AUDIO

THE EQUIPMENT AUTHORITY

APRIL 1996

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–Julian Hirsch, *Stereo Review*

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AUDIO

THE EQUIPMENT AUTHORITY

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Yamaha AC-3 Decoder, Citation A/V Preamp/Processor, and Yamaha A/V Receiver

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Cover Photographer: Bill Kouirinis Studio
Cover Equipment: Yamaha DDP-1 AC-3 decoder, Harman Kardon Citation 7.0 A/V preamp/processor, and Yamaha RX-V2090 A/V receiver

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The Audit Bureau

Adcom's GFP-565 Preamp: Pure and Simple.

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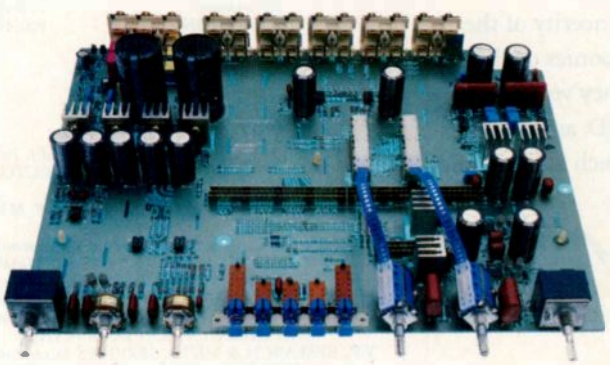

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FAST FORE-WORD

Every once in a while the audio business serves up a real head-scratcher—something that manages to provoke a lot of interest or controversy without, on careful examination, actually amounting to much. The most prominent recent examples I can think of are the alleged consumer version of the DTS multichannel audio coding system (I say "alleged" because it gets talked up relentlessly in some quarters without ever materializing in products people can buy and use) and HDCD. Both have seemed from the beginning to be solutions in search of problems.

HDCD, which gets close scrutiny this issue in "Digital Deliverance" (page 26), does have a leg up relative to DTS because it is a real product. There are a handful of HDCD recordings on the market, and a growing number of outboard D/A converters and high-end CD players either incorporate the HDCD decoder or make it available as an option. But what does HDCD do—and why? Considering how much attention the process has received, it's been astonishingly hard to get answers to those questions. HDCD's developer, Pacific Microsonics, will tell you that it eliminates distortions present in conventional digital audio, that there's a compander in the system, and that decoder operations are regulated by control codes buried in the dither noise. Beyond that, it gets pretty murky. It's not even clear what the distortions that supposedly are eliminated might be. Promotion of HDCD rides on the back of the idea that there is something basically wrong with digital audio as we know it, which some audiophiles and writers now seem to take as an article of faith. (This attitude also fueled some of the early, effusive press on Super Bit Mapping, which was often treated like some sort of magical sonic elixir rather than, accurately but mundanely, a potentially useful technical development in requantization of digital recordings possessing exceptional dynamic range.)

The HDCD recordings I've heard have sounded good when decoded but no better than other good recordings made without the process. They sound *different* when undecoded, which makes sense given that HDCD is supposed to be (ideally) an encode/decode process. That difference is pretty much by definition a distortion, however. And therein lies HDCD's most troubling aspect. It's a bit like somebody throwing a rock through your front window and then offering to repair the damage for a fee. The system is compatible with conventional CD equipment only in the sense that you can still get passable sound from HDCD releases on non-HDCD players. But if you don't have an HDCD decoder, no HDCD recording will ever have a chance of sounding the way it's really supposed to on your system. In the absence of a clear, compelling benefit, is that something we really want?

I don't doubt the sincerity of the folks at Pacific Microsonics or their belief in the system they've created. But I think that HDCD, as it stands now, demands too much for too little return.

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LETTERS

TheaterMaster Made Easier

Dear Editor:

Right after Edward J. Foster's "Equipment Profile" of the EAD TheaterMaster Dolby AC-3 surround processor appeared (March), we introduced the System Controller. This touch-screen remote puts even the most complex operation of the TheaterMaster, and almost all other infrared-operated home theater equipment, a single keystroke away. All operating modes and setups of the TheaterMaster, our new TheaterVision laserdisc player, and our about-to-be-introduced SwitchMaster video switcher are handled by this remote through a series of 18 linked screens. Simplified GUI (graphic user interface) techniques guide the user through even the most complex procedures.

Alastair Roxburgh
V.P., Engineering
Enlightened Audio Designs
Fairfield, Iowa

Kudos to Cordesman, King, and Crew

Dear Editor:

Thanks to Anthony H. Cordesman's informative "Auricle" review of Vandersteen's 3A speaker (June 1995), I auditioned and later bought a pair. Their soundstage and overall range, especially in the deep bass, is a big improvement over my Dahlquist DQ-10s.

At first I was quite upset when the 3As didn't sound as good at home as they did in my dealer's demo room. I then reread the Vandersteen review, noting Cordesman's mention of careful setup, a break-in period of about 100 hours, and that his pair of 3As was equipped with Sound Anchor braces. I bought the braces and, after installation, heard a remarkable difference. The soundstage opened up, and the imaging improved immensely.

I did find the Vandersteens to be less efficient than the DQ-10s. Considering I was driving them with a GAS Son of Ampzilla, I thought more power was needed. After reading Bascom H. King's "Equipment Profile" of the Legacy High-Current amp (April 1995), I bought it along with Legacy's preamp. Although my Legacy amp/preamp combo overshadows the 3As in price, I'm quite happy with the sound.

Thanks again to Cordesman, King and the rest of the staff for helping me assemble my best system to date.

Jeffrey C. Dyer
Columbus, Ohio

Bad Connections

Dear Editor:

I must take issue with Ken Kessler on the subject of connectors ("Mondo Audio," January). The connectors used on audio equipment are at least 50 years behind the state of the art. As Kessler says, the only suitable connector is the so-called XLR Cannon, and that is because it was intended for a battery box used with a movie camera.

Connectors I have used on military and medical equipment were chosen because of their utility, not because of custom or cost. A suitable connector always has a hood to protect the male pins, has a strain relief to protect the wire-to-contact junction, and is shaped to allow insertion only with the proper mate and orientation. It should also have a locking device to prevent accidental removal. The contacts should be gold on gold, mated at high pressure to force a cold weld, or used above 24 volts.

Look at the connectors used on computers, telephones, cellular phones, automobiles, and professional equipment of any sort. They are as safe and reliable as they can be made. It is ridiculous to hook up high-end equipment with RCA jacks and banana plugs; they are just not reliable or safe. And there still isn't a standard speaker connector!

Gilbert A. Johnson
Minnetonka, Minn.

Simple Solutions

Dear Editor:

Several months ago, I bought a couple of JBL Control One Plus speakers for the RCA 27-inch TV in my bedroom. Being lazy, I just hooked these speakers to the TV's speaker jacks directly instead of feeding them through an outboard power amp. Lo and behold, the TV cranks rather well, sans external amp! My wife and grandchildren can detect no distortion at really loud levels.

Last Thanksgiving, I put one of the JBLs atop our small 13-inch TV in the kitchen and got a similar result. Lots of folks are listening to their bad little TV speakers when they can upgrade, via the earphone jack, without going to the trouble of hooking up a power amp. Sometimes less is better.

Along these same lines, my son mounted a fine old JBL D123-4 12-inch speaker in an Altec wall cabinet several years ago. He stuffed it with fiberglass and sealed it up. The result was a speaker that has become a family legend. It's the best-sounding single speaker for vocals that any of my son's cohorts had ever heard. And it's very efficient in the bargain. This speaker system is too big for most uses but remains the family standard for testing out a source of audio.

Don Helgeson
Evanston, Ill.

We Can See for Myles

Dear Editor:

I was stunned recently by a bargain classical CD made with Sony's Super Bit Mapping recording technique. Where can I find information discussing the various labels' recording techniques, as well as an education on analog-to-digital and digital-to-analog conversion?

Cliff Myles
Cleveland, Ohio

Editor's Reply: Compiling individual recording techniques of each label is difficult because they often vary, depending on the artist and producer. However, we can recommend our series by D. W. Fostle on the latest CD mastering technologies ("19 Bits in a 16-Bit Sack," March, and "Digital Deliverance," this issue), which discusses Sony Super Bit Mapping and other similar techniques.

A good reference for A/D and D/A conversion is Ken C. Pohlmann's book, *The Compact Disc Handbook* (A-R Editions, 800/736-0070).—*S.V.C.*

Erratum

An incorrect company phone number was given for JoLida in the "Equipment Profile" of its SJ 302A integrated amplifier (March issue). The correct number for JoLida is 301/953-2014.

Rotel Report 5

Rotel's RSP-980 provides Dolby® Pro Logic® and THX® certified surround-sound decoding, video switching, and audiophile quality preamp functions for two independent zones.

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System flexibility? Seven source inputs and an independently controlled Zone 2 output allow you to choose one source for your main system and another for remote rooms!

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"The Rotel RMB-100s deserve serious consideration."
Dayna B., The Audio Adventure, Vol. 2, Issue 2, Dec. 1995

RCC-945 6-disc CD Changer

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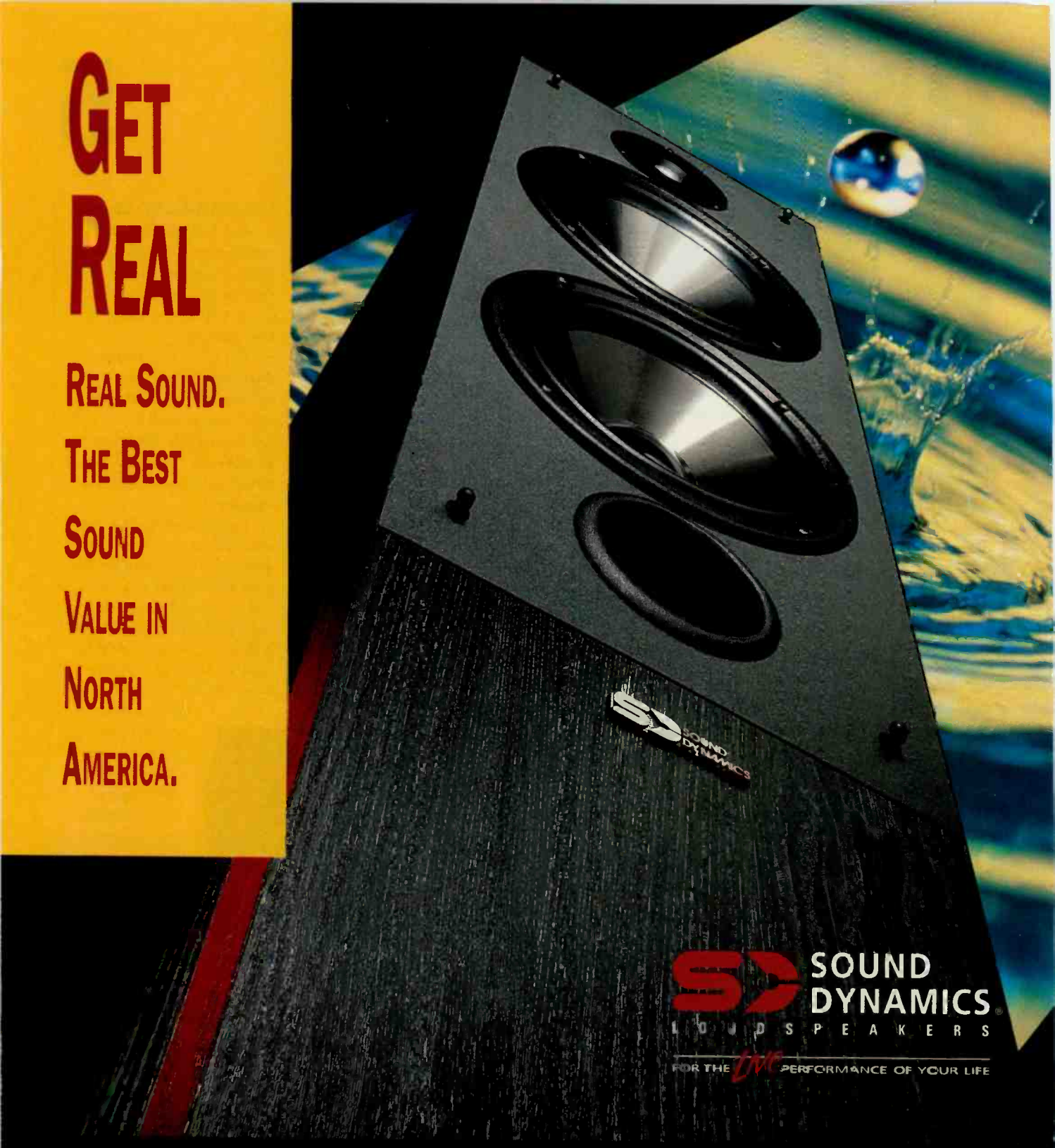

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WHAT'S NEW

AMBIANCE ACOUSTICS SPEAKER

Instead of a woofer, tweeter, and crossover, the California Cube, from Ambiance Acoustics, uses four full-range 4½-inch drivers plus an external equalizer. This equalizer features a 64-Hz bass rolloff filter with an 18-dB/octave slope, an EQ bypass switch, and a tape monitor. An optional "purist" upgrade replaces the standard speaker and equalizer wiring (including circuit-board traces) with silver wiring and adds premium ICs. The California Cube is available in a laminate or painted finish. Prices: $1,995 per pair, including equalizer and prepaid shipping; upgrade, $200 for two speakers and one equalizer.
For literature, circle No. 100

• MB QUART SPEAKERS •

Emulating quick-change artists, the speakers in MB Quart's Domain line have detachable grilles and trim panels. Ten different finishes are offered; depending on the model, the trim you select (and change yourself) will cost from $49.95 to $123.95 per pair ($53.95 each for subwoofers). Shown are the D20 satellite and D1000S powered subwoofer, in honey burl. The D20, with a 5¼-inch woofer and ½-inch titanium-dome tweeter, has a rated frequency range of 70 Hz to 22 kHz. The range of the D1000S, with a 10-inch woofer in a ported cabinet, is specified as 28 to 200 Hz; its amp is rated at 100 watts. Prices: D20, $299 per pair; D1000S, $649 each.
For literature, circle No. 101

AudioSource Subwoofer

The AudioSource SW 8 powered subwoofer is rated to deliver response down to 20 Hz from an 8-inch driver in a vented cabinet measuring only 11½ x 15 x 14 inches. The built-in amplifier, rated at 50 watts rms, has both line- and speaker-level inputs and outputs. Adjustable crossover frequency (50 to 180 Hz) and subwoofer level controls help you match the SW 8 to a wide variety of speakers, as does a polarity switch. The electronics automatically turn on when signal is present and turn off a few minutes after the music ends. Price: $299.95 each.
For literature, circle No. 102

TDL Speaker

Standing 4 feet tall, the Studio Monitor M is among the latest transmission-line speakers from TDL. The transmission line provides loading for an 8 x 12-inch oval woofer with a glass-reinforced polystyrene diaphragm. The other drivers are a 6-inch aluminum-diaphragm midrange and a ferrofluid-cooled 1-inch magnesium-alloy dome tweeter. Rated impedance is 8 ohms; sensitivity is 87 dB for 1 watt at 1 meter. Walnut and black-ash finishes are available. Price: $6,500 per pair.
For literature, circle No. 103

ADVENTURE SPEAKER

At the top of Advent's new B_2R (Bach to Rock) line, the Jade is a two-way speaker with a shielded 8-inch long-throw woofer and 1-inch dome tweeter. Overall frequency response is rated as 43 Hz to 21 kHz, ±3 dB. Sensitivity is 89 dB, and recommended power is 10 to 125 watts (400 watts peak). Price: $449 per pair.
For literature, circle No. 104

DVD Is Where It's At.

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AUDIO CLINIC

JOSEPH GIOVANELLI

Midrange Output from a Subwoofer

Q *Even though my subwoofer is fed frequencies only below 125 Hz, I can still hear most of the information above this point, albeit at much lower levels. I tested this by passing a 1-kHz tone from a test CD through the sub alone, and I was able to hear it clearly. Do I need to use an electronic crossover network rather than the passive networks I now use in order to prevent these frequencies from being heard?*—Paul Hanley, Jersey City, N.J.

A Crossovers don't chop off frequencies above or below the crossover point; they roll those frequencies off. If your crossover is a first-order type, which rolls off at 6 dB per octave, the signal fed to your subwoofer would be only 18 dB lower at 1 kHz than it is at 125 Hz (though the woofer may have some additional rolloff of its own). With a fourth-order crossover, which rolls off at 24 dB per octave, the level at 1 kHz would be down 72 dB, but even that might be audible if the original signal were loud enough. If you feel the need for a steeper rolloff than you're getting, you'll need a steeper crossover; you can use either a passive or an electronic type. On the other hand, if the leakage through the subwoofer is apparent only when the main speakers are disconnected, there may be no real advantage to changing

Shielding TV Sets

Q *In the past, you've discussed how to shield a TV set from nearby speakers by using thin sheet iron or sheet steel. I bolted four pieces of 16th-inch sheet metal to the underside of the shelf that holds my center-channel speaker. That gave me an undistorted picture, but only if I moved the speaker nearly all the way to the back of the shelf. I wanted to put the speaker as far forward as possible.*

When I wrote to you about this, you suggested magnetizing these sheets with a permanent magnet (first moving the shield and the TV apart, of course). Your advice was right on target. I magnetized the bottom plate with a magnet from a hefty 10-inch woofer, which cleared up 80% of the problem; I still got a bit of picture distortion when I moved the speaker back and forth on the shelf. But tilting the rear of the loudspeaker up, to aim it at the listening position, eliminated the picture distortion and put the speaker at the front edge of the shelf, right where I wanted it. Thank you for your advice.—Wayne A. Pflughaupt, Katy, Tex.

A The reason this works is that magnetizing the sheets increases their permeability to magnetic fields, which improves the shielding.

High-Output Cartridge into MC Input

Q *I want to add a second turntable and use a mono phono cartridge whose rated output is 22 millivolts for a 1-kHz recording at 10 cm/sec. My preamp's moving-magnet phono input is already in use. I have a moving-coil input available, but its sensitivity is 100 microvolts. The MC input's impedance is 50 ohms; the cartridge's required load depends on the type of equalization needed. What kind of network could I use to match the cartridge to this MC input?*—Name withheld

A I'm not at all convinced you can do this without serious overload, but here's a possibility: Use a Y connector to feed your cartridge's mono output into both the left and right MC inputs. Then put a 47-kilohm resistor in series with the "hot" lead from the cartridge. This should form a voltage divider with the preamp's 50-ohm input, reducing the signal going to the preamp. It should also satisfy the cartridge's load requirements, flattening its response so you can use your preamplifier's RIAA equalization.

If this doesn't work, you'll have to make a shielded switchbox that lets you select either your regular stereo cartridge or the mono cartridge to feed to your MM input. If you like, you can wire the mono cartridge so that its output feeds both channels. Paralleling the two channels this way will alter the frequency response a bit, giving you a peak followed by a rather fast rolloff; if you're playing 78s, this could be desirable, however. If you want flat response from the cartridge, put a series resistor of about 22 kilohms between the cartridge's hot lead and the switch. You'll lose about 6 dB of signal, but chances are that will also be to your advantage.

Equalizing 78-RPM Records

Q *I'd like to transfer my 78-rpm records to tape. I think I could really do a good job if I had information about the various recording curves used by record companies when they were producing these discs. (Most of my records are from the '40s and '50s, with a sprinkling of discs from the '30s.) Where can I find this information, and can I use my stereo third-octave equalizer somehow?*—Harry R. Porter, Louisville, Ky.

A I don't know of any books that include the information you're seeking. But I can tell you from experience that published curves won't be very useful, because you can tell just by listening that many companies' curves varied from record to record within the same time frame. On the other hand, once you have a setting for a given record company, you will need to depart from it only occasionally.

When I transferred my 78s to tape, I started with my preamp's standard RIAA curve, which was designed for LPs. I fed my preamp's output to a graphic equalizer and, listening for the most lifelike sound, made adjustments by ear for each record. If you try this, you might want to have a friend listen with you, to get a second opinion.

Since there's probably no bass below 40 Hz on any of your discs, you can turn your equalizer's lowest band all the way down, which will reduce rumble quite a bit. If this low-frequency cut intrudes into the next octave, you might need to boost that octave just a bit. In many cases, you may need to reduce bass between 100 and 200 Hz in order to avoid boominess. Keep in mind that you will also be starting with the RIAA

If you have a problem or question about audio, write to Mr. Joseph Giovanelli at AUDIO Magazine, 1633 Broadway, New York, N.Y. 10019, or via e-mail at JOEGIO@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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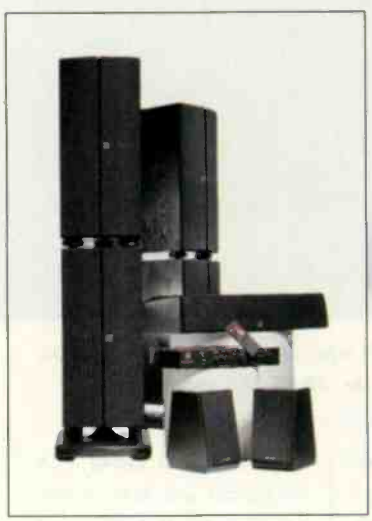

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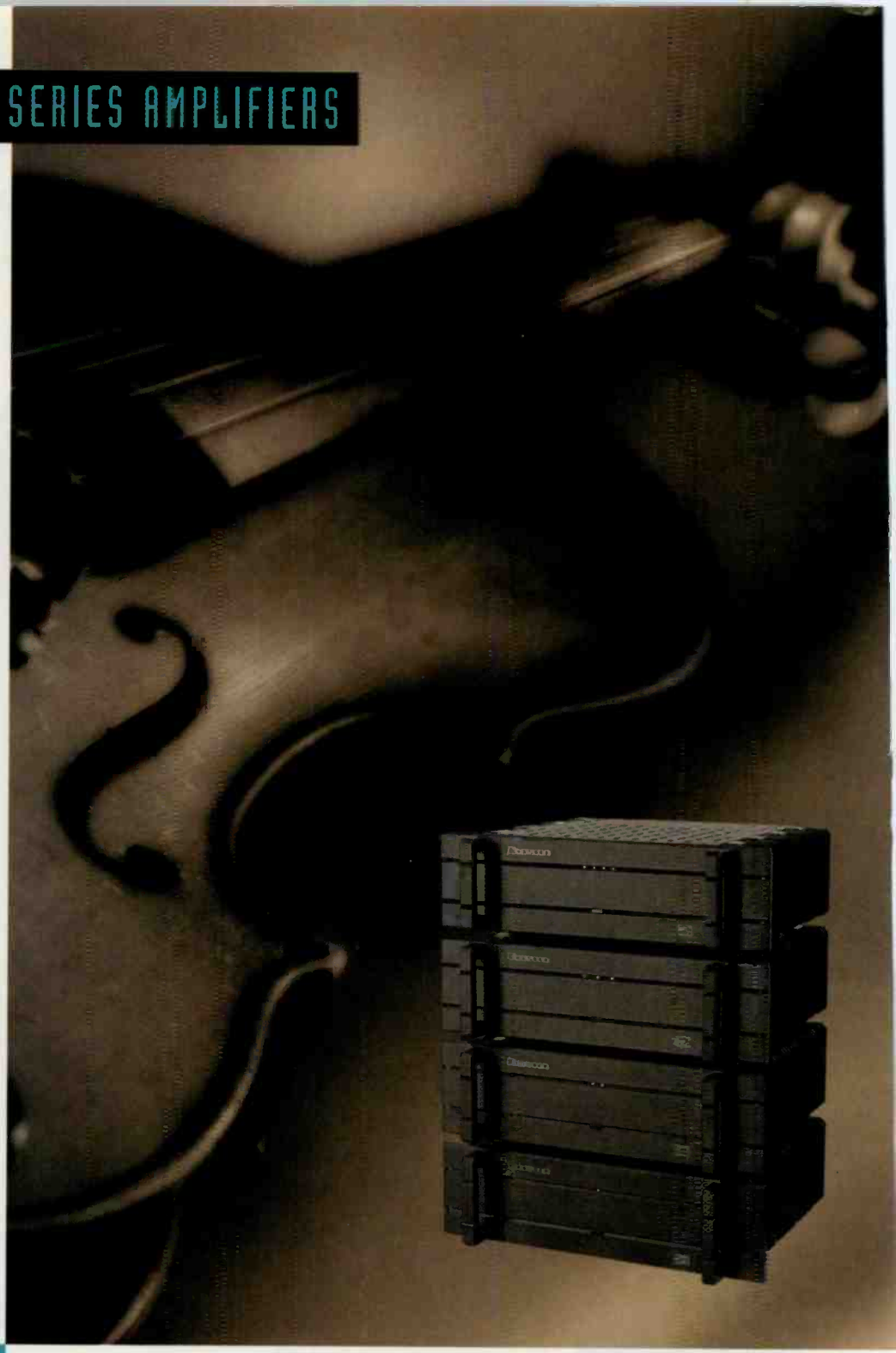

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curve, which boosts bass—often more than is needed for 78s.

I roll off highs above the highest frequency on the discs (usually 10 or 12 kHz), to minimize background noise. You may wish to boost highs somewhere below this cutoff point.

You may find that you'll be reducing frequencies in the region of 2 to 3 kHz, to compensate for the record producer's idea of what sounded good on phonographs of the day.

Experiment! It's amazing what a small change in settings, sometimes just 2 to 3 dB, can make.

This technique of equalizing for the difference between a record's correct playback EQ and the RIAA curve is also the basis of a commercial product from Esoteric Sound (4813 Wallbank Ave., Downers Grove, Ill. 60515). The Re-Equalizer ($310) comes with data on suggested settings for various companies' recordings (and was reviewed in the November 1985 issue).

Slow Preamp Warm-Up

Q *When I first turn my preamp on, the left and right channels fade in and out but not in unison. It takes approximately 5 minutes for the unit to operate properly. There is no reliable repair shop in my area, and I am reasonably good with electronics; should I repair the preamp myself?*—Grant W. Prokop, Winnipeg, Manitoba, Canada

A This sounds to me like a real challenge, because your problem has many possible causes. I would not proceed without first getting your preamp's service manual.

Dirty controls or poor solder connections can cause this problem, as could a defective IC.

If your amplifier has a volume or gain control, you may be able to use it as a signal tracer. Connect a test lead to the amp's input through a capacitor of about 10 microfarads. Use this lead to check various stages of the preamp, working from input to output, until you find the one that's acting up.

You might also want to measure voltages, to see if they change during warm-up. Perhaps the power supply is slow in coming up to voltage on one channel. If you get really frustrated, you might want to replace ICs without regard to which one is causing the problem. But this is easier said than done if the ICs are soldered to the board rather than socketed, and it is often difficult to obtain the proper ICs.

Turntable Safety

Q *While I admire the sonic qualities of belt-drive turntables, I worry that those thin little belts will let go, allowing the heavy platter to spin across the room at a wicked 33⅓ rpm. Do you know of a turntable I can rely on not to do this?*—B. Wildered, Fanwood, N.J.

A I have recently been informed that Lirpa Laboratories is developing a turntable that will offer the utmost in security, thanks to a revolutionary belt-and-suspenders drive.

Static "Pops"

Q *On cold winter days when the air is dry, I have noticed static buildup that causes a popping noise when I touch my components. Is this harming any circuits?*—Sal Rosselli, Leominster, Mass.

A I don't think you have anything to worry about. And if you touch a grounded object just before you touch your components, the problem will go away.

Improving Car-Speaker Gaskets

The gaskets I've seen supplied with car speakers are thin, hard, and cardboard-like. These gaskets don't readily conform to the often irregular surfaces surrounding typical loudspeaker cutouts and can't keep speaker vibrations from being transmitted to the mounting surface. Worse, some drop-in speakers have no gasket at all.

When I heard considerable buzzing from my rear-shelf car speaker, I removed it and applied a liberal thickness of silicone rubber around its periphery, to form a resilient gasket. I used a layer about ¼ to ⅜ inch thick and about ⅜ inch wide, mounted on top of the original gasket. This eliminated the vibration. It also created a really air-tight seal, which is important for good bass response. The same approach could be applied to drop-in car speakers by forming a silicone gasket on the underside of the speaker rim. I wouldn't be surprised if this same technique might improve the performance of some home loudspeaker installations. It seems to me that manufacturers could supply better gaskets, maybe even just as add-ons.—Ken Massey, Indianapolis, Ind. A

MONDO AUDIO

KEN KESSLER

BREAKFAST OF HIGH-END CHAMPIONS

Illustration: Danuta Jarecka

Consumer Electronics Shows might rightly be all about new products ready for the shops, but an aspect that's rarely covered in hi-fi magazines is industry maneuvering. Whether or not it means anything to you if you don't earn your living from hi-fi is another matter, but certain events that took place in January at the Las Vegas CES just might influence your audio future. Such affairs occur in and around the Show, often after hours, or—in the case of the AAHEA meeting—before hours.

The Academy for the Advancement of High End Audio is one of the only organizations in the world that exists solely to promote high-end audio beyond the audience of the converted. You don't have to think hard to realize why we need it. The home entertainment scene has changed radically since digital technology stripped away the soul, the hobby element, and the passion. The advent of home cinema? Yet another attempt to turn audio equipment into run-of-the-mill appliances, divorced from any semblance of quality or intellect. Meanwhile, AAHEA is fighting a rear-guard action designed to keep pure audio—that is, sound-only, music-for-music's-sake hardware—in front of the public. Pure audio will never again have the glamour it possessed in the '60s and '70s. It can never compete in the minds of the knuckle-draggers who want five channels' worth of Arnold-induced explosions, but some of us still like our music without cinematic accompaniment. Which almost explains why the most oft-heard demo laserdisc at the Winter CES was The Eagles' *Unplugged* in sound-only mode.

CONCERNS SHOWN FOR THE STANDARDS APPLIED TO THE SOUND CARRIER OF THE FUTURE ARE VERY REAL.

Whatever, the AAHEA breakfast meeting was a real ear-opener after a couple of years of ho-humminess. Ordinarily, one asks one's self, "Why on earth did I get up for an 8 o'clock meeting to listen to self-serving drivel about room prices at CES and parallel importing into Bucharest?" Good question. But invariably you always answer, "Because I care about the high-end audio industry." And so you rationalize your way through another 90 minutes even more boring than your typical Merchant-Ivory flick. Except this year's meeting was a shocker, and not just because the Academy's president stood up and spoke like a leader rather than an apologist.

Previously discussed in this column (January) are the CE regulations, the European directives designed to turn hi-fi into, well, crap. But safe crap. It emerged that the EIA (Electronic Industries Association), AAHEA, and all manner of industrious individuals have been doing their best to assist any American manufacturers who didn't understand what these regulations meant, how they could be addressed, how the testing was to be undertaken, and whatever else was involved in ensuring that American-made high-end equipment would still be available in Europe after January 1, 1996.

One day, a statue will be erected in honor of Mike Elliott of Counterpoint, who (unpaid and barely as-

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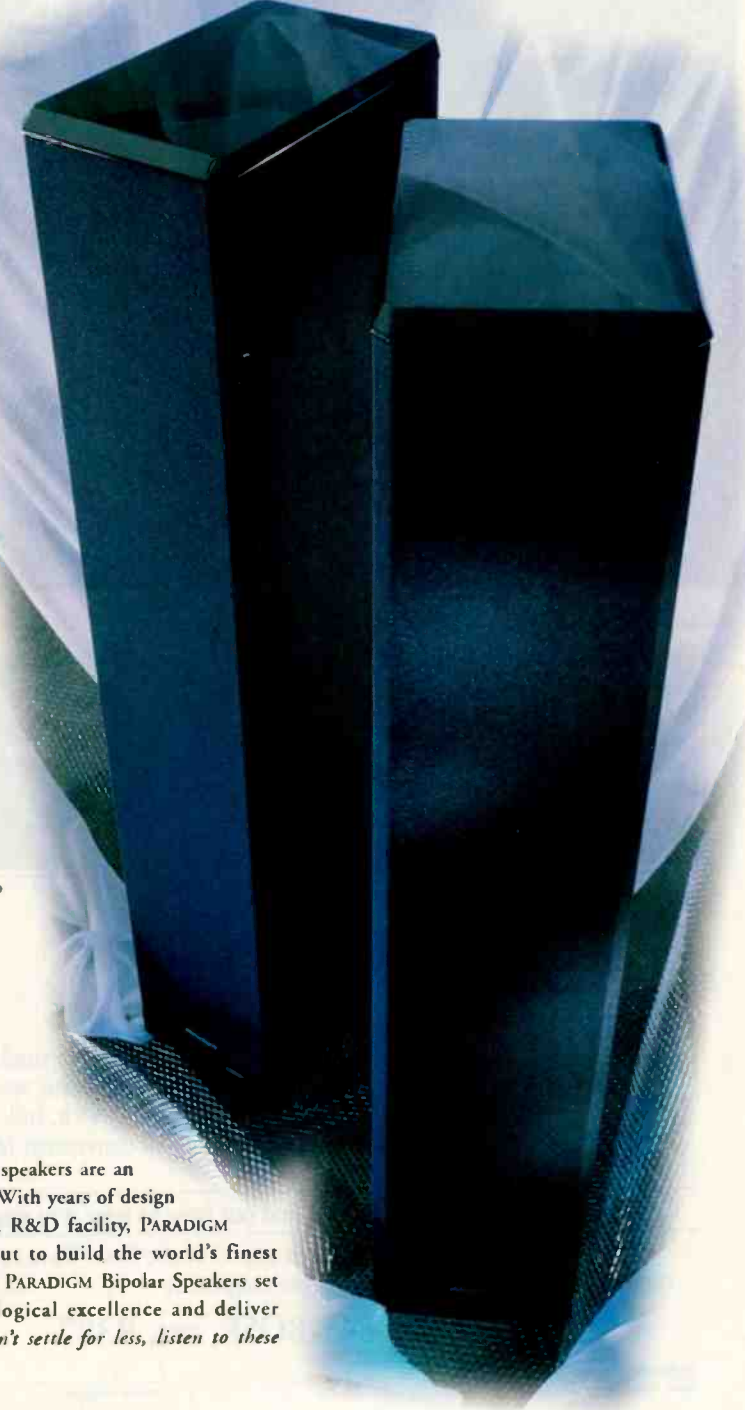

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sisted) set out to make certain that any of his colleagues—and that means his competitors—in need of assistance could turn to him for lucid explanations and guidance. Mike provided an update at the meeting while exhorting those present not to ignore the threat that the CE directives pose to all hi-fi manufacturers wishing to trade in Europe. Honestly, the man should run for office. And any who heard him who still choose to ignore the warnings will deserve what they will get, which is a total loss of access to a market of 300 million people.

During the show, I talked to a number of manufacturers that I know have a serious European presence and asked them if all of their products were CE-approved. As I'd hoped, the larger and more professional manufacturers had everything covered: Counterpoint (as you would expect, given Elliott's crusade), Audio Alchemy, Krell, Madrigal (the Proceed and Mark Levinson brands), and dozens more assured me that their wares would be wearing the requisite certificates. Ironically, it was a British manufacturer (who shall remain nameless) who told me that he discontinued a handful of models rather than modify them for CE approval because the mods would have ruined the products and the cost was prohibitive: It would have pushed the models' retail prices up into the next level.

I was even treated to a glimpse of a CE-ready alternative to the conventional and probably-to-be-banned multiway binding posts by Stu Wein of SW Marketing; he produced from his box of samples a neat chassis-mount binding post that offers full compliance with CE standards, along with a neat side-entry slot to accept spade connectors. Manufacturers who are worried about connector status vis-à-vis the CE rules should contact Stu by fax at 215/953-7483 or via e-mail at swmktg@ix.netcom.com.

And leave it to Dan D'Agostino of Krell to go all the way, by designing a new speaker terminal for the next generation of Krell amplifiers. This stout binding post features what looks like the center section of a Mercedes emblem as the screw-down portion. Lastly, on the matter of CE regs, Karen Sumner of Transparent Audio said she was ecstatic about CE regulations if it meant that she could terminate all of the company's speaker cables with spades; she, for one, detests banana plugs. (Sumner,

by the way, is in charge of AAHEA's long-overdue drive for foreign members. It's about time the organization realized that the world does not end at the Golden Gate Bridge and Long Island.)

But it was Bob Stuart of Meridian who alerted the assembly to what might be perceived as the biggest threat to the future of high-quality music playback: the forthcoming setting of standards for the audio-only version of the DVD. Bob is the chairman of Acoustic Renaissance for Audio (ARA), an organization founded by Hirokazu Negishi of Canon. The ARA's purpose is to act as an independent watchdog, trying, for example, to keep the major corporations from settling on shamefully low standards for new formats, as is their wont. The current target of the ARA's scrutiny is the audio-only application of DVD, also known as the High-Density Audio Disc, or HDAD.

THE ARA AND AAHEA WILL GO DOWN IN HISTORY AS VOICES THAT SPOKE OUT AGAINST MEDIOCRITY.

While conspiracy theorists love to wallow in such stuff, the concerns shown for the standards applied to what probably will be the sound carrier of the future are very real. There are four proposals on the table, not all of which are available for public scrutiny, and the headlong rush to quickly establish the standard smacks of the kind of political machinations that really happen only in the movies. Indeed, by the time this issue reaches the street, the standards will have been set, and heaven help us if the lobbying of a certain giant Japanese firm is enough to shove the poorest one down our throats.

Bob Stuart, along with Tom Holman (of THX fame), briefly explained what's on the table; we all knew what was at stake. The necessary background fills a 23-page ARA document, but Stuart explained succinctly what the high end should support; there was remarkably little dissent. (I don't wish to identify the guy who sat behind me, grumbling and muttering under his breath. Suffice to say, the words "vested" and "interest" spring to mind.) Stuart's plea was for AAHEA to draft a letter stating categorically what format the high-end manufacturers want to see implemented, the urgency created by a March deadline. The curious nature of publishing means that I have a copy of the proposed letter from the Academy before me, but it's not supposed to be made public yet. Of course, this column will appear long after these decisions are made.

What I can tell you is that AAHEA has lent its support to an HDAD system based on elements of the ARA proposal, calling for: (1) multichannel capability using a minimum of six channels of uncompressed or losslessly compressed data; (2) 88.2- and 96-kHz sampling rates; (3) a minimum of 20-bit resolution, expandable to 24-bit; and (4) pulse-code modulation rather than "bitstream" (delta modulation). The Academy's letter also addresses such points as backward compatibility and requirements for compatibility with first-generation DVD players. But, above all, it is based on a consensus that has determined the preceding recipe as the one to go for if sound quality is to be preserved.

As I said before, you'll likely know which way the industry went by the time this sees print. And you'll likely also know if your future holds the promise of realistic music reproduction or mere digital noise. Either way, the ARA and AAHEA will go down in history as the voices that spoke out against mediocrity. That's no consolation should we inherit a digital turkey, but it kinda makes me proud that I paid my dues again this year. A

IVAN BERGER

THE BUZZ OF THE BIZ

If you'd asked me last year what buzzword would dominate the 1996 Winter Consumer Electronics Show (WCES), I'd have said AC-3. I'd have been wrong. The Dolby Digital 5.1-channel surround format, based on the company's AC-3 audio compression system, *was* all over the show. But the biggest buzzword was DVD (originally Digital VideoDisc, now unofficially called Digital Versatile Disc by some).

I hadn't expected DVD to take this show by storm because, for most of last year, two mutually incompatible DVD formats were vying for support. Both the Sony/Philips Multi-Media CD (MMCD) and the Toshiba/Time Warner SD systems could pack about seven to 25 times as much data as a CD onto a CD-sized disc. Each had its own technical advantages, so the battle could have gone on for years (remember LP versus 45? CD-4 versus SQ? VHS versus Beta?). But for once, the opposing sides managed to work out a compromise format, and quickly.

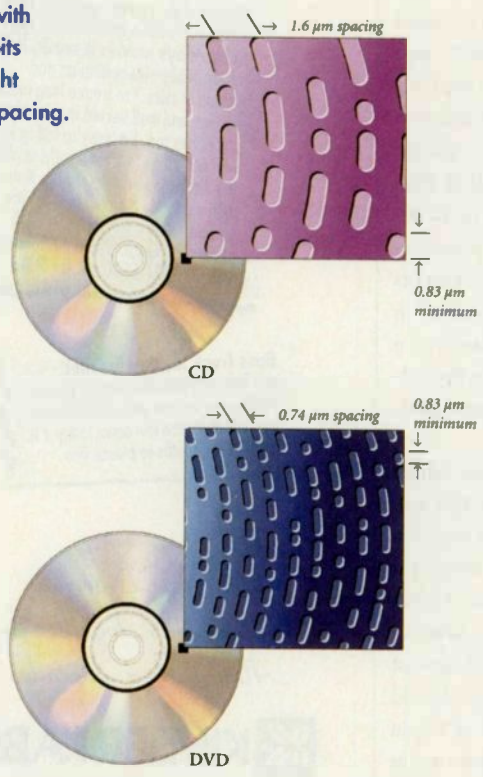
DVD PROMISES TO BE THE SINGLE MEDIA SYSTEM THAT CAN REPLACE EVERYTHING.

The January show brought DVD promises, prototypes, and preproduction samples from Onkyo, Panasonic, Philips, Pioneer, RCA, Sony, Toshiba, Zenith, and several others. The players should arrive later this year, at prices variously quoted from $500 to $900. About 400 to 500 movies should be available on DVD at launch time; even pessimists predict 125 titles.

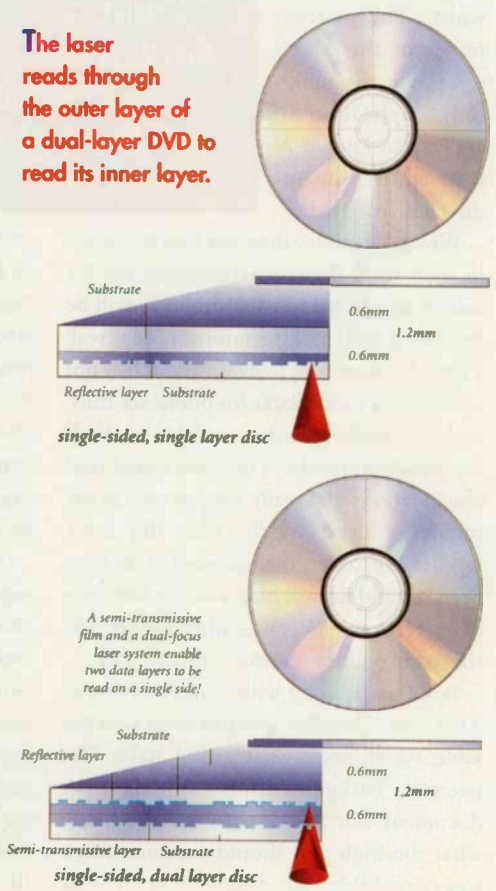
This far exceeds the initial enthusiasm for CD. But DVD promises to be the single media system that can replace everything: laserdisc, CD, CD-ROM, and ultimately perhaps even videocassette. As a replacement for laserdisc, DVD will offer higher picture quality, digital surround sound (using Dolby Digital AC-3 encoding in this hemisphere and other NTSC markets), more compact storage, the convenience of complete movies on one side of the disc, and more. For audiophiles, DVD players will be able to accommodate audio CDs, with the possibility of super-audio discs to come. In computer use, DVD-ROM drives will play today's CD-ROM discs as well as new discs with much greater data storage capacity and the ability to deliver substantial amounts of high-quality, full-motion video. And recordable DVD, due later, may eventually let us time-shift programs, the way we now do with our VCRs, and permanently archive our camcorder footage (after editing, I hope).

In part, DVD's immense capacity stems from the use of shorter laser wavelengths, shallower disc substrates, and dual-layer technology.

In DVD, high data density starts with small pits and tight track spacing.



The laser reads through the outer layer of a dual-layer DVD to read its inner layer.



Illustrations: Courtesy of Sony

We've spent 10 years connecting people to
the greatest advancement in Home Theater technology.

YAMAHA DSP
10th
1986–1996

1996 marks the 10th anniversary of Yamaha's introduction of our unique digital sound field processing technology. Many years in development, this technology was the first of its kind and remains unique to this day.

There's DSP. And then there's DSP. From the very beginning, Yamaha digital sound field processing has been different than digital *signal* processing. Rather than simply creating a computer model for what a performance venue might sound like, Yamaha engineers literally travelled the world digitally analyzing very specific venues. A stadium. An intimate jazz club. A gothic cathedral. A concert hall. And many others. We used four microphones, carefully located in each venue to precisely measure the level, direction and exact timing of individual sound reflections. The result is perhaps the most realistically accurate reproduction of live performances ever devised. But right there in your living room.

1986 Yamaha introduces the DSP-1 digital sound field processor. For the first time, a component recreates digitally sampled music halls in the home. It includes a setting for Dolby Surround. Critics call DSP "the most significant advance in the control of auditory space since stereo." The show begins.

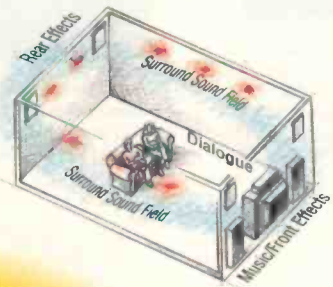
1987 Yamaha engineers embark on a new United States sound field sampling tour. Meticulously setting up a battery of carefully placed microphones and digitally sampling the sound fields of Anaheim Stadium and the Roxy Theater in California. The Village Vanguard, Village Gate and Riverside Church in New York. Orchestra Hall in Chicago, among others.

1988 The DSP-3000 is introduced. Many of the venues sampled in 1987 are incorporated as new programs, computer-modeled sound fields specifically designed for home theater applications are added. On-screen display and master volume control are also incorporated for the first time.

1995 Headlined by the RX-V2090, Yamaha introduces a new series of A/V receivers, with five models featuring DSP and Cinema DSP and ranging in price from $1,499 to $399. The flagship, RX-V2090, is the company's first 7-channel A/V receiver and is ready for the next step–Dolby Surround AC-3. All five units receive critical acclaim, with the RX-V2090 lauded as "A blockbuster product!"

And now, the next generation of Cinema DSP. AC-3, very simply, is the spectacular home version of Dolby Digital Surround found in the best movie theaters. Technically, it includes five discrete, full-bandwidth channels plus a sixth subwoofer channel. Yamaha combined Dolby Surround AC-3 with our own unique DSP to create "Tri-field processing," including presence and left and right surround fields, reproducing movie sound tracks with unequalled positioning, depth and realism. Essentially, Yamaha's DSP acoustically enlarges the listening room to that of a large movie theater. What you hear is exactly what a film's director intended you to hear. The new generation Cinema DSP represents the absolute state-of-the-art in taking the movie theater experience home.

Then came Cinema DSP.
Yet another milestone in audio history. Only Yamaha Cinema DSP (a combination of Digital Sound Field Processing and Dolby Pro Logic) creates phantom speakers to fully replicate the rich, full, exciting sound of a multi-speaker movie theater. Which means you'll hear sounds coming from virtually every place in your room. Even in places that have no speakers.



Phantom Speaker Effect

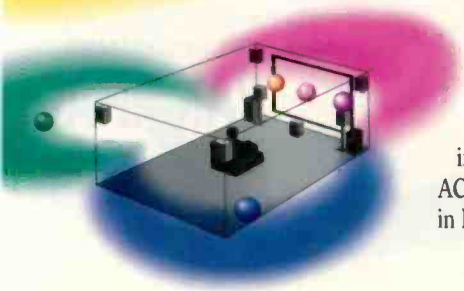
1990 The 7-channel DSP-A700 is introduced. For the first time DSP is included with on-board amplifiers. Dolby Pro Logic is added for more realistic movie surround.

1991 The DSP-A1000 breaks new ground. Hailed as "the only electronics you'll ever need for surround or home theater," the A1000 provides the most versatile control and switching yet on a Yamaha product. It's also the first Yamaha component to provide digitally processed Dolby Pro Logic and Cinema DSP with "Pro Logic Enhanced" and "70mm Theater" settings. Additionally, our RX-V1050 and RX-V850 become our first 5-channel A/V receivers with DSP.

1993 The DSP-A2070 is introduced, with newly developed IC chips for greater sound resolution, and more 70mm Cinema DSP movie modes. Critics hail "simply the best!" "Does everything." "The best integrated A/V component ever created." Four new A/V receivers are also added, all featuring 35mm Cinema DSP and two with 70mm Cinema DSP modes.

1994 Yamaha's DSP-A780 provides the versatility and processing of 7-channel processor/amp in a 5-channel format.

1996 Yamaha celebrates its 10th Anniversary of DSP with a spectacular new product. The DSP-A3090. A 7-channel DSP processor/amplifier which, for the first time, includes built-in Dolby Digital Surround AC-3 and Yamaha's own DSP enhancement to truly make the home theater as spacious as a movie palace. Using the power of DSP, five additional AC-3 programs are engineered, including AC-3 Enhanced and AC-3 Spectacle. The next decade in DSP is under way.



YAMAHA DSP 10th 1986–1996

RX-V2090 7-Channel A/V Home Theater Receiver. 100 watts output L/C/R channels. 35 watts x 4 Front and Rear Effects. Multi-room, multi-source capability. Discrete 5 channel input for Dolby Surround Digital AC-3. 10 DSP programs.

DDP-1 Dolby Surround Digital AC-3 Processor. Built-in AC-3 RF demodulator for AC-3 laser disc players. For use with the Yamaha RX-V2090 Receiver.

RX-V890 5-Channel A/V Home Theater Receiver. 100 watts output L/C/R channels. 25 watts x 2 Rear Effects. 10 DSP programs.

RX-V690 5-Channel A/V Home Theater Receiver. 80 watts output L/R/C channels. 25 watts x 2 Rear Effects. 10 DSP programs.

RX-V590 5-Channel A/V Home Theater Receiver. 75 watts output L/C/R channels. 20 watts x 2 Rear Effects. 8 DSP programs.

The new DSP-A3090 Digital Sound Field Processor. Incorporates Dolby Digital Surround AC-3. Provides the 5.1 channels of AC-3 surround as well as the 7 channels of Yamaha's Cinema DSP surround settings for Dolby Pro Logic sources. Five new modes that combine AC-3 with Yamaha DSP to deliver the most spectacular home theater experience possible today. 30 different surround modes in all. 80 watts output L/C/R channels, 80 watts x 2 Rear Effects, 25 watts x 2 Front Effects. 11 analog audio, 1 AC-3 RF, 5 optical, 1 coaxial, and 6 video inputs with S capability.

RX-V490 5-Channel Receiver. 70 watts output L/C/R channels. 15 watts x 2 Rear Effects. 6 DSP programs.

RX-V390 5-Channel Receiver. 60 watts output L/C/R channels. 15 watts x 2 Rear Effects. 4 sound fields.

DSP-E580 3-Channel Digital Sound Field Processor. Use as complete add-on to existing stereo system or as processor only. 25 watts for center channel and 2 Rear Effects. 16 DSP programs.

DSP-E390 3-Channel Digital Sound Field Processor. Use as complete add-on to existing stereo system or as processor only. 60 watts per channel for center channel and 15 watts x 2 Rear Effects. 5 DSP Programs.

CDV-W901 CD/LD Player. Dolby AC-3 Laser Disc Player. 2 sided play. Plays LD, CD and CDV discs.

Yamaha Digital Sound Field Processing has most assuredly changed the way the world listens to its music. Watches its movies. And we fully expect the newest generations of this revolutionary technology to make the next ten years every bit as exciting as the last. For the dealer nearest you, please call 1-800-4YAMAHA.

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The wavelength of the new lasers' red light is only about 15% shorter than the infrared light used for CDs now (blue lasers, which have very short wavelengths, are not yet practical). But that and new optics let DVD makers shrink the pits that carry the data, and the spacing between them, enough to increase data capacity about fourfold. More efficient modulation and error correction increase capacity by half again, letting a DVD store 4.7 gigabytes of data, about seven times a CD's capacity—for openers.

Use of a 0.6-mm plastic substrate, half as thick as that used for CDs, cleans up the optical path by giving the laser beam half as much plastic to work through. A second 0.6-mm substrate is bonded to the back of this, to protect the recording's reflective layer, stiffen the disc, and maintain compatibility between the new players and conventional discs. But the second substrate can also carry data, turning the DVD into a double-sided disc whose capacity has doubled once again, but which must be flipped over to play its second side. (Label information for double-sided DVDs will be on the unrecorded ring around the center hole.)

The short-wavelength laser, new optics, and thinner substrate also make it possible to put two layers of recording on each side of a DVD, raising capacity to 8.5 gigabytes per side (17 gigabytes for a double-sided disc). The outer recorded layer is semitransparent, so the laser can be focused past it to reach the inner layer.

Massive capacity? Not for the DVD's main application, digital video. Getting a single-sided, single-layer DVD to hold 133 minutes of video instead of just 15 minutes calls for massive compression. But by using the MPEG-2 compression scheme, DVDs can even have room for multiple versions of a video program. This will let you match wide-screen movies to your video screen by showing them in letterboxed form, in 4:3 pan-and-scan form, or, if you have a widescreen set, in 16:9 form. DVD can also carry multiple versions of a film, so parents will be able to lock out an "R"-rated version for their kids. DVDs can carry soundtracks and subtitles in multiple languages. Some discs might let you choose camera angles.

What about audio? Right from the start, the DVD standard provides for three digital audio formats. The first is CD-type 16-bit two-channel linear recording (stereo or Dolby Surround); this can be used with relatively short video programs or even full-length features, though at the sacrifice of multiple-language and discrete multichannel capability. But most soundtracks will be 5.1-channel Dolby Digital with AC-3 encoding, in our part of the world, at least. (In Europe and other PAL/SECAM markets, the standard compressed-audio format will be two-channel MPEG-2, with Dolby Digital as an option.) The third provision is for playback of MPEG-1 audio, for compatibility with the CD-V format.

Toshiba promises family fun with DVD (left). Below, a DVD prototype from Sony.

DVD also has potential for audio-only applications. Today's CDs hold enough music (about 75 minutes) to satisfy most listeners, but many audiophiles think they don't hold enough bits. They would like to see the sampling rate and sample size increased and would like multichannel capability—without AC-3, MPEG, or any other form of data reduction. With DVD, we can have it all—if proper standards are set and followed from the beginning.

A group called Acoustic Renaissance for Audio has proposed just such standards for what various proponents call the High-Quality Audio Disc (HQAD) or High-Density Audio Disc (HDAD), as discussed by Ken Kessler in "Mondo Audio" in this issue. A particularly interesting aspect of the ARA proposal is its flexible allowance for "trade-offs between precision, frequency, bandwidth, number of channels, and playing time." Through these trade-offs, a 93-minute disc could carry a 7.1-channel, 24-bit program with 48-kHz sampling or eight channels of 16-bit audio at 96 kHz, to name just two possibilities. And an archive disc could carry 472 minutes (nearly 8 hours) of 16-bit stereo with 48-kHz sampling.

As for AC-3, it probably will be all over next winter's CES. But it won't be a buzzword: Within weeks of the 1996 WCES, Dolby Laboratories announced that the system's name will be "Dolby Digital AC-3" for laserdiscs and laserdisc equipment, but for DVD (which is where it should really catch on), its name will be just plain "Dolby Digital."

Music, but Not Sound, by Wire

Yamaha plans to distribute music by wire in Japan, but that music will be in the form of MIDI commands rather than recorded sound. Visitors to any of 200 shops in Japan will be able to download MIDI sequences onto floppy disks, for playback on MIDI-compatible home PCs or MIDI sequencers. Signals will be distributed to the stores via ISDN (Integrated Services Digital Network) lines; if such lines ever become common in homes, direct MIDI distribution might become practical.

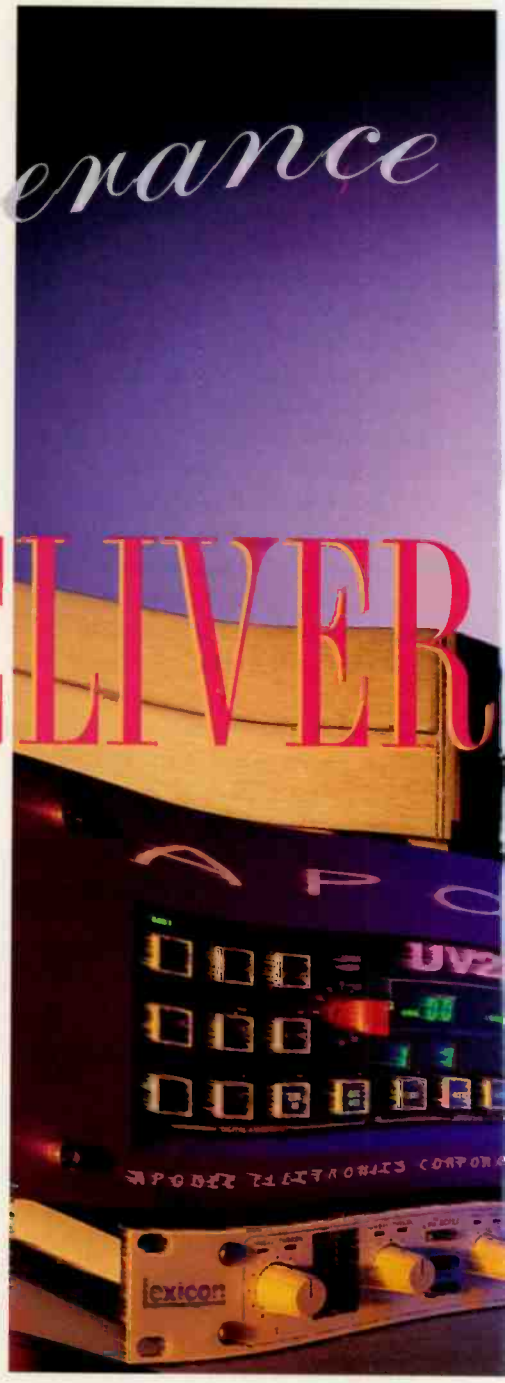
Remote Possibilities

Two multiroom A/V distribution systems that require no new wiring were introduced at the Winter CES this past January. They are similar in principle but connect differently: Elcom's EZ system transmits via your home's AC wiring, whereas the Terk Technologies HomeNetwork will use telephone wiring. Either way, a basic system of one transmitter and one receiver should cost less than $200. The cost should come down further if either HomeNetwork or EZ gets popular enough that makers of other home electronic devices incorporate the technology in their own equipment. A

NEW RECORDING TECHNOLOGIES SUCH AS NOISE SHAPING AND HDCD PROMISE MUCH, BUT DO THEY REALLY LIVE UP TO THEIR HYPE—AND ARE THERE BETTER ALTERNATIVES?

DIGITAL DELIVERANCE

BY D. W. FOSTLE



In last month's examination of 20-to-16-bit noise-shaping techniques ("19 Bits in a 16-Bit Sack?"), real musical signals recorded on practical systems were shown to contain enough noise to swamp the effect of the noise-shaping filters. Recordings with noise floors approaching even the 16-bit theoretical limit, without noise shaping, prove to be rare, and it can be safely stated that the "19-bit equivalent" performance predicted by both digital theoreticians and advertising copywriters has not yet been achieved.

If noise shapers as a class are typically defeated by noise in the signals on which they operate, the question arises as to whether their use is otherwise benign. Do these devices alter the musical information that passes through them, or are their operations confined solely, if largley ineffectively, to noise?

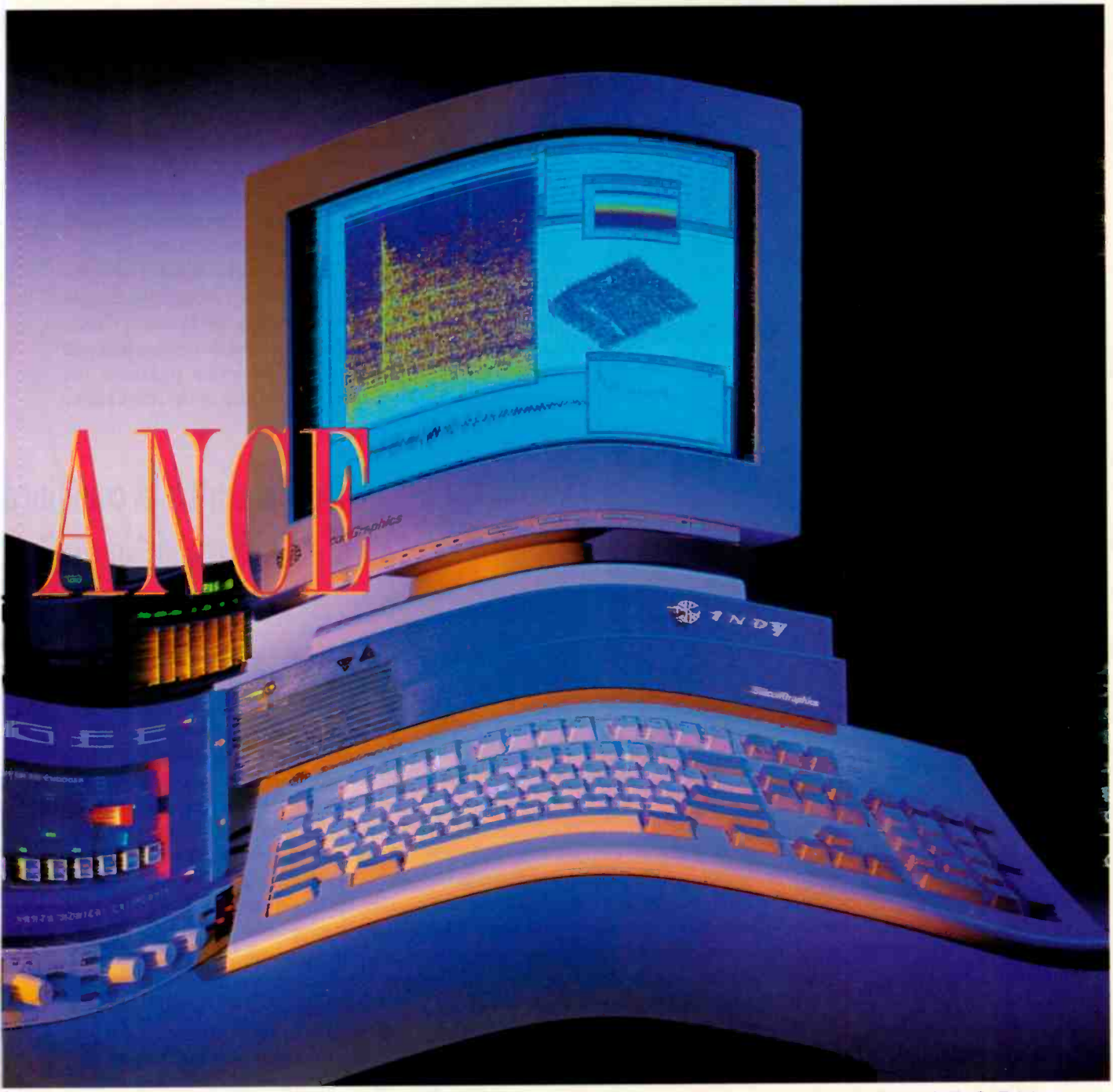
To gain insight into the issue, 20-bit "test" recordings were made. Assembled was a high-quality recording system comprising two Schoeps CM-65 microphones with 958 capsules, a Hardy M-1 microphone preamplifier, a Wadia Digital 4000 20-bit analog-to-digital (A/D) converter, and a Nagra D 20-bit digital recorder. With this system, Marc Aubort recorded performances by Jerome Lowenthal, a concert pianist and chairman of the Juilliard School piano department.

The main purpose of the recordings was to document the amazing variety of timbres and musical effects produced by Steinway pianos built over a period of 140 years, but the 20-bit masters also provided material having low noise, a musical dynamic range in excess of 60 dB, a complex reverberant field, and daunting transients. Some piano attacks contained instantaneous energy beyond 20 kHz, and even at moderate levels, "sprays" of energy up to 16 kHz were commonly measured.

Noise Shaping or Sound Shaping?

To audit and measure the effects of the noise shapers, I created a 20-bit edited master on a digital workstation and then transferred it back to the Nagra D. Using the Nagra's built-in error-logging facilities, I monitored digital error rates and found

D. W. Fostle is the author of The Steinway Saga *(Scribner, 1995). His techniques for computer-based measurement of musical signals, developed in researching that book, form the basis of this article. For their technical services in making the test recordings, the author wishes to thank Marc Aubort, Elite Recordings; Jerry Bruck, Posthorn Recording; Keith Johnson, Pacific Microsonics; and Chris Rice. A debt is also owed to pianist Jerome Lowenthal, producer Joanna Nickrenz, and piano tuner Tali Mahanor, who prepared "Penelope" (a.k.a. Steinway Model D, 56 290).*



PHOTOGRAPHS: MICHAEL GROEN

none. I then used the edited 20-bit data, now on tape, as a source to feed each of several noise-shaping devices (a Weiss SFC-1, a Meridian 618, and a Sony K-1203), whose outputs were transferred to a Marantz CD recorder.

The final result was a CD, playable on any system, that contained the various noise-shaped versions of the original 20-bit recording. On audition, I found that the different noise shapers yielded differences in instrumental timbre, reverberation color, and stereo presentation of the piano. As a class, the noise shapers tended to "harden" or "brighten" the sound, particularly in the reverberant decay. Though difficult to describe, the effect was similar to that of increasing the area of the performance space covered with plaster or stone and reducing the area covered with wood. The timbral corollary of this is a "brightening" of the piano, particularly in the top two octaves.

That the noise-shaping filter plays a role in these effects can be demonstrated with the Meridian 618, which has several increasingly powerful noise-shaping selections. Moving from the milder to the steeper curves causes a progressive brightening of both the piano and the reverberant field.

The noise-shaping devices also influenced the stereo image, sometimes in unexpected ways. The apparent size of the piano was noticeably smaller with the Sony Super Bit Mapping (SBM) processor than with other processors. This could be described as a more defined image or, if one does not prefer a smaller piano, as a reduction in

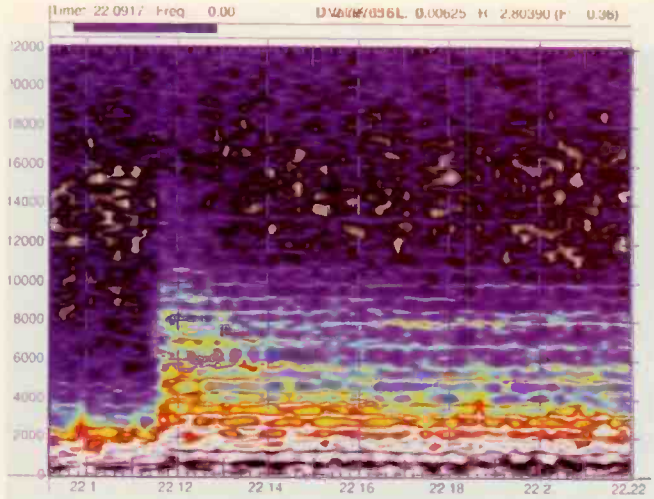


Fig. 1—*"Three-dimensional" spectrogram of a piano-attack transient after passage through a Sony K-1203 SBM noise shaper. Time is charted horizontally in seconds, frequency vertically in hertz; amplitude is indicated by color (see color key below). Note the slight bulge, or "puff," from the left edge of the attack's vertical structure, between about 6 and 8.8 kHz.*

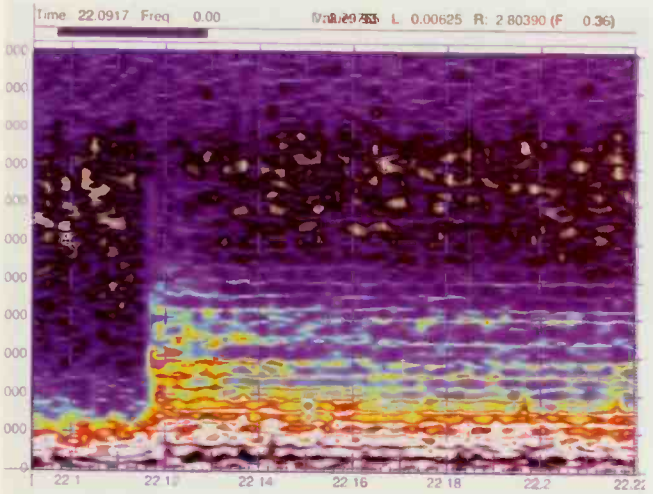
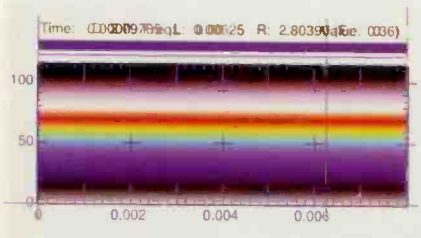


Fig. 2—*Spectrogram of the same piano attack in Fig. 1, this time processed through an Apogee UV-1000, which uses the company's UV-22 20-to-16-bit redithering process but no noise shaping. The slight "puff" of energy visible in Fig. 1, ahead of the attack, is absent here.*



scale. I also noticed that the Weiss SFC-1 seemed to "push" reverberation toward the speakers when compared with the other noise shapers.

There remained the question of how reproducible these effects would be on other systems in other rooms. To explore that issue, the comparison CD was auditioned through the same digital-to-analog (D/A) converter on two other systems, both owned by audio professionals. Although rendered differently in degree, the effects were sustained. The most robust effects were on piano timbre and the general brightening of reverberation. Stereo presentation, while consistent in direction, had markedly different scale among the three systems. (And in general, the sonic differences among the noise shapers were much smaller than the variations among the systems on which the recordings were played.)

A specific and measurable case can be seen in Fig. 1, a spectrogram of the piano-attack transient produced after passage through the Sony K-1203 SBM processor. The single, sharply struck mid-treble note, with a peak level 11.9 dB below digital full scale (0 dBFS), pops from a softly played bass figure in Paderewski's Minuet in G. Note the "puff" of energy between 6 and 8.8 kHz prior to the main attack's vertical structure. This manifests itself as something like a click, the reproduction of which was found to depend on the playback system.

On one system the puff was very sharply rendered, producing a sound similar to an instantaneous digital overload, a clear impossibility given the levels involved. On another playback system a light tick was heard, which could easily be confused with the click of the artist's fingernail accidentally contacting a piano key. On a third playback system the puff emerged as a low-level "thock" sound, which, in that instance, listeners might well have identified as a sticking piano action or as other mechanical noise from the instrument itself.

When the same signal is passed through a processor that doesn't use noise shaping, in this case the Apogee Electronics UV-1000, the puff is absent and there is better overall alignment of the attack transient. The Apogee's reproduction of the attack can be

Some piano attacks contained 20 kHz, and "sprays" up

seen in Fig. 2. The puff is an artifact produced by the SBM processor and was not present on the master recording when played back directly from the original 20-bit tape. Since each playback system rendered the artifact differently, listeners could easily come to different conclusions as to its cause. Without reference to alternative 16-bit masterings through other processors or a 20-bit original, the listener would not realize the sound was actually created by a noise-shaping process.

Caution is in order, however, with regard to generalizing from these observations. They emerged from experiments with only one class of program material, and a particularly daunting one at that. A signal having less natural reverberation would make it harder to distinguish between the various noise shapers. And the alterations to stereophonic imaging would likely have been reduced, if not obliterated, had more than a simple stereo pair of microphones been used, as is sometimes done even on classical piano recordings and which is the essence of multitrack recording.

It is nonetheless evident that noise shaping can have sonic effects, and those effects may alter not merely the noise floor but other aspects of the presentation as well. Of

those detected, the alterations of the piano's timbre and attack transients are perhaps the most important musically. Classical pianists are judged, in part, by their "touch" and their "tone," both of which can be modified by effects such as those introduced by the noise shapers. Since the general tendency of the process is to harden transients and brighten the overall piano sound (the two phenomena are correlated in the instrument), it is possible that subtleties of musical meaning or judgments of artistic capacity will be altered. That is not *necessarily* adverse; for example, the effect of transient "sharpening" might be to increase the definition of individual notes in a complex musical passage. But any such aesthetic application of a noise shaper, which effectively transforms it into a very peculiar form of equalizer, is separate from its design goal.

instantaneous energy beyond to 16 kHz were common.

The connection between equalization and noise shaping is not as farfetched as it might seem, noise shapers being a specialized permutation of a larger class of devices that includes equalizers and tone controls. In fact, the well-known tendency of filters to "ring" may possibly be relevant. Since the shapers examined can introduce alterations of 20 to 50 dB in the signal, it seems possible that they may alter transient waveform shapes. I advance this notion not as a finding but as an informal speculation as to the physical cause of some of the phenomena heard. Whatever the reason, however, it appears that noise shapers can, at least under some conditions, "shape" music as well.

The Apogee Alternative

One special alternative to noise shaping in converting 20-bit masters to 16-bit CDs is Apogee Electronics' UV-22 redithering system, incorporated in the company's UV-1000 mastering processor and, more recently, as a built-in function in its 20-bit A/D converter. Apogee reports wide adoption of the UV-1000 in mastering facilities. Intended as a "final step" mastering processor, the UV-1000, like some of the other devices examined, has other capabilities. In the case of the UV-1000, they include DC-offset removal, signal generation, left/right channel reversal, and an ability to slightly reduce digital signal levels to prevent overload.

In the UV-1000's manual, Apogee says that the UV-22 process "adds an inaudible, high-frequency 'bias' to the digital bit stream, placing an algorithmically-generated 'clump' of energy around 22 kHz." Figure 3 shows the spectrum of the Apogee's output (green curve) in comparison to that of the Meridian 618's "flat dither" (red curve). Until about 14 kHz, the Apogee's noise level is 4 to 5 dB below that of conventional dither. This is generally consistent with Apogee's claim that the process's noise floor is the same as the theoretical 16-bit minimum. By 16.5 kHz the energy in the Apogee's output is equal to that of the Meridian, and the small peak at 19.5 kHz is about 23 dB above the Meridian's noise. A second peak occurs at 20.9 kHz and a third, smaller peak at 21.8 kHz.

Apogee's claim that UV-22 is "not a new flavor of dither noise" is confirmed by Fig. 4, a spectrogram of 1 second of the UV-22 signal. It shows multiple frequency modulations that, over time, tend to center at the spectral peaks of Fig. 3 but vary as much as 1 kHz in either direction. If this signal were conventional random-noise dither, the spectrogram would show only small lacy patterns of blue and white. Underlying this unusual signal is a very complex, statistically based theory (not entirely explained in published papers) as well as extensive listening tests. The question is, does UV-22 work?

The Apogee's noise floor itself, when digitally multiplied 60 dB, had the least unpleasant sound of any of the processors examined. The 4- to 5-dB reduction in noise below flat dither was readily apparent, and

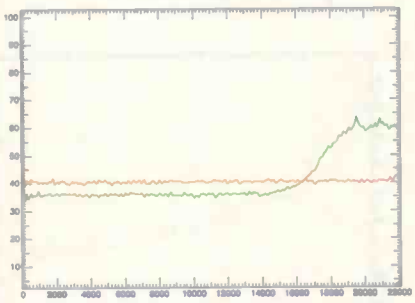


Fig. 3—*Spectrum of the Apogee UV-1000 processor's noise floor (green curve) compared with that of the Meridian 618 mastering processor in its "flat dither" mode (red curve). The bulge in the Apogee spectrum at extremely high frequencies results from its concentration of dither energy in the near-ultrasonic range, which reduces noise at lower frequencies. (As on most of the amplitude-versus-frequency graphs, the decibel scale to the left is strictly for evaluation of relative levels and is not based on any absolute reference.)*

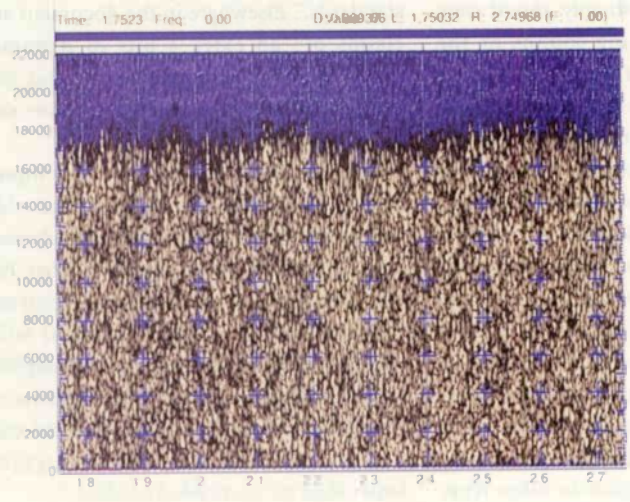


Fig. 4—*Spectrogram of the Apogee UV-1000's noise floor. Visible in the band at the top are multiple frequency modulations that, over time, tend to center at the spectral peaks of Fig. 3 but vary as much as 1 kHz in either direction.*

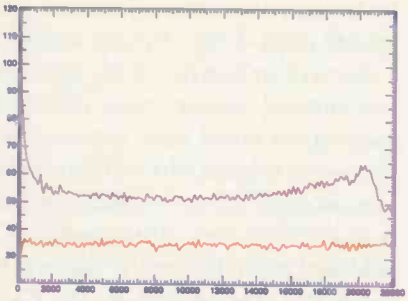


Fig. 5—*Spectrum of the noise floor at the beginning of cut 6 on the first Reference Recordings HDCD sampler (purple curve). Shown for comparison is the noise spectrum of a Meridian 618 in its "flat dither" mode, fed by a Lexicon 20/20 20-bit A/D converter with no input signal (red curve).*

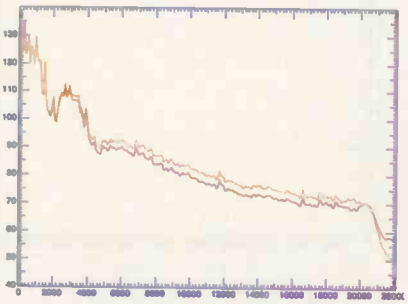


Fig. 6—*Spectra of the opening 1.7 seconds from two versions of "Lux Aeterna" on the second Reference Recordings HDCD sampler. The purple curve is for the HDCD version, the orange curve for a version recorded through a conventional Sony 1630 16-bit A/D converter. Note the slight high-frequency rolloff in the HDCD spectrum, starting a little below 2 kHz.*

the signal was devoid of the strong "hissy" quality of flat dither. Notably absent were the crackling and frying sounds or the strangely hollow noises produced by some noise shapers. If a noise floor is to be heard, the Apogee's seems the most benign.

The Apogee is notable for what it does *not* do to music signals. There was no detectable alteration of the piano's timbre or its attack transients. No "hardening" of reverberation was perceived, nor was any stereo image alteration detected. In sum, the Apogee UV-1000 seems to go about its word-length reduction chores in a minimally intrusive manner. As with the other processes, however, caution is urged in generalizing these observations to other types of program material and other recording techniques.

HDCD (Unplugged)

Apogee's UV-22 is a low-profile process. Although there is a UV-22 logotype, it is rarely, if ever, seen on CDs, and few people outside the trade seem to know of its existence. Precisely the opposite is true of Pacific Microsonics' HDCD, or High Definition Compatible Digital, process. Prestigious publications such as *The Economist* ("uncannily realistic"), *Fortune* ("captures important aural cues"), and *The New York Times* ("fully flowered music") have covered HDCD. Specific information about how the process works is in short supply,

but a document filed by Pacific Microsonics and published under the Patent Cooperation Treaty gives some insight into HDCD. The system's principal benefits are claimed to be "ultra-low distortion" and "improved apparent resolution" while maintaining compatibility with standard CD players. "The overall system of the invention," states the international application, "makes possible a more accurate reconstruction of the original analog signal than would have been possible using the same digital recording standards." Elsewhere in the document are claims of "an extra 4 bits of dynamic range" and "better spatial sense and less brittleness" as well as improved "inner detail perception."

The "smart optimization" techniques used in HDCD are also claimed to provide "improved sonics for portable and automotive playback when not decoded." That, Pacific Microsonics says, is because "conventional decoding. . .yields a signal with slightly less dynamic range and only slightly higher background noise." But, because of "lower quantization and slew induced distortions," the music will "sound equal to or better than an unencoded product."

Elsewhere in the patent document it is claimed that "signals lacking the encoding process [that is, conventional CDs] are provided some overall enhancement." In sum, according to these claims, everybody wins, and more than compatibility is provided. Play an HDCD disc in your car, and it will sound better. Play a conventional CD through an HDCD decoder, and it will be better too. But best of all is supposed to be the combination of HDCD encode and decode, with its promise of "increased apparent bandwidth and resolution" and an implied 19- or 20-bit dynamic range.

To summarize the dense aggregate of techno-speak and legalese in the 88 pages of the international patent document, which includes 107 specific claims, it appears that there are a number of methods by which HDCD *may* operate on an incoming music signal. The first of these is boosting low-level signals and attenuating peaks. This compress-during-recording, expand-during-playback function of HDCD appears conceptually similar to conventional compander-based analog schemes (such as Dolby and dbx noise reduction), but it is also stated that the process reduces distortion.

Amplification of low-level signals during HDCD encoding is claimed to "maintain a minimum LSB [least-significant bit] dither-like activity" that reduces distortion.

The noise shapers or "brighten" particularly in the

It is also asserted that the higher average recording levels permitted by peak compression further reduce distortion, albeit at the cost of *increased* distortion on "infrequent" peaks. Whereas conventional noise reduction usually relies on fixed and known signal levels for both the encode and decode

operations, HDCD tells the decoder how to vary its gain via a code embedded in the least-significant bit as a part of a pseudo-random dither noise. The gain increase on low-level signals helps conceal the code insertions, which for classical music are said to last for about 1 millisecond and occur several times per second "at most."

It seems that the codes can, at least potentially, control at least two other HDCD functions. One of these is filter shape during playback. The document lists three types of interpolation filters—one for high-level signals, another for low-level signals, and a third for transients. The HDCD decoder, if this function is implemented, switches between filter types according to signals in the control code. Pacific Microsonics claims that this technique removes the need to "compromise" filter design and that both "extended high-frequency response" and "improved transient settling" are obtained.

A third potential operation of HDCD is "wave synthesis." When the HDCD encode processor detects a waveform with distortions "known to occur at the reproducer," another waveform can be substituted. The new waveform is either looked up in memory, amplitude scaled, and then substituted, or, alternatively, data is sent via the control subchannel to enable the HDCD decoder to synthesize the signal. The "restructured" waveform is said to have more data points and therefore reduced distortion. Pacific Microsonics says the wave-synthesis feature is not used now, however, as it was found to be unnecessary.

It is clear that HDCD potentially involves very large amounts of signal processing. Most of this appears to occur during encoding. The encoder incorporates an A/D converter running at an 88.2-kHz sampling rate and generating 24-bit words, 20 bits of which are devoted to the audio signal. Its output feeds a buffer memory that stores the signal while the encoding logic analyzes for its salient characteristics. Another system performs the actual HDCD operations, such as compression, and then generates the control codes that are embedded in the output signal.

> tended to "harden" the sound, reverberant decay.

At the receive end, a Pacific Microsonics LSI chip, which includes a digital interpolation filter along with the decoder, performs the "conjugate" operations, thereby producing a signal incorporating whatever improvement the entire process provides. Independent of its HDCD decoding capabilities, the Pacific Microsonics PMD-100 chip is considered by some to be a very good filter that is adaptable to many D/A converter designs, and it is now used in equipment from roughly three dozen manufacturers. Those desiring HDCD should budget a substantial sum, as the average retail price of 42 D/A converters using the HDCD chip is now about $3,200, with a high of $15,950 and a low of $599. An outboard converter is almost a necessity, as only six integrated HDCD players—with an average price of more than $2,700 and none below $1,995—were available in late 1995.

Beyond the cost issue is the fact that HDCD-encoded program material is still scarce. That is at least partly because there was no commercially available version of the HDCD encoder until recently. Consequently, most HDCD recordings have come from the San Francisco-based Reference Recordings label, with which Keith Johnson, one of the HDCD developers, has long been associated.

Reference Recordings has released two HDCD samplers containing examples of recordings made in the format. Since almost all of that material was originally captured on an analog tape deck without noise reduction, the recordings themselves tend to be somewhat noisy. This is seen in Fig. 5, which shows the quiescent noise floor for about a quarter of a second at the beginning of cut 6 on the first Reference Recordings HDCD sampler (RR-S3CD), Mike Garson's version of Miles Davis's "All Blues" (purple curve). The plot was made directly from the digital signal on the CD, ported into a Silicon Graphics computer workstation. Shown for comparison is the noise spectrum from a Lexicon 20/20 A/D converter feeding a Meridian 618 processor, presented in last month's measurements, with the 618 set to "flat dither" (red curve).

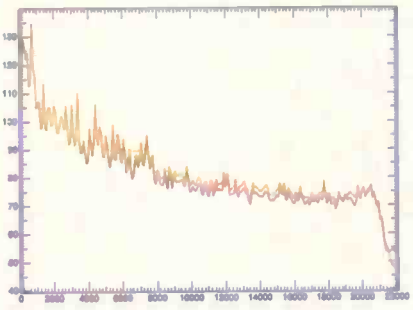


Fig. 7—*Spectra from alternative masterings of "Moonglow" on the second Reference Recordings HDCD sampler. As in Fig. 6, the HDCD version (purple curve) rolls off slightly above about 2 kHz relative to the Sony 1630 version (orange curve).*

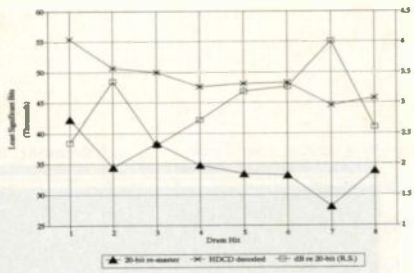


Fig. 8—*Peak levels, in LSBs (left scale), of eight drum hits from two masterings of Jimi Hendrix's "Gypsy Eyes," one a conventional 20-to-16-bit remastering, the other an HDCD remastering. A third curve plots the energy difference between the two, in decibels (right scale).*

In the region of greatest aural sensitivity, roughly from 3 to 5 kHz, the noise in the Garson recording is 17 to 18 dB above the noise floor of the Lexicon/Meridian combination. That's equivalent to about 3 bits of resolution. Had the original recording been made digitally, roughly similar noise levels would have been produced by a 13-bit analog-to-digital converter.

Also seen in Fig. 5 is HDCD's use of dither, possibly of a high-pass form but definitely noise. The dither accounts for the rise in the noise floor beginning at about 13 kHz. Since Pacific Microsonics claims in its patent papers that dither "creates new distortion," its presence on these and other HDCD recordings is as interesting as it is enigmatic. This, however, is only the first of a number of surprising behaviors by the HDCD process.

Notwithstanding the relatively high noise levels and the very strange shift in piano

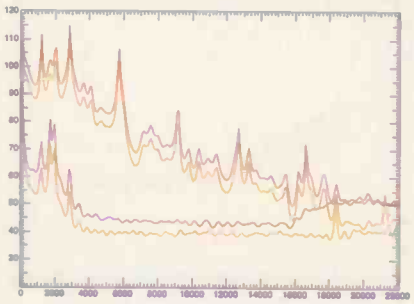


Fig. 9—*Spectra for the "heads" (upper pair of curves) and "tails" (lower pair) of a high-treble piano note. The purple curves are for the HDCD-encoded version, the orange curves for an unprocessed 16-bit recording of the same event.*

perspective that occurs in the first part of the recording, the Garson "All Blues" is a sonic confection with plump but not overbearing bass, well-delineated brushwork, and a large (though still crisp) saxophone sound. If there is a "process" at work here, it is difficult to detect it.

A word is in order about the influence of D/A converters on this recording. The reference converter—an Apogee DA-1000 that is widely used in professional recording, mastering, and some instrumentation applications—has no HDCD-decoding capability. It produced a particularly pleasing rendition of the Garson. When played through two different HDCD-capable converters, one from Proceed and another from EAD, and with sound-pressure levels adjusted for equality in the opening bars, the presentation turned out to be audibly different.

In comparison with the Apogee, *both* HDCD-equipped converters sounded rolled off in the high treble—particularly evident in percussion—and, at the same time, the Garson recording took on a "wetter," more reverberant quality, as if the walls of the space in which it was recorded were moved back and the microphones placed further from the musicians. It is a personal matter as to which presentation is preferred, but the difference is distinct.

In a separate test I found that this difference was due in part to the characteristics of the PMD-100 chip, not as a decoder but as an interpolation filter. Through the courtesy of Madrigal Audio Laboratories, a demonstration was mounted in which the same Mark Levinson No. 30.5 D/A converter was alternately fitted with an NPC filter chip and the PMD-100. With conventional recordings and precise level matching, the

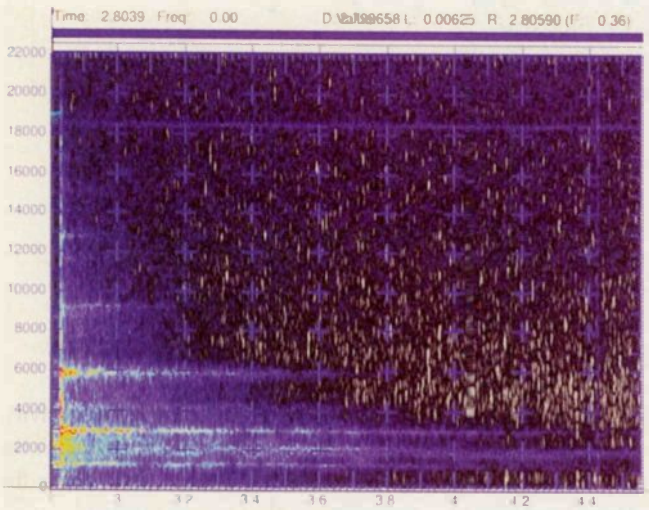


Fig. 10—*"Three-dimensional" spectrogram of the unprocessed 16-bit recording of the entire piano note depicted in Fig. 9.*

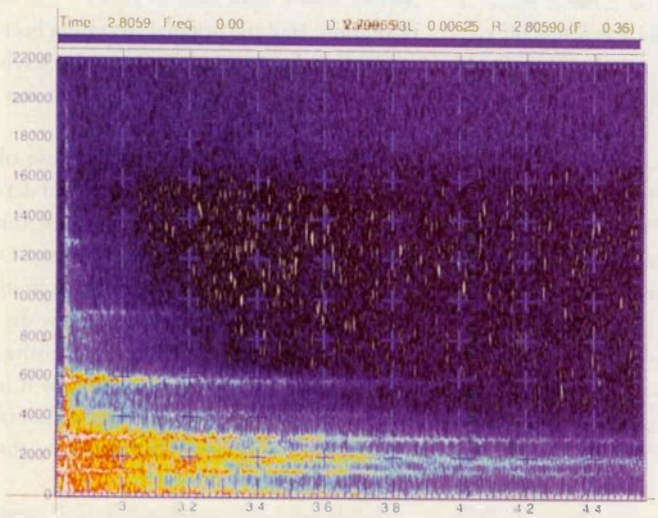


Fig. 11—*Spectrogram of the HDCD-encoded rendering of the piano note. Note how the tails of the partials are lengthened and intensified.*

> The HDCD rendering "wetter," and both the and its timbre

PMD-100 exhibited a different high-treble characteristic. Whereas the NPC filter had a certain "glisten" or "edge" when presenting choral voices and strings, this effect was absent when the Pacific Microsonics chip was installed. In comparing the Apogee to either of the HDCD-equipped D/A converters, playing conventional recordings, the alteration of treble was more pronounced and was particularly apparent on the ride-cymbal figures common in jazz recordings. Potential adopters of the HDCD technology, particularly those with single-box CD players that are sometimes "bright," should carefully audition HDCD decoders to ascertain that their performance on *conventional* recordings suits their taste and system characteristics. The HDCD-capable converters I auditioned have, to my ears, an inclination toward the mellow.

Given the current paucity of HDCD titles (and even if HDCD is wildly successful, encoded discs will be a small fraction of the total catalog for many years to come), the issue of the rendering of conventional recordings is certainly pertinent and largely

a matter of personal taste. With regard to HDCD itself, the issue is more clearly one of performance. The record there might be described as mixed, all puns intended.

A second Reference Recordings sampler (RR-905CD) contains HDCD versions and conventional Sony 1630 masterings of the same performances. I examined two of these, again by the all-digital method. The spectrum of the opening 1.7 seconds of "Lux Aeterna," a choral work from tracks 12 and 13, is seen in Fig. 6. In this section, peak levels nearly match, with the Sony 1630 version (orange curve) having a slightly higher peak level (+0.24 dB), measured in LSBs. Observe that at 1 kHz, the energy in the two versions closely matches, but as the frequency rises, the curves diverge. By 9 kHz the HDCD version is 3 dB down relative to the Sony 1630 version. That difference is maintained to about 18 kHz, where the HDCD curve starts to rise slightly; by 21 kHz it is up 1.7 dB relative to the 1630 curve. This rise at near-ultrasonic frequencies is probably due to dither noise. Except for that rise, the signal spectrum of the HDCD version of "Lux Aeterna" appears to have a substantial rolloff that begins before 2 kHz (roughly three octaves above middle C) and continues far into the range of musical partials. Comparative listening with both HDCD and conventional converters, as well as with two single-box CD players, demonstrated that the spectral difference was readily apparent in all cases.

was noticeably sustain of the piano were altered.

On another pair of tracks from the Reference Recordings sampler, alternative masterings of "Moonglow," the HDCD version's peak level measures 0.4 dB higher at the piano/percussion "hit" that begins the track. I also found a rolloff similar, but not identical, to the one on the "Lux Aeterna" cut, as seen in Fig. 7. At 2 kHz, the energy in the HDCD version is 0.1 dB below that in the Sony 1630 version, descending to –2.6 dB at 6 kHz. After rising slightly, about 0.3 dB on average, the HDCD signal is again down 2.5 dB at 13 kHz. As in the case of "Lux Aeterna," there is a sharp rise at extremely high frequencies.

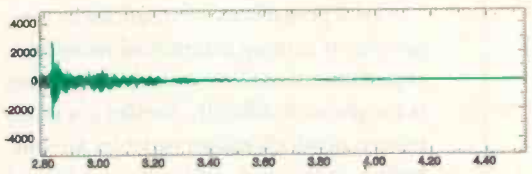


Fig. 12—*Energy-versus-time plot of the unprocessed 16-bit recording of the piano note, as depicted in Figs. 9 and 10.*

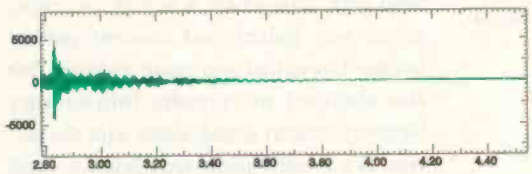


Fig. 13—*Energy-versus-time plot of the HDCD-encoded recording of the piano note, as depicted in Figs. 9 and 11.*

Once again, the difference in the spectra of the two versions was easy to hear through a variety of converters. Among the discernible effects of the HDCD process was an alteration in the timbre of the trumpet solo and a shift in the position of the piano. Apparent reverberation grew greatly, and the position of the trumpeter moved back with respect to the rest of the ensemble. These effects were audible in both conventional and decoded playback. A general and further darkening of the sound field occurred when the recording was played back through an HDCD converter on four otherwise entirely different systems.

In a demonstration conducted by Pacific Microsonics with the "Moonglow" tracks, a distinctly concave sound field was created by the HDCD version: The horn ensemble was forward and roughly at the longitudinal axis of the speakers, while the trumpeter seemed far to the back. The Sony 1630 version did not exhibit this "warpage." Although an interesting presentation, the HDCD "Moonglow" violates convention, which usually has the soloist in front. The measurable reduction in treble energy on this recording is probably the prime cause of the imaging changes relative to the standard track.

Another HDCD comparison is possible between a European HDCD release of Jimi Hendrix's *The Ultimate Experience* (Polydor 517 235) and a conventional, 20-bit-mastered domestic version (MCA MCAD-10829). Detailed analysis is confounded by both a speed difference (the HDCD being slower) and a polarity inversion. In comparison to a third, older version, *The Essential Jimi Hendrix* (Reprise 9 26035), the HDCD release again appears inverted but is of similar speed on the track examined, "Gypsy Eyes." Subjectively, both the HDCD and the "20-bit" CDs are substantial improvements over the older release. The reason is unclear, but there is a slight rolloff above 12 kHz, as well a small bass boost, in the oldest version.

Right from the start, the HDCD rendering of "Gypsy Eyes" delivers a subjectively startling presentation of Hendrix, whether decoded or not. One reason is found in Fig. 8, which shows the peak levels, in LSBs, for the first eight drum figures (a bass drum and hi-hat combination in which the bass drum naturally dominates the peak measurement). The data was taken from the balanced analog outputs of an HDCD-capable Proceed Digital Audio Processor (D/A converter), converted again from analog to digital by an Apogee AD-1000 running in 16-bit mode and transferred to the computer. There were substantial differences in both peak and relative levels.

On the first beat (reading the difference curve against the right-hand scale of Fig. 8), the HDCD version is 2.3 dB higher than the 20-bit-mastered version. This difference grows to 3.3 dB on the second beat, drops by

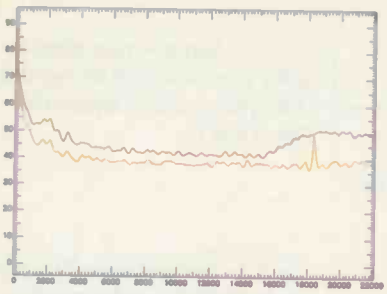


Fig. 14—*Noise floors of HDCD-encoded and unprocessed 16-bit recordings (purple and orange curves, respectively).*

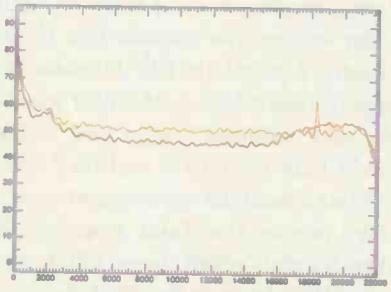


Fig. 15—*Noise floors of decoded HDCD and unprocessed 16-bit recordings (purple and orange curves, respectively).*

about 1 dB, and then climbs to a 4-dB differential by the seventh event. The eighth "hit" drops back to a 2.6-dB advantage for HDCD. The increased level is probably one reason for the subjective power of the HDCD version of this track. Since the relative level keeps changing, it is impossible to make a level-matched comparison.

If one thinks of the *shapes* of the 20-bit-mastered and HDCD curves (which read to the left-hand scale in Fig. 8) as musical indicators, it is clear that there is a rhythmic difference between the two versions. This is most apparent at the second and seventh events, but the overall shape of the curves is also different. As to which of these is "correct," the answer is unknowable: Both may have been subjected to other processes. It seems, however, that in the HDCD mastering the engineer may have taken advantage of the "gain interplay" features of HDCD, in effect using it creatively. The "oldest" version of "Gypsy Eyes" (not shown) yielded yet a third set of levels. The philosophically or musicologically inclined may wish to ponder the question: What did drummer Mitch Mitchell *really* play?

The Ultimate Comparison

As you probably have recognized by now, analysis of existing commercial recordings, even those released for formal comparison, is fraught with difficulty. Needed is a stable process in which known variables are controlled. To that end, an HDCD encoder and Pacific Microsonics personnel ventured to New York City, where a superb recording venue was rented and concert pianist Jerome Lowenthal was again engaged. We also obtained an exquisite 19th-century Steinway concert grand, along with the services of a concert-piano technician. A small platoon of engineers with a large complement of equipment was in attendance, along with me and both the Editor and Publisher of *Audio*.

The purpose of the exercise was to obtain *directly* comparable master recordings, all fed simultaneously by the same microphones and microphone preamplifier. Master media comprised a Nagra 20-bit digital recorder, an HDCD encoder feeding a 16-bit Sony DAT machine, a Stellavox professional 16-bit DAT deck, and two analog recorders, one a Studer 1-inch transport with custom tube electronics designed by Tim de Paravicini and the other a standard Studer quarter-inch, solid-state model. (A CD containing all versions of this comparison recording will be offered to *Audio* readers in the near future for evaluation on their own systems.)

I later made measurements comparing the digital information in the HDCD-encoded and 16-bit Stellavox recordings. (This was straightforward and avoided any need to process a 20-bit recording.) In listening to the two recordings, I noted the most marked differences at relatively low levels, particularly when using the Apogee D/A converter. With respect to the Stellavox DAT, the HDCD rendering of passages in the region of –20 dBFS was noticeably "wetter," and both the sustain of the piano and its timbre were altered. The first impression was similar to that created by the "rolled-off" HDCD tracks on the Reference Recordings samplers, particularly with respect to the sense of greater reverberation. In this case, however, no high-frequency rolloff was apparent, as short-interval measurements of the signals yielded essentially similar spectra on typical events when adjusted for level.

Refer to Fig. 9 for the likely solution to the mystery. The upper pair of curves shows the spectrum of the HDCD rendering of the "heads" of two high treble notes (purple curve) and just below it the DAT rendering (orange curve). This event is "out in the open" and sustains for about 1.75 seconds. At all of the many points measured, there is a 5-dB differential, ±0.1 dB, which is reasonably linear for the comparative deviations of two separately recorded signals.

Now examine the lower pair of curves in Fig. 9, the spectra of the "tails" of the same event over a period of 330 milliseconds. Here deviations at the peaks range from 9.5 dB at 1.25 kHz to 8.7 dB at 2.85 kHz. By 5.8 kHz the HDCD signal is into the noise floor, which is about 5 dB above the DAT noise floor until the HDCD dither starts pushing it further up at about 16 kHz. (The 6-dB spike in that DAT signal at 18.3 kHz is a recording artifact rather than part of the signal.) What this indicates is that HDCD raises the tails of musical events dynamically and probably introduces a time-varying frequency and amplitude response. Implied by this behavior is the ability to distinguish signal from noise, which might possibly be done by autocorrelation. In any case, this

HDCD is the
and obvious of the

example shows that HDCD encoding materially alters signal dynamics in audible ways. Listeners are invited to decide for themselves if this is an acceptable trade-off for the claimed HDCD benefits.

Figures 10 and 11 are full "three-dimensional" (time, frequency, and amplitude) spectrograms of the straight 16-bit DAT and HDCD versions of the entire event. You can see the tendency of HDCD to lengthen and strengthen the tails of the partials. The partial at 5.8 kHz, for example, is about a quarter of a second longer in the HDCD recording than in the unencoded DAT recording. Substantial increases in the low-level partials are also evident; locally, these variations can exceed 10 dB between the two signals.

The energy-versus-time plots (all frequencies summed) corresponding to Figs. 10 and 11 are shown in Figs. 12 and 13. Interestingly, there is little difference except in the tails. Without knowing the behavior of HDCD, one might attribute the fattened tail on the plot to the roughly 5-dB difference in large-signal amplitude.

Decoding does improve HDCD's behavior. The curves in Fig. 14 show the relative quiescent noise performance of undecoded HDCD and the straight 16-bit recording. In this condition, HDCD's measured noise is clearly higher (typically between 5.7 and 4.5 dB from 3 to 5 kHz and dropping slightly, to between 4 and 5 dB, from 7 to 15 kHz, after which the floor rises because of HDCD's dither). But since HDCD's companding action raises the recorded level by about 5 dB at low to moderate inputs (–20 dBFS or below), an undecoded HDCD disc can still have a signal-to-noise ratio roughly equivalent to that of the conventional 16-bit recording.

The curves in Fig. 15 indicate the comparative noise levels for the same recordings but with the HDCD segment decoded. This data was captured by taking the balanced analog output of the Proceed D/A converter and taking it back to digital with an Apogee AD-1000 A/D converter operating at 16 bits. (To keep the Apogee converter's own noise from confusing the measurement, I used its gain controls to raise the input level about 13.5 dB.) The curves show the quiescent noise of decoded HDCD is below that of the straight 16-bit recording, which suggests that the process is providing some noise-reduction effect. But whereas the undecoded HDCD signal was 5 dB above the straight 16-bit level, the decoded HDCD signal is 1 dB below the 16-bit when measured at the same point. Although the signal level swings 6 dB between the two formats, the noise level drops somewhat less. At 4 kHz the noise of HDCD is about 4 dB lower than the straight 16-bit; at 5 kHz this difference grows to 5 dB in favor of HDCD and then drops to about 4 dB until 11 kHz, where it again approaches 5 dB. Even given potential differences introduced by the decode to analog and return to digital, it does not appear that HDCD provides a large noise advantage over conventional 16-bit recording on this program material, even with an exceptionally quiet source such as that provided for the test recordings.

The significance of that fact becomes evident when you consider that the test recordings are substantially quieter than any material yet released in HDCD. This implies that HDCD is not getting much closer to true 18- or 19-bit equivalent performance than the noise shapers. At least in part, that is because HDCD is no more able than other processes to overcome the limitations of hall, microphone, and microphone preamplifier noise.

The Bottom Line

It is clear that HDCD encoding audibly changes the spectra and envelopes of piano tones. Decoding the signal largely eliminates this problem, however, which is to say that the levels within spectral peaks on the heads and tails of notes are the same (within about 0.5 dB) in decoded HDCD recordings and conventional digital recordings of the same passages. Examination of the spectrograms for the two signals also reveals much greater similarity after decoding of the HDCD version. (These spectrograms are not shown because the differences are so small that they would probably be obliterated in reproduction.)

Decoded or undecoded, HDCD has a signature sound, some portion of which is attributable to the encoding process, the rest to the decode side and, particularly, to the sound of the digital filter incorporated in the HDCD chip. Perhaps this characteristic follows from a certain reverence for analog on the part of HDCD's designers. Of all the processes examined, HDCD is the most aggressive and obvious in operating on the incoming signal. Pacific Microsonics undoubtedly would say that such operations are necessary to overcome the limitations of the digital medium. There is no clear evidence to support such a claim, however, at least in the test recordings or other material currently available, and the nature of the process raises other issues.

In particular, there is the matter of undecoded playback. The way in which HDCD operates on a piano signal has strong musical implications. The rate of sustain, which is altered by HDCD in the example presented, has been the subject of intense development by piano makers for two centuries or more. The "singing" quality for which some pianos are renowned emerges during sustain, and artists modify sustain through subtle manipulations of the piano's pedals. Measurable modification of sustain, whatever its motive, is not likely to yield a faithful reproduction of either the instrument or its use by artists who create refined performances in any genre.

The effect seen and heard on the grand piano is probably not confined to it. Any instrument that continues to sound after it is struck—be it a plucked string on a violin or guitar, a drum, a cymbal, or a vibraphone—has a characteristic decay that is probably susceptible to modification by HDCD. When altering such signals, the process also modifies the associated reverberation. That may possibly account for at least some of the tendency for HDCD recordings to sound "wetter" than conventional recordings. For those who prefer a recording style built around large spaces and a relatively distant perspective or who believe analog recordings are somehow "richer" than digital recordings, HDCD may well be deemed an aural success. If, however, the criterion is accurate reproduction of a musical event, then HDCD's signal-processing operations are less successful, particularly when they're not decoded.

Most remarkable, though, are the wide spectral variations evident among various recordings that are all claimed to represent "good" sound. The 15-kHz energy found in the cymbals on the Super Bit Mapped Sony Mastersound *Kind of Blue* and the HDCD version of "Moonglow" might easily differ by 15 dB or more. Digital technology is clearly being used to serve greatly varying aesthetic objectives and preferences. And if SBM and HDCD represent the future, or perhaps alternative futures, the traditional canons of recording and high fidelity are in need of revision. A

Finance

most aggressive

processes examined.

EQUIPMENT PROFILE

EDWARD J. FOSTER

HARMAN KARDON CITATION 7.0 A/V PREAMP/PROCESSOR

Harman Kardon has been introducing some impressive products in its upscale Citation line, the flagship of which is the Model 7.0 A/V preamp/surround processor. According to the company, the 7.0 is the culmination of more than three years of intensive research and development and incorporates the most recent versions of Jim Fosgate's movie and music modes. Among these Fosgate innovations is a new "six-axis" technology, which derives a pair of stereo-like surround channels from Dolby Surround's mono surround track. Fosgate, for those who may not know, championed surround sound well before there was such a thing as Dolby Surround and, over the years, developed a number of highly acclaimed surround sound processors under the Fosgate•Audionics label.

The Citation 7.0 is so novel that I don't expect to be able to describe it fully here. The owner's manual runs some 125 pages, which gives you an idea of its complexity. Fortunately, it is well written, and the 7.0's microprocessor and on-screen menus are designed adroitly enough to make the system usable in reasonably short order—even if mastering its potential takes some time.

The 7.0 accepts eight audio/video inputs. Four connections can be in S-video or composite-video form; the remaining four video connections are in composite form only. You can record composite- or S-video signals on two recorders, and both main and auxiliary video outputs also are carried on composite- and S-video jacks. In addition to stereo audio feeds for each recorder, there are line-level outputs for the main front and center channels, for stereo and mono subwoofers, and for two sets of surround channels (side and rear). If Citation's Dual-Drive dipole speakers are used in the surround channels, *both* sets of surround outputs are used, and the speakers switch between bipole and dipole operation under the 7.0's control. Which outputs are active and which are not is determined during initial setup, when the microprocessor is programmed. On the rear panel are 42 gold-plated RCA jacks for the audio and composite-video inputs and outputs; the S-video connectors are base metal. A calibration microphone, supplied with the 7.0, plugs into a rear-panel jack.

Three trigger outputs are provided: One to control room lighting, another to raise and lower a projection screen, and a third to activate compatible Citation power amplifiers. (Interface boxes are usually required to control screen motors, room lighting, et al.; the necessary switching interfaces are built into some Citation power amps.) The projection-screen trigger can be programmed to activate whenever the Citation 7.0 is on or only when specific inputs are selected. A "Custom Install" menu (which contains specialized commands for complex programming of trigger signals) is provided but is accessible only to specially trained dealers and installers. An RS-485 bus jack provides an expansion port for such options as multiroom controllers and external multichannel digital audio decoders, which Citation may introduce in the future.

The Citation 7.0 has two power switches: a master switch on the rear panel, which is normally left on, and an activating switch on the front, which brings the system to life. Although the 7.0 can be operated from its seven front-panel buttons (which select surround mode and source, raise and lower volume, and toggle muting on an off), operation is easier from the remote. With the remote, you can call up any of the eight sources, the eight factory-set surround modes (Dolby Pro Logic, THX, "70 mm,"

Dimensions: 17½ in. W x 5¼ in. H x 14½ in. D (44.5 cm x 13.3 cm x 36.8 cm).
Weight: 18 lbs. (8.2 kg).
Price: $3,950.
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Photos: Michael Groen

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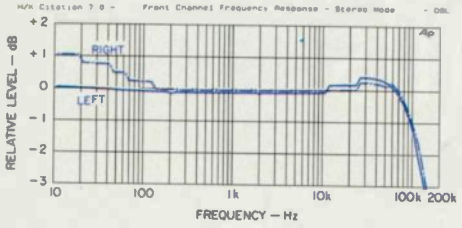

Fig. 1—Front-channel frequency response, stereo mode.

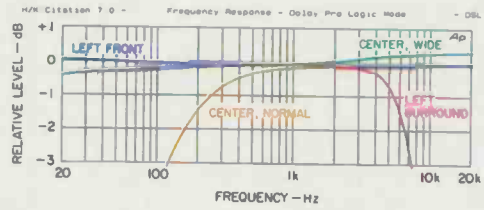

Fig. 2—Frequency response, Dolby Pro Logic mode.

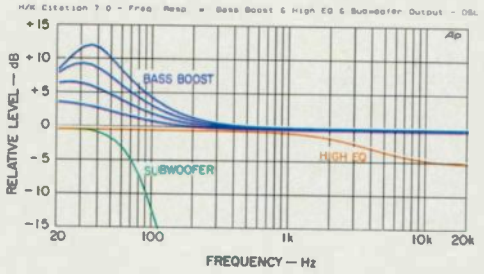

Fig. 3—Effects of bass boost and "High EQ" and response of subwoofer output.

"6-Axis," classical, "Jazz," "Rock," and "Mono"), and four surround modes that you can configure. Needless to say, the remote controls power, volume, and muting. It also permits you to revert the system to factory parameters ("Reset"), switch in equalization, and disable surround processing ("Stereo Only"). For equalization, your choices are "Bass EQ" (in four steps) and "High EQ" (THX-like front-channel re-equalization for use in modes other than Home THX).

The remote has a switch for a sibilance filter ("SIB. Filter"), which reduces leakage of center-channel dialog to the surround channel, and a panorama circuit ("PAN."), which widens the soundstage and creates a wraparound effect. (Neither function is available when you're using Pro Logic or Home THX processing.) A "Center Speaker" button turns that channel on and off, chooses between center-normal and center-wide operation, and enables you to boost center-channel level by 4 dB.

The remote's "Venue" button controls surround-channel DSP. Your choices are "Night Club," "Cinema," "Concert Hall," "Stadium," and a "Custom Venue" mode that you can configure. The remote's "Panel Dim" key turns off the front panel's vacuum-fluorescent display and its steering-logic and input-level indicators. The display wakes up for a few seconds when you press any remote-control key and then goes back to sleep.

The owner's manual refers to some of the remote's controls as "direct access functions," since each of these buttons performs a specific function. Other buttons on the remote are referred to as "menu call functions," which bring up menus, and "navigational controls," which you use when you're making choices. Four of the navigational controls are directional arrows that move an on-screen cursor. Another, "Select," lets you choose control options or advance to the next menu level. "Cancel" aborts changes to the current menu, and "Exit/OK" confirms a selection and exits the current menu.

Of the remote's four menu call buttons, "System Setup" is of primary importance. Using its menus and submenus, you can program the microprocessor for the sizes and types of all your loudspeakers, the number of subwoofers you have in your system, whether you're using a center-channel speaker, whether you have one or two sets of surround speakers (and whether they're direct radiators, Home THX dipoles, or Citation's Dual Drive types), and so forth. With the second option in the "Speakers" menu, you can calibrate and balance levels automatically or manually. The third option calls up submenus for instructing the microprocessor how far your listening position is from the center speaker and each surround speaker. Based on the information you've entered, the Citation 7.0 automatically sets itself up for your viewing room and speaker arrangement.

So far, I've discussed only the first level of the "System Setup" menu; I'll not discuss the other options in such detail. Suffice it to say that the "Video CONFIG" menu selects the way video is routed from the 7.0 to your TV, while other menus enable you to personalize the system with your name and to lock and reset settings. You can check the setup status on-screen by tapping "System Setup" once and exiting the menus without changing them.

With the remote's "Options Set" menu button, you can review such settings as how the two record output circuits are set up, which video output (or both) will carry the on-screen messages, the front-panel display's brightness level and time-out period, and the volume level at power on. You can change the options as desired and even defeat the subwoofer output if you don't want to use your subs when you're listening in stereo.

The remote's "Source Edit" menu button lets you check and customize the settings automatically selected for each input source. It gives you control over input level and balance, each adjustable manually or automatically. You can choose to display on-screen warnings, select the background color for on-screen displays, configure and customize the projection-screen trigger for each source, and customize the name of each source.

THIS IS A PROCESSOR AS MUCH FOR MUSIC CONNOISSEURS AS IT IS FOR CINEMA AFICIONADOS.

The remote's final menu call button, "SURR. Mode Editing," is covered in the manual's "Advanced User Operation" section. I think I'll let you find it there yourself, because fully describing its possibilities will open Pandora's box. With these menus you can program the surround DSP almost from scratch and adjust it for room type, size, and acoustical brightness and reflectivity. You can choose among low-pass filter cutoffs for the surround channel and even change the speed of the steering logic. Fortunately, the manufacturer tells you how

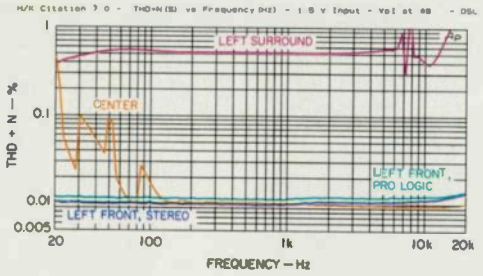

Fig. 4—THD + N vs. frequency.

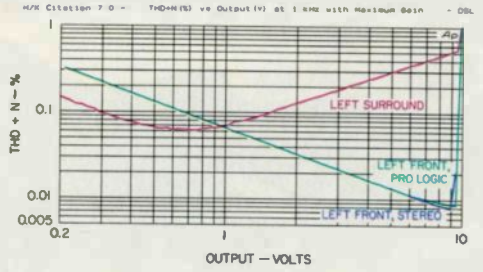

Fig. 5—THD + N vs. output.

the system is set when it leaves the factory, which gives you a road map if you find you've strayed too far.

Measurements

I tested the Citation 7.0 rather fully in its stereo and Dolby Pro Logic modes but checked only surround-channel noise in the other surround modes. For the most part, the readings in "Measured Data" and in the graphs were taken on the left channel, with the factory settings for gain and seating distance. Except for the test of subwoofer frequency response, I set the system up as if no subwoofer were used. I switched the center channel to the appropriate mode for each particular test I was running and set up for Home THX dipole speakers in the surround channels. The volume was set to "48," the Home THX reference point.

Frequency response in stereo is shown in Fig. 1. I have no explanation for the staircase-like curve shapes (especially noticeable on the right channel). But even worst-case response within the audio band, for the right channel at 20 Hz, is up less than a decibel, which I guess is reasonable. The –3 dB points are well beyond the audio band, below 10 Hz (the bass limit of the measurement) and at 130 kHz.

Figure 2 shows frequency response in Dolby Pro Logic mode, plotted on the same scale as Fig. 1. The response of the left front channel is flatter here than in stereo. In the center-wide mode, there's an overall tilt in the response that amounts to a 0.35-dB boost at 20 kHz and an equal cut at 20 Hz. In the center-normal mode, which you would use with small center speakers, the treble rise does not appear and all bass below 110 Hz is shifted to the main front speakers. Surround-channel frequency response parallels that of center-wide response in the bass and midrange; it then rolls off sharply above 7.5 kHz, as dictated by Dolby Labs standards.

Figure 3 again shows front left frequency response, this time with a more compressed scale so that you can see the effect of "Bass EQ" when it's set to its four boost options (+3, +6, +9, and +12 dB). There's a close match between the settings and the maximum boost each setting yields. However, each 3-dB increase in boost slightly raises the frequency at which the boost peaks, too. I expect this is purposeful, since it's dangerous to apply excessive boost in the infrasonic region.

In Fig. 3, I've included a frequency response curve taken with "High EQ" switched in. This setting is automatically activated when Home THX processing is selected but can also be applied when the 7.0 is in other surround modes. The curve meets Home THX re-equalization standards reasonably well, although its initial slope could be somewhat steeper. I have also included the response taken at the subwoofer output; it is down 3 dB at 60 Hz and is about –8 dB at 80 Hz. As the THX standard demands, the curve has a slope of 24 dB/octave.

Figure 4 shows total harmonic distortion plus noise (THD + N) versus frequency, in Dolby Pro Logic mode. This set of curves was taken using a 1.5-volt input and a volume setting of "48." I also ran curves using a 0.5-volt input and a volume setting 12 dB higher. The THD + N was higher in the front channels with the lower input level and the higher volume setting but was lower in the surround channels. However, since the readings at the high volume setting were more noise than distortion, I have not included those results. Either way, distortion in the front channels is unusually low for a Pro Logic processor.

I measured distortion versus output at 1 kHz, using various volume settings. It soon became clear that the maximum output level was limited by input overload, not by output-stage clipping, and that all channels overloaded at pretty much the same point. Thus, Fig. 5 reflects performance with the volume set to maximum but does not include a curve for the center channel. Obviously, there's more than enough output to drive even the least sensitive power amplifier into clipping.

With the factory gain settings, input overload occurred at 2.27 volts, which is typical of many processors. Although this level is usually considered adequate, it's actually somewhat marginal because the D/A converters in some new laserdisc and CD players put out more than the standard 2 volts. This need not be a concern with the Citation 7.0, however. I found that if I reduced the input gain (a function available on yet another menu), the 7.0 could accept nearly 4.5 volts before running into trouble; that's more than enough for any current source.

Input impedance was adequate, and output impedance at the main front terminals and recording outputs was nice and low.

I'VE NEVER HEARD A PRO LOGIC PROCESSOR THAT COULD SEPARATE SOUNDS SO BELIEVABLY.

Spectrum analyses (not shown) unearthed power-line-related components at 60 and 180 Hz, but they were quite low. Over most of the spectrum, there was only white noise; there was also a noise spike at 100 kHz, presumably related to the digital sampling rate.

On an A-weighted basis, noise was approximately 83 dB below the 0.5-volt reference in all channels. Since typical power amps reach full output with an input of about 1.5 volts, you can count on a usable system dynamic range of about 93 dB. The Citation's own dynamic range, referenced to its maximum output, approached 110 dB! The A-weighted noise in the surround

Master Craftsman Jacob Albright

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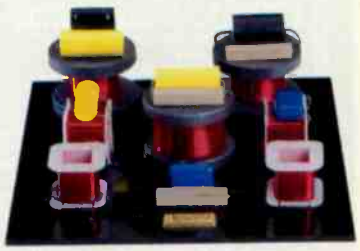

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channels was 2 to 3 dB higher with the "70 mm," "6-Axis," "Jazz," and "Rock" settings than in the Pro Logic or THX modes. Steady-state channel separation at 1 kHz in Pro Logic mode averaged about 43 dB; that average would have been better but for a leakage of –21.7 dB from the surround channel to the right front.

Use and Listening Tests

It may seem strange to speak of the Citation 7.0 first as a surround processor for *music*, but when I hear one of Jim Fosgate's creations, I never fail to be awed. What I find most impressive about his algorithms is how *un*impressive they are—until you turn them off! It's easy these days to program a DSP system to wow people with a hot demo of an all-enveloping soundstage. But live with such a DSP system for a while, and the wow will probably wear off.

I don't want my head inside Itzhak Perlman's violin (it wouldn't fit), nor do I want to live in a piano (much as I like its sound). I want to be in the audience. I want the performer in front of me, not surrounding me, and I want a natural and believable sense of ambience. This is precisely what the Citation 7.0 creates in its classical music mode. It provides a solid front image and a remarkably natural hall acoustic. Even the "Jazz" and "Rock" modes are not overly aggressive. (Unlike the classical mode, by the way, they use the center channel.) When the Citation 7.0 was in my home theater, I began listening to *music* in the various soundfield modes for the sheer enjoyment of it. Normally, I take my music in straight stereo, thank you, and in my listening room, not in my theater.

Some readers will view the Citation 7.0 primarily as a processor for home theater rather than for music. There's nothing wrong with that; it does a remarkably fine job for both. It's not a system that knocks you off your chair but, rather, one that reveals subtleties other Pro Logic and Home THX decoders miss. I've not heard another Pro Logic processor distinguish the raindrops hitting Gene Hackman's umbrella from the surrounding downpour (*Crimson Tide*) as well as this one does. (AC-3 does it better still, but relatively little material is available in that format yet.) Nor have I heard others that can separate left-side helicopter flyovers from right-side flyovers quite so believably as this one (*Clear and Present Danger*). Why is the 7.0 superior? I'm really not sure, but I suspect it has to do with the speed of Fosgate's steering logic. Whatever the reason, the results are terrific!

The Citation 7.0 is a surround processor designed as much for the music connoisseur as for the movie aficionado. Its subtlety is unsurpassed, its surround effects the most natural I've heard short of a true discrete-channel system. The Citation 7.0 gets *my* citation for excellence and rides high on my recommended list. A

MEASURED DATA

Maximum Gain, Stereo Mode: 14.3 dB.
Gain to Recording Output: –0.16 dB.
Input Overload: With factory settings, 2.27 V; maximum, 4.5 V.
Output at Clipping, 1 kHz: Stereo, 9.85 V; Pro Logic, more than 9.65 V for all channels.
Frequency Response, Stereo Mode: 20 Hz to 20 kHz, +0.26, –0 dB (–3 dB below 10 Hz and at 130 kHz).
Frequency Response, Pro Logic Mode: Main front channels, 20 Hz to 20 kHz, +0.12, –0 dB; center channel (wide mode), 20 Hz to 20 kHz, ±0.35 dB; center channel (normal mode), –3 dB at 110 Hz; surround channels, –3 dB at 7.5 kHz; subwoofer output, –3 dB at 60 Hz.
THD + N, Stereo Mode: Less than 0.0133%, 20 Hz to 20 kHz.
THD + N, Pro Logic Mode: Main front channels, less than 0.0135%, 20 Hz to 20 kHz; center channel, less than 0.03%, 100 Hz to 20 kHz; surround channels, less than 0.867%, 100 Hz to 7 kHz.
A-Weighted Noise re 0.5 Volt, Stereo Mode: –83.2 dB.
A-Weighted Noise re 0.5 Volt, Pro Logic Mode: Main front channels, –83.2 dB; center channel, –83.4 dB; surround channels, –82.9 dB.
Channel Separation: Stereo, greater than 46.3 dB, 100 Hz to 10 kHz; Pro Logic, 43.16 dB at 1 kHz (average), 21.7 dB at 1 kHz (worst case).
Input Impedance: 16.6 kilohms.
Output Impedance, Left Front and Record Outputs: 300 ohms.

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EQUIPMENT PROFILE

BASCOM H. KING

HAFLER TRANS-NOVA 9505 AMPLIFIER

The Trans-Nova circuit design goes back to about 1984, when it was introduced by Acoustat (later bought by Hafler) in two solid-state power amps (the Models TNT120 and TNT200). "Trans-Nova" is a contraction of Transconductance Nodal Voltage Amplifier (U.S. Patent No. 4,467,288). When I first examined the circuits for these amplifiers, I was most impressed with the topology of the output stage. Other aspects of the original circuit design were quite elegant also.

Rated Power Output: 250 watts per channel into 8 ohms, 375 watts per channel into 4 ohms.
Dimensions: 19 in. W x 5¼ in. H x 12½ in. D (48.3 cm x 13.3 cm x 31.8 cm).
Weight: 50 lbs. (22.7 kg).
Price: $2,200.
Company Address: 613 South Rockford Dr., Tempe, Ariz. 85281; 602/967-3565.
For literature, circle No. 91

The 9505, a third-generation Trans-Nova design, is aimed primarily at the professional audio market. It is the larger of two otherwise similar pro models and is rated at 250 watts per channel into 8-ohm loads. (The smaller 9303, rated at 150 watts per channel into 8 ohms, is priced at $1,300.) A reasonably sized package for its power output, the 9505 has a front panel graced by a single on/off rocker switch. An indicator in the switch glows when the amp is turned on. Both balanced and unbalanced input connectors are provided on the rear panel.

THE 9505 USES THE THIRD GENERATION OF HAFLER'S IMPRESSIVE TRANS-NOVA CIRCUIT.

The interesting XLR connectors will accommodate either the usual mating XLR connector or a ¼-inch phone plug. Speaker connections are made via two pairs of five-way binding posts. Three recessed slide switches select balanced or unbalanced input mode, stereo or mono (bridged) operation, and connection or disconnection of the chassis to the third-wire ground. The AC line connection is via an IEC socket and mating power cord.

Inside the 9505 is a main p.c. board in a "C" shape, oriented with its long side to the rear. A large, rectangular, UI-lamination power transformer is situated in the opening of the p.c. board. The main filter capacitors for each channel are mounted on the short sides of the board, adjacent to the heat sinks. All of the input connectors and slide switches on the rear panel are mounted to the rear portion of the p.c. board. This is the first power amplifier I've seen that uses surface-mount parts for most of its signal circuitry and the low-power parts of its power supply.

If one considers the power supply as part of an amplifier, the standard "half-bridge" output-stage topology is actually a full bridge, consisting of four elements. These elements are the two output devices (or the equivalent, where multiple devices are paralleled for more power-handling capacity) and the positive and negative power supplies. In the usual arrangement, the center point of the power supplies is grounded, and the load is connected between this ground reference point and the midpoint between the two output devices. In most designs, these output devices are driven as followers, with their input driving voltage slightly higher than the output voltage.

In the Trans-Nova design, the load is still connected between the same two points in the bridge. What's radically different is that the Trans-Nova uses the midpoint between the output devices as its ground reference and lets the center tap of its power supply move with the signal. In this arrangement, the output devices (MOSFETs in the 9505) are operated as common-source amplifiers with voltage gain, and

Photos: Michael Groen

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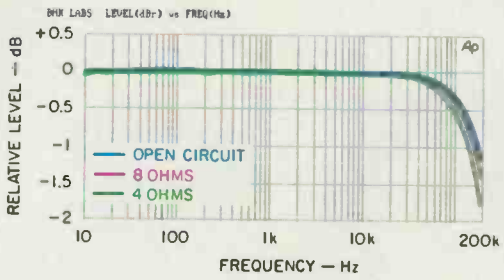


Fig. 1—Frequency response.

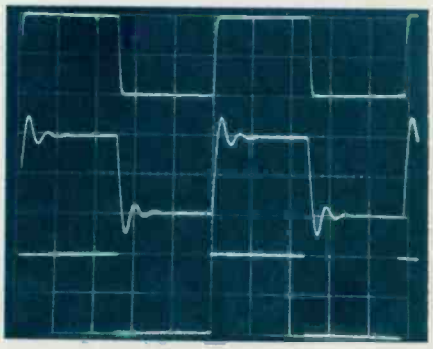
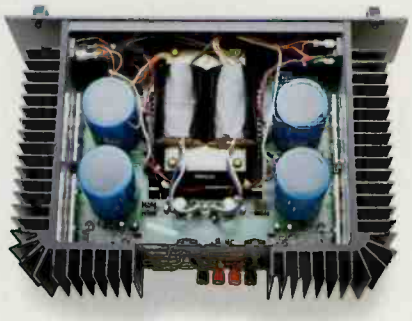


Fig. 2—Square-wave response for 10 kHz into 8 ohms (top), 10 kHz into 8 ohms paralleled by 2 µF (middle), and 40 Hz into 8 ohms (bottom).



their input driving signal is referenced to ground. The input signal required is much smaller, so the front-end driving circuitry can be operated from a much lower supply voltage than that needed for the output stage. As the 9505's excellent owner's manual points out, the output stage's voltage gain gives this stage approximately 10 times the power gain of a conventional follower circuit using exactly the same MOS-FET devices.

Negative feedback is taken from the output point back to the input gates of the MOS-FETs. This inverting feedback converts what would be a high-impedance input to a low-impedance input. In other words, the output stage has been made into a transimpedance stage, or current-to-voltage converter. This stage is fed by the driver circuitry, which is configured as the output stage's complement, a voltage-to-current (or transconductance) circuit.

The driver stage is a newly developed circuit, DIABLO (Dynamically Invariant A-B Linear Operation), that is designed to provide up to 14 dB greater headroom than the usual Class-A driver stage. This extra headroom is needed because the output stage has four pairs of MOS-FETs per channel, used in their common-source mode. The appreciable input capacitance of this arrangement calls for a driver stage that has more output current at high frequencies than the usual Class-A stage, with its limited 2-to-1 ratio of peak to quiescent current, can provide. To get around this limitation, the DIABLO circuit uses a complementary common-base first stage, direct-coupled to a complementary cascode-connected second stage.

At the input of the 9505, the phases of the signal are each buffered by a discrete circuit that consists of an N-channel J-FET source follower with a bipolar current source. This is coupled into a complementary bipolar emitter follower. Grounding one phase of this buffer input changes the input from balanced to unbalanced; the balanced/unbalanced switch merely ungrounds (or grounds) the negative input phase for balanced (or unbalanced) input configuration. For bridged operation, the stereo/mono switch establishes an inverted-polarity signal path from the left channel's input (which doubles as the mono input) to the right channel's. An op-amp servo circuit monitors the amplifier output's DC level and applies any error to the ground end of a signal-voltage divider that feeds the positive input of what I consider the power amplifier proper (i.e., everything that follows this buffer).

As is often the case, the amplifier proper is embedded in a four-resistor, differential-to-single-ended circuit that incorporates two voltage dividers, one for each signal phase. The input of the power amplifier proper is a differential amplifier using a matched pair of N-channel J-FETs. The J-FETs' sources are connected to a bipolar current source whose drain outputs are coupled to a bipolar current mirror. One of the differential amplifier's outputs is direct-coupled to the input of the driver stage.

THE MORE I USED THE TRANS-NOVA 9505, THE MORE I LIKED ITS HIGH RESOLUTION AND SMOOTHNESS.

Overall negative feedback is taken from the output to the inverting input of this differential amplifier.

The power transformer is somewhat unusual, having separate primary and secondary windings for each channel; each of the long sides of the transformer's UI core carries one such primary-secondary pair. This reduces the capacitive coupling between the high-current secondary windings as they move with the signal in respect to ground and to each other.

Measurements

The test results cited here are for the left channel with unbalanced input. Any significant departure, for the right channel or balanced input, is noted.

Frequency response for open-circuit, 8-ohm, and 4-ohm loading at a nominal level of 2.83 volts (1 watt into 8 ohms) is plotted in Fig. 1. Bandwidth is very wide; further, the curves are very close together over the audio range, indicating a very low output impedance and consequent high damping factor. Rise and fall times measured 1.1 microseconds for an output level of ±5 volts into 8 ohms, yielding an equivalent bandwidth of about 318 kHz. Square-wave response is shown in Fig. 2. For 10 kHz (top trace), rise time is sharp and fast. The addition of a 2-microfarad capacitor across the 8-ohm load (middle trace) causes ringing, typical of most solid-state am-

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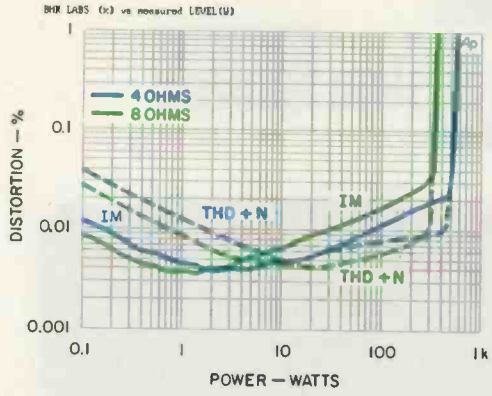

Fig. 3—THD + N and SMPTE IM distortion vs. power output.

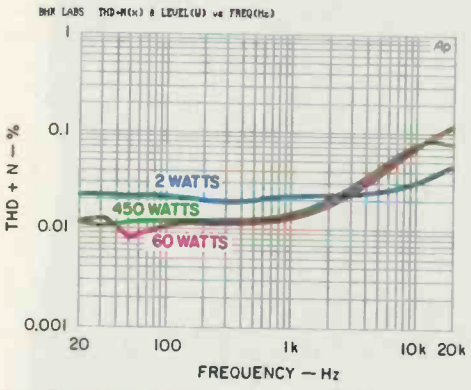

Fig. 4—THD + N vs. frequency.

plifiers. The absence of tilt in the low-frequency trace (bottom) is indicative of excellent, extended infrasonic response.

Figure 3 shows total harmonic distortion plus noise (at 1 kHz) and SMPTE intermodulation distortion versus power. With the balanced inputs (not shown), THD + N was about the same as seen in Fig. 3, but IM distortion was a third to a half as much from 10 to 400 watts. Figure 4 shows THD + N versus frequency for low, medium, and high power into 4 ohms. Spectrum analysis (not shown) revealed that the second harmonic was the dominant distortion component over much of the power output range. When the second harmonic is dominant, harmonic distortion level is relatively constant with change in output, as can be seen in Figs. 3 and 4.

With the unbalanced inputs, crosstalk was more than 100 dB down up to 2.5 kHz; there was remarkable similarity between the right-to-left and left-to right directions. Crosstalk then increased at 6 dB/octave, reaching –86 dB at 20 kHz. With the balanced inputs, the symmetry between directions was not as good; the amount of crosstalk was some 2 to 10 dB worse, depending on frequency and direction.

For the 9505's balanced inputs, common-mode rejection ratio (CMRR) rose by approximately 6 dB/octave over the audio range. It started at –106 and –110 dB at 20 Hz for the left and right channels, respectively; it ended up at –54 and –60 dB at 20 kHz.

Output noise levels for the right (worse) channel were 314 microvolts wideband, 252 microvolts from 22 Hz to 22 kHz, 131 microvolts from 400 Hz to 22 kHz, and 130 microvolts A-weighted. The results for the left channel were about 10% to 20% better. The unit's A-weighted signal-to-noise ratio was –88.2 dB for the left channel and –86.7 dB for the right, relative to a 1-watt output into 8 ohms. The noise was satisfactorily low, mainly hum components induced by power-transformer flux. (There was also some audible mechanical hum emanating from the transformer.)

Output impedance was very low in both channels. Damping factor, referred to 8 ohms, was 670 from 20 to 500 Hz, decreasing to 615 at 1 kHz and to 100 at 20 kHz. Voltage gain into 8-ohm loads was slightly greater than 28.7 dB.

In the test of dynamic power, the 9505 produced 390 watts into 8 ohms at the beginning of the tone-burst signal and 380 watts at its end; dynamic headroom was 1.9 dB. For 4-ohm loads, output was 666 watts at the start of the burst and 648 watts at its end, corresponding to a dynamic headroom of 2.5 dB. Maximum undistorted output into a 1-ohm load with one channel driven was 48 volts at the start of the burst and 44 volts at its end, equivalent to peak currents of 48 and 44 amperes, respectively.

Power attainable at the visual onset of clipping was 345 watts into 8 ohms and 553 watts into 4 ohms. Clipping headroom was therefore 1.4 and 1.7 dB, respectively.

The 9505's AC line draw was about 2 amperes. The current remained quite constant from cold turn-on to the point where the amplifier became quite hot during the power tests; this indicates excellent output-stage thermal stability.

Use and Listening Tests

During the review period, the equipment in my system included an Oracle turntable fitted with a Well Tempered Arm and an Accuphase AC-2 moving-coil cartridge, used with a Vendetta Research SCP-2C preamp. A Counterpoint DA-11A CD transport drove a Museatex Bidat or a Sonic Frontiers SFD-2 MKII D/A converter. Additionally, a Genesis Digital Lens jitter-reducing device was placed between the CD transport and the D/A converter. Other program sources were Nakamichi's ST-7 FM tuner, a Nakamichi 250 cassette recorder, and a Technics 1500 open-reel recorder. I used a Forssell balanced tube line driver with the Sonic Frontiers D/A converter and a Quicksilver preamp with the other components. Power amplifiers on hand were a Crown Macro Reference, a pair of Quicksilver M135s, an Arnoux 7B digital switching design, and a JoLida SJ 302A integrated tube unit. Loudspeakers used in the tests were B&W 801 Matrix Series 3s, each of which was augmented from 20 to 50 Hz by a subwoofer.

The Hafler Trans-Nova 9505 impressed me right away with its smooth presentation. The more I used this amplifier, the more I liked it. I found its ability to deliver excellent resolution and detail, without producing much edginess or irritation, endearing. Space, dimension, and air were excellent, as were tonal balance, bass definition, and impact.

"Resurrection," track 6 of *Bourbon & Rosewater* (Waterlily Acoustics WLA-CS-47-CD), yielded a sound so sweet, clear, and realistic that it was hard to imagine it sounding better. Similarly, on Mendelssohn's "Die Tageszeiten," track 7 of *The Times of Day* (Reference Recordings RR-67CD, an HDCD-encoded disc), the sound of an orchestra playing and men singing in a chorus was very palpably present.

Both in the lab and in my listening room, the Hafler Trans-Nova 9505 behaved just about flawlessly. I liked it very much. And although I didn't audition the less powerful 9303, I expect its sonic character is very similar to the 9505's. A

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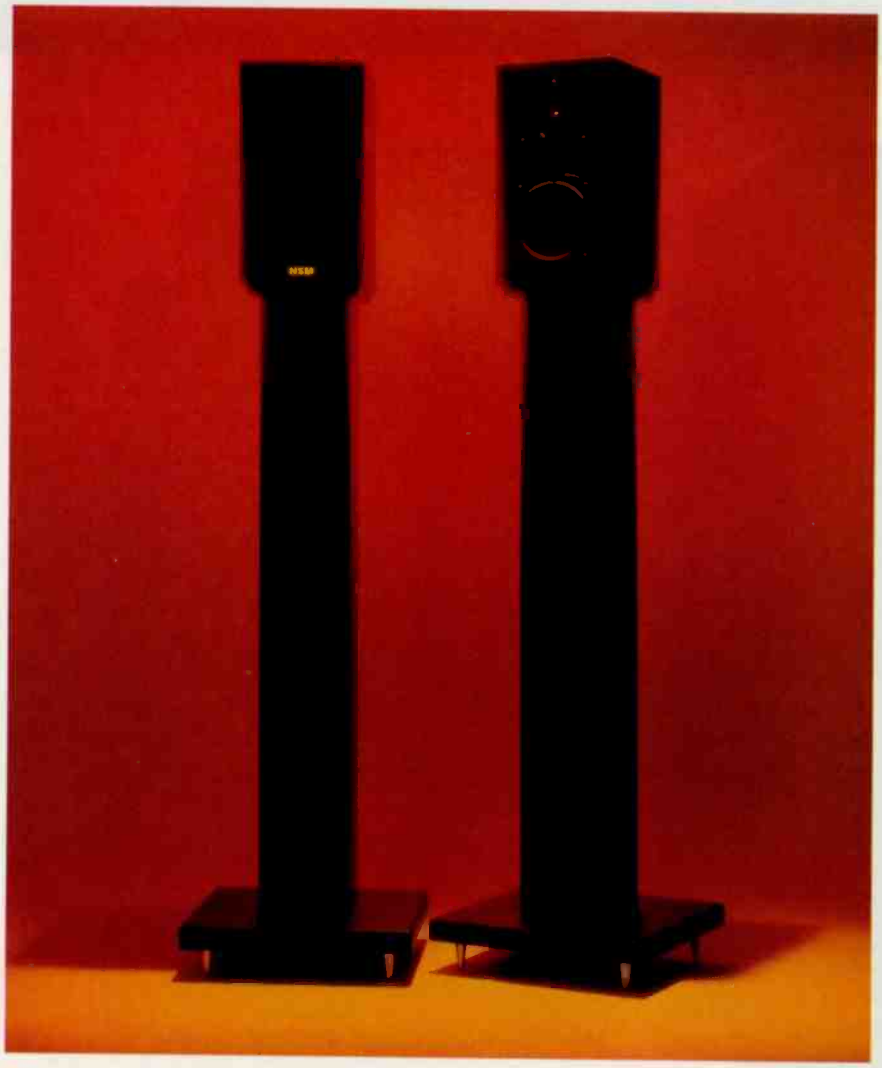
NSM 10S SPEAKER



Dr. Erol Ricketts has received many awards as an expert in urban poverty and public policy (about which he's written a book) and the spread of venereal disease and AIDS. And since 1991, he's been president of NSM Loudspeakers, a high-end company he founded and named after his children, Nsombi, Sekou, and Makeda. The company now makes more than 10 speaker models, ranging in price from $495 to $6,495 per pair. NSM also manufactures sand-filled speaker stands, called Sandbags (30-inch Matador stands, which cost $295 per pair, were supplied for this review), and a line of amplifiers under the GREO brand name.

The Model 10S is the smallest (though not the least expensive) speaker NSM manufactures. Although the 10S speakers were submitted for review as stand-alone systems, the company primarily intends them for use with a companion subwoofer, the Model 15-EXP.

The 10S is a two-way, closed-box design. Its cabinet, tightly constructed of half-inch MDF, is strengthened with an internal shelf that divides the enclosure into two equal parts. A large hole in the shelf lets the woofer use all of the box's internal volume. The cabinet is finished on all six sides. The grille frame, of molded plastic, is covered with black grille cloth. The grille attaches to the front of the enclosure via four pegs that mate with rubber-lined holes in the corners of the cabinet's front panel.

The drivers are centered on the front of the cabinet, with the tweeter above the woofer, and are flush with the cabinet. The tweeter's large faceplate keeps the centers of the tweeter and woofer separated by a significant 4½ inches. The 1-inch soft-dome tweeter is magnetic-fluid cooled and incorporates a large ferrite magnet, 3 inches in diameter and 0.6 inch thick. The 4½-inch woofer is a long-throw unit. Its inch-diameter voice coil is attached to a molded-plastic cone with rubber surround; its magnet is the same size as the tweeter's.

The crossover is a minimalist design, containing only three components. A hefty 3.1-millihenry air-core inductor, wound with large-diameter wire, is in series with the woofer, and a series combination of a high-quality, 5-microfarad capacitor and 24-ohm power resistor drives the tweeter. These components form first-order (6-dB/octave) high- and low-pass filters. The series resistor effectively attenuates the tweeter level to match the woofer's relatively low sensitivity. The crossover is mounted on a small piece of fiberboard attached to the back of the cabinet, behind the tweeter. The NSM's internal connections are soldered and use audiophile-grade, large-diameter stranded wire. Connections to the speaker

Rated Room Frequency Response: 55 Hz to 20 kHz, ±3 dB.
Rated Sensitivity: 84 dB at 1 meter, 2.83 V rms applied.
Impedance: 8 ohms, nominal.
Recommended Amplifier Power: 50 to 200 watts per channel.
Dimensions: 10 in. H x 5½ in. W x 6½ in. D (25.4 cm x 14 cm x 16.5 cm).
Weight: 6 lbs. (2.7 kg) each.
Price: $695 per pair in satin black, $795 per pair in walnut; single-wire version (Model 10), $595 per pair in satin black or white.
Company Address: P.O. Box 326, Garden City, N.Y. 11530; 516/486-8285.
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"...A BENCHMARK PRODUCT AGAINST WHICH OTHER AMPLIFIERS CAN BE MEASURED."

– STEVEN STONE, *STEREOPHILE*, VOL. 17 NO. 3, MARCH 1994

But what did surprise us, as well as flatter us, was being thrown into the ring with $12,000 monoblock behemoths. The result of this apparently absurd comparison? Not carnage, but rather: *"...the Parasound HCA-2200[II] gives them all a run for the money, and even beats 'em in flexibility and price."* He continues, *"...a pair of HCA-2200[II]s performed with Apogee full-ranges on a par with a pair of Boulder 250 AEs and four VTL Deluxe 300 amps. Dynamic impact and attack were excellent...Compared to the VTL300, the HCA-2200[II] had a greater sense of extension..."*

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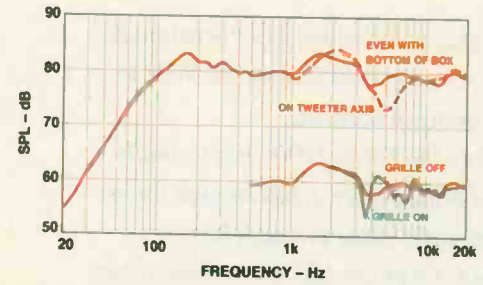


Fig. 1—On-axis frequency response.

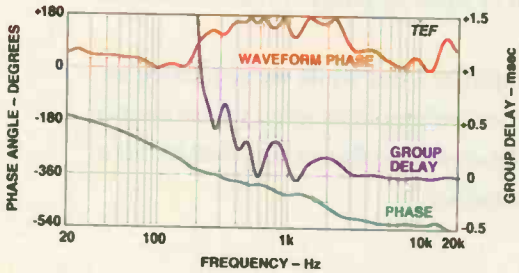


Fig. 2—On-axis phase response, group delay, and waveform phase (see text).

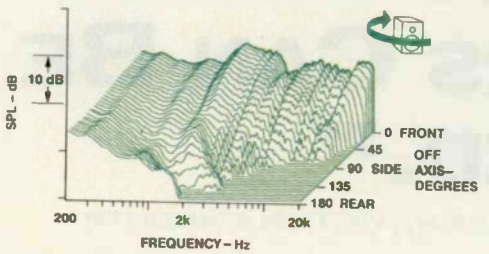


Fig. 3—Horizontal off-axis frequency responses.

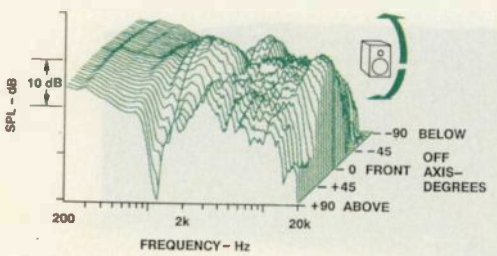


Fig. 4—Vertical off-axis frequency responses.

are through a pair of gold-plated, audiophile-grade terminals on the cabinet's bottom rear. (You may bi-wire the terminals; a single-wire version, the Model 10, is available.) Standard double-banana jacks and cable up to 0.3 inch in diameter (AWG #2!) are accepted.

Measurements

I measured the NSM Model 10S's anechoic frequency response (Fig. 1) at a distance of 1 meter from the front of the cabinet and used a tenth-octave filter to smooth the curves. The top curves, taken without the speaker's grille, show the response at two locations: on the tweeter's axis, which yields a quite rough response through the crossover region, and at a point even with the bottom of the cabinet (the woofer end), which yields a much flatter response.

I experimented with different measurement locations because of the poor response I obtained on the tweeter's axis. That curve has an octave-wide hump of about 4 dB centered at about 2 kHz and a narrower, 7-dB dip at 5 kHz. If you exclude this hump and dip, however, the curve is fairly flat. To explore why this curve was so poor, I remeasured the response but reversed the tweeter connections. (I could do this easily by changing the speaker's bi-wire connections.) The curve (not shown) exhibited a significant reduction in level between 1 and 4 kHz but had much higher output between 4 and 8 kHz. This indicates that in the normal connection, the woofer and tweeter are approximately in phase in the lower frequency range but are significantly out of phase in the upper range, which can yield poor vertical coverage. The out-of-phase condition was responsible for the dip at 5 kHz. The wide range of interaction between the woofer and tweeter (the three octaves from 1 to 8 kHz) is a result of the gradual rolloffs of the speaker's first-order crossover and the drivers' consequent broad, overlapping responses.

I searched for other measurement locations that would yield flatter response through the crossover region when the drivers were connected in normal polarity and also yield a reduction in response through the same region when the drivers were connected in reverse. I obtained the desired results when I measured the 10S on the woofer's axis (or lower), at a point even with the bottom of the cabinet. The response (Fig. 1, top curve set) is much smoother than on the tweeter's axis. The hump at 2 kHz is reduced, and the dip at 5 kHz has disappeared. On this new axis but with the tweeter's connection reversed, there was a reduction of some 5 to 15 dB from 1 to 8 kHz (response not shown), which is a good sign. Having the drivers more nearly in phase through the crossover range minimizes lobing and improves vertical coverage.

THE NSM 10S SEEMED QUITE SUBSTANTIAL FOR ITS VERY DIMINUTIVE SIZE.

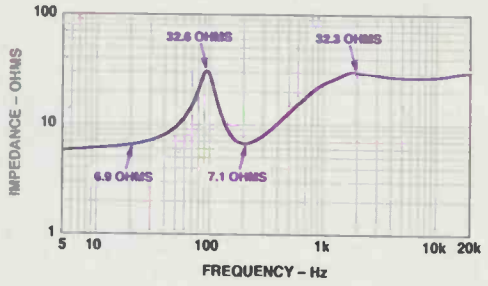
The 12-dB/octave rolloff in the bass is normal behavior for a closed-box speaker system. In the NSM 10S, this rolloff begins at a fairly high frequency (180 or 80 Hz, depending on whether you count its beginning from the slight upper-bass peak or from the –3 dB point relative to 1 kHz), but that would be inconsequential if the 10S were used with a subwoofer.

The lower set of curves in Fig. 1 demonstrates the effect of the speaker's grille. The grille significantly roughens the response above 2.5 kHz.

Averaged from 250 Hz to 4 kHz (with equal emphasis on each third-octave frequency band), the 10S's sensitivity was a very low 80.7 dB, about 3 dB below NSM's low, 84-dB, rating. The right and left speakers matched within a very close ±0.5 dB from 100 Hz to 20 kHz.

Figure 2 shows the phase and group-delay responses, referenced to the tweeter's arrival time. The phase curve is very well behaved and decreases only 90° between 1 and 10 kHz. When averaged from 1 to 4 kHz, the group-delay curve indicates a low offset of about 0.15 millisecond, with the woofer delayed relative to the tweeter.

Also shown in Fig. 2 is the waveform phase, which indicates whether waveshapes



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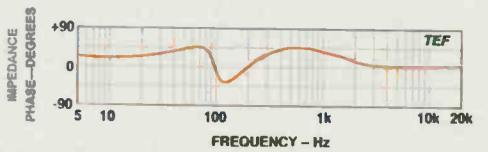

B

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

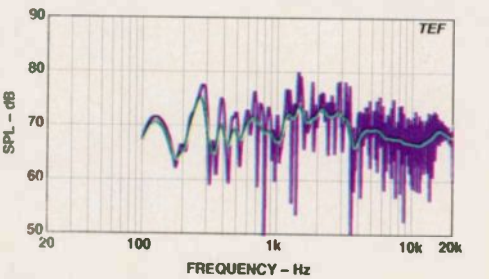

Fig. 6—Three-meter room responses.

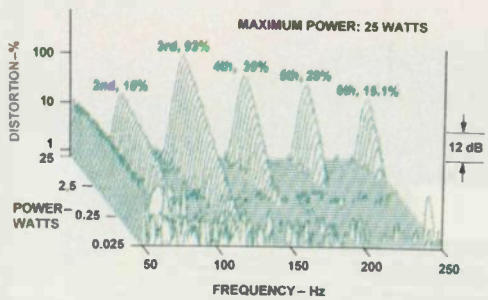

Fig. 7—Harmonic distortion for E_1 (41.2 Hz).

will be preserved in specific frequency ranges. In previous reviews, I have plotted waveform phase on a wrapped ±180° scale. However, here the graph shows the absolute value of the waveform phase, plotted on a scale from 0° to 180°. This eliminates the sharp transitions when the phase rotates from –180° to +180°. If the waveform phase is at or near 0° over a specific frequency range and the frequency response is relatively flat over that range, waveforms will be preserved (and will be in proper polarity) if the signal's energy is constrained to that range. Likewise, if the waveform phase is at or near 180°, waveshapes will be preserved but inverted. For the NSM 10S, the curve of waveform phase indicates that waveshapes in the woofer's range from 300 Hz to 2.5 kHz will be somewhat preserved but will be inverted, while signals whose energy is constrained to higher and lower frequencies will come through in proper polarity. Odd as it may sound, this actually represents unusually good performance on the waveform phase test. Interestingly, when I examined the drivers' crossover connections, I found that the woofer was connected in reverse polarity and the tweeter in normal polarity.

Figure 3 shows the speaker's horizontal off-axis responses. (The bold curve at the rear is on-axis response.) The curves here and in Fig. 4 were obtained by rotating the speaker around the woofer's axis and measuring 1 meter in front of the 10S. The curve-to-curve uniformity in Fig. 3 indicates very even horizontal coverage; from 10 to about 18 kHz, only moderate narrowing is evident.

The 10S's vertical off-axis responses are shown in Fig. 4. (The bold curve in the middle of the graph was taken on the woofer's axis.) In the important range from on-axis to 15° above axis, the curves are quite uniform except for a dip between 4.5 and 7 kHz (which corresponds to the dip in Fig. 1 in the response taken on the tweeter's axis). At downward angles in the same range, a broad depression between 1.8 and 7 kHz develops not far below the axis (not clearly seen in the graph). At angles far above the speaker's axis, a sharp dip develops at about 1.3 kHz. The vertical responses are quite asymmetrical, with the curves above axis much better than those below it.

At low frequencies, the NSM's impedance magnitude (Fig. 5A) exhibits the classic characteristic of a closed-box loudspeaker—a single peak. Here, the peak is at 90 Hz, the resonant frequency of the woofer in the closed box. At higher frequencies, the impedance reaches a minimum of 7.1 ohms at 200 Hz and then rises smoothly to about 32 ohms above 1.4 kHz. The high impedance at high frequencies is directly due to the crossover's resistor in series with the tweeter. Between 20 Hz and 20 kHz, a 32.6-ohm maximum occurs at 90 Hz and a moderately low minimum of 6.9 ohms at 20 Hz. The max/min impedance variation is thus a moderate ratio of 4.7 to 1 (32.6 divided by 6.9). Cable series resistance should be limited to a maximum of about 0.1 ohm to prevent cable-drop effects from causing response peaks and dips greater than 0.1 dB.

APPEARANCE AND CONSTRUCTION WERE UPSCALE, WORTHY OF THE BEST HIGH-END SPEAKER SYSTEMS.

For a typical run of about 10 feet, therefore, you should use 16-gauge (or larger), low-inductance cable with the NSM 10S.

The impedance phase (Fig. 5B) stays within a moderate ±45° over the entire frequency range. Above 2 kHz, the phase is essentially 0°, which indicates a resistive load. The 10S should be no problem for any amplifier, and solid-state amplifiers should have no difficulty handling a pair of these speakers in parallel.

When I subjected the 10S to a high-level sine-wave sweep, the cabinet exhibited minimal side-wall vibrations. The maximum *linear* excursion of the woofer was about 0.25 inch, peak to peak; the absolute maximum excursion (with high third-harmonic distortion) was about 0.3 inch, peak to peak. I could not detect any sign of dynamic offset.

Figure 6 shows the 10S's 3-meter room response, with both raw and sixth-octave-smoothed data. The speaker was upright in the right-hand stereo position, mounted on the supplied 30-inch stand, and aimed laterally at the test microphone. I raised the front of the cabinet by about ⅜ inch so that the test mike was even with its bottom. The

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

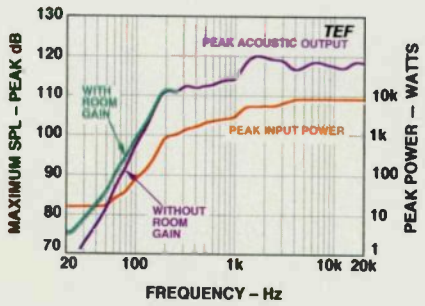

Fig. 9—Peak input power and sound output.

system was driven with a swept sine-wave signal of 2.83 volts rms (corresponding to 1 watt into the speaker's rated 8-ohm impedance). The direct sound and 13 milliseconds of the room's reverberation are included. If you exclude the range below 340 Hz, the smoothed curve fits a moderately tight, 7.5-dB window. This curve's distinguishing features are many small undulations, a dip at 190 Hz followed by a peak at 270 Hz, and a broad rise between about 1.2 and 3.4 kHz. Above 4 kHz, the curve fits a very tight, 3-dB window.

Figure 7 shows the Model 10S's E_1 (41.2-Hz) bass harmonic distortion; input power ranged from 0.025 to 25 watts (14.14 volts rms into 8 ohms). Even at the relatively low 25-watt input power level, the third harmonic reaches a very high 93%; this indicates hard symmetrical limiting in both directions of woofer excursion. Other results include 15% second harmonic, 39% fourth, 28% fifth, and 15% sixth. Clearly, this speaker is being overloaded by this amount of power at 41.2 Hz. Although the distortion at the E_1 tone was quite high, the speaker handled the overload well and did not sound excessively distressed.

The A_2 (110-Hz) bass harmonic distortion (not shown) rose to only moderate levels at a 25-watt input. The maximum distortion was 8.9% second harmonic, with only 4.0% third and 2.7% fourth. The A_4 (440-Hz) harmonic distortion (also not shown) rose only to the low level of 1.6% second harmonic; higher harmonics were below the floor of my analyzer. It is obvious from the differences between the 41.2-Hz and 110-Hz distortion readings that the 10S would benefit greatly from being used with a subwoofer.

Figure 8 shows the IM versus power created by tones of 440 Hz (A_4) and 41.2 Hz (E_1) of equal power, over the range from 0.1 to 25 watts. The IM rises gradually and reaches 11% at full power. Although moderately high, 11% is a relatively low IM level for a speaker of this size that reproduces both tones from the same driver.

Figure 9 reveals the 10S'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 8-ohm impedance.) The peak input power starts at a moderate 12 watts at 20 Hz, stays constant until 50 Hz, and then rises rapidly. It crosses 100 watts at 120 Hz and 1,000 watts at 300 Hz before leveling off at 6,000 watts above 4 kHz, in the tweeter's range. With room gain, the speaker's maximum peak SPL starts at an unusable 74 dB at 20 Hz and then rises rapidly. It crosses 90 dB at 60 Hz, 100 dB at 105 Hz, and 110 dB at 180 Hz before rising into the loud range of 115 to 119 dB SPL above 1.1 kHz. Although the 10S will play sufficiently loud above 180 Hz, its bass output is rather anemic; it is at the bottom of the list of all systems I have tested. However, the 10S is also the smallest speaker I've tested for *Audio*, and its low-frequency output competes favorably with that of other speakers in its size range I have used.

THE NSMs SOUNDED BIGGER THAN THEY LOOKED, WITH SMOOTH AND EXTENDED HIGHS AND SUPERB IMAGING.

Use and Listening Tests

The NSM 10S speakers arrived at my lab packed two to a box, in a carton whose size seemed more appropriate for a single small system. The diminutive size of the Model 10S must be seen to be appreciated. Although I could easily carry a pair under one arm, subjectively these speakers seemed quite substantial and weighty for their size. My review samples were finished in walnut, and their appearance and construction proclaimed a very upscale quality. Everything fit very well, including the grilles. Even the large, gold-plated bi-wirable terminals were worthy of the best high-end system.

For my listening tests, I mounted the NSMs on the 30-inch-high Matador stands. These stands, which must be assembled, came in a box more than twice the size of the speaker carton. And at nearly 20 pounds, each sand-filled stand weighs more than three times the speaker it supports! Each stand had four screw-in adjustable spikes, which came in quite handy when I needed to change vertical aiming. When the 10S is mounted on the Matador, the speaker's tweeter is approximately at ear height for a seated listener (37 inches).

The owner's manual goes into reasonable detail about unpacking, break-in, connections, bi-wiring, placement, use with subwoofers, and amplifier requirements. For best imaging, NSM suggests placing the systems on 30-inch stands, 2 feet or more from any walls, and about 8 feet apart. (My usual speaker locations conform to these guidelines.)

Hooking up the NSMs was a breeze, because their terminals are large and very accessible. I did not bi-wire them; instead I used supplied gold-plated straps. I connected the speakers to a Krell amp with Transparent Audio's Music Wave Reference cables. Other listening components included Onkyo and Rotel CD players, Krell's KRC preamp, and B&W's 801 Matrix Series 3 speakers for comparison.

I placed the NSMs in my customary positions: about 8 feet apart, well away from walls, and aimed toward my listening position (10 feet away). I conducted the listening tests both before and after the bench tests. One valuable piece of knowledge I

gained from the measurements was that the NSM's response could be improved by raising the speaker's axis so that a line extended from the bottom of the enclosure intersected my ear. To accomplish this, I tilted the stand backward and adjusted its spikes so that the stand's bottom was about ⅜ to ½ inch higher than the rear. This adjustment provided an audible improvement when I was seated, and most of the following comments apply to the tilted-back configuration.

THE 10S MADE HARPSICHORDS SOUND CONVINCINGLY ALIVE, WELL BALANCED, AND FULL.

First listening to the NSMs revealed excellent imaging, smooth and extended highs, and a much bigger sound than the speakers' size would suggest. However, their bass output was quite restricted compared to that of larger systems, and their sensitivity was significantly less than that of the B&W 801s. The B&Ws needed some 6 to 7 dB of level reduction, depending on the program material, to match the NSMs' acoustic output.

When I listened to jazz and pop that had significant bass, such as kick drum or bass guitar, the 10S speakers could not be turned up very loud before being overloaded in the bass range. On the title track of Dave Grusin's *Mountain Dance* (GRP GRD 9507), for example, I could turn these speakers up only to about 80 to 85 dB SPL before exceeding the woofers' linear excursion range. At this level, the output was quite satisfying, however; everything except the bass sounded very good.

On program material that had less bass content, the NSMs could generate much louder levels. On Benedetto Marcello's Four Sonatas and a Concerto for Harpsichord (Jecklin-Disco JD 5001), the NSMs generated a very usable 90 to 95 dB SPL before starting to sound congested. On their own, the 10S speakers are much better suited to this kind of music. They made the harpsichord sound convincingly alive, producing a full and well-balanced sound.

On other classical chamber music, such as Dvorak's *The Piano Quintets* (Dorian DOR-90221), the Model 10S speakers presented a very solid and well-defined soundstage. The strings sounded quite convincing and realistic, and room ambience was excellent. The NSMs also did quite well on larger-scale symphonic works, but only if I restricted them to moderate to low levels. The low end of the NSMs sounded quite lightweight compared to that of the B&Ws.

Since NSM primarily intends these speakers for use with a subwoofer, I also tried them with a Velodyne subwoofer connected to one channel. For simplicity's sake, I kept the NSMs connected directly to the power amp, which meant that no high-pass filtering was provided. I was pleasantly surprised by how much the additional bass improved the sound, even though the acoustic output of the NSMs was, obviously, unchanged.

On pink noise, the NSMs exhibited significant tonality, primarily an emphasis of the upper midrange. The lower two octaves of bass (the characteristic bass rumble of pink noise) were missing. These systems did do fairly well on the stand-up/sit-down test, exhibiting only moderate midrange tonal changes when I stood up. On third-octave band-limited pink noise, no usable output was produced at the 20-, 25-, 32-, and 40-Hz bands. At 50 and 63 Hz, there was some usable output, but these speakers could not be played very loud before they generated high levels of third-harmonic distortion. From 80 to 125 Hz, the usable output was much better, but I noticed a tendency to overload at high levels. On higher bands the output was quite acceptable. When I moved the 10S speakers closer to the wall behind them, the lows improved but at the expense of smoothness at higher frequencies.

On female vocals, the NSMs presented a significantly more forward sound than the B&Ws. Sibilants were reproduced properly, with no undue emphasis, and the overall sound was otherwise well balanced. On male speaking voice, I judged the NSMs' performance to be slightly better than that of the B&Ws. In my listening room, the 801s have a tendency to add some chestiness to male voice; the NSMs didn't do that.

If you need a very small speaker that has great looks and offers solid performance, consider the NSM Model 10S. A pair would work well in a small room or would be a fine choice as satellites coupled with a subwoofer. A

EQUIPMENT **PROFILE**

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YAMAHA RX-V2090 A/V RECEIVER AND DDP-1 AC-3 DECODER

Yamaha is among the first to ride the Dolby Digital AC-3 bandwagon. Like most companies introducing a new technology, Yamaha has put the new technology into an add-on component (the DDP-1) and adapted a more traditional product (the RX-V2090 A/V receiver) to accept the add-on—not that this receiver is all that traditional, as you'll soon see. At present, Dolby Digital sound is available only on laserdiscs that carry the AC-3 logo, and extracting the AC-3 data stream from them requires a special player (such as Yamaha's CDV-W901 CD/CDV/LD player). In the future, however, Dolby Digital audio sources will include DVD, HDTV, and perhaps others, as well.

YAMAHA'S DSP MODES USE SOUND-FIELD MEASUREMENTS FROM REAL ACOUSTIC ENVIRONMENTS.

Although Yamaha has been making seven-channel A/V amplifiers for a while, the RX-V2090 is its first seven-channel receiver. (With 8-ohm loads, the three front channels are rated at 100 watts each, while the four effects channels are rated to put out 35 watts apiece.) This receiver is also the first Yamaha product that can accept five-channel audio from an AC-3 decoder. Besides AC-3, the RX-V2090 offers digital sound-field processing (including Yamaha's Cinema DSP enhancement of Pro Logic) plus a number of other features you'd hope to find in a top A/V receiver.

For Cinema DSP, Yamaha recommends that two front effects speakers be placed about 6 feet above the floor, to the outside of the main left/right pair, and about a foot behind the main speakers; two rear effects speakers are to be placed similarly, behind the listener. With Cinema DSP, these four speakers simulate an array of phantom speakers along the side and rear walls to create a sound pattern similar to what you'll hear in a first-run movie theater. However, although the objectives of Cinema DSP are similar in some respects to those of Home THX, the optimum speaker types and placements are different. Cinema DSP works best with "forward-radiating" speakers all around, not with the dipolar surround speakers that are recommended for Home THX, and the rear speakers are behind—rather than aligned with—the viewing position.

The RX-V2090's digital sound-field processing offers 10 program modes. Four modes are for film sound: Dolby Pro Logic, "Pro Logic Enhanced," "70mm Movie Theater," and "TV Theater." The remaining six modes are for audio only: "Sports," "Stadium," "Rock Concert," "Jazz Club," "Church," and "Concert Hall." These six modes are based on sound-field patterns measured in real acoustic environments; the cinema modes are based on the consensus of a group of recording engineers regarding ideal acoustic environments. With the exception of relative levels and sur-

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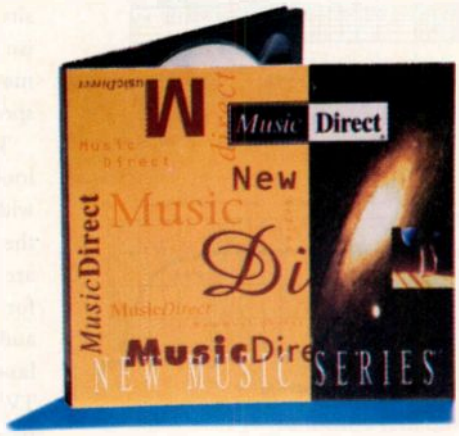

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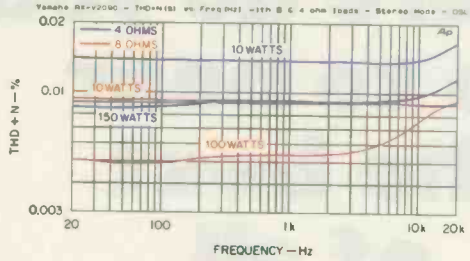

Fig. 1—Receiver's THD + N vs. frequency, stereo mode. (All graphs presented here are for the RX-V2090.)

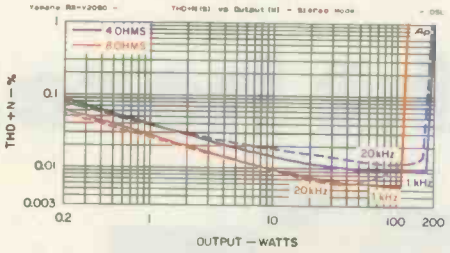

Fig. 2—THD + N vs. output.

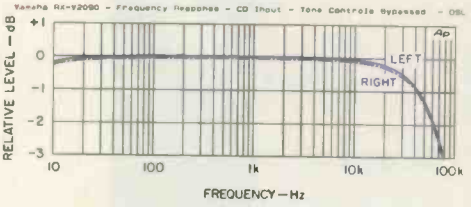

Fig. 3—Frequency response and channel balance via CD input.

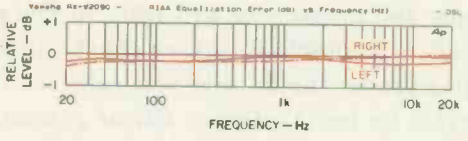

Fig. 4—RIAA equalization error.

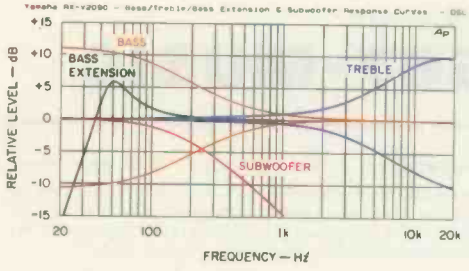

Fig. 5—Effects of tone controls, Bass Extension circuit, and subwoofer filter.

round-channel delay, you can't change the DSP parameters. Digital sound-field processing is defeated when the receiver is in the five-channel discrete (AC-3) mode, as are some functions not used with AC-3 (for example, center-mode selection and surround-channel delay).

Although Cinema DSP works best with a seven-speaker array, Yamaha provides a back-panel switch ("Front Mix") that, in the five-channel position, folds the front effects signals into the main front channels so the system can be used with a five-speaker array. The "Phantom" center option covers situations in which a center speaker isn't used, although I don't recommend doing without a center speaker.

The RX-V2090's back panel looks as if someone went crazy with a hole punch. In addition to the "5CH DISCRT Input" set, there are RCA (pin-jack) stereo inputs for MM phono, a CD player, two audio tape decks, two VCRs, and a laserdisc player (marked "LD/TV"). You'll find audio outputs for recording on both tape decks and both VCRs, as well as line-level outputs for every channel so that you can upgrade to more powerful amplifiers. The main-channel left/right preamp outputs are externally linked to their respective power amp inputs; therefore, by removing the links and rewiring, you can use the receiver's 100-watt/channel main front amplifiers for the front or rear effects channels if you do upgrade. A "Main Level" slide switch initiates a 10-dB change in amplifier gain, and a filtered "Low Pass" output will feed a powered subwoofer.

Additional preamp and composite-video output jacks enable you to drive an audio or A/V system in a second room, with independent source selection. The "Room 2" composite-video output is the only video jack not accompanied by an S-video connector. Inputs and outputs for both VCRs, the "LD/TV" input, and main "Monitor Out" have both composite- and S-video jacks. (Hear! Hear!)

Multiway binding posts are provided for all speakers, including sets for two pairs of front left/right speakers and for two center-channel speakers. You use buttons on the receiver's front panel to select either or both main speakers. A pushbutton near the center-speaker connectors selects a single center speaker or a pair; the latter arrangement enables you to flank your TV with two center-channel speakers if a single one won't fit

THE DDP-1'S CONTROL MODES PROVIDE FOR JUST ABOUT ANY SPEAKER ARRAY YOU MAY HAVE.

above or below it. If you use one center speaker, its minimum impedance should be 8 ohms; if you use two, they should be identical units, with a 4-ohm minimum impedance, as they're connected in series. The main front and center connectors are on standard ¾-inch centers and can be used with dual-banana ("GR") plugs; the connectors for the effects speakers are not on standard centers. All back-panel connectors are base metal; a fourth video input, behind a hinged door on the front panel ("Video AUX"), is outfitted with gold-plated audio and composite-video pin jacks and a base-metal S-video connector. Completing the back-panel array are a 75-ohm FM antenna connector, wire clips for connecting the (supplied) AM loop antenna, a ground terminal for a turntable, one unswitched and two switched convenience outlets, and input and output remote-control jacks to send and receive signals between the receiver and a second room.

Two remotes are provided, one for each room. The secondary remote permits you to select program sources, choose among tuner presets, and control the basic func-

tions of other Yamaha components (a CD player, a laserdisc player, and two audio tape decks). The primary remote is more versatile and can be "taught" the control codes of other companies' components. It offers full access to the DSP selections as well as control of volume and relative levels in the center and the four effects channels. With the primary remote, you can initiate the speaker-balance test sequence for Dolby Pro Logic operation, activate a sleep timer, control power, and mute the sound. The primary remote also offers more complete control of auxiliary equipment—for example, search functions for CD and laserdisc players and record/pause and record/muting for tape decks.

Although volume can be set from the primary remote, left/right balance and bass and treble are adjustable only from controls behind the hinged door on the receiver's front panel. Here too is the "REC Out" selector, which can be set to record from any of the eight inputs while you listen to another or can be set to follow whatever source has been chosen by the main selector. "Tone Bypass" and "Bass Extension" switches also lie behind the door. I like having a separate recording selector (a Yamaha tradition) and the ability to bypass the tone controls, and Yamaha goes one better in the RX-V2090: "Tone Bypass" and "Bass Extension" are independent. In other words, you can bypass the bass and treble controls and still use "Bass Extension" to boost 50-Hz response in the main front speakers and interpose a sharp, high-pass filter below that frequency.

EVERY VIDEO INPUT AND OUTPUT EXCEPT "ROOM 2" HAS BOTH COMPOSITE- AND S-VIDEO CONNECTIONS.

Relative channel levels are adjustable from the receiver's front panel as well as from the remote, although the test-tone sequence can be initiated only from the remote. "Center" mode ("Normal/Wide/Phantom") and "Delay Time" are controlled exclusively via pads on the RX-V2090's front panel. Nine panel buttons choose the listening/viewing source; 10 others choose the digital sound-field processing mode, while an 11th ("Effect") enables you to bypass DSP and return to normal stereo.

The receiver's tuner section has automatic and manual tuning plus 40 station presets (which can be manually or automatically programmed). Stereo reception is possible only in the auto-tuning mode; mono reception prevails whenever the "Tuning Mode" switch is set to the manual position.

The DDP-1 decodes Dolby Digital AC-3 signals into their six components: five full-bandwidth channels (for left/center/right front and left and right surround) and one limited-bandwidth channel for low-frequency effects (LFE). Output connections are via base-metal RCA jacks on the back. This processor has two digital inputs and one pin-jack RF input specifically for connection to an AC-3-capable laserdisc player. One digital input is Toslink optical; the other is coaxial. These two inputs are intended for future Dolby Digital sources, which will have direct digital outputs instead of the RF output used for laserdisc. One unswitched convenience outlet is provided.

The DDP-1's controls are relatively straightforward. "Mode" cycles through three setup categories ("A," "B," and "C"), while "Menu" advances through the options within each category. Settings are changed with a "Parameter +/–" bar and are shown in the display.

Mode "A" adjusts center- and surround-channel delay. It also offers a choice between AC-3's two options for dynamic range: "Max," which affords full dynamic range on each channel, and "Standard," which compresses the dynamic range when you're listening at low levels. With "Standard" dynamics, you have five choices of high-level

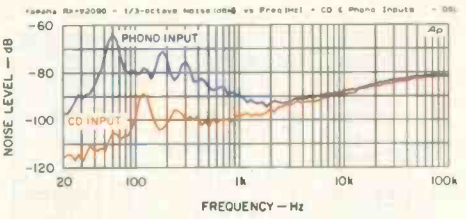

Fig. 6—Noise analysis.

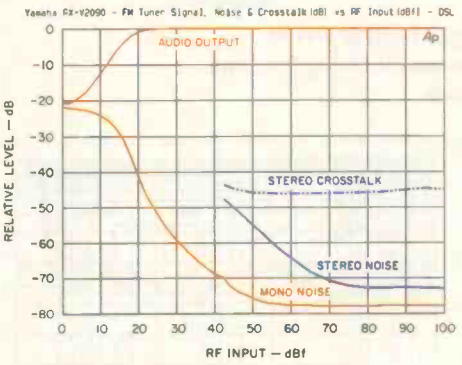

Fig. 7—FM tuner section's quieting characteristics and stereo crosstalk.

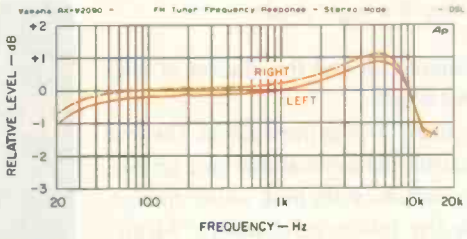

Fig. 8—Frequency response and channel balance, FM tuner section.

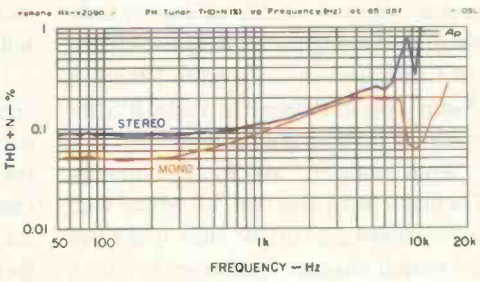

Fig. 9—THD + N vs. frequency, FM tuner section.

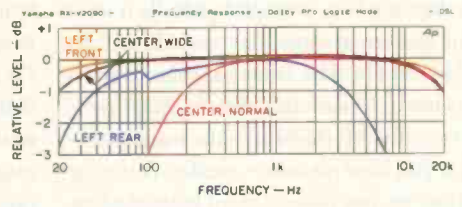

Fig. 10—Frequency response, Dolby Pro Logic mode.

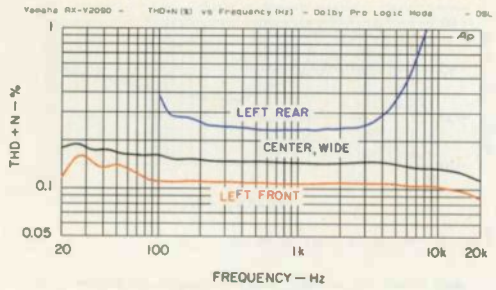

Fig. 11—THD + N vs. frequency, Dolby Pro Logic mode.

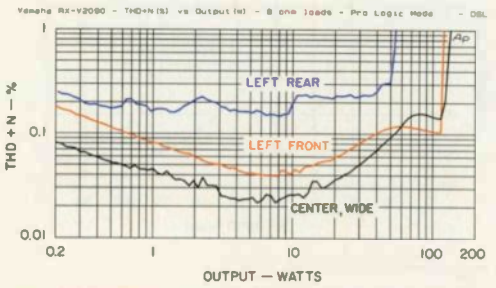

Fig. 12—THD + N vs. amplifier output, Dolby Pro Logic mode.

compression and five choices of low-level boost.

Mode "B" has five options. The first controls the internal test-tone generator, which cycles pink noise through the five full-range channels. "Menu" then accesses each channel in turn, so you can adjust speaker level with the "Parameter" bar. With the next three "B" options, you can modify balance by individually adjusting the levels of the left and right surround channels and of the LFE channel. The final option in mode "B" is for trimming the level of all outputs.

Setup mode "C" also has five options. The first is input selection (RF, optical digital, or coaxial digital); the other four adapt the output channels' responses to match your speaker setup. The options for the center and the surround channels give you the choice of full-bandwidth output when the speakers are large enough to handle it or, if your speakers are small, let you redirect bass below 90 Hz. The center-speaker option also has a "Phantom" choice, which redirects center information to the main speakers if you have no center speaker. A similar option lets you redirect front left/right bass below 90 Hz to the subwoofer output. The final option allows you to select whether bass redirected in the previous options goes to the main outputs or to the subwoofer output.

Measurements

Although I used the RX-V2090 and DDP-1 in combination, I tested them individually—the RX-V2090 as a "standard" A/V receiver, the DDP-1 as a stand-alone AC-3 decoder.

Yamaha rates the RX-V2090 for 8- and 6-ohm loads, whereas I customarily use 8- and 4-ohm terminations. Yamaha specifies 120 watts/channel into 6 ohms; I made 4-ohm "full-power" tests at 100, 120, and 150 watts/channel to establish my own rating. The results for full-power output listed in "Measured Data," and the total harmonic distortion plus noise (THD + N) curves of Fig. 1, reflect the amp section's performance at 100 watts into 8 ohms and 150 watts into 4 ohms, in stereo mode with both channels driven. Curves taken at 10 watts also are included in Fig. 1. (I took data at 1 watt but have not included it since it showed mostly noise rather than distortion.) Needless to say, the data suggests excellent performance: The receiver's worst-case distortion at an output of 10 watts into 8 ohms is less than 0.01% and barely more than that at full power.

Figure 2 shows the receiver's THD + N versus output at 1 and 20 kHz. (The 20-Hz curves, not shown, were almost identical to the 1-kHz plots.) Data was taken on the left channel, but both channels were driven for the test. From these curves, I determined that the clipping point at 1 kHz was 120 watts/ channel with 8-ohm loads and nearly twice that (200 watts/channel) with 4-ohm loads. Clearly, the RX-V2090 has no trouble driving 4-ohm speakers, even though Yamaha declined to rate it that way. On the IHF tone-burst signal, the receiver delivered 135 watts into 8 ohms and 225 watts into 4 ohms, for a "dynamic headroom" of +1.3 dB into 8 ohms. (I could not calculate dynamic headroom with 4-ohm loads since there's no manufacturer rating.)

Besides being competent power-wise, the RX-V2090's output stage had a high damping factor, and output impedance remained quite low to 10 kHz. I have found that these characteristics often correlate with better-than-average sound quality.

Figure 3 shows frequency response and channel balance of the RX-V2090's amp section, measured from the CD input with the tone controls bypassed, while Fig. 4 shows phono equalization error. As you can see, the channels are well balanced, equalization error is within ±0.23 dB, and basic response is reasonably flat to 20 kHz and relatively extended. Although the RX-V2090 is not the most wideband receiver I've tested, it's certainly capable of delivering everything my ears can hear.

Figure 5 shows the receiver's maximum tone-control range and the effect of the Bass Extension circuit; I've also overlaid the response curve taken at the subwoofer output by scaling the data to 0 dB at 20 Hz. The tone controls operate symmetrically and, for my taste, have more than adequate range. Bass Extension boosts 50-Hz output by almost 6 dB and rolls off the low bass sharply; it should prove valuable if you use small bookshelf-type speakers. The slope of the subwoofer low-pass filter is too gentle to be truly effective, but since powered subs usually have internal filters, this doesn't concern me.

Noise-spectrum analyses (Fig. 6) reveal a small amount of power-supply hum (–89 dBW at 120 Hz) from the CD input and (as is often the case) rather greater amounts of magnetically induced hum at 60, 180, and 300 Hz from the phono input. On an A-weighted basis, output noise with the CD input came in at –81.7 dBW. From the phono input, S/N was 7.5 dB lower. Considering the circuitry in the RX-V2090, these figures don't strike me as worse than can be expected.

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The Audio Curmudgeon

Bob O'Neill

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These Mini-Mags are the smallest speakers that Magnepan makes – they even have the great quasi-ribbon tweeter/mid-range. Their size may be small but their sound is BIG.

In preparation for this review, I listened to a number of speakers in the price range. (And remember, with ordinary box speakers you have to figure another one or two hundred dollars for stands. The MMG's are, of course, floor standing and thus require no stinking stands.) I have yet to hear any other competitive speakers that sound as real, or as natural as the Mini-Mags. In order to grab your attention in a dealer show room, the box speakers have a boosted bass and exaggerated highs. Take one of these boxes home and see how long it takes you to tire of boomy one note bass and ear splitting treble.

Let's face it, there are few - very few - good $500 speakers out there. Most of them will make Bonnie Raitt sound like Lyle Lovett, and they will not have the definition and imagery, breadth or depth of sound stage that a planar speaker can give you. On the MMG's, a Steinway will sound like a Steinway and not like that old spinet in your uncle's basement.

Buy these! They are one of the true bargains in audio. And then in three or four months when you've become as hooked on planar sound as I am, truck 'em on down to your Magneplanar dealer and trade 'em in (remember that 100% trade-in allowance) on some bigger and better Maggies.

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MEASURED DATA

RECEIVER, AMP SECTION

Output Power at Clipping (1 kHz, 1% THD): 8-ohm loads, 120 watts/channel (20.8 dBW); 4-ohm loads, 200 watts/channel (23 dBW).

Dynamic Output Power: 8-ohm loads, 135 watts/channel (21.3 dBW); 4-ohm loads, 225 watts/channel (23.5 dBW).

Dynamic Headroom re 8-Ohm Rating: +1.3 dB.

THD + N, 20 Hz to 20 kHz: 8-ohm loads, less than 0.0135% at rated output and less than 0.0092% at 10 watts/channel out; 4-ohm loads, less than 0.0116% at 150 watts/channel and less than 0.0165% at 10 watts/channel out.

Damping Factor re 8 Ohms: 410 at 50 Hz.

Output Impedance: At 1 kHz, 22 milliohms; at 5 kHz, 43 milliohms; at 10 kHz, 79 milliohms; at 20 kHz, 130 milliohms.

Frequency Response: Tone controls bypassed, 20 Hz to 20 kHz, +0, –0.24 dB (–3 dB at 10 Hz and 77.4 kHz); tone controls at detent, 20 Hz to 20 kHz, +0, –0.35 dB (–3 dB at 110 Hz and 62.5 kHz).

Tone-Control Range: Bass, +10.7, –11.1 dB at 100 Hz; treble, +8.5, –7.9 dB at 10 kHz.

Bass Extension: +5.8 dB at 51 Hz.

Subwoofer Crossover: –3 dB at 175 Hz and –6 dB at 305 Hz, 6-dB/octave slope.

RIAA Equalization Error: ±0.23 dB, 20 Hz to 20 kHz.

Sensitivity: CD input, 16.8 mV for 0 dBW out and 168 mV for rated output; MM phono input, 0.277 mV for 0 dBW out and 2.77 mV for rated output.

A-Weighted Noise: CD input, –81.7 dBW; MM phono input, –74.2 dBW.

Input Impedance: CD input, 39.4 kilohms; MM phono input, 44.3 kilohms + 275 pF.

Input Overload for 1% THD at 1 kHz: CD input, 7 V; MM phono input, 120 mV.

Channel Separation: CD input, greater than 54.4 dB, 100 Hz to 10 kHz.

Channel Balance: CD input, ±0.03 dB.

Record Output Level: CD input, 0.488 V for 0.5 V in; MM phono input, 0.292 V out for 5 mV in at 1 kHz; FM tuner, 0.6 V.

Record Output Impedance: 1,080 ohms.

RECEIVER, FM TUNER SECTION

50-dB Quieting Sensitivity: Mono, 23.8 dBf; stereo, 44.7 dBf.

S/N at 65 dBf: Mono, 77.7 dB; stereo, 68.5 dB.

Frequency Response: Stereo, 20 Hz to 15 kHz, +0.9, –1.3 dB.

Channel Balance: ±0.1 dB.

Channel Separation: Greater than 38 dB, 100 Hz to 10 kHz.

THD + N at 65 dBf, 100% Modulation: Mono, 0.049% at 100 Hz, 0.092% at 1 kHz, and 0.195% at 6 kHz; stereo, 0.087% at 100 Hz, 0.109% at 1 kHz, and 0.237% at 6 kHz.

Capture Ratio at 45 dBf: 1.4 dB.

Selectivity: Adjacent-channel, 5 dB; alternate-channel, 58.5 dB.

Image Rejection: 45.2 dB.

AM Rejection: 56.2 dB.

Stereo Pilot Rejection: 81.9 dB.

Stereo Subcarrier Rejection: 85.6 dB.

RECEIVER, DOLBY PRO LOGIC MODE

Output Power at Clipping, 8-Ohm Loads: Main front channels, 120 watts/channel (20.8 dBW); center channel, 135 watts (21.3 dBW); rear channels, 52 watts/channel (17.2 dBW).

THD + N at Rated Output, 8-Ohm Loads: Main front channels, less than 0.112%, 75 Hz to 20 kHz; center channel, less than 0.171%, 70 Hz to 20 kHz; rear channels, less than 0.65%, 100 Hz to 7 kHz.

Frequency Response: Main front channels, 20 Hz to 20 kHz, +0, –0.59 dB (–3 dB below 10 Hz and at 46.8 kHz); center channel, wide mode, 20 Hz to 20 kHz, +0, –1.17 dB (–3 dB at 10.7 Hz and 34.6 kHz); center channel, normal mode, 100 Hz to 34.6 kHz, +0.04, –3 dB; rear channels, 18.5 Hz to 7.2 kHz, +0, –3 dB.

A-Weighted Noise: Main front channels, –79.4 dBW; center channel, wide mode, –83.8 dBW; rear channels, –73.7 dBW.

Channel Separation at 1 kHz: 48 dB or greater.

AC-3 DECODER

Maximum Output Level: All front channels, 1.957 V for 1-kHz signal at 0 dBFS.

Output Level re Left Front: Surround channels, –0.11 dB; LFE (low-frequency effects) channel, +9.85 dB.

Frequency Response: Main front channels, 20 Hz to 18.9 kHz, +0, –0.25 dB; center channel, 20 Hz to 18.4 kHz, +0, –0.42 dB; surround channels, 20 Hz to 16.8 kHz, +0, –0.28 dB; LFE, 20 to 61 Hz, +0.03, –0.33 dB.

THD + N at 0 dBFS: Front and surround channels, 0.007% or less at 1 kHz; LFE, 0.046% at 30 Hz.

Channel Separation at 1 kHz: 84.5 dB or greater.

for normal cartridges. The overload point of the CD input was more than you'll ever need. Recording output levels were typical, as was the source impedance of the output circuitry. Channel separation was better than 60 dB over the most meaningful range, which is pretty decent (and more than you need, in any event.)

I checked FM tuner performance at the RX-V2090's tape recorder outputs. The tuner section proved less sensitive than I would have hoped (Fig. 7), possibly because my test sample was slightly mistuned. Mono "usable" sensitivity measured 20.3 dBf and improved by 1.3 dB when I adjusted my test generator to agree with the tuner. With auto tuning selected, the tuner shifts to stereo at 42.5 dBf, at which point channel separation and quieting are already quite good. The 50-dB quieting point is reached with a 44.7-dBf stereo input or a 23.8-dBf mono input.

With adequate FM signal strength, the RX-V2090's tuner performs well. Frequency response (Fig. 8) is reasonably flat (±1 dB from 20 Hz to about 11 kHz), and channel balance is excellent. The S/N ratio at 65 dBf was almost 78 dB in mono and 68.5 dB in stereo. The THD + N (Fig. 9) is better than average for a tuner. Channel separa-

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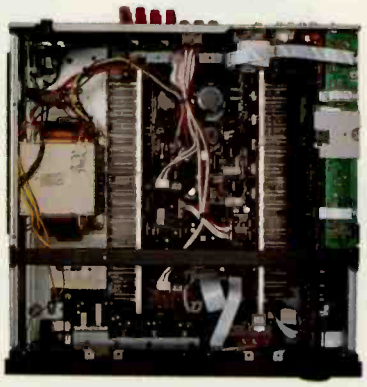
tion was impressive—better than 40 dB from about 130 Hz to 9 kHz, worst case. Capture ratio was excellent. Selectivity and image-rejection ratios were modest; these tuner characteristics are less important in the home than in a car, so I'm willing to sacrifice them—especially since lower distortion and better channel separation usually result from doing so. The AM rejection was fine, and pilot rejection and subcarrier rejection were unbelievably good.

Figure 10 shows the RX-V2090's frequency response in Dolby Pro Logic mode. The results are classic and almost uniformly excellent. Main front response is nearly as broad and flat as that in stereo, although the center channel's response droops a bit more at 20 kHz. In the "Normal" center mode, response is down 3 dB at 100 Hz, as it should be, and rear-channel response rolls off above 7.2 kHz, again according to Dolby Labs norms. The A-weighted noise was greater in Pro Logic than in stereo mode, but that's to be expected. Referenced to rated power, S/N approached or exceeded 100 dB in the front channels and attained almost 90 dB in the rear channel. Steady-state separation at 1 kHz ranged from a low of 48.1 dB (between the rear and right front) to a high of greater than 100 dB (between the right front and the center). In general, separation approached 60 dB, which is excellent Pro Logic performance.

Figure 11 shows the receiver's THD + N versus frequency in Dolby Pro Logic mode; the results, once again, are far better than typical for an A/V receiver. In the front channels, distortion remains at or below 0.17% across the meaningful frequency range. In the rear, it's less than 0.3% from 120 Hz to above 3 kHz. The rapid rise in high-frequency THD + N in the rear channel is as much due to the fundamental rolloff called for by Dolby Labs standards as it is to an increase in the level of the distortion components. (Note that in Fig. 11, and in some of the prior figures, I've expanded the vertical scale to reflect the RX-V2090's superior performance and to allow you to see differences more readily.) Figure 12 shows THD + N versus output.

In Dolby Pro Logic mode, the receiver's output power at clipping (8-ohm loads) for the main front channels was 120 watts/channel, with 135 watts available in the center. The main front's clipping point was precisely the same in Dolby Pro Logic mode as in stereo. The rear channel delivered 52 watts/channel at clipping, far above Yamaha's specified 35 watts/channel.

At present, AC-3 decoders are difficult to evaluate in a lab because the only available test disc is far from adequate. I was able to measure the DDP-1's output level and channel balance as well as make a stab at measuring the unit's frequency response, 1-kHz THD + N at 0 dBFS, and channel separation at 1 kHz. I found nothing to complain about in any respect.



YAMAHA'S "CINEMA DSP" TRADES IMAGING PRECISION FOR A BROAD, ENVELOPING SOUND FIELD.

I was unable to graph frequency response of the DDP-1's front and LFE channels, because my Audio Precision system can't track the test disc's fast sweep when levels change substantially. Nonetheless, I have reasonable assurance that the response was within +0, –0.25 dB from below 20 Hz to above 18 kHz in the main front channels and to almost 17 kHz in the surround channels. The center channel was down less than 0.5 dB at 18.4 kHz, and the LFE was essentially flat from below 20 Hz up to 60 Hz. The THD + N at 1 kHz and 0 dBFS was no more than 0.007% in all five main channels and was less than 0.05% at 30 Hz in the LFE channel. Output level in the main channels was about 2 volts, and all channels were balanced within ±0.055 dB. With its gain at maximum, the LFE channel's level was approximately 10 dB above that of the main outputs. Channel separation in most cases exceeded 100 dB at 1 kHz; worst-case separation (between the right and left surround channels) was still greater than 84 dB.

Use and Listening Tests

The main potential weakness in Yamaha's Dolby Digital AC-3 setup is that the RX-V2090's five discrete-channel inputs render the receiver unable to accept the DDP-1's subwoofer output. You must set up the DDP-1 so that it reroutes the LFE channel to the main front pair. (If you use small speakers, you must also set up the DDP-1 to strip the bass out of the center and effects channels.) True, you can connect a subwoofer to the RX-V2090's "Low Pass" output, but the bass will still remain in the main front channels, where it will place an additional burden on the main front amplifiers as well as on the speakers. It is imperative that those speakers be able to stand the gaff even if they can't reproduce the bass. (It's not feasible to connect a powered sub to the DDP-1's subwoofer output, since then the sub's level can't be adjusted with the receiver's volume control.)

It also should be noted that although the DDP-1 can switch among three Dolby Digital sources, it can't switch video. When Dolby Digital becomes available from DVD and satellite, you'll be able to decode the bitstream, but you'll have to rig a separate video switcher to keep the picture with it. What a nuisance.

Laying aside those negatives, I was quite pleased with the performance of the Yamaha combo. I set it up in my home theater and connected full-range tower speakers that could handle the bass (Paradigm 9se Mk3s) as the main front pair. Sometimes I also used Paradigm's PS-1000 subwoofer, and to maintain tonal balance, I used Paradigm's CC-300 speaker in the center.

You can toggle between AC-3 and Dolby Pro Logic with the RX-V2090's "LD/TV" pad. Out of the box, the sound level with AC-3 was higher than with Pro Logic, but I corrected this with the DDP-1's "Output Trim" function. Once I got the system balanced, I could make fairly direct comparisons of AC-3, Dolby Pro Logic, and Pro Logic with Cinema DSP.

On every disc I used, Dolby Digital AC-3 was cleaner and had deeper and stronger bass than Dolby Pro Logic (with or without

Cinema DSP). I always preferred AC-3 to Dolby Pro Logic; its sound field was notably more stable and believable, and it correlated better with the picture than Pro Logic's sound field did. Yet the degree of difference between the two depended on the disc. For example, although the flyovers in *Top Gun* had better left/right rear definition in AC-3 than in Pro Logic, the old system really did a fine job, too. (That's because the flyover sounds are the dominant signal, and Pro Logic has little trouble steering this signal appropriately—albeit, in this case, into a mono surround channel.)

Dolby Digital really showed its mettle in scenes where there was dominant on-screen action and subtle off-screen sounds. In a scene in *Rob Roy*, softly lowing cattle and bleating sheep are far in the distance while the main action takes place on-screen. AC-3 was able to place the animal sounds off-screen and distinguish between off-screen left and right, while Pro Logic just placed them in an anomalous and comparatively ill-defined world.

In some cases, the differences between AC-3 and Pro Logic were so apparent that I wondered if the soundtracks had been mixed differently. I think of Gene Hackman standing in the rain while haranguing his submarine crew, an early scene in *Crimson Tide*. The Pro Logic mix has rain pretty much everywhere; in AC-3, I could hear individual raindrops plopping onto Hackman's umbrella amidst the background of rain. Wow!

Most of today's programs aren't encoded with AC-3, so I compared the RX-V2090's Pro Logic and Cinema DSP modes. I found its Pro Logic operation on a par with the finer surround systems I've used and far above that of run-of-the-mill A/V receivers. Cinema DSP broadened and widened the soundstage and made it more enveloping. This was especially noticeable in the 70mm mode, where sounds were placed considerably further off-screen and had more "wrap." However, I felt this widening was achieved at some sacrifice in the precision of on-screen sound images. On-screen sounds seemed more diffuse with Cinema DSP and occasionally could slip off-screen. Whether somewhat less precise sound placement is a worthwhile trade-off for the more exciting and enveloping experience of Cinema DSP is a decision that you probably should make on a movie-by-movie basis.

The same can be said for the RX-V2090's music sound fields. Although you can't adjust these fields the way you can on some Yamaha stand-alone music processors, they sound better than most such processing programs and were quite enjoyable on the demo disc that Yamaha provided. Long-term, I might find the processing somewhat aggressive for everyday listening to classical music.

Because the main front speakers I used had substantial bass, the RX-V2090's lack of an LFE input proved less of a problem than I thought it would. This is not a system to be used with weak-kneed main front speakers, so I give the RX-V2090/DDP-1 combination my seal of approval only if you do use it with speakers that aren't bass-shy. It's always disappointing to find an otherwise first-rate product with a design flaw that could easily have been prevented. But I'm sure Yamaha will correct it in future products. A

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Q How do I provide from one audio system "high quality" stereo sound to more than one location within my home?

A There are many ways to distribute stereo sound into remote locations within your home. The trick is in reproducing "high quality" sound. As in a single room application, source equipment, speaker selection/placement and cabling choices should be considered. Source equipment options can include a preamp with multiple outputs or a multi-room controller. Consider each room's individual decor, size and shape when selecting and placing speakers. In-wall speakers are discrete in appearance and work fine for background music environments. Where uncompromised sound quality is desired, any high quality mini-monitor or floor-standing speaker can be utilized. Due to the long lengths of wire involved, selection of interconnects and speaker cabling is just as important as it is n your primary audio system. Working with a reputable retailer is highly recommended as they can assist you in making the best possible choices.

–Peter Lee and Steve Toth
Future Sound Audio Video Design Group
Burlingame, California

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audio/video design group

Q Now that I've bought a number of stereo components, how do I choose a cabinet?

A The equipment stand is a surprisingly important part of any stereo/home theater system. Beyond aesthetics alone, there is performance and convenience to consider. "Open-air" cabinet designs–with no doors, sides or backs–are generally the best choice for both of those. Because there are no sides to interfere with the sound waves, the open-air designs lets the equipment run cooler, allows very easy access to the rear of the components, and does not reflect the sound coming from the speakers. In effect, the cabinet is nearly "invisible" to sound waves. Metal stands, with their weight and density, tend to perform better than wooden stands. Remember, vibration is detrimental to sound reproduction. The more vibration you can control, the better.

–Scott Cray
Hawkeye Audio Video
Iowa City, Iowa

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Each month, Audio Magazine's newest feature "See a Specialist", will showcase some of the finest audio/video dealers from across the country. The dealers, chosen as a result of recommendations from equipment manufacturers, Audio Magazine staff and industry organizations, will exemplify the best audio/video dealers from New York to California. The chosen dealers will offer solutions to problems that can best be handled by a specialty audio/video retailer.

If you would like to submit questions to dealers in your area please write to :
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Q How *good* does my center channel speaker need to be?

A Well, times have changed since Dolby Pro Logic's inception several years ago. Initially, it was understood that a center channel speaker's purpose in the Pro Logic scheme was to reproduce primarily the dialog portion of a film. Therefore, a speaker of limited size and marginal quality would suffice in most cases. Today, the center channel speaker plays a far more critical role. Film producers are progressively putting greater demands on the center channel by "steering" dynamic special effects from side to side as well as relying on this speaker for dialog. These production techniques can be quite entertaining, however, a "wimpy" center speaker could result in "clouding" of dialog and annoying inconsistencies throughout. We suggest that the center speaker be high quality and as closely matched to the left/right main speakers as space and budget will allow. If you purchased your center channel speaker some time ago, consider this component when upgrading your system. By cutting back here, you could be missing half of the fun that the film makers have cooked up for us!

–Joe Freppert and Brian Bowen
Audio King
St Louis Park, Minnesota

AUDIO KING

Q They told me I could put my subwoofer anywhere in the room because bass is non-directional, but I hear midrange sound and voices coming from my subwoofer, how come?

A In order to make a subwoofer truly non-directional, you must use a steep high pass filter. Most subwoofers have a shallow filter slope which allows audible information at 200Hz and above. This degrades the systems' overall sound quality and allows you to identify the location of the subwoofer. Some companies make high quality subwoofers that use steeper filters, thus making them truly non-directional. There is also an outboard filter that you can use with your powered subwoofers, assuming you are using the low level inputs. This high pass filter is available in both 2 and 3 channel versions.

–David Wexler
The Little Guys Home Electronics
Glenwood, Illinois

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ANTHONY H. CORDESMAN

THETA DIGITAL DATA III CD TRANSPORT AND DS PRO GENERATION V-a D/A CONVERTER

Both the Theta Digital Data III CD transport (which can also be used as a laserdisc player) and DS Pro Generation V-a D/A converter are improved versions of components well known to many audiophiles. The new iteration of the DS Pro is the first D/A converter I've reviewed that offers both a separate computer and algorithm for digital processing and the option of an HDCD filter; this makes it possible to compare HDCD with Theta's fundamentally different type of digital processing. The Data III, a far more advanced transport than the earlier Data II, utilizes Pioneer's top-of-the-line laserdisc mechanism, with separate loading drawers for CD and laserdisc. It now automatically plays both sides of a laserdisc and offers a wide range of control features for movie buffs who like to dissect films frame by frame. By itself, the Data III can play only the analog tracks on a laserdisc; to hear the digital soundtrack, you need to add an external D/A converter.

THETA'S DATA III COMPARES FAVORABLY WITH STATE-OF-THE-ART CD TRANSPORTS AS WELL AS LASERDISC MACHINES.

Company Address: 5330 Derry Ave., Suite R, Agoura Hills, Cal. 91301; phone, 818/597-9195; fax, 818/597-1079.
For literature, circle No. 94

The Data III transport, which sells for $4,500, has three digital audio outputs (RCA coaxial, BNC coaxial, and AES/EBU balanced), with the option of adding an AT&T ($300) or Theta's proprietary Laser Linque ($800) glass-optical output. There is also an RF output jack for AC-3, BNC and RCA composite-video outputs, and two S-video outputs. Loading time for CDs and laserdiscs is much faster than in previous Theta transports, and the ergonomics are very good. The front-panel controls are relatively simple, and the remote is reasonably easy to understand. (Any experienced Starship captain should be able to operate it after only a year of training at the Academy.) A switch turns off the panel display to avoid any interaction between the display circuitry and the audio and video signals; another switch can disable the video circuitry during CD playback. Both of these switches make slight, but noticeable, improvements in low-level detail and transparency and in the definition of depth and imaging.

In the Data III, Theta Digital has done a great deal more than simply adding digital outputs to a laserdisc player. One whole side of the interior is filled with five isolated, separately regulated power supplies for the video and audio sections. The digital audio output board contains a voltage-controlled crystal oscillator that is hand-calibrated, through the use of a high-resolution time-interval counter, to reduce jitter. All of the electrical digital outputs are pulse-transformer isolated and are driven by high-speed C-MOS logic gates. The Data III's video circuitry carefully isolates vulnerable video lines to ward off pollution from nearby digital audio signals, and all of the

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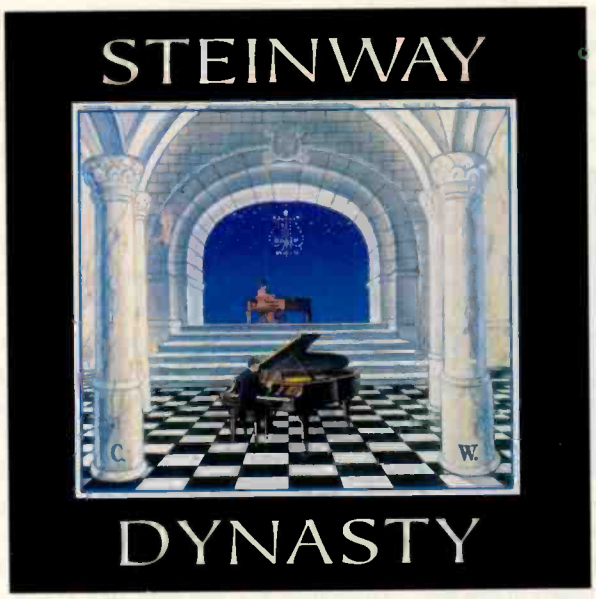

He sits raptly in the pews of the old church while snow falls silently on the roof. Though midnight nears, the walls are painted with the hews of sunrise by light from golden chandeliers. The critic listens to the silence.

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units are hand-tweaked to improve picture quality.

The result is a truly outstanding transport. The Data III offers far better video performance than its predecessor and equals that of any laserdisc player I have used. It provides excellent tracking, low-noise playback, and fine resolution and color. I usually preferred the picture without the Data III's digital noise reduction, but this is true of such circuits in all of the laserdisc players I have used. Its sound was consistently better than that of laserdisc players that had only low-quality Toslink outputs, even when I used an Audio Alchemy or a Theta Digital jitter-reduction device. The Data III also produced cleaner sound than I have heard from stock laserdisc players that have coaxial digital outputs. The improvement showed up largely in low-level sonic detail, which affects depth, imaging, sweetness, and apparent dynamic range.

THE MAJOR CHANGE IN THETA DIGITAL'S DS PRO GENERATION V-a D/A CONVERTER IS ITS OPTIONAL HDCD FILTER.

I also compared the Data III's performance in reproducing CDs with that of the Mark Levinson No. 31 and PS Audio Lambda transports and the Krell KPS-20i CD player used as a transport. The audible differences were slight and highly dependent on the D/A converter, cable, and interface I used. It seemed to me that each manufacturer had optimized its transport to sound best with its own D/A converter. But all four transports performed well with other brands of converters, particularly when I used a top-quality cable and the AES/EBU or AT&T interface. The Mark Levinson No. 31 did a slightly better job on CDs so badly made that any sane audiophile would discard them. But you'll seldom hear a musically meaningful difference between today's best transports, particularly with recent audiophile-quality CDs.

In short, I believe the Data III competes with the state of the art in CD transports. It may *be* the state of the art for those looking for the best possible sound from laserdiscs.

Theta Digital has made fewer improvements in its top-of-the-line DS Pro Generation V-a D/A converter. (I reviewed the previous version in the February 1995 issue.) The analog section now uses six hand-selected sets of eight matched transistors, which Theta feels will improve sweetness and imaging detail. The company has also eliminated the inductors in its output filters, in an effort to reduce sibilance, tighten the focus of the imaging, and improve tonal quality.

The most important change in the Generation V-a is the availability of an HDCD filter/decoder as an option. This option adds $459 to the price of the DS Pro Generation V-a D/A converter, which sells for $3,795 with unbalanced connections and $5,600 with balanced ones; an AT&T optical input costs an additional $300, and Theta's Laser Linque input is $800.

I auditioned two samples of the DS Pro Generation V-a, one with HDCD and one without, so I could analyze the value of the HDCD option. The unit without HDCD revealed a number of subtle but important improvements in sound quality. It was sweeter than its predecessor and more detailed. The noise floor seemed slightly lower, which improved the apparent dynamic range and soundstage detail. The upper midrange was more harmonic and musically natural with strings and woodwinds. Brass had a more musical bite, with less trace of digital edge, and good recordings of cymbals had a more natural shimmer and decay.

The DS Pro Generation V-a was not quite up to the Mark Levinson No. 30.5 in its ability to resolve upper-midrange and treble detail or to extract very low-level musical information. Yet it was richer in the midrange than the 30.5 and had more powerful and dynamic bass. Its bass was excellent, surpassed only by that of the converters in the Krell KPS-20i player. The Generation V-a was also slightly more dynamic than either the Mark Levinson or the Krell. It seemed state of the art in terms of depth and front-to-back imaging. Overall dynamics and soundstage perspective were typical of what you might hear on the main floor of a concert hall, about one-third to halfway from the stage.

The HDCD filter, which automatically decodes HDCD discs, proved a mixed blessing. It did reveal that HDCD recordings are getting better: Reference Recordings' Leos Janàcek (RR-65CD) and George Whitefield Chadwick (RR-64CD) discs, for example, are two of the finest recordings I have heard. But the HDCD setting forces you to use the digital filter in the HDCD chip and bypass the filtering system that is the heart and soul of the Generation V-a.

My listening panel and I mostly preferred to listen to HDCD recordings using the Generation V-a's native digital filtering rather than the HDCD option. Although the HDCD filter provided a bit more upper-octave detail, it was less musically natural and less warm; it spotlighted right-to-left imaging relative to depth. Blind listening tests with non-audiophiles produced roughly similar results. Opinions among my "guinea pigs" were divided, but most preferred the Theta filtering.

More broadly, I found no reason to prefer the sound of HDCD discs over others. Reference Recordings makes some of the world's best recorded CDs, but playing its HDCD recordings back through an HDCD decoder didn't yield sound better than that of well-made non-HDCD recordings played through conventional converters. I listened at length to Reference Recordings HDCD-encoded CDs and other audiophile CDs through the Theta DS Pro Generation V-a, with and without HDCD. Recent recordings from Chesky (Oregon's *Beyond Words*, JD130, and O *Magnum Mysterium*, CD83), Sheffield Labs (*The Art of Fuguing*, 10047-2-G, and *Earth Chants*, 10049-2-F), and Telarc (Oscar Peterson's *The More I See You*, CD-83370, and Jim Hall's *Concierto*, CD-83365) did not have the same sound character as the Reference Recordings CDs but were equally musical. The differences among discs from these labels seemed to be more the result of production values and microphone choice and placement than of anything to do with HDCD. I also played good "extra-bit" recordings, including a Sony Classical Super Bit Mapped CD (two Mozart string quintets, SK-66259) and a Deutsche Grammophon Authentic Bit Imaging disc (Vivaldi's *The Four Seasons*, 43 9933). These recordings roughly equalled the HDCD recordings in most musically relevant aspects of sound quality. Consequently, I would buy the Generation V-a without the HDCD option and put that money toward something more useful. In the Generation V-a, HDCD not only doesn't gild the lily but tends to diminsh its bloom.

THERE'S A SUPERB SYNERGY BETWEEN THE DATA III AND THE DS PRO GENERATION V-a.

The Data III is a tempting A/V crossover product. I occasionally use it in my A/V reference system, and I look forward to using it with AC-3 processors. I cannot, however, end this review without stressing the synergy between the Data III and DS Pro Generation V-a, using Theta Digital's Laser Linque glass-optical interface. The stereo sound from this combination is truly musically involving and offers an outstanding mix of musical nuances. A

AURICLE

JOHN SUNIER

NuREALITY VIVID 3D THEATER SRS PROCESSOR

Despite the growing popularity of multichannel home theater systems, there are still many listeners who want surround effects yet don't want extra speakers. Realizing this, many companies have developed processors that attempt to create surround-like sound fields with just two front speakers.

One of the oldest, best-established techniques for doing this is the Sound Retrieval System (SRS), used by NuReality in its series of Vivid 3D processors. Invented by Arnold Klayman, SRS is said to use processing based on the psychoacoustics of head-related transfer functions. These functions help the brain localize sounds precisely, in all directions, because the spectral characteristics, or frequency content, of those sounds vary according to the direction of the sound source. Sounds from different directions strike different areas of the head, shoulders, and pinnae (outer ears), all of which act as frequency-selective baffles. It's like having separately tuned bandpass filters for the azimuth and elevation of each sound we hear. Our brains use the resulting minute shifts in frequency spectra, phase, and level to augment the primary timing and level cues in order to localize sounds. We use these aural abilities to enjoy music in a space; our ancestors used them to avoid attacks by tigers.

If moving a sound source in space changes its apparent spectral content, then changing its spectral content should make it seem as if it's moved in space. Klayman says he has capitalized on this to "move" specific sounds out of the two stereo loudspeakers. By equalizing certain portions of the ambient field (the L – R component of the stereo signal), SRS can place some sounds off to the sides of the listening area or even to the rear of it in some cases. The result is a seamless soundstage that wraps around much of the room and makes the pair of speakers seem to "disappear" sonically.

THE SWEET SPOT, WHERE SOUND AND SPATIALITY ARE MOST ENJOYABLE, WAS VERY WIDE WITH THE VIVID 3D.

The first SRS processor was made by Hughes Corporation (*Audio*, April 1992). Klayman's SRS circuitry is now being used in high-end TVs by Thomson (RCA) and Sony, in home audio and home theater components by Nakamichi and Paramount, and in computer multimedia gear. NuReality's line of home SRS units ranges from a bare-bones computer multimedia model (the Vivid 3D Plus, $79.95) to the Vivid 3D Theater processor reviewed here ($249.95).

Like most sound processors, the Vivid 3D Theater is normally connected to the tape-monitor loop of a preamp or receiver. About 8 pounds in weight and 16½ inches wide x 9¼ inches deep, the processor has its own rear-panel jacks for a loop connection, so an SRS unit plugged into your system's tape jacks won't keep you from using an equalizer, expander, or other processor. Since the output to the loop is SRS-processed when the circuit is engaged, you can also use a tape deck plugged into these jacks to make SRS-encoded tapes.

On the Vivid 3D Theater's front panel are buttons to switch on power and the SRS effect (the only controls duplicated on the supplied remote), a display, and then three more buttons. These are used to select mono or stereo, defeat the display (which uses amber and green arcs to show the extent of the center and surround images), and select or deselect the signal from the loop jacks on the rear panel.

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At the far right are two small knobs, "Center" and "Space," and a large "Volume" knob. The "Center" and "Space" controls affect the level of the sum (L + R) and difference (L – R) signals, respectively, before those signals undergo further processing. Turning "Center" up gives you a stronger center image, while turning "Space" up gives you more ambience. Turning "Center" all the way up and "Space" all the way down gives you an almost monophonic signal, while reversing those settings fades centered soloists out almost completely. I usually preferred the "Center" setting almost full up, with the "Space" knob at about the 3 o'clock position. However, I had to readjust these settings for almost every CD or FM program. Ironically, the smaller knobs needed frequent readjustment, while I normally set "Volume" once, for the highest level that left peaks undistorted, and then left it alone.

I evaluated the Vivid 3D Theater using my main audio system, a more modest home theater system, and via pairs of extension speakers throughout my house. Making A/B comparisons of the enhanced and unenhanced signals was difficult, even with the remote control, because the sound almost always became louder when the SRS function was on.

The SRS circuits are optimized for use with speakers spaced fairly close together. Luckily, I already had two mini-monitors spaced only 3½ feet apart—the center pair of a four-speaker array used with a Cogent Research SPI processor. When I switched from the Cogent processor to NuReality's SRS box, I first thought that I was still hearing all four speakers. Not so; the two outside speakers were mute. Nevertheless, sitting 9 feet away, I heard a seamless soundstage that started almost directly to my left and ended almost directly to my right. The two speakers were even harder to localize than the four speakers used with the Cogent processor.

The SRS enhancement varied with different CDs and often required readjustment of the "Center" and "Space" controls from the approximately 2 o'clock settings recommended by NuReality. But that enhancement was impressive. Though frequent readjustment is an inconvenience, I especially appreciated the "Center" control and used it to modify overly aggressive multimiked recordings of solo instruments. The Cogent processor can make grand pianos seem 30 feet wide, but turning up the "Center" control on the NuReality processor reduced pianos to their proper size.

NuReality promises that SRS widens the "sweet spot," where sound and spatiality are most enjoyable. The Vivid 3D Theater delivered this, and very successfully. Many very expensive speakers have very small sweet spots, as do most binaural and "three-dimensional" audio processors. But if you are sitting at the far right of the room, SRS still enables you to hear a fairly good balance from the left side of the soundstage. This may be particularly noticeable when you're moving around. The wide sweet spot might even let you get away without a center-channel speaker in a modest home theater setup, since viewers at the sides of the room should still hear the opposite speaker quite clearly.

To determine how well the Vivid 3D Theater created pseudo-stereo from mono sources, I pressed its "Mono" button and played a CD reissue of some old jazz 78s. The

soundstage was spread widely, but bass was exaggerated (as was rumble, presumably from the original 78s) and distortion increased. A symphonic recording from the pre-stereo '50s worked better. However, on a concerto from that period, the piano sounded as if it were across the street. Unfortunately, the "Center" and "Space" controls are inoperative in mono mode, so I could not turn up the "Center" knob to place the piano on the stage with the other instruments.

After using the Vivid 3D Theater with the two front speakers alone, I turned on my matching rear-channel speakers. These are fed via a PhaseAround passive processor, which derives an L – R signal from my preamp. With the preamp getting its signal from the NuReality processor, the most noticeable effect on the rear channels was a significant bass boost. Since the bass from these speakers did not need boosting, I preferred the sound with the surround-channel information tapped from a point upstream of the Vivid 3D Theater.

After more extensive A/B listening through my main audio setup, I began to notice changes in the front channels' frequency content. Literature from SRS Labs states that "the enhancement does not rely on encoding or decoding and it does not alter the original program material" except for the sound-field enhancement. I disagree: There were definite timbral changes on all recordings. And on a high-quality system, those changes muddy the sound.

Results were better with my home theater system (which uses Cambridge SoundWorks speakers); the pleasing spread of sounds throughout the room made up for a slight loss of transparency. Again, the bass level (in this case, from my subwoofer) had to be reduced when SRS was on. Using SRS with the "70mm" setting of a Fosgate/Harman Kardon Dolby Pro Logic processor achieved excellent surround effects from music and movies on laserdiscs and from telecasts. The signals were fed to the Vivid 3D Theater before going to the Pro Logic processor; Klayman says that SRS processing gives Dolby Pro Logic more information to use in steering sounds to the various speakers. Once, when I accidentally turned off the surround-channel amp, I was certain that the side speakers were still operating. On some video material, if "Space" was advanced too far or "Center" turned too far down, all sounds moved away from the screen and dialog no longer seemed to come from there.

The 3D Theater also proved a boon in other rooms. The sound coverage on my patio was better than ever. Radio Shack Minimus 7 speakers, mounted near my kitchen ceiling, gained enough bass and spread to sound nearly as good as the speakers in my home theater. In fact, my one ideal use of the Vivid 3D Theater would be to process the signal feeding the amp that powers my remote speakers.

The better your speakers and audio system, the less I think you'll gain from using the Vivid 3D Theater. Listeners with high-end systems may find the timbral modifications unacceptable. True, these changes can be somewhat reduced by backing off the "Center" and "Space" controls, but this also reduces the enhancement, to the point that the NuReality processor might as well be out of the circuit. The more modest your speakers, however, the better I think you'll like the NuReality Vivid 3D Theater's SRS enhancement. A

CLASSICAL RECORDINGS

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Bartók: The Wooden Prince; Music for Strings, Percussion, and Celesta
London Symphony Orchestra, Antal Dorati
MERCURY LIVING PRESENCE
434 357, CD; ADD; 77:45
Sound: A, Performance: A

Janos Starker (Works by Chopin, Bartók, Mendelssohn, Martinu, Debussy, and Weiner)
Janos Starker, cello; Gyorgy Sebok, piano
MERCURY LIVING PRESENCE
434 358, CD; ADD; 72:53
Sound: A, Performance: A

Ravel: Gaspard de la Nuit; Debussy: Three Preludes and Pour le Piano Suite; Stravinsky: Three Movements from *Petrouchka*
Gina Bachauer, piano; John Gielgud, reader (in Ravel)
MERCURY LIVING PRESENCE
434 359, CD; ADD; 60:43
Sound: A, Performance: A+

Grofé: Grand Canyon Suite and Mississippi Suite; Herbert: Cello Concerto No. 2
Georges Miquelle, cello (in Herbert); Eastman-Rochester Orchestra, Howard Hanson
MERCURY LIVING PRESENCE
434 355, CD; ADD; 65:42
Sound: A, Performance: A

Popovers II (Carousel Waltz and Other Orchestral Favorites)
London and Eastman-Rochester Pops Orchestras, Frederick Fennell
MERCURY LIVING PRESENCE
434 356, CD; ADD; 64:42
Sound: A, Performance: A

These essays in audio archeology are not without their pitfalls, but by and large they offer an exciting and engrossing sonic window on the way we were in the late '50s and into the '60s. With that in mind, I've graded them all A for sound, despite some caveats; the grades you give them may differ, depending on your point of view and the degree to which you find certain anomalies disturbing. I've likewise given all but one of the performances an A. You may prefer Karajan or Bernstein to Dorati, for example, but all of the performers are acknowledged experts in the areas in which they are represented here. The one departure from an A rating is the A+ I've given to the Gina Bachauer disc, which, by a brilliant stroke of imagination, combines the Maurice Ravel suite with John Gielgud's readings of the Aloysius Bertrand poems (in English translations by Christopher Fry) that inspired it. The extra illumination that this sheds on the music demands the premium rating.

As a unique presentation of this often-recorded repertory, the Ravel elbows its way forward in the crowd, so to speak. To some extent the same might be said of Dorati's Bartók, though the presence of the relatively rare ballet score constitutes a stronger recommendation than the frequently recorded Music for Strings, Percussion, and Celesta. And Starker is Starker; what more need be said? From there it's downhill, musically. Ferde Grofé wears thin quickly (kudos to him for his brilliant orchestrations for George Gershwin, but his own music is decidedly shallow). The Victor Herbert concerto, though downplayed in the cover art and admittedly less colorful and bold, has somewhat more substance. And the Pops pieces are just that: fun, but less than great music.

The real focus of this Mercury series is on the sound, however. The orchestral pieces are captured with an extremely close-up perspective that appears to hover over the conductor's head. It enables you to hear the first-desk players plus the body of sound from behind them, almost as though each solo had its own touch-up mike. Actually, most or perhaps all of the tracks were captured with three mikes, each presumably feeding its own track on

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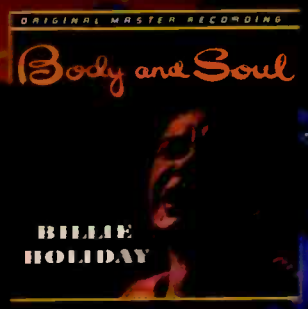

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half-inch, three-track tape. This technique can create a soundstage stability and believability that touch-up multimiking makes problematic. The tapestry of sound that is thus laid at your feet is what makes the orchestra recordings so exciting, but this sonic effect has nothing to do with the way you hear music in a hall. For that reason, it is radically unlike current recording technique, which seeks above all the "realism" of the ambience and listener perspective that the composer expected in creating the music.

That's not the only characteristic to which you may take exception. If you have the volume fairly high when you start the Dorati disc, for example, you will be reminded how noisy studio air-conditioning used to be. And the LP medium could barely contain a half-hour per side, even given fortuitous music timings, while these CDs all run more than an hour. Hence they combine material originally intended for issue on separate LPs. In the Pops, though two orchestras are involved, this makes little difference. But on the Bachauer disc, the disparity in her piano sound—between the London sessions and the *Petrouchka* transcriptions recorded in New York—is somewhat disturbing. In fact, only the Grofé/Herbert disc was recorded in a single venue, though the Herbert was originally on a separate LP. Finally, these are analog recordings that tend to lose clarity in the climaxes (notably on Dorati's Bartók) even when the pianissimos are deliciously captured.

"Audiophile" these recordings certainly are, though they don't represent an unassailable sonic ideal. Taken for what they are—or were—these albums are quite fascinating. But don't expect them to outclass the best of today's recordings, particularly if music rather than sound is your overriding reason for listening. *Robert Long*

BANTOCK

The Cyprian Goddess, Helena, and Dante and Beatrice

Royal Philharmonic Orchestra, Vernon Handley
HYPERION CDA66810
CD; DDD; 69:17
Sound: A, Performance: A

Hearing Granville Bantock's extremely cinematic tone paintings caused me to wonder if there might not be a screen image to go with these colorful works, even though two were written before movies existed. Bantock creates the feeling of an unfolding story in "The Cyprian Goddess" and "Dante and Beatrice," where the programmatic style of Richard Strauss is wedded to French exoticism.

"The Cyprian Goddess" is really Bantock's Third Symphony. This British composer had a rather wide view of what a symphony is. The goddess is Aphrodite, and the work was inspired by two Latin verses dedicated to her. Bantock's wife is the dedicatee of "Helena"; he called his "Dante" score a psychological study rather than a depiction of various Dantean episodes in detail.

This sumptuous off-the-beaten-path musical journey is appropriately played and was cleanly recorded by engineer Tony Faulkner. *John Sunier*

Kuhnau: The Biblical Sonatas

John Butt, harpsichord, clavichord, and organ
HARMONIA MUNDI FRANCE 907133
CD; DDD; 72:23
Sound: A, Performance: A+

Any previous impressions of Johann Kuhnau (1660-1722) as a boring predecessor of J. S. Bach will be dispelled by this quirky collection of long-forgotten program music. This organist, writer, composer, theorist, language expert, church music director, and practicing lawyer created some of the first verbal/musical illustrations of Biblical stories.

Each of the six keyboard sonatas illustrates a different Biblical story. Kuhnau provided a German version of the verbal program, with details of the story prefacing each sonata, and written into the score is a text in Italian. He wrote that although music "directly parallels and affects the human emotions. . . the words in texted music make the primary emotional impression on the listener."

Organist John Butt chose three keyboard instruments, selecting the one he felt best fit each sonata. The organ of Hertz Hall at U.C. Berkeley is used for the First and Fourth Sonatas. The First, "The Combat Between David and Goliath," is a precursor of the many 19th-century battle pieces, with sounds of struggle verging on atonality, "travel music" as the Philistines are pursued, and victorious hoopla at the conclusion. There are even bird sounds, more expected from a Wurlitzer theater organ than from an authentic copy of a baroque organ!

The happy feeling of The Third Sonata, "The Wedding of Jacob," is given to the harpsichord. The opening of the Second, "The Melancholy of Saul Assuaged by Means of Music," is a sentimental (in the best sense) depiction that calls on the clavichord's ability to "bend" notes. In the Fifth, "Gideon the Savior of the People of Israel," the clavichord conveys an unexpectedly wide range of sounds in another piece of battle music.

Don't raise the volume of the subtle clavichord sonatas, or the organ tracks will be excessive. Harmonia Mundi France is to be commended for keeping the level at a natural balance among the three instruments featured in this excellent collection of inventive keyboard gems. *John Sunier*

Where Shall I Fly (Mozart and Handel Arias)

Jennifer Larmore, mezzo-soprano; Lausanne Chamber Orchestra, Jesús Lopez-Corbos
TELDEC 4509-96800, CD; 63:30
Sound: A–, Performance: A–

This is a remarkable recording, if you can stand the constant emoting or plan only to dip into individual tracks. These high-power and devilishly difficult opera excerpts, many of them rarely performed these days, seem to hold no terrors for Jennifer Larmore. An occasionally intrusive flutter aside, her voice has all the qualities they demand: stamina, power, and flexibility. The accompaniments are fluent, lively, and precise. Somewhat annoyingly, the program intermixes Mozart and Handel. Sound balances and acoustics are fairly standard; Larmore's mezzo-soprano voice dominates preemptively. The booklet contains full texts and trilingual paraphrase/synopses. *Robert Long*

Pärt: Fratres; Cantus in Memory of Benjamin Britten; Summa; Festina Lente

I Fiamminghi, Rudolf Werthen
TELARC CD-80387, CD; DDD; 1:09:00
Sound: A+, Performance: A+

The Belgian chamber orchestra I Fiamminghi lends its rich string tone to Arvo Pärt's "Fratres." This work is based on repeti-

tions of an austere, hymn-like theme and is played in six different ensemble versions. Inspiration for this piece was a procession of monks moving through an abbey by flickering candlelight. Diverse aspects of the score are illuminated by the changing instrumentation.

The lengthy melody in "Festina Lente" is played simultaneously in three different time values, one of the 15th-century techniques borrowed by Pärt in his mystically introspective music. Velvety massed strings hallmark this meditative album; if even a hint of steeliness shows up, something in your system is likely at fault. *John Sunier*

Zelenka: Six Trio Sonatas, ZWV 181; Missa Dei Patris; Confitebor; Laudate Pueri; Three Capricci

Soloists; Virtuosi Saxoniae, Ludwig Güttler
BERLIN CLASSICS 0011502BC
Four CDs; DDD; 4:08:36
Sound: A, Performance: A

What distinguishes Jan Dismas Zelenka from the plethora of baroque mediocrity available on CD? Well, Bach himself esteemed the music of the introverted Bohemian Catholic musician, and today his music is finding renewed acceptance for its great beauty and originality.

Handel or Bach may come to mind, but one soon senses Zelenka's highly individual style, which is less predictable than that of other composers of the period. The technical virtuosity required of some of the instrumental soloists is very high; bassoonists must love Zelenka for the workout they receive. Like Bach, he absorbed the total compositional knowledge of previous musical generations and then put that knowledge to the test in his own works.

The Trio Sonatas, primarily for two oboes and continuo, are far from garden-party background music. Melodic and rhythmic patterns are varied and constantly changing. Italian opera was the model at the Dresden court, where Zelenka toiled, but in his 20 Masses he went his own way. The late ones, such as the "Dei Patris," go beyond opera influences, using a combination of mournfulness and ecstatic expression.

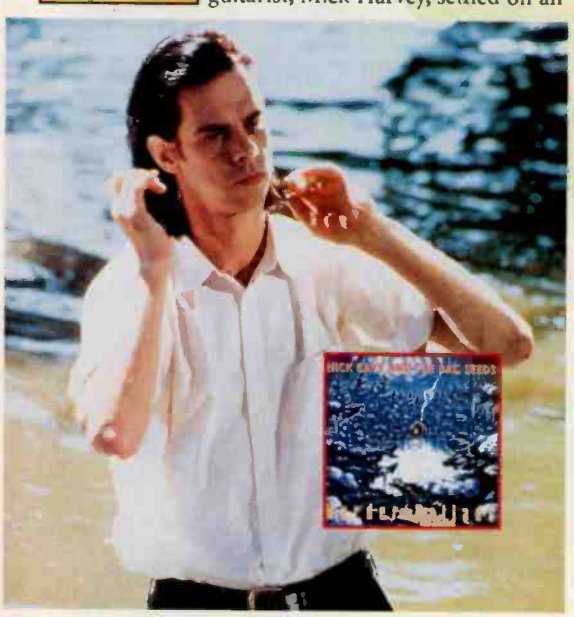
A single booklet, with all English notes in one spot, would make it easier for those wanting to learn more about Zelenka and his music. Otherwise, this CD set, with its attractive and very natural sound, is a commendable introduction to one of the most original composers of the baroque period. *John Sunier*

ROCK~POP RECORDINGS

Intoxicated Man
Mick Harvey
MUTE 9012-2, 44:46
Sound: B, Performance: B

Murder Ballads
Nick Cave and The Bad Seeds
MUTE/REPRISE 2-46195, 56:36
Sound: B+, Performance: A

Hey, they don't call 'em The Bad Seeds for nothing. Fishing around for album inspiration recently, bandleader Nick Cave chose the trusty old murder ballad; for his own album, his guitarist, Mick Harvey, settled on an English translation of obscure French hepcat Serge Gainsbourg's cabaret-cool material from the '60s. Needless to say, the two projects are equally grim and gloomy.



Employing a healthy dose of wheedling organ, plus the sultry vocal talents of Anita Lane, Harvey succeeds in capturing that smoky Gitanes feel of his bohemian subject, especially on the seedier numbers ("Sex Shop," "69 Erotic Year," and "The Barrel of My 45"). His voice is not always up to the task, but in a duet with Lane, "Bonnie and Clyde" (originally done by Gainsbourg and Brigitte Bardot), he achieves a perfect, murmured balance in a celebration of the rakish gangster lifestyle. And one fact repeatedly surfaces throughout these facile readings: The record was obviously a labor of love for Harvey, who seems bent on hipping the world to France's own tortured take on Leonard Cohen beat-dom. Les Misérables, indeed.

Even on his best, most sunshiny day, however, Nick Cave will always be the baddest of The Bad Seeds. His voice is as deep and final as a casket lid slamming shut on *Murder Ballads*' sinister centerpiece, "O'Malley's Bar." This 15-minute tale of sin and salvation is about a town nobody who finally gets attention by systematically blowing away every patron at his neighborhood pub. It's a splatterfest that could only have come from the black-humored mind of Cave, who plays somber piano on the track to underscore the grue. There are no reporters here crying "Oh, the humanity!" There's just this lyrical vulture, repeatedly pecking at society's carcass with his amoral parables. As in classic Appalachian traditionals like "Knoxville Girl" and "Pretty Polly," Cave's characters kill each other for no apparent reason and display no remorse over their deeds. In the gorgeous processional "Where the Wild Roses Grow" (a duet with fellow Aussie Kylie Minogue), the protagonist finally gets a date with his object of desire, and what does he do? He lures her down to the riverbank and bashes her skull with a rock. The draped beauty of the music works in startling contrast to the creepy wordplay.

This disc is perhaps the apex of Cave's enduringly gothic shtick. He even finds morbid humor in Dylan's religious treatise "Death Is Not the End," letting just about every musician involved in the session sneer out a verse before hammering his cynicism home in the final join-hands chorus. And his sendup of the traditional vengeance yarn "Stagger Lee" is positively feral, with the singer crowing like a spurred rooster over his foe's lifeless body—all to a funky, minimalist backbeat. Cave is not afraid to deal himself some rough justice, either: "Henry Lee" finds the fickle fiend hacked to death with the penknife of co-vocalist Polly Jean Harvey, who will brook no infidelity at all.

And piano, either Cave's or Conway Savage's, is the signature instrument that inches this funereal pall along. There's so much of it that the uninitiated might think Nick Cave has grown soft over the years. Far from it. He and The Bad Seeds are simply finding more latent, insidious ways to be ghoulish. Mock them at your peril.

Tom Lanham

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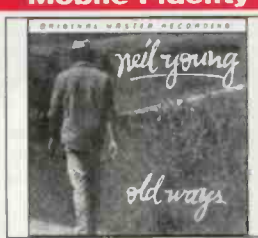

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Black Diamond

Stan Ridgway
BIRDCAGE 11007, 50:59
Sound: B, Performance: B+

Stan Ridgway is the music world's version of a character actor. With his carnival barker's phrasing and sardonic demeanor, he's like the instantly identifiable second banana who brightens the screen for a few minutes before the leading man steps back to the fore. Of course, Ridgway has the same predicament as any good character actor—he's typecast. People remember that yowling voice from his early '80s hits with Wall of Voodoo, "Mexican Radio" and "Ring of Fire," and it's because of this distinctive instrument that his identity has frozen in time.

Black Diamond is Ridgway's conscious effort to stretch out and break ties with his history. His first post-I.R.S. album is a low-budget production that finds the Los Angeles singer/songwriter stripping down to spare guitar, keyboards, and percussion. In the process, he places greater emphasis on his songs, which he sings as straight as possible. Certainly "Luther Played Guitar" and "Wild Bill Donovan" don't fit with Ridgway's New Wave past. The former finds the singer inhabiting the mind of Johnny Cash as he wistfully recalls his early sideman, Luther Perkins. The latter, a Warren Zevon-meets-Bob Dylan folk ballad, chronicles the exploits of one of America's seminal spies. Speaking of Dylan, Ridgway revives "As I Went Out One Morning" from *John Wesley Harding*, giving a refined reading to an intriguingly cryptic but seldom-covered song. "Gone the Distance" is yet another Kurt Cobain elegy. *Black Diamond*'s seven other songs are less immediate but, in the long run, every bit as worthy.

This is the kind of album that's likely to slip through the cracks, which is unfortunate. Ridgway is by now a certifiable journeyman, but *Black Diamond* indicates his best work may lie ahead, even if he may be destined to be the rock 'n' roll Warren Oates. (Available from Birdcage Records, P.O. Box 784, Sierra Madre, Cal. 91024.) *Steven Stolder*

The Valentine Tapes

Sharkboy
NUDE 4CD, 39:33
Sound: B, Performance: B

Somewhere between the precious niceties of the 4AD label and the sleepy Gothic twang of Mazzy Star sits surreal U.K. combo Sharkboy. Wrapped around the unearthly moan of soulless sister Avy, the music bounces through Duane Eddy-ish guitar boom and a general feeling of country loneliness. But unlike Mazzy's dour Hope Sandoval, Avy and Sharkboy have a self-deprecating sense of humor, although the core of Sharkboy remains relatively shadowy. The band seems more concerned with pushing its parameters than settling on a recognizable style. Yet if you like your singers all dusky and magenta-hued, Avy's the gal for you. Like that old Halloween standby Elvira, she can chill your spine and tickle your funny bone simultaneously. *Tom Lanham*

FAST TRACKS

Rank & File: *Mark Germino* (Winter Harvest WH 3303, 57:43). Gruff-voiced Germino is one hell of a storytelling songman. On this "non-electric guitar album," as he calls it, his lyrics shine through the rock 'n' roll center stage. His melodies are toe-tapping catchy, and your attention will be rewarded by the stories he spins. **M.T**

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JAZZ-BLUES

RECORDINGS

Saga

Randy Weston

VERVE 314 529 237-2, 74:48

Sound: B, Performance: B+

Randy Weston embodies jazz. His music is charged with the soul of African rhythms, his piano playing is stoked by boogie-woogie, and his arrangements are tinged with the air of Ellington. Weston is a musician who is informed by the past but who doesn't live in it.

On *Saga*, Weston gathers a veteran group of musicians who sound like they're still hitting their stride. Trombonist Benny Powell and saxophonist Billy Harper, in particular, are revelations as they find new life in Weston's blues-inflected themes. On "The Beauty of It All," Harper's smoke-charred tenor blows smoldering lines across Weston's open-ended phrasing. Another veteran, drummer Billy Higgins, teams up with the relatively young bassist Alex Blake, who plucks earthy pizzicatos and vamps furiously. Higgins can play at the edges of a rhythm while still making a band swing like furious pistons. Add to this alto saxophonist Talib Kibwe, who gives a wild, swirling solo on the samba-driven "Tangier Bay" and trades off with Harper on "Saucer Eyes."

Reminiscent of Thelonious Monk, Randy Weston is a transparent player who never calls attention to himself, even on the solo tracks. But suddenly you realize that he has taken you through some extraordinary harmonic changes. By extension, he rarely makes monumental albums. Instead, they insinuate themselves quietly, like Mona Lisa's smile. But she might have a slightly more joyous grin if she heard *Saga*. *John Diliberto*

TAB BENOIT

Standing on the Bank

Tab Benoit

JUSTICE JR 1203, 1203-2, 50:38

Sound: A, Performance: B+

On his third release as a leader, guitarist Tab Benoit draws heavily on the influences of Albert King and Freddie King. A stripped down affair recorded live to two-track, *Standing on the Bank* showcases the South Central Louisiana native's soulful vocals and razor-sharp guitar work in a collection of originals and blues classics. While certain covers (Leon Russell's "Me and My Guitar," Willie Dixon's "The Seventh Son," Blind Lemon Jefferson's "Matchbox Blues," and the classic jamming vehicle "Going Down") come off as ordinary bar-band fare, Benoit makes more personal, dramatic statements on the powerful title track, a lowdown Delta-flavored original that bears the unmistakable stamp of John Lee Hooker, and on his unaccompanied country blues original "Still Going Down the Road."

Willie Nelson adds a nice touch with his signature vocals and nylon-string guitar work on "Rainy Day Blues," an intimate duet with Benoit (whose steady toe-tapping sets the tempo). "If I Could Quit You" is a sultry slow-dance vehicle in the vein of Earl King's "Those Lonely Nights"; it is perfect for a hot August Saturday night at the Mid-City Rock 'n' Bowl, one of Benoit's favorite venues in New Orleans. And his heartfelt rendition of "Laundromat Blues" contains some particularly toe-curling licks and direct guitar quotes from Albert King himself.

With *Standing on the Bank*, the 28-year-old Benoit distinguishes himself as a strong contender on the new blues-rock scene; he's got chops, plays with conviction, and above all has heart—a necessity for a bluesman. *Bill Milkowski*

Photograph: ©Jimmy Katz

Jim Campilongo and The 10 Gallon Cats

BLUE HEN #1, 43:26
Sound: B, Performance: B+

Brisbane Bop: Western Swing, 1961-64

Jimmie Rivers and The Cherokees
JOAQUIN JR2501, 71:20
Sound: C–, Performance: A–

People tend to put jazz and country at opposite ends of the spectrum, but there's long been a junction where the two mix it up. The resulting fracas, whether you call it western swing or cowboy jazz, has maintained loyal adherents since Bob Wills and The Texas Playboys first rode the range more than 50 years ago.

Jim Campilongo and The 10 Gallon Cats represent the genre's current state of the art. Campilongo, an accomplished and innovative guitarist, penned 11 instrumentals for the group's self-titled debut. (Stick around after the last track to hear "Ping-Pong," an unlisted bonus selection.) He and his sidemen—steel guitarist Joe Goldmark, bassist Chris Kee, and drummer Ken Owen—keep it clean, sweet, and snappy throughout. Only "Bully Cat," an intoxicatingly raunchy seven-minute roll in the mire, stretches out at length; the rest of the cuts clock in at an average of three minutes each. Nary a word is sung, but the tunes are so varied and lively that vocals would have spoiled the mood. Campilongo's playing reveals a range of influences stretching from Roy Buchanan to Chet Atkins. One highlight, "Swingin' with The Cats," pays homage to Jimmie Rivers, another Campilongo favorite, albeit one of considerably less acclaim.

Rivers was the leader of an eight-man, late '50s to early '60s house band at DeMarco's 23 Club, a Brisbane, California, nightspot. There, when they weren't backing Lefty Frizzell or Ernest Tubb, Rivers and the boys indulged their own whims. *Brisbane Bop* captures those flights of fancy, and it's a revelation.

Rivers is a sophisticated, fleet-fingered player with a fondness for Charlie Christian and Barney Kessel. His eclectic taste in material encompasses everything from pop standards to the odd Art Pepper cover. *Brisbane Bop* is culled from informal recordings made by Vance Terry, The Cherokees' steel guitarist. Although it's not clean by today's standards, the CD is eminently listenable and has its own kind of honky-tonk charm. The "whoops" from the crowd and on-stage announcements ("every Sunday we'll start at 7. . .so you can get drunk and go home early") gives the 19-song collection a roadhouse ambience.

The 70-year-old Jimmie Rivers doesn't play much anymore, but he sat in recently with The 10 Gallon Cats. Jim Campilongo, meanwhile, appears frequently at Rivers' old stomping ground, the 23 Club. What could be more natural than a collaborative album? We'll have to wait for that one, but in the meantime, these two collections should tide us over just fine. (*Jim Campilongo and The 10 Gallon Cats* is available from Blue Hen Records, 258 San Benito Road., Brisbane, Cal. 94005; *Brisbane Bop: Western Swing, 1961-64* is available from Joaquin Records, 254 Scott St., San Francisco, Cal. 94117.) *Steven Stolder*

Puttin' It Down

Terry Evans
AUDIOQUEST AQ-CD 1038, 52:35
Sound: A+, Performance: A–

Maybe it's his Vicksburg, Mississippi, roots, or it might be that this "live"-in-the-studio recording presents such a clear portrait of a naturally gifted soul/blues singer. Whatever the reason, *Puttin' It Down* feels real. After 25 years on the L.A. club and session scene, Terry Evans has paid his dues through thousands of gigs and countless recordings as a backup vocalist. Now his deep, resonant voice is front and center, where it belongs.

To maintain the feel of his live shows, Evans used his touring band (smart) and added old buddy Ry Cooder (very smart), who contributes some of his best fretwork in years. Cooder's evocative guitar sound is more color and flavor than mere individual notes or chords. He's an intuitive player who bypasses the brain and heads straight to the spirit.

Evans and company pull out all the stops on "Down in Mississippi," a J. B. Lenoir tune that will send shivers down your spine. Evans preaches the potent southern imagery of the song as Cooder's guitar stings like a thousand bees and Jim Keltner's drums fuel volleys of thunder. The shuffle beat that percolates through "Rooftop Tomcat" gives Evans plenty of room to growl and howl. But the album's finest moment is the final track, "Blues No More." Evans begins the song with his voice pulled way down low, drawing you in. Slowly, very slowly, he lets the tension build, begging and pleading, but still manages to hold on to his dignity. It's a chilling performance.

Contemporary R&B artists rarely achieve the heights that Terry Evans and Ry Cooder have attained on *Puttin' It Down*. The interplay is magic. *Steve Guttenberg*

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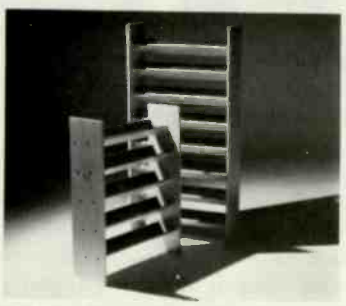

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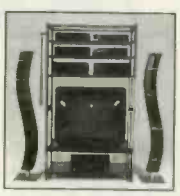

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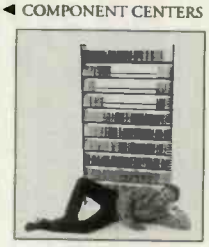

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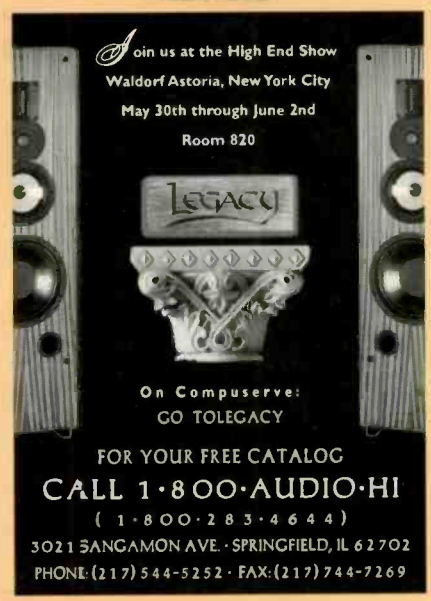

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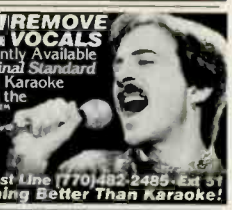

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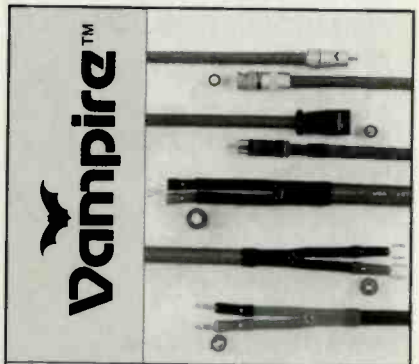

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PlayBack

Audio Advisor ELFIX AC Polarity Tester

Audio Advisor's ELFIX polarity tester ($29.95) is a handy device that checks for AC potential between the chassis of your audio components. This enables you to orient the prongs of each component's AC plug for minimum potential, reducing leakage current between your components and keeping hum in your system as low as possible. The ELFIX also tells you when you have oriented each component's AC plug so that potential between chassis and ground is at its minimum, the safest condition.

As you hold the ELFIX near a chassis, a red LED glows when AC potential is present. Reverse the AC power plug, and watch the LED: It glows with either AC plug polarity, but one polarity will cause the LED to glow only when the ELFIX is brought very close to the

component. This is the polarity to use, because the chassis has the lowest AC potential. You can check each component, one by one, as you plug it into an AC outlet. Some people contend that correct AC plug polarity improves perceived sound. Whether this is true or not, there's no disputing that it is the preferred AC polarity for safety.

GRADE: B

Edward M. Long

For literature, circle No. 120

Audio by Van Alstine
Ωmega III 440hc Amp and FET Valve EC Preamp

Frank Van Alstine has quietly made affordable, audiophile-quality gear for years. The Ωmega III 440hc power amp ($1,399) and the FET Valve EC hybrid preamp ($999, plus $199 for an optional phono stage) are two of his top-of-the-line products. Ergonomically, the FET Valve EC is a throwback to the days when preamps had abundant flexibility: It has defeatable tone controls, muting, a high-cut filter, and a stereo/mono/left-only/right-only channel switch. There are also two tape loops and a processor loop, six line inputs, and a headphone amp. The Ωmega III 440hc power amp is rated at 220 watts per channel.

GRADE: A-

Used together, the amp and preamp had excellent transparency and very good bass performance, and they revealed no harshness. With other amps, the preamp sound remained impressive on all kinds of recordings. Bass was a touch warm at times—but not "tubby," like the bass of other preamps I have heard that use tubes. The only anomaly from either product was an almost melodic noise from the speakers that I heard about 10 seconds after turning off the amp. Van Alstine said the noise is a side effect of the amp's regulated power supply; it occurs at 0.01 watt out and did not affect normal operation.

John Gatski

For literature, circle No. 121

Golden Sound DH Cones

DH cones are made of a ceramic material whose claimed hardness is surpassed only by that of diamond. Golden Sound says that placing three cones under your audio equipment, including loudspeakers, will make the sound more transparent, with tighter bass and better image stability. DH cones come in sets of three and are available in four sizes; a 1⅜-inch set is $70, a 1-inch set is $50, a ⅞-inch set is $40, and a ⅝-inch set is $20. The instructions tell you to place each cone's flat side under the equipment, with the pointed side against the floor or equipment cabinet.

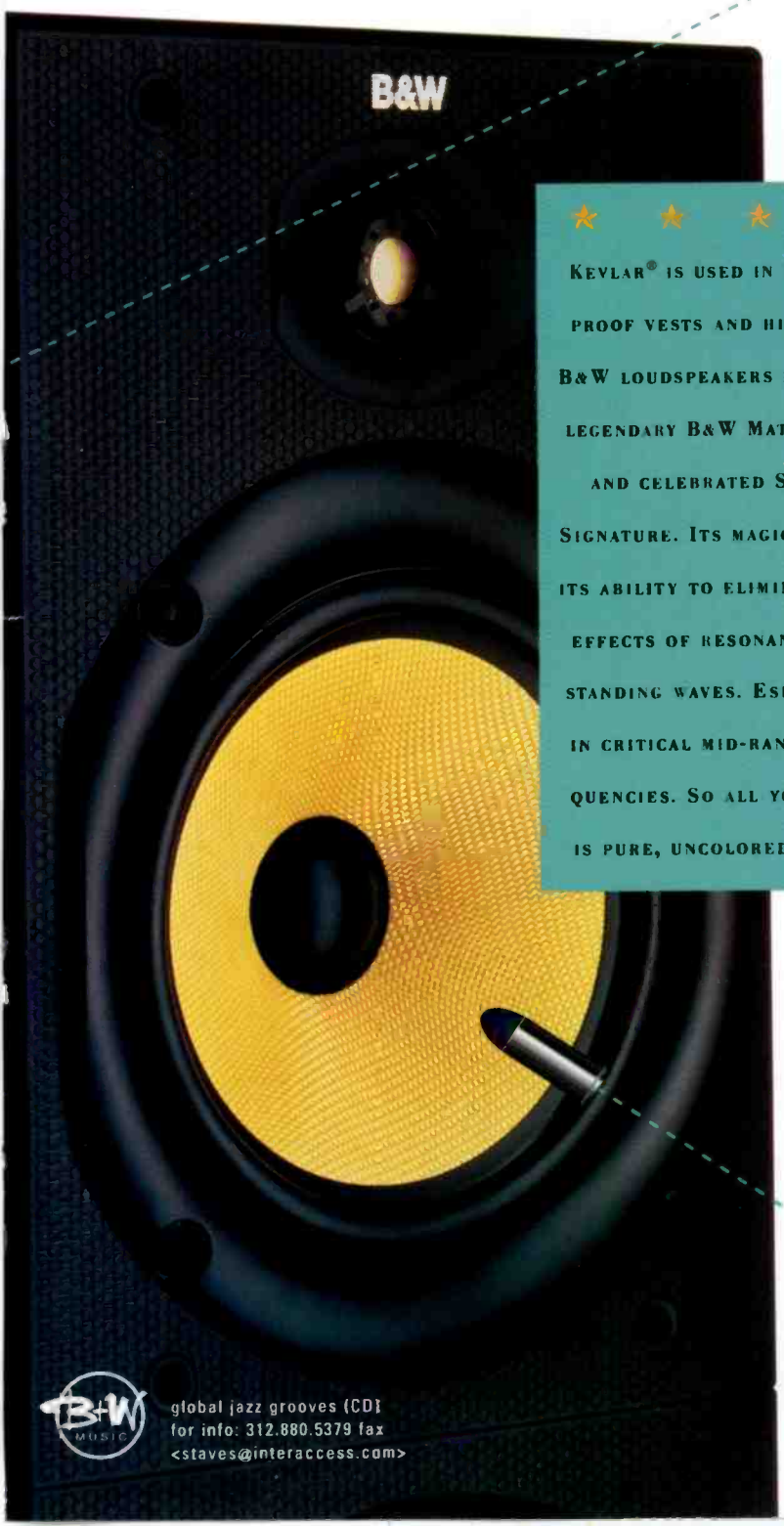
I have tested a number of isolation devices by applying mechanical impulses and measuring the results with an accelerometer connected to a digital storage oscilloscope and an FFT analyzer. I've found that conical feet, made of various materials, do affect the vibrational energy in both the time and frequency domains. They all cause a delay in energy transmission, but there are subtle differences between them. The Golden Sound DH cones do change the sound slightly; whether the sound is better or worse is a matter of subjective judgment. I suggest that you obtain return privileges if you buy them.

GRADE: C+

Edward M. Long

For literature, circle No. 122

A bullet-proof argument for the new B&W 600 Series.



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End of argument. Any questions? Fire away. Call 1-800-370-3740.

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