuners and to be ideal for main or remote-zone use in a multiroom

system. A rear-panel remote infrared jack enables connection with various home-automation technologies; there are also AC-line and DC-triggering facilities. Stereo S/N is rated at 74 dB, separation at 50 dB, AM suppression at 60 dB, alternate-channel selectivity at 80 dB, and FM frequency response at 30 Hz to 15 kHz, ±1 dB. Price: \$269. (Parasound, 415-397-7100)



Accuphase Preamp

Said to provide exceptional sonic transparency by keeping negative feedback to a minimum and maintaining phase integrity, the C-290V line-level preamp also has

a balanced output stage. Separate power transformers and filter capacitors are used for each channel. There are nine unbalanced and three balanced inputs and six outputs. The tracking error of the four-gang volume control is specified as 0.5 dB at -60 dB. Price: \$14,995. (Accuphase, c/o AXISS Distribution, 310/329-0187)

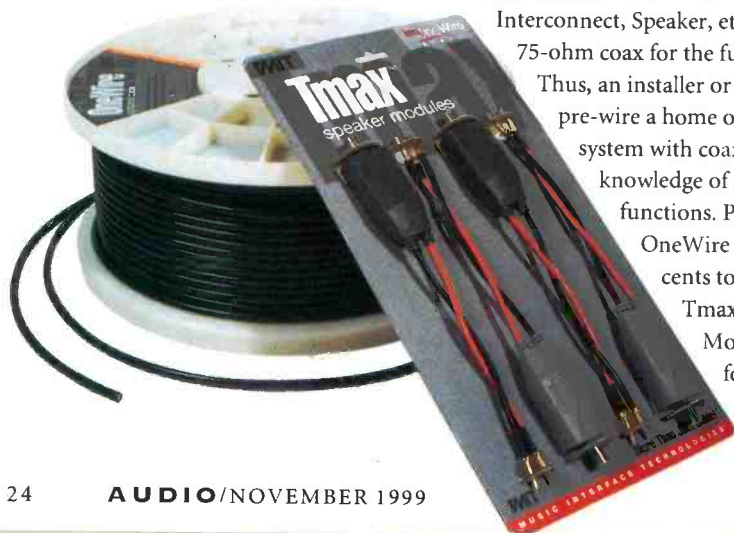
MIT A/V Cable

Music Interface Technologies says that one roll of its OneWire RG-59 or RG-6

coaxial cable, linked with the appropriate Tmax Terminator Modules, can fulfill any A/V cable function: line-level, speaker-level, video, or data. Each Tmax module type—Interconnect, Speaker, etc.—optimizes the 75-ohm coax for the function required.

Thus, an installer or A/V buff can pre-wire a home or home theater system with coax without advance knowledge of specific cable functions. Prices: range for OneWire cable, from 30 cents to \$4.20 per foot;

Tmax Terminator Modules (pack of four), from \$49.95 to \$69.95. (MIT, 530/888-0394)



Martin-Logan Hybrid Speaker

Comprising a 24-inch, curved electrostatic panel for midrange and treble frequencies mated (at 500 Hz) to an 8-inch, long-throw dynamic woofer for bass, the Scenario is said to outperform any other speaker in its class. Frequency response is specified as 45 Hz to 22 kHz, ±3 dB, with sensitivity of 89 dB/1 watt/1 meter. It stands almost 4 feet tall, is 10 inches wide and 15½ inches deep, and has a matte black finish. Price: \$1,995 per pair. (Martin-Logan, 785/749-0133)

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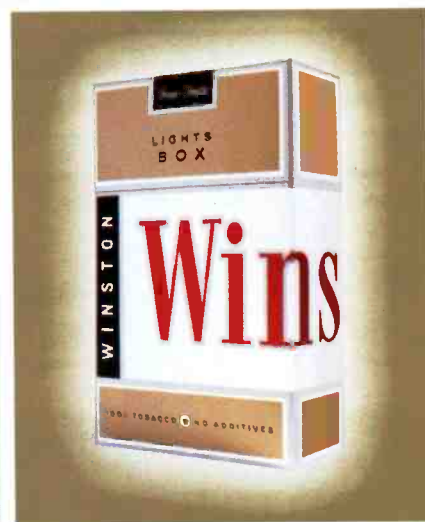
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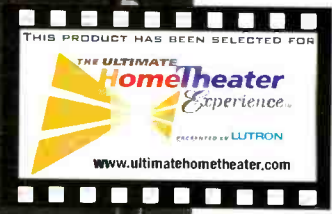
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sum·mit (sum´it) *n.* [*< L. summus, highest*]

1. the highest point; top
2. the highest degree or state

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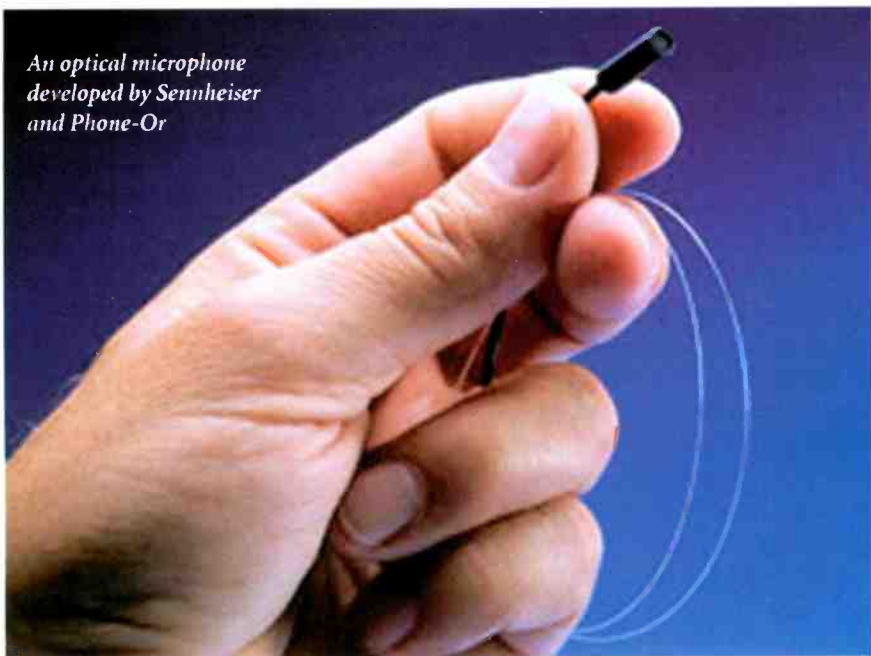
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An optical microphone developed by Sennheiser and Phone-Or



New Mike Designs for The Millennium

Someday, the microphones that record our music may be built like computer chips or made with fiber optics—though such mikes are likely to be used first for underwater mine detection, ultrasound imaging, conference recording, and cellular-phone design. Some of these technically daring designs are highly miniaturized versions of such old favorites as the condenser mike; others sense sound in entirely new ways.

Behind many of these new mikes lies a technique known as silicon micromachining. The technique involves placing thin layers of material on a silicon surface, then carving cookie-cutter patterns of material on each. Layers of different materials—conductive metals, semiconductor elements, and insulators—can yield other components, integrating the microphones with related circuitry. Even moving parts can be micromachined, as is now routinely done for such applications as accelerometers for

cars' airbag-control sensors. Mikes made this way are tiny (their features are just microns, or millionths of a meter, in size), so hundreds of mikes can be built on one silicon wafer, leading to easy fabrication of microphone arrays and potentially low production cost per microphone.

Researchers at the Technical University of Darmstadt in Germany have micromachined tiny silicon-based versions of condenser, piezoelectric, and piezoresistive microphones. One of their mike designs has a diaphragm of silicon nitride instead of Mylar or similar films, which makes it very rugged and resistant to high temperatures. Electret condenser mikes using these diaphragms have frequency response as good as conventional designs, with a range of 20 Hz

to 20 kHz. So far, these mikes are a little noisier than conventional electrets, but additional electronic devices could be built in to reduce this noise and do other sophisticated sound processing; someday, such microphones may be quieter than conventional ones.

The hundreds or thousands of microphones on one silicon wafer needn't all be carved apart into individual mikes. They can also be built as interconnected arrays. According to Marc Fischer of the Darmstadt group, those arrays could reconstruct a sound wave's origin and pinpoint its source by analyzing the tiny time differences between its arrivals at different microphones.

As yet, only relatively small silicon-mike arrays are being made, so the approach Fischer describes will probably be employed first for ultrasound (whose very short wavelengths make source location easier) for imaging applications from finding kidney stones to hunting defects in airplane wings.

Larger mike arrays, spaced farther apart, can be used to detect and locate longer waves, in the audible range. The mikes could even be individually aimed by motors micromachined onto the same silicon wafers. According to Peter Gammel of Lucent Technologies' Bell Labs, these larger, aimed arrays would be useful for conference calls, noise cancellation, and audience-participation pickup in talk shows. (A mike array

This condenser mike, developed at the Technical University of Darmstadt, barely covers the date on a penny.



Technical University of Darmstadt

NEWS+ NOTES

- Independent artists and small record labels have offered their works on the Internet for some time. Now, the major labels have joined them. This summer, the EMI Music Group's Capital Records offered recordings for direct download in either RealAudio or Windows Media Player formats, while Atlantic Records offered one Tori Amos single, "Bliss," through online music retailers (some of whom provided it in the Windows Media Player format, others as Liquid Audio files). Another Amos single, "Merman," was available online last year (in AT&T's a2b format), to anyone who preordered the CD it came from through Tower Records.

In December, Sony is scheduled to start selling music via the Internet in Japan. The company says that the downloads will be of CD quality, which seems to rule out the MP3 format and casts a bit of doubt on the prospect that Sony would use a Microsoft format it had earlier expressed support for.

- DVD-Audio discs will have their own distinctive packaging, to prevent confusion with CDs and video DVDs. Or maybe they won't—industry groups have failed to unite behind a standard. Some record companies and music retailers back a "super jewel box," the same width as current CD and DVD packs but an inch taller than CD boxes and about 2 inches shorter than DVD packages. Others favor sticking with the CD's jewel box design, at least for now.

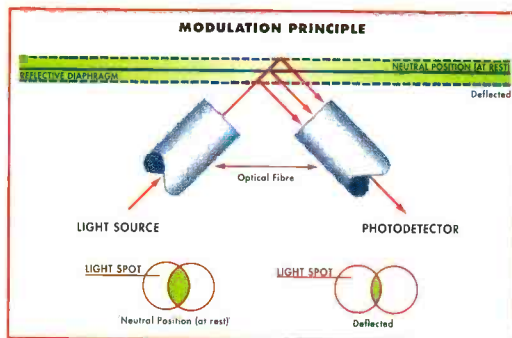
The competing format, Super Audio CD, will use jewel boxes, but with distinctive silver trim, according to Sony. The first sample disc given out to the press, however, was in a plain jewel box.

- Humans aren't the only species to be aroused by love songs. A researcher at the University of Maine is using the recorded songs of male fruit flies (produced by their vibrating wings) to encourage female fruit flies to mate with mute males.

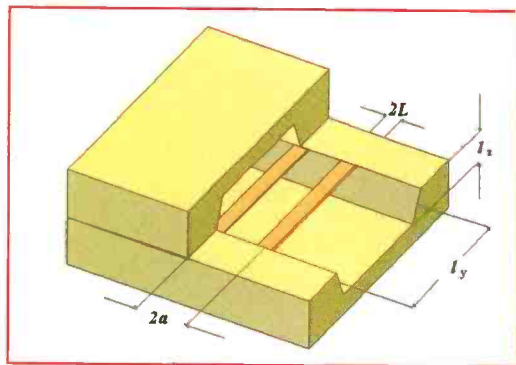
could be "directed at an audience member, rather than physically passed," Gammel says.) The Bell Labs micromachined mikes are pyramid-shaped and tiny enough for Dick Tracy's wrist videophone. Their diaphragms are of polysilicon, strong enough to easily withstand 1,000-G accelerations like those suffered by tennis, golf, and other balls. "Imagine listening to what a baseball hears when it is hit," says Gammel.

Other researchers are developing optical microphones in which, typically, laser light is reflected from the diaphragm to a photodetector. As sound vibrates the diaphragm, the reflections dance in and out of the detector's pickup pattern, making its output fluctuate to produce an audio signal. A unique advantage of optical mikes, says Wolfgang Niehoff of Sennheiser (which is developing them with an Israeli company, Phone-Or) is that "acoustical pickup and conversion into an electrical signal take place in different places." The detector can therefore be placed away from magnetic fields, extreme temperatures, high pressures, and other adverse conditions that may exist at the pickup point, and electrical interference can't affect the optical signals from the diaphragm to the detector. This makes optical mikes desirable for recording sounds near medical MRI machines, in hazardous industrial environments, and underwater. For singers and actors, optical microphones may offer a sweat-proof alternative to today's moisture-sensitive condenser body mikes.

Boston University researchers have proposed silicon mike arrays that combine acoustical and optical techniques to create handheld devices to locate underwater objects in silty water. The devices will work "like bat sonar," sending out ultrasound pulses and building pictures of unseen objects from the pulses reflected back. The device will require an array of more than 10,000 acoustic sensors, again micromachined on a silicon chip. Each sensor's diaphragm will be at the narrow waist of an hourglass-shaped cavity micromachined



In an optical microphone, diaphragm motions move a spot of reflected laser light, changing the output of a photodetector pickup.



The microflow generates signals from the changing resistance of two heated wires as a sound wave passes.

into the chip, the top of the hourglass open to serve as a horn and the bottom closed to serve as a Helmholtz resonator. The horn and resonator amplify diaphragm movements—by a factor of six in experiments so far. Diaphragm movements are read by a laser and photodiode. "The technology," says the Boston team, "is also capable of measuring airborne sounds."

But the optical and silicon microphones are utterly conventional compared to another design described by Sennheiser at a recent acoustics meeting in Berlin. At the meeting, company chairman Joerg Sennheiser described the "microflow" design, invented by Hans-Elias de Bree as a graduate student. Instead of a diaphragm, it has two platinum wires suspended over a microscopic trench and heated to 300° C (572° F). Sound waves passing through this setup change the velocity of cooling air across each wire; the signal is derived from resulting changes in the wires' electrical resistance.

The microflow's advantages include small size, resistance to water and extreme ambient

Continued on page 37

ART AND SCIENCE MEET.

FALL MADLY IN LOVE.



At Infinity, we've been "pushing the envelope" for over thirty years by constantly challenging established "speaker thinking" with dramatic new technology. From our very first product, a three-piece electrostatic system with a servo-controlled subwoofer and on to EMIT™ and EMIM™ Electromagnetic Induction Transducers in the Seventies. Two of the Eighties' premier systems, the IRS Reference Standard and legendary IRS Beta, and, later, the first high-end system to successfully integrate active electronics with premium transducers. In short, Infinity has never been a "me, too" speaker company and never will be. Our passion is to continue advancing both the art and science of sound. Our proof is the Prelude MTS system.



**PRELUDE MTS
SYSTEM SPECIFICATIONS**

Prelude MTS Tower

Frequency Response	80Hz – 22kHz (±3dB) 100Hz – 20kHz (±1.5dB)
Impedance	4 Ohms (±1 Ohm)
Sensitivity (2.83v @ 1 meter)	90dB
Recommended Amplifier Power Range	25 – 500 watts
2nd- and 3rd-Order Harmonic Distortion (20Hz – 20kHz @ 95dB SPL)	< 1%
Crossover Frequencies	80Hz, 300Hz, 2kHz
Dimensions (HxWxD)	37" x 6-1/2" x 7-1/2"

Prelude MTS Subwoofer

Frequency Response	23Hz – 80Hz (±3dB) 30Hz – 80Hz (±1.5dB)
Maximum Amplifier Output (In to 8Ω from 20Hz – 100Hz with no more than 0.1% THD)	850 watts
2nd- and 3rd-Order Harmonic Distortion (20Hz – 20kHz @ 95dB SPL)	< 1%
Crossover Frequency	80Hz
Dimensions (HxWxD)	20" x 9-1/2" x 20-1/2" 20" x 13" x 20-1/2" (including foot)

Prelude MTS Center Channel

Frequency Response	80Hz – 22kHz (±3dB) 100Hz – 20kHz (±1.5dB)
Impedance	4 Ohms (±1 Ohm)
Sensitivity (2.83v @ 1 meter)	89dB
Recommended Amplifier Power Range	25 – 500 watts
2nd- and 3rd-Order Harmonic Distortion (20Hz – 20kHz @ 95dB SPL)	< 1%
Crossover Frequencies	300Hz, 2kHz
Dimensions (HxWxD)	6-1/2" x 23" x 7-5/8"

NATURAL MAPLE

NATURAL CHERRY

ONYX ANIGRE



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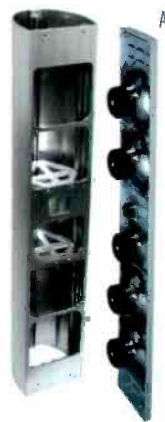
At the heart of the Prelude MTS system is our new C.M.M.D. technology, which has resulted in a revolutionary diaphragm — one much more rigid than those made with conventional materials. That means the elimination of unwanted resonance and the enhancement of listening pleasure.

CERAMIC METAL MATRIX DIAPHRAGM™ TECHNOLOGY

Transducer engineers have long sought cone and dome materials that could simultaneously achieve stiffness (for uniform, pistonic contact with room air), ultralight weight (for quick reaction to musical impulses), and freedom from internal resonances (which noticeably compromise the timbral character of music). Infinity's new Ceramic Metal Matrix Diaphragm technology is the first to satisfy all three criteria.

The key is a ceramic compound called alumina. Three times as stiff as titanium — and 85 times stiffer than felted paper — ceramic alumina conducts sound at nearly double the rate of traditional cone or dome materials. This increased speed raises natural mode cone vibration to frequencies above the range produced by each Prelude MTS transducer.

A pure alumina diaphragm is so impossibly brittle that it would immediately shatter during normal operation. So we scaled aerospace "honeycomb lamination" processes down to the microscopic level. Layers of alumina are deposited on both sides of a low-density aluminum substrate, creating a 3-layer "sandwich" that's stiffer and lighter than pure ceramic. The sound-speed differential between ceramic and substrate also provides additional damping that dramatically smooths frequency response peaks.



Each anodized-aluminum, primary-transducer column (A) houses a 1-inch C.M.M.D. high-frequency transducer (cast frame, 1-inch aluminum voice coil, neodymium magnet, integral rear heat exchanger), a 4-inch C.M.M.D. midrange (cast frame, 1-1/2-inch aluminum voice coil bonded to the cone for additional heat dissipation, butyl surround, neodymium magnet with Symmetrical Field Geometry™ and vented polepiece) and four 5-1/4-inch C.M.M.D. mid-bass drivers (cast frame, 1-1/2-inch aluminum voice coils, butyl surrounds, neodymium magnets with Symmetrical Field Geometry and vented polepieces).



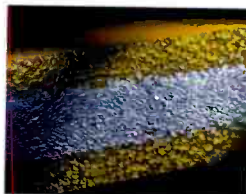
Detachable, elliptical subwoofer enclosures (B) contain a 12-inch low-frequency transducer (C) (cast frame, C.M.M.D. cone, butyl surround, Symmetrical Field Geometry with vented polepiece and external ceramic shielding assembly), powered by a dedicated 850-watt BASH™ amplifier capable of delivering musical peaks in excess of 2.5 kilowatts. The cabinets' hand-rubbed, natural Maple, natural Cherry or Onyx-stained Anigre veneers conceal a rugged, cross-braced enclosure structure designed to create a rock-stable platform for the high-output bass transducer.



D



Prelude MTS's matching center channel (D) reprises the main-column-transducer complement with a 1-inch C.M.M.D. high-frequency transducer, a 4-inch C.M.M.D. midrange, and two 5-1/4-inch C.M.M.D. mid-bass drivers. All Prelude transducers are magnetically shielded.



Cross section of Infinity's proprietary ceramic/metal matrix. Outer layers are pure alumina bonded to an internal substrate.

Rarely, if ever, has such powerful sonic accuracy been realized in a form as exquisite as the Prelude MTS system's. Seduction for the eye and bliss for the ear are now within your grasp.

The Prelude is the first high-end system that can, via our innovative Room Adaptive Bass Optimization System™, allow you to electronically tailor its bass output to the unique dimensions of your personal listening room.

It is also the first system to use Ceramic Metal Matrix transducer diaphragms, which are three times as rigid as any other cones or domes — and which virtually eliminate internal resonances at audible frequencies.

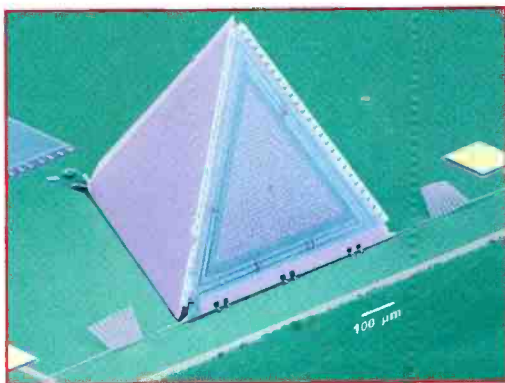
For the technical story of Prelude, read on. Or, if sound quality speaks more deeply to your soul than mere words, contact us for the location of your nearest Infinity Prelude MTS dealer at www.infinitysystems.com or call 1.800.553.3332.

And then immerse yourself in a profound state of musical art . . . made possible by the advanced acoustic science of Infinity.



SPECTRUM, continued from page 28 conditions, high directionality, low cost, and an absence of moving parts. Its noise levels are reasonable. But so far, its frequency range goes up only to about 5 kHz—good enough for telephony but not for music.

Of the designs I've described, only the silicon mikes seem directly destined for the audio market. Proponents believe they will replace many common microphone types in the next decade. But it won't happen until their costs come down. Silicon-wafer fabrication is very sensitive to economies of scale. As long as just a few hundred thousand silicon mikes are made each year, they're likely to cost at least 10 times as much



Lucent's silicon mike is less than 0.03 inch on a side.

as electret condensers. But their prices should drop dramatically with increased production. For now, their only consumer use is likely to be in hearing aids.

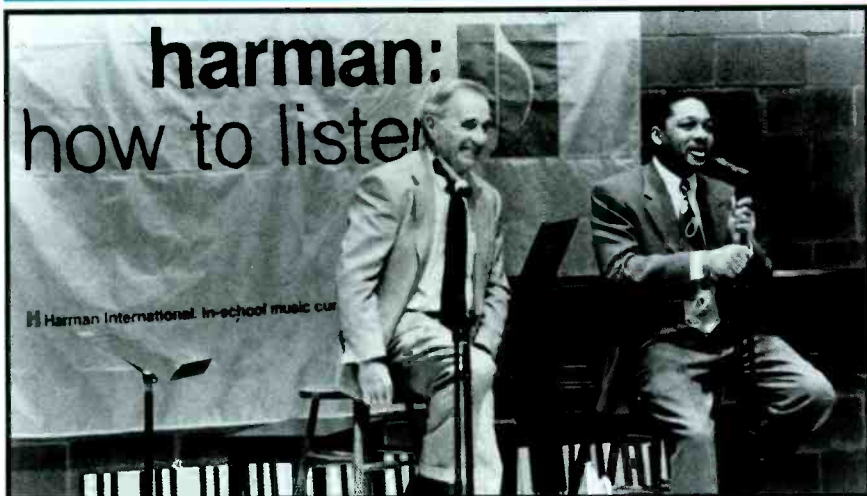
Ben P. Stein

NEWS+ NOTES

- Controversy has arisen over scientific findings that playing classical music to babies may enhance their brain functions ("Spectrum," March 1999). A new book, *The Myth of the First Three Years*, by Dr. John Bruer, says there's no neurological evidence of this. And Dr. Francis Rauscher, co-author of the original studies on the "Mozart effect," has told *The New York Times* that she feels the press mangled her results. The original study was not conducted on young children but on college students, and the music's effects were brief and limited to performance on a specific task of spatial imagery.

- Philips, Matsushita, and Amiga have announced plans to produce solid-state digital audio players for downloaded music. Philips's player, due early next year, will be SDMI-compliant, play MP3 files, and use removable media; enough memory for an hour's music will be included. Matsushita's player will also be SDMI-compliant but will play special-format files from the company's own music distribution system rather than MP3 and will download music directly from the Internet, no computer required. It will be available next April. Details of the Amiga player were not available by press time.

- It's not enough to listen: You have to listen right. Vulcanologists, says Dr. Milton Garcés, a geophysicist at the University of Hawaii in Manoa, haven't been. They've been trying to predict eruptions by monitoring volcanoes through the ground, where the earth's complex structure can distort seismic waves. Dr. Garcés's experiments with seismic and acoustic monitoring show that sound waves in air give clearer, more consistent warnings. The only catch is that the warning sounds occur below 20 Hz, the nominal low-frequency limit of human hearing.



Dr. Sidney Harman and Wynton Marsalis

Building Music's Future

For at least 2,000 years, music was considered a fundamental part of education. Today, it's the first frill to be trimmed with every budget cut—an attitude that eats at the future foundations of the audio and recording industries. Some people in those industries want music back.

In 1996, Dr. Sidney Harman (founder of Harman International) and Wynton Marsalis came up with a program called "harman: how to listen" that visited 20 schools in four cities. This fall, with aid from the Recording Industries Music Performance Trust Funds (a nonprofit group

that sponsors free musical performances), it reached 100 schools in 10 cities.

At each school, a 45-minute interactive presentation with live musicians is given for third- to sixth-graders, supplemented by eight follow-up sessions handled by the school's own staff. Each school is given teaching guides, sound equipment, and a collection of CDs donated by Tower Records. (Schools can get further information from the John Schreiber Group, 212/977-1100.)

At the same time, Harman's JBL subsidiary has joined VH1 and others in sponsoring a music tour to benefit the VH1 Save the Music Foundation. The foundation works to rebuild and raise awareness of music programs in public schools. *Ivan Berger*

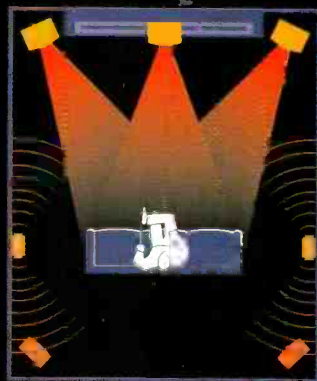
ONE GOOD DENON LEADS TO ANOTHER.



D·D·S·C
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MUSIC SURROUND

"This receiver gets my highest recommendation."

— Joe Hageman, Home Theater



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Denon's AVR-3300 – affordable surround sound without compromise. Like our critically applauded AVR-5700, the new AVR-3300 lets you choose between two surround speaker types and placements for discrete multi-channel music and movie surround soundtracks. Powered by the newest Analog Devices 32 bit SHARC DSP processor with real 24 bit/96 kHz D/A conversion, the AVR-3300 includes state-of-the-art features such as component video switching, along with 8 channel external input and 8 pre-amp outputs for future sound format and system upgrade capability. Denon's AVR-3300 A/V receiver – the finest sound you've ever experienced, for far less than you'd ever imagine.

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by Edward J. Foster

Evolutionary or



SUPER AUDIO

Revolutionary?

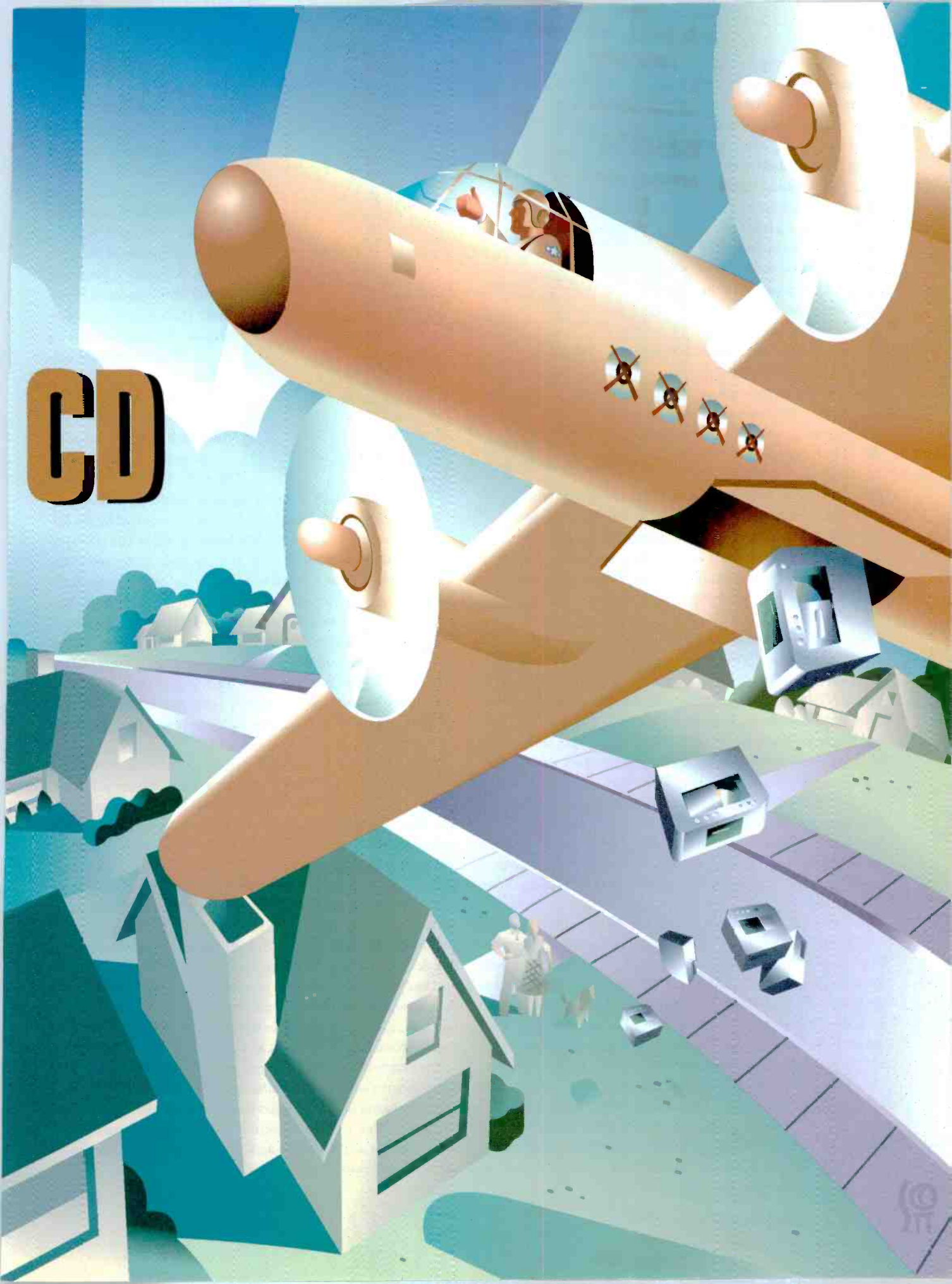
I can remember walking across Manhattan on a sparkling day in the late summer of 1996 to hear a new digital coding system called Direct Stream Digital (DSD). The venue was Sony Music's West 57th Street studios; I had barely an inkling of what I was in for. Sitting in the control room, I could see a jazz trio in the next studio, everyone close-miked. On the other side of the console was a pair of Wilson Audio Watt/Puppies. The idea was to compare the sound of the console feed with the sound through a then-state-of-the-art 20-bit pulse-code modulation (PCM) chain and the sound through a DSD chain, and then to decide which of the latter was closer to the former. As I recall, we had a choice of 48- or 96-kHz sampling rate on the PCM system, and a Studer 15/30-ips deck was available to play analog masters.

Everyone seemed to agree that DSD was closer to the direct feed than 48-kHz PCM, but something stuck in my craw. Finally, the light dawned. In the next room, I could see a microphone positioned 3 inches in front of the trumpet and another swallowed up in the piano, but my ears heard a reasonably spacious sound with a

modest degree of ambience. When I pushed the point, the engineers admitted to adding a bit of reverb and otherwise toying around to make the sound "more natural." Presumably, this was done digitally. Whether this affected the experiment's validity is moot, but, having run lots of demos in my 10 years at CBS Labs, I am a very suspicious guy. So I left Sony Music that day unconvinced that DSD was better than PCM. Besides, DSD proved to be a real bit-hog compared with PCM, and the scientist in me thinks that wasting resources is a sign of inelegant engineering.

We asked whether Sony intended DSD as a new consumer audio format and got the ol' runaround: "DSD was developed to archive Sony Music's vast collection of analog masters that are drying out and disintegrating [at] this very moment!" (Help! Help!) Sony's stated DSD objective was a digital recording system that would preserve every nuance recorded on those masters, was not limited by PCM's bandwidth and dynamic range constraints, and was convertible to any PCM format presently used or likely to be used, without sound degradation. Phew! Such a lofty objective, and here I was quibbling about bit rate! For shame. Besides, videotape (the

CD



proposed archiving medium) can store wads of data, Sony pointed out. I repressed my urge to ask why one would want to replace one crumbling tape medium with another when optical storage is possible and left the studio.

If DSD is the perfect way to archive past recordings, ipso facto it must be the best way to record new programs. Soon after, Sony and co-developer Philips trotted the DSD system around the pro audio world to drum up interest. Despite a lack of professional mixing and sound processing equipment capable of handling DSD (DSD signals can't be mixed on a PCM board),

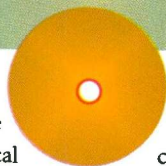
Sony managed to convert a handful of top-notch recording engineers, who made some excellent recordings using the new DSD technology. I remained my curmudgeonly skeptical self until last January, when I heard these recordings in a private demo at the Consumer Electronics Show. They'd now become Super Audio Compact Discs (SACDs), and a new consumer audio format was born.

Sony and Philips have been accused of launching SACD simply to roil the waters for DVD-Audio, a statement easier to make than to prove. The way I see it—and I'm sure I'll get lots of arguments on this—DVD-Audio extends present-day PCM technology into the surround sound realm and permits use of higher sampling rates and longer word lengths, whereas SACD takes a fresh look at what digital recording should be all about. DVD-Audio's goals are admirable—but it is still a multibit, PCM system, whereas SACD uses the aforementioned Direct Stream Digital technology. Whether DSD proves sonically superior to 20-bit/192-kHz PCM remains to be seen, but I'd not rule out the possibility. (Yes, I know DVD-Audio claims to permit 24-bit resolution, but for the reasons given in my DVD-Audio article in the September issue, I think that's just specsmanship.)

It's not what DSD has, but what it *doesn't* have, that makes the difference: a case where less may be more and where 1 bit may be better than 20. Nor did DSD emerge from the seashell as a fully formed Aphrodite. DSD is a byproduct of developments that led to the modern PCM converter. In fact, DSD analog-to-digital converters and most modern high-resolution PCM A/D converters start off the same way. Both use high-speed, oversampling 1-bit (or "low-bit") delta-sigma modulation, and noise shaping, to transform analog signals into the digital domain. DSD samples incoming signals 2,822,400 times a second (64 times the 44.1-kHz CD rate), an oversampling rate typical of PCM converters as well. (For more about oversampling, 1-bit delta-sigma modulation, and noise shaping, see "A Compleat Digital Primer.") Where DSD and PCM part compa-

SUPER AUDIO CD

DIRECT STREAM DIGITAL
IS A BYPRODUCT OF
DEVELOPMENTS THAT
LED TO THE MODERN
PCM CONVERTER.



ny is in what they do with the 1-bit data stream. To record PCM, the high-speed, 1-bit data are converted into multibit words at a lower sampling rate. In the conversion, data are decimated and digitally filtered to avoid aliasing (see "Primer"), because the sampling rate is being reduced. Although a brick-wall digital filter is easier to implement than its analog equivalent—it simply involves a series of mathematical calculations—its effects are not necessarily benign. Digital filters overshoot and ring both before and after transients, and each mathematical calculation increases the word length. If the accumulators in the filter cannot accommodate the longer words, overshoots caused by the calculation can be clipped or the least significant bits (LSBs) of calculated data can be truncated. In a complex, multistage brick-wall decimation filter, internal word length can reach or exceed 100 bits! To constrain the word length, well-designed multistage decimation filters requantize (to reduce the word length) at each stage. In any case, the output data must be requantized to fit the system parameters—i.e., word length must be reduced to 16 bits for CD or to 16, 20, or 24 bits for DVD-Audio. Each requantization produces distortion if the data are not properly redithered, but in randomizing quantization distortion, dither raises the noise floor slightly. No free lunch!

When played back through a delta-sigma D/A converter (the dominant method nowadays), multibit PCM words are converted back to a high-speed 1-bit (or low-bit) data stream by an interpolation filter and returned to analog by a delta-sigma modulator and reconstruction filter—hence more calculations, more overshoot, and more phase shift. Which perhaps is what has led some audiophiles to prefer the sound of gentle, low-order interpolation filters to that of brick-wall types, despite the large amounts of aliasing distortion that so-called soft filters permit! I'm not in that camp, but it does raise a question: Why use this approach? The simple answer is that delta-sigma modulators have been found to be the most practical and cost-effective way to convert digital information back to the analog domain. A 1-bit modulator is inherently linear and, properly implemented, can have wide dynamic range. Ladder DACs have problems achieving 16-bit accuracy, never mind 20 or 24 bits!

The beauty of a 1-bit delta-sigma-modulated data stream is that it contains the analog signal within itself. Although the delta-sigma stream is digital, in that it toggles between two fixed levels ("1" and "0") rather than trying to describe a continuum of intermediate values, Fourier analysis of the data stream reveals the original analog signal embedded in the original band of frequencies where it

began. All that is needed to restore it is an analog low-pass filter to dump the digital trash!

The salient difference between Direct Stream Digital and PCM is that DSD cuts out the middlemen. Instead of using a decimator and digital filter to get 1-bit data into multibit form for recording and then using more calculations in the player to turn PCM words into 1-bit equivalents so they can be linearly converted to analog, DSD records and plays the 1-bit stream directly (Fig. 1). In principle, all that is needed in the player is an analog low-pass filter to reconstruct the audio and reject the ultrasonic digital trash. Looked at this way, DSD is a simpler, more straightforward, more analog approach to digital recording, and the old audiophile adage that says “the less the better” is more often right than wrong.

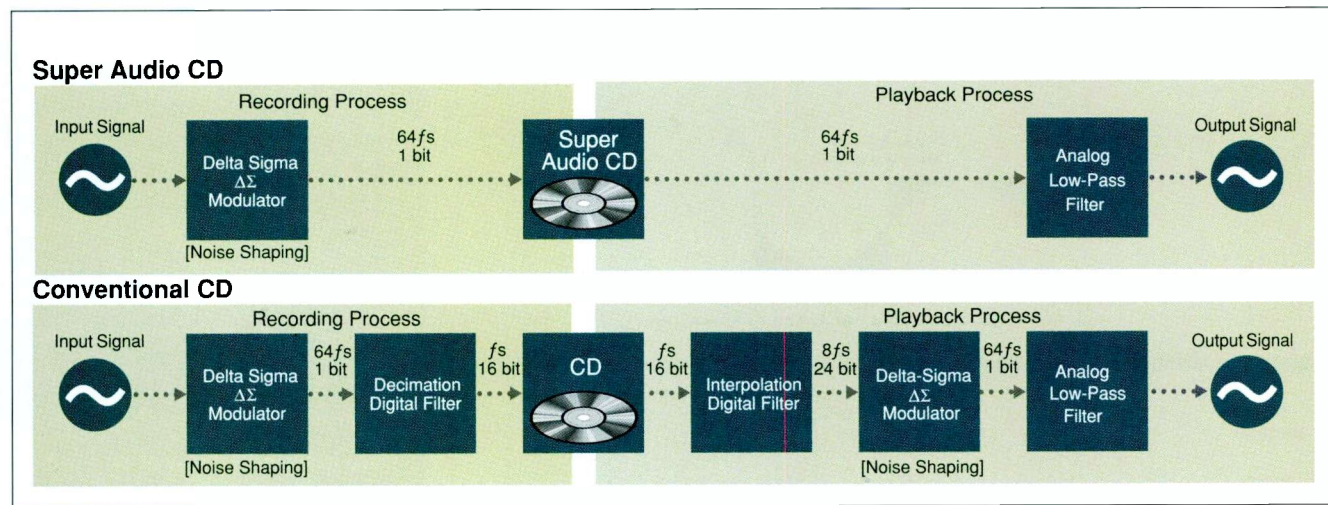
DSD also offers a flexible trade-off between bandwidth and dynamic range. With PCM, bandwidth is sharply limited to half the sampling rate while maximum dynamic range is dictated by word length. Proponents argue that the dynamic range of a PCM system can be made arbitrarily large by increasing the word length, but in my experience, the practical end-to-end limit for a PCM system is about 20 bits, and there are good reasons for that.

With DSD, bandwidth and dynamic range are determined by the type and order of the noise shaping used in recording and, to a lesser extent, by the analog low-pass filter in the player, characteristics that are not cast in stone. The only constraint the SACD “Scarlet Book” of standards places on the encoder is that the total noise energy in the region below 100 kHz not exceed -20 dBFS. There is a recommendation that SACD players incorporate a 50-kHz low-pass filter “for use with conventional speakers and amplifiers,” but higher cutoff frequencies are permitted.

instance, use a high cutoff frequency to maximize system bandwidth, in which case you’d have the choice of using either high-order noise shaping to maintain the same dynamic range over the wider bandwidth or a lower-order filter at the sacrifice of dynamic range. On the other hand, you also could lower the cutoff frequency of the noise shaper to improve dynamic range in the audio band (for a given filter order) if you thought that delivered better sound.

The point is that DSD is a flexible coding system that leaves the recording engineer (and A/D converter designer) in charge of sound quality. I find that appealing because it portends future quality improvements within the SACD format. By adopting 16-bit/44.1-kHz PCM, Sony and Philips locked the CD in a straitjacket. Apparently, they don’t intend to repeat that situation. The flip side of the flexibility coin is that it’s difficult to speak in concrete terms of a player’s (or the SACD format’s) bandwidth or dynamic range because the two are interrelated and affected by choices made in the recording studio.

Suffice to say that SACD claims the equivalent of 20-bit PCM resolution within the audible range and a bandwidth of 100 kHz. That should encompass the range of human hearing quite nicely. Presumably the 20-bit/100-kHz claim is based on using reasonably high-order noise shaping in the A/D converter and a fairly steep low-pass filter in the player. There’s a limit to how far one can (or should) go in optimizing both factors at the same time. It is counterproductive to shoot for maximum bandwidth together with maximum dynamic range. Doing so would require a very high-order noise shaper with a very high cutoff frequency, which would force so much of the quantization noise into the ultrasonic region



fs: 44.1 kHz

High-order noise shaping forces more of the quantization noise into the ultrasonic region and improves dynamic range within the audio band. But since high-order noise shapers are not stable when overloaded, they must be designed with controls that prevent overload and a way out should it occur. (The same applies to the noise shapers used in high-resolution PCM converters.) The cutoff frequency of the noise shaper enters the equation because it affects the bandwidth of the DSD system. You could, for

Fig. 1—By eliminating the conversions from delta-sigma modulation to PCM—and back—that are typical of modern CD recording and reproduction, SACD greatly simplifies the entire process.

A C O M P L E A T D

Digital audio systems have two things in common: sampling the analog input signal at a regular rate and quantizing (assigning a value to) each sample. The sampling rate puts an upper limit on frequency response; quantization establishes the dynamic range. The theoretical upper limit of a sampling system is one-half the sampling rate. This is the so-called Nyquist criterion. Because Compact Discs use 44.1-kHz sampling, the theoretical upper limit on frequency response is 22.05 kHz.

Signals of higher frequency that enter the sampler cause *aliases* that cannot be distinguished from real signals. Aliasing is a form of intermodulation distortion, or beating *between* the signal and the carrier, that produces new signals at the sum and difference frequencies. For example, if a 43.1-kHz (or 45.1-kHz) signal is sampled at 44.1 kHz, a 1-kHz beat is produced that cannot be distinguished from a true 1-kHz signal. Aliases at the sum frequencies (87.2 kHz and 89.2 kHz in this case) also occur, but, lying in the ultrasonic region, they are inaudible. The 1-kHz difference signal definitely is audible, so signals of frequencies greater than half the sampling rate must be prevented from entering a sampler. This is the job of the anti-aliasing filter.

In digital audio's early days, anti-aliasing filters were complex analog circuits that attempted flat response to 20 kHz and high rejection at 22.05 kHz and above. Designing such a filter was (and is) a formidable task; building an affordable one was (and is) even more difficult. In-band response seldom was flat, out-of-band rejection rarely was as much as needed, and group delay wasn't uniform. This caused severe phase distortion at high frequencies.

Oversampling—sampling at a higher rate than the Nyquist criterion requires for the desired bandwidth—offers an out. Instead of sampling at 44.1 kHz, suppose one samples at 176.4 kHz (four-times oversampling) while maintaining the original 20-kHz system bandwidth. Signals above 88.2 kHz still alias, but the lowest frequency that creates a sub-20-kHz alias is 56.4 kHz (176.4 kHz minus 156.4 kHz equals 20 kHz). That provides more room for the analog input filter to work, greatly simplifies the design, and improves phase response.

When the digital signal is returned to the analog domain, it appears as a series of samples, and similar aliasing problems occur. If the D/A converter operates at the original sampling rate, another brick-wall filter is needed at the output. (That's what was done in the early days, and CDs got the rap for bad sound.) A solution is the use of another form of oversampling, a digital interpolation filter.

Interpolation filters use mathematical calculation to increase the sampling rate and move images out to higher frequencies, where they can be removed by a relatively simple analog filter. Oversampling is beneficial but has a major drawback: There's less time for each conversion, which is a real problem in

Interpolation filters use mathematical calculation to increase the sampling rate and move images out to higher frequencies, where they can be removed by a relatively simple analog filter. Oversampling is beneficial but has a major drawback: There's less time for each conversion, which is a real problem in

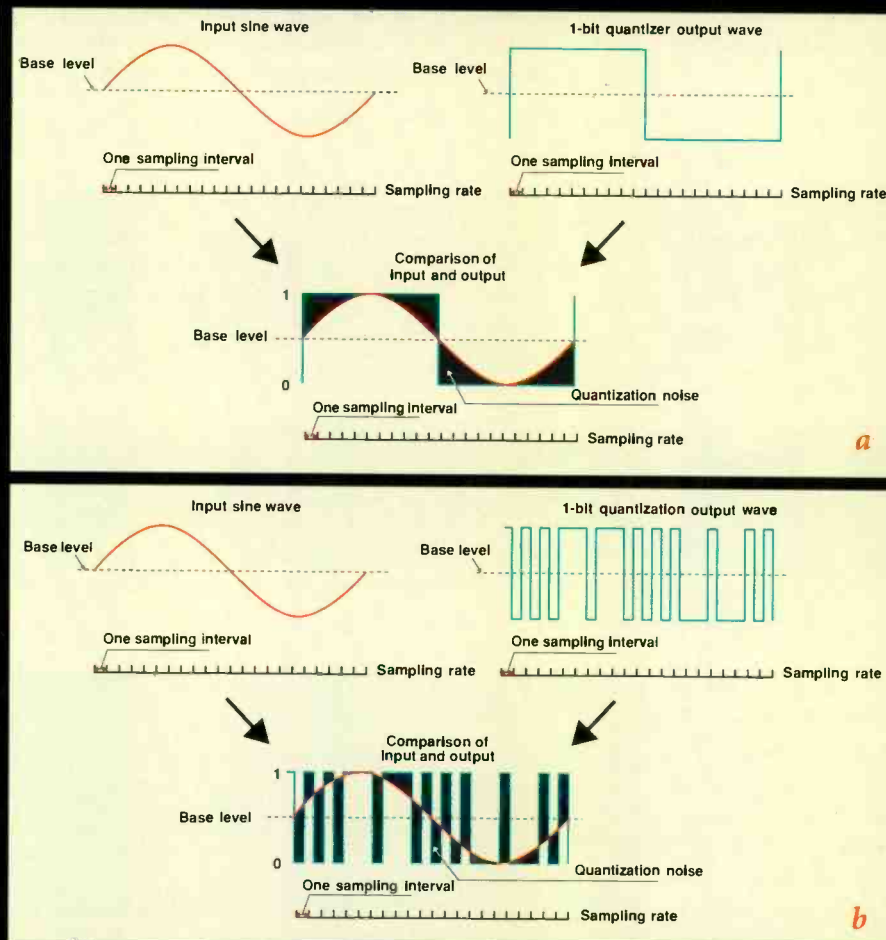


Fig. A1—A simple 1-bit FCM quantizer (a) produces very high quantization noise (the difference between the input and output waveforms) within the audio band. A 1-bit delta-sigma modulator (b) produces the same total amount of quantization noise, but it is spread over a much wider bandwidth, so less of it appears in the audible range.

DIGITAL PRIMER

one is shooting for 16-bit (or better) accuracy. This brings up the subject of quantization.

Just as prices are usually rounded up or down to the nearest penny because that's the smallest coin in our currency system, a digital representation must be rounded up or down to the nearest value permitted. This produces quantization error, which in the audio world is called quantization noise. PCM 16-bit binary words (CD, DAT, etc.) have 216 possible values. In decimal notation, that's 65,536 possible values, one of which is zero. Because the maximum quantization error is always $\pm 1/2$ of the least significant bit (LSB), increasing the word length provides finer resolution and better dynamic range. In a PCM system, theoretical signal-to-noise ratio is equal to 6.02 times the number of bits plus 1.76 dB, so a 16-bit system can theoretically handle a dynamic range of 98 dB. Achieving this in practice is easier said than done.

Early analog-to-digital and digital-to-analog converters used a straightforward way of converting between domains. On the A/D side, the sample value was compared to a set of voltages established by a resistor network. The digital word was then generated by successively approximating the value until it got as close as possible. On the D/A side, another resistive ladder generated currents proportional to each bit of the digital word. The currents corresponding to the "1" bits were summed to produce the output. The concept is simple, the execution excruciating. The problem is one of tolerance; the MSB (most significant bit) of a PCM word accounts for half the total value, and it's nearly impossible to make it precise enough that the error doesn't swamp the less significant bits. Consequently, early 16-bit converters rarely achieved true 16-bit performance.

Most modern converters use high-order oversampling, 1-bit or low-bit delta-sigma modulation, and noise shaping to transform between the domains. Delta-sigma modulation is an offshoot of the delta modulator developed at Bell Labs decades ago. Delta modulators are rather simple circuits that compare the present value of the analog signal with the past and output a "1" if the value has increased and a "0" if it has decreased. Delta modulators do not encode the actual signal; instead, they mathematically encode its change—its delta, or derivative. By including an integrator (sigma) in the comparator loop, the delta modulator becomes a delta-sigma (probably more properly called a sigma-delta) modulator. Integration mathematically reverses the derivative so that a delta-sigma modulator encodes the signal itself.

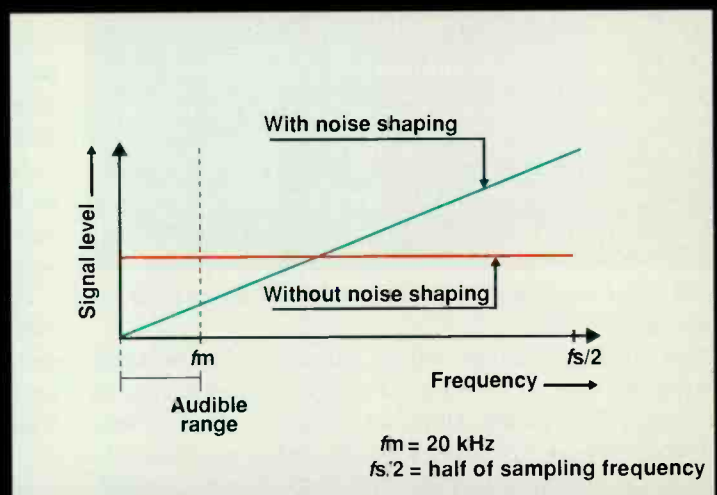
Fig. A2—Comparison of noise spectra with and without noise shaping.

In theory, a 1-bit delta-sigma modulator is perfectly linear, because all bits have identical value. The problem is quantization noise. With only 1 bit to describe data, the dynamic range is zilch! Oversampling and noise shaping come to the rescue. Digital quantization noise spreads from DC to half of the sampling rate. (See Fig. A1.) With 64- or 128-times oversampling, most noise is in the ultrasonic region and can be disregarded, but the raw quantization noise of a 1-bit converter is so great that oversampling by itself is not enough. Doubling the sampling rate spreads the noise over twice as much bandwidth, but that improves the dynamic range within the audio band by only 3 dB. Thus, 64-times oversampling results in an 18-dB gain and a 1-bit, 64-times oversampled converter has about 4 bits of resolution in the audio band. Hardly enough!

Here's where noise shaping comes in. Noise shaping is a technique that effectively low-pass filters the desired signal and high-pass filters the quantization noise. This squeezes the noise out of the audio band into the ultrasonic region, much as air in a cylindrical balloon can be squeezed into one end by grabbing the other (Fig. A2). Actually, a 1-bit delta-sigma modulator is itself a first-order noise shaper. The integration provides the filtering action, and a 64-times oversampled delta-sigma converter has better than 4-bit resolution within the audio band.

Combining several delta-sigma modulators in the same loop results in higher-order noise shaping that forces more of the noise into the ultrasonic region. Within reason, this technique can achieve arbitrarily good resolution within the audio band and perfect converter linearity. The extremely high sampling rate also effectively eliminates aliasing concerns in the delta-sigma modulator, although aliasing can occur if the 1-bit stream is downconverted into multibit PCM at a slower rate. One of DSD's prime claims to fame is that it avoids that last step.

E.J.F.



that a brick-wall filter would be required in the player to dump it. That's exactly what DSD was meant to avoid.

So much for DSD; what about SACD? I draw a distinction between DSD, the recording technology, and SACD, the consumer audio super-disc, because DSD may succeed for archival purposes whether or not SACD proves a consumer success. Physically, an SACD is very similar to a DVD. Although it can't be played on today's DVD players, I see no reason why it couldn't be played on future systems because the physical size (12 centimeters), storage capacity (4.7 gigabytes per layer), and optimum laser wavelength (650 nanometers) are the same. (In fact, Philips recently announced its intention to deliver a universal DVD-Video/DVD-Audio/SACD/CD player late next year.) Only the maximum transfer rate and data format differ.

SACD discs are single-sided and come in three varieties: a disc with one high-density (HD) layer that carries DSD information exclusively, a disc with two HD layers that provides 8.5 gigabytes of storage for longer playing time, and a hybrid that has an HD upper layer and a 44.1-kHz, 16-bit Red Book (CD-compatible) lower layer that existing CD players should recognize (Fig. 2). Hybrid discs solve the dual-inventory problem that was said to be so important to the music industry. At one point, a DVD-Audio spokesman told me that the same could be done with their format, but lately they seem to be backing off that position on the grounds

culty recognizing the hybrid SACD as a CD, nor did my Philips laserdisc player. The only machine that refused to read the disc was a Matsushita-sourced single-laser DVD player that also burps on CD-Rs.

SACD supports 255 tracks, which eliminates any need for index numbers. It also supports text (song lyrics, liner notes, and the like), graphics, and limited video (still-frame, album covers, etc.), but it is not primarily a video system. The format allows for as many as six channels of DSD surround sound in addition to a DSD stereo track. SACD does not incorporate anything like DVD-Audio's Smart Contents automated-mixdown capability, so a separate stereo track is not merely an option if high-resolution stereo is desired, but a necessity. Sony and Philips contend (and most top-notch recording engineers would agree) that it is not possible to do justice to stereo by having a player generate it from a surround mix, even if the producer has as much control over the mixdown process as he does in Smart Contents. In the studio, stereo mixes are made from the original multitrack master, not from a surround mix thereof. Sometimes even the microphone setup is different for stereo than for surround sound.

SACD was designed to have the same 74-minute playing time as a normal CD (sensible in light of the Red Book layer on the hybrid disc), but with eight DSD channels (six surround plus studio-mixed stereo) on the HD layer, SACD devours storage capacity at a

wild pace. The DSD data rate comes to 2.8224 megabytes/second, which chews up a 4.7-gigabyte HD layer in 27 minutes, 45 seconds. To boost this capacity to 74 minutes, the Philips half of the team concocted a lossless compression algorithm called Direct Stream Transfer (DST). DST uses a combination of linear prediction and Huffman coding to compress the data by a ratio greater than 2:1. (By my calculations, they'd need 2.67:1 packing to deliver 74 minutes of six surround plus two stereo channels on a 4.7-gigabyte layer.)

DST divides the data into 13.3-millisecond frames. Within each frame, a linear filter predicts whether the next bit will be "1" or "0," based on the value of the preceding bit. The predicted value is compared with the true value. If the prediction is correct, the comparator outputs a "0"; if it's incorrect, the comparator outputs a "1." Because audio data are not random, the predictor is right more often than wrong. Therefore, the output of the comparator is likely to consist of relatively long strings of "0s" with occasional "1s" where the prediction was incorrect. And because it contains long strings of the same value, the predicted data is more redundant than the original. The redundancy is then removed by a Huffman code, which produces the actual compression.

Huffman coding replaces common patterns of data with simpler codes. For example, if four consecutive "0s" is the most frequent occurrence, "0000" could be replaced with a single "0," defined in the Huffman table as "0000." That yields 4:1 compression for the "0000" pattern, but now a different code is needed to replace a single "0." Because the single "0" code will be more than 1 bit long, some ground is lost. The point is to make the data as redundant as

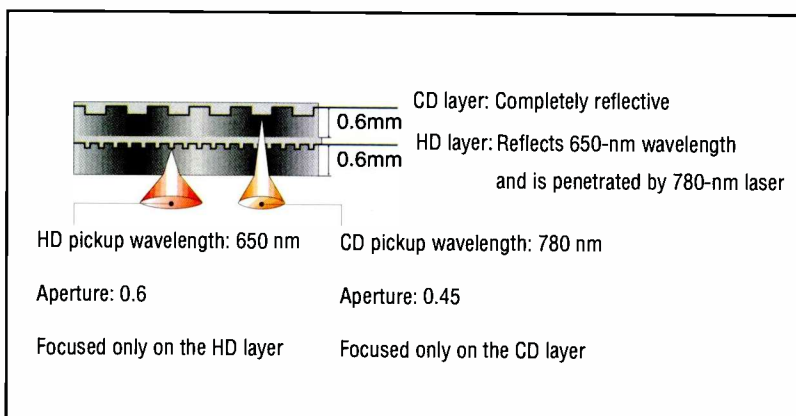


Fig. 2—A hybrid SACD has two layers. The high-density layer is derived from DVD optical technology and carries the high-resolution DSD data streams. The base layer is essentially a standard CD. The HD layer is only semireflective, to allow the longer wavelengths of a standard CD player's laser pickup to penetrate it and read the CD layer.

that they've found many CD players that will not recognize the CD layer of a hybrid disc.

Four of the five discs I got with the Sony SCD-1 (reviewed elsewhere in this issue) were hybrids, so I thought I'd give them a go on the players I had around. All played fine on my reference Sony CDP-XA7ES player, on a Technics portable, and on an antediluvian Yamaha CD deck. My Sony DVP-S7700 DVD player had no diffi-

possible (via linear prediction) and then assign the shortest codes to the most common patterns and the longer codes to the least common patterns.

A Huffman table can be fixed or computed for each data frame to optimize compression on a frame-by-frame basis. It's not clear which approach is taken, though I suspect Philips derives a new table for each frame based on the patterns found within it. Because the table constantly changes in this case, modifications to it must be included with the data as side information, so the player knows how to decipher the block. Consequently, there's a delicate trade-off between the size of the frame and the amount of side information that must be transferred to optimize the compression ratio.

Assuming error-free transmission, this type of compression is lossless. That is, the original 1-bit data stream can be perfectly restored from the compressed information. Although I use the term "prediction error," there is no error overall. When the encoding predictor is wrong, that information is sent in the data to the player whose decoding predictor is told "whatever you think the value should be is wrong, so fix it!"

As I write this, the only SACD player and existing sample discs are stereo-only. One cannot help but conclude that in order to beat DVD-Audio to market, choices had to be made. My guess is that Philips' DST algorithm was not locked in silicon in time, but it's also possible that no multichannel DSD masters were available. As I said earlier, DSD cannot be mixed on a PCM board, and DSD mixers and signal processors are as rare as hens' teeth.

Sony has stated that the SACD launch will be supported by an initial release of approximately 40 titles from AudioQuest, Delos, dmp, Mobile Fidelity, Telarc, Water Lily Acoustics, and Sony Music. Sony Music has indicated it will release 10 titles per month thereafter. Time will tell. Philips can't help because it sold its record labels (PolyGram et al.) to Universal Music, which is aligned with the DVD-Audio group. At present, the DVD-Audio group has gotten more companies to sign on the dotted line than have Philips and Sony, possibly because it seems more amenable to the stronger copy-protection and anti-piracy schemes the record industry desires. But the protection issue remains a thorn in the sides of both camps.

As I see it, the music industry wants something it can't have without destroying the rationale for a superior audio carrier. From what I've been told, the record companies not only want to be able to protect against indiscriminate digital cloning but to control

SUPER AUDIO CD

DSD'S GOAL WAS
A SYSTEM THAT WASN'T
LIMITED BY PCM'S
BANDWIDTH AND
DYNAMIC RANGE
CONSTRAINTS.



copying in the analog domain as well. It's one thing to scramble a digital signal or insert flags in the data stream that legal digital recorders recognize and refuse to record; it's another to have protection carry over into analog output signals. Digital flags can be recognized, acted upon, and stripped before conversion to analog, but it seems to me that anything that ends up recognizable by an analog recorder can't help but be audible. If the music industry couldn't get away with this on CDs (it tried, remember), how can it possibly expect to do so on a higher-quality medium?

I think the best the record labels can hope for is to make indiscriminate digital cloning illegal and difficult and let it go at that. No one is seriously proposing military-style encryption, and anything short of that will quickly be hacked by commercial pirates. Commercial piracy and the Internet are the serious threats to the music industry, not audiophiles. We're the customers!

Actually, SACD seems to have certain advantages over DVD-Audio with respect to piracy, even though Sony and Philips won't agree to any tampering with the signal that possibly could be audible. SACD discs not only carry a digital watermark but can also carry a visible one. As with DVD-Audio, the digital watermark can be used to prevent a player from reproducing an illegal disc and to control how many copies can be made. The (optional) visible watermark assures the buyer that the disc is legal.

The visible watermark is created by Pit Signal Processing (PSP) while mastering the disc. PSP varies the pit width in a way that leaves a visible pattern on the disc—for example, the DSD logo. Reportedly, the technology needed to do this in a way that does not cause jitter is extremely complex, and the magic boxes will be made available only to licensed pressing plants. PSP offers a fighting chance of reducing commercial piracy if consumers refuse to buy unwatermarked discs. But that's a big if, when visible watermarking is optional. **A**

ACKNOWLEDGMENTS

I wish to acknowledge the assistance of David Kawakami of Sony and Dr. Andrew Demery of Philips in providing AES Preprints and other technical background material. Special thanks to Ed Meitner of EMM Labs for sharing his experience in designing the DSD professional equipment that made possible many of the recordings I heard.

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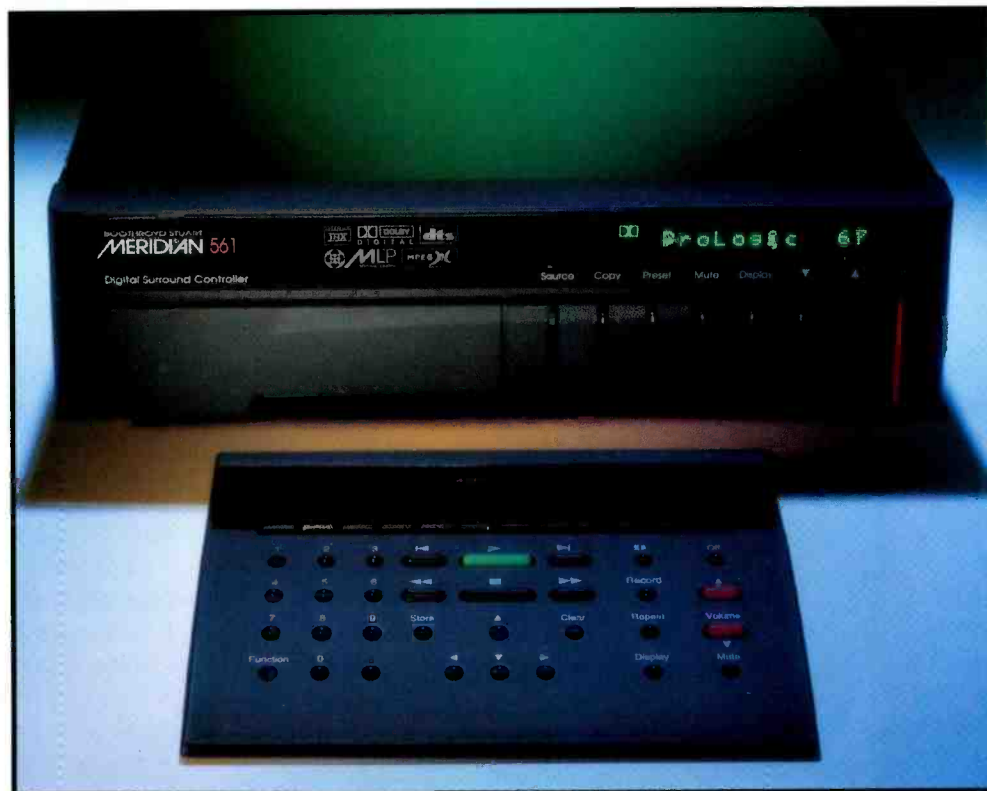


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COREY GREENBERG

Meridian 561 Surround Preamp



Photos: Michael Groen

What's with the titty twisters in movies lately? After being pleasantly surprised by *The Wedding Singer*, I rented Adam Sandler's *The Waterboy* and was treated to the sight of a probably Royal Shakespeare Company trained actor old enough to be Sandler's father suddenly yanking up his shirt at the end of the movie and blissfully adjusting his bass and treble controls. Then I'm in the theater to see *Austin Powers: The Spy Who Shagged Me*, and all of a sudden it's Mike Myers in a fat-guy suit bellowing "I'm dead sexy!" in a Scottish accent as he pincers his fatted dugs.

Okay, let's run down the checklist. Semen as hair gel, funny. Bald midget biting another man's privates, funny. But nipple twist-

ing? Which Friar's Club meeting did I miss where Sid Caesar banged the gavel on this one?

Don't get me wrong, the titty twister has its place. As a means of adolescent torture it's a hallowed maneuver, fully equal to anything Torquemada ever thought up. Why, if

MERIDIAN

Dimensions: 12³/₈ in. W x 3¹/₂ in. H x 13¹/₂ in. D (32.1 cm x 8.9 cm x 33.5 cm).

Weight: 19 lbs. (8.6 kg).

Price: \$4,995.

Company Address: 3800 Camp Creek Pkwy., Bldg. 2400, Suite 122, Atlanta, Ga. 30331; 404/344-7111; www.meridian-audio.com.

I myself were to be tied up and subjected to said treatment till I revealed the name of the best sounding surround processor I've ever heard, (see "Personal Ads," *The Village Voice*, October 12), I'd yelp "The Meridian 565!" in a heartbeat. Joined at the hip to its companion 562V audio/video controller, the 565 is pure sonic bliss.

So why don't I use this \$7,440 combo as my reference? Because—and I can't stress this highly enough—setting up the Meridian duo is a scorpion's titty twister. With no on-screen menus and a confusing multi-button configuration scheme, the 565/562V is as tough to set up as it is great sounding. Frankly, it was a relief when the similarly priced Theta Casablanca surround preamp came along (Auricle, April 1997), because its sound rivalled the Meridian's but with a far simpler set-up scheme.

Now Meridian's firing back with the new 561, a one-box surround preamp with the same features and state-of-the-art DSP as the 565/562V combo. The key new feature, though, has got nothing to do with sound quality—it's an RS-232 serial port on the Meridian's back panel, which, along with Meridian's Win95/8 setup software supplied on a floppy with each 561, lets you configure the new preamp from the comfort of your home PC. The software also

**The forward-thinking
561 preamp/processor
is aimed squarely at
the CD/DVD user.**

makes it easy to download firmware upgrades off the company's Web site and install them with nothing more than a few mouse clicks. And the kicker is the sticker—just \$4,995, a full \$2,445 less than the 565/562V.

Not surprisingly, the forward-thinking 561 is aimed squarely at the CD/DVD user, making no apologies to those who still bang the drum for analog formats like vinyl and laserdisc. CD and DVD-Video players can plug right into any of the 561's six digital inputs, but you'll need to add Meridian's optional 519 RF demodulator to play the Dolby Digital soundtracks on AC-3 laserdiscs. And die-hard LP purists will clutch their chests and crumple to the ground over the 561's lack of a true analog pass-through—all analog sources plugged into the Meridian are immediately translated to digital with a Crystal Semiconductor 20-bit delta-sigma A/D converter (the 561's three DACs are also 20-bit).

A couple of years ago, I would've found the 561's lack of an analog pass-through a tough pill to swallow. But I have to admit that while I've still got all my records and an upscale-though-hardly-he-man analog rig, I'm not bothered at all by the Meridian's digital futureboy bent. Certainly, it helps that the 561's A/D is so damn clean—other than a slightly rolled-off top end, I didn't hear any significant coloration when listening to my LPs through the 561's 20-bit A/D/A labyrinth. (I find that the latest Crystal 20-bit A/D chips found in today's better gear all but banish the edginess and grainy treble I used to hear from older DSP preamps and receivers that ran analog signals through an ADC). I've heard plenty of highly regarded tube and solid-state preamps that colored the sound of my records to a far greater and more bothersome degree than the 561. Still, I can see where a guy who's dropped five or six grand on his turntable alone would keel over on principle alone. The rest of us can breathe easy.

An extremely sophisticated and proprietary DSP engine serves as the heart of all processing inside the 561. Two Motorola 56002 chips running at 66 MHz and a Motorola 56303 running at 72 MHz spit the bits for Dolby Digital and DTS decoding, THX processing, MPEG audio decoding, and (not surprisingly) Meridian's own MLP processing for DVD-Audio, making the 561 one of the very few surround preamps on the market able to properly decode the digital output from DVD-Audio players when they arrive.

But this doesn't mean the 561 is ready to play DVD-Audio discs yet. The first DVD-Audio players will be six-channel analog output only, and the Meridian does not have such an input to accommodate them. There's a plugged hole on the back panel presumably reserved for an IEEE-1394 (aka FireWire) digital input, but Meridian has yet to work out the details for the upgrade. Officially, the company expects to have it ready to go by the time second-generation DVD-Audio players with FireWire outputs hit the market sometime next year.

I plugged the Meridian preamp into my reference system where Theta's mighty Casablanca usually rides herd. A Bryston

An extremely sophisticated DSP engine serves as the heart of all the 561's processing.

9B-ST five-channel amp drove four NHT 3.3 full-range loudspeakers and NHT's AudioCenter One center speaker via Kimber 8TC speaker cable. Digital signal sources included a Theta Data III LD/CD transport, Toshiba's SD-3109 DVD player, and the S/PDIF digital output from my PC's Event Gina 20-bit sound card. Analog sources included my aforementioned Rega/Grado/McCormack LP rig and an RCA S-VHS Hi-Fi VCR. All cables were from Canare, its 75-ohm digital/video stuff and L-2B2AT analog interconnects in particular, while a cheap-ass, no-name, gravy-stained RS-232 serial cable routed signals back and forth between the Meridian and my Dell desktop PC. Behold the future of high-end audio! Cheap cables with gravy on them!



In terms of set-up ease, Meridian's PC program is a godsend. I never thought I'd ever write the words "ridiculously easy to configure" and "Meridian surround processor" in the same review, but the 561 rewrites the book. If you don't own a PC, don't worry—you can still set up the 561 the "old" way from the front panel, but your nipples will probably be good and sore by the time you're through. Believe me, the PC method is the way to go.

And the sound? I'm going to cut to the chase with this one—the Meridian 561 is flat-out *awesome*. While it's blessed with the sweet, grain-free treble that's become a Meridian family trait, it also offers a more full-bodied, dynamic, and energetic character than I remember from the 565/562V combo. Its low-end punch staggered even the big, hulking Theta. Looking at these David and Goliaths of the high-dollar surround processor category, you expect the Theta to *sound* heavier as well, but the slim, elegant Meridian easily matched it blow for blow, with even better low-end definition and ease. Next to the quicker, nimbler Meridian, the Theta sounded a bit thick. (The unit I've been using has the "superior" grade 20-bit DACs for the front three channels, 18-bit for the surrounds. Theta apparently has a newer high-rez DAC board available as an upgrade to the Casablanca, but I haven't gotten hold of one yet.)



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In the critical vocal range, the nod also goes to the 561. This is where the preamp really shines. The Meridian displays the smoothest, most natural midrange and treble character I've heard from any surround unit to date. A CD I keep coming back to is the Grateful Dead's *Terrapin Station*, the album hardcore Deadheads like to diss the most. But what can I say—it's the only Dead record I ever really liked. All it took was one listen to the first track, "Estimated Prophet," first on the Theta and then the Meridian, both in straight stereo mode, to tell me all I needed to know about each preamp's ability to decode PCM digital off CDs. The Theta sounded thicker, with a

For ease of set-up, the Meridian 561's computer program is a godsend.

more forward tonal balance. The 561, on the other hand, sounded cleaner and more relaxed on top, even though Mickey Hart's close-miked ride cymbal cut through the mix with a natural sheen and no rounding off whatsoever. The track's sense of drive

was also stronger through the 561, with a greater sense of layered depth and overall detail. Even something like Elvis's "Are You Lonesome Tonight?" (albeit off DCC's incredible remastered gold CD *24 Karat Hits*) sounded more lifelike via the Meridian, with a greater sense of space and image focus between Elvis and his backup singers, the Jordanaires. This entire CD is a sonic treat, but never more-so than when I heard it with the 561 in my system.

Funny thing—usually, I find that audible differences between surround processors are huge in plain stereo comparisons but much more subtle during Dolby Digital playback. So you can imagine how sur-

TEST RESULTS

The Meridian 561's frequency response (Fig. 1) is very, very flat (down less than 0.2 dB at the extremes of the audio band in the main channels) and uniform from channel to channel. The figure shows the response for the front left and right channels operating full-range and for the center, surround, and subwoofer channels with the crossover set to 80 Hz. The only oddities, both minor, are the small droop at the very bottom of the subwoofer output's range and

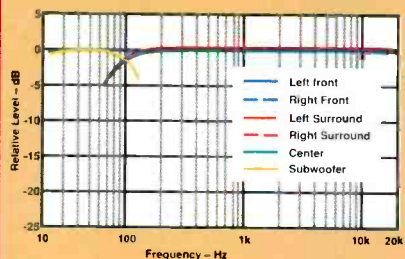


Fig. 1—Frequency response, Dolby Digital Mode, 80-Hz crossover.

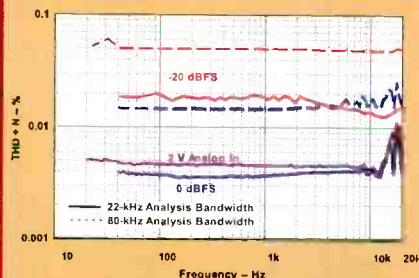


Fig. 2—THD + N vs. frequency.

the slightly higher-than-spec crossover frequency, which is close to 100 Hz rather than 80.

Figure 2 shows total harmonic distortion plus noise (THD + N) under various conditions. (For simplicity, only the results for the left front channel are shown; data for the other channels was very similar, and there was essentially no difference between the readings obtained for PCM and Dolby Digital test signals.) Predictably, distortion readings were higher with the wider analysis bandwidth, as they reflect much more ultrasonic content, but they are still low. With a 22-kHz measurement bandwidth, more reflective of the human hearing range, distortion is down extremely low, even for an analog input, which must pass through both the A/D and D/A converters. The differences between the 0-dBFS and -20-dBFS plots are largely artifacts of the input level difference, by the way; normalized, they would be nearly the same.

As one would expect from the THD + N readings, noise alone is also very low. The noise spectrum in Fig. 3 is for a silent digital input relative to a 0.5-volt output. The plot shown is for the worst-case channel (left surround), but the other channels were not much different. A-weighted noise works out to -88.6 dB. D/A converter linearity (Fig. 4) and channel separation (Fig. 5) are likewise excellent.

Overall, these are essentially state-of-the-art measurements for a surround processor.—Michael Riggs

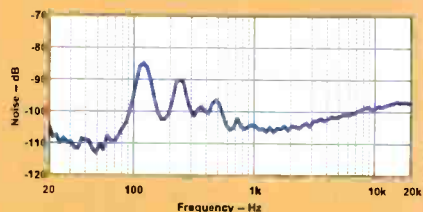


Fig. 3—Noise spectrum.

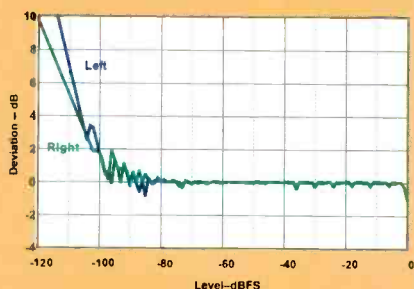


Fig. 4—D/A converter linearity.

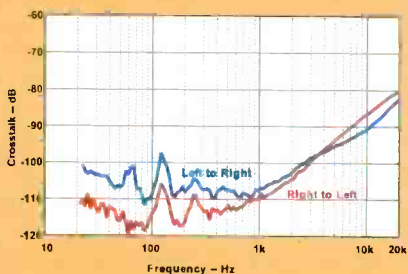


Fig. 5—Crosstalk vs. frequency, stereo mode.

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prised I was when I compared the Meridian's Dolby Digital decoding to the Theta's and heard the 561 pull even farther ahead of the Casablanca! I thought I'd heard the best that Dolby Digital had to offer, but the Meridian schooled my ass something fierce.

A big surprise for me on the DVD front has been the indie film *Little Voice*, starring Jane Harrocks as LV (two guesses), a geeky British shut-in who uncannily channels torch legends like Judy Garland and Shirley Bassey when the mood strikes. I missed this one at the local art house, but man am I glad I did—the DVD absolutely kills! The



The 561 has a magical ability to transform stereo recordings into 5.1-channel sonic bliss.

movie's amusing enough, but the Dolby Digital soundtrack is one of the cleanest I've heard yet, and it's the perfect playback fodder for the 561 to strut its stuff. I have never, ever heard better sound from DVD.

The fact that the 561 isn't quite DVD-Audio capable is a bit of a minus, but as I said, Meridian plans to have the FireWire digital input available as an option by the time similarly-equipped DVD-Audio players hit the market. In the here and now, the big deal behind the 561 is its magical ability to take two-channel recordings and turn them into 5.1-channel sonic bliss. The company's unique approach to surround synthesis is simply to optimize a stereo recording's inherent soundstage for proper playback over a multichannel speaker array. In other words, you're still hearing the same stereo presentation the artist and producer intended but with the enhanced image stability and spread of a multichannel speaker array.

The TriField and Music modes, in particular, are astonishingly effective at making most two-channel recordings sound better than straight stereo—nine times out of ten I'd put on a CD, whatever the genre, and the 561's music modes would make it sound so much closer to a group of real musicians in

my room it's silly. The modes added a bit of deep bass emphasis as well, which is not at all unwelcome in my listening room, but it was the added dimensionality that grabbed hold of my attention and rendered stereo listening much less of a musically involving experience.

It's one thing to listen to someone else's CD and make a judgment call as to whether a digital processor's surround synthesis brings the presentation closer to realism or takes in an altogether different direction.

What really convinced me of the 561's sonic integrity was listening to *myself*, in both stereo and derived multichannel, to see which came closer to the audiophile's holy grail of *being there*. My friend Archer Prewitt of the band The Sea and Cake just finished mixing his second solo release, and I know *exactly* how it's supposed to sound because I was there in the studio, adding lead guitar to several tracks. While Archer's CD sounded fine in two-channel stereo, the Meridian's TriField and Music surround modes fleshed out the sound field to a *much* more realistic degree. Closing my eyes, I felt as if I could reach out and touch the various elements in the mix, exactly where they were supposed to be. With the 561 set for straight stereo, the sound was tonally dead-on and every bit as clean and detailed as I remembered in the studio, but the dimensional realism that TriField mode breathed into the recording was sorely missed.

The Meridian 561 is the best-sounding surround preamp I've had in my system and certainly one of the most technically advanced A/V products the high end has ever produced. Compared to most surround processors on the market, the Meridian is light years ahead in terms of design brilliance and stunning performance. With its combination of state-of-the-art sonics, superior music surround synthesis, best-of-class Dolby Digital decoding, and no-brainer PC-based set-up, the Meridian 561 is an unbeatable value even at its not-inconsiderable price of \$4,995. Go ahead and twist 'em all you like, Meridian—I'm not ready to ship this thing back just yet. Highly recommended! **A**

FEATURES

Audio Inputs: 8 stereo analog, 1 Toslink optical digital, 5 RCA coaxial digital.

Audio Outputs: 6 analog for main or sides, center, surround, and subwoofer; 8 channels digital output for main, sides, center, surround, and subwoofer; 2 analog tape, independent copy.

Video Inputs: 4 composite, 4 S-video.

Video Outputs: Main: composite and S-video (on-screen display available on both). Tape: composite and S-video. S-video to composite conversion.

Controls and Display: Front panel controls for Source, Copy, Mute, Display, Volume, and Off; other features operated via supplied Meridian System Remote; 12-character dot-matrix display; lights for AC-3, DTS, MPEG, and THX.

Other: Flash memory for software updates; RS-232 port for computer control, setup, and software updates; 2 12-volt trigger outputs.

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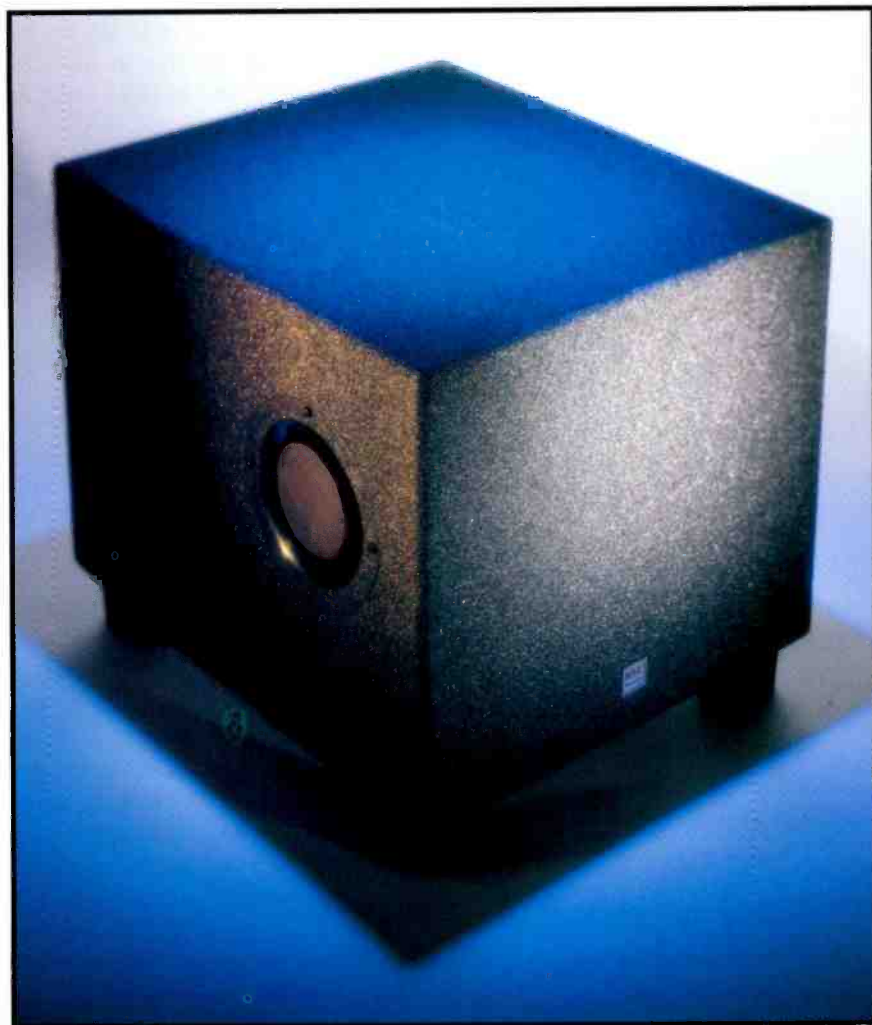


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LISTEN AND YOU'LL SEE

STEVE GUTTENBERG

Hsu Research VTF-2 Powered Subwoofer



Photos: Michael Groen

I'm a convert, and with typical convert's zeal I'm spreading the word: It's finally safe for music lovers to "git down" with subwoofers. Sure, sure, for home theater applications, subwoofers' visceral power and bass extension were always *de rigueur*, but *musical* subwoofers are a fairly recent development. Fact is, most serious audiophiles stopped listening to subs years ago. Maybe it was the, er, explosion in the home theater market that spurred subwoofer development; whatever,

there's a whole new crop of subwoofers from the likes of Aerial Acoustics, Sunfire, REL, Audio Physic, and the subject of this review, Hsu Research, that now deserve your attention.

Subwoofers mine low-frequency information buried in many recordings that, sans subs, goes unheard. It's not just small speakers that need the assistance; I'm also convinced that most so-called full-range speakers are incapable of delivering truly deep bass. We've been listening to filtered

versions of our music, and subwoofers can make it whole again.

Nowadays it seems as though most speaker manufacturers have at least a couple of subs in their lines, but Hsu Research specializes in the high-performance/maximum-bang-for-the-buck end of the sub market. That's *all* the company does.

The VTF-2 is the first conventional box subwoofer from Hsu Research. (There's also the larger VTF-1, which has an 800-watt amplifier, two 12-inch passive radiators, and one 12-inch active woofer. It's priced at \$1,199. Beginning this year, Hsu Research products will be available through dealers, in addition to directly from the manufacturer.) Heretofore, Hsu was identified exclusively with cylindrical or tube-shaped subwoofers. The logic here is similar to that behind Anthony Gallo Acoustics' spherical enclosures: The tubes eliminate standing waves and wall-flexure problems. But their rather ungainly look turns off many potential customers. As you can see from the photo, the VTF-2 is a standard box—but don't get the wrong idea, as Hsu didn't cave in to the aesthetic backlash. Though tubular designs still dominate the company's lineup, the VTF-2 was conceived as the first Hsu Research sub with a built-in amplifier/crossover. There was simply no way to mount the flat electronics chassis on

H S U

Rated Frequency Response: "Maximum Extension" mode, 25 to 100 Hz, ± 2 dB; "Maximum Output" mode, 32 to 125 Hz, ± 3 dB.

Rated Amplifier Power: 150 watts.

Rated Input Impedance: Line level, 10 kilohms; speaker level, 1 kilohm.

Driver: 10-inch, treated-paper cone.

Crossover: 12-dB/octave low-pass; continuously variable, 60 to 125 Hz.

Dimensions: 16 in. H x 16 in. W x 18 in. D (40.6 cm x 40.6 cm x 45.7 cm).

Weight: 50 lbs. (22.7 kg).

Price: \$499, finished in black Zolatone.

Company Address: 3160 East La Palma Ave., Unit D, Anaheim, Cal. 92806; phone, 714/666-9260; fax, 714/666-9261; www.hsuresearch.com.

a curved surface, and Hsu wanted to incorporate two easily accessible, variable tuning ports on the VTF-2. So it was good-bye, tube; hello, box. That Variable Tuning Frequency system enables the sub to be optimized for either home theater or music by blocking one of the ports with a dense, foam-rubber plug (supplied). In "Maximum Extension" (music) mode, with one port blocked, the VTF-2's magnetically shielded, 10-inch paper-cone woofer will reach down to 25 Hz; "Maximum Output" (home theater) mode gets you 4 dB more output and slightly less distortion but limits the sub's low-end response to 32 Hz.

As for the box itself, it's a pretty impressive piece of work. Weighing close to 50 pounds, it feels robust. The corners are nicely rounded, and the black Zolatone (textured) finish is handsome enough. I suppose the more audio-compulsive among you may swap the VTF-2's chunky plastic feet for some sort of spiked feet; like chicken soup, that can't hurt. Short of surgery, there's not much that can be done about the rather puny, nondetachable power cord or the VTF-2's cheesy, spring-clip speaker connectors. Oh, well, Hsu does include a LaserLight Virgil Fox CD so that VTF-2 owners can boogie down right from the get-go.

The sub's back panel sports an external heat sink (for the otherwise internal 150-watt amplifier), "Subwoofer Level" and "Crossover Frequency" controls, a 0°/180° phase switch, and a multitude of line- and speaker-level inputs and outputs. Most *Audiophile* readers would probably hook up the VTF-2 in one of two ways: from their pre-amp outputs, using line-level coax, or from their amplifiers, "bi-wiring" the VTF-2 with a second set of speaker cables from the amp. I was slightly concerned about the impedance of the VTF-2's line-level input; at 10 kilohms, it's fairly low and may excessively load down some tube preamps with highish output impedances (1 kilohm or higher). Hooking the VTF-2 directly to your power amplifier sidesteps that prob-

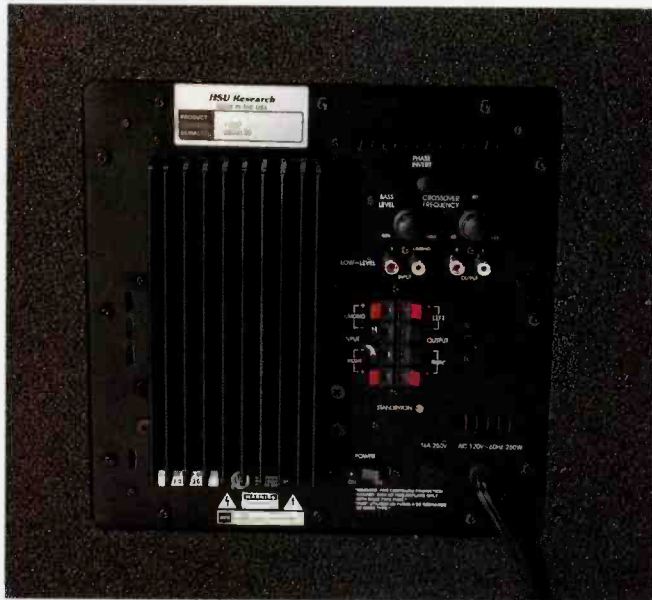
lem and has the added benefit of maintaining your amp's sonic signature. Don't get nervous about this arrangement: The sub's high input impedance draws virtually no current from your amp, so it won't adversely affect the feed to your main speakers. And there is at least one other primary hookup option: the subwoofer output from an A/V receiver or surround processor.

With regard to placement, subwoofers require just as much care as your main

course, you can use a more traditional corner placement, a.k.a. the "heavy-hitter" position, which is pretty much guaranteed to produce maximum extension and output. Symmetry freaks can stick the VTF-2 between the main speakers. Plan on doing at least some experimentation. Confused? Let Hsu Research figure it out for you. Just fax the company a detailed diagram of your room (include the locations of relevant furniture, windows, door openings, etc. and specify the type of walls and floors), and you'll be sent a few options.

My goals for the VTF-2 were not exactly of the dinosaur-foot-pounding-subterranean thrill-seeker variety; I just wanted a deeper, fuller foundation for music. The VTF-2 easily delivered the expected low-frequency goods, expanding the spatial continuum of my main speakers' soundstage while helping to recreate the recording venue's acoustic space. The "effect" was really quite addictive. I ran all of the partnering satellites full-range; in other words, I didn't limit the bandwidth of the signal

feeding the main speakers. I brought up the VTF-2's sound under the satellite speakers, blending the sub/sat combo by tweaking the VTF-2's low-pass crossover, the level control, and the phase switch. Initially, I used a Radio Shack 33-2050 SPL meter to set the subwoofer level, but the bass balance was consistently too fat for my taste. Hsu Research claims the Radio Shack meter's low-frequency response isn't very accurate: "It may be off by as much as -4 dB at 25 Hz and -7 dB at 20 Hz." That would explain the bass boost! I continued on, setting the VTF-2 by ear and confirmed my judgments by listening to a wide range of recordings, fine-tuning as I went along. After an hour or so, I was done fiddling and rarely touched the controls again. The hassle factor was really low; remember, with a good sub you're more likely to find the magic zone for flattest deep-bass response than you are with large full-range speakers. The latter invariably require a compromise between bass extension and optimal imaging.



If you're looking for more bounce from your audio bucks, the Hsu VTF-2 has no equal.

speakers. Hsu Research favors a near-field subwoofer placement strategy; it recommends starting with the coffee-table position, directly in front of the main listening spot. I'd have to agree; in both rooms where I tried the VTF-2, this location yielded the smoothest subwoofer/main speaker integration. Once I dialed in the crossover, phase, and level adjustments, the VTF-2 disappeared. If the coffee-table position is unacceptable, try placing the VTF-2 directly behind the listening position. The third near-field option is the end-table position; unfortunately, it's the easiest to localize. Of

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I listened to the VTF-2 partnered with a variety of different speakers to determine its quality; as long as this subwoofer was anywhere near dialed in, it behaved very well, without the slightest trace of boom or

bloat. In fact, the VTF-2 seemed to enhance the nimble \$699 Anthony Gallo Acoustics Nucleus Micro Satellite/Subwoofer system's speed in the mid-bass. On Nigerian drum master Olatunji's stunning Chesky CD,

Love Drum Talk, the VTF-2 extracted far more palpability, subtle dynamic shadings, and physical presence. The drums were talking to me in ways that the Gallo Micro Satellite/Sub system only hinted at. Once the soundstage dimensions snapped into focus, I became more aware of the size of each drum and of how the other musicians were taking their cues from Olatunji. The transformation of the already impressive Gallo Micros' sound was dramatic; they now sounded like much bigger, far more expensive speakers.

The \$1,995/pair Totem Model 1 Signatures are deliciously seductive mini-monitors, with a bottom-end fullness that belies their modest size, but they still benefited from VTF-2 augmentation. Louis Armstrong, of all people, had a word that perfectly describes the Totem/Hsu matchup: "rhythmical." That word popped into my head as I listened to Laurent de Wilde's *Spoon-a-Rhythm* CD (Columbia). It's thick and juicy but has a modern sound, serving up a close combination of piano, bass, drums, and percussion. The Totem/Hsu mating had no trouble convincing me this quartet of equals really listens to each other. De Wilde believes we hear sound "from the bottom up," so it should come as no surprise that the support provided by Ira Coleman, his bassist, is somehow both heavy-weight and freewheelin'. As I listened to the band tear through seven de Wilde originals and three covers, there was no doubt that it's de Wilde's gripping pianism directing the action. The Totem/Hsu combo's dynamics won't floor any B&W Nautilus 801 owners, yet this \$2,500 pairing will blow the woofers off most full-range systems anywhere near its price.

My listening room is bass-friendly; it's large, and—thanks to the absence of parallel walls—standing waves are well distributed. I was sure I was hearing the very best out of the VTF-2, but maybe this was just too easy. What about problem rooms? To hear what the VTF-2 would do under more difficult conditions, I schlepped it over to a friend's squarish room (roughly 19 x 19 feet, with a ceiling of almost 7 feet). Yeah, I thought, this would be a tough nut. The "satellite" speakers, Quad ESL 63 electrostatics, were pulled out a good 7 feet from

TEST RESULTS

The effects of the Hsu Research VTF-2's double- and single-port Variable Tuning Frequency system are clearly revealed in the two frequency response curves of Fig. 1, taken quasi-anechoically by True Technologies over a range of 10 to 200 Hz. For the curve made with both ports open, the VTF-2 was in its "Maximum Output" (home theater) mode. Response is commendably smooth from 95 to 45 Hz (at an average output level of 103 dB SPL), at which point the sub begins to roll off; by 34 dB, its output is 9 dB less than at 50 Hz. For the other curve, taken with just one port open, the sub was in its "Maximum Extension" (music mode). It clearly illustrates the improvement in low-frequency extension—albeit at a 3-dB penalty in SPL. The two curves' shapes essentially mirror each other from 100 to 80 Hz (separated by about 1.5 dB SPL), at which point the one-port-open curve gradually slopes to 30 Hz, where the sub's output is only 3 dB down from its 60-Hz level. At 26 Hz, the VTF-2's output falls another 3 dB, but depending on where the sub is placed, you could expect boundary reinforcement to supply from 3 to 9 dB of improvement. Realistically, then, the VTF-2 should produce useful deep bass down to 26 Hz in a listening room at 100 dB SPL (or more). Excellent!

Figure 2 shows the sub's harmonic distortion at 100 dB SPL, with one of its ports open. The third, fourth, and fifth harmonics are well-controlled, remaining less than 10% to about 26 Hz. At 95 dB SPL, the sub's distortion with both ports open (not shown) was 5% or less down to 35 Hz. With one port open, distortion at 40 Hz at the same level was 4% for the fourth harmonic and 7% for the third. By 25 Hz, fourth harmonic distortion fell to 1% but the third hadn't changed.

When the Hsu is driven harder, to 105 dB SPL (Fig. 3), distortion rises modestly but stays at 10% or less to about 45 Hz. Even at 26 Hz, distortion is still under control, but it climbs precipitously at lower frequencies. There's no question, however, that the Hsu Research VTF-2 has the capability to deliver "a whole lotta shakin'!"—Alan Lofft

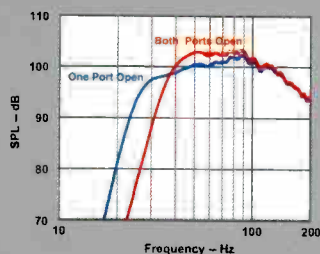


Fig. 1—Frequency response.

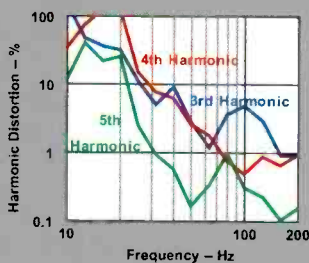


Fig. 2—Harmonic distortion vs. frequency at 100 dB SPL/1 meter, one port open.

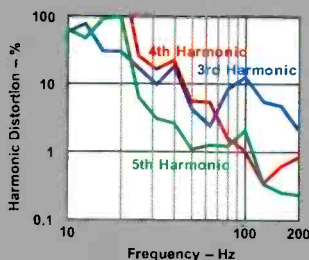


Fig. 3—Harmonic distortion vs. frequency at 105 dB SPL/1 meter, one port open.

the front wall, and I listened from a couch up against the back wall. This position minimized the boominess of the square room, but the Quads were still a touch thick in the mid-bass. With the VTF-2 plopped down in the coffee-table position, it was remarkably easy to synch with the Quads. Wow, the VTF-2's speed was fully up to the task, and the synergy between the "fast" electrostatic panels and the Hsu VTF-2 was surprisingly seamless.

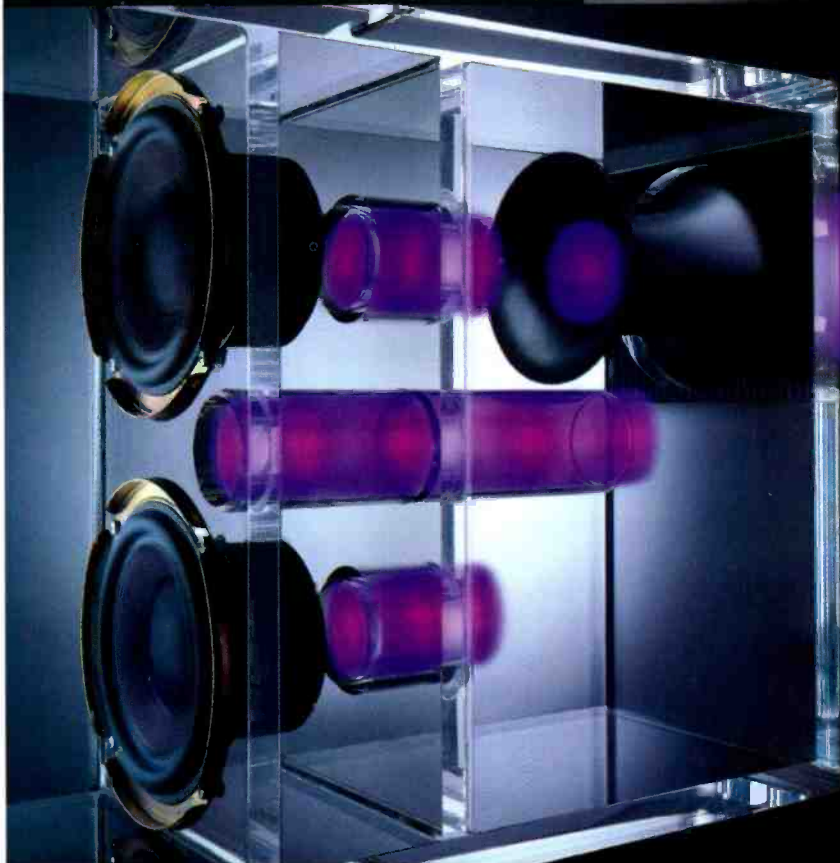
Lusting after a good, tight bottom end has gotten many an audiophile into deep trouble. Some of us are hung up on super-detailed bass and confuse rolled-off bass with tight bass. Or to put it another way, the lack of bottom-end response directs our attention to the harmonics and transients relative to the fundamental. If you're looking for that sound, adding a sub probably wouldn't be a great idea; the sound

**The Hsu VTF-2
is easily the best
\$500 "tweak"
I've ever heard.**

may seem to lose too much detail—different strokes and all that. But the fidelity gains the VTF-2 delivers with most audio systems in the \$6,000 to \$7,000 range will be great. It's easily the best \$500 "tweak" I've ever heard. I'm not referring to blow-your-audiophile-buddies-out-of-their-minds-with-pants-flapping or thumping, feel-the-pressure-on-your-gut bass (although in "Maximum Output" mode, the VTF-2 will give you a taste of that). No, in the purist, most musical realm, the VTF-2 is an unqualified success. It's not my first-choice sub to mate with full-range speakers; Hsu offers more appropriate models for that purpose. But if you're looking for more bounce from your audio bucks, the Hsu Research VTF-2 powered sub has no equal. I can't resist paraphrasing Brian May's line from that old Queen song, "Fat bottom girls [uh, subwoofers], you make the rockin' world go 'round." Do they ever!

A

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“I was losing all my friends!”

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When friends needed an audio system, they would turn to me for advice. I was happy to help; nothing thrills me more than helping someone discover the joy of great sound. I make no apologies: I'm an audiophile. When friends asked my advice, I steered them to the highest performance components they could afford, which was easy when things were just 'stereo.' I would recommend components, give some quick set-up advice, and everybody was happy.

Things got complicated when digital home theater came along.

The phone calls would come just as we were sitting down to dinner. 'Hey Matt, what the %\$&! is bass management and how do I turn it on?'

Or, 'Matt you creep, I need an electronics degree to hook this contraption up!' Creep? Me? *Ouch!*

Obviously things aren't as simple as they used to be.

Don't get me wrong, I love digital surround technology, and nothing beats the excitement of a slick action flick on a great home theater system. But I got tired of making after-dinner house calls to hook up, set up, and explain how to use complicated home theater systems.

Yet I couldn't bring myself to recommend one of those 'home theater-in-a-box' systems. They may be easy to operate, but they fall far short of a 'spine-tingling' home theater performance.

I got to thinking, 'It doesn't have to be this way. There's no reason why you can't have an easy to use, high performance home theater that quickens your pulse, tugs on your heartstrings, and gives you goosebumps.'

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So now my friends get the simplicity and high performance they want, and I get to eat dinner.



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Sony SCD-1 Super Audio CD Player



Photos: Michael Groen

Every once in a while, it's *déjà vu* all over again.

"What's that?" she asks me.

"Lamborghini Diablo. . .500 horsepower V12. . .does better than 200 mph."

"How do you get in?"

"Doors pivot up."

"Can we get one?"

"Where would you put the groceries?"

Days later a messenger arrives, wheeling an instrument case. "Where do you want it?" he asks.

"Here will do."

Her piano stops. "What's that?"

"Sony's new SACD player."

"What's an SACD?"

"A better CD."

"What's wrong with the old one?"

"Nothing, but this one's better. It's Super Audio."

"Where does the disc go?"

I point to a heavy plate on top. "In there."

"Oh, does it pivot up like that Lamborgetti?"

"Lamborghini. I'm not sure; I think it slides to the side. Help me get this thing

into the lab. It weighs a ton!"

The SCD-1 is on the bench, plugged in, powered up, and I push "eject." Sure enough, the plate rises slightly and glides to the side.

"Wow! Gorgeous! Looks like a spaceship."

"I'll tell Sony you like it. Now stop fondling it and get out of here so I can get to work!"

"Can we get one?"

"That depends on how this review turns out."

The SCD-1 really is gorgeous, and it is heavy. Totes like a power amp, not a CD player. But then, it's only incidentally a CD player—primarily, it's the world's first player for Super Audio CD (SACD), the Sony/Philips answer to DVD-Audio (see my feature article in this issue). The SCD-1 reeks of class and no-holds-barred engineering, looks almost handmade, and costs 5 grand. I can't imagine that Sony expects to sell tons of these machines, but what a way to launch a format!

The SCD-1 is stereo-only. When multichannel SACDs arrive, it will play just the two-channel mixdowns encoded on them. Meanwhile, the Sony can play conventional CDs, single- and dual-layer high-density (HD) SACDs, and hybrid SACDs.

Hybrids are dual-layer discs whose outer, HD, layer carries Direct Stream Digital (DSD) data and whose inner layer carries conventional CD data. That inner layer, which enables hybrid discs to be read by ordinary CD players, is one of SACD's major pluses.

Except for hybrid discs, the SCD-1 detects what type of disc has been inserted and sets itself up accordingly. With hybrids, you can choose which layer to use, but you must decide before hitting the play button—no toggling on the fly. The SCD-1 has two lasers, one emitting light at a wavelength of 780 nanometers for CD playback, the other emitting 650-nanometer light for HD layers. Sony also uses a dual-laser approach in its DVD players. But despite the similarity in density between the HD layers

SONY

Dimensions: 17 in. W x 5½ in. H x 17½ in. D (43 cm x 14.9 cm x 43.6 cm).

Weight: 58.3 lbs. (26.5 kg).

Price: \$5,000.

Company Address: 1 Sony Drive, Park Ridge, N.J. 07656; 201-930-1000; www.sel.sony.com.

carrying DSD data and a DVD-Audio disc (DVD-A), the SCD-1 cannot recognize the latter.

Like my all-time favorite CD player, Sony's CDP-XA7ES, the SCD-1 moves the disc over a stationary optical pickup and laser rather than the other way around. This is claimed to reduce variations in servo current that can influence the data and, ultimately, the sound. Whatever. Like the CDP-XA7ES, the SCD-1 sounds great! And also like the XA7ES, it's slow as molasses when reading a disc's table of contents, skipping tracks, or doing anything else that requires lateral disc movement. I guess it's easier to pivot an optical head than to reposition a disc drive, motor and all, but for this kind of performance I'm willing to wait.

The SCD-1's drive motor is a new design. Its bearing, which has a sapphire sleeve and a ruby thrust ball, is said to be super-durable and to reduce friction and motor-servo current variation, thus avoiding data contamination from servo-induced power-supply noise. The drive is built on a 6-millimeter (that's almost ¼-inch!) milled aluminum plate, with the spindle cutout reinforced by a second plate. (No wonder this beast is heavy.) The mechanism rests on four pillars and is isolated from the chassis by dampers to quell external vibration, while the full SCD-1 sits on "eccentric" isolation feet that use gel cushions sandwiched between dissimilar metals (brass and cast iron) to damp resonance. And instead of the usual automatic chuck that holds the disc in place, Sony includes a weight that you place on the disc by hand. (Fail to do so, and you get your wrist slapped by a panel warning.) Nothing short of an earthquake upsets this player!

Each optical sensor feeds an RF (radio-frequency) amplifier, mounted close by to minimize RF pathlength. An RF processor chip extracts and synchronizes the clock and error-corrects and demodulates the data for both CD and SACD, but these data streams are so different that we're really talking about different circuits that share a single chip.

At this point, 16-bit PCM data from a CD or a hybrid disc's CD-compatible layer pass to a new VC24 (24-bit variable-coefficient) digital filter. This filter oversamples

the data to 64 times the original sampling frequency and noise-shapes it to produce a 1-bit data stream at a clock rate of 2.8224 MHz, much like the DSD stream from an SACD.

An SACD's DSD data takes a different path. First, a DSD demodulator reads an "invisible watermark" pattern on the disc that confirms the disc is not a counterfeit; only if the watermark is found will the demodulator accept the bit stream. It then extracts such subcode data as track numbers and text, unpacks the audio, and rearranges it into a continuous stream.

utive 1s or strings of 0s, so the number of transitions, each with a characteristic ring, varies with the data pattern. This variation causes distortion.

Sony's ACPDM gets around this by forcing complementary transitions in each clock period. Instead of 1 remaining 1 for the full period, it is forced to 0 for a short time; similarly, 0s are forced to 1 for a short time. This lowers the average signal level (no different from having chosen lower reference levels to begin with) but ensures that in every clock period there will be complementary 0-to-1 and 1-to-0 transitions



**For CD play,
Sony provided a choice
of filters—unnecessary,
since the "Standard"
filter is so good.**

The DSD data stream consists of pulses whose widths are proportional to signal amplitude at each point. So simply running those pulses through a low-pass filter would restore the data to the analog domain—if the circuitry were ideal. Real circuitry never is, however, so Sony came up with a clever dodge, Accurate Complementary Pulse Density Modulation (ACPDM), to squeeze out some extra performance. Even the fastest transistors take time to switch between the voltage levels that represent 1s and 0s in a DSD signal, causing overshoot and ringing at every transition. In unmodified DSD bit streams, transitions occur only when data changes from 1 to 0 or from 0 to 1. There are no transitions between consec-

whose overshoots cancel each other out. Thus, the data pulses reaching the D/A converter will have accurate amplitude.

Between the SCD-1's ACPDM system and its D/A converter is another Sony novelty, S-TACT (Synchronous Time Accuracy Controller), which is used for both CD and SACD playback. Power-supply noise caused by high-speed digital filtering can vary the axis crossings and affect pulse width. If allowed to occur, these variations, a form of jitter, can affect the audio. S-TACT is said to isolate the pulse generator and other digital operations from the D/A converter and ensure that each pulse's duration will be controlled with quartz-crystal accuracy.

Whether it originated as DSD data or is an oversampled 1-bit representation of 16-bit PCM data from a CD, the signal at this point is a 1-bit pulse stream. The voltage pulses are converted by the SCD-1's Current Pulse D/A converter into fixed packets of charge that are integrated by a capacitor to restore the analog signal. The final stage is the analog low-pass filter needed to suppress the quantization noise that was shifted to the ultrasonic region by the noise

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TEST RESULTS

Except where noted, results in the graphs are for the Sony SCD-1's left channel (the right's performance was essentially identical), unbalanced output, and the "Standard" settings of the output and interpolation filters.

As you'd expect, the effects of the SCD-1's filter options are visible in the curves of frequency response. In Fig. 1A, made with Sony's SACD test disc, response with the "Standard" output filter is flatter between 20 Hz and 20 kHz but is more extended with the "Custom" option: -2.94 dB at 60 kHz with "Custom" versus -2.72 dB at 50 kHz with "Standard." Furthermore, output at 80 kHz is about 10 dB higher with the "Custom" setting. As usual with balanced outputs, treble response droops slightly. Figure 1B shows CD frequency response (using the CBS CD-1 disc) with the player's "Standard" interpolation-filter setting and with settings #1, #2, and #4. (Response with filter setting #3 was almost identical to that of setting #4 but without its ± 0.02 -dB ripples.)

The Sony SACD test disc contains two "mute" tracks. "Analog Mute" keeps the

A/D converters alive, as they would be in real-world operation. The other track, "Digital Mute," is computer-generated "digital silence" (unrealistic, but the same nonsense used to get great S/N numbers from CD players). The noise spectra for the "Analog Mute" tracks (Fig. 2A) show how the SCD-1's two output filter settings affect ultrasonic energy (the effect of noise-shaping used in recording). The noise energy peaks slightly above -60 dBFS at 65 kHz with the "Standard" filter setting and at nearly -50 dBFS at 80 kHz with the "Custom" setting. The difference doesn't seem like much, but 10 dB is a tenfold increase in power, and the space between the two "Analog Mute" curves from 50 kHz to a few hundred kilohertz indicates there's quite a bit more ultrasonic energy hitting the tweeter with the "Custom" setting. I understand Sony's reluctance to have it used in systems not designed for it. In Fig. 2B is a spectral analysis of the SCD-1's output with "digital silence" and with a 1-kHz, -60 dBFS signal. (Use caution when comparing Figs. 2A and 2B; their vertical scales differ.) There are no power-supply or hum components in the CD curves (Fig. 2B), but there is a trace of 120-Hz power-supply ripple in the SACD curves (Fig. 2A). Nonetheless, with "A" or CCIR weighting (which rank frequencies by their audibility), the signal-to-noise ratio for this player's SACD system bettered its CD performance by almost 1.5 dB. Even more impressive, this also held true when the SCD-1 was playing the SACD "Analog Mute" track, which includes noise from the recording chain's A/D conversion.

In Fig. 3A, the THD + N scale runs from -100 to -105 dBFS rather than my usual -80 to -100 dBFS; with a DSD test disc, the SCD-1's THD + N at 1 kHz bottoms out around -104 dBFS, more than an order of magnitude better than most CD players! Because the difference of about 0.6 dB between the top curve (made with a measurement bandwidth of 22 Hz to 22 kHz) and the bottom one (with a measurement bandwidth of 400 Hz to 22

kHz) probably stems from the 120-Hz ripple mentioned above, I consider the bottom curve to be the more meaningful.

Figure 3B, made with a test CD, shows the effects on THD + N of three of the

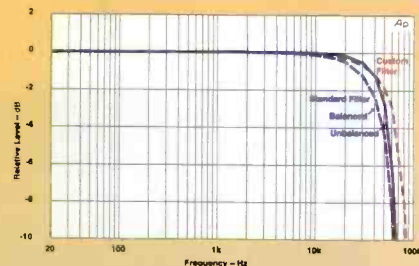


Fig. 1A—Frequency response, SACD mode, for "Custom" output filter with unbalanced jacks and for "Standard" output filter with balanced and unbalanced jacks.

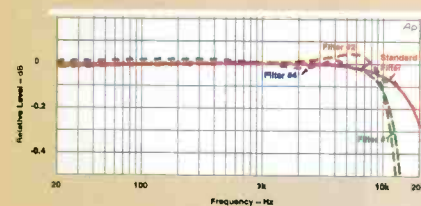
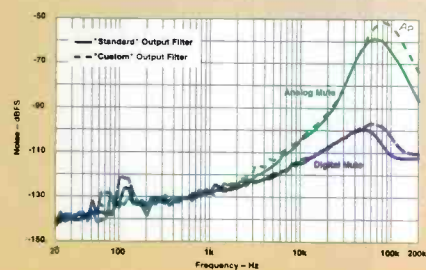
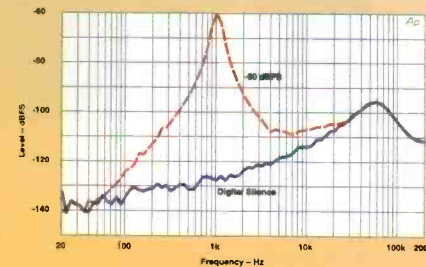


Fig. 1B—Frequency response, CD mode, for various settings of interpolation filter.



A



B

Fig. 2—Noise analysis for SACD mode (A) and CD mode (B).

MEASURED DATA

Line Output Level at 0 dBFS: Unbalanced, 2.22 V; balanced, 4.4 V.

Line Output Impedance: Unbalanced, 33 ohms; balanced, 395 ohms.

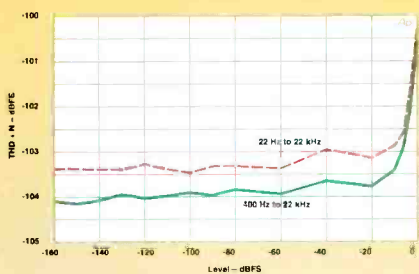
S/N re 0 dBFS, with Digital Silence Track: CD mode, 106.3 dB, A-weighted, and 97.6 dB, CCIR-weighted; SACD mode, 107.6 dB, A-weighted, and 99.1 dB, CCIR-weighted.

S/N re 0 dBFS, with Analog Mute Track, SACD Mode: 107.2 dB, A-weighted, and 98.6 dB, CCIR-weighted.

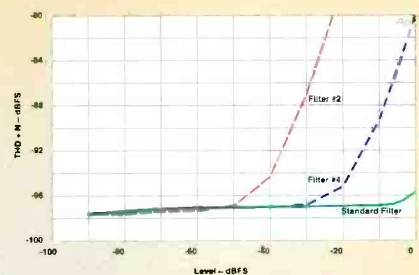
Quantization Noise, CD Mode: Setting #2 of interpolation filter, -59.5 dB; all other settings, -96 dB or better.

Dynamic Range: CD mode, 96.7 dB unweighted, 99.4 dB A-weighted, and 89.6 dB CCIR-weighted; SACD mode, 103.5 dB unweighted, 107.3 dB A-weighted, and 98.4 dB unweighted.

SCD-1's interpolation-filter settings. With the "Standard" setting, performance is outstanding. The curves taken with setting #1 and setting #3 were close enough to those with the "Standard" filter

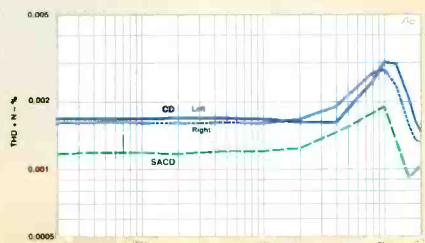


A

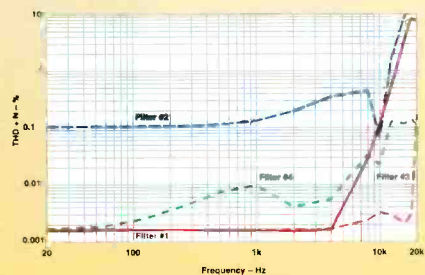


B

Fig. 3—THD + N vs. level for SACD mode (A) and CD mode (B).



A



B

Fig. 4—THD + N vs. frequency for SACD mode and for CD mode with "Standard" setting of interpolation filter (A) and for CD mode with other settings of interpolation filter (B).

to warrant their omission. But with setting #2 and setting #4, all hell breaks loose over the upper 20 to 40 dB of dynamic range.

Figure 4A plots THD + N versus frequency for SACD and CD test discs. Both channels are shown for CD mode but only the left channel for SACD. CD performance (taken with the "Standard" setting of the interpolation filter) is superb. Performance with the DSD recording is even better—less than 0.002%, worst case. True, the SACD curve was taken at -3 dBFS (the recording level on the disc) and the CD curve at 0 dBFS, but I don't think that made much of a difference. Great, great either way! Figure 4B shows THD + N for a test CD and four settings of the SCD-1's interpolation filter. (Note that the vertical scale is grossly different.) Setting #3 isn't bad until you get almost to 20 kHz, where aliasing appears. But it's no match for the "Standard" setting, whose distortion heads down above 16 kHz. (Don't look for that curve in Fig. 4B; it's in Fig. 4A.) The curve with setting #4 reminds me of a rather punk CD player from days of yore, while the fold-down distortion permitted by setting #1 and setting #2 is just dreadful. Sure, those filter settings sound different; even golden ears can hear 10% to 40% intermodulation distortion!

Figure 5 compares linearity error in CD and SACD modes. The SACD test disc

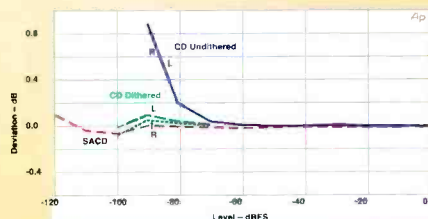


Fig. 5—Linearity vs. level.

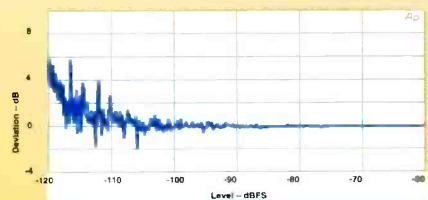


Fig. 6—Fade-to-noise test, CD mode.

contains tracks for assessing linearity down to -160 dBFS, but I'm presenting results only to -120 dBFS because noise in my setup's tracking filter affected the measurements below that point. I'm convinced the SCD-1 produces the equivalent of 20-bit PCM performance on DSD recordings—true, no-bullshit 20 bits, not some dumb-ass claim. Great, in my book!

Not that the SCD-1's CD performance is anything to sneeze at: With less than 0.1 dB of linearity error at -100 dBFS for a dithered signal, only DSD beats it! The fade-to-noise linearity error in CD mode (Fig. 6) is about the best I can recall. There's virtually no error at -110 dBFS, and the 3-dB noise-induced error point comes in below -118 dBFS, far better than one has any right to expect from a 16-bit PCM system. I couldn't run this test with a DSD recording, as there's no fade track on the SACD test disc; from other tests, I'd guesstimate the 3-dB noise-induced error point at close to -128 dBFS.

In CD mode, the choice of setting for the interpolation filter had no effect on linearity error or dynamic range and (except for setting #2, which was atrocious) had little impact on quantization noise. Results for quantization noise were the best I've logged from CD except for Sony's CDP-XA7ES and Meridian's 508.24. With respect to DSD, whose data is not quantized to more than 1 bit, I'm not sure what (if any) significance a quantization-noise measurement has. So all I'm reporting is that it was substantially better than you can get from CD.

Channel separation was far better than anyone needs, especially via the SCD-1's unbalanced outputs. Those jacks also have lower output impedance than the balanced connectors, so I see no reason to use the balanced outputs unless you're running very long lines, experience a ground loop, or are just married to balanced connections. Channel levels matched perfectly, and the 0-dBFS output levels were the same for both CD and SACD playback.—E.J.F.

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shaper and, in the case of DSD, not removed by an interpolation filter.

Sony uses a generalized-impedance-converter (GIC) topology in the SCD-1's output filter to avoid passing the analog signal through active circuitry prior to the output buffer. With GIC topology, the desired signal flows through passive components (resistors) while the undesired signals are shunted to ground through the active components. Thus, distortion in the active circuitry cannot affect the music. I buy the concept in principle, but although passing signals through resistors may not elicit distortion, it does increase thermal noise. (How much depends upon the value of the resistors.) You pay your money, and you take your choice.

When it comes to DSD, the output filter is by no means a trivial matter. A delicate balance exists among conflicting requirements: player bandwidth, flatness of frequency response, the amount of ultrasonic energy in the output, and filter group delay (phase distortion). Therefore, a designer must carefully select the filter's characteristic (Butterworth, Bessel, Chebyshev, etc.), cutoff frequency, and slope. The idea behind DSD is to avoid brick-wall filtering, analog or digital, but still dump ultrasonic noise.

Considering the attention devoted to the niceties of circuit topology, it goes without saying that Sony paid equal attention to cir-

cuit layout, grounding, choice of components, power-supply design (using separate power transformers for the analog and the servo and digital circuits), etc. This was clearly demonstrated on the test bench, where the Sony SCD-1 performed impressively.

Before I get into performance, a few words about this player's features are in order. The SCD-1 has unbalanced and

balanced analog outputs, via top-quality insulated gold-plated RCA jacks for the former and XLR connectors for the latter. Digital output, available only for 16-bit PCM data from CDs or compatible hybrid layers, is through a gold-plated RCA coax jack and a Toslink optical interface. You can disable the balanced analog outputs via a rear-panel slide switch and the digital outputs via a "Digital Out" pad on the front panel.

The SCD-1's remote is stylish and intuitive; I liked it very much. The main differ-

Sony's SCD-1 costs 5 grand and looks as though it should, reeking of class and solid engineering.

ence between SACD and CD operation is that SACD supports 255 track numbers and doesn't distinguish between track and index marks, so the remote's "Index" keys function only with CDs. The remote can generate separate command codes for two Sony players, so it can independently control the SCD-1 and a CD player or changer.

Because many more SACDs will probably carry embedded text than CDs traditionally have (a text mode was included in the CD standard but has never been widely

supported), the SCD-1 has "Text" and "Language" buttons to display whatever info a disc includes. (SACDs can also carry limited video content, but the SCD-1 does not support this.) Other than the "Text," "Language," and (maybe) the "Filter" pads, anyone familiar with using a CD player should have little difficulty operating the SCD-1 right out of the box.

"Filter" offers a choice of five coefficients for the VC24 digital interpolation filter used for 16-bit PCM (CD) data. They enable you to trade off resistance to high-frequency aliasing (intermodulation between high-frequency audio signals and the carrier that results in nonmusical in-band components) for a gentler rolloff slope. The gentle slope is thought to elicit less ringing on transients and therefore less "smearing" in the time domain. I have decried such filters in the past because I think the audible fold-down distortion they may cause is far worse than potential ringing at a frequency too high to be heard. Both my test instruments and my ears tell me that the difference people hear with gentle filters is, for the most part, simply distortion.

Although I remain unconvinced, I will say that some of Sony's filter choices do less to make a travesty of the music than others I've heard. Setting #3 is particularly interesting. It is said to be a new characteristic. Using eight-times oversampling and combining original data with interpolated data to create a 224th-order filter, it is claimed to be flat to 17 kHz and to have 80-dB rejection above 26 kHz. This limits fold-down distortion to the extreme treble. With sloppy filters so much in vogue these days, I can't fault Sony for including options on the SCD-1 as long as its "Standard" filter setting is really good—and it is. As good as it gets, in fact!

Since interpolation filters aren't used with DSD (one of its main claims to fame), "Filter" has no effect when the SCD-1 is playing SACDs or the DSD layers of hybrid discs. However, as mentioned earlier, Sony offers a choice of characteristics for the low-pass output filter, which removes ultrasonic noise in DSD playback. You can change the filter setting with a rear slide switch that's locked to "Standard" position by a removable plate. Its other position

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"Custom," extends frequency response when the SCD-1 is playing a DSD recording but leaves substantially more ultrasonic energy (shaped quantization noise) in the output. Because this could cause problems if your system's other components are not designed to handle it, the "Custom" setting is not recommended unless you're using wideband electronics and speakers.

When I moved the SCD-1 into my listening room, the first thing I wanted to do was compare DSD and CD sound. However, that's nigh unto impossible with this player. Although four of the five Super Audio discs Sony sent me were hybrids, I could not make A/B comparisons between any disc's DSD and CD layers. The SCD-1 took so long to stop, switch modes, and get back to the track I was listening to that I could read the disc's program notes in the interim. There were times when I actually got up and walked over to the player to be certain it had received the command from the remote, only to be greeted by a blast of music as it finally finished setup and got on with things. I did convince myself that I heard a difference, but I'm well aware that expectation has a profound effect on conclusion. The SCD-1 is such a bloody good CD player, and these discs (on the whole) are so well recorded, that it was hard to be sure.

To put the interpolation-filter bit to bed first, let me say that I always preferred the "Standard" setting to the others—oddly enough, for the very reason many criticize it: It had the best transient response! If you put distortion aside for the moment (a dangerous thing to do), some might claim filter setting #1 has more depth; I'd call it distance. Setting #2 made the performers sound closer but duller. Setting #3 could be worth toying with, but I still preferred "Standard" and could not be dissuaded under double-blind conditions. Setting #4 focused the center—even when it shouldn't have. A pox on them all!

Now, what about DSD? If I were to describe the difference I heard with DSD recordings, it would not be about what was added but what was missing. The veil—that thin gauzy tissue between listener and performer, so translucent you can neither identify it nor even be sure it's present until it no longer is—fell away when I played the

DSD layer. I could tell you that I've never heard more realistic brass, hi-hat, and brushed cymbal than what Tom Jung captured on *Tango* (Stockholm Jazz Orchestra, dmp CD-05252), one of the SACDs Sony supplied for this review. I could also tell you that Michael Bishop captured pianist Julie Spangler's playing of "Ragtime" to perfection on the SACD version of *On Broadway* (Erich Kunzel, Cincinnati Pops Orchestra, Telarc CD-80498-SA). This disc sounded distant and insipid at first but grew on me as I discovered its often uncanny realism.

I defy you to hear anything between you and the performer, which is what SACD is all about!

You may agree with me that its balance is often rather weird, but I couldn't help but like the sound of the English horn and the deeper woodwinds.

I don't think you'll have the same complaints with Jack Renner's recording of Kunzel and the Cincinnati Pops Big Band on *Super Audio CD Sampler* (Telarc SACDP-99-1): same conductor, same venue, but terrific presence and great muted trumpets. (This recording is due out on CD in January as *That Nelson Riddle Sound*, CD-80532.) And if the "Deep Purple" cut on Telarc's sampler is any indication, the CD of Dave Brubeck's *The 40th Anniversary Tour of the U.K.* (Telarc CD-83440) is a must-have (and is available now). Clearly Renner miked this cut rather closely—the British applause is veddy polite and quite distant—but he managed to capture (and DSD managed to preserve) the ambience of London's Royal Festival Hall with extraordinary realism. Ditto for the recording of Oscar Peterson, Ray Brown, and Milt Jackson (on CD as *Oscar, Ray, and Milt: Live at the Blue Note*, Telarc CD-83443), although I found the drum set at the opening of "Caravan" a bit heavy.

If you're into choral music, the Telarc sampler previews a great CD, *Orlando and the Flemish Masters* (CD-80521), which

Renner recorded in the Netherlands. I prefer Renner's sound to Bishop's on Dvorák's *Stabat Mater* (Robert Shaw, Atlanta Symphony Orchestra and Chorus, available as Telarc CD-80506), though one could argue that Bishop's is the more natural. The Bishop recording should be out now; Renner's is slated for an April 2000 release.

Another sampler, *DMP Does DSD*, contains an outstanding choral recording destined to be a classic. It comes from my friend and almost neighbor, Tom Jung. Tom's better known for his studio jazz recordings than big-scale choral stuff, but the tracks from the CD *Sacred Feast* (dmp CD-805), by a group called Gaudeamus, prove that his talents with choral music match those he's demonstrated with jazz. Actually, every recording on the dmp sampler is a winner—tracks from Manfredo Fest's *Just Jobim* (dmp SACD-05) and *Alto* by Joe Beck and Ali Ryerson (dmp SACD-06), as well as the two mentioned above—but the ones that show DSD's potential to its fullest may be the tracks from *Quality of Silence*, by the Steve Davis Project (dmp SACD-04). I defy you to hear anything between you and the performers on this one. That is what SACD is all about!

But will SACD succeed? Of the major labels, only Sony Music has agreed to support SACD's launch; it intends to release 10 titles per month. The other majors are sitting on their you-know-whats, petrified about piracy. (Hey, guys, I dare say it's harder to pirate SACD than DVD-Audio.) That leaves the little guys—the Telarcs, the dmps, the AudioQuests—the labels for whom sound quality is of paramount importance and who don't care about getting ripped off or are willing to risk it to some degree in pursuit of that goal.

No question about it, you take a risk buying the Sony SCD-1. If SACD succeeds, you'll be limited to stereo while the format progresses to surround sound. But at least the SCD-1 won't become an albatross like the Elcaset: If SACD fails, you'll still have a world-class CD player that will be the envy of everyone who sees and hears it. The Sony SCD-1 strikes me as the Lamborghini of the audio world—of questionable practicality but absolutely incredible. And, yes, I'd like one! Who wouldn't?

A

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JAMES K. WILLCOX

Denon AVR-3300 A/V Receiver

With the possible exceptions of “I accidentally ran over your puppy” and “I really think we need to discuss our relationship,” there are few phrases I enjoy hearing less than, “The company’s marketing manager would like to stop by your apartment to make sure you’ve set up the receiver correctly.” And yet, shortly after finding out that I would be reviewing Denon’s new AVR-3300 surround sound receiver for *Audio*, that’s exactly what the company’s public relations firm was suggesting.

Now, I have nothing personal against David Birch-Jones, despite his marketing title and hyphenated surname (Spinal Tap’s Sir Anthony Eaton-Hogg ruined me for hyphenates). David, in fact, is an extremely personable, intelligent, and likable human

being. And it wasn’t even that his visit would force me to clean my apartment to a luster it hadn’t seen since I stopped dating a woman for whom every floor held romantic possibilities.

No, what it was really about was ego. Af-

DENON

Rated Power: 105 watts/channel into 8 ohms, from 20 Hz to 20 kHz, at 0.05% THD, two channels driven.

Dimensions: 17 in. W x 6¼ in. H x 16½ in. D (43.4 cm x 17 cm x 41.7 cm).

Weight: 33 lbs. (15 kg).

Price: \$999.

Company Address: 222 New Rd., Parsippany, N.J. 07054; 973/396-0810; www.del.denon.com.

ter all, I’m a seasoned industry guy with a rack-full of costly components—I think I know how to set up a wimpy receiver, by God! So I responded to the request by saying, “I’d be happy for David to stop by my place—as long as he’s going to stop by and visit the homes of every other person who buys an AVR-3300 to make sure *they’ve* set them up properly.”

Perched on my soapbox of righteous indignation, I reasoned that part of my job is to describe to readers how easy it is to set up and use the equipment I review and that having the manufacturer’s marketing guy tsk-tsking any wrong moves would seriously skew that experience. “And I’m sure my editor would agree,” I informed the PR woman, whose

sudden bout of throat-clearing sounded suspiciously like the word “dickhead” spoken through a cupped fist. And so, I thought, that was that.

Apparently, my editor did not exactly agree. Without getting into the arcane subtleties of editor/writer relationships, I will only say that less than two days later I found David Birch-Jones and the smiling PR representative crossing the threshold of my recently cleaned Manhattan apartment. “David—so great to see you!” I positively beamed. “I’ve so been looking forward to this!”

With the launch of the AVR-3300, Denon is hoping to reach a broader range of customers, including those seeking a kick-ass home theater receiver but who couldn’t, wouldn’t, or won’t cough up the \$2,800 it costs to own an AVR-5700. In order to hit the AVR-3300’s dramatically lower \$999 list price, Denon, of course, had to shave a few features here and there. For example, while the 5700 includes Lucasfilm’s THX Ultra processing in addition to Dolby Digital and DTS decoding, the 3300 struggles by with just Dolby Digital and DTS. Also, the 5700’s amplifier is about a third more powerful than the 3300’s, which pumps out 105 watts to each of its five channels.

Photos: Michael Groen

What's truly surprising, however, given the AVR-3300's comparatively low price, is the number of standout features—including component-video switching and 24-bit/96-kHz DACs—that have been carried over from the AVR-5700. On paper, at least, Denon's AVR-3300 appears to establish a new benchmark for features offered in sub-\$1,000 receivers.

By the time David arrived, I had been living with the AVR-3300 for nearly a month, so imagine my, er, *amusement* when a very quick run-through of the setup procedure with him revealed that I had incorrectly configured the system for my speakers. You see, during setup you're asked to select either "Large" or "Small" as the speaker option. Had I given the instruction manual more than a cursory glance before attempting setup, I would've known Denon was referring to the speakers' response characteristics—i.e., their ability to play frequencies below 80 Hz—rather than their physical size. Instead, I glanced at my fairly large floor-standing Energy speakers and opted to super-size all the way around.

Unfortunately, as David patiently informed me, that meant only the low-frequency effects (LFE), or .1 channel, would be sent to the sub. The "Large" setting, he explained, was really for the increasingly popular breed of "powered tower" speakers that include built-in subwoofers as part of their design. To his credit, he refrained from adding, "And especially not two-ways like those Energys, Mr. Big Shot." David also mentioned that because many movie soundtracks have little or no content in the LFE channel, powered subwoofers with auto-on circuits will often fall into sleep mode after a while, with the result that they miss the



first few seconds of low-end program material when it finally reappears. Lo and behold, after my system was properly configured, bass response, which I had listed as AWOL in my listening notes, marched smartly back into the barracks.

The Denon AVR-3300 is a fairly impressive-looking piece of A/V gear: Not particularly striking but solidly built and possess-

Denon's AVR-3300 appears to establish a new benchmark for features offered in a sub-\$1,000 receiver.

ing the kind of heft notably missing in many mid-priced receivers. The clean, relatively nondescript faceplate belies the myriad of analog and digital inputs and outputs (well, not digital outputs, but more on that later) that populate the back. All the digital inputs—one coaxial, three optical—are addressable during the initial setup, so they can be assigned to any program source, giving the receiver a flexibility missing in cost-conscious models that hard-wire the digital jacks.

This Denon receiver offers an impressive array of switching options. Perhaps the AVR-3300's most surprising feature is the presence of two (two!) sets of component-video inputs and one set of component video outputs for connecting to a TV or display that has component-video inputs. In addition to the component video I/Os, five composite and five S-video inputs are included, along with three composite and three S-video outputs. On the audio side,

the AVR-3300 has nine analog inputs (including one for moving-magnet phono), three optical digital inputs, one coaxial digital input, and eight (7.1) external analog inputs, giving the receiver an upgrade path for accommodating future multichannel audio formats as they emerge.

Certainly, there are many receivers in this price range that offer more power than the AVR-3300, but for most home listening conditions its 105 watts of power per channel will be more than adequate. In my New York City apartment, it was clearly capable of rocking my—and my neighbors'—world. Not surprisingly, nearly half the receiver's weight comes from the power amp block and a beefy (14 pounds, according to Denon) power transformer. Helping to keep things Ray Charles-cool are a finned aluminum heat sink and a microprocessor-controlled "smart" fan system mounted at the front of the power block. Denon says the fan system is sensitive to both heat and output level; as a result, it will kill the fan when it senses quiet passages and then crank it up again when the sound gets louder. Apparently the system works; I found the AVR-3300 to be quieter than a Detroit Lions fan around playoff time.

Denon's costlier AVR-5700 receiver sports a number of unusual features, many of which have flowed through the gene pool into its younger sibling. For example, most analog signals entering the AVR-3300 are converted to digital by 20-bit A/D converters en route to its digital signal processing section, based on the same Analog Devices SHARC 32-bit floating-point DSP chip used in the 5700 (which has two). But the 3300 receiver also includes an analog bypass that whisks signals around the converters and DSP section entirely. And a "parallel





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bass management circuit”—essentially a crossover system for the front left and right speakers and the subwoofer—works its voodoo by matching the analog speaker/subwoofer settings to those used for digital sources. Denon says the bypass system works especially well for high-quality ana-

log sources, such as a turntable, or for CD players with HDCD decoding.

Another standout feature—again, particularly at this price level—is the AVR-3300’s ability to handle 96-kHz/24-bit audio. Denon employs true 96-kHz/24-bit DACs and filters on all six audio channels and a

digital interface receiver chip of its own design that can accept stereo 96-kHz/24-bit PCM audio. I can’t think of another receiver in this price range that doesn’t down-sample 96/24 audio to 48-kHz/16- or 20-bit for processing and D/A conversion. The ability to handle true 96-kHz/24-bit audio

TEST RESULTS

T rue Technologies’ measurements show very flat frequency response across the entire audio band for all main channels in “Large” mode and above 80 Hz in “Small” (Fig. 1). What little deviation is present shows up as a tendency for the frequencies below 1 kHz to shelf up perhaps a quarter of a decibel relative to those above, which might add just a touch of mellowness.

Plots of total harmonic distortion plus noise (THD + N) into 8 ohms (Fig. 2)

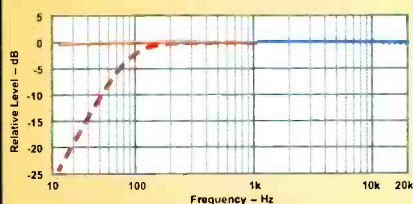


Fig. 1—Frequency response.

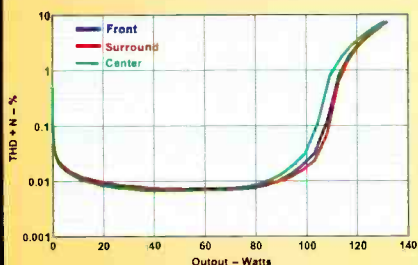


Fig. 2—THD + N vs. output.

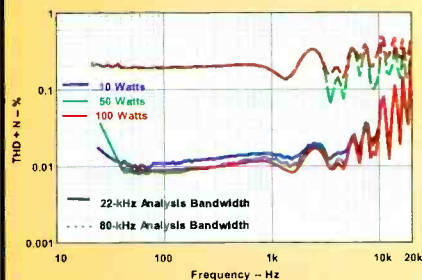


Fig. 3—THD + N vs. frequency.

essentially confirm Denon’s 105-watt (20.2-dBW) continuous power spec. Dynamic power measured 142 watts (21.5 dBW) per channel into 8 ohms with two channels driven or 133 watts (21.2 dBW) with all five channels going. Into 4 ohms with two channels driven, this receiver’s dynamic power was a very impressive 219 watts (23.4 dBW). The lab noted, however, that the AVR-3300 did not seem happy when pushed to clipping in 4-ohm continuous-power testing, so some

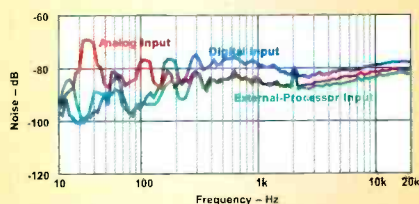


Fig. 4—Noise spectra.

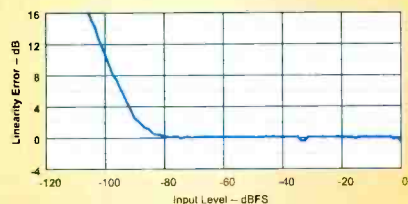


Fig. 5—D/A converter linearity.

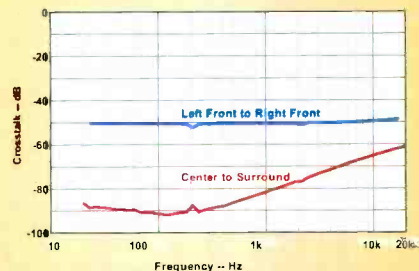


Fig. 6—Crosstalk vs. frequency.

caution might be in order if you have unusually low-impedance speakers.

Figure 3 shows THD + N versus frequency at various levels and with both standard 22-kHz and 80-kHz analysis bandwidths. (The input signal was 0-dBFS PCM digital for all curves.) The curves for the wider measurement bandwidth lie considerably higher, presumably because of the larger amount of ultrasonic noise included from the D/A converters. Otherwise, the curves are all very similar, and when out-of-band components are eliminated by the 22-kHz filter, very low to beyond 10 kHz. There is a surprising amount of raggedness in the curves from about 2 kHz up, for which I have no ready explanation.

The plots of noise versus frequency (Fig. 4) are relative to 1 watt (0 dBW) out, with the receiver’s gain turned all the way up. Worst case is, as one would expect, for analog input, reflecting the contribution of the A/D converter. Summed, A-weighted noise for an analog input was a low -81.2 dBW in analog bypass mode but deteriorated to -63.8 dBW in five-channel stereo mode, presumably because of the digital stages interposed.

Figure 6 shows separation versus frequency for the best and worst channel pairings. These tests were made through the external processor inputs, but using the digital or two-channel analog inputs instead made essentially no difference, suggesting that the crosstalk was predominantly in the power amp section. Though not impressive technically, the 50-dB separation between the front left and right channels is more than adequate, and all other combinations were much better.—Michael Riggs

"marvelous speakers"

CS7.2 / Stereo Sound, Japan, Winter '98/99

"dream speaker"

CS7.2 / Image HiFi, Germany, March/April '99

"all-time great"

CS6 / Fi Magazine, October '97

"truly amazing"

CS1.5 / Revue du Son, France, January '97

"superb"

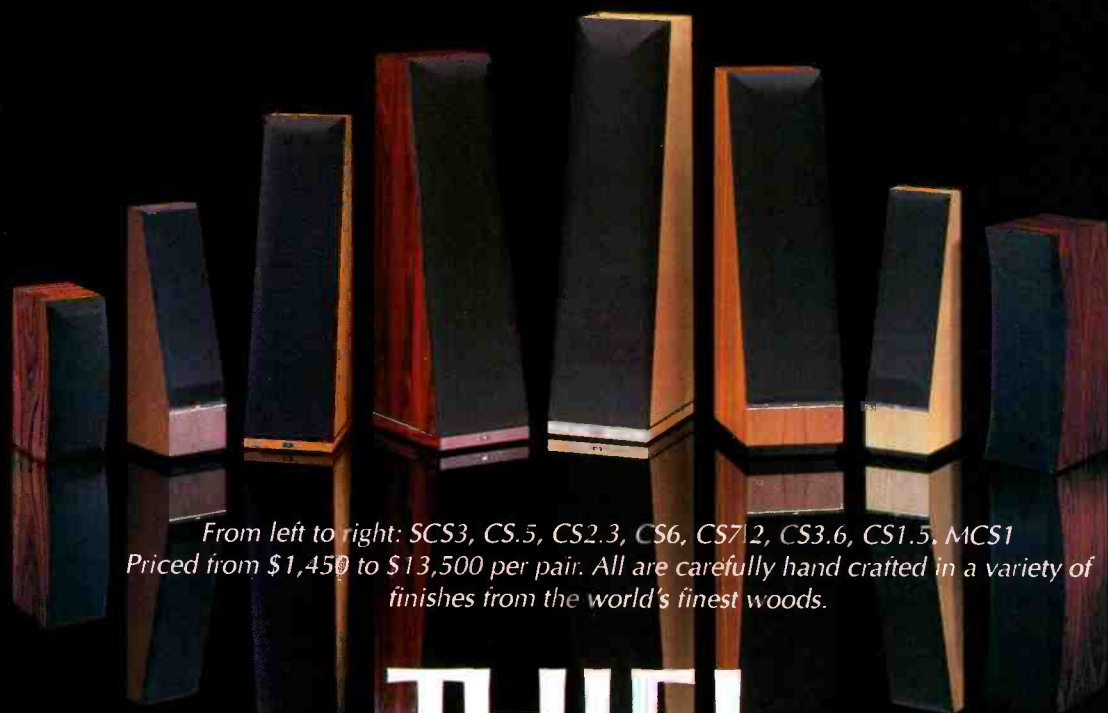
MCS1 / The Perfect Vision, May/June '99

"a breakthrough"

CS7.2 / Audio, December '98

"outstanding"

CS2.3 / The Absolute Sound, December '98



From left to right: SCS3, CS.5, CS2.3, CS6, CS7.2, CS3.6, CS1.5, MCS1
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will become increasingly important as more DVD players and audiophile DVDs with 96/24 audio become available.

Finally, the AVR-3300—like the 5700—tackles the issue of music versus movie surround sound in a unique manner. Many people feel that movie soundtracks benefit from the diffuse sound provided by side-mounted bipole or dipole speakers located high on the walls, while multichannel music is more realistically reproduced by direct-radiating speakers located behind, and pointing toward, the listener. By including two sets of surround speaker terminals, Denon obviates the eye-gouging arguments over which system you're going to live with by giving you the option of using bipole or dipole surrounds for movies *and* direct radiators for multichannel music. You can even use two pairs of surround speakers in tandem—and calibrate their levels separately—if you find that gets you closer to home theater nirvana.

As I discovered during David's visit, making the surround speaker situation even easier is a feature Denon calls Personal Memory Plus. Essentially, PMP remembers your preferred surround mode and the parameters and speaker configuration for each main input you select. As a result, once you've entered your preferred settings for a source, they will become its default settings.

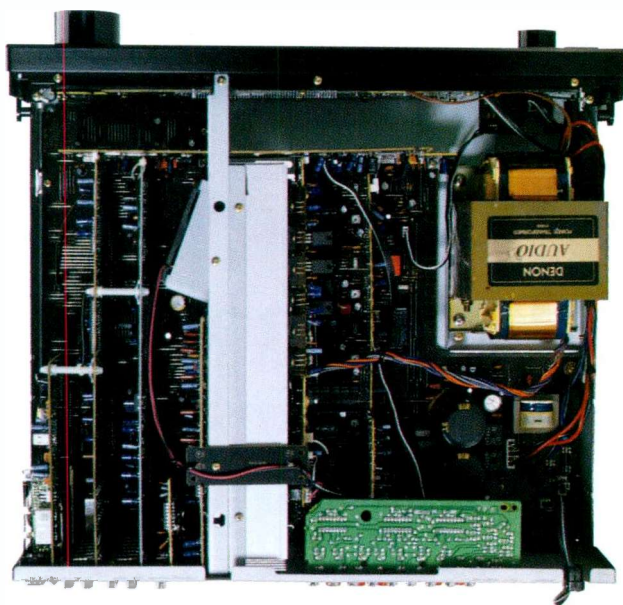
To evaluate the AVR-3300's performance, I substituted it for electronics in my reference music/home theater system, which includes an Aragon 8008 250-watt-per-channel stereo amplifier, an Aragon 8008 three-channel amp, and a Lexicon MC-1 digital controller. (The Lexicon replaced the Citation 7.0 A/V controller—which decodes Pro Logic but not Dolby Digital—that I had been using previously.) Pioneer's excellent DV-09 DVD player, which can feed 96-kHz/24-bit audio from its digital output, was used for playing both DVDs and CD. The speakers in my all-Energy reference system are floor-standing XL26s up front, an XL Center resting on my 36-inch Panasonic direct-view TV, and floor-standing XL25s in the rear. Energy's XL S12 12-inch powered subwoofer handles frequencies below 80 Hz. Later, I also added a pair of Energy XL-R two-way dipole surround speakers for the review.

Although all of the Energy speakers except the center channel had been bi-wired with Monster Cable Z3 cables terminated with spade lugs, the Denon receiver doesn't accept spade connectors. Therefore, I rewired the system with Kimber Kable 4TC loud-speaker cables, terminated with Kimber's WBT-0645 banana plugs. Audio connections were made with 1-meter runs of Monster's Z200I Reference interconnects and a generic optical digital cable. For my system's video connections, I used generic S-video cables, until they developed a bad case of the flakies. Then I switched to Monster Z300 composite-video cables.

Thanks to the absence of DTS-encoded DVDs in my two local video rental stores, my primary movie references were Dolby

Denon employs true 96-kHz, 24-bit D/A converters and filters on all six audio channels.

Digital-encoded DVDs. The AVR-3300 handled every one of them—as well as matrix-encoded Dolby Surround discs—with aplomb. The rapid-fire, nonstop gunplay during several scenes in the Arnold Schwarzenegger film *Eraser* was reproduced with alarming realism and power, and explosions rocked my apartment's walls with near-terminal authority, as my new neighbors will attest. But the 3300 wasn't just about sheer cinematic bombast. Quieter, more complex passages, such as some of the underwater scenes in *Sphere* and the rain effects in *Tin Cup*, were also delivered effectively, without obvious tonal coloration or the background noise common to many inexpensive receivers.



Truth be told, I am much less demanding of audio in the home theater environment than I am when listening to music, and that's where I expected the AVR-3300's weaknesses to become readily apparent. But to my surprise, the 3300 is damn musical for a receiver of its price, with a warm, sweet sound, a fairly wide soundstage, and above-average transparency. Compared to other receivers I'm familiar with in this price range—Yamaha's RXV-955, for example—the Denon is less strident, more detailed, and less fatiguing to live with for long periods of time.

On Steve Morse's underappreciated CD *High Tension Wires*, his guitar playing runs the tonal gamut from a nylon-string, neo-classical solo piece to high-energy, blisteringly fast electric runs. The AVR-3300 not only kept up with Morse and his wicked guitar vibrato but maintained a tight, focused low end when electric bassist Jerry Peeks matched Morse's jaw-dropping runs note for note on the showoff track "Tumeni Notes."

The Denon AVR-3300 also performed admirably on a tweaked rerelease of the Bill Evans Trio performing at Shelly Mann's club in Hollywood in 1963. The recording—a superb special edition mastered using JVC's high-resolution 20-bit XRCD (Extended Resolution Compact Disc) technology—emerged from the AVR-3300 with the excellent detail, accurate

Continued on page 88

WILLIE GLUCKSTERN

Grado Reference RA-1 Headphone Amp



I have a confession to make—one that will, I'm sure, seal off the last remaining avenue to my quest for the highest elected office in the land. Back in the 1960s, I indulged in certain youthful transgressions: I listened to music through headphones.

In those times I never met a crossover I couldn't melt. And when my very last speaker bit the dust, it was a pair of headphones, dynamically modest though they were, that saved the day. Headphones couldn't rattle the kitchen cabinets like a pair of Altec's Voice of the Theater industrial P.A. horns, but with a few candles and some good wine, who cared? The Beatles, The Stones, and The Moody Blues all managed to make their presence felt.

Cassettes were brand-new in the late '60s; on the road or at home, 8-track was still the

tape format of the masses. Mostly though, LPs ruled the roost, and back then many of the phono cartridges that played them were manufactured by Grado Labs, one of the oldest family-owned companies in the audio industry.

Grado! Rolls right off the tongue, no? Great name for a new shoe everyone's talk-

ing about, as in, "Hey! My girlfriend got me a pair of Grados for my birthday." Or a tasty new snack, as in, "Sweetheart, get me a beer and a bag of Grados and hand me the remote, will you?"

Brooklyn-born Joe Grado began producing phono cartridges at his kitchen table in 1953. In 1958, he opened a storefront factory on the site of his Sicilian-born father's fruit store in Brooklyn's Sunset Park, manufacturing his new invention, the world's first moving-coil phono cartridge. In 1990, 32 years and 10 million cartridges later, John, Joe's nephew, branched the company out into a new line of audiophile-grade headphones, to great success. Grado Labs' entry-level SR60 headphones (\$69) are probably hi-fi's best headphone bargain. Meanwhile, Grado says it sold 60,000 phono cartridges last year, an incredible feat at this stage in the game.

So this brings us to the real business at hand—the dedicated headphone amplifier. High-end headphone manufacturers have always been frustrated by the paltry attention paid to the circuitry behind most amplifiers' and receivers' headphone jacks, and with good reason: The biggest amp manufacturers were not headphone manufacturers, so headphone sound quality was never a priority. Lots of components nowadays don't even include a headphone jack. Users of high-quality headphones often find themselves staring at a \$4,000 amplifier with no place to stick them in.

That's when John Grado realized the dedicated headphone amp was a niche waiting to be filled. Other high-end headphone companies felt the same way, largely because of a world of headphone jacks that simply did not meet their standards. The original Grado Reference Products headphone amp was introduced in 1994 at \$795; today the price has fallen to \$350. I reviewed its current version, which represents the company's latest thinking on how best to drive its special 'phones.

The design is fairly simple: a pair of audiophile-grade op-amps with high-current output capability and wide bandwidth, a high-quality volume control, a single headphone output (beefy enough, Grado says, to drive two pairs of headphones at once), and a set of stereo RCA line inputs. The RA-1 is

Photos: Michael Groen

GRADO

Rated Frequency Range: 20 Hz to 20 kHz.

Rated Power Output: 250 milliwatts.

Rated Input Impedance: 100 kilohms.

Weight: 1 lb. (0.4 kg).

Price: \$350.

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5340; hpsr60@aol.com.

housed in a cabinet hewn from a solid block of mahogany approximately the size of a stack of four CD cases (5½ x 5½ x 1½ inches). It weighs just 12 ounces and is powered by two 9-volt batteries that supply the amp with 40 to 50 hours of operating time. Grado's modest press release describes the sound of the RA-1 amp in terms that would serve uncannily well in characterizing a tasty, late-harvest German Riesling: "warm, smooth, full-bodied, non-fatiguing, and rich." Yum! I couldn't wait to hook it up.

Setup is simple: Insert two 9-volt batteries, connect the amp inputs to any high-level line source (portable or in-home), and away you go. You probably don't want to be wearing your headphones when you turn the RA-1 amp on, though: When it clicks on, it produces a bright, audible pop. John Grado claims a great Sisyphean trade-off was required: Nix the pop, and sonic integrity falls off ever so slightly. Hence, the pop stays.

So, I thought I'd slip on my Grado Labs' SR80 headphones (\$95), plug 'em into the Grado Reference RA-1 amp, and go hunt me some bear. I headed right for some big ol' super-dense orchestra music from Erich (the bad boy of turn-of-the-century Vienna) Wolfgang Korngold and, using an all-NAD rig as my baseline, loaded up. I hooked the Grado amp into the "Rec Out" jack of the excellent, no-fuss NAD 317 integrated amp, mated to an NAD 512 CD player, and cued up the opening bars of Korngold's brilliant, "unperformable" magnum opus, *Das Wunder der Heliane* (London 436636). A lush, celestial, chordal theme for full orchestra and harmonium wells up in a progression of shimmering, bi-tonal harmonies that crystallize the opera's recurring themes of the power of eternal love and resurrection. Phew!

I greedily plugged the SR80s into the Grado RA-1 and began to listen to this fabulous music, planning to hear a few minutes worth and then begin switching between the RA-1 and the NAD. Forty minutes later, I realized I had been savoring this music in a way I never had before. The sound was at once more immediate, clearer, and more refined than I recalled from speaker listening. A quick switch over to the

NAD provided my first confirmation of the rightness of dedicated headphone amps. The NAD's sound was broader, more diffuse, with voices less focused in the mid-range and not nearly as clear and airy in the high end. The music heard through the Grado Reference RA-1 amp sounded appreciably better in every way.

Next, on to the splendid composer/arranger Maria Schneider's distinguished, hard swinging, big-band jazz orchestra. On



**Through the RA-1,
music was
rendered truer
than I had
imagined possible.**

the edgy, fear-laced "Bombshelter Beast," the first section of the three-movement "Scenes from Childhood" suite from her 1996 recording *Coming About* (Enja ENJ-90692), Scott Robinson's gutsy baritone sax projected real heft for such a diminutive speaker system. And Jim Anderson's uncannily concise mix of this authoritative 19-piece ensemble, complete with brilliantly involved theramin (again, Robinson's) remained dynamically smooth throughout. Tony Scherr's creepy, "bug-crawling-up-your-leg" deep electric bass lines on "Night Watchman" sent me cranking up the volume, fascinated by its better-than-lifelike presence through the Grado SR80 headphones and RA-1 amp.

This kind of music is richly layered, engagingly plotted, and powerfully performed here. On sexier, laid-back cuts like "Love Theme from Spartacus," I found an exquisitely audible midrange tension in Rich Per-

ry's tenor-sax playing that was not nearly as pulsingly vibrant when heard through the NAD's jack.

While headphone listening can never approach the bone-crunching deep bass of full-size, high-end speakers with subwoofers or hope to project the high-grade imaging of full-blown systems, the benefits and advantages of the Grado SR80 headphones—with the Grado Reference RA-1 amp doing the driving—were stunning in serving as a sort of microscope for my ears.

This was a consideration made strikingly clear when I swapped the Kimber Hero cables connecting the RA-1 with a pair of generic, came-in-the-box cables I had lying around. Gadzooks, what a difference! The entire sound profile took on the lackluster patina of soiled tape heads. Dullsville.

Back to the cleaner, more detailed sound of the Kimbers, and back again to Korngold for my final test audition, a bit of his flawlessly detailed, yet orchestral-essence, chamber music. Korngold, after the strenuous effort of composing opera and large orchestral pieces, would seek a kind of psychic sabbatical in chamber pieces. Quite a few of these exciting works are now finally available on CD. In the kinetic first movement of his String Quartet No. 1 in A, Op. 16, with the Chilingirian Quartet (RCA Gold Seal 7889-2-RG), an extremely demanding piece to perform, Korngold brilliantly juxtaposes a forbidding, relentlessly onrushing, chromatic figure with a poignantly touching love theme in a way that in its sound picture is pure Korngold, at once displaying breathtaking technique and lovely tenderness. Here the Grado RA-1 really came through with flying colors, allowing a terrifically precise dynamic flow, more focused and with a far more accurate sense of presence than the NAD.

Overall, with no disrespect to the NAD 317, which is a first-class integrated amp and then some, the all-Grado listening experience with the SR80 headphones and RA-1 dedicated headphone amp was quite a turn-on. With the Grado Reference RA-1 handling the amplification, music was rendered truer, clearer, and more lifelike than I had imagined was possible. Hats off to Joseph and John Grado! **A**

TEST RESULTS

The Thule CD100's frequency response (Fig. 1) shows a very slight droop at the uppermost frequencies, an even slighter one at the lowest. Not perfect, but the droops are small enough (0.1 dB at 20 Hz, 0.45 dB at 20 kHz) to be unremarkable. (Plotted on the scales we use for speaker measurements, even the worst CD player's response would be a dead-flat line.)

The Thule's crosstalk (Fig. 2) came as a mild surprise, being highest in the bass (just under -44 dB at 21 Hz) and very low in the treble (just over -75 dB at the curve's end) instead of the other way around. In any case, good performance, below -60 dB from about 130 Hz on up, and the two channels' curves were nearly identical.

A fussy budget could cavil about the 60-Hz noise bump in the left channel (Fig. 3), but even at its peak it's a mere -109 dBFS. (Tsk tsk? More like hohum.) Overall, A-weighted noise was 95.9 dB below 500 millivolts.

The Thule's DAC linearity (Fig. 4) is similarly boring, deviating by less than 0.1 dB almost everywhere and with a maximum deviation of +0.34, -0.5 dB. The test frequency was 4 kHz.

Dedicated graph watchers may perk up at Fig. 5, which presents a minor mystery. What's causing the ripples above 8 kHz or so in the bottom curve? Can't be the clock frequency or high harmonics, which would all be filtered out by the 22-kHz test filter used in generating that curve's data—but it's some kind of noise, most likely. Still, the numbers are low, not quite reaching as high as 0.02% until 20 kHz (and then only in one channel). Changing measurement filters to take in all frequencies up to 80 kHz does increase THD + N noticeably, but that's mostly because of noise, especially noise from the CD100's clock.

Except for Fig. 4, all measurements for the Thule CD player were made using 0-dBFS test signals.—Ivan Berger

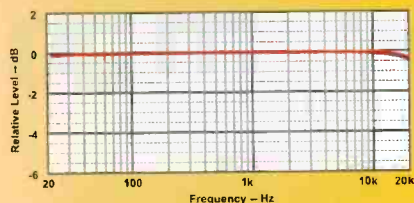


Fig. 1—Frequency response.

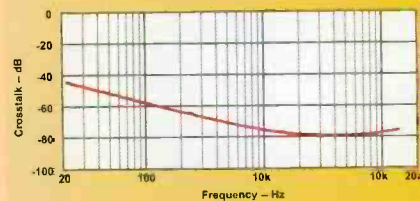


Fig. 2—Crosstalk.

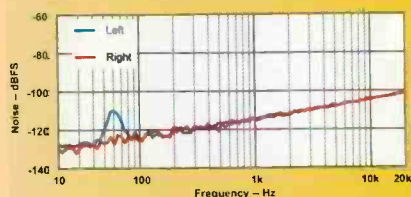


Fig. 3—Noise vs. frequency.

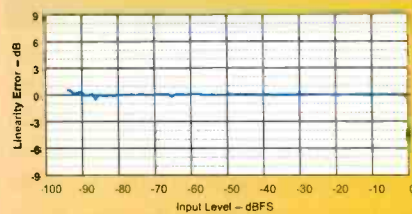


Fig. 4—DAC linearity.

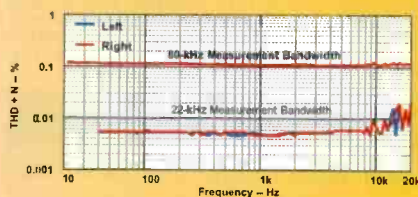


Fig. 5—THD + N vs. frequency.

up from her magazine and said, "Wow! That really sounds different!" (and this from a woman I usually have to address repeatedly—with more volume and more irritation in my voice each time—to divert her attention from the latest *Martha Stewart Living* and focus it on my system's sound). I repeatedly played *Turf*—which contrasts Bloom's boomy, resonant vocals with his steely acoustic guitar—over the four months or so I tested the CD100, and it was like discovering the disc's understated charms all over again. Delicate background details, such as the "mermaid" murmurs in "Sunny Sailor Boy," were effortlessly clear; with many players, I have to strain to hear them.

A disc that's spectrally similar to *Turf* is the Red House Painters' '95 release *Ocean Beach* (4AD 9 45859); I've used it regularly in the past few years to audition components and systems. The opening track, "Cabezon," is a loping instrumental with layered acoustic guitars that were well delineated by the Thule. The maudlin, melancholy voice of head Painter Mark Kozelek on the sparse and somber "Summer Dress" was rendered in all its pretentious detail. The droning electric guitar that forms this song's foundation was distinct, not just the background fuzz some CD players portray it as.

Bluesiana Triangle (Windham Hill Jazz WD-0125) is a captivating 1990 disc of a one-off blues/jazz/R&B collaboration of multi-instrumentalist/singer Dr. John, hornman David "Fathead" Newman, and the late, legendary jazz drummer Art Blakey. In the spirited instrumental opener, "Head's Up," spaces in the soundstage were large enough to drive a semi through, and the overall presentation was stunning. The spectral balance on "Life's a One Way Ticket" was as good as I've ever heard it, and the timbre of the instruments was spot-on, with only a little high-frequency edge to Newman's saxophone. The sound of Dr. John's cascading piano riffs was so sensual it made the roof of my mouth tingle, and his vocals had the appropriate amount of growl. On the disc's highlight, the 10-minute jam "Shoo Fly, Don't Bother Me," Dr. John's piano chords and Newman's flute solo were palpably lifelike, with just a little treble overemphasis. Blakey's extend-

Pioneer



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ed drum turn, which closes out the track, was so accurately reproduced that I could feel the vibrations from his kit, and the Spirit CD100 wrung every bit of subtle detail out of Dr. John's understated background guitar fills.

On "A Novidade" from Gilberto Gil's '94 live recording *Acoustic* (Atlantic Jazz 82564), tonal balance was excellent. Gil's reedy tenor was faithfully reproduced, and Lucas Santana's trilling flute solo—always a tough test—was surprisingly smooth and not at all spitty-sounding. The detail in Gil's hushed vocal fade-out at the end of "A Novidade" showed that the Spirit CD100 handles low-level information with ease. Virginia Rodrigues' voice in "Negrume da Noite," from the Brazilian singing sensation's 1997 debut disc *Sol Negro* (Hannibal/Natasha HNC D 1425), sounded immaculately clear, and the handclaps in the song were placed in the soundstage with pinpoint precision. The a cappella track "Veronica" sounded as though there were nothing between Rodrigues' angelic voice and my ears.

While I liked the Thule's sound overall, it did seem a bit forward compared with that of the more neutral NAD player. On Texas-based singer/songwriter Alejandro Escovedo's thematic '93 recording *Thirteen Years* (Watermelon CD 1017), the swooping strings that kick off "Ballad of the Sun and the Moon" were brighter-sounding; on "Helpless" the electric bass guitar was supple and the drums seemed weighty and convincing, but Stephen Bruton's keening slide guitar had a grittier sound than I'm used to from the NAD.

In day-to-day operation, my interaction with the Thule Audio Spirit CD100 was largely uneventful—just the way I like it. I loved the CD100's distinctively understated styling and really valued its low-key front-panel layout, especially since I have a curious, hands-on toddler in the house. The player was easy to operate, once I got used to its few quirks, and sonically it performed admirably. If you're hunting for a high-end CD player that will help you get the most out of your music with the absolute minimum of complications and frills, the Thule Audio Spirit CD100 fills the bill—simply and superbly. **A**

Denon continued from page 81

imaging, and overall impressive sound quality that I hear from it through my reference system.

Reviewing the AVR-3300 was my first in-home experience with 96-kHz/24-bit audio—the Lexicon arrived toward the end of the review—and, man, it spoiled me for more! The only 96/24 disc I have is Jon Faddis's *Remembrances*, a Chesky release that sounded great on the AVR-3300—richer, more alive than the CD, with an extensive palette of tonal colors. Subtle differences in instrumental timbre—oh, there's the baritone sax, and there, the bass clarinet!—were readily apparent on the Chesky DVD.

Although DTS movies were in scarce supply in my neighborhood, I was able to get my hands on several DTS audio discs, including a DTS sampler. At the risk of drawing fire from audiophiles who feel that anything but two-channel stereo is hokum, I loved the ways the cuts on this disc sounded! On the opening track, "She Makes Me Feel Good," Lyle Lovett's distinctive, emotive voice sounded better than ever, with harmony background vocals popping in and out from the surround channels. On the AVR-3300, Dean Parks' acoustic slide solo retained a tight, sinuous snap, while the subtle Hammond B3 organ parts sounded, well, like a real Hammond B3.

On the Boyz II Men reworking of The Beatles classic, "Yesterday," you'd swear the Boyz were in the 'hood—or even better, in your living room. The 3300 was able to fill the room with the Boyz' lush a cappella harmonies, accurately reproducing the warmth and depth of their respective voices. And on Diana Krall's version of "They Can't Take That Away from Me," I closed my eyes and was transported to a smoky jazz club, with her voice seeming to bounce back off the rear wall.

Perhaps the biggest surprise was how much I enjoyed listening to music using the AVR-3300's five-channel stereo mode. As far as I'm concerned, if they can shave \$10 off the price of the receiver, they can eliminate the rest of the DSP modes; I frankly didn't care for them at all. But at the risk—again—of committing audiophile heresy, I found myself using and enjoying the five-channel setting frequently when listening to CDs,

particularly when I wasn't going to settle down in the sweet spot in my room. What came from my speakers was warm, rich, and detailed, with a huge, satisfying soundstage—certainly not the cheesy, artificial sound I associate with most receiver DSP modes. If you have decent surround speakers, my guess is that you'll be using the five-channel stereo more than you'd imagine.

It should be obvious by now that I am favorably impressed with the AVR-3300, especially when you consider its price. But that's not to say it doesn't have its shortcomings. For one, it doesn't have a digital output, which may be important to some

Perhaps the biggest surprise was how much I enjoyed listening to music in the five-channel stereo mode.

of you. The AVR-3300 also doesn't allow you to name stations or tune them directly, which are standard features on a lot of receivers in this price range. The remote is a bit clunky and difficult to use (though Denon is getting better at this). And maybe my opinion is skewed, but I think they could have put a bit more thought—and easier explanations—into the manual.

In addition, when I compared the AVR-3300 to my reference electronics, there was a significant difference in performance—muddier dialog, narrower soundstage, more tonal coloration, less focused bass, and vocals that sounded much more veiled. My reference rig was demonstrably smoother when pushed to higher volume levels. But I would certainly hope so: We're talking about \$15,000 worth of gear.

That said, I can't think of a sub-\$1,000 receiver I'd rather own than the AVR-3300. If you're looking for an amazingly quiet, affordable receiver with plenty of power, impressive Dolby Digital and DTS home theater performance, 96-kHz/24-bit audio capability, and a warm and detailed sound for music playback, you need not look past this one. It does tons of things way better than its price gives it the right to. **A**

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DANIEL KUMIN

NHTPro A-20 Speaker System



Photos: Michael Groen

Professional studio engineers check the details of their mixes on huge monitor speakers built into their control-room walls but then switch off to “near-field monitors,” small speakers balanced precariously atop the mixing console, to check how those mixes will sound on typical small speakers. For decades, two particular near-fields dominated the studio scene. Yamaha’s NS-10M, an unremarkable small bookshelf type, stood in for the typical home hi-fi speaker, sometimes with Kleenex draped

over its tweeters to soften a somewhat frisky top end. And almost always, a pair of tiny Auratones sat adjacent, 4-inch whizzer-cone cubs uncannily able to mimic the sound of cheesy car stereos, clock radios, and low-rent boomboxes.

But over the years, a funny thing happened. Engineers and producers began noticing that they often heard “more,” “better,” or “deeper” via their cheap near-fields than from their hulking, big-dollar, horn-loaded bruisers. Today, in the production of music both pop and classical, it’s

quite common to mix and master using near-field monitoring predominantly or exclusively.

The reason is simple. When you sit within a meter or so of the loudspeakers, your ear is swamped by direct sound, taking the profound effects of room acoustics (even in “scientifically treated” rooms like big-time studios) pretty much out of the picture; you hear what you put on the tape (or disc), with less influence from your listening room’s acoustics. Pro audio manufacturers have therefore been quick to produce small, high-performance two-ways specifically targeted at this market. Some of these are almost identical to “hi-fi” two-ways, distinguishable only by their top-grade, high-power-handling components, careful voicing for accurate response, and unit costs many times the price of similar-looking home models. Many others, however, are “active,” having built-in amplifiers and electronic crossovers.

The advantages of active loudspeakers are well known and should require little rehearsal here: Improved efficiency and reduced distortion (thanks to active electronic crossovers, which eliminate the inherently dirty, watt-sucking passive dividing circuit); ditto, improved dynamic potential and peak output; superior transient behavior, double-ditto; flatter top octave and smoother inter-driver transition

NHTPro

Rated Frequency Response: 48 Hz to 20 kHz, ± 2 dB; -6 dB at 40 Hz (in room).

Rated Amplifier Power: 250 watts/channel continuous, 400 watts/channel for 100-millisecond peaks.

Dimensions: Speaker, 7½ in. W x 14 in. H x 11½ in. D (19 cm x 35.6 cm x 30.2 cm); amplifier/controller, 19 in. W x 3½ in. H x 10½ in. D (48.3 cm x 8.9 cm x 27.4 cm)

Weight: Speaker, 17 lbs. (7.7 kg); amplifier/controller, 42 lbs. (19 kg).

Price: \$2,000/pair, including amp.

Company Address: Vergence Technology, 555 First St., #302, Benicia, Cal. 94510; 707/751-0270; www.NHTPro.com.

SPEAKER DETAILS



The foam strip near the A-20's tweeter presumably cuts down diffraction effects and side-wall reflections.

The rear-panel inputs are professional XLR female jacks, the standard connector for recording studios.



Pro chose to go with a conventional passive crossover rather than an active line-level circuit) reside not in the speaker cabinet itself but in an ordinary-looking rack-width chassis. Placing the electronics away from the enclosures removes their heat, electromagnetic influence, and noise potential from the speakers themselves, reduces the speakers' bulk and weight, and puts the processing controls within easy reach instead of on the backs of the two speakers. Yet this dedicated "amplifier/processor" retains all the custom-engineering advantages of active design.

be subjected in the typical studio, I want to weep.

Each A-20's rear panel presents only a recessed female XLR jack, which accepts the swanky red, dedicated 25-foot cables from the A-20 Control Amplifier. These multi-conductor cables are necessary because the amp delivers discrete tweeter and woofer signals (and has to power those spiffy baffle-board LEDs). Besides the corresponding male XLR outputs, the amp's back panel holds balanced XLR and unbalanced ¼-inch inputs (with pin-configuration info screened right on the panel—yay!), a fused IEC AC-cord receptacle, and a user-accessible AC voltage selector behind a clear panel.

On the control amp's face are a big power key, a large green numeric display, and three controls. There's also a headphone jack, which mutes speaker output whenever something's plugged in—a very handy feature, as you can never have too many good-sounding headphone outputs in the studio.

The A-20s' sonics are so accurate that commentary seems almost superfluous.

response, triple-ditto; and so on. Better still, powered speakers are a natural for custom-tailored equalization to smooth response, improve accuracy, and extend bass response, so most designers are happy to include it.

And so we come to NHTPro, a new company born of the peregrinations of NHT, a home-fi brand originated by longtime audio designer Ken Kantor, previously of Acoustic Research and elsewhere. NHT quickly established a prominent rep for high-value, low-silliness designs capable of excellent sound; Kantor, a lifelong musician and recording semipro, seems to have set out to steer his new company along the same path in the pro world. NHTPro's charter is to bring to the studio the level of reproduction quality familiar to high-end fanatics the world around, via small, affordable monitors that make such quality easily repeatable from session to session and from studio to studio.

The A-20 is NHTPro's "statement" design, an active two-way with a difference: The 250-watt/channel stereo amplifier and associated electronics (interestingly, NHT-

From a distance, the A-20 monitors look much like NHT SuperOne home two-ways, but they have higher-quality drivers (6½-inch treated-paper woofer and 1-inch aluminum-dome tweeter) and a slightly larger acoustic-suspension enclosure. A strip of foam, rather like weatherstripping, borders each tweeter's outer edge, presumably cutting down diffraction effects and side-wall high-frequency reflections. The box has the signature NHT slash-cut baffle that aims inward some 30° or so, obviating any need for toe-in and giving the enclosure one fewer pair of parallel internal surfaces. The speaker's cabinet is made up of heavy, ¾-inch MDF and sounds very dead to knuckle-raps. A tiny green LED, located between tweeter and woofer, glows when the controller is on.

The A-20's rather gorgeous finish deserves a mention: It's a subtly sumptuous, "Steinway-black" ebony-toned woodgrain with tight, excellent joinery and slightly chamfered edges. The A-20s do not have grilles. However, when I think of the cigarette (and, er, other) burns, beer rings, and carved initials to which these speakers will

The three controls, all five-position rotary switches, are marked "Sensitivity," "Boundary," and "Position." The first has four gain settings, 7 dB apart (+11, +4, -3, and -10), plus muting ("M"); the discrete steps make level-set repeatability a literal snap. The "Boundary" knob manages output in the bottom octaves, compensating for the reinforcement of—you guessed it—boundary surfaces; its five settings range from "2" (suggested for quarter-space, in-corner locations) to "0" (for full-space, free-standing setups). It sounded to me like this knob was a low-frequency "tilt" control, hinged at about 400 Hz and with 1 or 2 dB per step; I suspect many users will simply set it to taste, matching their expectations (heavily influenced by earlier experiences with predecessor speakers), regardless of physical setup. "Position" does much the same thing, but over the top two octaves or

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Figure 1 shows the NHTPro A-20's on-axis frequency response with its amplifier's "Boundary" and "Position" controls at several different settings. Responses were taken with each switch at three of its five possible positions: full counterclockwise, midway, and full clockwise. These correspond to indications of "2," "1," and "0" for the "Boundary" control and "NF" (near field), "MF" (mid-field), and "FF" (far field) for the "Position" control. The curves combine ground-plane measurements in the bass range with measurements taken in a large anechoic chamber. The test microphone was located halfway between the woofer and tweeter.

The flattest frequency response (which is very flat indeed) resulted with the "Boundary" switch set to "0" and the "Position" switch set to "NF." This is as it

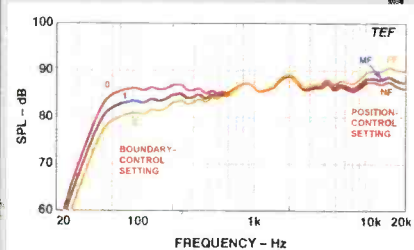


Fig. 1—One-meter, on-axis frequency response.

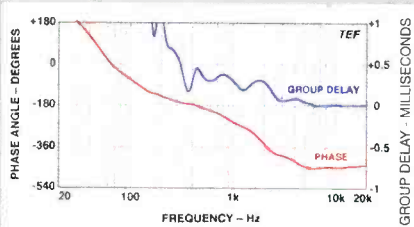


Fig. 2—On-axis phase response and group delay.

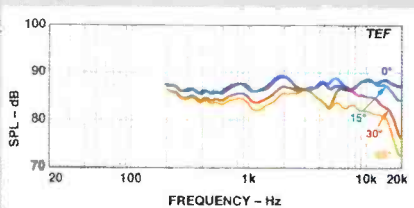


Fig. 3—Horizontal off-axis frequency responses.

should be, since these settings are the ones most appropriate for the test conditions. Higher "Boundary" control values yielded progressively greater rolloff below 600 Hz, to compensate for the acoustical low-frequency augmentation that will occur when the speaker is placed close to one or more room boundaries. With the control set to "2," the axial output was reduced by about 5 to 6 dB below 100 Hz. Each click of the "Boundary" control provided about 1.5 dB of bass adjustment at 50 Hz. The "Position" control provided gentle treble lift above about 3 kHz, with a maximum boost of about 2.5 dB at 10 kHz and 4 dB at 20 kHz. Each click of the "Position" control altered the output about 0.6 dB at 10 kHz and 1 dB at 20 kHz. With the controls set to give flattest response under the test conditions, a 2.83-volt output from the amplifier (equivalent to 1 watt into 8 ohms) generated an average sound pressure level of 86 dB from the speaker between 250 Hz and 4 kHz.

By driving the tweeter and woofer individually and then comparing their responses (not shown), I determined that the acoustic crossover frequency was 2.2 kHz. The outputs of both drivers were down 6 dB at that point, which indicates a good in-phase crossover design. Above this frequency, the woofer rolled off at 12 dB/octave; below it, the tweeter rolled off at a higher rate of 24 dB/octave. Between 100 Hz and 20 kHz, the outputs of the right and left speakers matched within a close ± 1 dB, with deviations spread equally over frequency.

Figure 2 shows the A-20's phase and group-delay characteristics referenced to the tweeter's arrival time. As with most other speakers I measure, the woofer acoustically lags the tweeter slightly. When averaged from 400 Hz to 2 kHz, the group delay indicates a difference of about 0.3 millisecond, due to both crossover and physical offset effects. The lag is reflected in the phase curve, which falls continually with frequency until about 6 kHz, where it levels out in the tweeter range. A separate

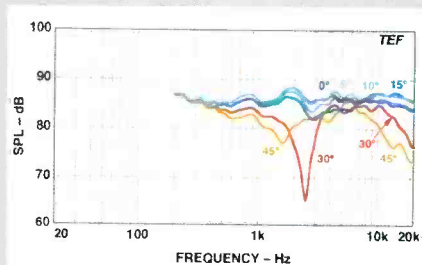
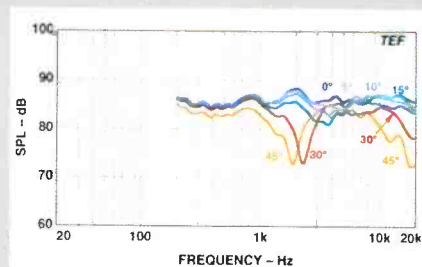


Fig. 4—Vertical off-axis frequency responses, upward (A) and downward (B).

plot of waveform phase (not shown) indicated that the A-20 will not preserve the waveshapes of signals it reproduces in any frequency range, which, again, is typical of conventionally designed speakers.

Figures 3 and 4 show the A-20's horizontal and vertical off-axis frequency responses, respectively. The horizontal responses, measured at angles of 0°, $\pm 15^\circ$, $\pm 30^\circ$, and $\pm 45^\circ$, are quite well behaved. Only slight rolloff above 14 kHz is evident at 15° off axis. At greater angles, the high-frequency response exhibits progressively more rolloff. In addition, some midrange and upper-midrange narrowing is evident, between 700 Hz and 2.5 kHz.

The upward and downward off-axis responses (Figs. 4A and 4B, respectively) are similar to the horizontal responses except for significant narrowing in the 2-kHz crossover region, evidenced by dips in the 30° and 45° plots. The up and down responses are fairly symmetrical, except for a deeper dip at 30° downward than upward. The symmetry is an indicator of good in-phase crossover behavior.

The A-20's 50-Hz second- through fifth-harmonic distortion (Fig. 5) is referenced to the point at which the system's amplifier

overloads (at or near its power rating of 250 watts), as indicated by the red front-panel clipping LED. The drive levels are given in dB below the clipping point. At power levels above -10 dB (roughly 25 watts), the third and fifth harmonics rise swiftly, reaching a very high 107% third and 28.8% fifth. Odd harmonics indicate symmetrical overload of a driver's suspension; it simply runs out of excursion capability. Although high, the A-20's distortion didn't sound as bad as the numbers might suggest, and the woofer suffered no permanent damage. These distortion values also indicate that NHTPro has chosen not to include any form of limiting in its power amplifier.

Fed high-level sine-wave sweeps, the speaker exhibited no significant cabinet-wall vibrations and was quite rigid. The woofer had a generous excursion capability of about 0.4 inch, peak to peak, and overloaded quite gracefully. No dynamic offset was apparent at any drive level or frequency.

The A-20's intermodulation distortion versus input level for equal-amplitude tones at 50 and 440 Hz (A_4) is shown in Fig. 6, up to the amplifier's clipping point. The amplifier controls were set to yield flattest response. The IM distortion rises smoothly up to the -10-dB point, then increases more rapidly at higher power levels, reaching 20% at full power. Setting the amplifier's "Boundary" switch to "2," which produces the least amount of bass, reduced the IM distortion at full power to less than 14.9% (not shown). Note that this setting of the "Boundary" switch effectively reduced the 50-Hz power applied to the woofer in relation to the 440-Hz power, because in this test I maintained equal levels at the input of the amplifier.

Figure 7 shows the A-20's maximum short-term peak output for a shaped tone-burst input signal. Three characteristics stand out: the curve's overall smoothness, the low output in the bass range below 80 Hz, and the relatively low maximum output above 400 Hz. Larger speakers are usually capable of significantly more deep-

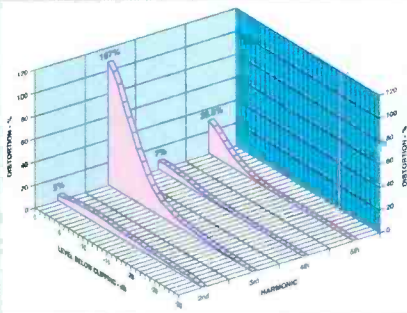


Fig. 5—Harmonic distortion for 50 Hz.

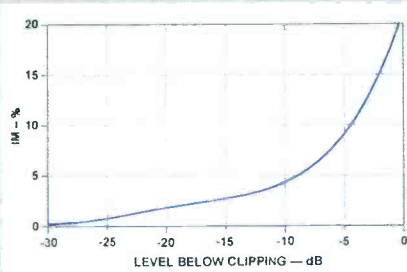


Fig. 6—IM distortion for A_4 (440 Hz) and 50 Hz.

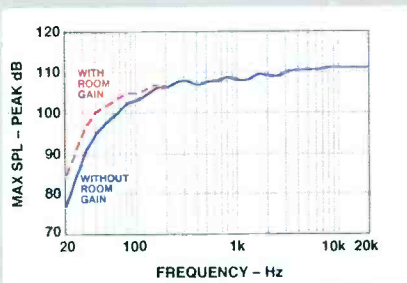


Fig. 7—Maximum peak sound output.

bass output. However, the A-20 competes very well in this respect with other systems of comparable size.

Subwoofer it ain't, but why doesn't the maximum level at high frequencies rise into the low to mid 120-dB range, as with most of the speakers I test, instead of topping out at about 110 dB above 3 kHz? Because I normally use an amplifier much more powerful than the 250-watt unit supplied with the A-20s. My amplifier is some 10 dB, or ten times, more potent. But in the A-20s' designed application, as near-field monitors, this is scarcely a concern. Placed within 3 to 5 feet of your listening position, they will play quite loud indeed.—D. B. Keele, Jr.

so; its marked settings are "NF," "MF," and "FF," for near field, mid-field, and far field, plus two unmarked intermediate positions. This control is said to compensate for power response changes due to room influences and air absorption. It, too, sounded like a simple tilt filter, this one hinging at maybe 4 kHz and with perhaps 1 dB per step.

My favorite front-panel feature, however, was the A-20 controller's three-digit display. Via an adjacent "Mode" key, this cycles between showing speaker output in dB SPL, line voltage (if this goes to 0, your power is out!), and heatsink temperature in Celsius (the amp shuts down at about 100°C). The dB SPL display will, I suspect, be welcomed in pro studios, as it furnishes a quick-and-easy reference for actual monitoring loudness. This promotes consistency from session to session and even across multiple projects, which can be important, since overall monitoring loudness profoundly influences mixing balance. (The display is, in fact, quite accurate, since the designer had foreknowledge of listening distance and speaker and power amp sensitivities, the key factors affecting output. My trusty Radio Shack sound level meter's readings matched the A-20 controller's setting within ± 0.75 dB SPL at the listening position.)

I set up the A-20 system on the workstation rack-desk that occupies one end of my 21 x 16-foot studio/listening room. The speakers sat about 40 inches apart and a like distance from my head. This positioning is more or less free-space: The room's front wall is 12 feet distant, and the nearest side wall is 4 feet to one side, slanting away at 45° to become the back wall about 9 feet behind me; the nearer portion of the angled wall is modestly treated to reduce focused reflections. I played DATs with my old (but hale and still really great-sounding) JVC deck routed via an Apt/Holman preamp to the A-20 controller's unbalanced inputs; hard-disk audio at a 48-kHz sampling rate arrived via a Korg 168rc (16-bit) digital mixer. I also auditioned many CDs via a direct-connected Sony ES player.

After so lengthy a preamble, I actually have embarrassingly little to say about the NHTPro A-20's sonics: They are so accurate that commentary seems almost superfluous. Tonal balance is flat, flat, flat; the A-20s

sounded as if they would prove to be the most accurate speakers, measured anechoically, I've ever had in-house. This makes them, of course, entirely ruthless. A rather nice two-piano concert (Brahms and Messiaen) I recorded with a simple spaced-omni setup years ago sounded great: airy and extremely detailed. I could hear—and vividly recall—all the flaws in each piano's setup, such as a mild "crink" in the mechanism of one's soft



pedal (which always gets a workout in Messiaen) and a subtle buzz from one A-flat of the other. I also got an excellent representation of individual piano tonalities, of hall sound and air, and of back-wall bounce. But, boy, was this recording noisy by modern standards. It was recorded live to 15-ips stereo on a half-track Revox A77, wonderfully quiet by the standards of the day, then later dubbed direct to DAT. But the virtually horizontal top octaves of the A-20s' response brutally showcased what we would today consider unacceptable noise.

The A-20 system's bass sounded unrestricted down to about 50 Hz. There was useful output to perhaps 40 Hz, and then it fell off pretty steeply below that point. So, for example, on Natalie Merchant's *Ophelia*, an excellent-sounding CD (Elektra 62196), the very loose and deep bass drum on "Thick As Thieves" sounded weighty and solid, with easily discerned bloom from the very soft beater, but it did not have nearly the bottom-octave weight and sternum-thumping impact as on my "big" system (Platinum Solos supported below 40 Hz by a B&W ASW 800 subwoofer) at the other end of the room. Overall, despite my more-or-less free-field setup, I had a clear preference for a "Boundary" setting of "0.5" or even "1," a click or two counterclockwise from the "0" position; these yielded a tighter, more transparent feel that I felt outweighed their mild sacrifice in low-frequency output. But even set at "0," the

NHTPro A-20s delivered what most hi-fi listeners would characterize as a somewhat lean bottom end, very easily listened through for low-midrange sounds, edits, flaws, hums, and the like.

Interestingly, vocal tones changed subtly over relatively small shifts in listening distance. Throughout the Merchant CD (and other vocal music), when I listened from close in, as I might while actually working the mixing board, I heard a hint of the slightly nasal, up-front tonality I associate with speakers whose response, measured anechoically, is ultra-flat. But rolling my chair back just 18 inches or so brought a subtle but audible change to a more traditionally "hi-fi" balance—a little less nasal, with a little more warmth and "hoo" to the lower-midrange region. I quickly began responding to this as a virtue rather than a flaw, because it let me change from microscopic, headphone-like monitoring to a more real-world/end-user overall-music effect, merely by leaning forward or back. (You will hear a similar shift when you move super-close to 'most any decent small two-way, but it's unusual for a speaker to sound this good both ways.)

The "Position" knob did not really affect this phenomenon at all. It seemed instead to affect still higher frequencies, giving me a gradual increase/decrease of "air" or "tizz," depending on how much of either was on the recording. I had a clear preference for the control's near-field, fully rolled-off,

setting. For instance, on acoustic-guitar recordings I'd made with a single large-diaphragm condenser, the more far-field settings emphasized the pick-attack "plink" more than I was accustomed to or desired.

A country-western-style tune I have on hard disk in multitrack form, not yet mixed, referenced very closely to my usual monitors (no great surprise; quite by coincidence, they're NHT Super-Ones). The tune's dominant instrument is a Telecaster guitar played through a Fender Deluxe reverb, recorded via a

single, off-axis large-diaphragm condenser mike mixed with a phase-inverted Shure SM-57 dynamic mike hung behind the guitar amp's speaker (via the pro-sanctioned method of wrapping the mike cable around the amp handle). This setup makes for a pretty dangd spanky guitar sound: The A-20 system delivered it with full, honking twang and lots of pick-attack click'n'scrape, with each individual slap-boing of the amp's reverb springs clearly audible. My ear could easily pick out each mike's contributions (even though that shouldn't theoretically be possible unless I had the chance to fade from one to the other). The NHTPros' even, extended treble also made the guitar amp's inherent noise a bit more obvious than my usual setup. (You're probably asking yourself why rock recordists spend thousands on high-end mikes and 100-dB recording systems when the 30-year-old guitar amps that anchor most sessions offer dynamic range of maybe 60 dB on a really good day. That's an excellent question; can I get back to you on it? I gotta run out and spend \$975 on a '58 Champ with a hum problem....)

The A-20s will not deliver the 120-dB SPL average levels old-school rock gods are thought of as desiring, but almost nobody monitors that way anymore. (What's that? Speak up, sonny!) They did sound just great up to about 106 dB SPL (at 1 meter), retaining full definition and unchanged tonal balance; much beyond that point they began

sounding a little forced to my ears. Then again, this might've just been my ears.

I found the A-20 system's imaging, at least in terms of soundstage, to be unusually stable as I moved forward or back about a foot in each direction. This is highly desirable, since you can never really hold a single position as you work at mixing. I've always found near-field spatial sound a bit paradoxical, especially from good recordings. For instance, on Arvo Pärt's *Fratres* for string orchestra, an excellent EMI CD (7243 5 55619 2), the NHTs spread out a lovely lateral soundstage, very cohesive and stable from the first desk of fiddles to the farthest-right bass; they also yielded an excellent illusion of depth, placing the percussion ensemble on an almost palpably inset back tier. But—and I've noticed this from all near-field monitors—the depth dimension seemed a bit cone-shaped, sounding decidedly less pronounced toward the outer edges of the sound field.

I'm not sure the NHTPro A-20 is a system on which I'd want to drop \$2,000 for recreational listening; it's too devoid of the euphonic colorations and sonic melanging that we routinely tolerate—or encourage—even from high-end loudspeakers. On the other hand, two large is downright cheap for the kind of precise, ultra-close vantage on incoming audio that the A-20 system provides. The result isn't always pretty, at least at my place, as my productions are too often flawed, sonically and musically, for me to be entirely thrilled by hearing them quite so well. But if you're serious about music production—as distinct from music reproduction—that queasy feeling on playback is something you must learn to live with, since perfection is but a theoretical state.

In short, NHTPro's A-20 combo produces just the sort of reproduction you need for serious recording. A bit ironically, given near-field monitoring's hi-fi origins, similar monitors are now appearing for similar money (or more—in some cases much more) from the major pro audio brands, names largely unknown in the hi-fi world. But several of these clearly don't match the A-20 system's resolution, and I've yet to hear one that seemed to deliver greater resolution in any meaningful way. **A**

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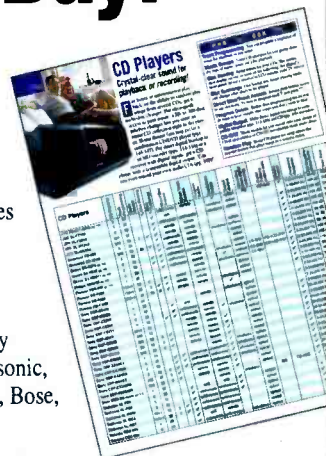
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Theta Digital DaViD

DVD Transport & Voyager DVD/Laserdisc Transport



The Theta Digital DaViD and Voyager don't solve my discontent with video's mediocre image quality. (Even HDTV, in my experience, does not quite measure up to film, and NTSC TV lags far behind it.) But they do provide the best video images I've seen yet from DVD and laserdisc. So, although they are state-of-the-art components and are priced accordingly (about five times as much as some good players that I have previously used), they are worth it. What's more, they offer some assurance that buyers

won't be left high and dry by the tide of technology.

A small part of that assurance stems from the fact that these are transports (at least from the audio standpoint), enabling you to hear their output from whatever D/A converter you use for your other digital sources now and to upgrade as technology demands or your budget allows. Both models' digital outputs can deliver PCM, Dolby Digital, and DTS signals via coaxial RCA or BNC jacks or AES/EBU balanced connectors, with AT&T (ST) or proprietary single-

mode optical outputs available as an option. In addition, the Voyager has stereo analog outputs for laserdisc analog tracks and an AC-3 RF output for Dolby Digital laserdiscs. (On the video side, both models have the outputs you'd expect from a premium player: two S-video jacks, composite video via RCA and BNC jacks, and more BNC jacks for component video.)

It may seem odd to talk of the technological future and laserdisc in the same breath. That format is dying rapidly, and it will go out unmourned by me. I have had far too many laserdiscs that suffered from poor video and audio mastering, have lived with laserdiscs that showed obvious deterioration, and am far from convinced that others haven't lost a bit of visual quality over time. In short, I'd have no reason to bother with a laserdisc player if I did not already have a large collection of discs.

DVD's overall visual quality is equal to or better than that of laserdisc; the newer format's detail and contrast are competitive with the older one's, and its color is usually significantly better. Relative sound quality is more uncertain, although Dolby Digital sound quality seems to be almost purely a matter of each individual disc's production values.

Even DVD, however, has an indefinite future—as does CD. We may have HDTV DVDs to come, and both the DVD-Audio and Sony/Philips Super Audio formats should reach the stores soon. The foreseeable changes and format wars make buying

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DaViD

Dimensions: 19 in. W x 3½ in. H x 16½ in. D (48.3 cm x 8.9 cm x 41.9 cm).

Weight: 25 lbs. (11.4 kg).

Price: \$4,500.

VOYAGER

Dimensions: 19 in. W x 7¼ in. H x 20 in. D (48.3 cm x 19.7 cm x 50.8 cm).

Weight: 52 lbs. (23.6 kg).

Price: \$6,500.

Company Address: 5330 Derry Ave., Suite R, Agoura Hills, Cal. 91301; 818/597-9195; www.thetadigital.com.

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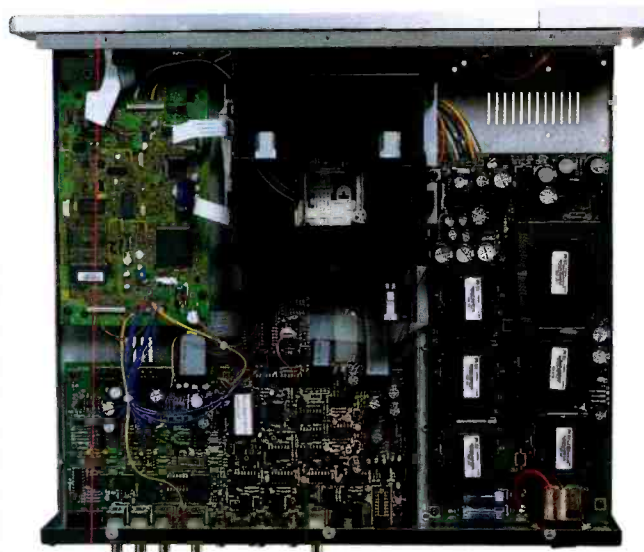
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a top-quality digital front end a crapshoot. Fortunately, the DaViD and Voyager come with a technology guarantee to deal with these uncertainties—something I've never seen before but that may become vital in selling high-end A/V equipment in the future. Theta Digital guarantees to update these players, at cost, to incorporate any new DVD formats that become available within three years of each model's introduction. This guarantee is hardly ideal, and the upgrades aren't free, but it gets you today's technology without forcing you to forgo tomorrow's.

The video technology in the DaViD and Voyager is outstandingly executed. While there are no radical technical features in the circuitry of either machine (both are 10-bit video systems using Pioneer mechanisms), there is tremendous attention to detail. There is a lot more to these machines than simply slapping a Theta Digital nameplate on someone else's product. For example, both players use multiple transformers and highly regulated power supplies for each

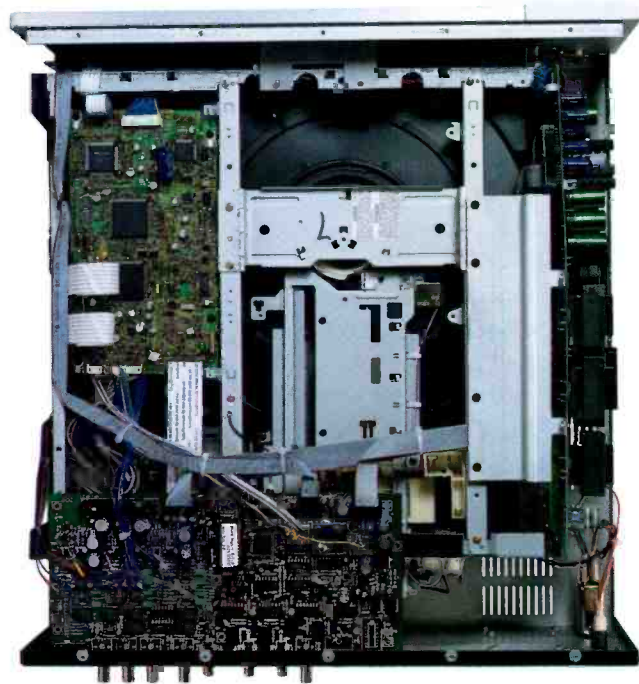
critical section (audio, video, and even motor control and display) to isolate these sections from each other and minimize noise; the Voyager (which must also maintain isolation between its DVD and laserdisc sections) has seven different transformers and 21 supplies. And once the digital video signals from DVD are converted into analog signals, they are sent to individual, Theta-designed video filters and very-high-speed output buffers.

The Voyager employs two separate laser pickups—a DVD pickup with a 650-nanometer wavelength and a 780-nanometer laser for CDs and laserdiscs. It also has a high-speed mechanism to switch to the second side of a laserdisc. All options, settings, and functions can be read from the on-screen display and set with the remote control. But most important of all, with good

ture that I've often seen do more harm than good.

With DVD, the Voyager and DaViD yield outstanding picture quality. Compared to really good DVD players like the Sony 7000 series and Faroudja VD1000, the Voyager and DaViD provide a smoother and more accurate image, though the differences are relatively small. These differences become more apparent as you increase picture size, despite the limitations of projectors.

The audio sections of the DaViD and Voyager build on the technology that Theta Digital developed for its Jade CD transport. They use a custom-manufactured, low-jit-



laserdiscs the Voyager delivers the cleanest, smoothest, most noise-free picture I have seen and seems more tolerant of lesser discs' imperfections. Further, it gives its best performance without a noise-reduction circuit, a fea-

ter crystal oscillator and a Motorola DSP-56004 chip running proprietary algorithms to isolate and buffer the digital data. High-speed C-MOS logic gates are found in the reclocking section, and extensive use of ground planes prevents digital noise and hash from corrupting the clock signal. Like the video sections, the audio areas are isolated by separate transformers and power supplies. Finally, the digital audio signals are passed through extremely high-frequency pulse transformers.

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REVIEWS

No matter what external D/A converter I used, the Voyager and DaViD gave me the best audio I have heard to date from laserdiscs and DVDs. The limiting factor in sound quality is usually the soundtrack of the disc you're playing, not the transport. But with really good recordings and a high-resolution system, the Theta transports delivered more clarity, detail, and ambience—and sometimes deeper and better-defined bass. The differences were rarely apparent in the more spectacular aspects of soundtracks but were noticeable in those places where the sound engineer actually worked to create a sound field with a lot of low-level detail and a natural sense of space. The improvements also came through in those passages where there were a lot of musical details or sudden low-level transients. If you're heavily into car crashes and cannon fire, you probably don't need transports this good.

As to music, a good transport helps, but don't expect CD sound quality from Dolby Digital. Music on Dolby Digital recordings is getting better but simply doesn't have the upper-octave life and detail of CDs, DTS CDs, and DTS laserdiscs and does not approach the sound quality of recent 24-bit/96-kHz recordings.

To my surprise, the Voyager and DaViD equaled or outperformed a really good dedicated CD transport, the Theta Digital Jade. The Jade has the Pioneer Stable Platter mechanism, widely recognized as one of the best in the industry. I had assumed that the DVD/CD mechanisms in the Voyager and DaViD would be audibly inferior, but they turned out to have the same broad sound character as the Jade and the same ability to elicit a bit more harmonic detail, slightly reduce upper-midrange glare, and yield a little more bass detail and speed. In some cases, they even seemed to provide slightly more natural harmonic information, depth, or low-level ambience; this was particularly true with close-miked soprano voices, massed strings, upper woodwinds, cymbals, solo piano, and harpsichord.

I also really enjoyed using the Voyager and the DaViD to play Chesky and Classic Records 24-bit/96-kHz recordings. I have had my Theta Digital DS Pro Generation V D/A converter updated to play these discs.

Although the Generation V does not provide true 24-bit performance, it does provide true 20-bit performance. But then, you can see from their specs that many D/A converters and DVD players claiming 24/96 performance do no better than my updated Gen V, despite their use of 24-bit chips; most claim 100 to 110-dB S/N, while a true 24-bit D/A (if one were possible) would have an S/N rating of 144 dB and a true 20-bit processor would measure 120 dB. Nonetheless, superior 24-bit processing and calculations in the DACs may produce real sonic benefits. With my updated Gen V, the superiority of 24/96 recordings over CD is

**To my surprise,
the Voyager and
DaViD equaled or
outperformed a really
good CD transport.**

clearly audible in virtually every aspect of sound quality.

Another downside of DVD players claiming 24-bit/96-kHz performance is that most are limited to 48-kHz output if they are used as transports, and many seem to have really mediocre audio circuits that sound bad even with CD. You can get a level of sound quality with units like the Theta transports and Generation V D/A that you cannot hope to get with machines whose only merit is a 24-bit/96-kHz DAC.

Is the Voyager or DaViD for you? If you have one system for stereo music and home theater, either may well be the way to go. Certainly the Voyager is far more convenient than having separate transports for laserdisc, DVD, and CD. Of course, a lot depends on how much of a perfectionist you are. Both transports offer reference-quality performance and a unique technology guarantee. Both allow you to explore the best in home theater and digital stereo. But if your budget demands some trade-offs, you'll gain more from investing in a truly high-quality A/V preamp like Theta's Casablanca or a D/A converter like its Generation V than in a high-quality transport like the Voyager or DaViD. **A**

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KEF RDM one SPEAKER

As reviewed in

AUDIO

September 1997

Some notable quotes from Edward M. Long in *Audio's* September issue:

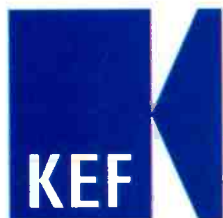
"...KEF has gained an enviable reputation for producing excellent loudspeakers."

"...clear, precise imaging."

"The RDM one reminds me of the classic BBC LS3/5a, but with deeper bass and higher output."

"...the KEF RDM ones are an excellent value—and very good looking, too."

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It is no wonder that Home Theater magazine concluded: "If you're in the market for a full-featured controller for your system, look no further than the amazing value you get with the Theater Grand." — Jeff Cherun, Home Theater, February, 1999

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PAUL TATARA

Mirage MRM-1 Speaker



Photos: Michael Groen

It's a little spooky to see the things that surrounded you when you were a kid changing as you get older. A few years go by, and all of a sudden the memories of the house that you grew up in become fodder for a supposedly "improved" world that has little, if anything, to do with the all-important You. When I pry myself away from Manhattan and head back to Alabama to visit the family, I feel like I've en-

tered some vague reference to my own life. It can get pretty disorienting if I'm not prepared for it.

Parking my butt in Dad's old car sets me straight every time, though. All I have to do is flick on the tape machine, and the muffled morass of notes that comes pouring out of the speakers fully establishes that I'm in the right place. My mom, you see, likes far too much bass in her music, and that's

not about to change. I mean, she pushes the treble control down to the floorboard, opting to listen to melodies that sound like they're being blasted through several family-size loaves of Sunbeam bread.

It's nice when you can extract usable information from a bad experience, so this is what I've theorized regarding Mom's bass obsession: Our listening preferences are fully resistant to the strains of time. Or, as

The Mirages manage the bass wonderfully on Sinead O'Connor's "Fire on Babylon."

Plato once posited, "I yam what I yam, and that's all what I yam."

I've been listening to a set of Mirage MRM-1 loudspeakers for the past several weeks, and all I can say is: I wish I had more appreciation for an especially bright high end. But I don't, and I never will. I prefer a delicate mating of bass and treble, something that hands me a level musical playing field whenever it can. Sonic mellifluousness

MIRAGE

Rated Frequency Response: 40 Hz to 22 kHz, ± 3 dB.

Rated Sensitivity: 85 dB SPL/1 watt/1 meter.

Rated Impedance: Nominal, 8 ohms; minimum, 4 ohms.

Recommended Amplifier Power: 50 to 150 watts.

Dimensions: 13 in. H x 7½ in. W x 12½ in. D (33 cm x 19.1 cm x 31.7 cm).

Weight: 35 lbs. (15.9 kg) each.

Price: \$2,200 per pair in black ash, \$2,300 in cherry, or \$2,500 in tigerwood; stands, \$500 per pair in black ash or cherry, \$600 in tigerwood.

Company Address: Audio Products International, 3641 McNicoll Ave., Scarborough, Ontario M1X 1G5, Canada; 416/321-1800; www.miragespeakers.com.

soothes my savage breast; the music itself can run the gamut from Gerry Mulligan to The Sex Pistols.

That kind of honeyed texture is what I usually get out of my regular NHT Super-Two floor-standing speakers, which run about 800 bucks per pair. I'll admit, they're not as much fun as the \$2,500 Mirages if you're planning to blurt out the price in front of company on a regular basis, but sound is what this is supposed to be about. I'm sure the design team at Mirage enjoys what it hears coming from its own speakers. They're no fools, and a lot of research goes into producing these things. The consumer, however, should understand that the "winning" speaker in any comparison lies firmly within the ears of the beholder. And certain speakers are often heard to best advantage when blasting certain types of music.

My altogether groovy setup consists of an Acurus DIA-150 amp, an NAD 522 20-bit CD player, and Kimber Kable 4TC cables. From a purely aesthetic standpoint, the Mirages fit right in with my other components—they're attractive in an uncomplicated sort of way. They're average-sized for shelf speakers, and the pair I've been listening to features a beautiful tigerwood veneer.

On Springsteen's "Brilliant Disguise," the layers of sound are more apparent through the MRM-1s.

(Insert golf joke here.) Thick, black pieces of Corian—a heavy, manmade, nonresonant, marble-like material—cover the front baffles, and they, in turn, are almost completely obscured by black grille cloths. The back of each speaker has two pairs of top-quality Cardas binding posts. (But you can use one set of cables if you prefer a conventional connection.)

In recent years, Mirage has focused mainly on bipolar speakers, which have a second set of drivers on the rear baffle that bounces music off the wall to create a more ambient sound field. The MRM-1s, however, are forward-firing speakers; they fill the

room with no extra help from the rear. This is accomplished with a 1-inch Pure Titanium Hybrid (PTH) dome tweeter and a 5½-inch woofer that uses a cone made of carbon, graphite, and mica-injected polypropylene, with a butyl rubber surround and an injection-molded copolymer basket. Try saying *that* three times fast.

Shelf speakers (it should be pointed out in case you're not very sharp) can be placed on shelves or in cabinets. But I'm using Mirage's separately sold speaker stands (\$600 per pair in tigerwood), which are 27½ inches tall. Like many high-end stands, they can be filled with sand or buckshot for more stability, though they're quite solid without it. They look good, too, with matching veneer trim and sturdy black Corian bases.

That's all great, but without illegal pharmaceuticals, it's virtually impossible to dance to how speakers look. So let's slap on some CDs and see what we get.

Sonny Rollins, *Sonny Rollins: Volume Two*. Talent-wise, this session is arguably the most formidable of the new series of Blue Note 24-bit remasters. Get a load of this band: Rollins, J. J. Johnson, Paul Chambers, Art Blakey, Horace Silver, and (sometimes) Thelonious Monk! When these guys start trading licks, it's like a Wimbledon doubles match between Einstein, Freud, Picasso, and Oppenheimer—with Blakey supplying drum rolls between serves.

The master tapes are from 1957, so there's bound to be some hiss and possibly a bit of tinniness in the overall sound. But on "Why Don't I," the album's first track, the Mirages pronounce the cymbals to the point of sustained clatter. The brush strokes don't support the soloing as sweetly as they do on the NHTs. Instead, there's a steady, too-overt "sssssssss" *in front* of the music. It sounds like a short-order cook frying up breakfast next to the microphone. At lower volumes it becomes far less obtrusive, but crank these babies up and it's "How do you like your eggs?"

The bass is another matter. You get a full sound that doesn't thump you on the side of the head the way lesser speakers do. Rollins' tendency to let out a jolly "honk" in the middle of a passage is also highlighted to the music's advantage. Even as he's attacking the chords, there's a warm texture

BACK TO FRONT



The MRM-1's veneered back panel contains the woofer port and bi-wirable pairs of binding posts.



On the black Corian front baffle are a 1-inch titanium-dome tweeter and a 5½-inch woofer.



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to what he's doing. That said, if you dig bebop (with all the cymbal-riding that you can get from bop drummers), you should give the MRM-1s a close listen before you fork over any dough.

Bruce Springsteen, *Tunnel of Love*. From the undeniably brilliant Phil Spector homage of *Born To Run* to the sparkling arena rock of *Born in the U.S.A.*, Bruce Springsteen has always pushed himself to

make singular-sounding records. Over the years, however, the romanticized guitar-and-glockenspielia has given way to a more stripped-down approach. In my book, 1987's *Tunnel of Love* stands out as the strongest of his post-superstardom albums.

"Brilliant Disguise," even with its marital heebie-jeebies lyric, is one of Springsteen's most radio-friendly singles. You get a drum machine (which seemed like heresy at

the time), ringing keyboards, strumming acoustic guitars, and what sounds like a synthesized electric guitar, all slowly building on each other until the song fades out to a forbidding timpani rumble.

The MRM-1s lend the piece a much darker tinge than the NHT SuperTwos, with the bass line more focused and the timpani more resounding. There's lots going on in "Brilliant Disguise," but, happily,

TEST RESULTS

Lots to talk about here. True Technologies' measurements of the Mirage MRM-1's on-axis frequency response (Fig. 1) reveal a pronounced mid-bass hump, elevated by 5 dB at 150 Hz, followed by a deep midrange trough that begins at 1.8 kHz and bottoms out at 3.8 kHz, with levels 5 dB less than the speaker's 1-kHz output. From there, treble response rises in somewhat irregular fashion to a 12-kHz peak that is 5 dB greater than average output between 2 and 4 kHz. At 15 kHz, upper-octave response dips briefly, then climbs rapidly to a 5-dB peak at 19 kHz.

In the bass region (apart from the hump at 150 Hz), the MRM-1's output is well maintained to 40 Hz—solid performance from a modest-sized driver.

A waterfall plot of the Mirage's horizontal off-axis frequency responses (not shown) was very consistent in overall contour and variation with the MRM-1's on-axis response, with quite excellent high-frequency dispersion at fairly extreme angles away from the speaker's center. However, the peaks (resonances) evident on axis at 150 and 800 Hz and at 1.5, 12, and 19 kHz also persisted off axis, suggesting they will color the Mirage's timbral character. Those same peaks maintained a similar presence in a waterfall plot of the Mirage's vertical off-axis frequency responses (not shown).

The Mirage's sensitivity proved to be on the low side of the ledger: Measured at a distance of 1 meter with an input of 2.83 volts (equivalent to 1 watt into 8 ohms), the MRM-1 produced about 82 dB sound-pressure level throughout much of the

upper bass and midrange portion of the spectrum.

The curve of the Mirage's impedance magnitude (Fig. 2) reveals some fairly dramatic fluctuations caused by the tuning of the ported enclosure. And except for a brief and inconsequential dip to 5 ohms at 150 Hz, the MRM-1's impedance remains above 6 ohms across the audible spectrum. The impedance phase (Fig. 3) is acceptable as well.

Distortion of the second through fifth harmonics (Fig. 5), measured at an input level needed to produce 100-dB SPL output through the mid-band, clearly reveals a small woofer pushed beyond its capabilities. Even at 1 kHz, second and third harmonic distortion is almost 10%, and below 800 Hz, distortion climbs rapidly to

levels approaching 80% for the second harmonic and 50% for the third. Fourth and fifth harmonic distortion is somewhat better controlled, but obviously the MRM-1 would be much more comfortable at SPLs of 95 dB (or mated to a subwoofer) and should not be expected to produce concert-hall volume.—Alan Lofft

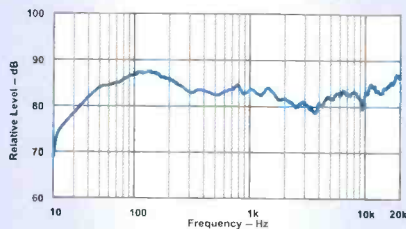


Fig. 1—On-axis frequency response.

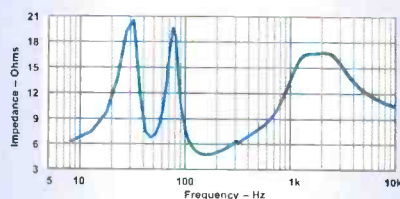


Fig. 2—Impedance magnitude.

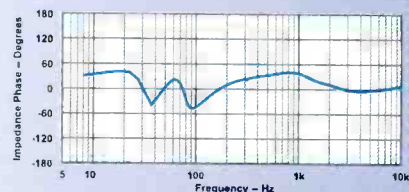


Fig. 3—Impedance phase.

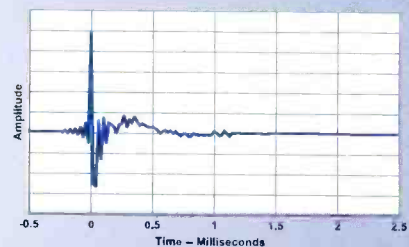


Fig. 4—On-axis impulse response.

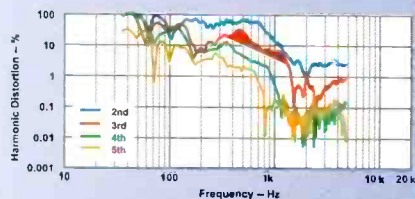


Fig. 5—Harmonic distortion vs. frequency.

the treble doesn't overwhelm the mix as much as it does on the Sonny Rollins disc. ("Brilliant Disguise" is a superb digital recording, which doesn't hurt matters.) The NHTs, on the other hand, soften pretty much everything to some degree. The bass is more diffuse, wafting behind the other instruments rather than pushing the song forward. And the mix gets a little crowded near the end, with the layers of sound (which are more apparent as distinct entities through the MRM-1s) piling on top of each other to less than inspiring effect.

All in all, I'd have to say that Mirage gets the edge in this round. Even Springsteen's vocal sounds a bit earthier than it does on the NHTs. The whole thing is more suitably intense on the Mirages. Surely the Boss would approve.

Sinead O'Connor, *Universal Mother*. Sinead is a strange case, no doubt about it. Though she's a first-rate silly-ass when she opens her mouth for nonmusical purposes—I was there when she had her on-stage meltdown at that Dylan tribute several years ago, and it's not like you couldn't see it coming—she's a powerful vocalist and a very tender lyricist. She obviously means every harrowing word of what she's singing, and she's not about to jiggle and coo for our approval. So she's been virtually ignored by the music-buying public since her fluke success nine years ago. I'd be pissed off, too.

One of *Universal Mother's* best tracks is "Fire on Babylon," a little ditty in which Sinead's dead mom takes a few knocks for the willful psychological torture of her daughter. (People don't usually play this at the beach.) There's an imposing bass line crawling along behind the vocal, which runs the gamut from pitch-perfect falsetto to Celtic-flavored caterwauling. Both the Mirages and the NHTs handle the song without any overwhelming problems. The one that handles it "better" depends on what you're looking for.

The Mirages manage the bass wonderfully on this type of song, which, for all its anguish, is still dance-oriented. It sounds better when it's really booming. Sinead's range as a vocalist, however, always seems to wreak havoc on her engineers; once she gets going she has a tendency to push the needle into the red. That brings on some rasp,

something that you can really hear the MRM-1s wrestling with. I keep finding myself being drawn to the trebly roar of her high notes, which dulls the emotional impact of the song. And Sinead isn't Sinead without the emotional impact. The NHTs accommodate the high treble much better, though their softer bass response weakens the song's groove. They turn the experience into something that can be more properly enjoyed in a living room rather than creating the sort of downtown disco feel that you get out of the MRM-1s. I know a lot of people would enjoy a 24-hour downtown disco existence, so I'm not saying that Mi-

On "Silly Love Songs," the Mirages' bottom end is impressive—that is, until the horn section kicks in.

rage doesn't cut the mustard. It just seems to me that you can get too much of a good thing, especially if you dwell in an apartment building. If your neighbors are farther away than the nearest wall, well, then, let it fly.

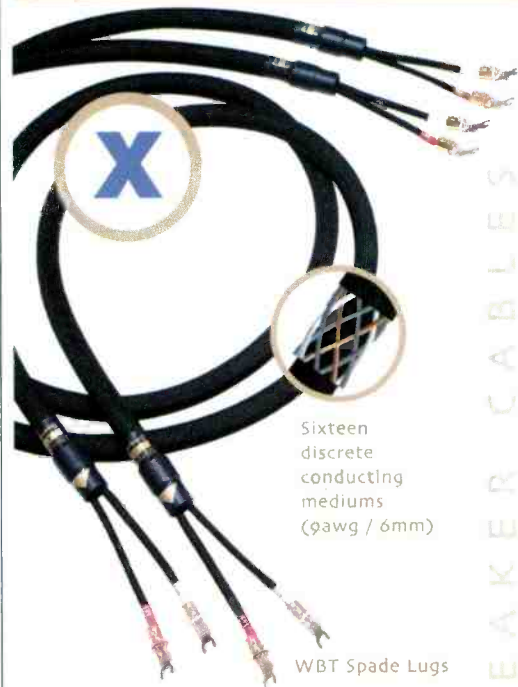
If you prefer a somewhat metallic backdrop to your music, with trumpets and such vying for superior position in the instrumental mix, the Mirage MRM-1s are definitely for you. I want to stress again that the bottom end is quite impressive (Paul McCartney's "Silly Love Songs," with its catchy lead bass line, is marvelous—that is, until the horn section kicks in), and I'm sure the overall sound would benefit from a larger room than the one where I have my stereo.

Mirage suggests splitting the listening area into thirds; ideally, the speakers should be placed a third of the way into the room, the listener should sit in the second third, and the last third should be the open area behind the listener. If you can manage that, you might be happy with the MRM-1s. Just hope that nobody on the recording decides to give a cymbal a hearty whack. It's liable to announce itself louder (and hang around longer) than a drunken frat brother. **A**

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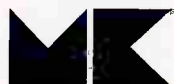
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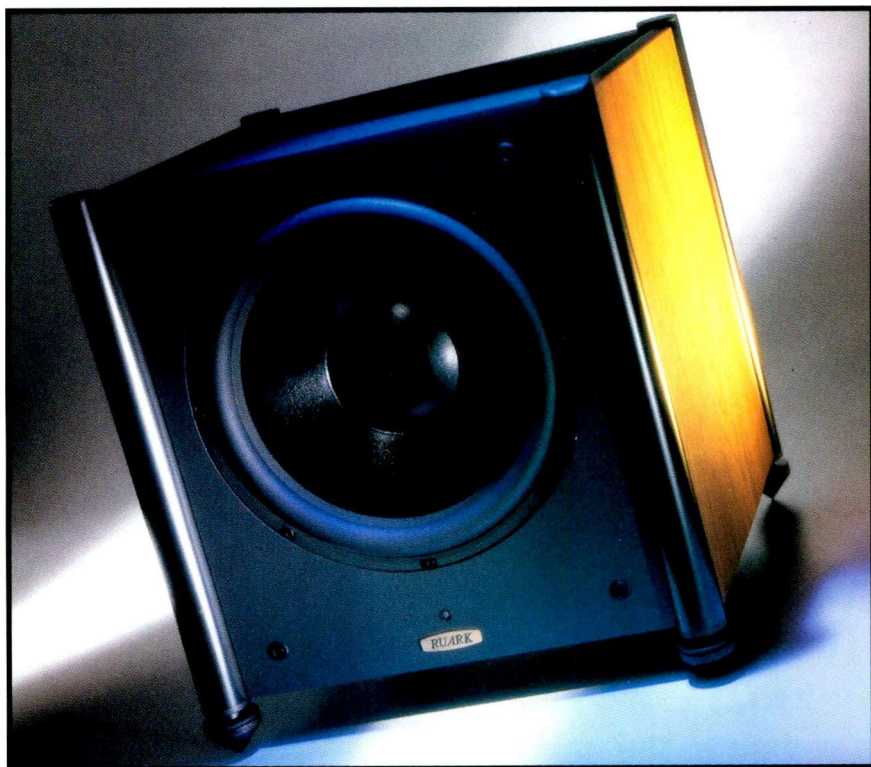


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Photos: Michael Groen

KEN KESSLER

Ruark Log-Rhythm Powered Subwoofer

Ruark Acoustics may not strike many as a likely candidate for subwoofer manufacture. For one thing, the company is British, and some audiophiles feel the British know squat about bass. For another, Ruark's line would not seem to require a subwoofer, because its full-range speakers have never been accused of weak lower octaves—not even its small two-way systems.

To those with a bias against British bass, I simply point out that REL exports loads of subwoofers from the United Kingdom to America. Although I'm not suggesting for an instant that the United States is about to be flooded with British boom boxes, the cube in front of me indicates that REL is not alone. And what (partially) inspired Ruark to invade REL's turf is the same thing that has inspired other ultra-conservative,

two-channel-über-alles speaker makers to introduce center-channel and surround models: home theater.

As has been stated time and again, if you already own massive speakers, you don't really need subwoofers. I know of a host of models from Avalon, Wilson, Thiel, B&W, and others whose bass output and extension are more than sufficient to convincingly reproduce whatever explosions film-makers put on their soundtracks. Yet subs proliferate, even in inherently well-endowed systems. The "point-one" element of 5.1 surround has been hammered into us so much that some listeners feel the absence of a subwoofer as strongly as they'd notice the absence of a jigsaw puzzle's final piece. Some listeners now consider a subwoofer the mark of a man; I find that thinking of ten to be more a mark of the same immatu-

rity that fills our ears with moronic thumping from car stereos that emanate 130 dB of thud, even with the car's windows closed.

Be that as it may, Ruark has produced a sub to increase its appeal in the A/V market (a center-channel speaker is on its way) and—more appropriately for *Audio* readers—to accompany its new Solus, a very classy, compact two-way system that completes the company's flagship Sterling Reference line. (Even without a subwoofer, the Solus should satisfy the bass requirements of all but the most Butt-headed of listeners in rooms no larger than, say, 15 x 20 feet. Smooth and refined, yet robust, it's a modern spin on classic British speaker philosophy. To a two-channel purist, then, the addition of a subwoofer to the Solus is like adding lake pipes to an MGA roadster. But not all of us are purists.)

Some semi-articulate, marketing-ignorant imbecile saddled the Ruark subwoofer with the embarrassing name of Log-Rhythm, as awkward and forced a pun as I've ever heard foisted on audiophiles. I mean, your buddies pop over for an evening to hear your latest toy, and then one of them asks you what it's called. Ugh. But I suppose it's no dumber than someone calling a product or a company Gloway or Anodyne or T&A.

The Ruark sub's nearly cubical cabinet is a sealed enclosure made from inch-thick MDF; this is one seriously solid, stout, and

RUARK

Rated Frequency Range: 20 to 240 Hz.

Rated Amplifier Power: 100 watts, continuous.

Driver: 12-inch cone.

Crossover: Variable, 50 to 120 Hz.

Dimensions: 17 in. W x 16½ in. H x 17 in. D (43 cm x 42 cm x 43 cm).

Weight: 55 lbs. (25 kg).

Price: \$1,750 in black; optional wood side panels, \$145 per pair in cherry, yew, black oak, natural oak, walnut, beech, or rosewood.

Company Address: c/o The Sound Organisation, 903 North Bowser, Suite 162, Richardson, Tex. 75081; 972/234-0182; www.soundorg.com.

beautifully crafted box. While most subs are merely gloomy black lumps, the Log-Rhythm is rather handsome. Optional snap-on side panels transform it from neatly utilitarian-looking to almost gorgeous. The side panels are available in seven wood veneers, the same finishes as on Ruark's other speakers but clearly useful for matching other makers' systems. Tedium is further dispelled by protective corner poles. Two types of supplied feet can be attached to these poles. It's advisable to use the flat, rubbery isolation feet or the hard-pointed cones to raise the cabinet slightly off the floor; the result will be cleaner, more coherent reproduction of the deepest signals.

Inside the box are a 12-inch, long-throw, composite-paper cone woofer on a steel chassis, with a double magnet for shielding, and a DC-coupled bipolar amp rated at 100 watts, continuous (280 watts, peak to peak).

The Ruark's connections and controls are pretty much the norm these days. There are high- and low-level stereo inputs and a pair of RCA low-level output jacks for daisy-chaining to other components. Adjustable parameters include crossover frequency, gain, and polarity. So straightforward is the setup process and so comprehensive the owner's manual that even a nonbeliever such as I had this sub running satisfactorily in 20 minutes, with only tiny adjustments made over the following weeks.

The internal amplifier was up to the task, and at no point did it ever approach clipping in my 14 x 22-foot room. The Log-Rhythm can be left switched on at all times, as its amp goes into standby mode (indicated by a red LED) after approximately 2 minutes with no input signal and resumes full operation (the LED changing to green) the instant a signal is received. Also featured is thermal protection circuitry; the Ruark was designed under the cloud of paranoid CE regulations.

If your system lacks preamp outputs or a dedicated subwoofer output, you can connect your amp to the Log-Rhythm's high-level input—an unbalanced, 100-kilohm, dual-channel input accessed through a Neutrik Speakon connector. For signals from dedicated subwoofer outputs, 5.1-compatible surround processors, and stereo

preamps, you'd use the 10-kilohm low-level inputs, accessed through gold-plated phono sockets. Both high- and low-level inputs can be used simultaneously, and each has its own gain control. The manual points out that if you feed the high-level jacks from your music system and the low-level jacks from a surround processor, the sub will be able to reproduce "the deepest bass not revealed by the main front speakers (or others if wired correctly)" as well as the low frequencies from your processor's dedicated subwoofer output. Also fitted is a 10-kilohm low-level stereo output to feed the original input signal to a second subwoofer or a power amplifier.

With all my speakers, the Log-Rhythm lent heft, weight, and power to the sound.

A rotary control adjusts the subwoofer's output level; a similar control and a pushbutton switch adjust the low-pass filter's rolloff point. With the pushbutton in its "Hi-Fi" position (the mode that Ruark says yields "ultimate extension and performance"), you can set the low-pass filter's cutoff point between 50 and 120 Hz. The button's "Theatre" position doubles the crossover's adjustment range so that its maximum upper cutoff becomes 240 Hz instead of 120 Hz. Another two-position pushbutton switch inverts polarity, when necessary to achieve best blend with the output of your main speakers.

I assessed the Log-Rhythm in purist hi-fi mode as well as in my A/V system. The former setup consisted of

a Krell KAV-300cd CD player, GRAAF 13.5B and Musical Fidelity Nu-Vista preamps, and Musical Fidelity's Nu-Vista 300 power amp driving a pair of Ruark Solus speakers and the Log-Rhythm. I also used the subwoofer with both vintage and recent Quad full-range electrostatics and a pair of Rogers LS3/5As, teeny mini-monitors that beg some form of bass augmentation. For A/V use, the Ruark sub was fed the subwoofer signal from a Lexicon DC-1 processor in a system containing three Apogee LCRs and two Apogee Ribbon monitors for the primary five channels, driven by Acurus amplification; sources included Pioneer DV-414 DVD and DVL-919 DVD/laserdisc players and digital satellite broadcasts. Integration of all the speakers was simply a matter of using the Lexicon's test signals along with a trusty Radio Shack SPL meter and a handful of test CDs and DVDs. Naturally, the final arbiters were the ones attached to either side of my head; in every instance I opted for slightly less output from the subwoofer than might have been deemed optimal by a bass gourmand.

Sorry to upset subwoofer devotees, but for two-channel listening I preferred all of the speakers, including the Solus pair, *au naturel*. I cannot deny that every one of them benefited from the added heft, weight, and power imparted by the Log-Rhythm



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(especially the Quads and the LS3/5As), but the sub also added something too easily detectable on all but the noisiest of material. It was not a loss of transparency or increased coloration due to the insertion of the sub's circuitry in the signal path; I had avoided those possibilities by isolating the Log-Rhythm from the main speakers, driving the sub from the GRAAF preamp's sub-

woofer output (a rare feature in a stereo preamp) while feeding the main speakers from the preamp's normal outputs, via the Musical Fidelity amp. Even after careful matching of crossover frequency, level, and polarity, I could still detect slight tonal differences between the deep bass and the mid/upper bass when listening in hyper-critical paranoid-audiophile mode.

As expected, the Solus speakers blended best with the Log-Rhythm, though at no point was the disparity between the sub and any of the main speakers so gross as to constitute a crime against music. But golden ears will hear differences, be it speed, texture, or—in the case of the electrostatics—openness. Because the Log-Rhythm is so well-controlled, its overall voicing is dry, crisp, and therefore very un-tube-like; some might actually find this preferable to the unassisted, intrinsic, and therefore limited bass of the speakers I used it with. What's sacrificed is a smidgen of seamless, or continuity.

I found the reverse situation in my A/V setup. Quite clearly, this subwoofer excels in a home theater. In the newly remastered DVD of *Dune*, the scene where Paul Atreides calls the sandworms with a thumper device tested the Ruark sub's extension and weight. While I have been living happily with the five Apogees' total complement of eight 6-inch woofers, I noticed an immediate increase in spread and impact when I added the Log-Rhythm. Blessed with solid floors, my room didn't demonstrate this through a deceiving increase in rattling or vibration; it simply filled up with fat, rich, sandworm-seducing, lowest-octave energy.

Speed isn't as obvious in the *Dune* test (or massive reptiles' footfalls) as it is with various and sundry explosions, so I dipped into the finale of *Armageddon* and some gunfire sequences in *Last Man Standing*, *Soldier*, and *Starship Troopers* to assess the sub's kick-assness. I was rewarded with the kind of snap I expect from reggae recordings heard through systems containing far smaller bass units. I have to give full marks to Ruark Acoustics for achieving something I think of as near impossible: more bass with no bloat. No unwanted breathing or "whoofing."

What you pay for this glorious bottom-end enhancement is a serious \$1,750, plus \$145 if you want the timber embellishment. This places the Log-Rhythm at the high end of the subwoofer scale, though still some distance from the Wilson Audio Whow and its ilk. While I won't call it a bargain, I have no qualms recommending it.

Whatever will the British come up with next? Reliable automobiles? **A**

TEST RESULTS

The higher the frequency setting of the Log-Rhythm's low-pass filter (Fig. 1A), the greater its output, a common phenomenon even more

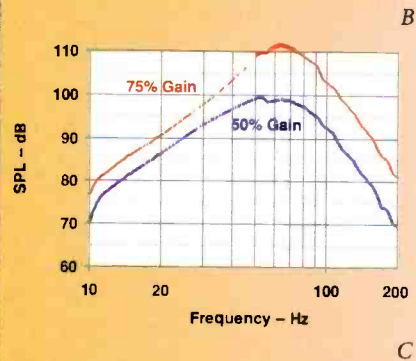
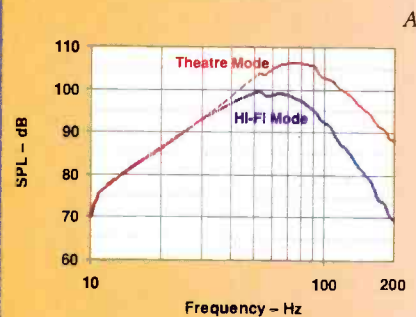
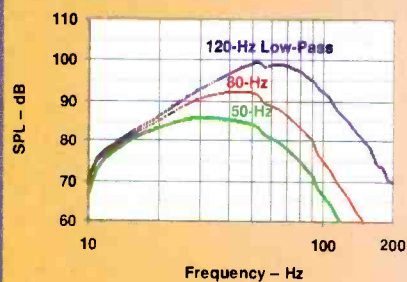


Fig. 1—Output vs. frequency for high, low, and middle filter settings in “Hi-Fi” mode (A), for 120-Hz filter setting in “Hi-Fi” and “Theatre” modes (B), and for 50% and 75% gain settings and 120-Hz filter in “Hi-Fi” mode (C). Input was 1 volt for all curves.

pronounced when that frequency is doubled by switching to the “Theatre” mode (Fig. 1B).

The frequency markings on the low-pass controls aren't terribly precise—but then they rarely are in subwoofers, which are mostly set by ear. The Ruark was set at 50% of its maximum gain in Figs. 1A and 1B, resulting in relatively modest output levels; increasing gain to 75% (Fig. 1C) produces an appreciable boost.

Don't expect such high output on a long-term basis, however. When True Technologies attempted to measure distortion at 105 dB SPL, free-field, the sub's built-in amp kept shutting down. Distortion at 100 and 95 dB SPL was definitely on the high side (Fig. 2).—Ivan Berger

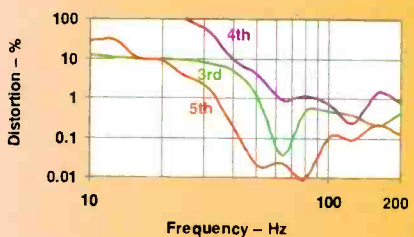
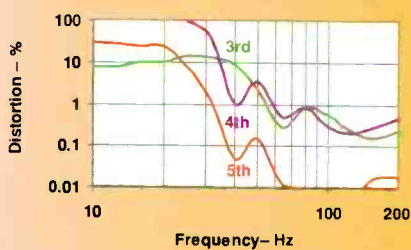


Fig. 2—Distortion vs. frequency for three harmonics at 100-dB SPL output (A) and at 95-dB SPL output (B).



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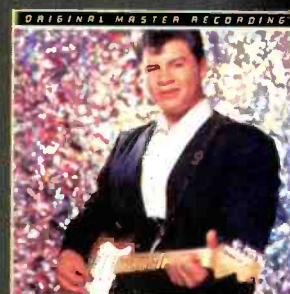


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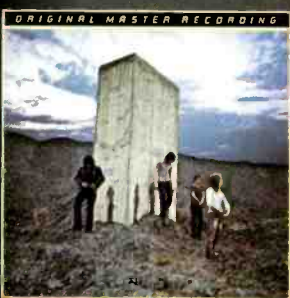
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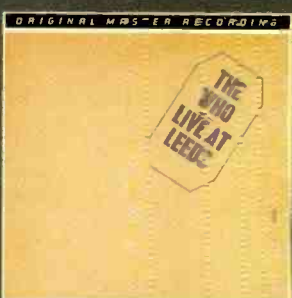
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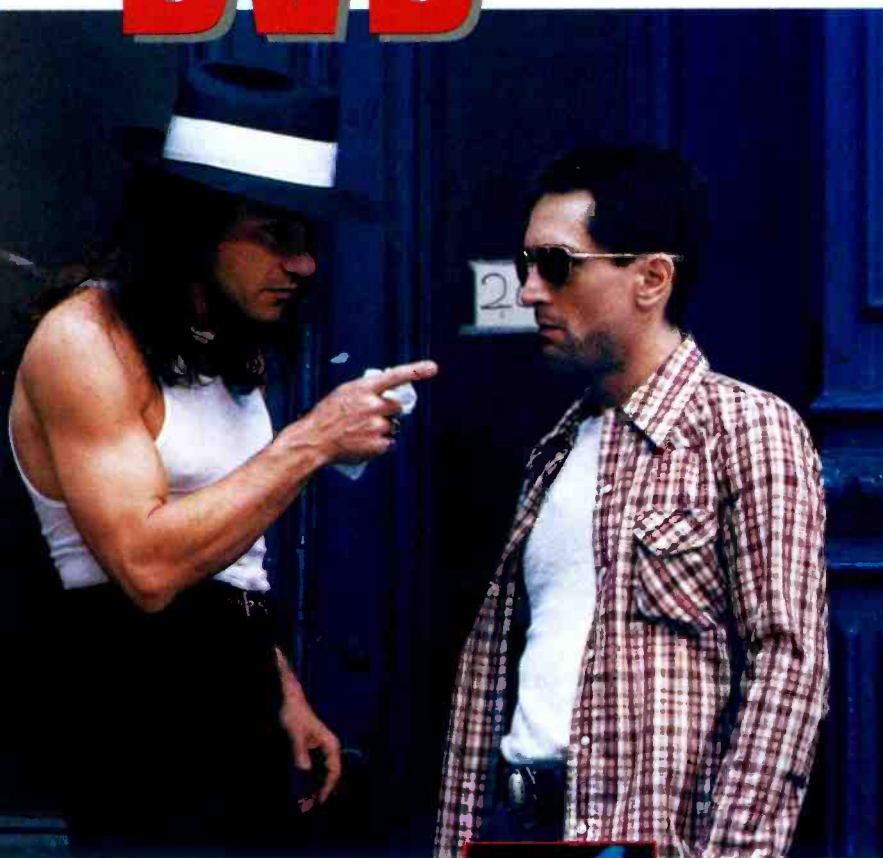
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YOU TALKIN' TO ME?

Taxi Driver: Collector's Edition 1976; R rating; one-sided, dual-layer (1.70:1 aspect ratio); English Dolby Digital two-channel matrix surround; English, Spanish, Portuguese, Chinese, Korean, and Thai subtitles; closed-captioned; includes a documentary, still-frame gallery, production art, original screenplay with links, and theatrical trailers from this and other films. COLUMBIA TRISTAR 03481; 114 minutes (feature run time), \$24.98

In one of the voice-overs near the middle of this landmark film, the main character, taxi driver Travis Bickle (Robert De Niro) states, "Loneliness has followed me my whole life. . .I'm God's lonely man." Loneliness is at the heart of Paul Schrader's story and script and a key factor in sending the psychotic Travis over the edge. In this movie, director Martin Scorsese paints a



vivid portrait of the underbelly of urban society. The characterizations are dynamic, particularly those by De Niro, Jodie Foster, and Harvey Keitel. The scene in which Travis faces himself in the mirror and does his macho bit with "you talking to me" became as much a part of our spoken lexicon as did Clint Eastwood's "make my day." Many would argue, however, that this is a movie one admires yet cannot really like, because of its disturbing violence and garbled message, which seems to say that a bad guy can become a hero without any real catharsis and that the sure cure for a psychopath's problems isn't therapy but to kill a bunch of people.

Decide for yourself on which side of the artistic and societal fence *Taxi Driver* sits, but I believe we'll agree that this DVD is one heck of a bang-up edition. For starters, the

picture has been restored and the sound remixed, so the movie looks and sounds quite impressive. Bernard Herrmann's jazz-oriented score plays a great role in this film's success, and it has never sounded better.

This special edition provides a wealth of extras, including an hour-long documentary in which the creators revisit the film and talk about its making. Other treats are a

Photo: Warner Bros./Courtesy Kobal

sundance

Film-Fest DV: Issue 1: Sundance 1999, not rated, color and black-and-white; one-sided (1.33:1 aspect ratio with some letter-box); English Dolby Digital two-channel stereo, some other languages with subtitles. BROADCAST DVD 812 370 001-2; 130 minutes, \$14.98 (\$4.99 by subscription)

What a cool disc, and what a neat idea! It brings some of the content and spirit of a film festival right into your media room on a high-quality DVD. This, the first issue of a quarterly series, is devoted to last year's Sundance Festival and its spin-offs, including Slamdance, and even Van Dance, a one-man festival hyped from yes, a one-man van.

The DVD is divided, like a publication, into sections containing interviews with such diverse film folk as Tim Roth, Laura Dern, Stewart Copeland, and Eric Stoltz; two selections of shorts shown at the festival, all of which contain commentary tracks by the filmmakers; and an intriguing section of previews and clips from full-length festival movies that are opening this fall. The DVD video quality is first-rate, as is the sound, and the shorts are all interesting. One of the best, a seven-minute jewel called *An Incident Near Falaise*, is a *Twilight Zone*-like fantasy, in which a small boy playing near his home in France discovers long lost dog tags at the bottom of a stream, whereupon he suddenly finds himself in the middle of a World War II shoot-out. The next issue, probably out by now, will cover Cannes, while future DVDs will be devoted to the LA Independent Film Festival, among others.

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photo montage with a narration that gives us more information on the movie, a storyboard sequence, a gallery of production art, and filmographies. The trailers are more extensive than usual and contain not only previews for *Taxi Driver*, but also for *The Age of Innocence*, *The Fan*, and *Awakenings*. All are presented in rough-and-ready pan-and-scan.

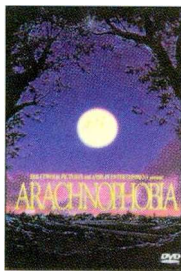
The unique feature, though, is the complete printed script that is linked and coordinated with the movie. By using the title button on the remote control, as well as the direction keys, you can go straight from a scene to the corresponding section of the script; vice versa, you can be reading a section of the script and whiz right to that particular spot in the movie. On-screen directions make reasonably clear how to use this interesting feature. This collector's edition is surely one case where a DVD has given us a lot more than just the movie. *Rad Bennett*

Arachnophobia 1990; PG-13 rating; one-sided (1.85:1 aspect ratio); English Dolby Digital 4.1; includes production featurette and trailer. HOLLYWOOD 17098, 110 minutes (feature run time), \$29.99

A young doctor (Jeff Daniels) moves his family to a small town, expecting to set up a rewarding practice, not knowing that the old-line doctor, who was supposed to retire, has decided to stay around a while longer. He's also unaware that a vicious South American spider has hitched a ride to his neighborhood in the

hearse of one of its victims and is marshaling and mating with local spiders to create a venomous brood. Campy, humorous, and downright frightening, *Arachnophobia* has chills aplenty, all the more so because it seems entirely believable, drawing on the fears and misconceptions that most people harbor about these eight-legged wonders.

The DVD presents a rich, detailed image without a trace of artifacts, far superior to the grainy old laserdisc, and the sound is full-bodied, with just the right amount of well-focused bass to do justice to Trevor Jones' suspenseful score. The jacket says that the audio is a 5.1 mix, but the player



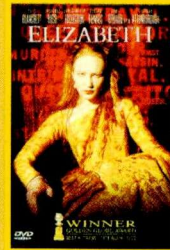
THE VIRGIN QUEEN

Elizabeth 1998; R rating; one-sided, dual-layer (1.85:1 aspect ratio); English Dolby Digital 5.1 and two-channel matrix surround; French and Spanish subtitles; English closed-captioned; includes two featurettes, theatrical trailers, and director commentary track. POLYGRAM 440 058 273-2, 124 minutes (feature run time), \$29.98

This lavish production attempts to fill in a lot of blanks in English history through educated conjecture. It is the story of the young Queen Elizabeth I, told from her reconciliation of sorts with the dying Queen Mary on up to her iconoclastic presence as "The Virgin Queen." The film's uneven style is distracting at times, but viewers should be won over by the lavish sets and costumes, as well as Cate Blanchett's riveting performance as the young monarch.

This DVD has amazing video definition and, on my system, a total lack of artifacts. Gratings and intricate costumes, which can shimmer and bristle given careless DVD processing, are rock solid here. Foremost is a scene where two characters are shot through an ornate screen as the camera pans left to get around this semitransparent obstruction. No problem, no shimmer.

The sound, especially the 5.1 mix, is just as solid, with lots of presence and ample, tightly focused bass. The score for this film should have won the Oscar last year; it is just retribution that it is one of the best sounding in the entire DVD catalog. Bonus extras shed a lot of light on the production and also reveal which historical facts are amplified and altered for the movie. *R.B.*



readout pegged it as 4.1. Regardless, the sound's effective, so why worry about the numbers? Watch this flick on Halloween, but don't watch it alone. And, considering the difficulties two characters encounter in the movie, maybe you'd better skip the popcorn. *R.B.*

Super Slide 1999; no rating; color, with some black-and-white; single-layer (1.33:1 aspect ratio); Dolby Digital two-channel stereo; includes music videos and interviews. OPPER SPORTS PRODUCTION/TRINIDAD/IMAGE ENTERTAINMENT TE 1001 DVD, 90 minutes, \$29.95

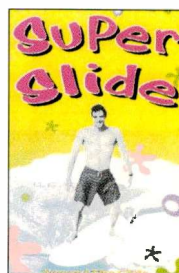
Expecting to dislike *Super Slide*, I reluctantly put this disc on in the midst of this summer's heat wave and found it totally cool. Director Ira Opper tells us in the DVD that he hopes viewers come away with a sense of how classic surfing's evolved over 100 years and that when the DVD player is off "all they wanna do is go get wet." Bingo on both counts!

Super Slide contains fantastic new photography as well as amazing

archival footage. It makes the surfing seem so real you can almost feel the spray. As a bonus, there are eight interviews and nine music videos, which present surfing scenes from the movie accompanied by the grooving genre music of Sly & Robbie, Birth Through Knowledge, Purple Bosco, Solid Foundation, The Cat Mary, Colorblind, The Bent Scepters, Brazil 2001, Alien Fashion Show, and Lodestone. The high-definition video captures all the sights, and the tunes are transferred in honest, wide-range stereo. Be sure to catch this wave. *R.B.*

Harry Connick, Jr.: The New York Big Band Concert 1992; no rating; one-sided (1.33:1 aspect ratio); Dolby Digital 5.1 and PCM stereo; English subtitles (lyrics). COLUMBIA MUSIC VIDEO CVD 49168, 60 minutes, \$24.98

Harry Connick, Jr., has been able to market the classic American songbook to countless numbers of new listeners as young as himself. Not because he is patronizing and lowers the musical bar, but because he sings and plays it in the style intended, with a little extra flair and polish. Back in the days of Clara Bow, we'd simply say that he has "it," and has it in abundance.



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Since success has come so early, Connick can appear to be a little too full of himself, and that cute attitude mars the first four numbers of this concert. But once he gets to "They Can't Take That Away from Me" and performs it beautifully, his innate musicianship takes charge and never lets up for the rest of the program. His band is terrific. Several numbers give its principals a chance to shine, especially trumpeter Leroy Jones. The video is satisfactory, but only that. Perhaps the cameras were hampered by the overall red and blue lighting effect, but the images, though clean, are not quite as sharp as one might hope. The two audio mixes are closer than usual, with the 5.1 simply adding some wraparound ambience and audience presence.



Overall, there's a lot to enjoy here, and the concert is worth buying for the exhilarating big ensemble numbers, such as "With Imagination," in which Connick takes over the drums in an impressive way, and the encore "All of Me." But it's just as interesting, in the long run, for Connick's quieter moments.

R.B.

Trinity and Beyond: The Atomic Bomb Movie 1995; no rating; (1.33:1 aspect ratio); English Dolby Digital 5.1; includes director's commentary; slide show; "3-D" bonus section; separate soundtrack score recording; and live-action bomb explosion with actual sound delay. GOLDHIL GH1232 120 minutes (video), 60 minutes (soundtrack), \$24.98

This disturbing yet riveting film chronicles the United States' atomic and hydrogen bomb test programs begun in the White Sands desert in 1945 and includes rare footage, some declassified through the efforts of director Peter Kuran. *Trinity* is one of the most exciting and skillfully edited documentaries I have ever seen, hooking the viewer right from the start and never letting up. Its effect is greatly enhanced by a splendid orchestral score by William T. Stromberg, which sounds something like Prokofiev's Alexander Nevsky revisited by Bernard Herrmann. There's an incredible amount of virtuoso writing for horns, and the Moscow

Symphony Orchestra is outstanding. When you see a brilliant, digitally restored orange-red explosion and mushroom cloud accompanied by Stromberg's passages for chorus and orchestra, there's a feeling of viewing the apocalypse itself. Despite the horror of death and destruction, there's an awesome, horrible beauty to it as well.

The supplemental "3-D" section (one pair of glasses is supplied) is rather ineffectual but interesting. Far more impressive extras are the director's enlightening commentary and a great-sounding, two-channel Dolby Digital recording of the complete soundtrack, which has lots of well-focused bass, especially in the explosions. The whole DVD will give the low end of your audio system quite a workout. If that's not enough and you have a DVD-ROM drive in your computer, you can call up a complete list of all U.S. nuclear detonations, including yields!

R.B.

Twentieth Century Blues: The Songs of Noël Coward with Suede, Marianne Faithfull, The Divine Comedy, Robbie Williams, The Pet Shop Boys, Sting, Shola Ama, and Elton John. 1998, no rating; one-sided (1.33:1 aspect ratio); PCM stereo. EAGLE ROCK/IMAGE ID5531ERDVD, 49 minutes, \$24.98

This concert, staged to raise money for the Red Hot Charitable Trust in England, attracted many top stars to honor the memory, and tradition, of Noël Coward, one of the greatest wits of our century. Coward quotes and quips abound in the introductions to each song, set forth by members of England's theatrical community. The songs are really a lot more successful than one might think from the set list. Marianne Faithfull, sounding more and more like Lotte Lenya, croons "Mad About the Boy"; Divine Comedy, successfully shifting back and forth between English music hall and heavy rock traditions, nails "Marvelous Party." Sting, accompanied only by harp, does an effectively



bittersweet version of "I'll Follow My Secret Heart," and there's a genuinely moving version of "If Love Were All" from The Pet Shop Boys. The editing and camera work are a little too fussy sometimes, but the basic picture has good definition and the sound is consistently good and well balanced.

I would recommend this offbeat program more enthusiastically if it were priced lower. As it is, it's a good bet for a rental if you're looking for quality entertainment that's out of the ordinary. Or, of course, if you're a Coward fan, and who isn't one of those? R.B.

The Avengers: 1967 Season 1999; no rating; each DVD is one-sided; dual-layer (1.33:1 aspect ratio); English Dolby Digital two-channel mono. Packaged as eight separate DVDs: A&E 70018/19/20/ 21/ 22/23/24/25, three episodes, 170 minutes each (except 70025: four episodes, 208 minutes), \$24.98 each. Also packaged as four two-CD boxes: A&E 700/14/ 15/16/17, six episodes, 340 minutes each (except 70017: seven episodes, 400 minutes), \$44.98 each

The 1960s saw a large number of spy, espionage, and caper shows on television, calculated to captivate the millions who had been hooked by Agent 007, James Bond, in movie theaters around the world. *The Avengers* was the best, brightest, and most successful of these efforts. After an initial minute or so of establishing the level and method of villainy for the episode, there was a follow-up minute devoted to whatever clever way dapper John Steed (Patrick Macnee) devised to inform his partner, elegant, leonine Emma Peel (Diana Rigg): "Mrs. Peel, we're needed."

And, in the wake of the disastrous feature film released last year, the original Steed and Emma are badly needed again. Thanks to A&E, then, for providing top-notch transfers of the first *Avengers* season shot in color, which was also the last for Rigg. The awful, previously available, independently produced VHS tapes—with their washed-out hues and screen-wide splices—can now be retired. These new digital A&E transfers

have rich, resplendent colors and abundant detail. Fans will rejoice, and newcomers to the series will marvel at the rich and hot '60s flower-power colors.

The sound is excellent and does justice to Laurie Johnson's scores, which, chameleon-like, always seemed to hit the mark, whether paying tribute to Bernard Herrmann or Henry Mancini. The only blot: There are no subtitles or any closed-captions.

The 1967 season is available two ways: as separate DVDs or, at a savings of \$5 per two

DVDs, in slip cases that contain two individual discs. As I write this (summer 1999), A&E has just announced the complete 1965 season of this show on DVD. These episodes were black-and-white and feature Rigg's introduction as Mrs. Peel. Let's hope A&E will go back even further to 1963 and '64, when Steed's partner, Cathy Gale, was played by Honor Blackman. Through her role on this show, Blackman was tapped to be immortalized as Pussy Galore in the James Bond feature *Goldfinger*. R.B.

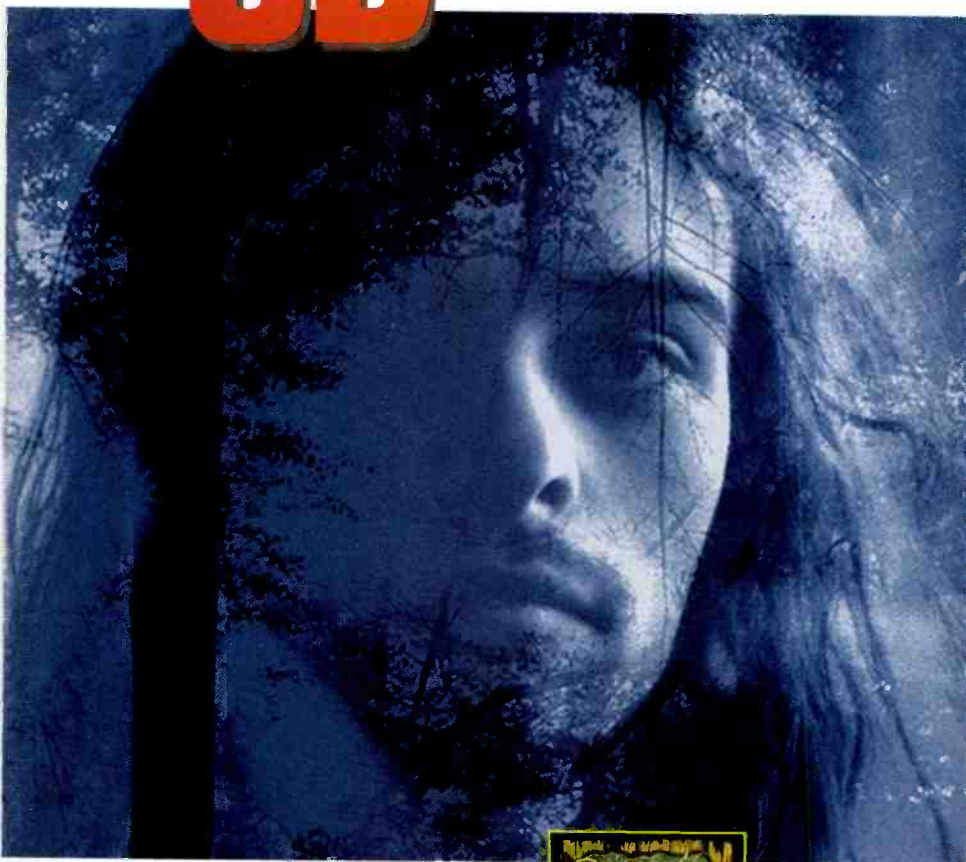
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BRAND NEW DAYS

Days of the New
OUTPOST RECORDINGS
OPR3P-3032, 62:18

A funny thing happened after Days of the New's debut recording went platinum last year on the strength of its radio-play hits, "Touch, Peel and Stand" and "The Down Town." Frontman and principal songwriter Travis Meeks fired the band and went into a kind of self-imposed exile to work on his/the band's second recording. What the 20-year-old boy genius has emerged with is an incremental leap in his artistic development. More hard-hitting, more passionate, darker, and far more revealing than the band's rather intelligent debut, this self-titled follow-up is a Travis tour de force. Brilliantly crafted and executed (Meeks plays most of the instruments himself, including his trademark open-tuned acoustic guitar), the CD organically



combines rock-tinged catharsis with mysterious lyrics and symphonic pretensions.

The purely self-taught Meeks demonstrates an inherent musicality that is a step above the norm. He has an intuitive sense of counterpoint, which he plays out with a full string section. (Meeks originally recorded the parts himself on a sampling keyboard and then hired some orchestra pros in L.A. to transcribe and overdub the parts.) But at the heart of these tunes is a powerful, driving rhythmic force that propels the music forward. And his bold vocals—often compared to Jim Morrison's—add a touch of mystique and foreboding to the proceedings.

With an eclectic batch of tunes woven into a highly personal expression, Meeks' ambitious concept album travels from the mesmerizing opener, "Flight Response," and harder-edged offerings like "The Real" and "Weapon and the Wound," through more esoteric territory like the world-music influ-

enced instrumentals "Skeleton Key" and "Longfellow" (the last containing a rather avant sound collage at the tag that recalls The Beatles' "Revolution No. 9"). Meeks' urgent, open-tuned strumming is most potent on the exhilarating "Bring Yourself." He even dabbles a bit in techno with "Enemy," though his strong suit lies in the more snarling, confessional mode, as exemplified by "Phobics of Tragedy" and the mournful "Not the Same," a dark ballad that makes the most effective use of strings on the album. Each step of the way Meeks provides plenty to think about in enigmatic mantras alluding to fear, anger, pain, and alienation.

Part poet, part provocateur, this Kentucky prodigy is a hot caldron bubbling over with ideas. He's pulled them all together superbly here on this very powerful and fully realized album.

Bill Milkowski

NEW YORK CATS

Mark Elf

JEN BAY JAZZ JBR 0005, 65:45

It doesn't take long for guitarist Mark Elf to get his fingers all heated up. By the time he reaches the third cut on *New York Cats*, Cole Porter's "From This Moment On," he's careening up and down the neck of his guitar like a well-lubed piston in a Formula One racer. Though Elf enjoys speed racing a bit more than the next guy, he's also fond of quirky shifts in tempo and mixing single-string lines with unexpected chordal moments ("Smoke Gets in Your Eyes").

This disc, Elf's fourth, recorded with bassist Jay Leonhart and drummer Dennis Mackrel, features the guitarist going to great pains to vary tone and technique as he negotiates a complicated course of melodic, stylistic, and rhythmic obstacles. In the end, Elf triumphs with performances like the jubilant "No More Blues," the boppin' "Stompin' at the Savoy," and the marvelously baroque "Lady Be Good."

Bob Gulla



Burn to Shine, Ben Harper and
The Innocent Criminals
 VIRGIN 48151, 54:37

As with his three previous albums, Ben Harper expects his listeners to drop all preconceived notions. Harper sings the blues on *Burn to Shine*, as he always has, but this time he travels extensively, borrowing liberally from the regions he visits.

Urban gothic drives "Alone"—with everything thrown in shadow, Harper's whispery guitar stands out in lonely relief. "Suzie Blue" recalls the jazz halls of 1920s New Orleans (The Real Time Jazz Band lends a hand). Harper returns to Detroit for "Steal My Kisses," starting the charming ditty with man-made hip-hop beats, moving quickly into a playful Motown jangle with tight harmonies, then coming full circle and ending on a head-bopping happy note. The sorrow of Appalachian folk echoes in the spiritual "In the Lord's Arms," while California shines through the somber



tones of the folk-rock-informed "Two Hands of a Prayer."

Harper makes a bold statement with *Burn to Shine*: Nothing is beyond the blues—not the second-line jazz of New Orleans, the progressive rock of '70s England ("Forgiven"), or the tightly controlled music of, say, Henry Mancini circa 1963 ("Beloved One"). As always, Harper ties it all together with the solid backing of his band, The Innocent Criminals, well-written songs, and his trademark raspy vocals, with which he wails and whispers all at once.

Marie Elsie St. Léger

Western Wall: The Tucson Sessions

Emmylou Harris and Linda Ronstadt
 ELEKTRA 62408-2, 50:50

Western Wall has a whole lot going for it: terrific songs, great sound and production, inspired instrumental support, and career performances from the two principals, Emmylou Harris and Linda Ronstadt. Harris's alternately breathy and powerful voice and Ronstadt, with her best singing since *Hasten*

Down the Wind 25 years ago, are a heavenly match. But this is nothing like the work they did with Dolly Parton in the two *Trio* albums. As Harris has said, "with Dolly in the mix the music invariably veers toward the beautiful." As a duo, Harris and Ronstadt tackle edgier, darker, and more diverse numbers. In fact, diversity is a hallmark of *Western Wall*.



The sequencing is outstanding; segues from one song to the next are often hairpin turns of genre. The thrilling opener, "Loving the Highway Man," leads to Harris's own "Raise the Dead," which evokes the ghosts of Hank Williams, Sam Cooke, Robert Johnson, and Bill Monroe. Rosanne Cash's tender title song leads to David Olney's dark "1917," one of three songs featuring vocals by Kate and Anna McGarrigle. "Sweet Spot," a skitish song by Harris and Luscious Jackson's Jill Cunniff leads to the gloriously read "Sisters of Mercy" (penned by Leonard Cohen), with Patty Griffin's knockout "Falling Down" following.

The album sounds wonderful. Producer Glyn Johns has kept the instrumentation sparse yet carefully deployed, particularly with the percussion, which is often "found" sounds of odd things being struck. The voices are front and center—just as they should be on this album.

Western Wall: The Tucson Sessions is one of the rarest things to stumble across these days while listening to pop music. It's a thrill-ride of an album that commands attention from beginning to end—with nary a letup. It dares to be diverse in an era when predictability rules.

Michael Tearson

... So Far, D.D. Jackson
 RCA Victor 09026-63549-2, 55:52

They should have called it "Stand Back, Here Comes D.D. Jackson." This passionate young Canadian pianist sounds like a state-of-the-art player piano exceeding the limits of human performance. "... So Far" is a touching tribute to Jackson's wide-ranging influences: everyone from his two mentors,

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Where some jazz pianists might be working with a bunch of licks, Jackson seemingly has hundreds of ideas at his fingertips, just waiting to get out. One second he's caressing the keyboard, practically making love to it, and then, watch out, he's manhandling it. His head-first charge through Monk's "I Mean You" will knock you down and straighten you right up. His gonzo stride flourishes are interspersed with dense, rolling thunder rumbles. But Jackson's no primitive—you'll be aware of an intelligence behind every note.

"... So Far" is clearly a contender for jazz record of the year. Don't miss it.



Steve Guttenberg

Jimi Hendrix: Live at Woodstock

MCA MCAD2-11987, two CDs, 1:36:37

When Jimi Hendrix played Woodstock on August 18, 1969, he had made it to the very top of a musical mountain. Having just disbanded The Experience, one of the great trios in the history of rock, Hendrix had begun to relish the idea of exploring fresh musical horizons. He assembled his band for the show, Gypsy Sun & Rainbows, and hastily scratched out a set list. But Hendrix knew the songs and his accompanists didn't truly matter. What mattered came directly from his fingers, via his heart and soul.

Onstage, Hendrix was flanked by a quintet of supporters, including second guitarist Larry Lee and two percussionists, Juma Sultan and Jerry Velez. But the mix obscures the contributions of everyone but drummer Mitch Mitchell and bassist Billy Cox, while Hendrix's own maelstrom seems to exist in a heavenly vacuum; wild thought after wild thought comes flying off his Strat like sparks from a grindstone. Yet even though this sextet sounds like a trio, the recording still goes a long way in capturing the sound and spirit of Jimi's performance.

With the sun rising over Yasgur's farm—it was 9:00 Monday morning when Hendrix, the festival headliner, actually took the stage—Jimi and company blazed through an incredible array of revelatory grooves

Bill Bruford's Earthworks

A Part, and Yet Apart

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DGM9905, 48:42

From his early solo albums, *Feels Good to Me* and *One of a Kind*, former Yes and King Crimson drummer Bill Bruford has proven a resourceful bandleader and inventive composer, always nudging notions of what jazz is, and what it ain't! His previous outings with Earthworks used acoustic instruments in creative, neofusion arrangements. *A Part, and Yet Apart* explores witty, odd-metered compositions in concentrated quartet playing that cleverly combines flowing, straight-ahead soloing with Bruford's cerebral rhythmic approach.

Each track is refreshingly cliché-free, with unusual twists that keep everything popping along. The quasi-Caribbean "Footloose and Fancy Free" swings on a catchy, melody-twirling number that soars in 14/8 time thanks to the drummer's droll sleight of hand. *A Part, and Yet Apart* closes with "Dewey-Eyed, Then Dancing," a lovely ballad that swings both sensitively and with a lithe backbeat. Bill Bruford sticks it to 'em, again.

Ken Micallef



(especially on the new "Izabella" and "Jam Back at the House"). Beyond the now infamous (and nearly clichéd) "Star Spangled Banner," Hendrix's Woodstock appearance left us a set of incredibly complex and accomplished rock music, a performance that finally, from Hendrix's perch atop that musical mountain, has a chance to be fully heard.



Bob Gulla

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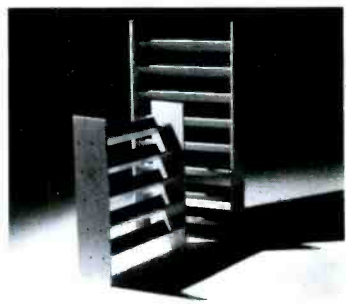
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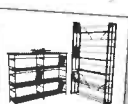
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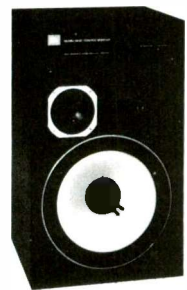
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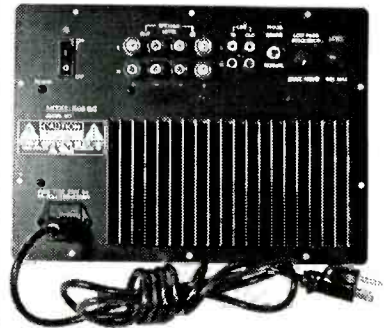
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Super Sound vs. The Big Squeeze

In the September issue, our main story was the launch of DVD-Audio. This month, the big story is Super Audio CD. Both formats designed to raise the bar on audio performance without sacrificing the convenience and durability we have become accustomed to with CD. It seems like a nice, linear progression into the future.

Look around, however, and it becomes apparent that the current cutting-edge action is off in another direction altogether: highly compressed music (MP3 and

the like) created on home computers or downloaded from the Internet for playback on those same computers or on portables built around solid-state memory. The appeal is acceptable, rather than state-of-the-art, quality combined with immediacy and convenience.

Does that sound familiar? Turn back the calendar 20 years, to when analog ruled the earth. The high-performance medium at that time was the LP, which had been the dominant music format since the

'50s. But LP sales were gradually being eroded by the upstart music cassette. Cassette could not be counted on to deliver equivalent performance, but it was much smaller and much more adaptable to portable use. Plus, it was easy to record your own. Though it's often said that CD ended the LP era, the

statistics make it clear that the vinyl disc was already on the road to a much diminished role. CD just accelerated the process.

CD did something else eventually, which was to undercut the cassette as well. With CD, you got it all (or almost all) in one package: performance, convenience, and portability. Unity between high-end and mass-market was restored (except for the dwindling cadre of retro audiophiles who clung to the LP).

I think that tranquil era is about to career into the abyss. While there is good reason to expect, and certainly

to hope, that at least one of the new high-density audio disc formats will prosper, I see equally good reason to think that neither will reach the pinnacle to which CD has risen. The serious competition from compressed audio emerging in the mass market will forestall that.

So, how horrified should we be, exactly? I think not very. If MP3 and such were going to sweep away everything in their path, *then* there would be cause for alarm. But that possibility seems very remote. We will simply, once again, have more ways to acquire and enjoy music—not a bad thing, surely. (I realize it is common practice for audio writers to profess “it’s the music that matters,” all the while looking down their noses at anyone who won’t sell his children into slavery in order to buy a better amplifier, but I really mean it’s a good thing. A longtime audiophile friend of mine confesses that the sound of music reproduced over an AM car radio still holds a special appeal for him, because that’s how he first learned to love music. I wouldn’t dream of arguing the point.)

At the same time, this development probably will lead to some pain for us audiophiles, because the ugly truth is that most of the important technical developments are made by big companies like Philips and Sony and Matsushita, who inevitably will follow the money wherever it leads them. Will we see the same kind of breakneck development of DVD-Audio or SACD that we did of Compact Disc if they are eclipsed in the mass market by something else? Perhaps not. Or perhaps all the current interest in audio over the Internet will yield breakthroughs in the quality of compression designed to squeeze sound into narrow transmission bandwidths and cramped storage media—something everybody eventually could love without reservation. Whatever happens, however, I think it’s sure to be different from what we’ve grown used to.



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