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FEBRUARY 1996



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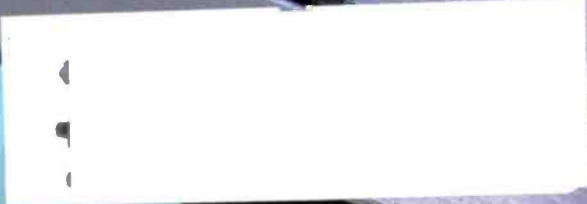
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Stereo Review

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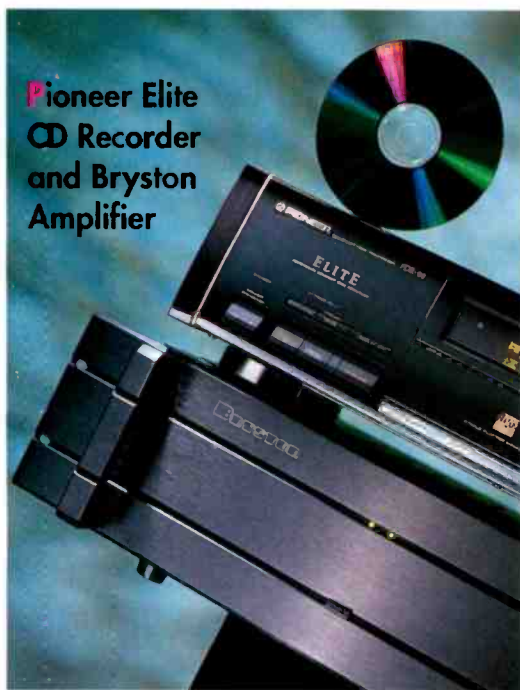


AUDIO

THE EQUIPMENT AUTHORITY



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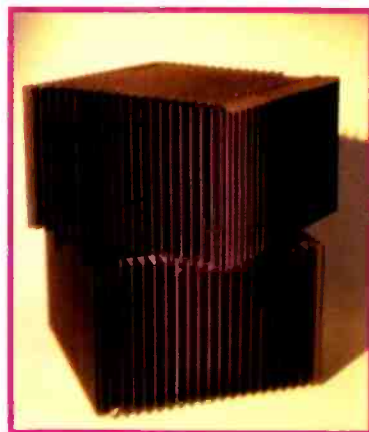


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**PANASONIC PV-4564 VHS HI-FI VCR,
 SALAMANDER DESIGNS ARCHETYPE MODULAR SHELVING,
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We couldn't have said it better ourselves.

— excerpts from *Audio Magazine*, by Anthony H. Cordesman

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CUT ALONG DOTTED LINE

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The term "surround sound" is one we most readily associate with movies and video. We still think of unaccompanied audio mainly in terms of two (probably big) speakers in the front of the room, forming the classic triangle with the listener at the third vertex. We've lived with this system for 30 years now. Modern music recording practice is geared almost entirely to two-channel stereo, and we're comfortable with it. If only it worked better!

Over the last year or so, several people in the audio business have mentioned to me in passing that they often prefer listening to stereo music recordings with Dolby Pro Logic decoding. Most discovered this accidentally by just forgetting to turn the decoder off. Presented with an ordinary stereo recording, Pro Logic will direct anything centered in the mix to the center speaker and any out-of-phase information to the surround speakers. When everything goes well, the net result is a more open, spacious sound combined with a better focused and more stable front stereo image, even for listeners seated off-center.

The trouble is that Pro Logic is very much a hit-or-miss proposition with unencoded material: Sometimes it works okay, other times pretty badly. And it's never ideal. Ambience-enhancement systems designed specifically for the purpose can be much better—and very satisfying—but really good ones are rare. The best thing would be to have true multichannel music recordings, preferably ones that could be reproduced effectively over the speaker setups currently being installed at such a furious pace for A/V surround sound. The widespread consumer acceptance of such installations and the development of high-density discs that can hold many times the amount of data on a conventional CD are creating a golden opportunity for the establishment

of a new and better system for multichannel music reproduction.

But with the 20-year-old memory of the quadraphonic debacle still alive, will the record industry bite? And if it does, how will artists and producers exploit the expanded medium? Dan Sweeney has talked extensively with many of the recording professionals most interested in multichannel for music, and he reports his findings in this issue ("Multichannel Music Recording: A View from the Console"). Like the people Sweeney interviewed, I hope very much that the record industry does wake up to the potential of moving beyond two-channel stereo and its long-recognized inadequacies. I've been disturbed to hear so much of the industry discussion of a "Super CD," based on the new high-density discs, cast in terms of things like higher sampling rates, which would have little or no impact on perceived sound quality. Today, the greatest remaining impediment to sonic realism is the spatial distortion of two-channel stereo; as anyone who's heard a well-reproduced, high-quality surround soundtrack (especially a discrete-channel digital one) can attest, we can do a *lot* better. That's what's sold home theater, and we shouldn't let ourselves be stopped there.

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Viva Van Gelder

Dear Editor:

I thoroughly enjoyed James Rozzi's interview of Rudy Van Gelder (November 1995). Rudy Van Gelder has dedicated close to 50 years of his life capturing the spontaneity of an art form labeled "jazz." Unlike chamber music, operas, and symphonic recitals that have been performed time and time again, jazz demands an intuitive focus on the part of the recording engineer. Along with this, Van Gelder's exquisite choice of microphones, and their positioning, have made his recordings classic works of art. And it is why his earliest tape recordings sound so good on CD.

A smile crossed my face when Van Gelder stated, "I'm glad to see the LP go." The chance of buying a "perfect" reproduction on a 12-inch disc was worse than the odds of winning the Florida lottery. Cutting the perfect acetate was step one, followed by the plating, the positioning of the two stampers in the jaws of the press, and the timing cycle of the heating and cooling of the presses. And this doesn't even take into account the fact that the pressing material may have suffered temperature and humidity changes while the plant was shut down during the night. And if the LPs weren't wrapped and shipped properly, they would arrive warped. Among the many wonderful features of CDs is that there is no physical contact, plus the linearity that exists between the information at the outermost and innermost radii.

Whatever the next accepted reproduction medium is, Rudy Van Gelder's recordings will still sound good. Keep 'em rollin', Rudy.

*Tom Dowd
Tom Dowd Productions
Coconut Grove, Fla.*

So Long, Vinyl?

Dear Editor:

Good riddance! Thank you, Rudy Van Gelder for stating what should be seen as obvious. The Van Gelder interview should be required reading for anyone still clinging to the antiquated vinyl format! (Unless

you're the odd sort who doesn't feel whole without wow and flutter.)

*Martin A. Padilla
Hillsboro, Ore.*

Dissing the Dish

Dear Editor:

As a subscriber for many years, I compliment you and the entire staff for the continued excellence of *Audio*.

The reason for this letter, my first to you, is that I was amazed at the candor and truthfulness of your article on RCA's Digital Satellite System by Anthony H. Cordesman with RCA's response by James Harper ("A Gourmet Dish or Pot of Trouble," August 1995).

All other material written about this system has been glowing and without criticism; Cordesman really told it like it is. After a major hardware purchase, expensive installation, and the not-so-easy adjustments on the dish, there is the hidden expense of paying for the DTV and USSB programming.

I fully concur with Cordesman as to the mediocrity of the picture and sound—especially in the variability of quality, since it depends not on the system itself but on those sending material to the satellite for retransmission to our homes. My greatest disappointment is the lack of constant clarity in the picture, due to the digitization process—which all too frequently runs out of digits. And then there are the moments when the picture is lost due to heavy rain or an airplane passing by.

The criticism of the "mystery" ports for some future use is justified because they are a waste of the consumer's money. In today's volatile market, trying to predict what port or connection will allow HDTV, computers, or other future products or formats to work is ridiculous.

This brings me to the fact that most viewers who have seen the system do not notice these glitches until you point them out. Then they see the downside of the digital system. It's interesting to see a visual system running out of digits; it makes me wonder about digital sound, where it is

harder to detect the running out of digits, and how much we might be missing in CD sound due to the marginal level of the Sony/Philips standard. The whole idea of tossing away information not deemed necessary and cramming what's left into the available data stream can be seen as a failure in this present Digital Satellite System. Why are we settling for less with these new systems instead of more?

Congratulations on tackling the downside of a system that is not as good as it's been made out to be and for confronting the manufacturer. Keep up the fine work.

*John L. Dorn
Baltimore, Md.*

Do Not Disturb

Dear Editor:

In Bascom H. King's reply to Bob Smith's letter in the November 1995 issue about the Cary Audio Design CAD-805 tube amp sounding superior to the solid-state Carver Research Lightstar Reference, King states, "Getting people disturbed is the precursor to possibly changing their thinking." And "To be honest, though, the measurements that most of us reviewers make don't relate very well to the sonic results."

"Disturbing" people should not be confused with an honest dialectical exchange of ideas. Disturbing people only reinforces the conclusion that the disturber wants attention and seeks to annoy. Indeed, King does not seem "annoyed" at all that the measurements do not correlate to what he hears and seems somewhat complacent in continuing to use them. Instead, maybe he should be "concerned."

Now if King wants to convince or challenge us gentle readers with a point of some kind, he should state what he knows. Otherwise, "changing their thinking" will merely give way to further entrenchment in the tube versus transistor debate.

King has his "feelers" out looking for new ways to measure sonic performance. That's great. However, as a subscriber I am paying you guys to get in the lab and actively find out what goes into good sonic performance; otherwise, I can just read the advertising claims. Sitting around and listening to the hi-fi is fine, but it's only half the job.

*Steve Doyle
Kamuela, Hawaii*

Testing...One, Two, Three

Dear Editor:

I have some comments on Bascom H. King's response to Bob Smith's letter concerning amp measurements and listening tests in the November 1995 issue.

On the subject of better tests on amplifiers, I recommend that amps not be loaded with a resistor but with a loudspeaker. Alternatively, load the amp with a circuit that is representative of a loudspeaker load. The technical basis for this suggestion is that the characteristic of the load on an amp is an integral part of its transfer function. The performance of an amp depends, in part, on the nature of its load. We would like its performance to be *independent* of the nature of its load and to be able to evaluate its departure from this ideal. This can be done by comparing its performance with a resistive load to that with a loudspeaker load, or a circuit that represents a loudspeaker.

Tube enthusiasts argue that traditional tests do not reveal the true nature of amplifiers because they aren't evaluated with signals that represent the dynamics of music. To answer this objection, I propose that amps be tested with pink noise shaped to correspond to the latest IEC/DIN frequency/amplitude spectrum, with gradually increasing levels. Better yet, modulate this signal at a random rate and at a random intensity. Record and compare the applied signal to the reproduced signal.

I have one more suggestion, perhaps only half serious: Why not listen to a tube push-pull amp for reference and then pull one of its output tubes? This should have the seemingly desired effects of reducing its power rating, increasing its distortion, and saturating the core of its output transformer. Who knows, it might even exhibit additional aberrations that used to be considered undesirable!

David J. Meraner
Scotia, N.Y.

Author's Reply: Your suggestion of testing power amplifiers with a loudspeaker load or a simulated loudspeaker load has catalyzed me to action! I will start experimenting with simulated loads, and I hope to be able to test with this new load in my next amplifier review.

The idea of testing with a dynamic shaped-noise signal sounds like a good

idea. I will think about it and see if I can come up with a way that it could be implemented with my Audio Precision System One test instrument. One thing that might be promising along these lines is the new Fastest DSP program, wherein lots of frequencies can be generated but with a gap somewhere in the spectrum. Looking at what "fills in this hole" because of intermodulation of all the frequencies present might prove revealing.

Finally, as to pulling out one output tube of a push-pull pair: what a great idea! It would turn your old-fashioned push-pull tube amp into a modern single-ended marvel! One would have to crank up the plate current to get Class-A operation, however. This reminds me of when I first met James Bongiorno (of GAS and Sumo fame). He came up with an SAE solid-state amp for me to review, and I was using a pair of fairly large tube power amps that had four output tubes per channel. When they were on and playing, I pulled one of the output tubes. There was no ill effect, except for a pop in the speaker, and I said, "Try that with one of your solid-state things, and see if it still plays."—*B.H.K.*

Thagard Amp Available

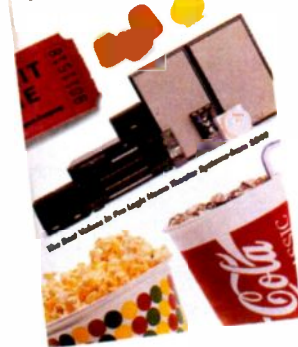
Dear Editor:

Beginning with the January 1995 issue, *Audio* ran a three-part series by Dr. Norman E. Thagard on the design and construction of a 100-watt Class-A mono amplifier. The design philosophy was both pragmatic and technically sound. Without hearing the actual amp perform, I thought it appeared to offer a chance to indulge my love of fine music with a piece of equipment otherwise beyond my financial resources. I have looked in vain in subsequent issues of *Audio* to find a supplier of either a complete kit or a finished version of the amp.

Denis Macourt
Calgary, Alberta, Canada

Editor's Reply: There is a kit (and probably a finished product) using Dr. Thagard's design in the works. Manufactured by Sescom, it should be available in the next few months. For more information, contact Sescom at 2100 Ward Dr., Henderson, Nev. 89015; phone, 702/565-3400; fax, 702/565-4828.

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BY HENRY KLOSS



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WHAT'S NEW



DANIELS AUDIO CD PLAYER

Daniels Audio's Zero-One CD player combines a Philips transport and single-bit DAC, together with such audiophile niceties as separate power supplies for the digital and analog sections and an analog filter whose



stop-band rejection is greater than 120 dB. The result, claims the manufacturer, is the kind of sound usually heard from separate CD transports and D/A converters. Price: \$749.95. For literature, circle No. 100

PS AUDIO D/A CONVERTER



PS Audio has added an HDCD decoder to its UltraLink Two D/A converter, to improve performance with both standard and HDCD-encoded discs. An UltraAnalog low-jitter receiver chip and 20-bit DAC are also included. Four inputs allow

Toslink, ST optical, AES/EBU, and coaxial digital connections. The analog section of the UltraLink Two is a discrete, Class-A, buffered design with third-order, linear-phase Bessel filtering. Price: \$2,295. For literature, circle No. 101

BOSE MULTIROOM SYSTEM



Bose's Lifestyle systems are known for the sleek, compact shape of their control centers, achieved by putting the amplifiers into the speakers. The new Lifestyle 20 maintains that design while incorporating a six-disc CD changer along with a 30-preset AM/FM tuner and four inputs. The system can deliver separate signals to each

of two zones, with multiroom control from a wireless remote that uses radio, rather than infrared, transmission. The system's Jewel Cube satellite speakers measure only 4 x 2 x 3 inches; a hideaway Acoustimass bass module holds 200 watts' worth of amps for the Lifestyle 20. Price: approximately \$2,500. For literature, circle No. 104



The modules on most of Transparent Audio's latest Transparent Cables hold networks that are designed to control resonance, RF noise, and the impedance seen by the components the cables are connected to. Even the cable's

length is taken into account in the networks' design. Price: from \$45. For literature, circle No. 102

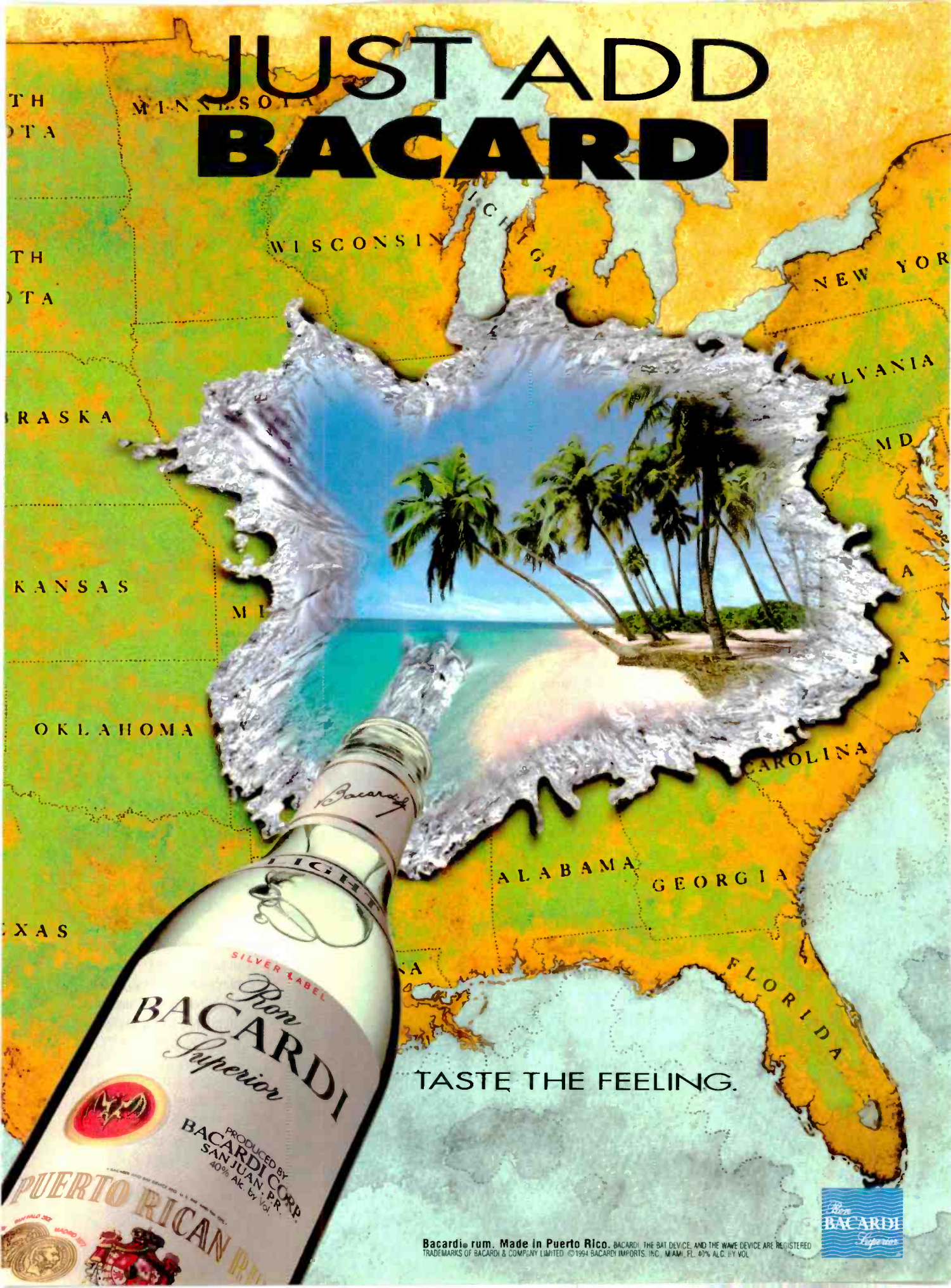
Newpoint Surge Protector

Designed for home digital satellite installations, Newpoint's Satellite Smart incorporates voltage-surge protection, interference reduction, and system power control. If a TV is plugged into the device's "Master" outlet, turning it on or off (even by remote) will control power to other A/V components except those plugged into

the "VCR" and "AUX 1" outlets. The power, satellite, cable, and telephone lines are clamped against surges, and all three legs of the power line are fused. A similar unit without master power control, the Satellite Surge, is available. Prices: Satellite Smart, \$179.95; Satellite Surge, \$89.95. For literature, circle No. 103



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WHAT'S NEW

PSB Mini Speaker

Smallest in PSB's Stratus line, the Stratus Mini measures only 16½ x 9 x 12½ inches. Its

6½-inch woofer is mounted above the ¾-inch tweeter to maintain spectral balance for both seated and standing listeners.

Bass response is rated as -3 dB at 45 Hz and -10 dB at 34 Hz. Prices: dark or black oak, \$950 per pair; gloss black, \$1,050 per pair; MS-2 stand, \$179 per pair.

For literature, circle No. 105



Quintessence Acoustics Speaker

Despite its name, the Stealth speaker from Quintessence Acoustics stands 68 inches tall and weighs 300 pounds. With four 12-inch woofers, four 7-inch Kevlar midrange drivers, four 1-inch titanium-dioxide tweeters, two 1-inch ceramic supertweeters, and one 18-inch subwoofer, the Stealth is rated to reproduce frequencies from 18 Hz to 32 kHz, ±3 dB. Two active crossovers are included. Power handling is 400 watts, continuous (1,000 watts, peak). Prices: \$35,000 to \$40,000 per pair, depending on finish.

For literature, circle No. 106

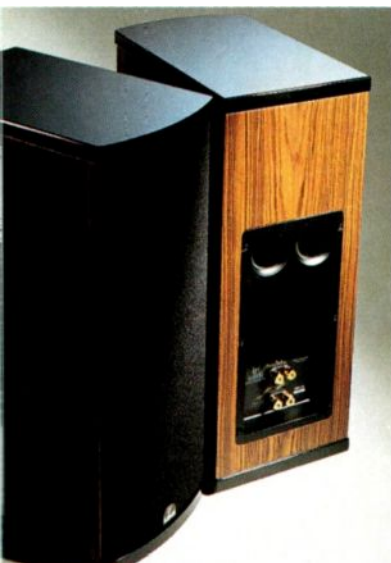


Canon Speaker

Among its wide-dispersion loudspeakers, Canon deems the S-25 especially suited for stereo systems and, because of its magnetic shielding, for center-channel use in a home theater system. The two-way speaker combines a 5¼-inch woofer with a ¾-inch tweeter. The diffusing reflector into which the tweeter fires is said to deliver ±45° dispersion horizontally and +25°, -0° vertically. Nominal impedance is 6 ohms, though Canon rates "effective" impedance at 8 ohms. Bandwidth is listed as 55 Hz to 22 kHz and power handling as 100 watts. Matching floor stands and wall-mount brackets are available. Price: \$299 per pair. For literature, circle No. 108

Platinum Audio, Ltd. Speaker

The Duo, from Platinum Audio, Ltd., has dual 5-inch woofers plus a dome tweeter with a damped magnet system. All three drivers have alloy diaphragms with butyl rubber surrounds. The crossover has staggered frequency ranges for the two woofers, with asymmetrical slopes. The diecast aluminum backplate includes a heat sink for the crossover. Price: \$3,795 per pair. For literature, circle No. 107



POLK BOOKSHELF SPEAKER



Polk's RT series of bookshelf speakers all use a dual-port Acoustic Resonance Control system with staggered tuning to suppress internal cabinet resonances. The Dynamic Balance drivers, designed to reduce cone resonances and breakup, are all magnetically shielded. In the Model RT7, those drivers include a 7½-inch woofer and a 1-inch trilaminate dome tweeter. Rated response is 49 Hz to 25 kHz, and recommended amplifier power is 20 to 150 watts. Price: \$224.95 each. For literature, circle No. 109

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CIRCLE NO. 17 ON READER SERVICE CARD

Aircraft Interference

Q *Living near an airport, I can often hear pilots' comments loud and clear through my stereo system. This unwanted interference occurs only when I am listening to LPs or transferring them to tape. Why do I hear this interference, and what can I do about it?—Name withheld*

A Most likely, the cable from your turntable to your phono input is acting as an antenna, and some semiconductor in your system's phono section is rectifying these AM signals, demodulating them into plain audio. (Cable shielding is seldom completely effective and is likely to be even less effective at high radio frequencies, such as the 118 to 136 MHz used by aircraft.)

The simplest cure is to place some ferrite beads on the cables. Some of these beads even let you wind a turn or two of cable through them, which provides some inductance beyond that offered by the beads themselves. The combined series inductance may be sufficient to "choke" the interference—hopefully eliminating it completely. You should place the beads as close to the preamplifier as practical. (Radio Shack lists ferrite beads in its catalog, under "Filters—EMI/RFI Choke Cores.")

You may be able to find interconnecting cables that are better shielded than those you now use. However, cables with better shielding may have considerably more capacitance than your present cables. You may need to compensate for this if you have a moving-magnet cartridge. Your cartridge and preamp owner's manuals may describe the best way to do it.

Are My CDs Defective?

Q *With LPs, you knew on the first play if you had a defective album, but I never really know when I've bought defective CDs. Some of them cannot be played even once, and others play perfectly once or twice, after which I hear dropouts, skips, and so on. Not knowing whether discs are good or not means I'm unable to return the defective ones; too much time goes by between the time I take*

them home and the time the trouble starts. What should I do?—David A. Taylor, Braintree, Mass.

A First, try these discs on another machine. If they play properly, your problem is probably with your own machine; perhaps its optics are dirty or dusty, or maybe its tracking has become marginal. If your CDs are the problem, have you been taking proper care of them? Are you putting them back in their jewel boxes between plays? If not, they may be picking up dust or becoming scratched. Are there fingerprints or dirt on the discs?

If it's the player's fault, have it fixed. If it's your fault, buy a CD cleaning device (get one that rubs across the disc's surface rather than around it) and reform your habits.

Subwoofer Crossover Types

Q *John Sehring's recent article on subwoofer design (July 1995) talks about crossover filters to be used in tape loops. Are these the same as filters that I've seen used between preamps and power amps? Is such a filter better than a typical crossover network mounted in the cabinet?—Name withheld*

A The article described a low-pass filter, used to roll off upper frequencies before they reach the subwoofer. Such filters are usually connected between a preamp and subwoofer amp, so that only the signal to that amp is filtered. Mr. Sehring put his filter into a tape loop only because he used an integrated amp, not a power amp, to drive his subwoofer. You should definitely not put the filter in your main preamp's tape loop, or you'll roll off the highs to your entire system.

If you're using only one subwoofer, you'll also need a network to add the two channels together to get a mono sum signal. If you put this after the low-pass filter, you'll need one such filter for each channel. If you put it before the filter, you'll have to isolate it from the preamp, or your entire system's stereo separation will suffer. If your preamp has a center-channel output, you can use that to feed your subwoofer filter.

A low-pass filter is only half a complete crossover. The other half is a high-pass filter, which keeps low frequencies out of the satellite speakers and allows them to produce more volume with less distortion. The high-pass filter would go between your preamp and the amp that feed your satellite speakers.

The crossover filters built into subwoofers should have the right frequencies for those speakers, but they will vary in quality. These crossovers will also vary in type: Subwoofers having only input terminals but no output terminals have only low-pass filters inside; subwoofers having output terminals usually incorporate high-pass filters, too.

Multiple Driver Impedances

Q *How can multidriver loudspeaker systems present impedances of about 4 to 8 ohms to an amplifier when each driver's impedance is about 4 to 8 ohms?—Alan Fassinger, Rochester Hills, Mich.*

A If you connected an 8-ohm woofer, a midrange, and tweeter directly to a pair of amplifier terminals, the impedance would not be 8 ohms. It would be much higher than 8 ohms if you connected them in series and much lower than that if you connected them in parallel. But drivers are not connected that way. There is usually a passive crossover network, which ensures that the amplifier is mainly feeding to the woofer in the bass range, to the tweeter in the treble, and to the midrange in between. (I say "mainly," because the amplifier feeds two drivers at a time in the region around each crossover frequency; this is true even though there's theoretically only one frequency per crossover at which both drivers are fed equal signal levels.)

In speakers that have active crossovers, each driver is fed from a separate amplifier, with the crossover determining which frequencies go to each amp. Since no amplifier sees more than one driver, combined impedance is, again, not a factor.

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

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What's "0 dB"?

Q *Test reports and spec sheets keep referring to "0 dB," but they don't all seem to mean the same thing. What is it?—Ben Shepherd, Fanwood, N.J.*

A Decibels (dB, for short) are not absolute units like volts and ohms. Instead, they represent a ratio between measurements. We can turn decibels into absolute units by appending a fixed reference to the "dB." Sometimes, we make that reference explicit, as in dB SPL (sound pressure level in dB relative to the threshold of human hearing), dBW (dB relative to 1 watt), etc.; sometimes, however, the reference is only implicit.

In digital audio, "0 dB" usually refers to a full-scale digital signal, the loudest signal that can be recorded digitally. (This is not defined in terms of volts or watts but in terms of the bits involved—a "0-dB" signal's bits are all ones instead of zeros.) Audio has lately been calling this level "0 dBFS," the "FS" standing for "full-scale."

In discussing analog tape decks, the 0-dB reference point may be the level for a signal recorded when the deck's meter reads "0" (a level that varies between models), but it might also be either the recording level at which third-harmonic distortion reaches 3% or a fixed signal level of 250 nWb/m (nanowebers per meter) on the tape. It's up to the author of the article to explain which "0" he's using.

In graphs of frequency response, however, 0 dB is merely a convenient temporary reference, usually the system's output at 1 kHz. A reading of +2 dB at a given frequency tells us that the system's output is 2 dB higher at that frequency than it is at 1 kHz. The reading does not tell us what the system's output is, as this will depend on the input.

Diagnosing a Dead Phono Channel

Q *I have almost no output from the left channel of my moving-coil phono cartridge. My balance control is centered, and I can find no problems with any of the connections. But I did notice that the tracking force was 1.8 grams instead of the factory-recommended 1.5 grams. Could this have caused premature failure? If so, wouldn't both channels have been affected?—Stephen Bruyere, Ottawa, Ont., Canada*

A No, that slightly high tracking force would not have caused the premature failure of your cartridge. When tracking force is too great, stylus wear increases or the stylus bends. Your 0.3-gram error is insignificant.

Did you check the wiring within the tone-arm? Breaks are likely at the terminals where the wire connects to the turntable's output leads. Check all connections between the phono cables and the terminal lugs that attach wires to the cartridge. You can test this wiring by reversing the two channels' leads to the cartridge (be careful not to break those delicate wires). If the same channel stays dead, your cartridge is okay; if it isn't, you'll have to send the cartridge back to the manufacturer or importer for repair.

Audio Accountability

Q *I spend a lot of money on equipment, and I believe much of it is thrown away because manufacturers do not support their products. For example, in the early '80s I bought a cutting-edge surround processor that cost \$1,300; about a year after its introduction, another \$250 bought a modification for use of a remote. (By the way, the company never did offer the remote, just the modification for one.) The processor proved difficult to calibrate and also leaked spurious, tweeter-damaging signals. The maker never offered any adjustment or refund; it just took the money and ran. I find that other companies also lack accountability. It's not the principle; it's the money!—Herb Leibson, New York, N.Y.*

A Did the company "take the money and run," or did it really take the money and fold? I note that the maker of your processor is no longer listed in Audio's Annual Equipment Directory (October 1995 issue).

Many audio companies start in someone's kitchen or garage, led by people who have a dream, good ears, and technical knowledge but not much capital (and, too often, not much business knowledge). Most of these companies want to be accountable, but some never get the chance. They may be swept away by normal business storms or lose their shirts attempting to fix problems they were unaware of until defective products were returned. It might be that in dealing with the adjustment problems you

mention, the company used up the money it intended to spend on producing a remote control. (Obviously, it would have been better if they'd withheld the "remote-ready" modification until they really had remotes to sell.)

I also know of firms whose products were selling very well but whose owners squandered their capital while trying to produce the perfect "whatsit." During the more than 40 years that I have followed the audio field, many companies have come and gone, and very few of the early, pioneering firms remain with us today.

Despite the fact that most audio manufacturers are ethical, there are inevitably some cons around. So if you feel you're due money back and can't get it, and you suspect dishonesty, you should take some action—whether the firm is large or small. If you believe you have a valid case, take it to your state's attorney general, department of consumer protection, or perhaps even to a federal agency. Your local Better Business Bureau can often help, as can your postmaster if the company sells by mail.

Audio Leakage

Q *I have recently noticed faint audio leakage in the right channel of my preamplifier. When listening to the output of my tape deck through the preamp's tape monitor, I can hear the currently selected line source in the right channel. I can also hear it with the tape monitor out and with the volume all the way down. This happens with any source I select and with any setting of the volume and bass controls. Boosting the treble makes the leakage louder. However, when the tone controls are bypassed, the leakage disappears. What might be causing this?—Stephen Savulak, Marlton, N.J.*

A All signs point to a deteriorating decoupling capacitor in your preamp's power-supply system. Since the leakage increases with treble boost and disappears when the tone-control circuits are bypassed, the decoupling capacitor associated with the tone-control circuit is the one to replace. (There are probably separate decoupling capacitors for the left and right channels.) The problem capacitor will be easier to find if you have a service manual for your preamp. Otherwise, you may have to tediously trace circuit-board foils or replace a lot of your capacitors. **A**

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CIRCLE NO. 19 ON READER SERVICE CARD

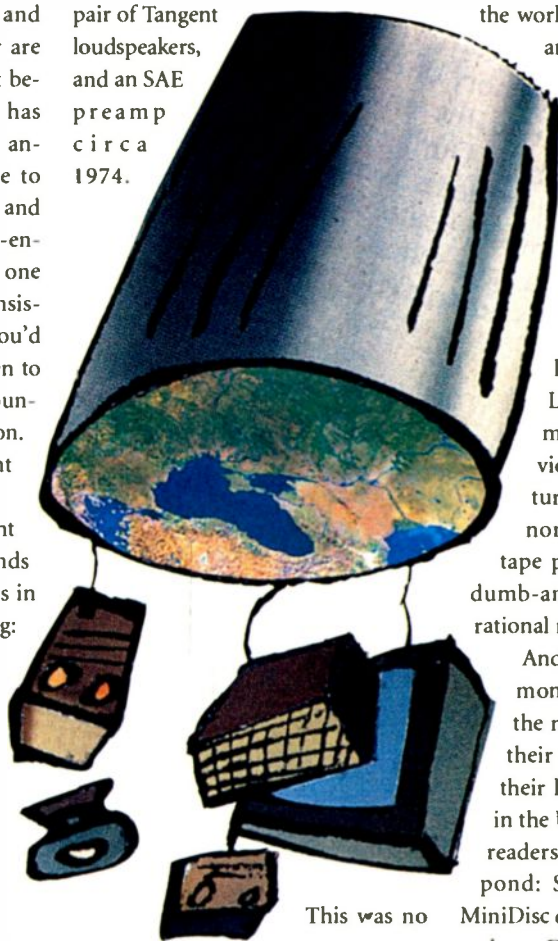
DUMB AND DUMBER

Traveling around the world reveals something dark and dirty about the audio business: You learn that certain countries have become dumping grounds for the home-entertainment industry and that the various markets really are treated differently. (And not just because one country's populace has greater disposable income than another's.) So while we'd all like to think that the world is shrinking and that a can of Coca-Cola in Aix-en-Provence will taste exactly like one you'd slurp in Peoria, such consistency isn't always a given. Yes, you'd probably have to be a cola maven to tell Cokes bottled in different countries apart, but that's an exception. The hi-fi scene is quite different from the soft-drink trade.

Before you gasp at the thought that a particular amplifier sounds different in the Alps than it does in the Appalachians, stop worrying: I'm not talking about sonic variations but actual model availability. It manifests itself in dozens of ways, not just through counterfeiting. (Yes, there are people in this world stupid enough to think that they can get real B & W, Bose, or JBL speakers for \$29 per pair.)

China, as I learned about two years ago, is *the* place to go if you have the hots for something obsolete. I found stores full of the unsold detritus of the Hong Kong hi-fi wars, ancient models that predated the need for an input marked "CD." Sadly, these antiques weren't collectors items, so please don't think for a moment that mainland China is a repository for unused Marantz Model 7s or McIntosh 275s. What I saw

were late '70s Infinity speakers (most with dead EMITs) and Meridian amps from the "chocolate bar" era, when all Meridian products looked like Hershey bars. In one locale, I saw several Musical Fidelity tuners, a pair of Tangent loudspeakers, and an SAE preamp circa 1974.



This was no museum,

however, nor was it a shop declaring itself to be a purveyor of pre-owned goods. This stuff *was* new, but only in the sense that it had never been sold before. Selling it in China was simply a way for distributors in other Asian territories to clear their warehouses by exploiting an unsuspecting public.

Japan, too, has weird little foibles, a result of that country's obsession

with saving face. Rather than risk embarrassment by exporting an utter turkey to the United States or Europe, Japanese manufacturers tend to try out their most bizarre ideas on the locals, knowing that word of such strange wares is unlikely to reach Western ears.

It is therefore with deep regret that I tell you I didn't purchase (or even photograph) the Panasonic combination cassette/radio/electric razor I saw in an Akihabara department store. However, I remain astonished that one of the largest companies in the world failed to realize (1) that an electric shaver produces an unpleasant buzzing sound that will interfere with the enjoyment of music generated by the same device and (2) that the actual vibration from an electric shaver will have some effect on a tape player housed in the same chassis. Like, uh, wow and flutter, maybe? Even though the device was a marvel of miniaturization, no bigger than a normal shaver or personal tape player, its Jim Carrey-like dumb-and-dumberness defies all rational marketing practice.

And yet it persists. In the first months of 1996, we find that the majors still haven't learned their lessons or learned to cut their losses. For what do we see in the United Kingdom? Yes, dear readers on the saner side of the pond: Sony is still beating the MiniDisc drum, while Philips refuses to bury Digital Compact Cassette. The latter is all the more surprising because it was reported more than a year ago in a major British newspaper that the head of Philips, Jan Timmer, had deemed DCC, well, *dead*. But the company just won't give up, no doubt because it must smart to write off millions of wasted guilders.

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price, right? Given that the shops aren't exactly filled with prerecorded DCC tapes (despite a catalog of around 1,000 titles), the format's only appealing aspect is that of a digital recorder on the cheap. And that has been exploited about as far as it can go: You can now buy a brand-spanking-new DCC deck—not just some piece of portable, pocket-sized junk—for £250 in the U.K. That's \$375 for a real digital tape recorder.

But who wants it? Philips—the company that co-invented CD, the first usable and commercially viable optical playback system—continues to contradict itself by promoting a system launched in the 1990s that suffers from physical contact between machine and software. The continued bleating about DCC's backward compatibility with existing analog cassettes wasn't the selling point the Dutch giant had hoped it would be, so physical-contact heads are quite simply a compromise, not a gift.

**PHILIPS REFUSES
 TO BURY DCC
 EVEN AFTER ITS BOSS
 HAS DEEMED
 THE FORMAT DEAD.**

On paper, though, that DCC deck looks like it offers exceptional value for money, especially if you're one of those sad and sorry schmucks who thinks that anything bearing the tag "digital" is automatically wonderful. The analog cassette playback aspects of a DCC deck (full-sized or portable) merely offer convenience. With decent-quality analog tape decks available in the U.K. for as little as the equivalent of \$180 (and acceptable portable players for even less), the analog section of a DCC unit is hardly a point of great value. But for anyone who craves a digital recording system, DCC almost looks good, given the high prices for R-DAT machines.

Since the record industry all but killed off DAT, forcing it into the professional sector (where it serves perfectly in a number of roles), DAT doesn't really succeed as a consumer rival to DCC. The tapes cost more, the hardware costs more, and there simply are no prerecorded DAT cassettes to speak of in European shops. Maybe DCC can ex-



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ploit this, but I rather doubt it. Some suckers, like yours truly, live in hope that CD-R (recordable CD) might one day be affordable. (And Pioneer is taking the lead there.) Others realize that, for portable and car use anyway, analog cassettes are good enough and that CD and LP remain the primary sources for audiophiles.

So that leaves digital recording fetishists with but one alternative, that other virtual-ly stillborn system (at least in Europe) currently undergoing another bout of feverish promotion in the U.K. Hey, I wanted MiniDisc to survive because it had the makings of being a dream all-in-one music carrier. It's optical, so no wear and tear. The disc comes in a protective case. It's small without being impossible to handle (like the microcassettes in dictation machines). And it records. The success of MD would have meant one size fits all: home hi-fi, car stereo, and portable. Playback and record. *Sturm und Drang*. Love and marriage. But there was one problem: It sounded pretty average, certainly not as good as CD.

But, as with DCC, each generation of MD has brought improvement, and Sony has not let early disappointments in the ex-

port market halt the format's development. (I keep hearing that MiniDisc has a great future as a computer storage medium, but the technology for bulk data storage is undergoing a tumultuous revolution because of high-density read/write CDs, new tape formats, etc. So I wouldn't bank on the personal computer being MD's savior.) The latest products are alleged to have improved over the second-generation models as much as the second generation improved over the first.

You have to hand it to Sony. It has promoted MD not just through the hi-fi press but also in expensive, general-interest media. I've seen the ads in film magazines and glossy lifestyle magazines. I even saw one in *Car*, the U.K.'s leading automotive title. And it wasn't just any old ad but an eight-page insert on the kind of paper stock that you'd expect to see used for a Bentley brochure. The ad is lavish, cool, and worthy of the high technology it's trying to sell. The front page is black, with a half-dollar-sized opening through which you read the word "holes." Open to the first spread, and there's a sepia-toned shot of an absolutely wrecked music cassette. Again, an opening

on the right-hand side reveals the word "holes," placed in the middle of the tape's right-hand hub. Then comes the punch line: "There are no holes in our system." Which, of course, is bull, because an MD's shell, just like a cassette's, does have a hole in it (so the drive hub can connect to the disc to make it spin). But that's not the point. Indeed, I'm ashamed that I let such pedantry undermine the work of a brilliant copywriter. *Not*.

Sony has belabored the "holes" thing so thoroughly that you can easily find yourself forgetting it's a premise based on a big, fat misconception on the part of the ad writer. You get a full page about the product's benefits, followed by a lavish spread showing the various offerings: car, portable, home hi-fi, plus midi-system. It's titled "The Future of Tape," the theme recurring throughout this campaign, that MD is the cassette of tomorrow.

And that sets up the other punch line, which the ad writer created without even realizing it. The very last item shown on the page is the MHC-MD5 midi-system, which gives you the works, including (and I quote) "...even a twin-cassette deck." A



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CIRCLE NO. 15 ON READER SERVICE CARD

Multichannel Music Recording

By DANIEL SWEENEY



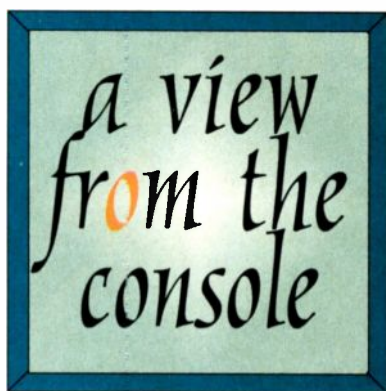
With fully discrete, digital multichannel sound now promising (eventually) to supplant matrixed Dolby Surround in home theater, speculation

has begun to grow that the time is ripe for a serious reemergence of multichannel music recording. For movie and TV sound, the standard format employs "5.1" independent channels: three full-range front channels (left, center, and right), two full-range surround channels (left and right), and a low-frequency effects (LFE) channel that cuts off above 125 Hz. In this country, implementation will be primarily, if perhaps not exclusively, by means of Dolby AC-3 coding, which has been adopted for laserdisc, the U.S. HDTV system, and DVD (digital videodisc) in NTSC TV markets and possibly in PAL markets as well—we should know the answer to that one shortly after this article goes to press.

Multichannel music recording could follow exactly the same path, simply exploiting equipment already in place for home theater, or it could diverge in one or more respects. The high-density discs developed for DVD have so much capacity that data reduction (as in AC-3) would be unnecessary for audio-only applications, yet there would still be room for more channels and longer word lengths (20 bits, for example, rather than the CD-standard 16), if desired,

without reducing playing time from that on conventional two-channel CDs.

Beyond the format question, though not entirely independent of it, is the more fundamental question of whether the music industry is prepared to embrace multichannel recording again. The quadraphonic debacle



of the '70s is still a haunting memory for many people in the music business, and there are so many different ways of implementing multichannel recording and playback that a format war like the one that helped do in quad could easily occur again. Even if that doesn't happen, there's still the question of music-industry acceptance, given the generally short shrift accorded the Dolby Surround matrix by recording engineers and artists. There is a buzz in the air, however, and if nothing else the notion of multichannel music recording will get a second hearing in the audio community.

In the midst of this discussion of multichannel music software, two related questions will be paramount: What use will be made of all these channels by recording engineers (and to what end), and how must the listener configure his playback system to recover the new information most completely? I'll be focusing mainly on the first question here.

The Road Behind Us



The why and how of multichannel sound will ultimately be answered by the recording engineers, not by academicians, and it was to the engineers that I turned for answers about what sorts of listening experiences we might expect from multichannel. In any event, no one's doing much theorizing in the scientific publications anymore. The seminal conceptual work was done in the '60s and '70s, and purely practical considerations dominate today's discussions.

But to understand current thinking, it's helpful to know the foundations on which it is based. Multichannel recording, as it was first presented to the public, was an accompaniment to wide-screen motion picture processes of the 1950s. Millions of Americans thrilled to the high-fidelity multichannel soundtracks of such films as *The Sound of Music*, *Oklahoma*, *Ben Hur*, *Lawrence of*

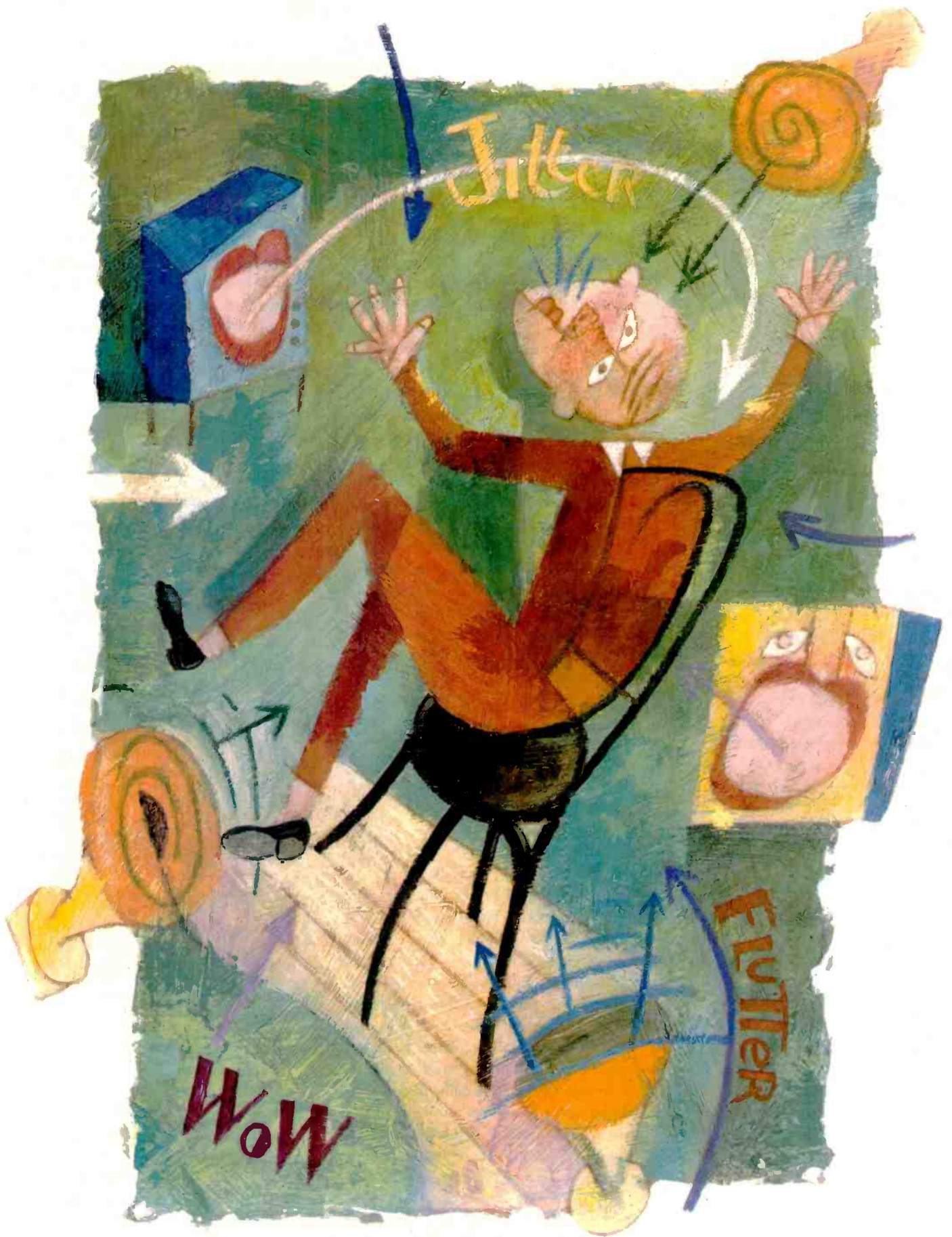


ILLUSTRATION: ANTONIO CANGEMI

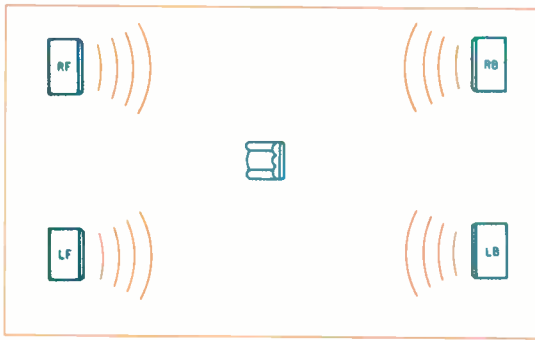


Fig. 1—The classic quadrasonic speaker array, with four identical speakers deployed symmetrically about the listening position in a rectangular (preferably square) array. Ideally, the four speakers would be equidistant from the listener. As in modern surround sound systems, the quad speaker layout preserved compatibility with conventional stereo playback.

Arabia, and *2001: A Space Odyssey*, but the influence of this kind of recording on the music industry seems to have been minimal. Most of the pioneering quad mixers of the early '70s had no experience in film recording. Instead, they tended to think of multichannel as a fairly straightforward extension of stereo music recording, though theoreticians were even then propounding models that were fundamentally subversive to the familiar two-channel paradigm.

It's also interesting that at the time the quad formats were being launched, stereo recording techniques themselves were beginning to splinter. Relatively simple miking arrangements had characterized all types of recording at the dawn of stereo, but during the late '60s the advent of eight- and sixteen-track tape recorders and Dolby noise reduction made possible the "assembled" stereo that has characterized popular music recording ever since. Minimalist techniques became almost exclusively the province of purist classical and, to a lesser extent, jazz recording, where the illusion of a real performance was sought. Thus the quad recordist, in seeking to build upon stereo, could choose either to extend the naturalistic soundstage he was already creating with his basic stereo microphone set-up or to modify his pop studio mixdown

techniques to produce four final channels rather than two. In either case he was simply producing, at least in his own mind, stereo squared.

In the early days, the minimalists seemed to have a clearer idea where they were going in augmenting stereo. Their goals were fairly straightforward, their tools were relatively simple, and the

theoretical basis behind their work was more solid, if for no other reason than that most of the deep thinkers who chose to write about quad espoused the ideal of replicating a performance event rather than producing interesting sound effects.

There were a few early theorists interested in naturalistic recording, such as E. Roerback Madsen in Denmark, who experimented with miking arrangements that owed little to accepted stereo recording practice. However, the usual minimalist technique of the early '70s was to use some kind of basic stereo microphone technique up front, such as angled cardioids or spaced omnis, and then to employ another pair of mikes—often omnis—well back and spaced wide apart. Some theoretically inclined recordists, such as John Eargle, speculated that a fairly dry up-front presentation should be sought from the front pair, with the hall sound consigned mainly to the back channels, but this notion was by no means universally held.

Most minimalists did choose, however, to assign nondirectional diffuse sounds to the back channels and to that end sought to capture an ambient sound field consisting of random-phase information, using a widely separated pair of microphones at the rear of the hall to sample the reverberant field. Both Eargle and David Hafler suggested that cardioids rather than omnis be used in back and that the microphones be turned toward the orchestra if the hall seemed excessively live. Eargle, seeming to anticipate Tom Holman's notion of surround-channel decorrelation, felt that the back pickups should be out of phase to prevent the formation of a rear phantom image.

An interesting variant, described in the literature but apparently never used commercially, was "triphonic" recording, with a

pair of angled omnis up front and close together and a pair of widely spaced figure-eights in back (with nulls facing the orchestra). Each rear pickup represented a pure difference signal, $L - R$ or $R - L$, while the front microphones represented a kind of homogenized stereo, which registered arrival-time differences but not amplitude differences.

Still other minimalists sought to achieve a podium perspective by using directional pickups in all four positions and attempting to place direct sounds beside and behind the listener. Many of the discrete four-channel reel-to-reel tape recordings featured this kind of mid-orchestra perspective.

Finally, there was UMX, later known as Ambisonics. Basically a variant of MS (mid-side) intensity-stereo recording technique, it used a three- or four-channel matrix with two or three bidirectional microphones feeding as many tracks and one omnidirectional microphone assigned to its own track. All microphones were disposed



Symmetry
was a given
in quad;
in today's
surround
systems,
it isn't.

about a single point. This technique stood somewhat apart from what was being sold as quad and achieved negligible success at the time. Most of the interest in Ambisonics came during the late '70s, when the dominant quadrasonic systems (SQ, QS, and CID-4) were expiring.

Interestingly, at the same time that the uncharacteristically systematic Ambisonics approach was attracting attention, many writers on the subject of quadrasonic

recording began to question the ultimate resolving power of a four-channel medium and to stress its limitations in terms of fully re-creating the spatial cues present at a live event. As early as 1970, Peter Scheiber, the father of matrix multichannel recording, had expressed the opinion that four channels did not necessarily represent the optimum number, but only toward the end of the decade did the experimental evidence begin to accumulate suggesting that a greater number of channels might be needed for adequate re-creation of an acoustical space.

But four playback channels remained the norm even for Ambisonics, though it permitted additional channels to be generated from the matrix. Furthermore, the model of four-channel playback adopted by the consumer audio industry, with a square of speakers arranged about a central listening position (see Fig. 1), conditioned the recording practice of the period. It predisposed recording engineers to favor arrangements in which essentially two sets of stereo pickups were deployed—one fore and another aft—despite the lack of any firm theoretical basis for the practice.

In fact, two of the earliest theorists of multichannel playback, Hafler and Madsen, both suggested different models. Madsen advocated a system in which sum and difference components defined a triangular speaker configuration, with common information ($L + R$) being reproduced by a center channel and antiphase difference signals ($L - R$ and $R - L$) each being assigned to side-mounted speakers along the left and right walls (Fig. 2A). Hafler also favored a center-front $L + R$ speaker, with side speakers to the left and right of the listening position. But whereas Madsen would send difference signals to the sides, Hafler would send pure left and right, with an $L - R$ difference signal assigned to a fourth speaker placed directly behind the listener (Fig. 2B). That diamond arrangement later found favor with many in the Ambisonics camp, but the demands for full compatibility with conventional two-channel stereo were too strong, and center channels were seldom seen in dealer showrooms. Years later, when the center channel reappeared in A/V systems, it was kept in line with the left and right speakers, reflecting the speaker layout used in movie theaters.

Despite the chaos and controversy of the quad years and the ambivalence of the record labels toward the whole notion of multichannel sound, a family of miking techniques for quad did begin to develop. But quad miking practice never became anywhere nearly as systematic as its two-channel counterpart, and as with so many other failings of the great quadrasonic experiment, the reasons behind the arrested development of basic recording procedures were largely commercial. According to most of the quad recordists I interviewed—including Dan Graveraux and John McClure of CBS Records, Larry Boden of RCA Victor, and John Eargle—the great bulk of the classical releases in quad were not specifically recorded for quad playback at all, and quad miking never even entered into the picture. Recording for good stereo playback

flanging, and wah-wah pedals all played their part in altering the contemporary consciousness. Nobody I know of in popular music ever developed any specific miking technique for quad; instead, recording engineers attempted to implement quad at the mixing level by means of amplitude panning along each of the four sides (a dubious practice, as we shall see). Those in popular music who embraced quad, and there were many, were often eager to experiment with very aggressive quad mixes with equal output levels at each speaker location, but both the nature of the formats and the exigencies of the marketplace tended to dilute the effects of such experiments. Only one true discrete format, Victor's CD-4, ever won any degree of acceptance, and most of the material released came out instead in SQ or QS matrix format.

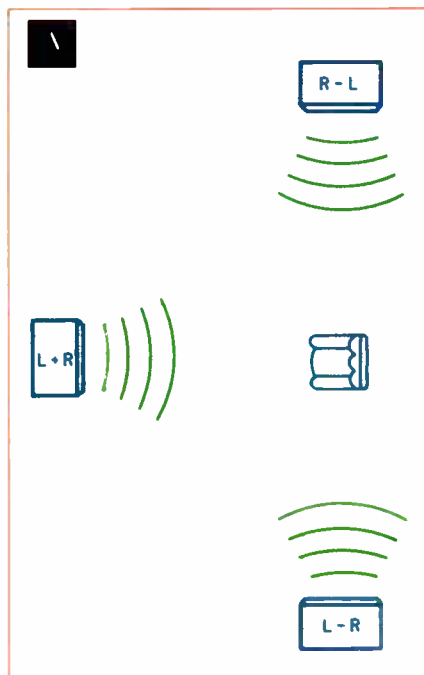
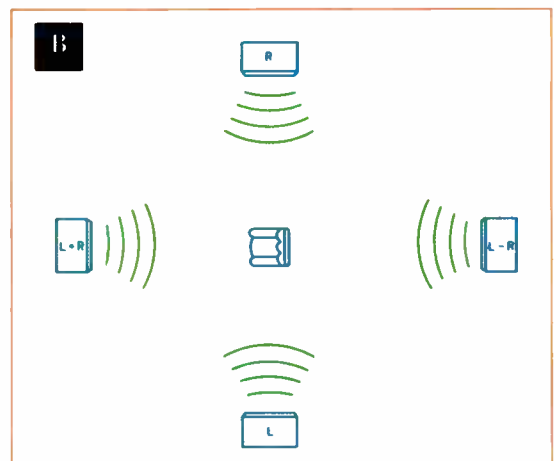


Fig. 2 – Madsen and Hafler proposed alternatives to conventional stereo that placed greater emphasis on reproduction of ambience. Both used a single speaker centered in front for reproduction of a summed mono ($L + R$) signal. Madsen (A) required only two additional speakers, placed to the sides of the listening position, which reproduced difference signals in opposite phase ($L - R$ and $R - L$). Hafler's diamond array (B), on the other hand, sent pure left- and right-channel signals to side speakers and a difference signal ($L - R$) to a speaker directly to the rear of the listener.

remained the overriding concern of the record labels, and stereo material was simply remixed for quad—provided, of course, that the original master tapes were multitrack.

In popular recording quad was, not surprisingly, viewed rather differently. Many saw it as harmonizing rather well with the prevailing musical aesthetic, which favored layered, processed, effects-laden productions in which feedback, fuzz boxes,



The dominance of the matrix formats had a profound impact on quad recording and mixing practice, because these formats did not provide the kind of channel separation all around that would enable pinpoint localization in two dimensions. The SQ matrix maintained decent separation only across the front, so pans in depth or across the back were badly muddled (they tended to be unstable even with fully discrete systems), while the QS matrix had weak separation all around, denying one even a solid frontal soundstage. Without steering-logic decoders to enhance separation, which appeared only in the late '70s when quad was dying, you just couldn't get much in the way of precise directional effects with matrix encoding. You could spread the sound out, but you couldn't place sound

sources precisely away from the front of the room.

And, in any event, the same imperative obtained in pop as in classical recording: Optimize for stereo, and make damned sure the mix is completely mono compatible. Recording specifically for quad considerably complicated matters, so it was almost never done.

The Road Ahead



What about today? How do recording engineers, drawing on 20 years of additional experience, propose to reinvent multichannel?

From my interviews, I'd have to say that most working engineers don't yet have clear

notions as to how to record for multichannel, although it is generally expected that whatever is done will be based on the 5.1-channel layout established for soundtrack recording. Only a handful of engineers appear to have really thought deeply on such matters, and predictably they are among those who are clamoring for a reintroduction of multichannel music software. Interestingly, most began their

careers during or before the quad era and worked extensively with four-channel mixes.

Those who expressed fully developed philosophies of recording for multichannel playback were John Eargle, renowned industry consultant, engineer on hundreds of major-label classical recordings, and currently chief recording engineer for Delos; Tom Jung, chief recording engineer for dmp records; Brad Miller, president of Mobile Fidelity International (not the same company as the more familiar Mobile Fidelity Sound Lab); and Tom Holman, guiding light of Lucasfilm's THX program and an engineer with vast experience in both consumer and professional audio. Though not so well known as a recording engineer and with no history of involvement in multichannel music recording, Holman is known for his championing of multichannel music programming and has an exceptional grasp of the scientific literature on sound localization relating to multispeaker playback. He and Eargle are, in fact, cochairing an Audio Engineering Society working group on optimum formats for multichannel music recording. His insights on 5.1-channel recording were most valuable. John McClure and Larry Boden proved extraordinarily helpful, though both declined to discuss the theoretical aspects of multichannel recording at great length.

The question I asked everyone is perhaps the most obvious: What use do we make of the three channels beyond the stereo pair, and how will such determinations be reflected in recording practice?

"The most significant thing is having a hard center instead of a phantom center channel," asserted John Eargle.

Tom Holman concurred. "The presence of a center stabilizes the image, though not completely. Five channels across the front would be even better—that's the key number beyond which you don't get any improvement."

Other interviewees familiar with experimental literature on the subject agreed. In spite of the notion of envelopment implicit in multichannel surround sound, the frontal presentation was deemed to be paramount and the presence of a center channel of crucial importance.

Nevertheless, one interviewee with considerable experience in recording for multichannel playback strongly disputed the im-

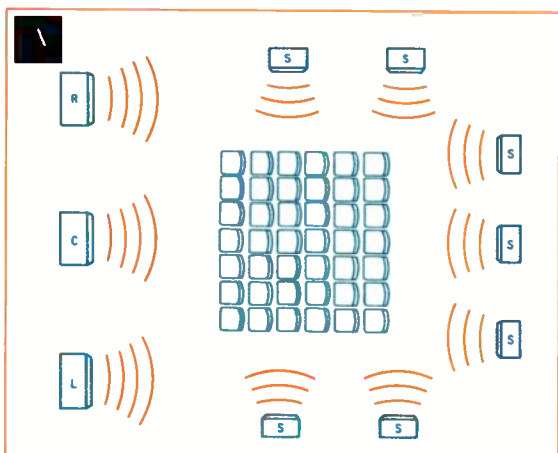
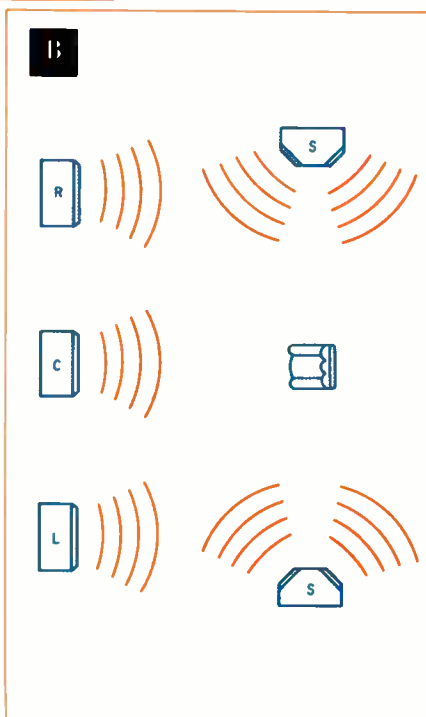


Fig. 3—Today's surround sound layout devotes three speakers (left, center, and right) to reproduction of the front stereo image. In theater systems (A), surround information is delivered by multiple speakers arrayed along the sides and back of the auditorium to provide adequate coverage. In playback of matrix four-channel Dolby Surround, all surround speakers receive the same signal; for the new 5.1-channel digital systems, the surround array is split left and right. The home theater layout (B) is essentially the same, except that the smaller room dimensions eliminate the need for multiple surround speakers on each side of the room.



portance of the center channel. Brad Miller of Mobile Fidelity International had this to say on the matter: "I feel the quad arrangement of four matched loudspeakers in a square is correct and is sufficient to re-create the original sound field if the right recording technique has been used. The fifth [center] channel is valid for film and maybe for some types of music, but I don't think it's generally required for music. I like to maintain symmetry."

Miller's views touch upon a central issue in recording for multichannel playback, one that was rarely discussed back in the '70s because of the overwhelming prevalence of the quad model of four identical loudspeakers equidistant from a central listening position: What is the place of symmetry in a playback system limited to four or five principal channels? In quad, symmetry was a given, but in today's four- and five-channel A/V surround sound systems it is not. Though bilaterally symmetrical, they are not at all symmetrical in the dimension of depth. Just as quad was the stepchild of two-channel stereo, so A/V surround is the stepchild of motion picture surround, and it follows the movie theater model of three channels of information reproduced in the front of the room and one or two channels toward the back. This front-to-back asymmetry is partly a reflection of the inherent frontal bias of a film or video presentation, but it also has to do with what seems to be an asymmetry in our own mechanisms of sound localization.

According to Eargle, who has written fairly extensively on the matter in his classic text *Sound Recording*, and Holman, who addressed the subject recently in this magazine ("Surround Speakers: Confusion, Diffusion, and Resolution," July 1995), phantom images produced by amplitude or phase panning are most stable when formed in front of the listener, less stable and precise behind the listener, and least stable when panned along the sides of the listening position between front and back speakers. If so, that would support not only the concept of a playback system with relatively nondirectional speakers aft, but also a recording technique that would not attempt precise localization in all directions (at least, not without more channels).

Eargle's views on the matter have undergone some recent modification, however. "I now believe," he said, "that it is possible to produce stable side phantoms, but not with a normal quad panpot where you're simply going between a pair of speakers, front to back. You have to redefine the panning function by introducing signals in the other speakers as well, but in certain specific phase relationships. But even then the phantom would obtain only for a single

Many people see 5.1 as the key to a revival of interest in music playback.



listening position. What you really need are more channels—six will do nicely. Alternatively, you could try a higher-order matrix, perhaps a four into six. You might not even need logic enhancement there; the basic separation might be sufficient. When you get the angle between speakers down to 60° or less, you begin to get a stable sound image all around."

Eargle, feeling the topic was important, expanded on it without much prompting on my part. "In classical music the way is clear. For big works you want an offstage effect, direct ambience. You don't want to put sound sources in the back anyway. This is fine for 5% of the music, but what are the pop/rock guys gonna do with the format? They don't have that much ambience to record. I think they will put primary information into the rear channels, but of a very special sort. I also think they'll use the rear

channels to try to widen the soundstage in front. One thing's for certain: We have more to work with than quad did, and we can overcome many of the problems of quad, because every time you have a loudspeaker you have a real source, and we have more speakers now."

Against Eargle's cautious position regarding assignment of sources to the rear channels, which is ultimately based on psychoacoustical studies, are the views of Brad Miller and of the Ambisonics camp. Both insist that with appropriate single-point miking techniques, one can achieve accurate sound-field reproduction with just four channels. Again, Miller is unequivocal. "If you sample the sound field with a point-source array and play back the recording over four matched loudspeakers, you will be able to reproduce the sound field. I've clearly demonstrated this numerous times. Basically, I agree with the Ambisonics position, except that I don't think you need to encode phase difference and I don't like that Calrad microphone they used."

John McClure, who headed CBS Records' classical division in the '70s, voiced an objection of a different sort to the idea of a focused sound field in front and just ambience in back. "We did a number of recordings with orchestra in front, reverb in back, and they could sound very natural. When it is right, you're hardly aware of the rear channels at all. The problem is that those kinds of recordings lack impact. They don't exploit the possibilities of the medium. Multichannel should provide a whole fresh medium for composers. In the past, everyone has been proscenium oriented. Even in the '70s some people appreciated that it [multichannel] could take serious music in a new direction. One night I had Pinky Zukerman, Dan Barenboim, and [the late] Jackie Du Pré over to my place, and I had them listen to some of my discrete masters. They were so excited that they got up and did a ballet in my living room."

Tom Jung of dmp, who has made some surround recordings, takes a pragmatic approach to the appropriate number of channels and the use that should be made of the rear speakers. "I think five channels works out pretty well. Personally, I put more ambient information in the back. I find it distracting to assign things to the rear channels. At the same time, I will pan from front

to back. I appreciate the academic arguments against panning along the sides, but I think they're based on the assumption of the head in a vise. I also think there are possibilities for entirely new types of music if you use the rear channels to place sound sources—things like antiphonal choirs. Why limit yourself to just ambience? We can create ambience through processing and production. We don't have to rely on the recording technique; we can make the decision in software.

"I like to try different things. For instance, I've played around with one channel in back and two along the sides, and that can create a good compromise. I do think that more than two channels in back is overkill, though."

Jung is also pleased with the usual disposition of the front channels in a 5.1-channel layout. "I like the three channels across the front. I like the standup bass in the center channel. In my big-band project, I put the rhythm section up front, in the center, and I had the brass farther back, with a mike on each side in a U shape. I do all kinds of different stuff, though I consider myself a minimalist. On the Bob Mintzer project, I put a Blumlein pair in the center and assigned a separate mike to the rhythm section. I've also used the Calrad Soundfield mike for multichannel, but at the same time I'll use other mikes to highlight what needs highlighting."

Like Miller, Jung also expressed approval of the Ambisonics philosophy. "Ambisonics is very valid. I may make Ambisonics versions of some of my future releases."

Holman, who has advocated the use of 5.1-channel recording for music but with the rear channels confined to reproducing ambience, did allow that more channels would be desirable in back as well as in front. "There is a noticeable improvement going from two to four channels for the surrounds. I also think that you would want to reproduce the dimension of height. There's a high reflection off the proscenium arch that is clearly audible." But regarding the notion that primary sources might routinely be assigned to rear channels, Holman retains his reservations. "I think there's some legitimacy to having an experimental phase to multichannel recording, but the point is we've been through it already in the '70s. We know what works and what does

not work, and we shouldn't be making the same mistakes again."

The Multichannel Recording Session



When it came to actual microphone techniques, my interviewees were typically less forthcoming than in articulating a vision of how multichannel might be used, but Eargle and Holman, particularly, had interesting observations on some of the details of recording practice in the multichannel environment. Eargle thinks that "a new line of second-order mikes will have to be developed, something dedicated to multichannel and unlike anything available now. We need tighter patterns—a regular cardioid has too much spill." Eargle added, "I don't think the Ambisonics arrangement of four supercardioids is the answer. It's fraught with a lot of difficulties. There's too large a dimension from front to back, and you can't take pattern control up all the way."

Holman proposes a different technique. "I think that intensity stereo and single-point Blumlein are hopeless for 5.1-channel. We should be looking at spaced omnis, something like the London tree using large-diaphragm omnis that are deliberately directional at higher frequencies. I don't really disagree with John Eargle's ideas about using more directional microphones, and I'd say the corollary there is using more directional loudspeakers, which is what I've been advocating all along in the THX program."

But McClure, who certainly speaks from experience, argued against the whole notion of developing distinctive microphone techniques for multichannel. "I never saw the need for it. Most of the material we worked with was multitrack, and if you've got 24 tracks you can do it all in post."

Prospects for the Future



On the eve of the second coming of multichannel music recording, considerable uncertainties remain—even among the strongest and the most thoughtful advocates of a multichannel revival. Among recording engineers and pro-

ducers with a more peripheral involvement, and I interviewed a couple of dozen music-industry professionals and hardware manufacturers, the lack of clear notions as to how recordings should be presented in 5.1-channel format is much more apparent. "Recording engineers will fly guitars over the listener's head, and that'll be enough to sell the concept," one pundit ventured. "It doesn't matter what they do, because 5.1 will sell itself," declared another. Time will tell.

By now you may be asking yourself why so few celebrated recording engineers or record producers have been quoted here. Where are the Bruce Swediens, the Rudy Van Gelders, the Tony Faulkners, the Marc Auborts? Larry Boden supplied a ready answer to that question. "Recording engineers are staying away from it, because record labels are not convinced that there is any advantage to promoting 5.1. How do they stand to benefit from it—they're not selling audio equipment, they're selling software. Can they charge more for it, like they did for CD? I don't know anyone in mainstream pop who is recording for 5.1. All the activity is in little audiophile labels. What 5.1 needs to succeed is a champion who is a major star and who is willing to throw all his prestige behind it. I don't see anyone yet." Boden added, "In this business, remember, all hardware developments proceed from software developments."

Holman, on the other hand, stressed the hardware side. "Multichannel movie sound succeeds because everything is standardized—the levels, the playback systems, everything. The music business doesn't have that discipline. Instead, you're going to have all kinds of recording techniques and all kinds of speakers in all kinds of arrangements. Multichannel music recordings could remain a specialty format for that reason."

Within the hardware sector itself, especially the high end of it, such cautionary notes are seldom sounded, however. Many manufacturers see 5.1 as the key to vastly increased sales and a revival of interest in music playback as opposed to home theater. And perhaps it will be, but in the midst of accolades, it might be well to continue to ask what manner of experience multichannel is supposed to deliver. Unless clear answers can be communicated from the sales floor, history could repeat itself. A

PACEMAKER.

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CIRCLE NO. 25 ON READER SERVICE CARD

A photograph of a man with dark hair, wearing a light-colored button-down shirt, sitting in a recording studio. He is surrounded by large, dark-colored studio monitors and speakers. The lighting is dramatic, with strong highlights on his face and arms, and deep shadows in the background. The overall mood is professional and artistic.

when a record

PHOTOGRAPH: STEPHEN HARVEY, ©1995

THE AUDIO INTERVIEW

BY DANIEL LEVITIN

M & K's
KEN KREISEL

KEN KREISEL'S WORKSHOP RESEMBLES A COFFEE IMPORTER'S WAREHOUSE WITH CRATES AND BOXES OF SAMPLES FROM ALL OVER THE WORLD STACKED TO THE CEILING BUT IN KREISEL'S CASE THE SAMPLE BOXES ARE FILLED WITH SPEAKER DRIVERS OF EVERY IMAGINABLE SIZE SHAPE AND COMPOSITION AMONG THE MANY RESPONSIBILITIES OF RUNNING A SPEAKER COMPANY KREISEL PAYS EXTREMELY CLOSE ATTENTION TO DRIVERS HE IS A FANATIC ABOUT NOT LETTING ANY NEW COMPONENTS SLIP BY HIM

KREISEL'S CAREER, AND M & K SOUND'S HISTORY OVER THE LAST 20 YEARS IN MANY WAYS PARALLELS THE MAJOR BREAKTHROUGHS IN HIGH-PERFORMANCE AUDIO IN 1977 KREISEL OPENED THE WORLD'S FIRST

EXCLUSIVELY DIRECT-TO-DISC RECORDING STUDIO AND ITS COMPANION COMPANY REAL-TIME RECORDS THAT SAME YEAR SAW THE INTRODUCTION OF THE VOLKSWOOFER THE FIRST INTERNALLY POWERED SUBWOOFER THIS WAS FOLLOWED BY THE FIRST DIGITALLY RECORDED DBX-ENCODED LP (1979) THE FIRST COMPACT DISCS RELEASED BY A US LABEL (1982) AND THE FIRST TRANSMISSION-LINE DOME TWEETER (1992)

KREISEL'S TWO PARTNERS AT M & K COMPLEMENTED HIS BACKGROUND AS AN AWARD-WINNING RECORDING ENGINEER JONAS MILLER (THE M OF M & K NOW DECEASED) OWNED A RESPECTED HIGH-END AUDIO STORE IN LOS ANGELES CHIEF SCIENTIST LESTER FIELD WAS FORMERLY THE CHIEF SCIENTIST AND VICE PRESIDENT OF HUGHES AIRCRAFT AND HAD BEEN A PROFESSOR OF

ELECTRICAL ENGINEERING AT CALTECH AND STANFORD KREISEL DESIGNED THE FIRST M & K SUBWOOFER TO HELP MILLER SELL MORE ELECTROSTATIC AND PLANAR SPEAKERS HE DESIGNED THE NOW-FAMOUS M & K SATELLITES TO GO WITH IT WHEN HE COULDN'T FIND A SATISFACTORY REFERENCE MONITOR TO USE IN THE REAL-TIME RECORDING STUDIOS KREISEL RECENTLY SPOKE WITH ME ABOUT HIS PHILOSOPHY OF SPEAKER DESIGN AND AUDIO IN GENERAL

D.L.

Daniel Levitin studied physics at M.I.T. before earning degrees in Cognitive Science from Stanford University and the University of Oregon. A recording engineer and producer throughout the 1980s, he has also published over 200 articles on audio and music technology.

*ing engineer makes speakers,
people listen*

THE AUDIO INTERVIEW

There's one thing that has always interested me about the evolution of your company. You started out as a recording engineer and had one of the premier high-fidelity labels in the country. And yet, you decided your initial customer base should be consumers. I would have thought you'd try to get your speakers into studios, since you had initially developed them for your own studio.

It's interesting you brought that up. Of course, before we started making speakers at all, we had a high-end hi-fi store and a lot of people from the recording business were cus-

tomers. For a long time the audio professional and the high-fidelity audiophile never spoke with each other. But these different people would come to our store, and they would communicate with each other. In those days the monitor speakers in the studios were very poor—you had Altec Lansing 604Es, for example...

...and JBL pro monitors.

Right. And Jonas Miller was a dealer for Quad and Magneplanar. In fact, we were one of the world's largest Quad dealers. And I had built some subwoofers to supplement these electrostatics. Everybody, espe-

cially other dealers, thought it was amazing how many Quads we were selling and wanted to know how we did it. Well, it was our compact, single and dual 12-inch subwoofer designs that gave us the sales. I first built 24-inch Hartley woofers in huge

PEOPLE TALK ABOUT DEPTH IN AN LP,
AND THEY SAY,

"OH—LISTEN TO THAT GREAT ROOM AMBIENCE."

WELL, A LOT OF THE "AMBIENCE"

THEY THINK THEY'RE HEARING IS GROOVE ECHO!

transmission-line cabinets (they looked like commercial refrigerators), but the small dual 12-inchers produced better performance and were far more practical. I had also designed a passive crossover and a passive electronic crossover, or if they wanted, we would sell them a commercial active electronic crossover.

People have been making subwoofers for a long time, but in terms of the modern three-piece system, we were the pioneers. One of the guys from Visonik came into our store in the '70s, and he told us that their David speakers were good for installing in

your kitchen or your boat. I thought they sounded fantastic in the mid and high ranges. So we hooked them up to our 12-inch subwoofer. I immediately designed an internal crossover for it and called it the Goliath. Overnight we built a reputable, inexpensive subwoofer. Dealers all over the country started selling Goliath with all their other small speakers.

A sub accomplishes three things. It extends the system's bass response. It cleans up the

sound of the main speakers considerably if it's based on true biampification with an electronic high-pass and low-pass crossover, because then your midrange speakers aren't trying to reproduce the lows, causing excess excursion and IM distortion. And it cleans up the sound of the amplifier, because the amp doesn't have to reproduce the lows, preventing it from going into clipping during heavy bass passages and thereby distorting the midrange and highs.

Do you remember the crossover frequency in your first subwoofers?

The Goliath crossed over at 100 Hz and went down to 20 Hz. As you know, a sealed box speaker rolls off at 12 dB per octave below its resonant frequency. Our other subwoofers of that same period crossed over anywhere from 50 to 100 Hz.

A couple of our customers were Steely Dan's Walter Becker and their recording engineer, Roger Nichols. Walter asked me to design a reference monitor system for them. At the time, they were out at Devonshire Studios recording *Pretzel Logic*.

So this must have been back around 1973 or so.

Right—it was 1973. I built a double woofer that was similar to our push-pull, with two opposing 12-inch drivers mounted sideways in a cabinet. Devonshire's control room was small, but I used this subwoofer along with Magneplanars for the top end. And they loved it; they had never heard a flat speaker system like that before. The studio engineers went home and brought their master tapes into the studio to hear them on this system. So that's what got me into speaker manufacturing, because these subwoofers were such a hit.

Was your subwoofer powered at this point? It was biamped, with a separate amplifier, but at that point it wasn't our amplifier. I think we set them up with a big Phase Linear or Crown.

Roger Nichols told me that the only reason he and Walter Becker didn't stay with that speaker setup for Steely Dan's next album

S-1C Satellite Speaker

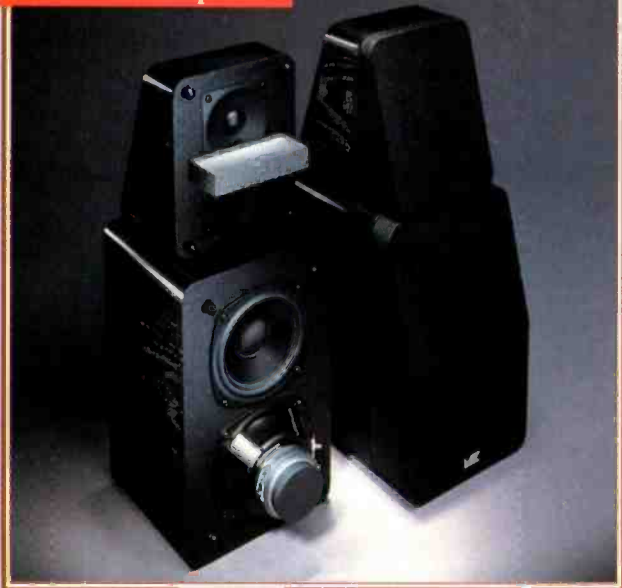


Photo: Courtesy of M & K Sound

KEN KREISEL

was that there was always the problem of where to put the subwoofer in other studios. Studio control rooms aren't usually designed to have subwoofers, and space is at a premium.

Yes, you're absolutely right. That is the biggest problem in most studios.



Where do you get your speaker drivers?

Our midranges and tweeters are made for us mainly by Peerless in Denmark, and Eminence makes most of our subwoofer drivers. All of the drivers are made to our exact specifications. Our MX-5000THX subwoofer driver is made for us in Japan. Expensive, specialized tooling was required to satisfy its unique design. I have dozens of new, lower-cost driver samples that I'm plowing through, and I'm really excited about some of them. I didn't want to get into the lower end of the market, because it's usually a major compromise. But we are at a technological point now where we can build quality into a lower-priced speaker system.

What's your favorite speaker?

The original Quad electrostatics. I keep a pair of them hooked up, just to keep me honest.

What are the best and the worst things about them?

They're very accurate for tonality and imaging: You record something from a foot away, and it sounds a foot away. But they don't have anywhere near the dynamics you need.

One of the things that has changed since you started is the emergence of the CD as the standard. Your RealTime records kept a lot of audiophiles in vinyl because of their high, direct-to-disc quality. Have you thought about releasing any of those on CD?

Yes, we're eventually going to release all of the albums on CD. And I'm releasing some new recordings on CD, too, in the near future. I've built a mastering studio at my house, and I'll be mastering those new releases and the reissues myself, using Wadia 20-bit converters.

I'm also excited about a new piece of test equipment I just got, the Audio Precision System One Dual Domain. It has digital ins and outs, so you can check D/A and A/D converters. And you can test speakers. It has an MLS [maximum-length-sequence] test, which we don't really use because I have

three new DRA Labs MLSSAs [pronounced Melissas] in three separate units.

What's your opinion about vinyl versus CD?

If you listen to a phono system and it sounds more real to you, I say that's great, because it's what you want. But don't believe that because it sounds more real to you that it is more nearly perfect technically, because it probably isn't. One of the biggest revelations for me was the experience of disc cutting: I realized what a limited medium the LP is. People have no idea how much intermodulation distortion is on an LP, particularly music with very heavy bass—for example, organ music. You can have tens of percent of IM distortion. And when people first heard digital, many said, "Gee, it sounds like a lot of the notes are missing." Well, there were notes missing—the IM distortion was missing!

Tom Stockham said something interesting to me about this. He said if you put a group of audiophiles in a studio control room and ask them to choose between an analog tape and a digital tape of a performing group, a great many will choose the analog tape. But if you ask them to choose between the tapes and then let them compare the sound to the group performing live in the studio, most will choose the digital. So without a reference, they prefer the sound of distortion.

I believe that's true with some listeners. People talk about depth in an LP, and they

say, "Oh, listen to that great room ambience." Well, a lot of the room ambience LP listeners think they are hearing is groove echo! When you listen to an LP, you can easily hear pre-echo right before a track starts and post-echo when it ends. And that's going on all through the LP! There's an "echo" button on cutting lathes that spreads the grooves apart before and after a transition from a quiet passage to a loud one, to reduce the intergroove echo. But that uses up a lot of space. If you used that all the time, you'd only be able to get seven minutes on a side.

What people don't realize is that on an LP, you're constantly listening to a lot of pre- and post-echo, conveying an artificial depth that was never heard by the microphones, while intermodulation distortion is generating "notes" that nobody actually played. Then there's harmonic distortion, which can reach the tens of percent, introducing harmonics that were never produced by the original instruments. (I'm not saying it doesn't *sound* great, because it can.) Then, to add insult to injury, the high-frequency response of an LP rolls off as you get farther in toward the center, not to mention the increase in distortion.

Getting back to speaker testing, would you explain MLSSA?

MLSSA [maximum-length-sequence system analyzer] is a device developed by Doug Rife for testing speakers anechoically in a reverberant environment. It does everything. You can test frequency response, distortion, coherence, reverberation time—you can make any kind of analysis of a speaker or room both in the time domain and in the frequency domain. A new beta software version enables, for the very first time, accurate Dolby Surround speaker-level calibration in a room, consistent with the time-domain characteristics of the human ear! Truly a revelation.

What kind of microphones do you use for speaker testing?

The B & K 4133 omni, exclusively.

You've gotten into the home theater market in a big way with Home THX speakers.

What are the unique problems associated with designing for THX?

First, there's a lot of confusion about what THX is. THX is not a multichannel encode/decode system like Dolby Pro Logic or Dolby AC-3. THX has nothing to do with

THE AUDIO INTERVIEW

encoding and decoding an audio signal. It's a set of standards originally for theater sound and is now for home theater, too. So it is not a competitor of Dolby Surround. It all goes back to the late 1970s and *Star*

sorption materials—measuring distortion and frequency response and, for speakers, horizontal and vertical dispersion characteristics. They then came up with a blueprint book of how to build a great theater speaker system and improve acoustics. So if a theater wants to join, they pay a fee to Lucasfilm. Then they pick a tweeter from column "A," an amplifier from column "B," and so on. The theater installs the equipment in accordance with these standards, and the THX people measure their equipment and calibrate the theater to make sure the sound system meets these specs.

So the THX people are like independent auditors.

Right. And that's what it means to have a commercial THX theater. What they did for Home THX is similar. They set standards for electronics (for Dolby Pro Logic and AC-3 surround decoders/con-

trollers, internal electronic crossovers, power amplifiers, equalizers, and cables) and acoustical standards for speakers (for front-channel speakers, surround-channel speakers, and passive and powered subwoofers). Home THX equipment must meet or pass these standards, which call for additional signal processing to make the listening ex-

A Dolby Stereo movie theater, whether it's THX or not, at least has to meet certain calibration standards; for example, the sound pressure level [SPL] is set; there's a reference level throughout the film industry. Holman once said that the difference between home and theater systems is that the theater has no volume control. In the theater, the entire chain, from the studio to the theater, is controlled. The average dialog has to be at 85 dB SPL, and when they set up the theater it has to measure out at 85 dB SPL at a certain distance from the screen.

That's pretty loud.

That is pretty loud, actually. And depending on whether it's an optical, a Dolby SR, or a digital print, the maximum SPL can be 20 dB above that, which is 105 dB SPL.

In the home, there are different THX standards for different components—there's a spec for the front speakers, the subwoofer, the processor, the amplifiers, the equalizer, etc. True, a calibration engineer does go into the theater and not always into your home. But George Lucas's philosophy is that because his company itself makes movies and because it designs, calibrates, and controls THX dubbing stages and theaters, then it knows what the movie is supposed to sound like in the theater. Lucasfilm wants to get that same calibrated sound into the consumer's house without the engineer showing up. If you purchase all THX components—processor, amp, and

speakers—Lucas says you'll come pretty close.

It seems impossible! Lucasfilm and the equipment manufacturers have no control over where somebody's going to put the speakers—whether they're going to be on a carpet, on a stand, or hanging off the ceiling—

and they don't know if the room's carpeted or if it's got parallel walls. . . . It just seems impossible, unless you can design a speaker for which the room acoustics are relatively unimportant.

Well, that's exactly what they did. Or what they attempt to do. And it's actually not much different from what we found out

S-5000 THX Satellite Speaker



Photo: Courtesy of M & K Sound

Wars, directed by George Lucas. That was one of the first films encoded with Dolby Surround, which is played back in the home through what is called Pro Logic decoding. Before that, you had to go to a six-channel, 70mm-equipped theater to hear surround sound, and there weren't a whole lot of those around. But Dolby Surround gave the more common 35mm theaters a chance to have surround sound.

Originally, there weren't any standards at all for theater sound systems. Around this time, George Lucas's company, Lucasfilm, formed a division that set standards for theater sound. Those

standards were eventually called THX; some people say it stands for the Tom Holman Experiment [Tom Holman originated the program]. The first thing they did was to come out with a special crossover for theater speakers. Then they took it another step: They tested a bunch of equipment—woofers, tweeters, amplifiers, sound-ab-

SUBWOOFERS HAVE BEEN AROUND FOR A LONG TIME, BUT AS FOR MODERN, THREE-PIECE SYSTEMS, WE'RE THE PIONEERS.

perience consistent with sound heard in a studio dubbing stage or THX movie theater. *But it sounds like there's a huge difference. THX engineers actually go into the theater and make sure that the acoustics of the room conform to an exact standard. But they're not going into your home and checking out your living room.*

15 years ago when we were designing our studio monitors, and this is related to experiments that Tom Holman did a number of years ago.

The idea is that you want to make a speaker directional vertically. In many cases, the first reflection is going to be off the ceiling or the floor, and you don't know anything about that surface—whether it will be carpeting, a hardwood floor, a hard ceiling, a beamed ceiling, or whatever. So how do you make the speaker vertically directional? You stack the drivers. Do you remember our S-1 speaker from 1978?

Yes. It had a pair of tweeters stacked on top of a pair of mids.

Right. If you look at most THX front speakers, you'll see they have two or three tweeters on top of each other, to make them vertically directional. This is to achieve the directivity spec. Our S-100Bs have three stacked tweeters. Two versus three tweeters affects how the speaker lobes. The technical reason for how you get directionality is this: When you're between the two tweeters, on axis, the distance between the tweeters and your ears is the same. As you move off axis, you become farther away from one tweeter than the other. If you're half a wavelength away, the waves completely cancel each other out, resulting in no output at that frequency at that angle.

So you end up with sweet or sour spots, depending on where you're sitting.



Right. The whole point of THX speakers is that they're designed to be listened to exactly on axis, vertically, about $\pm 5^\circ$. It doesn't matter what their actual height is, as long as the drivers are pointed right at your head.

One of the things we developed here, and the new S-1C uses this, is our unique foam technique. We use a very high-tech piece of

foam. For many years I was unable to find the correct piece of foam or felt that would do what I wanted. I had wanted to do this with the original S-1s, but I couldn't find the material.

Because the wrong foam is going to absorb too much?

No, just the opposite. Most people think that foam and felt are absorptive. But they're actually both reflective and absorptive, depending on the frequency. For some frequencies the sound is absorbed, and for others it's like having a piece of wood there. You wind up with something that's worse than not having anything at all.

For years, wherever I've gone, when I've seen a new piece of felt or foam, I tried to take some with me to experiment with. I had the intuition that felt wasn't the right thing. In fact, it turns out that it's too reflective where you don't want it to be; most foam stuck on studio walls is reflective at some frequencies.

Which frequencies are we talking about?

The midrange or, sometimes, the high frequencies. It depends on the density and thickness of the material. The foam we're using now is the most absorptive and linear that I've found, without being reflective.

On your S-1Cs, why do you place the foam between the tweeters?

When you're on axis, it doesn't make any difference. But remember, as you move above or below the axis, you can get some very deep,

complete dips in response. With the foam in there, as you rise above axis, the foam starts to attenuate the bottom tweeters and you don't get the cancellation. If you have two drivers putting out the same signal level, you can get an almost infinite cancellation dip. But as soon as you attenuate one driver—it could be by as little as 3 dB—all

of a sudden you don't get that severe cancellation. So that's what the foam does: It controls the off-axis lobing.

And the foam on the sides?

That just breaks up the diffraction effects off the edges of the cabinet.

It seems to me there are two design philosophies that are at opposite extremes.

On the one hand, you could design a speaker that is so insensitive to the room that it will sound remarkably similar no matter



where you put it. But most speakers, on the other hand, aren't like that. They are tremendously sensitive to the room's acoustics. What are the trade-offs in the two designs?

This has been a driving philosophy since I got into this business, in both the recordings and the speakers. I started recording music when I was nine years old; my sister was a singer. I've always had a concept of what recorded music should sound like. As a listener, I've always been interested in hearing the instrument or the voice. I want to hear the room that it was recorded in, not the room I'm playing it back in. I love headphones for that reason. And if you listen to a pair of original Quads, they sound like really big headphones—very directional vertically and very transparent.

You've always tried to get away from playback room reflections.

Right, and that's how the S-1 came about. If you're sitting in a control room, you don't want much vertical dispersion.

Photo: Courtesy of M & K Sound

Photo: Stephen Harvey, ©1995

THE AUDIO INTERVIEW

But you're still battling with a cabinet that has a resonant frequency and a back wave, as opposed to the Quads.

Well, a planar speaker has both a resonant frequency and a back wave, too. In some cases, the resonant frequencies are not very well damped. We always put absorptive material in our cabinets to deal with the resonant frequency.

The original Quads are totally different from other planar speakers: They are true dipoles. For the back-wave problem, they put a felt pad behind the tweeter and midrange. So it's dipole in the bass, but most of the rearward mids and highs are absorbed by this felt pad.

What first got you thinking about minimizing the reflections in speakers?

I first met Jonas Miller in 1969, my last year in high school. Back then, Lester Field, who is now a partner in M & K, was the chief scientist and a vice president at Hughes Aircraft. His hobby was acoustics. On one of his family vacations, I tagged along and went to Bell Labs with him, as well as to some other important acoustic research labs, to see what they were doing. When Field was at Bell Labs, he co-invented the traveling-wave tube with John Pierce, who was head of the lab at that time.

We spent a couple of days in Bell's acoustics lab. I'll never forget one of the experiments; it literally changed my life and my outlook on this whole business of room environments. They had set up an array of speakers in an anechoic chamber. You sat in a chair, and the speakers were all at different distances from you, lined up in a row leading away from your head. Your task was to tell them which speaker was playing. The volume was normalized, so the levels reaching your ear were the same. The amazing thing was that you couldn't tell which speaker was playing! The recorded voice appeared immediately in front of my face, regardless of the speaker distance. I was shocked. You take away the room reflections, and you don't know how far away the speaker is! This is what I was looking for!

Since you can't go into everybody's house and take away the room reflections, how do you design that quality into a speaker?

The first thing you do is make it directional. One of the reasons this doesn't work with most speakers is because the drivers or the crossovers are no good. So you can't accurately hear the room environment on the recording; you rely on reflections bouncing around the room to enhance the "sense" of ambience. The one criticism I have of many audiophiles who talk about ambience is

If you design a speaker that's reasonably directional, and it's not right next to a side wall, most of the audible changes in the sound as a function of the room occur below 500 to 800 Hz.

Years ago, at the advent of third-octave equalizers, I took a Dayton-Wright electrostatic speaker and a JBL speaker and equalized them for identical anechoic frequency responses. Lo and behold, the speakers sounded very much the same! That is 80% of the speaker's sound. At our store, years ago, we had every top-end speaker in the

world. I realized that the Rogers and the Spondors, the BBC monitors, the B & Ws, and the KEFs all had an acoustic family resemblance: a "British" sound, based on their anechoic and room frequency response. The same was true of German speakers (like those from ADS, Visonik, and Braun) and

American speakers (such as JBLs and Altec's). The most interesting thing was looking at the Fletcher-Munson curves and realizing that these companies had optimized their speakers for the different listening levels typical in their regions.

Do you think there's a psychological effect of infrasonics, frequencies below the threshold of hearing?

It couldn't hurt. Normally, our subwoofers are anechoically flat down to 15 or 18 Hz, and they roll off 12 dB per octave from there. We do active processing to achieve flat response down to about 15 Hz. According to Dolby's research, there is usually room gain of 12 dB per octave below about 30 Hz. So actually, at 20 Hz the room gain boosts our subs by about 8 to 10 dB. But because the ear isn't so sensitive in this range, as you can tell from the Fletcher-Munson curves, it's not bad to have it there.

This is a little off the topic, but every speaker you have here has its grille off. What percentage of your customers do you think leave them off?

Well, I would guess that if the owner is a man and he's married, he's going to leave the grille on if he wants to stay married! A

A S A LISTENER, I'VE ALWAYS BEEN INTERESTED
IN HEARING THE INSTRUMENT OR VOICE.
I WANT TO HEAR THE ROOM
THAT THE MUSIC WAS RECORDED IN,
NOT THE ROOM THAT I'M PLAYING IT BACK IN.

that they're hearing ambience not in the recorded music but in listening-room reflections or sound bouncing around inside the speaker cabinet. For example, some people say they love dipole front speakers and comment about their "wonderfully accurate depth." In many cases what they are actually hearing is the sound bouncing around the room from the back of the speaker; they're not listening to ambience that the microphone ever heard.

What else did you learn at Bell Labs?

It got me thinking about baffle coloration. How does the box color the sound? So I thought, "Let's put the drivers in the right-sized box." And I put a lot of research into figuring out what that was.

Recently, I listened to three top professional studio engineers who were talking about room equalization. One was from England, one was from the East Coast, and one was from the West Coast. And do you know what they argued about? The frequency above which they would not touch the EQ controls, even though their real-time analyzers said the speaker response was not flat. For one it was 600 Hz, for another 1,000. ...above that frequency, they knew that they could not believe what the RTA showed them.

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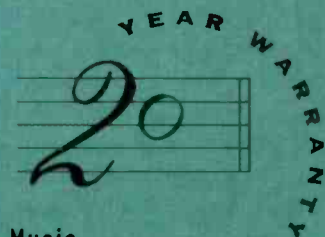


Bryston ST amplifiers, from the top: 8B ST 4 channel 120 wpc, 5B ST 3 channel 120 wpc, 4B ST 250 wpc stereo, 7B ST 500 watts mono. Not shown is the 3B ST 120 wpc stereo.

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PIONEER ELITE PDR-99 CD RECORDER



Ever since the Compact Disc rocketed into the audiophile firmament, enthusiasts have wanted to know where they could get their hands on a CD recorder. Rumors abounded, but for many years, the real McCoy existed only in the research laboratory. Somewhat over a year ago, Pioneer introduced the PDR-09, a rather pricey \$4,000 system that reportedly was less than user-friendly. But it did record! The company has just launched the PDR-99 in its Elite line, and by the time

you read this, the PDR-05 should be available in its regular line. Since the two are priced similarly, \$2,000 for the PDR-99 and \$1,950 for the PDR-05, why not be Elitist?

Audiophile CD recorders undoubtedly got a shot in the arm from the computer industry, where CD-ROMs are the going thing and the need for recordable mass storage is widespread. Recordable CDs for audio and for computer use look the same and technically are the same except for one little thing: Recordable CDs (CD-Rs) for computers can handle 74 minutes of recording, while blank audio discs are currently limited to 60 minutes. There's no technical reason why an audio blank can't accommodate a maximum-length (74-minute) CD; it's just a concession to the record industry.

Audio CD recorders check the coding of each new blank and burp if you try to slip them a computer disc. (I did manage to get the PDR-99 to take an old computer blank,

evidently manufactured before coding came into use, but not any of the newer ones I had.) Recordable CDs are WORM discs, an acronym for Write Once, Read Many. Unlike magneto-optical discs, such as MD, which are rewritable, you get one shot at recording these babies. As you do, the PDR-99 creates a temporary Table of Contents (TOC), which tells the system where each track starts and stops, its number, and so forth. You can edit the disc only in the sense that you can instruct the PDR-99 to skip failed recordings. Thus, you're not erasing the recording, just telling the system to ignore it (so any boo-boos you make reduce the total recording time).

When you've finished recording, you "finalize" the disc, a process that takes about 4 minutes on the PDR-99. During this operation (which cannot be interrupted), the temporary TOC (including skip instructions) is transferred to a permanent TOC that can be recognized by standard CD players. Until the disc is finalized, it can't be read by ordinary players, only by CD recorders; once the disc is finalized, it can't be edited or recorded on again. Such is the penalty for producing a universally readable recordable CD (magneto-optical discs, which *can* be re-recorded, are not readable by conventional CD players).

The PDR-99 features Pioneer's Stable Platter mechanism, which supports the full disc instead of just its center. This is to reduce resonance, disc sag, and vibration, all of which are thought to induce jitter and the sonic aberrations it might cause. This mechanism requires that the disc be placed "upside down"—that is, label side down and shiny side up. The Stable Platter system is complemented by a chassis and mechanism designed to minimize resonance and vibration. A new three-beam differential push-pull laser pickup reads the disc. The A/D converter is a 1-bit "Pulseflow" design that theoretically eliminates distortion at axis crossings.

The PDR-99's D/A converter is mated with a second-generation Legato-Link S circuit, which Pioneer says "extends the CD's 'musical response' for audibly improved high-frequency detail and transparency." By applying a newly developed algorithm that "psychoacoustically, and more accurately, restores the frequency content lost in digital recording," this circuit is said

Dimensions: 22½ in. W x 9¾ in. H x 15¼ in. D (57 cm x 24.3 cm x 38.6 cm).

Weight: 15.1 lbs. (6.8 kg).

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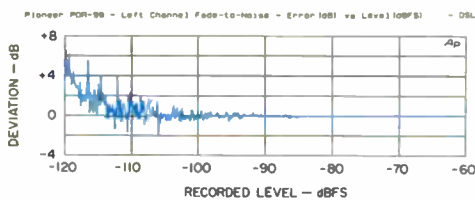


Fig. 1—Fade-to-noise test.

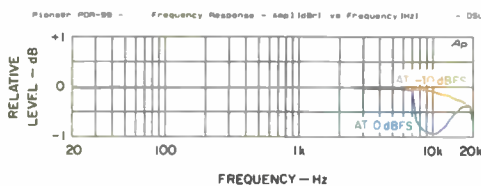


Fig. 2—Record/play frequency response, analog input.

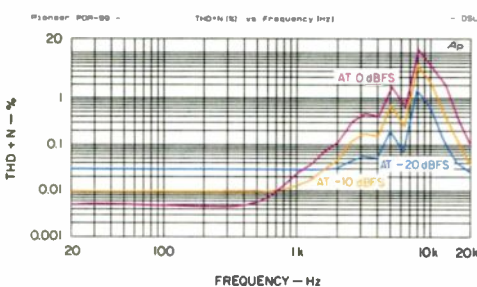


Fig. 3—Record/play THD + N vs. frequency, analog input.

to “mirror the characteristics found in a naturally occurring sonic event.”

The recorder has one set of analog inputs and one set of fixed-level analog line outputs on back, all with gold-plated RCA jacks. (There’s a gold-plated headphone jack on the front, along with a headphone level control.) Optical and coaxial digital inputs and outputs are on the back, the latter using base-metal RCA jacks. (A slider on the back switches the digital outputs off.) The active input is selected by a front-panel pad, so in theory, three sources can remain connected. “Control In/Out” jacks enable connection with Pioneer equipment carrying the “SR” mark. When this wired control system is used, the PDR-99 ignores its remote and is operated by signals relayed through the cable from another Pioneer component.

The “REC Level” and “REC Balance” controls function only with analog sources; direct digital copying needs no level setting. For digital dubbing, the PDR-99 has a sampling-rate converter for transforming 32- or

48-kHz sampled data (from a DAT, digital-radio broadcast, or whatever) to the 44.1-kHz rate required for CD. “REC” and “REC Mute” buttons stand to the right of the “REC Level” control and are separated by a bright “REC” LED that illuminates when the deck is recording. Beneath are buttons to set and clear “Skip ID” codes that control which tracks will not be played when the adjacent “Skip Play” button is pressed.

Front-panel transport controls are conventional except that the same pads are used for both track and manual search. Tap them lightly to skip to the next track or back to the beginning of the current track; hold either pad down to search the current track. (There are separate pads for track search and manual search on the remote control, which I find more convenient.) On the left of the panel are “Power,” “Input Selector,” “Digital Synchro,” and “Finalize” buttons, along with one that chooses automatic or manual track numbering, one to “Write” track numbers (in the manual mode), and another

(despite being labeled “Display Off”) to cycle through full display, a display without level indicators, or a dark panel.

Recording is simple. When you’ve loaded a disc and it’s recognized as an unfinalized CD-R (this takes a few seconds, with the display alternating between “CD?” and “CD-R?”), the PDR-99 reads the TOC and indicates that it’s doing so. If the disc is totally blank, the display indicates “New Disc.” If it’s been partially recorded but not finalized, the display briefly shows the last program number and time before cueing to track 1. If the disc has been finalized, it’s recognized as a CD rather than a CD-R; further recording is not possible.

To make a digital dub of one track from a CD, DAT, MD, or DCC, you select one of the PDR-99’s digital inputs, make sure that the source player is stopped or paused, and press “Digital Synchro” once. When you start the source player, the PDR-99 automatically begins recording. Don’t start play until the PDR-99’s “Sync” legend blinks, indicating that the PDR-99 recognizes the bit-

stream (that comes from the player even when it’s stopped) and is ready to go. After you copy one track, recording stops. To record multiple tracks in succession, you follow the same procedure except you press “Digital Synchro” twice. The display shows “AL-Synch,” and recording continues until the last track has been recorded or until you press “Stop.”

To make an analog recording, you select that input, press “REC,” set the recording level and balance (guided by the meter’s eight segments and “Over”), and press “Pause” or “Play” to start. Track numbers are written sequentially as each recording begins. You can also write the next track number by pressing “Manual/Write.” (The PDR-99 defaults to manual numbering when recording from the analog input.) During digital dubbing, the track count advances each time a new source track number is detected. However, you can record manually from a digital source by pressing “REC” instead of “Digital Synchro” and following the rest of the procedures for recording from the analog input. This is helpful when you’re recording from a source that doesn’t have track numbers. Note, however, that the PDR-99 will record only digital audio signals; you can’t dub a CD-ROM.

To ward off mistakes, finalization of the disc is a multistep procedure. When you press “Finalize,” the display asks you to confirm (“Final?”), at which point you

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press it again. The recorder reads the temporary TOC and displays the time remaining on the disc. When the time appears, you can then press “Pause” to commence actual finalization.

Playback features are fairly standard. You can cue tracks by number, via the remote’s keypad, or advance through them manually with the program-skip buttons on the panel or the remote. You can elicit random playback via the remote or program your

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CIRCLE NO. 16 ON READER SERVICE CARD

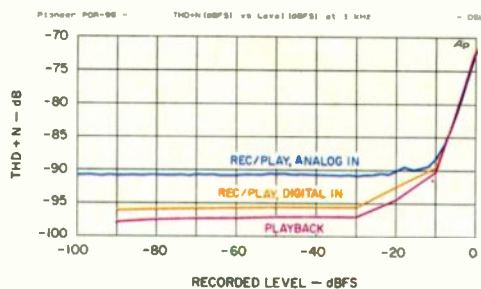


Fig. 4—THD + N vs. level.

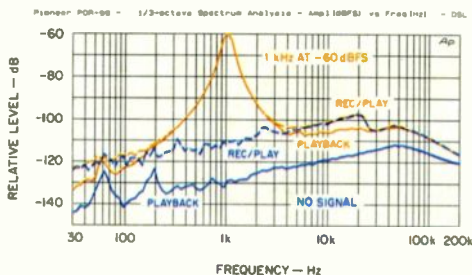


Fig. 5—Spectrum analyses for record/play (via analog input) and for playback.

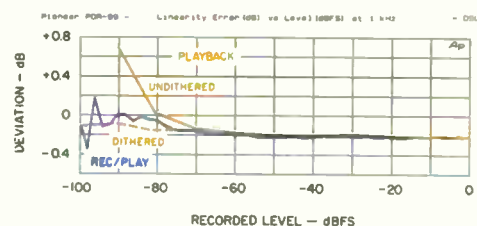


Fig. 6—Deviation from linearity for record/play (via analog input) and for playback.

own selections with the remote's "PGM" button and its numeric keypad; the "Clear" and "Check" buttons are used to correct mistakes and confirm your selections. You can repeat a single track by pressing the remote's "Repeat" key once or repeat the entire disc by pressing it twice. If you're in programmed or random mode, pressing "Repeat" twice repeats the programmed sequence or yields repeated random play.

Via the remote's "Time" pad, you can choose to display the elapsed or remaining time during recording; in playback, you can view the elapsed track time, remaining track time, remaining playing time on the disc, or the CD's total playing time. When the Elite PDR-99 is in record or record/pause mode, you can check the time remaining on the disc by tapping the front-panel "Display Off" button.

The remote permits fading in and out during recording and playback. If you press "Fader" while in record mode, recording stops in about 5 seconds. A 3-second fade begins automatically when the available recording time runs out. Four-second silent passages can be written to the disc by pressing the "REC Mute" button on the panel or the remote. Like all other consumer digital audio recorders, the PDR-99 "features" SCMS copy protection.

Measurements

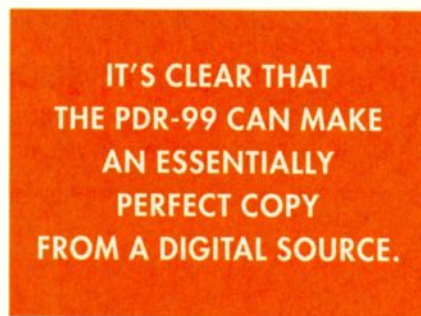
It was difficult to stifle my curiosity about the PDR-99's recording ability and stick to a logical sequence by testing it first as a CD player. (As with any recording device, playback characteristics must be determined before trying to interpret any record/play measurements.) Except for some effect from the Legato-Link S conversion system, I expected the PDR-99 to perform pretty much like any good player. Imagine my surprise, therefore, when I ran a frequency sweep and found an almost 1-dB dip throughout the octave from 7.5 to 15 kHz. Hmmm! Surprising, but I guess not all that bad.

Next, I ran a distortion test and found that total harmonic distortion plus noise (THD + N) was admirably low in the deep bass (less than 0.004% at and below 250 Hz) but increased to 0.009% at 500 Hz, kept rising, and reached a peak of 12.3% at 8 kHz. Furthermore, this was real distortion, predominantly odd-harmonic, not the result of intermodulation with the sampling component. Above 8 kHz, odd harmonics beyond the third were reduced by my analyzer's 22-kHz low-pass filter, which explained why the curve dropped above that point. At 4 kHz, fifth-order products also were present; in the lower-frequency region, the distortion appeared as "ringing" where the signal waveform crossed the zero axis.

At first, I suspected my test setup, but when I fed the Pioneer's digital output to a D/A converter in my lab, the results were fine. A call to Pioneer revealed that Legato

Link does exhibit somewhat higher distortion than traditional converters (presumably intentional, to simulate the ultrasonic harmonics assumed lost in the recording). Still, it seemed surprisingly high, so I requested another machine from Pioneer. Its distortion results were the same as the first unit's, so I proceeded with the first sample.

In almost every other respect, the Elite PDR-99 proved to be an exemplary machine. In my playback measurements (see "Measured Data"), all made with the CBS



CD-1 test disc, output level was 2 dB higher than normal. However, this should be a concern only if you're using a preamp (or some other device) that has a precariously low input overload threshold (some Dolby Pro Logic and other signal processors do). The channels were almost perfectly balanced; output impedance was less than 1 kilohm, which suggests that interconnect cable capacitance should be of little significance. And if you're listening to the PDR-99 with headphones, you'll find it has more than adequate drive into both high- and low-impedance sets.

Despite the higher-than-typical playback distortion at 0 dBFS (the maximum level recorded on CD), THD + N at 1 kHz dropped sharply with level, so that below -30 dBFS maximum contamination was less than -96.6 dB. That's very good performance. The -71.5 dB I measured at 0 dBFS corresponded perfectly with the 0.027% measured with the discrete-tone sequence on the CBS test disc.

The PDR-99's Legato Link DAC had superb low-level linearity at 1 kHz; deviation was no worse than 0.91 dB down to -90 dBFS on the undithered tracks of the CD-1 disc and no worse than 0.12 dB down to -100 dBFS on dithered recordings! The exceptional linearity is apparent in Fig. 1, a plot of fade to noise. Results for the left channel are shown, the poorer of the two by a tiny margin.

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The left channel also proved the poorer channel vis-à-vis signal-to-noise ratio, quantization noise, and dynamic range, but this is really splitting hairs: The A-weighted S/N of 111.4 dB on the left channel was superb, even if the right was 3 dB better. In any case, conventional S/N tests on DACs tell more about the analog electronics following the DAC than about the DAC itself, which is not exercised during this test. The data for quantization noise is more meaningful, as the DAC gets a full workout. Here, too, the right channel was 1.6 dB better, but even the left's figure represents superb performance. The same goes for the PDR-99's dynamic range.

I copied several tracks from the CBS test disc to a 60-minute recordable CD, using

the PDR-99's optical input. One would hope that the copy would be identical to the original; by and large, this was true. The results listed in "Measured Data" for frequency response, THD + N at 0 dBFS, quantization noise, and linearity error are the same, give or take a few tenths of a decibel, for CD playback and record/play. The data for A-weighted S/N, low-level THD + N at 1 kHz, and dynamic range are slightly inferior on record/play (more so on the right channel, which heretofore had been superior to the left), but none is less than excellent. It's clear that the PDR-99 can make an essentially perfect copy of a CD or, presumably, of other digital sources. I expect that the slight differences between playback and record/play were due to interface jit-

ter, but the effects are below the threshold of audibility.

I next shifted my attention to recording from the analog inputs. From the shape of the curve for distortion versus level in playback, I suspected that the odd-order harmonics introduced by Legato Link were level-dependent. But there was no way to prove this by digitally copying the CBS test disc, since it lacks low-level high-frequency tracks. Using the analog inputs, however, I could record at any level I wished. First, I checked record/play response at 0 dBFS (using a 2-volt input signal) and then repeated the test at -10 and -20 dBFS (Fig. 2). At 0 dBFS, I saw about the same dip between 7.5 and 15 kHz that I'd seen in playback. But lo and behold, the dip disappears at -10 dBFS and is replaced by a gentle rolloff beginning at about 10 kHz. (The -10 dBFS record/play curve has been shifted to overlie the 0-dBFS curve at 1 kHz. The -20 dBFS record/play curve has been omitted, because it was the same as the -10 dBFS curve except for level. Only the left-channel results are presented here and in all subsequent graphs, since the right-channel curves were essentially identical.)

For Fig. 3, THD + N versus frequency, the PDR-99 was playing a disc recorded from the analog inputs at levels of 0, -10, and -20 dBFS. From 1 to 10 kHz, the 0-dBFS curves for playback of the CD-1 (not shown) and for record/play matched perfectly at every frequency on the test disc. (These occur at approximately octave intervals from 1 to 8 kHz, with extra spots at nominal frequencies of 10, 12.5, 16, 18, and 20 kHz.) Since there was no point in showing all these closely matched curves, only the results for record/play via the analog input are included. The record/play curves I selected are probably a better indicator of performance, as they contain many more test frequencies than the play-only curves. (And they differed only at intermediate points.)

Note how the high-frequency distortion decreases at the lower recording levels in Fig. 3. It's never really low (it still hits 5.16% at -10 dBFS and 1.64% at -20 dBFS), but at least it's heading in the right direction! In the bass and lower midrange, the curves are flat and their THD + N increases as the recording level drops. This simply represents the noise floor of the ana-

MEASURED DATA

PLAYBACK

Line Output Level, 0 dBFS: 2.52 volts.

Channel Balance: ± 0.02 dB.

Line Output Impedance: 915 ohms.

Maximum Headphone Output Level: 4.65 volts.

Maximum Headphone Power: With 600-ohm loads, 31.0 mW; with 50-ohm loads, 25.8 mW.

Headphone Output Impedance: 115 ohms.

Frequency Response: 20 Hz to 20 kHz, +0, -0.90 dB.

THD + N at 0 dBFS: Less than 12.3%, 20 Hz to 20 kHz.

THD + N at 1 kHz: From 0 to -90 dBFS, less than -71.5 dB; from -30 to -90 dBFS, less than -96.6 dB.

Maximum Linearity Error to -90 dBFS: Undithered recording, 0.91 dB; dithered recording, 0.12 dB.

A-Weighted S/N (Infinity Zero re 0 dBFS): 111.4 dB.

Quantization Noise: -94.9 dBFS.

Dynamic Range: Unweighted, 95.9 dB; A-weighted, 98.0 dB.

RECORD/PLAY

Analog Line Input Sensitivity: 0.29 volt for 0 dBFS.

Analog Line Input Impedance: 33 kilohms.

Analog Line Input Overload Level: More than 10 volts.

Frequency Response: Analog input at 0 dBFS, 20 Hz to 20 kHz, +0, -0.92 dB; analog input at -10 dBFS, 20 Hz to 20 kHz, +0, -0.52 dB; digital input at 0 dBFS, 20 Hz to 20 kHz, +0, -0.90 dB.

THD + N, 20 Hz to 20 kHz: Analog input, less than 12.7% at 0 dBFS, less than 5.16% at -10 dBFS, and less than 1.64% at -20 dBFS; digital input, less than 12.3% at 0 dBFS.

THD + N at 1 kHz: Analog input, less than -71.5 dB from 0 to -90 dBFS and less than -89.3 dB from -30 to -90 dBFS; digital input, less than -71.4 dB from 0 to -90 dBFS and less than -95.5 dB from -30 to -90 dBFS.

Maximum Linearity Error: Analog input, 0.24 dB at -90 dBFS or above and 0.40 dB from -90 to -100 dBFS; digital input, 0.84 dB at -90 dBFS or above (undithered recording).

A-Weighted S/N (Infinity Zero re 0 dBFS): Analog input, 92.0 dB; digital input, 110.7 dB.

Quantization Noise: Analog input, -89.4 dBFS; digital input, -94.7 dBFS.

Dynamic Range: Analog input, 90.1 dB unweighted and 92.8 dB A-weighted; digital input, 96.0 dB unweighted and 97.8 dB A-weighted.

Channel Separation, Analog Input: Greater than 63.9 dB, 100 Hz to 17 kHz.

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log input electronics and is not distortion per se.

Figure 4, the THD + N versus level for a 1-kHz test tone, tells a similar story. Since there was a slight difference between the data for playback of the test disc and for the digital copy thereof, I've also included a curve obtained after I dubbed the CD-1 through the optical digital interface. The record/play curve taken through the analog input bottoms out at about -90 dBFS, the noise floor of the analog input electronics.

You can also see the effect of the analog input's noise floor in "Measured Data": Compare the record/play results via the analog and via the digital inputs for A-weighted S/N ratio, dynamic range, and quantization noise. This effect is to be expected, and the PDR-99's analog input circuitry is certainly not shoddy! It's sensitive (0.29 volt will get you pretty much to 0 dBFS), is immune to overload, and has a decently high input impedance. The "Over" indicator lights just at the verge of clipping the A/D converter, although the digital recording level at that point is about 0.25 dB below the level attainable with a digital dub. To avoid clipping the A/D circuit, I "defined" 0 dBFS for analog recording as -0.5 dB referred to digital full scale and adjusted the data accordingly. For normal recording, you'll be fine as long as you don't let the "Over" indicator flash.

Figure 5 shows third-octave spectrum analyses of the output for playback of the test disc's "no-signal" (infinity-zero) track and its 1-kHz, -60 dBFS track; I've also included the results for record/play of equivalent signals via the analog input. The -60 dBFS curves line up pretty well. The curve for the "no-signal" recording made via the analog input lies well above the curve for playback of the test disc's "no-signal" track, as you would expect.

A trace of analog-input electronic noise is actually beneficial, in that it "dithers" (and therefore helps linearize) the A/D conversion process. Figure 6 compares the linearity error for playback of undithered and dithered tracks on the test disc and for record/play of a comparable signal via the analog input. (I omitted the linearity-error curve for record/play of the test disc's undithered track via digital input, as it was nearly identical to the curve for playback of the test CD.) Note the improvement in low-

level linearity with the digitally dithered track and the almost equally good performance for record/play via the analog input.

The crosstalk figures in "Measured Data" speak for themselves. Channel separation is better when a CD is played than when you're recording and playing your own disc through the analog inputs. It's more than adequate either way however.

Use and Listening Tests

The PDR-99 was a sheer delight to use, about as friendly as I expect a digital recorder can get. (The manual could use some editing to clear up the Japanese concept of English, although its graphics were good.) The deck's control ergonomics were so pleasing that I had no trouble learning to

THE PDR-99 WAS A SHEER
DELIGHT TO USE,
AS USER-FRIENDLY
AS I EXPECT A DIGITAL
RECORDER CAN GET.

use it. The major oddity was having to press "Display Off" to check remaining time during a recording session.

Digital dubbing was a snap, since the PDR-99 senses the start of each new track and starts and updates its track counter automatically. You needn't worry about where you are on the disc; the "housekeeping" occurs seamlessly in the background. You just have to be sure you don't run out of room, but even if you do, the PDR-99 gracefully fades out the recording. Recording analog signals is a bit dicier: You do have to set levels, and an indicator that has only eight segments (one of which, ∞ , is useless) makes the gradations way too far apart. When the "Over" indicator comes on, you're already in trouble. (Of course, the same can be said for some other consumer digital recorders.)

The PDR-99 did strike me as a bit sluggish. Track access during playback was rather slow. When a new disc was loaded, the system took its own sweet time deciding what type of disc it was. Disc finalization was so lengthy, I could have taken a coffee break. But, hey, this is a CD recorder, just what we've wanted for years. So what's a few minutes?

In my listening sessions, I dubbed CDs and DATs, using the digital hookup. The PDR-99 recognized each unfailingly and confirmed what they were. As far as I could tell, the sound was equally good on the copy as on the original, provided that the CD-R was "finalized" and then played on the CD player in my own system. That's the rub: Pioneer's Legato Link D/A converter has a sound of its own, and it's not one I particularly cotton to. On the other hand, it does have its strong point: The bass was full and rich and tight. I particularly noticed this on pianist Andrew Rangell's recording of Beethoven's Sonata No. 30, Op. 109 (Dorian DOR-90158) and on Christopher Rousset's harpsichord performance of Rameau's Premier Livre de Pièces de Clavecin (L'Oiseau-Lyre 425886). But on both discs, the treble got edgy and hard (uncomfortably so on the harpsichord recording) during high-level passages. There was too much snap on the harpsichord attack and too little "puff" on the piano.

Violins fared poorly through the Legato Link, especially "original" instruments played without vibrato. Mozart's "Eine Kleine Nachtmusik" by the Academy of Ancient Music under Christopher Hogwood (L'Oiseau-Lyre 411720) is a rather bright recording to begin with; the violins sounded like nothing I had ever heard by the time the PDR-99 got through with them.

The higher the level, the harder the sound got. On Wagner's "Siegfried's Rhine Journey" from *The Ring Without Words*, recorded by the Berlin Philharmonic under Lorin Maazel (Telarc CD-80154), the opening horn call and bassoon passage were nice, but the sound lost clarity in the high-level high-frequency passages. On Rodrigo's "Concierto de Aranjuez" (EMI Classics CDC 54665), Christopher Parkening's guitar fared better, yet still wasn't as smooth and natural as on my reference player. And the Royal Philharmonic Orchestra's violins were steelier than they should be.

On *The English Lute Song* (Dorian DOR-90109), Julianne Baird sounded fine when she wasn't reaching, but the poor woman sounded like an over-the-hill coloratura when she was. And Ronn McFarlane's lute came with a bit of extra "attack" on the PDR-99 compared with the sound of my CD player.

Continued on page 58

We Get Letters...



634-34th Avenue
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May 17, 1995

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Rancho Cucamonga, CA 91730

COPY

To Whom It May Concern;

I recently purchased a 4-meter run of your Reference Series Type 2 interconnect cable. Without even breaking them in, they have to be the finest cables that I have *never heard*. (Sounds like a new slogan- "The finest cable you have never heard".) It seems as though every other cable that I have tried invariably shines in one or two areas as one runs down the usual audiophile checklist (i.e. sound staging, tonal balance, focus, etc....), but somehow always leaves one thinking that something is missing or that there is too much of something. I always thought that I had assembled a reasonably good system, but it wasn't until I inserted the Type 2 that I realized I have never heard it the way it *should* sound. At times, I can actually sit back and listen to real musicians playing in real space.

I think my next move is to slowly replace all of the cable and wire in my system with XLO. The wire tangle presently includes Monster Cable, Straightwire, MIT, and OCOS. Anyway, kudos, hosannas, yippee, and thanks for making "The Best In The World."

Sincerely,

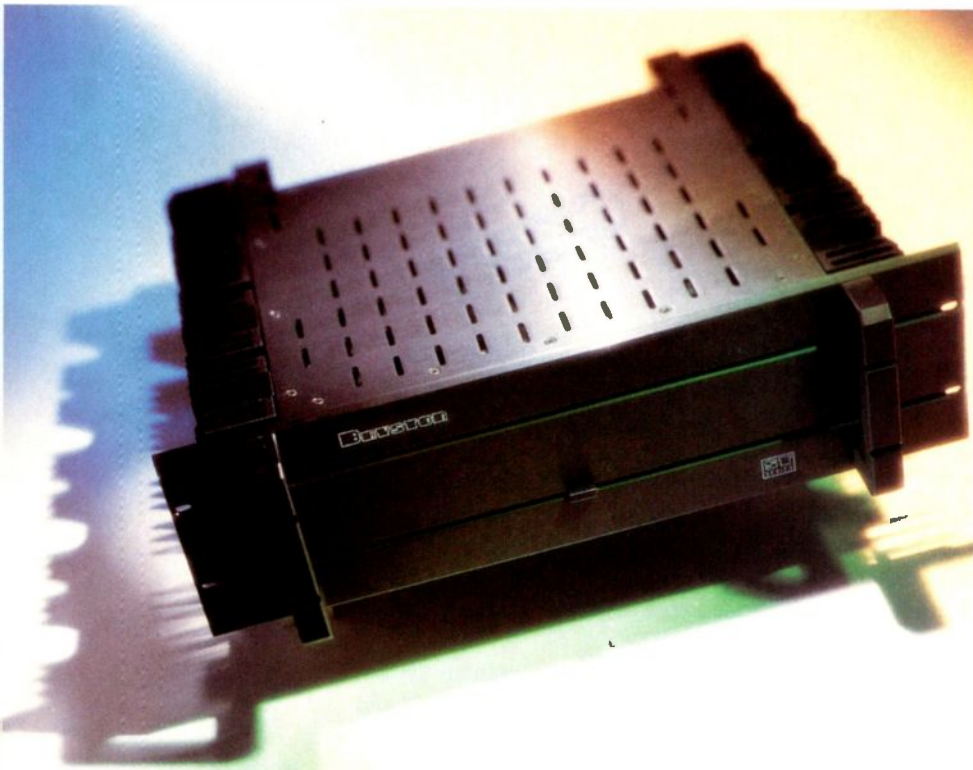
Mike Kanai

P.S.: Present system, F.Y.I.

Versa Dynamics 1.2
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Mark Levinson 23
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BRYSTON 4B ST AMPLIFIER



It's been almost two years since a Bryston product crossed my bench. That one (the BP 20 preamp, *Audio*, July 1994) was such a pleasure that I looked forward to getting my hands on the 4B ST power amplifier. Bryston's "ST" line of power amps strikes me as quite sensible. The 4B ST is a bridgeable stereo amp delivering 250 watts per channel into 8 ohms in stereo or 800 watts, bridged. The 3B ST is a similar amp, with an 8-ohm stereo rating of 120 watts per channel. The 7B ST has two amp modules but is designed for monophonic use; the two modules can be "bridged" to double the output voltage into relatively high-impedance loads (3 to 8 ohms) or operated in parallel to double the current into relatively low-impedance loads (1 to 3 ohms). Interesting concept. The 8B ST is a four-channel amp that is otherwise similar to the 3B ST; it can be configured to drive four, three, or two speakers. All of

these amps are available in THX versions, which differ only in having 12-volt trigger inputs for remote turn-on; the 4B ST that I tested was the standard version.

Technically, Bryston seems to have done its homework. The 4B ST's topology is classic, with each amplifier module built around eight custom output devices powered by separate positive and negative 85-volt supplies. There are two large toroidal power transformers, one for each channel.

Both unbalanced and balanced inputs are provided, the former via gold-plated RCA phono jacks and the latter through gold-plated connectors that can accept both XLR and ¼-inch stereo phone plugs. All inputs sport fully discrete active buffers. A slide switch centered between the jack pairs selects balanced or unbalanced input. The output terminals are gold-plated multiway binding posts set on standard ¾-inch centers and outfitted with wire holes large

enough for heavy-gauge wire. Another slide switch, between the RCA jacks and the output terminals, selects bridged or stereo operation. In bridged mode, either channel 1 input is used, and the load is connected between the red output terminals. (The wiring details are clearly indicated on the back panel.) Between the output terminals and the combination IEC line-cord jack and fuse holder is a toggle switch for lifting the signal-ground connections to the chassis. Lifting the grounds breaks the hum-pickup loop that might occur through a common power ground when you're using multiple amplifiers, yet it still permits the chassis to be grounded for safety. Good thinking!

The front panel is straightforward: solid handles near each end, a centrally located power button, and two multicolor LEDs above the power switch. The LEDs indicate normal operation (green), the approach of clipping in each channel (yellow), and clipping (red). They also flash red momentarily on power-up and may glow red if signal is present as the supply voltages collapse when powering down; neither condition is cause for concern.

The ¼-inch black-anodized aluminum panel is drilled for rack mounting. When not rack-mounted, the 4B ST sits on feet that provide a bit more than ½ inch of clearance above the supporting shelf. Black-anodized heat sinks along each side provide adequate cooling without a noisy fan. The chassis is designed so that you can temporarily rest this hefty amp on its backside without having to disconnect the wiring. Nice thought!

Measurements

With continuous signals, the Bryston 4B ST ran warm (but not dangerously hot) during my bench tests but remained a good


Rated Output: Stereo, 250 watts per channel into 8 ohms or 400 watts per channel into 4 ohms; bridged, 800 watts into 8 ohms.

Dimensions: 19 in. W x 5½ in. H x 15½ in. D (48.3 cm x 13.3 cm x 39.4 cm).

Weight: 42 lbs. (19 kg).

Price: \$2,095; THX version, \$2,295.

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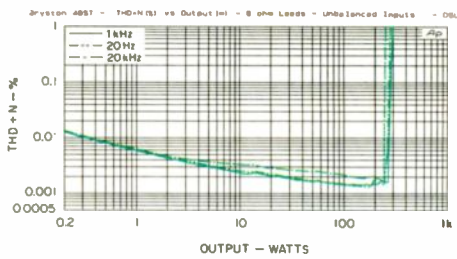
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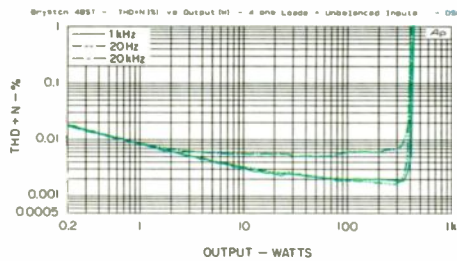
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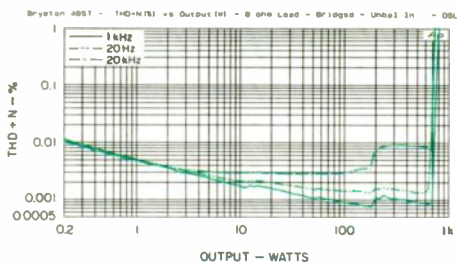
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A



B



C

Fig. 1—THD + N vs. output in stereo with 8-ohm loads (A), in stereo with 4-ohm loads (B), and in bridged mode with 8-ohm load (C).

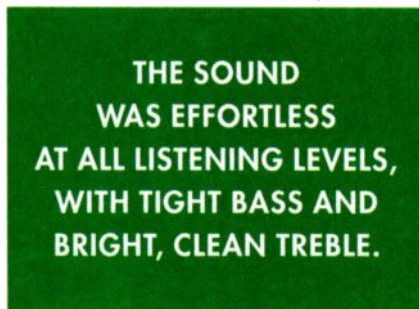
bit cooler in normal operation. Perhaps the heat was due to the high supply voltages. Theoretically, an amplifier whose power supply delivers +85 and -85 volts could deliver 450 watts into 8-ohm loads, almost 2.6 dB above Bryston's 250-watt rating. What the 4B ST actually delivered on the bench was 300 watts (24.8 dBW) of continuous power into 8 ohms at clipping and 0.1 dB more (310 watts) with the IHF dynamic-headroom tone burst—more than it's rated for but still less than theory would suggest. That's not a complaint; the data simply suggests that Bryston uses a rather stiff power supply, which many people consider to be an advantage.

I measured total harmonic distortion plus noise (THD + N) as a function of output for stereo operation with 8-ohm loads, stereo operation with 4-ohm loads, and bridged mono operation with an 8-ohm

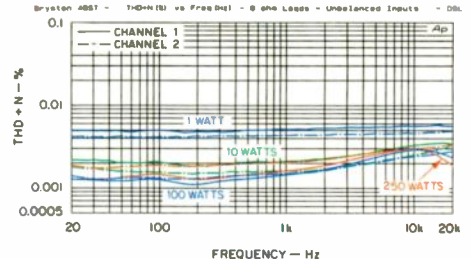
load (Fig. 1). The data was taken at 20 Hz, 1 kHz, and 20 kHz. I used the unbalanced inputs for these measurements, since that is how most people will use the 4B ST. With 8-ohm loads, both channels driven, I could keep my AC line at the standard 120 volts. With 4-ohm loads, I was unable to hold the line at 120 volts when both channels were driven to rated output. I therefore made the 4-ohm stereo test with only one channel driven, justified by the fact that the 4B ST has separate supplies for each channel. Bridged operation into 8 ohms, while technically similar to 4-ohm stereo operation, makes it impossible to drive only one channel at a time. Thus, as the amplifier approached clipping in this mode, the line dropped to approximately 110 volts.

The results for dynamic output power and headroom listed in "Measured Data" were obtained with both channels driven and with my meter reading an average of 120 volts across the AC line (the meter fluctuates a bit while an amplifier is being pulsed). Since the 4B ST was being driven to full power only part of the time in this test, I could maintain 120 volts at lower output settings of my vari-

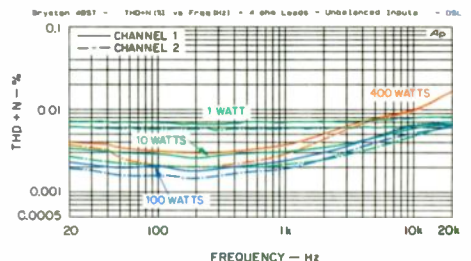
able-voltage transformer than I had been able to use in the sine-wave tests. Therefore, I also took data using the same transformer settings that had been needed to maintain 120 volts at the sine-wave clipping point (or the maximum I could manage when 120 volts couldn't be maintained). At these



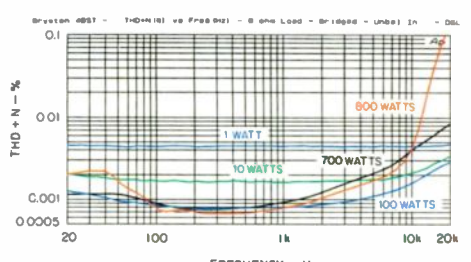
settings, my line meter naturally read more than 120 volts, and the numbers came out 0.5 to 1 dB better than those listed in "Measured Data."



A



B



C

Fig. 2—THD + N vs. frequency in stereo with 8-ohm loads (A), in stereo with 4-ohm loads (B), and in bridged mode with 8-ohm load (C).

Measurements of THD + N versus frequency (Fig. 2) were made at output levels of 1 watt, 10 watts, 100 watts, and rated power. The last, of course, varied with conditions: 250 watts per channel in stereo with 8-ohm loads, 400 watts per channel in stereo with 4-ohm loads, and 800 watts for bridged operation into 8 ohms. Driving the amplifier in bridged mode to 800 watts with an 8-ohm load dropped the AC line well below the 120-volt standard. I therefore repeated the measurement, this time at 700 watts; calculations showed that the amplifier's distortion at this power level with the available line voltage would be the same as its distortion at 800 watts with a true 120-volt line. The worst-case THD + N is listed in "Measured Data" for each operating configuration at 10 watts and at rated output. I have also reported the bridged 700-watt data, since it is probably more

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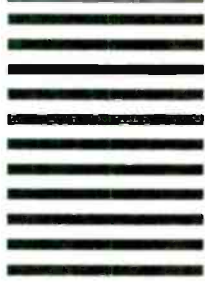
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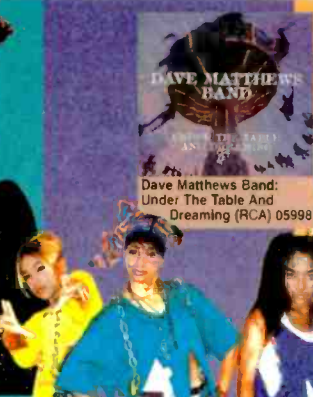


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typical of what the distortion at rated power would have been had I been able to maintain a 120-volt line.

If you compare these distortion figures with those of many similarly rated amplifiers, you'll see that Bryston has placed prime emphasis on performance. Even the worst-case THD + N is vanishingly low under all conditions, and the 1-watt curves in Fig. 2 (which stand above the others over most of the frequency range) reflect residual noise rather than distortion.

The noise is unusually low for an amplifier that combines such high power with reasonably high gain. On an A-weighted basis, worst-case output noise was a minuscule -93.6 dBW when the unbalanced inputs were used and negligibly worse with the balanced input. When referenced to rated output power, A-weighted signal-to-noise ratios ran from 116.3 dB (balanced input, stereo) to a whopping 123.5 dB (unbalanced input, bridged).

Figure 3 shows third-octave noise power (in dBW) versus frequency for the worst-case operating mode, 8-ohm stereo operation with balanced input. Obviously, the 4B ST is outfitted with excellent power-supply filters: Note the relative absence of components at 120 Hz and its harmonics. The

components that do appear are based on 60 Hz and its odd harmonics, suggesting that the components are caused by minute amounts of magnetic flux leakage from the power transformers (even toroids aren't perfect) or from the power-line wiring. In any event, since the very worst noise level (channel 1 at 60 Hz) is a mere -94.3 dBW, hum should certainly be inaudible. Because my setup in the lab is designed to avoid ground loops, it made little difference whether I made this measurement with the signal ground connected to the chassis or lifted from it. In normal use, you may well find the ability to separate the signal and chassis grounds quite beneficial.

Figure 4 shows frequency response with 8-ohm loads. In stereo mode, only the channel 1 data is shown, since the results for channel 2 were identical; channel balance was as near perfect as it is possible to document. It's clear that the Bryston 4B ST is a wideband design: Its high-frequency -3 dB points approach 200 kHz in stereo and 130 kHz in bridged operation, where the rollofts of both channels combine. At the low end, the -3 dB point is far below 10 Hz,

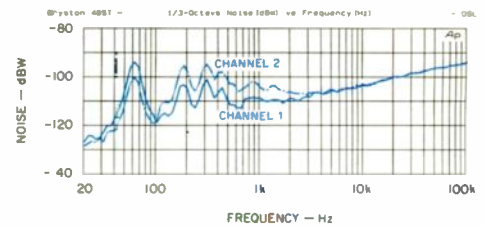


Fig. 3—Noise spectrum, worst case (stereo mode, balanced input).

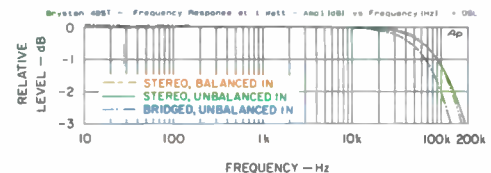


Fig. 4—Frequency response.

the limit of the measurement; in the most important range, 20 Hz to 20 kHz, response is dead flat.

Channel separation was a perfectly adequate 70 dB, in both directions, from 20 Hz to 1 kHz; it was 65 dB or better at 4 kHz and better than 60 dB at 8 kHz. Input/output phase error was less than 5° at 10 kHz and less than 10° at 20 kHz. Input impedance was relatively high for a power amp, almost 50 kilohms at the unbalanced input; this should present no problems for any preamp. Damping factor was a solid 600 at 50 Hz, and output impedance remained relatively low across the frequency band (180 milliohms at 20 kHz).

Use and Listening Tests

With only one 4B ST at my disposal, I confined my auditioning to the stereo mode, using the unbalanced inputs. My program sources were a variety of CDs and a few DATs that I had recorded live. Again and again, I heard an effortless quality at all listening levels and a clean, tight bass (especially noticeable in piano recordings) coupled with a bright high end that had nary a trace of frizziness. This is definitely a golden-ear amplifier at a silver-ear price. It's so solidly built, it carries a 20-year warranty! It's technically impressive, sonically superb, and a top value. I find it easy to recommend the Bryston 4B ST with enthusiasm and would love to keep it hard at work in my reference system. Pair it with a BP 20 preamp, and you'll have a system to drool over. A

MEASURED DATA

Output Power at Clipping (1% THD at 1 kHz): Into 8 ohms, 300 watts (24.8 dBW) per channel, both channels driven; into 4 ohms, 440 watts (26.4 dBW) per channel, one channel driven (see text); bridged, into 8 ohms, 820 watts (29.1 dBW).

Dynamic Output Power, All Channels Driven: Into 8 ohms, 310 watts per channel (24.9 dBW); into 4 ohms, 525 watts per channel (27.2 dBW); into 2 ohms, 710 watts per channel (28.0 dBW); bridged, into 8 ohms, 1,000 watts (30.0 dBW).

Frequency Response: Stereo, unbalanced input, 20 Hz to 20 kHz, +0, -0.05 dB, with -3 dB points below 10 Hz and at 195 kHz; stereo, balanced input, 20 Hz to 20 kHz, +0, -0.01 dB, with -3 dB points below 10 Hz and at 174 kHz; bridged, 20 Hz to 20 kHz, +0, -0.1 dB, with -3 dB points below 10 Hz and at 129 kHz.

Dynamic Headroom: Stereo, 0.9 dB re 8-ohm rated power and 1.2 dB re 4-ohm rated power; bridged mode, 1.0 dB re 8-ohm rated power.

THD + N, 20 Hz to 20 kHz, at Rated Output: Stereo, less than 0.0053% into 8 ohms and less than 0.0158% into 4 ohms; bridged, into 8 ohms, less than 0.130% at rated output (see text) and less than 0.0085% at 700 watts.

THD + N, 20 Hz to 20 kHz, at 10 Watts Out: Stereo, less than 0.0035% into 8 ohms and less than 0.0063% into 4 ohms; bridged, less than 0.0032% into 8 ohms.

Sensitivity: Stereo, unbalanced input, 96.6 mV for 0-dBW output and 1.53 V for rated output into 8 ohms; stereo, balanced input, 193.0 mV for 0-dBW output and 3.05 V for rated 8-ohm output; bridged, unbalanced input, 97.0 mV for 0-dBW output and 2.74 V for rated 8-ohm output.

D. B. KEELE, JR.

WILSON AUDIO WATT V/PUPPY V SPEAKER SYSTEM



One of the very few speaker systems with an excellent reputation in both high-end home audio and professional recording is this Wilson Audio Specialties setup—which is actually two systems. The two-way WATT (Wilson Audio Tiny Tot) was originally designed by David Wilson as a high-accuracy portable monitor for location recording; the Puppy woofer was added later, to extend the WATT's bass from 55 Hz down to 28 Hz. The resulting WATT/Puppy combination, now up to Series V, has been widely praised and is, according to Wilson Audio, used as a recording monitor at Chesky Records, Harmonia Mundi U.S.A., and Lucasfilm.

Until recently, the WATT/Puppy combination was Wilson Audio's least expensive full-range system—at about \$15,000 per pair! However, the WITT (essentially an all-in-one version of the WATT/Puppy) is now available at \$8,888 per pair. Wilson also of-

fers the X-1 Grand SLAMM at \$67,500 per pair and the legendary WAMM (Wilson Audio Modular Monitor) system, at \$147,000 per four-piece stereo setup.

What does the WATT V/Puppy V give you for \$15,000? Lots. Besides the attention Wilson Audio has paid to its performance, the company overlooks no detail of appearance or construction. And your Wilson Audio dealer will personally set up each of these systems in your home.

The WATT V is a modest-sized two-way speaker with a 7-inch woofer and a 1-inch dome tweeter. The surprise comes when you first try to pick it up: It's heavy! The WATT's cabinet is a very massive pyramid, with a very inert feel—not your conventional vinyl-wrapped particleboard box. A

nice touch is the tubular alloy “handle bar,” running across the bottom rear of the system, to help you lift and carry the speaker.

The WATT's sloping front panel holds the drivers, which are attached with machine screws. The front of the cabinet is covered with quarter-inch foam, to minimize diffraction. Hook-and-loop fastener strips at the center and periphery of the front panel hold the grille, an unframed piece of low-density open-cell foam, also a quarter-inch thick.

The WATT's tweeter is a much-modified Focal driver with an inverted titanium dome; the long-throw woofer is a scan-speak unit with a doped-pulp cone. Both drivers have very large and heavy magnets. The WATT's cabinet is made of a mineral and ceramic-filled methacrylate polymer, a very dense and rigid material. The cabinet is cross-braced and is damped internally with lead-alloy blocks; a bituminous surface treatment is applied to strategic points inside the enclosure for further damping. The cabinet's vent is 1 inch in diameter and 1.9 inches long, with a flared metal end. The cabinet is said to be aligned to a QB₃ (quasi-Butterworth third-order) tuning.

The WATT's crossover is encapsulated within an aluminum can, bolted to the bottom of the enclosure. (The bottom is attached to the cabinet with 16 socket-head machine screws.) As I could not examine the encapsulated crossover and Wilson provided no circuit details for it (not even the crossover frequency), I inferred its topology through measurements (not shown) that revealed second-order high- and low-pass filters with a crossover frequency of about 2.5 kHz. According to a Wilson Audio brochure, “Minimum energy storage behavior in the crossover is achieved by using only the finest audio-grade polypropylene capacitors, OFC [oxygen-free copper] air-core inductors, and time-coherent wire. All components are matched to less than 0.1% tolerance.”

All connections to the WATT's crossover, drivers, and terminals are soldered and use large-diameter, audiophile-grade cable. The

**NO OTHER SYSTEM
I'VE TESTED HAS HAD
SUCH INERT, UNMOVING
CABINET WALLS.**



**Rear view of the Watt V.
Note the "handle bar."**

gold-plated WBT terminals can handle bare wires, large spade lugs, or even the shafts of single banana plugs (the spacing is incompatible with double-banana plugs). The single pair of terminals cannot be bi-wired.

The Puppy V woofer consists of two 8-inch, long-excursion Dynaudio drivers in a vented box that was designed to act as a stand for the WATT as well as providing low-frequency extension for it. The enclosure is tuned with a foam-lined port tube, about 2½ inches in diameter and 6½ inches long, on the rear panel. (An alternative, slightly longer, vent tube is supplied. It lowers box resonance, which effectively in-

creases damping by slightly reducing bass level and extending low-frequency response.) An internal crossover provides low-pass filtration for the Puppy woofers and a high-pass for the WATT, crossing over with a broad overlap in the region from about 125 to 250 Hz. A concealed channel runs upward from the input-terminal cup on the bottom rear of the Puppy's cabinet to accommodate the connection cable between the Puppy and the WATT. The Puppy's enclosure, made from MDF and machined high-density phenolic, is heavily cross-braced. Very large, adjustable spikes are supplied.

The Puppy's drivers have high sensitivity and high power-handling capacity. Each has a rigid, polymer-based cone, a long-excursion voice coil (2 inches in diameter and 1 inch long), and a very large magnet coupled to a die-cast magnesium basket. Terminals are provided on the rear of the Puppy for connection to the input cable and the WATT. Wilson Audio recommends against bi-wiring or using an electronic crossover and separate amplifiers to drive the WATT/Puppy. Like the WATT, the Puppy has an encapsulated crossover in a metal can, premium-grade cabling and soldered connections, and a frameless foam grille with hook-and-loop fasteners.

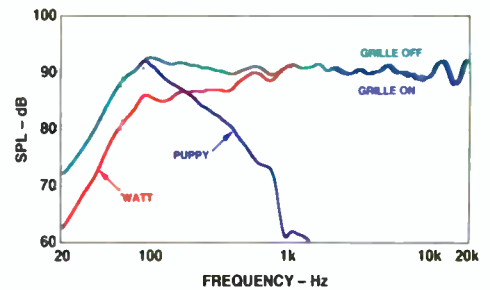


Fig. 1—On-axis frequency responses.

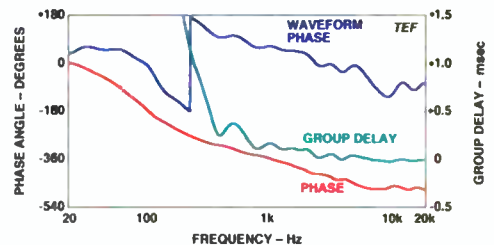


Fig. 2—On-axis phase response, group delay, and waveform phase.

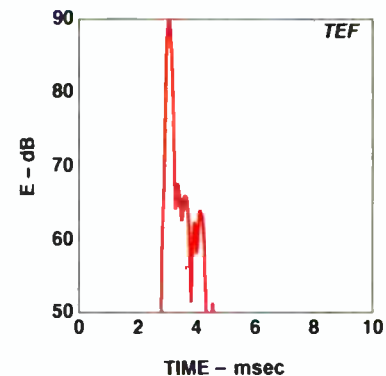


Fig. 3—Energy/time response.

80 and 200 Hz and a high-frequency peak at 12.6 kHz followed by a dip at 15.5 kHz (a replacement tweeter I received later exhibited even smoother high-frequency response). As can be seen in Fig. 1, the WATT's grille is quite transparent acoustically, causing essentially no change in the on-axis response.

The response of the Puppy alone has a peaked bandpass characteristic. Its maximum output is at 90 Hz; the output falls at 12 dB/octave in the lower frequencies and 6 dB/octave at higher frequencies. When the Puppy is used alone, its internal low-pass crossover filter is still operating, thus rolling off its high-frequency response. When the WATT is driven directly (not through

Rated Frequency Response: 28 Hz to 21 kHz, +0, -3 dB.

Recommended Minimum Amplifier Power: 10 watts per channel.

Dimensions: Overall, 39 in. H x 11½ in. W x 16½ in. D (96.5 cm x 29.2 cm x 41.9 cm); WATT V, 14 in. H (35.6 cm); Puppy V, 24 in. H (61 cm).

Weight: Overall, 162 lbs. (73.6 kg) each; WATT V, 70 lbs. (31.8 kg) each; Puppy V, 92 lbs. (41.8 kg) each.

Price: \$14,990 for four-piece system (WATT V, \$8,200 per pair; Puppy V, \$6,790 per pair) in high-gloss black; other gloss colors, no charge on WATT V and \$1,112 per pair additional on Puppy V; wood-veneer side panels, \$500 per pair additional on WATT V and \$1,600 per pair additional on Puppy V.

Company Address: 2233 Mountain Vista Lane, Provo, Utah 84606; 801/377-2233; E-mail, WAS@wilsonaudio.com

For literature, circle No. 92

Measurements

The on-axis anechoic frequency response of the WATT/Puppy, with the WATT's grille on and off, is shown in Fig. 1. Also shown are individual response curves of the WATT and Puppy driven directly. Measurements were taken from the front of the speakers, on the tweeter's axis, and averaged with a tenth-octave filter.

The WATT/Puppy's on-axis response is exceptionally flat and smooth and fits a tight, 4-dB, window (+1, -3 dB referenced to 1 kHz) from 50 Hz to 20 kHz. Referenced to 1 kHz, the response is 6 dB down at 45 Hz and 10 dB down at 37 Hz, quite respectable low-frequency extension. There is a slight rise in bass response between

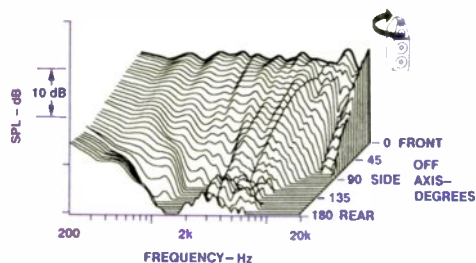


Fig. 4—Horizontal off-axis frequency responses.

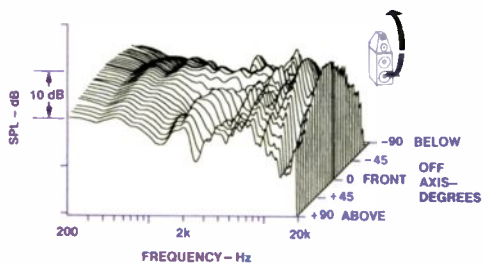


Fig. 5—Vertical off-axis frequency responses.

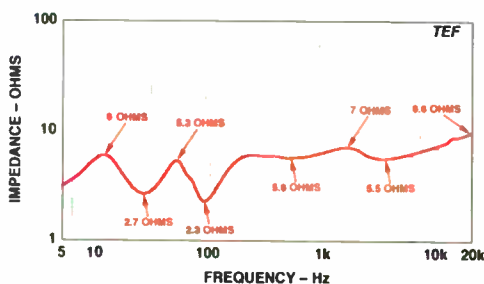


Fig. 6—Impedance.

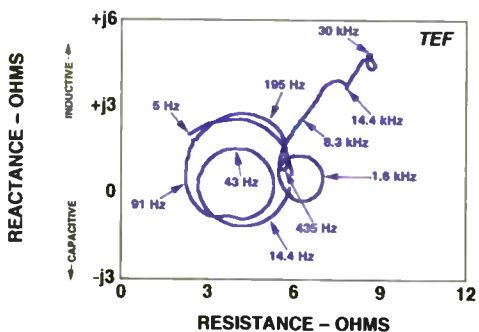


Fig. 7—Complex impedance.

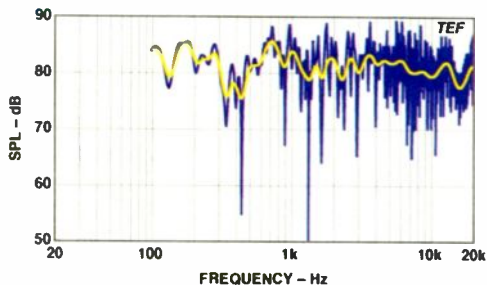


Fig. 8—Three-meter room response.

the Puppy's crossover), its response falls at about 1.5 dB/octave below 800 Hz and at 12 dB/octave below 80 Hz.

The WATT/Puppy's sensitivity averaged 89.8 dB from 250 Hz to 4 kHz. This is about 1 dB below Wilson's 91-dB published rating. Below 10 kHz, the right and left systems matched within a close ± 1 dB; above 10 kHz, they matched within ± 2 dB, with the maximum difference occurring at 20 kHz.

Figure 2 shows the phase and group-delay responses of the WATT/Puppy, referenced to the tweeter's arrival time, as well as the waveform phase (which indicates whether waveshapes will be preserved in specific frequency ranges). The phase curve is quite well behaved and decreases only 102° between 1 and 10 kHz. When averaged over the range from 800 Hz to 4 kHz, the group delay's offset is only 0.09 millisecond, with the WATT's woofer delayed slightly behind its tweeter. The curve of waveform phase indicates that most waveshapes will not be preserved, because the phase does not stay at or near 0° or 180° over any significant bandwidth. However, the waveform phase does not rotate as rapidly as it does on most other systems. Between 800 Hz and 6.5 kHz, the waveform phase does stay within $\pm 60^\circ$ of 0° .

Figure 3 shows the WATT/Puppy's energy/time response. The test parameters accentuate the system's response from 1 to 10 kHz, which includes the upper crossover region. The main arrival, at 3 msec, is extremely compact but is followed by several delayed responses, down 23 dB or more. Generally, this curve indicates very good behavior.

Figure 4 shows the combo's horizontal off-axis responses. (The bold curve at the rear of the graph is the on-axis response.) The excellent curve-to-curve uniformity demonstrates very even horizontal coverage. Some narrowing is evident above 10 kHz.

Figure 5 shows the vertical off-axis responses of the WATT/Puppy. (The bold curve in the middle of the graph is on the tweeter's axis.) Although the on-axis and $\pm 5^\circ$ curves are quite uniform, at greater off-axis angles the response is depressed between 2 and 6 kHz. The response is fairly symmetrical up and down, which indicates that the midrange and tweeter are roughly in phase through the crossover region. Farther off axis, the polar response does exhibit some asymmetry; fortunately, the response is significantly flatter above the axis than below it.

The WATT/Puppy's impedance magnitude is shown in Fig. 6. Because there are two speakers in this system, we see two peaks and two dips instead of the two peaks

**THE WATT/PUPPY
COMBINATION'S
FREQUENCY RESPONSE
WAS EXCEPTIONALLY FLAT
AND SMOOTH.**

and one dip that are typical of a vented box. The 2.7-ohm dip at 28 Hz indicates the approximate location of the Puppy's vented-box tuning frequency; the dip at 90 Hz (where the impedance falls to its minimum, 2.3 ohms) is due to the crossover that links the Puppy with the WATT. Above 200 Hz, the impedance stays within a fairly narrow, 4-ohm, range between 5.5 ohms and the system's 9.6-ohm maximum impedance, which occurs at 20 kHz. The WATT/Puppy's overall impedance variation is a moderate 4.2 to 1 (9.6 divided by 2.3). Cable series resistance should be limited to a low maximum of about 0.035 ohm, to keep cable-drop effects from causing response peaks and dips that are greater than 0.1 dB. For a typical run of about 10 feet, I recommend that you use 12-gauge (or larger), low-inductance cable.

The WATT/Puppy's complex impedance, over the frequency range from 5 Hz to 30 kHz, is shown in Fig. 7. The two largest loops correspond to the two low-frequency peaks of Fig. 6. A smaller loop corresponds to the slight impedance rise between 800 Hz and 2 kHz of Fig. 6; a much smaller loop occurs in the vicinity of 435 Hz.

Above 8 kHz, the impedance continues to rise and heads off toward the upper right of the graph. The somewhat unusual curve is due to the WATT being driven in cascade with the Puppy's high-pass section.

Effectively no side-wall resonances were detectable when either the WATT or the Puppy was driven by a high-level sine-wave sweep. The sides of both systems were essentially inert and unmoving. No other speaker I have tested has passed this test so well. Both the WATT and the Puppy always sounded quite clean and effortless in the sine-wave test. The woofers in both systems overloaded quite gracefully and did not generate any harsh sounds.

The maximum excursion of the Puppy woofers was a fairly generous 0.5 inch, peak to peak, while the maximum excursion of the WATT woofer was a quite respectable 0.35 inch or so, peak to peak. Based on my estimate of the frequency where each cone's excursion reached its minimum, the vented-box resonance of the Puppy was about 35 Hz and that of the WATT was about 50 Hz. Closing the port showed that it reduced the Puppy's cone motion at box resonance by a significant 70%; the WATT's motion reduction was about 50%, which is still very good. The WATT's port reduced cone motion over a wide frequency range, about 27 to 78 Hz. I noted some dynamic offset on the Puppy woofers when levels exceeded 14 volts rms at certain frequencies.

**MAXIMUM BASS OUTPUT
WAS IN THE TOP 20%
OF ALL SYSTEMS
I'VE TESTED.**

The WATT/Puppy's 3-meter room response is shown in Fig. 8, with both raw and sixth-octave-smoothed data. The speakers were in the right-hand stereo position and aimed laterally at the test microphone, which I placed at ear height (36 inches), at the listener's position on the sofa. The system was driven with a swept sine-wave signal of 2.83 volts rms (corresponding to 2 watts into the rated 4-ohm impedance). The direct sound and 13 msec of the room's reverberation are included.

Between 800 Hz and 16 kHz, the smoothed curve is quite flat and fits within a tight, 5-dB, window. If you include all peaks and dips, it still fits a respectable 10-dB window from 100 Hz to 20 kHz. Note the depressed region between 300 and 500 Hz and the peaks at 180 and 710 Hz. High-frequency undulations above 10 kHz mimic the anechoic axial response.

Figure 9 shows the E_1 (41.2-Hz) bass harmonic distortion of the WATT/Puppy. I used higher amplifier power than usual because of the speakers' very clean and effortless sound. At 200 watts, the second harmonic reaches only 4.9%, while the third rises only to 8.3%. Higher harmonics are at 2.3% or less. (The peaks at low power levels, in the front of the graph, were caused by random acoustic background noise in my test setup.) At a 200-watt input at 41.2 Hz, the system generated a healthy 105 dB SPL at 1 meter.

The similarly low A_2 (110-Hz) bass harmonic distortion is shown in Fig. 10. At 200 watts, the second harmonic reaches 6.1%, the third rises only to 1.6%, and higher harmonics are negligible. The higher proportion of second harmonic in this test was due to moderate dynamic offset of the Puppy's woofers, which caused an outward displacement of the cone and resultant asymmetrical rounding of the output waveshape. With a 200-watt input at 110 Hz, the system generated a very strong 114 dB SPL at 1 meter.

Figure 11 shows the IM versus power, created by tones of 440 Hz (A_4) and 41.2 Hz (E_1) of equal level. As in the previous two distortion tests, the WATT/Puppy sounded quite clean. Even at 200 watts, its IM rises only to 5.6%. The wide overlap of the lower crossover was one reason why the Wilson combination had somewhat higher distortion in this test than other three-way speakers whose crossover frequencies are below 400 Hz. This is because the overlap lets the WATT's woofer undergo significant displacement at

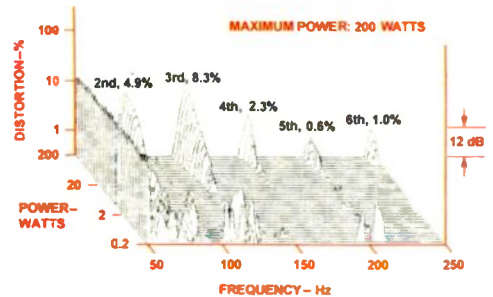


Fig. 9—Harmonic distortion for E_1 (41.2 Hz).

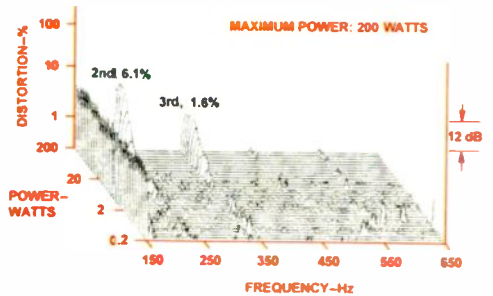


Fig. 10—Harmonic distortion for A_2 (110 Hz).

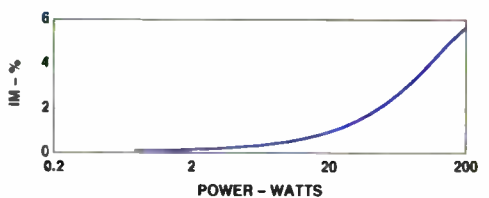


Fig. 11—IM distortion for A_4 (440 Hz) and E_1 (41.2 Hz).

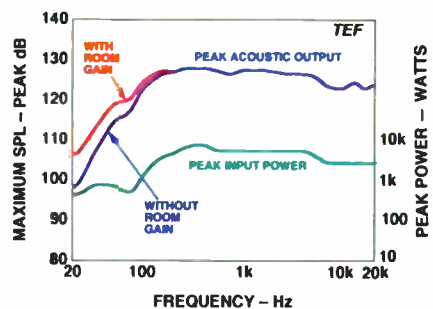


Fig. 12—Maximum peak input power and sound output.

high power levels from a signal as low as 41 Hz.

Figure 12 shows the combination's short-term peak-power input and output capabilities. The peak input power was calculated by assuming that the measured

peak voltage was applied across the rated 4-ohm impedance. The peak input power starts at a very strong 360 watts at 20 Hz, rises to 700 watts at 40 Hz, falls somewhat (to 450 watts at 80 Hz), and then rises rapidly into the region of 5 to 6 kilowatts above 200 Hz. In the tweeter's range, above 5 kHz, the power drops somewhat (to 2,500 watts).

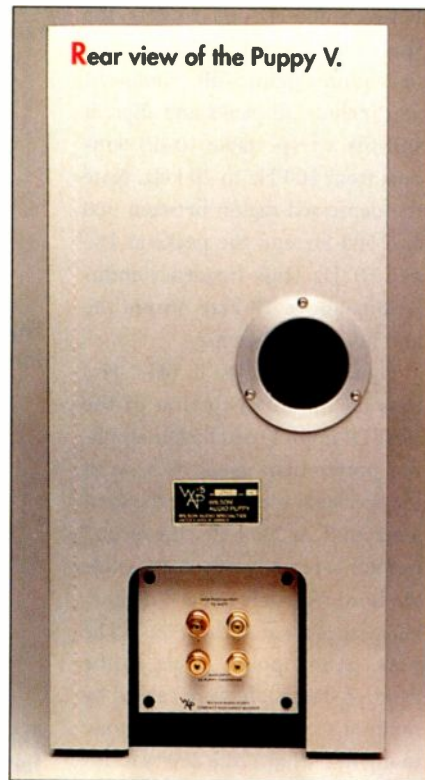
As you can see in Fig. 12, the maximum peak SPL with room gain starts at an impressive 107 dB at 20 Hz, rises rapidly to a slight plateau of 120 dB at 65 Hz, and then continues to rise to about 125 dB or so above 150 Hz. The system reaches 110 dB SPL at a low 30 Hz and then rises past 120 dB at an impressively low 65 Hz. These SPL thresholds place the WATT/Puppy's maximum bass output in the top 20% of all loudspeakers I have tested, including several that are much larger.

Two mishaps occurred to the WATT during the peak-power tests. The woofer stopped operating when the 500-Hz burst reached a power level of nearly 7,000 watts. A call to Wilson Audio's factory revealed that a resistive protection device in the crossover had engaged and shut off the woofer; after the protector was replaced with a new device, operation was normal. The second mishap was a buzz that developed in a tweeter after it was tested. A retest at lower power was accomplished without further problems. A new tweeter brought the WATT back to factory specifications, and the right/left match was then even slightly better than it had been when I originally measured it.

Use and Listening Tests

The Wilson speakers arrived in four heavy wooden crates, two housing the WATTs and two housing the Puppies. I needed help both in unpacking them and in carrying them. (Normally, the Wilson Audio dealer would take care of setup.) The WATTs are very heavy for their size; it felt as if they were weighted with lead inside. As I learned later, they really do contain lead blocks, not to add weight but to mass-load the cabinet walls to reduce vibration!

I was immediately impressed with both the packaging and the appearance of these speakers. My review systems had an attractive "platinum" glossy finish that looked like real metal. The fact that most of the fas-



teners were socket-head machine screws contributed to this impression. All the cabinets had the look of very expensive pieces of precision equipment.

The WATTs are normally placed on top of the Puppies, which act as optimum-height stands. Three small bituminous damping pads are supplied; they go between the WATT and Puppy to "decouple subtle midrange interface resonances." Two half-inch spacers are provided, which Wilson Audio says enables the speakers' height to be adjusted for fine control of upper-bass and lower-midrange reflections. A set of four Puppy Paw spikes (and a socket wrench) are provided for each Puppy. The company suggests finding the optimum position before the spikes are attached. I conducted my listening tests both with and without the spikes.

The WATT connects to the Puppy through a heavy-duty spade-lugged cable (called a Puppy Tail). It passes through the channel in the rear of the Puppy's cabinet to that speaker's high-pass output terminals. An arrow on the cable should point to-

ward the WATT, according to Wilson, to allow a network in the cable to terminate high-frequency reflections. Signals from your amplifier are fed to both speakers through input terminals on the rear of the Puppy. I could make the terminals only finger-tight because of their shape; even when the terminals seemed tight, a gentle tug would sometimes pull the spade loose.

Separate owner's manuals are supplied for the WATT and the Puppy. The WATT's manual is 26 pages long, while the Puppy manual is seven pages. Among the topics in the WATT's manual are selection of interchangeable tuning ports (which I did not evaluate), room acoustics, mounting height, room placement, adding a subwoofer (other than the Puppy), and the magnetic field around the WATT (accompanied by a very useful chart of the field shape). Confusingly, some of the statements seemed applicable only to bygone versions of the WATT. Much of the manual illustrated how frequency response, "resolution of low-level detail," and soundstaging vary with location and mounting height; the graphs of frequency response were quite instructive.

Wilson suggests placing the WATT/Puppies at least 3 feet from the wall behind them, at least 2 feet from the side walls, and toed in so that a seated listener can barely see the inner side panel of the WATTs. After

**THE WATT/PUPPIES
SOUNDED VERY DYNAMIC
AND OPEN, WITH SMOOTH
AND WELL-BALANCED
RESPONSE.**

some experimenting, I wound up placing these speakers close to my usual locations; the toe-in matched the recommendation from Wilson Audio.

I listened with gear that included Onkyo and Rotel CD players

and Krell's KRC preamp and KSA250 power amp, with B & W 801 Matrix Series 3 speakers used for comparison. The Transparent Audio cables and interconnects were recommended by Wilson Audio.

On Maceo Parker's *Life on Planet Groove* (Verve 314 517197-2), the WATT/Puppies sounded very dynamic and open, with smooth and well-balanced response coupled with excellent bass control and extension. The crowd sounds at the start of track 1 were reproduced with extreme realism; the drum solo from 6:42 to 7:24 on that

track was extremely effective. The Wilson speakers delivered a rarely matched combination of clean sound and high volume. Loud rock and jazz percussion were reproduced particularly well.

On demanding female vocals, such as my favorite Holly Cole track on *Musical Truth* (Alert Music DPRO-240, a promo CD available from Energy Loudspeakers), the WATT/Puppies sounded very smooth and clean, emphasizing sibilants only a bit more than the B & W 801s. And since the 801s' high frequencies are slightly depressed, they sounded slightly dull in comparison to the WATT/Puppies. On male voice, the Wilson Audio speakers also did very well, with no tubbiness or other tonal aberrations.

The WATT/Puppies are quite sensitive; I had to reduce my amplifier's output by 5 or 6 dB to match their sound level to the level of the 801s during my comparisons. On clean hard-rock music (there actually is such a thing!), the WATT/Puppies could play significantly louder and cleaner than the 801s. However, this seems mainly due to the Wilsons' higher sensitivity and the limitations of the 200-watt amp I used. Although the Wilson speakers were clean at levels where the B & Ws sounded harsh and compressed, the 801s have reproduced these levels cleanly with other amps.

On pink noise, the WATT/Puppies sounded somewhat smoother to me than the 801s when I was seated but noticeably less smooth when I stood up, because of upper-midrange roughness and tonality. Horizontal coverage was excellent. On third-octave band-limited pink noise, the Wilsons had some usable output at 20 Hz, more usable output at 25 Hz, and lots of clean output at all higher frequencies. At 32 Hz and above, the WATT/Puppies delivered more clean output than the B & Ws, whose output capability has been exceeded by very few speakers I've tested. The only problem I found in the Wilsons was some outward dynamic offset at 25, 80, and 100 Hz at very high levels. Port noise was significantly lower than that of the B & Ws when played at equal levels.

On large-scale cathedral pipe organ, as in Jean Guillou's very demanding recording of Mussorgsky's "Pictures at an Exhibition" (Dorian DOR-90117), the WATT/Puppies actually delivered more clean bass output than the 801s at all but the very lowest fre-

quencies. The Wilson combination could handle the full output of the Krell amplifier without any problems. Only rarely was the WATT/Puppy's limit reached, and even then its overload behavior was very good.

On more sedate classical music, such as *Telemann for Trumpet* by Stephen Burns (Dorian Discovery DIS-80132), the WATT/Puppies produced a full-bodied, neutral tonality with good depth and soundstage. Trumpet peaks were reproduced cleanly, with no roughness. On classical guitar recordings, plucked string

sound was crisp and clear. On massed orchestral music, the WATT/Puppy's output was always quite clean and allowed me to delineate individual instrument sections.

The WATT/Puppy combo performed superbly in most of my bench and listening tests. Its level of performance surpassed that of most of the other speakers I have evaluated, making it a definite contender for—dare I say it?—best of breed. For those who can afford it, this system delivers as much performance and pride of ownership as a Jaguar, or perhaps even a Ferrari. A

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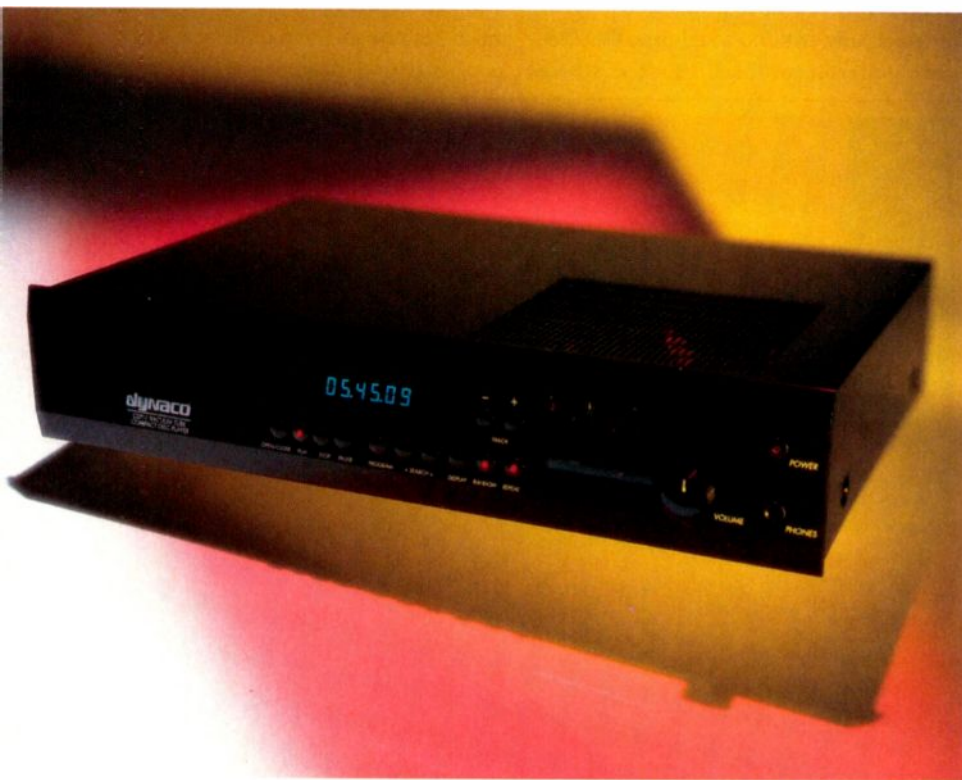
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DYNACO CDV-1 CD PLAYER



Tubes are not often found in the analog stages of D/A converter circuits, though the Dynaco CDV-1 is not the first CD player to use them that way. The owner's manual says the player's two 6DJ8 tubes help it deliver "rich, soft, warm harmonics with a deep and natural bass response" and that music will sound appreciably more pleasing on the CDV-1 than on conventional, solid-state, CD players.

Because it has a volume control, the CDV-1 would be a logical candidate for a CD-only system when used with an appropriate power amplifier. Aside from that volume control and the window through which the tubes can be seen, the CDV-1's front panel is fairly standard. Its round buttons are divided into two logical groups, one for the main transport functions and

the other for up/down search and such less essential functions as programming. Several buttons have red indicator lights, of which the ones for "Play," "Program," and "Repeat" blink or glow, depending on the operating mode. The power on/off indicator is green during initial standby and turns red once the tubes are warmed up.

The transport mechanism is one of Philips's latest. It has a three-beam laser pickup and a straight-line-tracking sled for the optics. The digital audio decoder and digital filter is a Philips SAA7345GP chip, operating in its four-times-oversampling mode. This is an infinite-impulse-response (IIR) design rather than the more usual finite-impulse-response (FIR) type. An IIR filter needs fewer filter sections or filter computations than an FIR design to achieve a given amount of out-of-band attenuation. However, the phase response of IIR filters is

not as linear as that of FIR filters, so IIR filters have asymmetrical transient characteristics. Also, when normally configured (as in the CDV-1), this chip set digitally attenuates the signal to both the converter and the digital output by 0.5 dB, which will prevent proper operation of an external HDCD decoder. (The CDV-1 does not itself provide HDCD decoding.)

The Dynaco's 1-bit DAC is a Philips SAA7350GP. (This chip is also used in a number of separate D/A converters.) Its differential output is converted to a single-ended signal by a Burr-Brown OPA2604 op-amp. Capacitors across the appropriate resistors in this op-amp circuit, together with a two-stage passive RC filter between the output of the op-amp and the volume control, form a low-pass filter whose cutoff frequency is about 75 kHz. The player's tube output circuit, which uses one 6DJ8 twin triode per channel, is implemented as a common-cathode amplifier and is direct-coupled to a cathode follower. The negative feedback loop for this stage runs from the output coupling capacitor back to the first stage's grid.

Measurements

With the volume control fully up and a signal at digital full scale (0 dBFS), the CDV-1's output measured 3.2 and 2.98 volts, respectively, for the left and right line outputs with instrument loading. The headphone output delivered 2.85 volts for the left channel and 2.66 volts for the right. Output resistance was about 252 ohms for the line outputs and 100 ohms for the headphone outputs.

Frequency response is plotted in Fig. 1 for instrument loading. (With the IHF load, the high-frequency response was the same but the level at 10 Hz was down about 0.5 dB more.) However, the CDV-1's high-frequency de-emphasis overcompensates, as shown, for the pre-emphasis used on cer-

Dimensions: 22 in. W x 7 in. H x 16 in.

D (55.9 cm x 17.8 cm x 40.6 cm).

Weight: 19 lbs. (8.6 kg).

Price: \$699.

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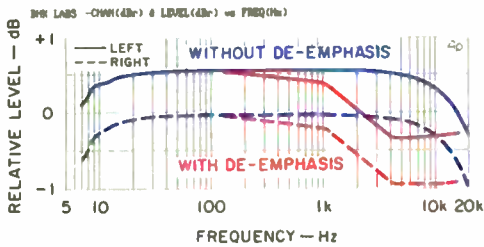


Fig. 1—Frequency response.

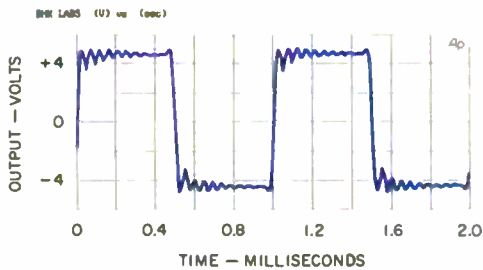


Fig. 2—Response to a 1-kHz square wave.

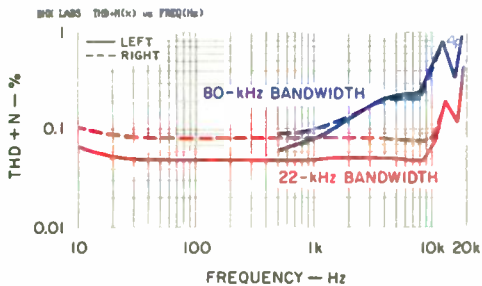


Fig. 3—THD + N vs. frequency.

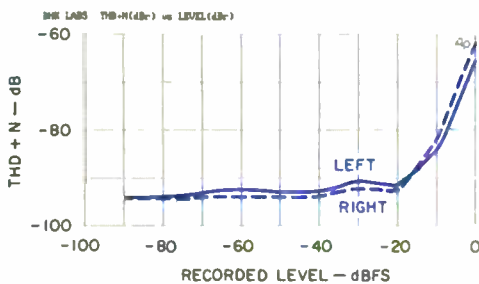


Fig. 4—THD + N vs. level.



tain CDs; the unit's de-emphasis error will slightly dull the highs if a disc recorded with pre-emphasis is played, but such CDs are rare. A 1-kHz square wave (Fig. 2) indicates asymmetrical ringing, caused by the IIR filter's nonlinear phase response. Playback polarity was not inverted.

Figure 3 shows total harmonic distortion plus noise (THD + N) versus frequency, at 0 dBFS with the CDV-1's volume control fully clockwise. In the curves made with my normal measurement bandwidth of 22 kHz, the rise in distortion at the higher frequencies is due to intermodulation and other artifacts rather than to harmonics of the signal frequencies, although this limited bandwidth makes that point unclear. With the measurement bandwidth opened up to 80 kHz, which lets in more out-of-band energy, you can see an even greater increase in non-signal energy as frequency increases. This is more representative of the signal this player would feed to your pre-amp and amp in actual use.

At the 0-dBFS signal level, distortion below about 1 kHz is generated in the CDV-1's tube output section, and it drops with decreasing signal amplitude. This can be seen in Fig. 4, THD + N versus recorded level for a 1-kHz signal and a measurement bandwidth of 400 Hz to 22 kHz. Distortion would also be lower if the output voltage were decreased by turning the volume control down instead of by reducing signal amplitude.

The fade-to-noise test (not shown), a measure of linearity (and, hence, distortion), yielded quite good results that were essentially identical for both channels. Deviation was about -1 dB at -90 dBFS, crossed through 0 dB at -100 dBFS, passed through +2 dB at -105 dBFS, and climbed to +5 dB at -115 dBFS.

Interchannel crosstalk rose at the typical rate of 6 dB per octave. Crosstalk from the left to the right

channel was -56 dB at 1 kHz and -32 dB at 16 kHz but was 20 dB better in the opposite direction.

With the transport on pause or playing a silent track, output noise level of the two channels averaged about -85.6 dB with wideband measurement. It was -87.6 dB over the band from 22 Hz to 22 kHz and was -97 dB from 400 Hz to 22 kHz or A-weighted. Quantization noise was -89.2 dB, and dynamic range came out to about 97 dB.

Volume-control tracking between channels was quite good down to about -15 dB. From that point on, though, the left channel's attenuation increased faster than the right channel's, creating an imbalance of about 3 dB at -25 dB and 8 dB at -50 dB.

As I suspected, the digital output would not pass an HDCD signal on to an external

**RESULTS OF
THE FADE-TO-NOISE TEST
WERE QUITE GOOD AND
ESSENTIALLY IDENTICAL
FOR BOTH CHANNELS.**

D/A converter with HDCD decoding. Jitter in the digital output, measured with a Meitner LIM jitter detector in conjunction with a Crystal 8412 input receiver, was rather high. I measured nearly 10 nanoseconds, peak to peak, of signal-correlated jitter components for a -90 dB, 1-kHz signal. Fortunately, the amount of jitter getting to the CDV-1's internal DAC is not this bad, as most of the jitter at the digital output jack is due to a poorly designed output-isolation transformer.

Use and Listening Tests

As my comparison CD players, I used a Counterpoint DA-11A CD transport to drive a Museatex Bidat or a Sonic Frontiers SFD-2 MkII D/A converter. Additionally, at various times a Genesis Digital Lens anti-jitter device was placed between the CD transport and the D/A converter. A Forsell tube line driver was used with the Sonic Frontiers D/A converter; other sources went through a Quicksilver Audio preamp. Power amplifiers on hand for the review period were a Crown Macro Reference, a pair of

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Quicksilver M135 tube units, an Arnoux 7B digital switching design, and a Hafler 9505. I also used a Jolida SJ 302A tube integrated amp. The loudspeakers were B & W 801 Matrix Series 3s, augmented from 20 to 50 Hz by a subwoofer in each channel.

I first listened with the Dynaco CDV-1 feeding directly into the Jolida amplifier. I set the CDV-1's volume control up fully and used the volume control on the amp. The sound was pretty good overall, although I did notice some high-frequency irritation on loud, complex passages. Bass was robust, full, and extended. I next paired the Dynaco player with the Hafler amp and used the volume control on the CDV-1. Again the sound was quite good, with excellent bass. However, the sense of space and dimension, and the musical believability, were not as good as with my usual listening setup, and I was bothered by a touch of high-frequency edginess heard on some CDs. Still, I was able to get into the music easily enough, which is the most important thing.

THE DYNACO CDV-1 PRODUCED BASS THAT WAS ROBUST, FULL, AND EXTENDED.

I have couple of nits to pick. The poor volume-control tracking below about the 9 o'clock knob position was a bit bothersome, causing me to sometimes turn up the volume more than I would have liked to get a reasonable left/right balance. Another thing that I consider a definite flaw in my review sample, and a potential flaw in the design, was a transient noise when starting or stopping a CD. At volume settings of about 9 to 10 o'clock, a definite pop could be heard and woofer displacement was evident. With the volume turned up real high, starting, stopping, or pausing a CD produced a substantial transient.

Does the CDV-1 live up to its promises of delivering the fabled attributes of tube sound? Regrettably, I feel it doesn't quite. Nevertheless, I think the Dynaco gave a pretty good account of itself overall, especially considering its modest price. A

PIONEER, continued from page 44

Pop and New Age sounded "different" but acceptable. Some of the discs I used—Madonna's *True Blue* (Sire 9 25442) and Kitaro's *Silk Road* (Gramavision R2 79409)—were originally recorded on analog tape, which might have made a difference.

I SEE NO POINT IN DESIGNING A GOOD D/A CONVERTER AND THEN PURPOSELY ADDING DISTORTION.

Legato Link reminds me of a moving-coil phono cartridge, many of which also strike me as being peaky in the treble and having considerable tracking distortion. Perhaps "MC sound" was what Pioneer sought from Legato Link. Many audiophiles do love that kind of sound, but I'm not one of them. To my way of thinking, Legato Link is the PDR-99's major weakness.

I see no point in designing an essentially distortion-free converter and then purposefully introducing artifacts (ringing on midrange axis crossings and scads of odd-order distortion on treble signals) on the assumption that they were originally in the music but removed by the bandwidth restrictions of 44.1-kHz sampling. Assuming that harmonics were lost, there's no way to know what they were. Each instrument has its own overtone structure that makes its sound unique. There's no such thing as a "universal fix." (Nor is it clear that there's really anything that needs fixing: Evidence of human perception of sound above CD's standard upper-frequency limit of 20 kHz is extremely scant.)

I have no problem with a manufacturer manipulating the signal if it believes the end product sounds better. Just allow me to turn the processing off if I disagree! Unfortunately, with the PDR-99, you can't. If you have a good external D/A converter, you're in luck. Run it from the PDR-99's digital output, and you'll have a CD recording system you can be proud of. Or you might consider spending \$50 less for the PDR-05, which differs only in having a shorter warranty, a less fancy finish, and (Pioneer tells me) no Legato Link. A

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—David Reid
High Fidelity, Inc.
Austin, Texas



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Q My television recently got hit by lightning. How can I protect my equipment from power surges like that?

A Buying an A/V system is no different than making any other major purchase. You want to protect your equipment because it is an investment. Electrical surges can destroy the electronics in your components in an instant. The cumulative effect of small, practically undetectable surges that come in periodically through the external wires and into your home can actually be more damaging to your components than larger isolated surges called "electrical spikes" which are caused by lightning. This dispels the myth that you can unplug your components before a storm and keep them safe, because damage occurs at random intervals. It is definitely worth while to invest a little extra money in surge protecting products to insure that your equipment will be protected. Work with your audio/video retailer to get the products necessary to protect your components from environmental disturbances.

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Cyclone Stereo
Ames, Iowa

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AURICLE

ANTHONY H. CORDESMAN

EGGLESTONWORKS ANDRA SPEAKER

At its best, the high end is glorious excess. At its worst, it is pretentious and grandiose. Happily, the Andra loudspeaker, from a new company, EgglestonWorks, is far more glorious than grandiose. With the Andra, EgglestonWorks has pushed efforts to eliminate cabinet coloration to new heights but has not lost sight of the need for advanced design technology in other areas. The Andra offers excellent performance in virtually every aspect, and its soundstaging is among the best of any speaker available.

Like most assaults on the state of the art, the Andra is expensive; it sells for \$12,960 a pair. One reason for this lies in its construction. For example, how many speakers incorporate large pieces of Italian black granite to damp cabinet resonances? And the Andra's laminated walls consist of two panels of $\frac{3}{8}$ -inch medium-density fiberboard. A final layer

of outer lamination is bonded by a viscoelastic damping adhesive, which EgglestonWorks claims decreases wall-transmitted vibrations by a factor of 10. The cabinet walls are a minimum of $1\frac{3}{8}$ inches thick, and in the upper section of the cabinet, the laminate is sandwiched between two pieces of granite to create



walls that are $2\frac{1}{2}$ inches thick. The cabinet uses dado and biscuit joinery, and the internal braces are rarely more than a few inches apart.

The Andra has a number of other features to reduce cabinet coloration. A nylon polyamide loose-bulk fiber, which does not require support and does not settle, is used as damping material. Simply Physics decouplers act as feet. The Andra's

grilles are unusually transparent and do little to color the sound, although I would recommend that you use only the tweeter guards for serious listening.

The Andra is a very stylish speaker that has the finish and look you expect at its price level. The speaker is very attractive and remarkably compact for its 210-pound weight. The

Andra is only $37\frac{1}{2}$ inches high and just $15\frac{1}{4}$ inches wide versus $18\frac{1}{4}$ inches deep, which makes it appear much smaller than it is. Its sculptured look should fit comfortably into a great many living rooms, without taking on the character of a room-dominating icon.

The Andra's cabinet is designed to create resistance behind the drivers that's as close to that of a free-air

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suspension as possible. This ensures that each diaphragm has roughly the same pressure in back of it as it does it front.

The Andra's tweeter has a large, aperiodic rear damping chamber to imitate infinite-baffle loading, and its crossover—which uses MIT capacitors and Vishay resistors—is in its own chamber. Eggleston-Works says it chose Dynaudio's Esotar T330D tweeter on the basis of its exceptional neutrality and because it is manufactured and tested with outstanding quality control.

The Andra's two Morel MW166 6-inch polypropylene, double-magnet mid-bass drivers are in independently tuned transmission lines. The MW166 has a large voice coil (3 inches in diameter) and an unusually rigid structure. It also has a natural rolloff characteristic and can be run full-range. EgglestonWorks claims that the transmission lines used to load the MW166s are the first to incorporate the design work by Larry D. Sharp, enabling the use of shorter transmission lines than previously possible.

The bass drivers are two Dynaudio 30W100 12-inch woofers. These are loaded in a pressure-driven configuration of two parallel chambers; the rear chamber is vented. The 30W100 has a very large voice coil (4 inches in diameter), a mass of only 35.2 grams, a large (28-mm) cone excursion, an unusually supple suspension, and high structural rigidity. The pressure-driven loading is said to minimize back pressure on the front woofer while still allowing it to produce good "slam," good definition, and low bass extension in a relatively small cabinet.

The Andra is easy on amplifiers and speaker cables. It has a moderate rated sensitivity of 87 dB, but its nominal impedance of 6.9 ohms makes it a good match with any top-quality amplifier capable of more than 100 watts per channel. I encountered no significant interaction problems in using my reference AudioQuest, Goertz, Discovery, and Wireworld speaker cables with a range of different power amps.

During the last few years, the best high-end dynamic speakers have advanced to the point where their apparent speed and transparency are similar to those of electrostatic speakers while providing superior bass, dynamics, upper treble, and dispersion. The Andra's sound has all of these characteristics. Like most of today's best de-

signs, it is remarkably free of the minor response irregularities and crossover colorations audiophiles had to put up with even a few years ago. It has a seamless transparency from the upper mid-bass to at least the limit of my hearing.

The Andra's most striking characteristic is its exceptionally wide soundstage. At the manufacturer's suggestion, I placed the Andras about 50% farther apart than I would most speakers, with a moderate toe-in toward the listening position. I expected this placement would be so wide that it would produce a "hole in the middle" effect. Instead, center fill, left-to-right imaging, and soundstage definition were all excellent. The Andra's only limitation was a slight loss of depth, relative to the best competing speakers, and a bit more vertical directivity in the treble than some line-source dipoles.

The Andras provided an exceptionally wide, stable listening area—nothing antisocial about the dispersion characteristics of this speaker. You do, however, need to pay attention to side-wall reflections. Much of the advice given audiophiles about speaker placement now emphasizes achieving flat

**THE MOST STRIKING
ASPECT OF THE ANDRA
IS ITS EXCEPTIONALLY
WIDE SOUNDSTAGE.**

bass response so much that it ignores the risk of smear from reflected treble and midrange energy. A speaker with the excellent dispersion characteristics of the Andra should not be placed too near the side walls simply to get the widest soundstage. Glorious as excess may be, musically natural is still better.

The Andra's treble was excellent. Only a few ribbon drivers give more apparent detail and life, and this speaker's timbre was well chosen to provide lifelike musical energy and information without excess treble. The Andra did not have a euphonic high-frequency rolloff or "forgiving" upper octaves, but it was in no way etched, overprecise, or analytic.

The midrange was very neutral and smooth. I occasionally heard a slight

amount of excess upper-midrange energy, but this seemed to be as much a matter of the recording as the speaker. The Andra's upper midrange was very revealing, and I did not hear any characteristic coloration of soprano and tenor voices, violin, or piano in this region.

The critical lower-midrange/upper-bass region had excellent definition and timbre. The Andra provided exceptional natural warmth here, an area where many speakers err on the side of either leanness or excess. The lower midrange also had outstanding transparency coupled with very good low-level detail and resolution. Cellos sounded exceptionally natural, as did organ and percussion.

The mid-bass was excellent and the low bass very good. The Andra is capable of reproducing very deep bass, but an apparent rolloff in energy began at around 35 Hz; it cannot provide the power and "slam" of a large separate subwoofer. I'd have liked just a bit more definition in the very low bass.

Overall transparency was very good over a wide range of levels. The Andra did an exceptional job of revealing low-level detail and could handle anything but insane rock-concert levels. There was no change in sound character from low- to high-level dynamics, and I experienced no problems in letting classical music "rip." I could let Wagner do his worst (best?) without pushing the Andra's dynamic limits.

The Andra is an exceptional speaker and should provide years of listening pleasure. New manufacturers often produce interesting loudspeakers, but ones that tend to emphasize some aspects of sound quality over others. They may have important innovations, but once the initial favorable reviews are over, the product is often found to lack balance and integration. I don't believe this will be true of the EgglestonWorks Andra, a speaker that is anything but a "one-trick pony." EgglestonWorks may have put special emphasis on reducing cabinet coloration, but it has also paid proper attention to driver selection, driver loading, dispersion characteristics, amplifier loading, and every other important design parameter. If you are looking for a reference-quality speaker that offers a superb soundstage and an outstanding ability to faithfully reproduce recordings, the Andra may be your speaker of choice. **A**



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AURICLE

ANTHONY H. CORDESMAN

ÅNGSTROM 200 A/V PREAMP AND PROCESSOR



Innovation is the essence of the high end, but only a few products break new ground in quality and function. The Ångstrom 200 not only addresses both, but it does so in an area where innovation is badly needed. In one way or another, preamps and processors have been the weak links in bringing high-end sound to A/V systems. The Ångstrom 200 is the first component I have encountered that successfully combines advanced digital signal

processing with all of the features of a good A/V preamp. It not only has inputs for a wide range of video equipment but can accommodate game consoles and other components that have often caused hum or pops with other A/V preamps. Its ergonomics

make it remarkably easy to live with. Most important, Dolby Surround soundtracks and music recordings seem far more lifelike on the Ångstrom than on any other surround processor I have heard.

The Ångstrom 200 costs \$3,495, but it is a bargain by high-end standards. You get six channels of digital signal processing, a full-featured A/V preamp with all-digital implementation of Dolby Pro Logic, plus matrix surround. Besides its built-in Dolby decoding, the Ångstrom can be upgraded to include decoders for two of the digital discrete six-channel ("5.1-channel") systems now coming on the market. A Dolby AC-3 demodulator and decoder will soon be available for under \$1,500, and you'll be able to add another such decoding system (DTS, for example), if one should become available. In fact, the Ångstrom is designed so that all of its digital processing is upgradable. This offers an unusual degree of protection against the high cost of keeping up with rapid changes in audio technology.

The Ångstrom 200 has a well-balanced mix of A/V and control features. It provides switching for six audio and audio/video sources, including three digital inputs (two optical and one coaxial). This makes it easy to connect the unit into a complicated audio/video system.

You may miss the usual welter of numerous (and often useless) front-panel controls and a display filled with indicators. On the other hand, I found the Ångstrom's combination of front-panel controls and on-screen features to be just right. The only choice I would question is putting the surround delay adjust-

ment on the rear panel. While I agree that it's normally best to set this control once and forget it, and that front-panel misadjustment

is a constant risk, I'd still prefer easier access.

The rest of the Ångstrom 200's ergonomics are very good. An on-screen display makes setup easy, the owner's manual is relatively well

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written, and much of the hookup is intuitively obvious. The key settings are shown by LEDs on the front panel, and the control features are relatively simple and hard to misadjust. For once, setup procedures are clearly differentiated from ordinary operation, which minimizes the chance of someone in your family accidentally fouling up your setup adjustments. The remote control is also mercifully simple.

The rear-panel layout is well arranged, with connectors placed in a logical order and spaced so you can easily use either bun-

dled or separate audio and video cables. I would have liked a test signal for subwoofer level, however. (The test signal for setting front and surround levels has no bass, per Dolby standards.) Using a subwoofer-level signal and a sound-level meter is much easier than adjusting subwoofer level by ear, particularly if you're not very familiar with setting up A/V systems.

The decoding modes include Dolby Pro Logic, "Matrix," "Plus 1," and "Plus 2." For the moment, the last two duplicate the Pro Logic and "matrix" modes but with full-

range surround signals (and, in "Plus 1," enhanced steering). The real purpose of these settings is to leave a place for the discrete 5.1-channel upgrades.

Central to the design is an astonishing amount of computing power. There are two Analog Devices ADSP-2115 main processors, for a total of over 30 MIPS (million instructions per second) of capability—plus a socket for a third processor for future upgrades. This enables the Ångstrom to use complex finite-impulse-response (FIR) filters in decoding Dolby Pro Logic and matrix sound. Ångstrom claims that FIR yields far more linear phase characteristics than the much simpler infinite-impulse-response (IIR) filters used in other digital Dolby Surround decoders. The benefits are said to include better directionality and imaging, wider bandwidth and better upper-octave information, and cleaner and more natural musical harmonics.

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For better sound quality, the Ångstrom's three digital inputs are not decoded to analog before processing, and its video signals are very carefully isolated. The 200 uses separate power transformers for its video, digital, and analog power supplies; shielding improves signal isolation. The active and passive components are of excellent quality, and the unit is solidly built, with a 3/8-inch aluminum faceplate and a 16-gauge steel chassis. It carries a 10-year warranty, 9 3/4 years longer than some video components and about 8 years longer than most audio components.

The Ångstrom's specifications include audio frequency response within ±0.1 dB from 20 Hz to 20 kHz, THD of less than 0.02% over the same range, more than 55 dB of separation between channels, and S/N greater than 95 dB. Delay time is variable from 15 to 30 msec, and the subwoofer crossover frequency is 80 Hz. The output voltage is a nominal 2 volts, and the output impedance is 100 ohms.

Audio's primary concern is sound, not images, but I should note two things about picture quality via the Ångstrom 200. First, it is one of the most neutral video switching devices I have encountered. Second, it does not have S-video connectors. Some video buffs use such connections for everything in sight, but I have found them to be useful only with leads less than 6 feet long and with Super-VHS tape machines

**MULTICHANNEL MUSIC
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VERY CLEAN SURROUND.**

and a few satellite systems. I'd suggest, too, that if you want to get the best picture available, you should use the video switching in your monitor in preference to that in the Ångstrom. If you connect the video output of your satellite terminal, laserdisc player, or S-VHS recorder directly to the monitor, it will make A/V switching a bit more complicated, but it also will take a lot of circuitry and cabling out of the video path.

I used the Ångstrom 200 in four different ways: To play Dolby Surround soundtracks, to play music recorded with Dolby Surround encoding, to play stereo CDs and DAT cassettes, and to play stereo from such analog sources as an FM tuner and a turntable and phono preamp. The advantages of the Ångstrom 200 were most striking when I was listening to Dolby Surround soundtracks and music. The sound was much closer to what I have heard from discrete multichannel digital and analog systems than from any other Dolby Surround processor. It was notably cleaner and less fatiguing, and there were fewer random surround-channel artifacts.

Virtually any A/V processor can be described as dramatic if the only sonic criterion is how loud you can make the special effects or how far you can boost the bass. The processing quality of an A/V decoder and preamp also has little meaning if you are playing one of the many Dolby Surround movies whose soundtracks appear to have been thrown together inexpertly or even

randomly. Fortunately, you can find more and more great surround-encoded soundtracks, and they deserve the best decoding possible. The Ångstrom provides this. It did an exceptional job of reproducing the forest sounds in the quiet passages of the *Last of the Mohicans*, the "arrival" scenes in *Terminator 2*, the water and ambient sounds in the director's cut of *The Abyss*, and the complex interplay of dialog, music, and sound effects in *Queen Margot*. It opened up the soundtracks of spectaculars (such as the Star Trek, Indiana Jones, and Star Wars

series) by providing cleaner low-level detail and sweeter and more realistic reproduction of the music. These improvements were particularly striking when the 200 was set in its "Plus 1" mode.

The only drawback I found in the Ångstrom's ability to reproduce soundtracks is that the 200 doesn't have equalization adjustments. There's no easy way to roll off the highs to compensate for soundtracks that have excessive treble. There's also no way to add the bass boost often applied in movie theaters.

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The Ångstrom 200's sound was very impressive with Dolby Surround CDs. Still very much a mixed blessing, many of these CDs are intrinsically awful recordings that have all the mindless surround abuses that characterized most quadraphonic recordings produced back in the '70s. Delos, however, combines surround technology with taste, and the Ångstrom 200 reproduced that company's surround recordings with more natural musical detail and transparency than any other unit I have tried. The music took on a new focus and defini-

tion, and the surround effects were much cleaner. (Try listening to Dennis Keene's *Beyond Chant*, Delos DE 3165, and Gerard Schwarz conducting Mendelssohn's *Symphony No. 2*, Delos DE 3112.)

The Ångstrom did a very good job in reproducing stereo CDs and DATs. The 200 is not a rival to the finest D/A converters, but it is very good indeed. It has a very smooth overall timbre, with no eccentricities, and a smooth transition from the deep bass to the top octaves. It is very detailed and transparent and adds no touch of digital edge to the

upper midrange or the treble. Its bass is extended, powerful, and well defined. The soundstage has very good imaging and left-to-right width. The Ångstrom is a bit lacking in depth, but it is free of the digital glaze that is present in some D/A converters costing nearly as much as this entire unit.

The Ångstrom 200 is also not state of the art as an analog line-stage preamp. I heard a slight loss of detail, transparency, and musical life when I compared it to top-quality stereo preamps. I would have liked a touch more deep bass, a bit more soundstage detail

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and depth, and a bit more upper midrange transparency. But, its sound quality never fell below very good. It did not harden pure analog sound. Its shortcomings lie in what it subtracts from the sound; it adds no irritating colorations. Given the 200's mix of features, it is a very good preamp for the price.

The Ångstrom 200 is scarcely the first digital A/V preamp, and many other units now provide digital Dolby Pro Logic decoding. Yet it is the first one I have heard that is fully successful in getting high-end sound from surround soundtracks and music recordings. In short, I believe that the Ångstrom 200 is a best buy for anyone seriously interested in a high-end A/V system—especially for anyone who wants to combine home theater with a music system. Although a number of rivals are scheduled to appear in months to come, the Ångstrom is real, not a promise, and its upgradability means it can continue to challenge the state of the art. In my opinion, the 200 is a truly outstanding audio/video component. A

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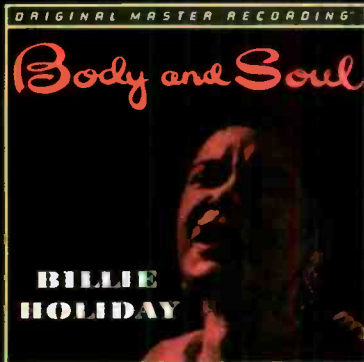


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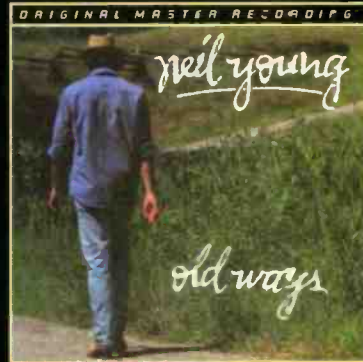
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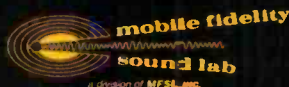
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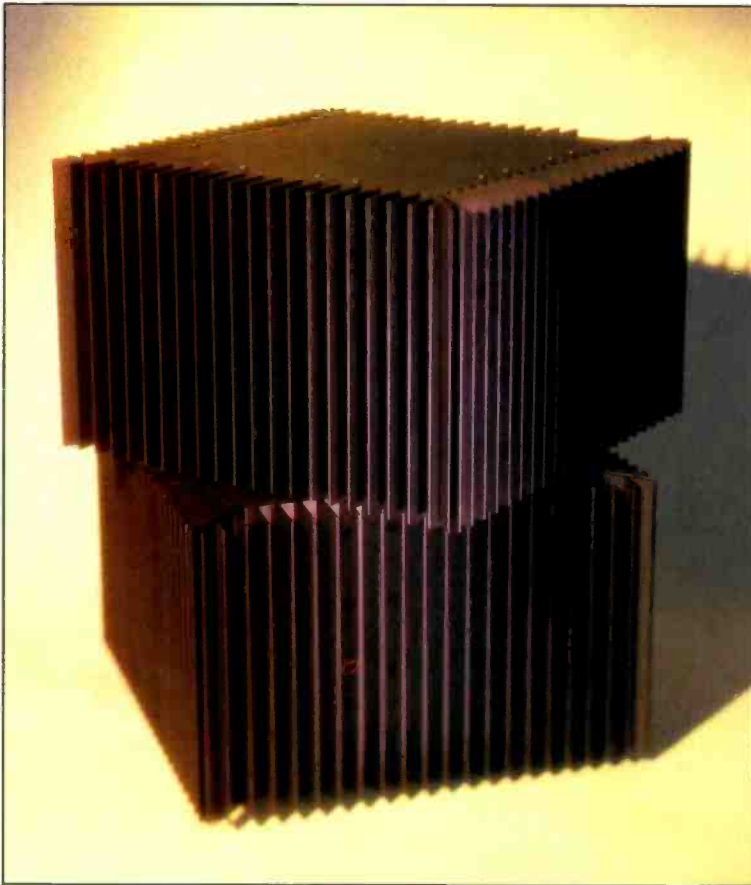
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MONO AMP



I reviewed the Aleph 0 mono amplifier, Nelson Pass's first product since forming Pass Laboratories, for the September 1994 issue. Its sound showed why Pass is widely regarded as one of the world's top designers of solid-state amps. The Aleph 0 demonstrated that a single-ended Class-A transistor design could have virtually all the sonic merits of a top triode tube

(and a switch to choose between them), and a set of binding-post output connectors. The Aleph 1, however, is nearly twice the size of the Aleph 0, and its power transformer is much larger. It weighs approximately 120 pounds and measures 16½ inches wide, 16½ inches deep, and 10½ inches high.

The Aleph 1's rated impedance is 10 kilohms for the unbalanced input

and 22 kilohms for the balanced input; gain is specified as 26 and 20 dB, respectively. Bandwidth extends to 100 kHz (the -3 dB point). Total harmonic distortion is rated at 1%, output noise at 30 nanowatts (500 microvolts), and common-mode rejection at 70 dB. The DC offset is no more than 50 millivolts. The Aleph 1 is rated to deliver 150 watts into 8 ohms, 300 watts into 4 ohms, or 600 watts into 2 ohms. This kind of power allows the amp to deal with the most demanding speaker loads.

Perhaps the only aspects of operation you need pay attention to are heat and warm-up. The Aleph 1 idles at 500 watts to ensure full Class-A operation with maximum headroom. As a result, its operating temperature is a comparatively high 122° F, so this Pass Labs amplifier requires good ventilation and cabinet clearance. And it takes at least an hour to warm up to its optimum operating condition.

The Aleph 1 shares much of its design philosophy with the Aleph 0. This includes an emphasis on simplicity and a minimum number of components to achieve the purest possible signal path. The Aleph 1 also retains the Aleph 0's Asymmetric Class-A topology, which uses a single-ended circuit rather than the normal push-pull arrangement. Pass Labs says that this sharply reduces crossover distortion, low-level non-linearity, phase problems, and odd-order harmonics.

Another holdover from the Aleph 0 is an element in the output stage to

avoid clipping at negative current levels that are greater than the bias point. According to Pass Labs, the Aleph 1 can handle 50 amperes on both

negative and positive peaks and can operate into impedances of less than 1 ohm at any phase of reactance. Its specified slew rate of about

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Asymmetric Class-A circuits need current gain that increases smoothly, so the Aleph 1's gain stages use MOS-FETs (whose gain tends to increase with current) rather than bipolar devices (whose gain drops off at higher currents). The Aleph designs also use the wide bandwidth and capacitance of the MOS-FET to roll off the amp naturally, with a simple, single-pole characteristic.

The technology in the Aleph 1 does differ from that of the Aleph 0 in a number of important ways, however. It uses larger MOS-FETs in the front end than the Aleph 0 and biases them higher. The Aleph 0's 1-watt devices in the initial gain stage have been replaced with 20-watt devices. The 20-watt devices in the Aleph 0's second gain stage have become 150-watt devices in the Aleph 1. These higher capacity transistors permit increased idle current and a further reduction in feedback, making it possible for the designer to use simplified input circuitry without low-pass input filters. The only ca-

pacitor in the input circuit is a 10-pF compensation device in the feedback loop.

There are major changes in the Aleph 1's output stage. The individual power transistors are twice as powerful as those in the Aleph 0 and have an aggregate current-dissipation capacity of 800 amperes. There is no protective current-limiting circuitry, and the entire output stage consists entirely of N-channel MOS-FETs, comprising a bank of followers biased by a bank forming the constant-current source. This circuit is said to provide up to 150 watts of Class-A power into 8 ohms, with 300-watt peaks.

An advantage of the output circuit in the Aleph 1 is that it makes full use of all the output devices to dissipate the enormous power constantly running through the amplifier. One-third of the output stage of the Aleph 0 was used only when the output was at high negative current; it did not conduct at idle. In the Aleph 1, the output devices share equally in the idle dissipation. (Pass Laboratories says this change in the output stage has been so successful that it has been incorporated into all Aleph 0s produced since December 1994.)

The changes in the Aleph 1 pay off sonically, both in sheer power and in nuance. Like the Aleph 0, the Aleph 1 shows that Class-A single-ended circuits do not have to be the province of triode tube amplifiers, which often are little more than midrange amplifiers—amps that get much of their sweetness and distinctive sound by limiting dynamic power and rolling off the bass and treble.

The Aleph 1 can reproduce the subtlest low-level soundstage detail and still kick ass at rock listening levels. This amplifier did a superb job of driving Apogee Studio Grand, B & W Matrix Series 3, and Thiel CS7 loudspeakers to their limits, and it did so without any change in sound character from the softest to the loudest passages of even the most demanding recordings. This amp also has the nuance and delicacy to get the best out of small mini-monitors, ribbon drivers, and electrostatics. The Aleph 1's sound has the same superb openness, air, and transparency that I vividly remember from the triode power amplifiers of yore. It is quieter than any tube amplifier I have heard to date, however. The music emerges

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CIRCLE NO. 22 ON READER SERVICE CARD

from Stygian silence rather than from a slight electronic haze.

I loved the Aleph 1's reproduction of choral music and harpsichord. One of the key tests of an amplifier's resolution is how much detail you can hear in complex choral passages without artificial etching of any element. The Aleph 1 did a terrific job of reproducing the voices and musical detail in high-quality recordings, such as the Westminster Choir's *O Magnum Mysterium* (Chesky CD 83), the SBHS (Santa Barbara High School) Madrigals' recording of *Earth Chants* (Sheffield 10049-2-F), and the Turtle Creek Chorale's *Postcards* (Reference Recordings RR-61CD).

The Aleph 1 also did an excellent job of reproducing *Pomp & Pipes*, by the Dallas Wind Symphony under Frederick Fennell (Reference Recordings RR-58CD). Compared to the Aleph 0, it had notably better dynamics and very deep bass, as well as more power. I had thought the Aleph 0 was good, but the Aleph 1 has notably superior bass definition, "slam," and extension. It doesn't have the slight warmth in the deep bass that characterized the Aleph 0 but re-

tains the Aleph 0's exceptionally realistic transitions from the bass to the lower midrange and its ability to reproduce accurately such instruments as bass guitar, grand piano, and cello.

The Aleph 1's midrange combines sweetness with detail and life. Again, these are

**THE CHANGES IN
THE ALEPH 1'S CIRCUITRY
PAY OFF SONICALLY,
BOTH IN SHEER POWER
AND IN NUANCE.**

sound characteristics I associate with the best triode tube amps, although there are differences. The Aleph 1 has slightly less transient and dynamic energy than most triode tube amps, but it is slightly cleaner in reproducing low-level midrange detail.

The upper midrange and treble of the Aleph 1 also are improved. They retain the Aleph 0's freedom from hardness or edge but add a bit of energy and dynamic life. As

a result, the Aleph 1 can do an excellent job of reproducing the top octaves of the violin and the complex "shimmer" of the cymbal. It does a superb job of revealing the different levels of upper-octave detail in recordings, phono cartridges, and D/A converters without coloring them or favoring one kind of sound over another.

As you might suspect from the preceding description, the Aleph 1 has excellent overall transparency and dynamics. Its resolving power also gives it outstanding imaging and soundstage depth and width. This is an amplifier that does not impose its character on the soundstage but preserves all of the information in the recording and induces your speakers to do their best. The Aleph 1 is one of the most musically convincing amplifiers around (particularly, I feel compelled to add, when partnered by the Aleph P preamp). With really good recordings, its performance is exceptionally lifelike, and no aspect of musical ambience and presence is emphasized over another. Its mix of sonic virtues comes as close to combining the best of both tubes and transistors as any amplifier I have yet heard. **A**

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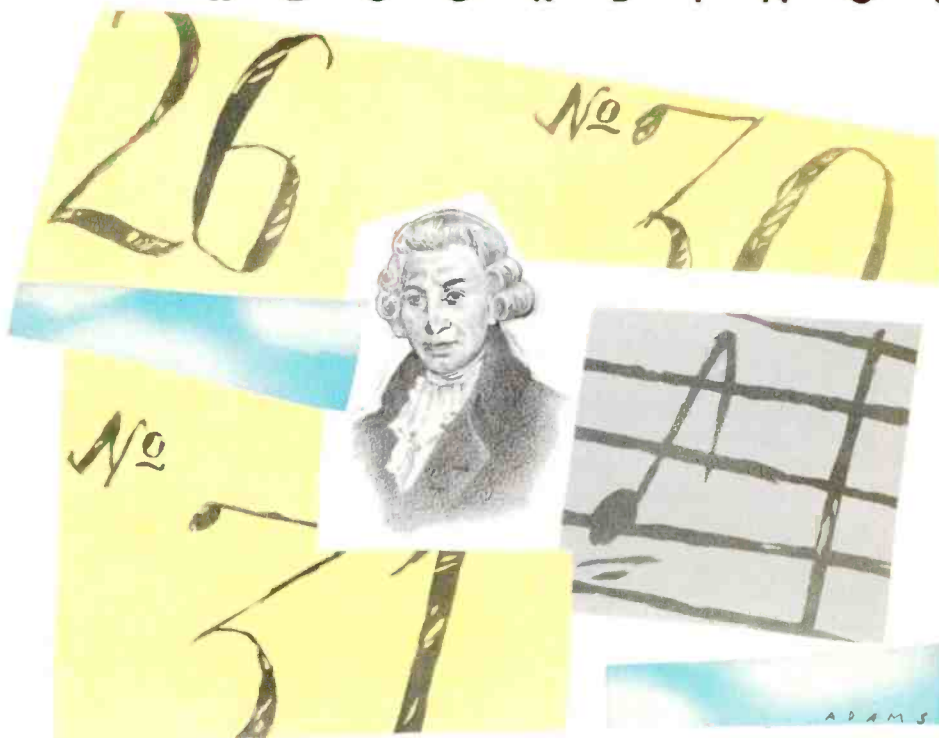
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CLASSICAL RECORDINGS



Haydn: Symphony No. 12, No. 44, and No. 64
Apollo Ensemble, John Hsu
 DORIAN DOR-90226, CD; DDD; 63:34
 Sound: A, Performance: A



Haydn: Symphony No. 26, No. 30, and No. 31
Chamber Orchestra of Lausanne, Jesús Lopez-Corbos
 DENON CO-78967, CD; DDD; 53:04
 Sound: A, Performance: A+

The Denon recording is part of an ongoing series of early Haydn symphonies; the Dorian is the second in what I hope will be a competing series. Both are utterly wonderful—but utterly different.

Denon's issue suggests modern forces scaled down to the needs of the music but still surrounded by plenty of air in a fine, modern concert hall. In keeping with the music, vibrato was minimized in the string playing, but the fair-sized chamber orchestra appears to be playing modern instruments. The Lausanne musicians observe the niceties of "authentic style" without making a fetish of it. The delight they seem to



take precludes the kind of preoccupation with mere technique and scholarship that infests so many performances of this music.

The Apollo Ensemble plays period instruments (John Hsu, its founder, also is known as a period-instrument cellist) and is carefully scaled to the forces known to have been available

to Haydn when these symphonies were first performed. On sonic evidence alone, I'd guess the ensemble to be no more than two-thirds the size of the Lausanne orchestra and possibly a good deal smaller than that. Despite the emphasis on scholarship, the Apollo Ensemble does not overlook Haydn's Dionysian side but does keep it in its place. Vibrato is absent (rather than minimized), and though the recording was made in a fairly large, modern hall (Dorian's gem in Troy, N.Y.), the pickup is much more intimate than Denon's. The hall's sonic bloom is there, but it's discreetly in the background.

Beyond that, the approaches actually are quite similar: loving and zestful, with superb ensemble work and none of the cavalry-charge prestos or lugubrious largos that often disfigure virtuoso symphonic concert performances. Because of the relatively querulous tone of vibratoless violins, some listeners will favor the somewhat flashier, richer Denon sound; purists will certainly prefer the Dorian. I must admit that I give the edge to the Denon (although I was less impressed with another disc I sampled from Denon's series). Yet both approaches are valid, and each makes a special kind of sense. I wouldn't be without a sampling, at least, of both. *Robert Long*

Illustration: Lisa Adams

CHAMBERS: TEN GRAND

Ten pianists; Wendy Mae Chambers and Artur Geisel, conductors
 NEWPORT CLASSIC NPD 85553
 CD; DDD; 51:39
 Sound: A, Performance: A-

Composer Wendy Mae Chambers is fascinated with sound produced by large numbers of the same instrument. She has created works for 30 harps, 77 trombones, and 100 timpani, but her first effort in this genre was for 10 grand pianos: "Ten Grand." It grew out of her interest in creating a big sound, especially with percussion instruments, and she remembered that the piano actually is a percussion instrument.

The suite of 22 short sections has similarities to Mussorgsky's "Pictures

at an Exhibition" (which has been recorded in a 45-piano version, by the way!). Instead of paintings, the listener visits different countries—China, Russia, Japan—and observes



descriptive subjects such as "Primordial Birds," "Gamelan," and "Chords." All 10 instruments do not always play simultaneously, and in "Spatial" they gleefully bounce a musical figure around the soundstage.

Chambers attracted the participation of a distinguished collection of pianists, including new-music keyboard notable Ursula Oppens. *Ten Grand* is a keyboard blockbuster and great new musical fun! *John Sunier*



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CIRCLE NO. 10 ON READER SERVICE CARD

Contatos (Works of Bellinati, Madureira, Rougier, Bartók, Brouwer, D'Angelo, Agobert, and Azuma)

Cristina Azuma, guitar

GSP RECORDINGS GSP 1009CD, CD; 55:42

Sound: A, Performance: A

This is a singular and exquisite classical guitar recital, built around the performer's awareness of rhythmic and modal similarities between music from northeastern Brazil and Europe. (The European portion of this musical jaunt is primarily to eastern Europe, but it also covers Spain and Italy.) Thierry Rougier's "Three Byzantines" encompass Bulgaria, Rumania, and Greece, and other works quote or are inspired by Falla and Satie. The Béla Bartók tracks are two transcriptions from his "Mikrokosmos." The CD's title is Portuguese for "contact" and suggests exchange and reciprocity. Such elements do occur throughout this fascinating program, as does Cristina Azuma's felicitous connection with the attentive listener.



John Sunier

Korngold: Violin Concerto; Sinfonietta

Ulrike-Anima Mathé, violin;

Dallas Symphony, Andrew Litton

DORIAN DOR-90216, CD; DDD; 70:06

Sound: A, Performance: A

As far as the concerto goes, this recording has formidable competition from the Deutsche Grammophon issue (DG 439 886) with Gil Shaham and the London Symphony Orchestra under André Previn. And since the concerto is the centerpiece of both discs, I fear the DG, which went on sale earlier, will obscure the worth of the Dorian.

Both reflect their companies' respective cutting-edge technologies: The DG is a 4D recording, the Dorian a 20-bit recording made with fiber-optic links. There the similarities end. The DG reminds me of Norma Desmond's line in *Sunset Boulevard*: "I still am big; it's the movies that got small." The average level is perhaps 10 dB higher than that of the Dorian, and Shaham is presented as SuperViolin—much larger than life. The level is achieved at the expense of dynamic range, and the lush self-confidence of the performance is achieved at the expense of the more vulnerable detail that comes through touchingly in Dorian's far more natural and human-scaled recording.

To some extent, DG's movie-music approach is appropriate to the concerto—which was written after Erich Wolfgang Korngold



MOON CHILD'S DREAM

Works of Koppel, Holmboe, Kulesha, Christiansen, and Arnold

Michala Petri, recorder;
English Chamber Orchestra, Okko Kamu
RCA VICTOR RED SEAL 09026-62543
CD; DDD; 77:49
Sound: A, Performance: A+

All five recorder concertos here are world-premiere recordings, and all are the result of the efforts by Michala Petri, a Danish recorder virtuoso. She adapts her ancient instrument to contemporary music rather than limiting it to adaptations of music written for other instruments or only to early music for recorder.

While each concerto has its own style, all share an upbeat and magical feeling, as suggested by the album title. Among the high-

lights is Malcolm Arnold's Concerto for Recorder and Orchestra, in which high spirits characterize both the music and Petri's stunning playing. Another standout, Gary Kulesha's Concerto for Recorder and Small Orchestra, shows the influence of the Japanese shakuhachi and requires the additional task of singing through the recorder while maintaining tuneful accessibility.

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John Sunier



had achieved star status for his film scores. It uses material from some of them, but it was an overt and at times diffident attempt to rekindle the "pure music" of his youth in Vienna. Dorian's orchestral textures remind you that Mozart was among his models there, as well as Mahler and Richard Strauss.

The Sinfonietta dates from the Vienna period and is a very nice piece indeed. All of Korngold's music seems ultraconservative for a boy brought up in the Vienna of Berg and Webern, but it is beautifully made. It was precisely because his music was so well made that he was hailed as a prodigy from the beginning.

The Dallas sound is rather anonymous, but it does leave more air around the orchestra than DG afforded its forces. The admittedly slicker, more maxed-out DG obviously will appeal to some tastes, but I suspect Korngold would have preferred Dorian's more musically approach.

Robert Long

Einhorn: Voices of Light

Anonymous 4 and other soloists;

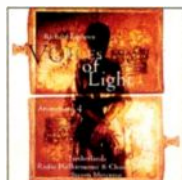
Netherlands Radio Choir and Netherlands

Radio Philharmonic, Steven Mercurio

SONY CLASSICAL SK 62006, CD; DDD; 70:40

Sound: A, Performance: A+

American composer Richard Einhorn was inspired by Carl Dreyer's 1928 silent film classic *The Passion of Joan of Arc*, but *Voices of Light* stands without visual images. This oratorio is a celebration of Joan of Arc, using a mosaic of ancient sources, Joan's own letters dictated to a scribe, and the writings of such medieval female mystics as Hildegard von Bingen.



Musically, the oratorio has surpassingly lovely sections of ecstatic melodic invention. Philip Glass-type progressions are occasionally heard. Even without the libretto, the work can be experienced as a dramatic melding of medieval and contemporary music. Intelligibility of the soloists and the chorus is excellent on this recording, probably aided by the spacious, though not cavernous, acoustic ambience (the session took place in a studio rather than a cathedral).

John Sunier

Rachmaninoff: Complete Songs, Vol. 1

Kalevi Olli, baritone; Ulrich Koneffke, piano

FINLANDIA 4509-98615, two CDs;

DDD; 1:34:04

Sound: C, Performance: A-

This set is more remarkable than my ratings imply. Kalevi Olli appears to have an extremely powerful voice (I would call him a bass-baritone rather than a baritone), and he sings these often marvelous and seldom performed songs in a style that is far more operatic than liederesque. Doubtless with that in mind, Finlandia (a Finnish label of Time Warner) abandoned the fairly intimate acoustics usually mandated for song recitals in favor of a cavernous sound that I find distinctly off-putting, though you may not agree. Admittedly, a conventional sonic perspective would have been disastrous: Olli's big voice and even bigger passion would have seemed overbearing at the climaxes instead of galvanizing, as they are here. Surely a satisfying middle ground could have been found.

Olli manages the quieter, more lyrical songs with considerable aplomb, at times displaying



an unusual mastery of head tone. Not every detail is perfectly managed or every song perfectly suited to the singer, but it is a very impressive performance, minor flaws and all. And pianist Ulrich Koneffke matches Olli point for point; occasionally, however, their loudest sounds become muddy.

For casual listening, an hour and a half of a single singer and composer can be tiresome, but this is intended instead as a library collection. I can imagine more refined readings of some of the quieter songs, but I know of no singer who could bring more power to the dramatic ones and few who could project their profoundly Russian character so vividly. On balance, Olli is an excellent proponent. (Full transliterated Russian texts and English translations are provided.)

Robert Long

**Janáček: Sinfonietta, Op. 60;
Lachian Dances; Taras Bulba**

Czech State Philharmonic, José Serebriar

REFERENCE RECORDINGS

RR-65CD, CD; 65:08

Sound: A+, Performance: A

Fame came slowly to the genius Leos Janáček in his homeland, Moravia. This was partly because of his heterodox insouciance about such institutions as marriage. But fame came to him even more slowly abroad, as only in the fairly recent past have the world's opera houses awakened to the unique riches of his *Jenufa* and his other passionate masterpieces.



Fans of top-quality audio will revel in the extravagant brass section required by the Sinfonietta—four horns, 14 trumpets in three keys and ranges, four trombones, two tenor tubas, and a bass tuba—all gloriously provided here by a splendid brass section and recorded with this small but trailblazing firm's HDCD technique.

Paul Moor

**Swedish Orchestral Favourites (Works
of Söderman, Stenhammar, Larsson,
Peterson-Berger, Alfvén, and Wirén)**

Helsingborg Symphony Orchestra, Okko Kamu

NAXOS 8.553115, CD; DDD; 68:28

Sound: A+, Performance: A+

While Hugo Alfvén's familiar "Vigil" and the single track from Dag Wirén's bouncy Serenade caught my eye, the rest of the sparkling program joined these two as personal favorites after just one listening. Never mind its cultural, historical, and biographical significance; this album is sure to captivate

because of its plain and infectious music, loads of marvelous melody, and life-affirming moods. You'll want to shout "Skool," and your pocketbook will also be pleased with this release from budget-label Naxos.

John Sumier

Borodin: Prince Igor

Soloists; Kirov Opera Chorus and Orchestra,

Valery Gergiev

PHILIPS 442 537, three CDs; DDD; 3:28:15

Sound: B+, Performance: A

This is as close to a definitive *Prince Igor* as it gets: an excellent edition, admirably docu-

mented, in a typically committed, idiomatic, rich, colorful, dramatically convincing, and— together beautiful performance by the Kirov forces recorded in St. Petersburg's Mariinsky Theater. Philips has preserved all of the Kirov's dynamics, from floated off-stage pianissimo to thunderous. The thunder may get slightly congested, and the sense of stage placement and movement might be clearer, but it's an admirable job.

Robert Long



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al green



Photograph: Carol Friedman

Your Heart's in Good Hands

Al Green

MCA MCAD-11350, 46:13

Sound: A+, Performance: A



It's been more than 20 years since Al Green sent shivers up my back. Of course, I still get goose bumps every time I hear "Let's Stay Together" or "I'm Still in Love with You," his soulful R&B crossover hits from 1972 on the Memphis-based Hi Records label. In subsequent years, Green lost his hit-making magic touch but found religion.

Through the mid-'80s, Reverend Al turned out pretty mediocre albums, some of which leaned heavily on drum machines and cheesy arrangements. But in spite of the inferior production work, the voice was always golden.

For *Your Heart's in Good Hands*, his first secular album in 18 years, Green put himself in the good hands of producers Narada Michael Walden, Arthur Baker, Jodeci's DeVante, and the tag team of David Steele and Andy Cox (both of Fine

Young Cannibals). The result is an uplifting, gospel-drenched gem that is dripping with passion and irresistible grooves. Needless to say, I'm shivering with delight.

Love is the theme of this comeback offering from the righteous reverend of soul. The upbeat "One Love," the smoldering R&B ballad "Could This Be the Love," the galvanizing title track, and the '70s-flavored "Keep on Pushing Love" (a

kind of '90s sequel to "Let's Stay Together") address matters of the heart while recalling the infectious grooves of Green's glory days with Memphis producer Willie Mitchell. The legendary Memphis Horns, Andrew Love and Wayne Jackson (who played on Green's string of hits for Hi Records), add their signature punch to "One Love" and "Best Love," while former Living Colour bassist Doug Wimbush grooves mightily on the anthem "Love Is a Beautiful Thing."

Arthur Baker's remake of Smokey Robinson's 1965 hit written for The Temptations, "Don't Look Back," rocks with an uncharacteristic edge for fans of vintage Al Green. But the reverend seems right at home with the romantic ballad "Your Love (Is More Than I Ever Hoped For)," a brilliant showcase for his passionate abandon and spine-chilling falsetto. Two pieces arranged and produced by Steele and Cox, "What Does It Take" and "People in the World (Keep on Loving You)," wrap Green's sensuous singing voice in a more contemporary setting, blending today's hip-hop beats with a classic '70s feel.

Regardless of the setting, it's the magic of Al Green's voice that cuts through on this triumphant comeback. This is pop music of the highest order, healing music in a real sense.

Bill Milkowski

PERMANENT SHADE OF BLUE

Roachford

EPIC EK 67345, 51:07

Sound: A-, Performance: A-

The British have always excelled at taking American R&B music, putting their own spin on it, and selling it back to the colonies. Although most British exports of late have been devoid of soul, Roachford, along with Seal and Terence Trent D'Arby (born in America but considered a British artist), are U.K. soul exports who have absorbed American R&B and made it their own. On his third album, *Permanent Shade of Blue*,



Roachford finally has a band worthy of his songwriting. And he comes up with a musical approach that—though heavily influenced by Prince, Jimi Hendrix, Sly, et al.—is his own.

The Prince references are sometimes too strong; "Cry for Me" and "Lay Your Love on Me" could pass for outtakes from the "Little Red Corvette"/"Raspberry Beret" periods. Yet Roachford presents a wide variety of music and sings his butt off. "Emergency," with its Kool and The Gang groove, seems a natural for radio. And if there is a longing for mid-'80s funk, Roachford is right on time.

Jon & Sally Tiven

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**A Testimonial Dinner:
A Tribute to XTC**

Various Artists

THIRSTY EAR THI 57019-2, 48:52

Sound: B+, Performance: B+

The tribute album trend is pretty tired, but this homage to XTC stands out as one of the genre's better efforts. XTC inspires no small amount of devotion from its fans, partly because it hasn't toured for about 15 years, but mostly for the nonpareil songwriting of Andy Partridge and Colin Moulding.

Most of *A Testimonial Dinner's* interpretations hew pretty close to the original, with the notable exception of Ruben Blades' searing Latin take on "The Man Who Sailed Around His Soul." Still, most of the participating artists manage to stamp personality into their performances. Sarah McLachlan's "Dear God," Freedy Johnston's "Earn Enough for Us," Spacehog's "Senses Working Overtime," Joe Jackson's "Statue of Liberty," and P. Dinklage's "Another Satellite" all qualify as highlights. Unlike on most tribute albums, there isn't a really awful or boring cover to be found. Even XTC gets into the act pseudonomously as Terry & The Lovemen, covering an obscure B side from the "Mayor of Simpton" single titled "The Good Things."

A Testimonial Dinner is a genuinely entertaining album, one of the best in the crowded field of tribute albums. If it encourages any fresh interest in the quirky but often brilliant XTC, so much the better. *Michael Tearson*

Almost Speechless

Ben Arnold

RUFFHOUSE/COLUMBIA CK 67215, 39:15

Sound: B+, Performance: A-

Ben Arnold wants you to know how he feels, and his straight-from-the-heart songs hit their targets with unerring precision. While Arnold isn't a prisoner of 20-something angst, his deeply-felt emotions are the glue that makes *Almost Speechless* whole, and deceptively simple arrangements leave plenty of room for his soulful vocals.

There is so much strong material here, but the real standout is "Be There." The song reflects on the troubled life of a friend whose tragic death might have been averted if only Arnold had "been there" for him. Don't be surprised if Rickie Lee Jones or Rod Stewart jumps on it, for this repentant confessional certainly belongs in the "most likely to be covered" category. On "You," Arnold uses his Graham Parker-like voice for maximum impact in recalling a tale of unrequited love. For atmosphere, a Dylanesque Hammond B-3 provides the perfect accompaniment. "Soar," Arnold's homage to Orville and Wilbur Wright, looks back to the brothers' early unsuccessful attempts to defy Newton's law. The opening line, "Wilbur, we'll try again tomorrow" serves as a reminder that we should never surrender our dreams. Ben Arnold may have his head in the clouds, but all of these songs embrace some very down-to-earth human feelings and concerns.

Although *Almost Speechless* is a consistently melodic and deftly conceived recording, it's even more than that; it's an all-out aerobic exercise for your emotional heart. Just press "Play."

Steve Guttenberg



Julian Cope

Julian Cope Presents 20 Mothers:
Better To Light a Candle
Than To Curse the Darkness

Julian Cope

AMERICAN 9 43044-2, 71:49

Sound: B+, Performance: B-

By now, there's no questioning Julian Cope's status as a genuine British eccentric. More than

a decade into a prolific solo career that kicked in on the heels of the short-lived but influential The Teardrop Explodes, "Saint" Julian forges onward with all his quirks intact (if "intact" is indeed a word one would use to describe a chemical zealot of Cope's rank). Of course, after a while, musical renegades become as tiresome as conformists if they don't come up with the requisite good tunes. *20 Mothers* has a few, but it's also 70 minutes long. So the question is, does it have enough?

For passionate devotees, absolutely. For them, tossed-off asides like "The Lonely Guy" and "By the Light of the Silbury Moon" (at minimum) offer precious insight into the swarming mind of the "Arch-Drude" ("drude" is a Cope-coined word, a combination of "druid" and

"dude") of neopsychodelia. Unconverted skeptics, on the other hand, may find their minds wandering as Cope's insights and melodies stray far and wide. "Try Try Try," "Highway to the Sun," and "Adam & Eve Hit the Road" are all relatively conventional rockers with wonderfully intoxicating hooks, subject matter be damned (they're about mom, meat-eaters, and virtual reality, respectively,



according to Cope's loopy liner notes). Elsewhere, Cope wanders into everything from British folk to art-noise to synth-pop, all designed to carry the weight of his pre-millennium fixations with these "desperate times."

Cope seems satisfied to put out one tripped-out treatise after another, and for those who constantly hunger for another dose of Cope, that's just delightful. For the rest of us, maybe we'll catch up with you later. *Steven Stolder*

Photo: American Recordings

The Sacred Squall of Now

Reeves Gabrels

UPSTART 020, 50:48

Sound: A, Performance: A

Guitarist Reeves Gabrels, David Bowie's accomplice in Tin Machine and a hired gun on his last two solo outings, is a sound alchemist with a deconstructionist bent. In fact, the guy's just plain bent—as in sick, twisted, and madly inspired beyond all reason. He's even got a band on the side called The Bentmen. I rest my case.

On his solo debut (he collaborated earlier in 1995 with slide-guitar god David Tronzo on *Night in Amnesia*, also on Upstart), Gabrels in-



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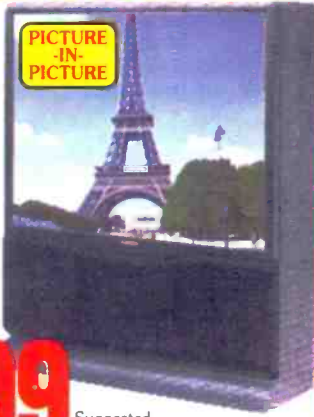
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dulges in sonic mayhem with fangs bared. The results are positively horrific by pop music standards but wholly transcendent by "weird music" standards.

As a songwriter, Gabrels has a knack for moody, abrasive rock with harmonic meat and savvy pop hooks ("Say That Now," "Problem," and "Comeback"). His interest in Middle Eastern music comes into play in the midst of the densely textured "Husnu," and he delivers a touch of drama on the melancholy blues lament "B.N.Y.," with lyrics by his wife, Sara Terry. Bowie makes a guest vocal appearance alongside movie star Gary Oldman on "You've Been Around" (which Bowie previously recorded for his *Black Tie/White Noise* album) and on a thrashing-good industrial rant, "The King of Stamford Hill." Former Pixies frontman Frank Black sings lead on "119 Years Ago," and Charlie Sexton joins Gabrels for an appropriately macabre rendition of Creedence Clearwater Revival's "Bad Moon Rising."

As an instrumentalist, Reeves is a revelation. His soaring solo on the Bowie-esque

lead-off track, "119 Years Ago," has all the epic uplift of Hendrix's levitating masterpiece "Bold As Love." His out-to-lunch solo on "Husnu" is state-of-the-art skronk, and his brief feedback-laden solo on "Problem" is a subversive gem. Gabrels' ethereal guitar orchestra piece, "Thirteen," is like Glenn Branca with a sense of humor. And the other urgent instrumental, "Firedome," contains some of the most radical guitar work this side of David Torn and *No Pussyfooting*-era Robert Fripp.

Vocals and amazing, otherworldly guitar playing haven't been so organically integrated into the fabric of pop tunes since the heyday of Jimi Hendrix. Think of this one as Reeves Gabrels' *Are You Experienced*. *Bill Milkowski*

Trust

Patrick O'Hearn

DEEP CAVE RECORDS 1001-2, 45:35

Sound: A+, Performance: B+

Patrick O'Hearn used to play bass for Frank Zappa, and he spent the early '80s with a fun-

ny haircut in Missing Persons. But for the last decade, he's been orchestrating landscapes of the soul. His modus operandi hasn't altered much since his 1986 debut album, the influential *Ancient Dreams* (Private Music 2002-2-P), with an organic mix of synthesizers, samplers, acoustic and electric bass, and percussion. But *Trust* shows that there are still landscapes to explore.

O'Hearn is a master of texture and sound design. There's nothing different in the equipment he uses, but he gets more expression out of it, yielding complex layers of synthesizers often outlined by the rubbery melodies of his electric and acoustic basses. O'Hearn is helped out by some old friends on a few tracks, including Zappa/Missing Persons mate Terry Bozzio and guitarists Peter Maunu and David Torn. But they are only there as part of O'Hearn's textures.

After struggling through six years of neglect at Private Music, O'Hearn is clearly emerging from a time of despair. On "Two Continents" and "Equinox," his mood is dark—full of foreboding and even menace. Percussive rhythms tug on the subconscious like a primal shadow, yet beneath it all is a sense of resigned heroism that marks the difference between despair and affirmation. (Available from Deep Cave Records, P.O. Box 290, Bat Cave, N.C. 28710.) *John Diliberto*

Techniques of Speed Hypnosis

Edsel

RELATIVITY 88561-1525-2, 48:46

Sound: B-, Performance: C

Unfortunately for Edsel, *Techniques of Speed Hypnosis* fails to get beyond sounding like everything else on college radio. The band's sense of melody comes through on most of the cuts, reaching a plateau of ethereal ecstasy, only to be discarded for something unlistenable in a perpetual search for the lost chord. Edsel should focus more on the sweeping warmth of its breaks and forget about so-called "alternative credibility," which is simply a trap for many up and coming bands. Every time I tapped my feet or yearned to catch the chorus and sing along, an overzealous guitar disrupted the moment.

On stand-out tracks "Chester's Wig" and "Skin of the Bear," Edsel shows an ability to craft pop compositions, where the vocals work with the arrangements in self-assured ease. More songs like these, and *Techniques of Speed Hypnosis* would have spent more time in my CD player. *Lauren Somerstein*



THE RENTALS

Return of the Rentals

MAVERICK/REPRISE 9-46093-2, 37:02

Sound: B, Performance: B

You can't accuse The Rentals of overreaching; everything about this debut murmurs a modest intent.

Essentially an outlet for Weezer bassist Matt Sharp to develop his frontman skills, The Rentals mix and match '90s lo-fi and early '80s retro aesthetics into something that's not exactly ground-breaking but is nevertheless satisfying. In fact, the majority of these 10 tracks make for tasty ear candy that has all the appeal of a New Wave compilation. Beginning with the one-two-three combination of "The Love I'm Searching For," "Waiting," and "Friends of P.," The Rentals frugally adorn sprightly melodies with multiple Moog synthesizers and bandied male/female vocals. Sharp compares The Rentals to Electric Light Orchestra on a budget, but The Cars-meet-Pavement may be a more ac-

curate comparison. Visually, The Rentals have opted for the East German bureaucrat look, which MTV immediately embraced (maybe someone there is nostalgic for that bygone "all videos, all day" age when Gary Numan and Devo ruled the air). But the more novel aspects of The Rentals have limited appeal; what's



attractive about this project is the freshness of its best songs.

Sharp promises that The Rentals are not just "my little side project," which may prove to be unfortunate—if ever there was an intrinsic "little side project," it's The Rentals. Just leave it at that.

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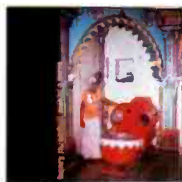


Makin' a Move

Henry Threadgill

COLUMBIA CK 67214, 64:22

Sound: A, Performance: A+



Henry Threadgill usually leads his group with an alto saxophone hanging from his neck. But calling his music "jazz" is like dressing him in an ill-fitting suit. Threadgill is a composer with a singular vision that defies familiar record-bin categories. The landscape he covers on *Makin' a Move* is, as always, full of unpredictable twists and glorious plays of shadow and light.

Like the best classical composers, Threadgill develops themes that appear and disappear, only to reemerge later with a different voice and feeling. Some of *Makin' a Move's* cur-

rents flow directly from Threadgill's 1994 album *Carry the Day*, while others date back further in his cata-

log; all of them sound fresh and undated. Unlike most concert-hall scores, Threadgill allows his musical themes to embrace influences without concern for their origin or conventional place. "Noisy Flowers" arrives via Myra Melford's delicate solo piano; the next track is introduced by Pheeroan Aklaaf's funk drumming. On "Like It Feels," French horn and tuba carry the melody while electric guitars provide counterpoint. On "Refined Poverty," Threadgill's alto soars elegantly above a cello trio.

At the core of it all is Threadgill's ensemble, Very Very Circus—a strange brew of instrumental voices anchored by twin tubas, played by Edwin Rodriguez and Marcus Rojas, and Mark Taylor's French horn. One could go on about the Indian influence in Threadgill's use of guitars or the superimposition of ragtime and circus conventions over his own themes, but that would be missing the forest for the trees. Though the word "soundscape" is overused these days, Threadgill's musical vision is panoramic and rendered in such great detail that you can live in it, which is a whole lot more fun than defining it. *Larry Blumenfeld*

Photograph: David Gahr

Melvin Taylor

Melvin Taylor & The Slack Band

EVIDENCE ECD 26073-2, 51:18

Sound: B-, Performance: B+

Judged by its cover, Chicagoan Melvin Taylor's latest album appears to be traditional electric blues, on the order of Otis Rush. But that's only part of the story; Taylor, like many of his peers, is a contemporary blues artist whose influences range from T-Bone Walker and B.B. King to blues rockers Jimi Hendrix and Stevie Ray Vaughan. On his second domestic release, Taylor shows off formidable guitar chops and vocal authority.

Melvin Taylor & The Slack Band is a live-in-the-studio album, warts and

all. It has flaws (the bass guitar lacks definition, and Taylor leans on his wah-wah pedal too much for those with "purist" tastes), but blues enthusiasts will appreciate how genuine it is. Taylor and his Slack Band—bassist Willie Smith and drummer Steve Potts—lock together in an un-



polished, stripped-down fashion to deliver a set of originals and covers that is hardly overproduced. The bottom line on

Taylor, a better interpreter than songwriter, is that even with his flaws, few current or emerging blues musicians play with his emotion and authenticity. *Jon & Sally Tiven*

Tone Poems II

David Grisman and Martin Taylor

ACOUSTIC DISC ACD-18, 64:24

Sound: A, Performance: A+

David Grisman's second *Tone Poems* album pairs the mandolin master (who additionally plays mandola, mandocello, and guitars here) with British jazz guitar whiz Martin Taylor. They play a diverse set of 19 period jazz tunes, including "Swanee," "Besame Mucho," "Mairzy Doats," "My Romance," Django Reinhardt's "Tears," and Ellington's "Mood Indigo" (a piece that has one of the sexiest melodies ever).

The chemistry between Grisman and Taylor is wonderful. It's obvious from the relaxed performances how much fun they had making this album. Each plays as fast as the wind when needed, but they also know how to play slow and hot, leaving necessary spaces between the notes.

Adding to the fun is how this live-in-the-studio album showcases the nuances of the different woods and designs of the 41 vintage instruments used on the album. The booklet includes color photos of each instrument, an essay relating to its history, and who played it and made it. Whenever possible the instrument is used on a song that was originally recorded with the same (or a similar) model.

The first *Tone Poems* album (Acoustic Disc ACD-10) was a similarly packaged collection of folk songs played by Grisman and guitarist Tony Rice, who used an equally dazzling array of instruments. Both albums are spectacular audio showcases for great playing and for the finest subtleties of fine instruments. My highest recommendations both technically and artistically.

(Available from Acoustic Disc, Box 4143, San Rafael, Cal. 94913.) *Michael Tearson*

Gunslinging Birds

Mingus Big Band

DREYFUS FDM 36575-2, 71:11

Sound: B+, Performance: A

Charles Mingus is alive and well. Most often you can find him in New York's East Village, every Thursday night, in a basement club called Fez. There, the Mingus Big Band, a 14-piece rotating outfit drawn from a roster of

more than 100 of New York's finest and most freethinking players, holds court. The brainchild of writer and producer Sue Mingus, his widow, the group has parlayed a three-week gig into one of the longest-running jazz shows, with European tours and two CD releases to boot.



Repertory jazz often gets a bad rap, but the Mingus Big Band succeeds in raising the weighty spirit of its name-

sake. Elegant yet vulgar, and full of defiant beauty, *Gunslinging Birds* proves the band is up to the challenge Mingus laid down: to perform his frustratingly difficult works, make them swing, and, above all, keep them sounding new.

There are some powerful reorchestrations of "Started Melody" (by Gunther Schuller) and "Noon Night" (by Ronnie Cuber), both drawn from the masterwork *Epitaph*. And while all in the unit deserve applause, trumpeters Randy Brecker, Philip Harper, and Ryan Kisor command special note. Tenor saxophonists Chris Potter and Craig Handy engage in a ferocious duel on "O.P.," and John Stubbs turns "Hog Callin' Blues" into a soul-satisfying, tenor sax showcase.

The fire and fury of the Mingus Big Band is admirably in the mix here; still, why not record it live? *Larry Blumenfeld*

blue sun

Mark Isham

COLUMBIA CK 67227, 60:59

Sound: A, Performance: A

Mark Isham's Columbia debut feels like a descendant of two Miles Davis landmarks, *Sketches of Spain* and *In a Silent Way*. One selection, "And Miles To Go...Before He Sleeps," even pays tribute to the legendary band leader and horn player with its title.

On *blue sun*, Isham presents eight originals and a lovely, wistful version of Duke Ellington's "In a Sentimental Mood." Isham plays trumpet, cornet, flugelhorn, and unidentified "electronics"; two key soloists are Steve



Tavaglione on tenor sax and David Goldblatt on acoustic and electric pianos. Bassist Doug Lunn and drummer Kurt Wortman complete the quintet.

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Though most of *blue sun* is still and languorous, opportunities remain for Isham and Tavaglione to let it out and wail, particularly on "Barcelona" and "Tour de Chance." "Barcelona" is a study in dynamics, as it opens softly and builds to a peak before falling back and repeating the ebb-and-flow cycle several times. The title track throbs with a sad heat of the tenor sax and Isham's muted cornet. The sound, engineered and mixed by Stephen Krause, drapes the music in elegance.

Isham's *blue sun* is an excellent album. It has soothed more than its share of my troubled late nights.

Michael Tearson

Infinity

McCoy Tyner Trio

featuring Michael Brecker

IMPULSE IMPD-171, 72:16

Sound: A, Performance: A

Infinity marks McCoy Tyner's return to the reactivated Impulse label (he was one of its first signings in the early '60s, as was John Coltrane), and more significantly, it chronicles Tyner's return to a piano, sax, bass, and drum setup after years of using mostly trio and big-band settings. In tow, he's got his trio mates of nearly a decade, bass player Avery Sharpe and drummer Aaron Scott, and a very special guest, saxophonist Michael Brecker. Tyner, who enjoyed important formative associations with Coltrane and Sonny Rollins, among others, knows a thing or two about tenor players. Brecker proves an inspired choice; he has been successful with a more progressive sound, and *Infinity* offers him the perfect opportunity to embrace his straight-ahead roots.

The nine-song session is nothing if not honest and pure. Tyner's "Flying High" gets things off to a powerful start. On "Happy Days," he begins with a relaxed descending pattern, but within a minute, he and Brecker are plumbing a deep blues well. Brecker tackles the tenor role admirably on Coltrane's "Impressions," which Tyner and Coltrane recorded decades ago. And Brecker is at his most urgent and affecting on Tyner's "Mellow Minor," reeling off responses to the pianist's lightning-quick figures. An unexpected treat, the album concludes with Tyner, alone at the piano, performing the ballad "Good Morning Heartache." To quote Tyner from his liner notes, "life without a doubt goes in cycles." Without a doubt *Infinity* couldn't express this better.

Larry Blumenfeld

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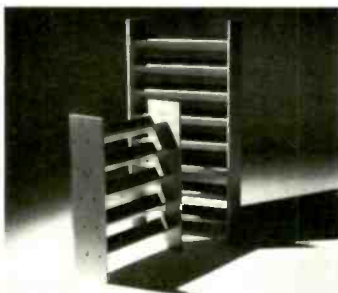
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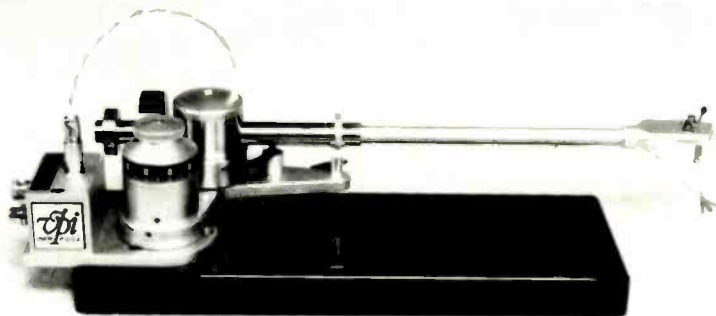


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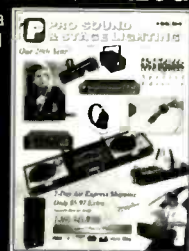
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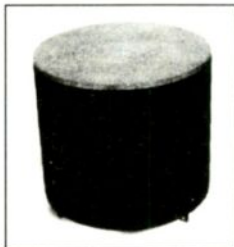
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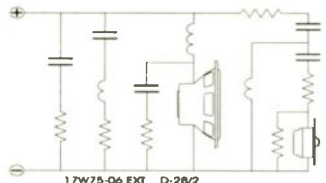
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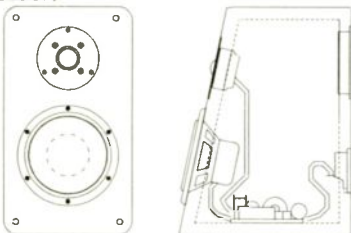
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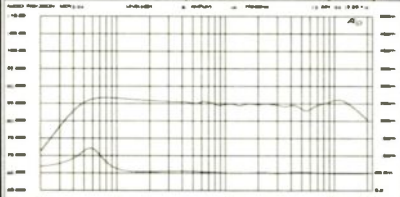


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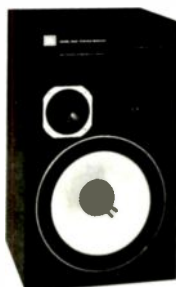
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SALAMANDER DESIGNS ARCHETYPE MODULAR SHELVING



Modular shelving units from Salamander Designs can be changed to accommodate varying component ensembles. Thanks to a system that employs hexagonal nuts on solid-steel rods, shelf height is a matter of choice. Units can be placed side by side or atop

one another and can be linked by special bridging shelves. Neoprene washers are sandwiched between metal ones to damp vibration, while mounting options include wheels, rubber feet, or heavy metal spikes (the last nearly a half pound each).

My 36-inch-high, five-shelf, natural cherry Archetype 5.0 came with adequate illustrated instructions and



both a level and a wrench; the only other tool required was a tape measure. The 90-minute assembly was simple but tedious, since I quickly tired of spinning nuts down threaded rods to their appropriate height. Others may finish more quickly, depending on how critical they are about spacing.

I very much like the Archetype's appearance; its black-oxide gunbarrel-finish hardware contrasts strikingly with the warm grain of the solid hardwood shelves. Prices for five-shelf units range from \$249.95 to \$379.95. Two- and three-shelf units (20 and 28 inches, respectively) are available, and other finishes include classic oak, hazelnut, black lacquer, and a black lacquer/cherry combination.

GRADE: A

David Lander

For literature, circle No. 121

Panasonic PV-4564 VHS Hi-Fi VCR

Panasonic's PV-4564 gives you plenty of space, whether or not you have a home theater. Its Spatializer Audio Processor chip, developed by Desper Products, accents spatial cues in the signal. This results in a more lifelike sound field, wider and deeper than conventional stereo. Spatializer (the latest in a long chain of stereo sound-field enhancers, ranging from Carver's Sonic Holography to Hughes' SRS) provides a wide "sweet spot" and subtly effective processing. Panasonic provides a switch for two degrees of processing, as well as defeat.

I used the PV-4564 with a 27-inch TV and front-firing stereo speakers. Voices stayed centered on the screen, while sound effects and music spread out to the sides of the picture and in front of it. Spatializer added little in the way of noticeable twang or coloration. Sitting closer to the TV enhanced the effect. The Spatializer



GRADE: A

circuit might be considered just a desirable gimmick if not for the overall outstanding recording performance of the \$430 PV-4564 itself. Besides enhancing acoustic space, the compact size of this VCR saves considerable physical space.

Rich Warren

For literature, circle No. 120

contrasts strikingly with the warm grain of the solid hardwood shelves. Prices for five-shelf units range from \$249.95 to \$379.95. Two- and three-shelf units (20 and 28 inches, respectively) are available, and other finishes include classic oak, hazelnut, black lacquer, and a black lacquer/cherry combination.

David Lander

For literature, circle No. 121

B & W 803 MATRIX SERIES 2 SPEAKERS



I could tell from their looks and sound that the 803s were B & W products. Their highs were clean and natural, even on sharp-edged soprano voices. Overall balance was good, distortion was generally low, and there were no colorations. I've heard more spaciousness, but the soundstaging was broad and natural; small groups (such as William Bolcom and Joan Morris) sounded as if they were right there in the room. Bass extended down to 18 Hz, was more audible at 28 Hz, and then came in solidly at about 33 Hz—but the deep bass seemed to lack some power and authority. On dense material like the Berlioz Requiem (Telarc), there was either a bit of high-end rolloff or some mushiness at high volume levels.

The speakers' size (40 x 11 x 14 inches) let them fit unobtrusively into my average-sized living room, and their \$1,500-apiece price makes them affordable. Overall, the sound was clear and neutral, and I found myself appreciating previously unheard subtleties in long-familiar recordings. There was nothing to dislike in the sound, yet I could not quite bring myself to love it—I found it just a little uninvolving.

GRADE: A-

Ivan Berger

For literature, circle No. 122



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