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AUGUST 1998

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POWER AMPLIFIER

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THE AUDIO  
INTERVIEW:  
Andy Kotsatos of  
Boston Acoustics

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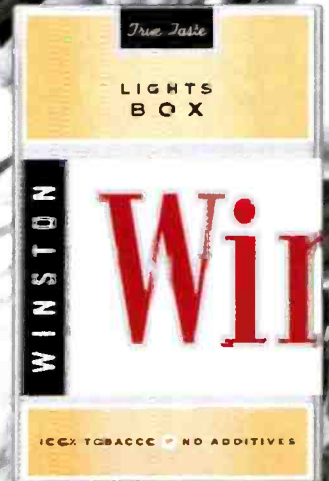
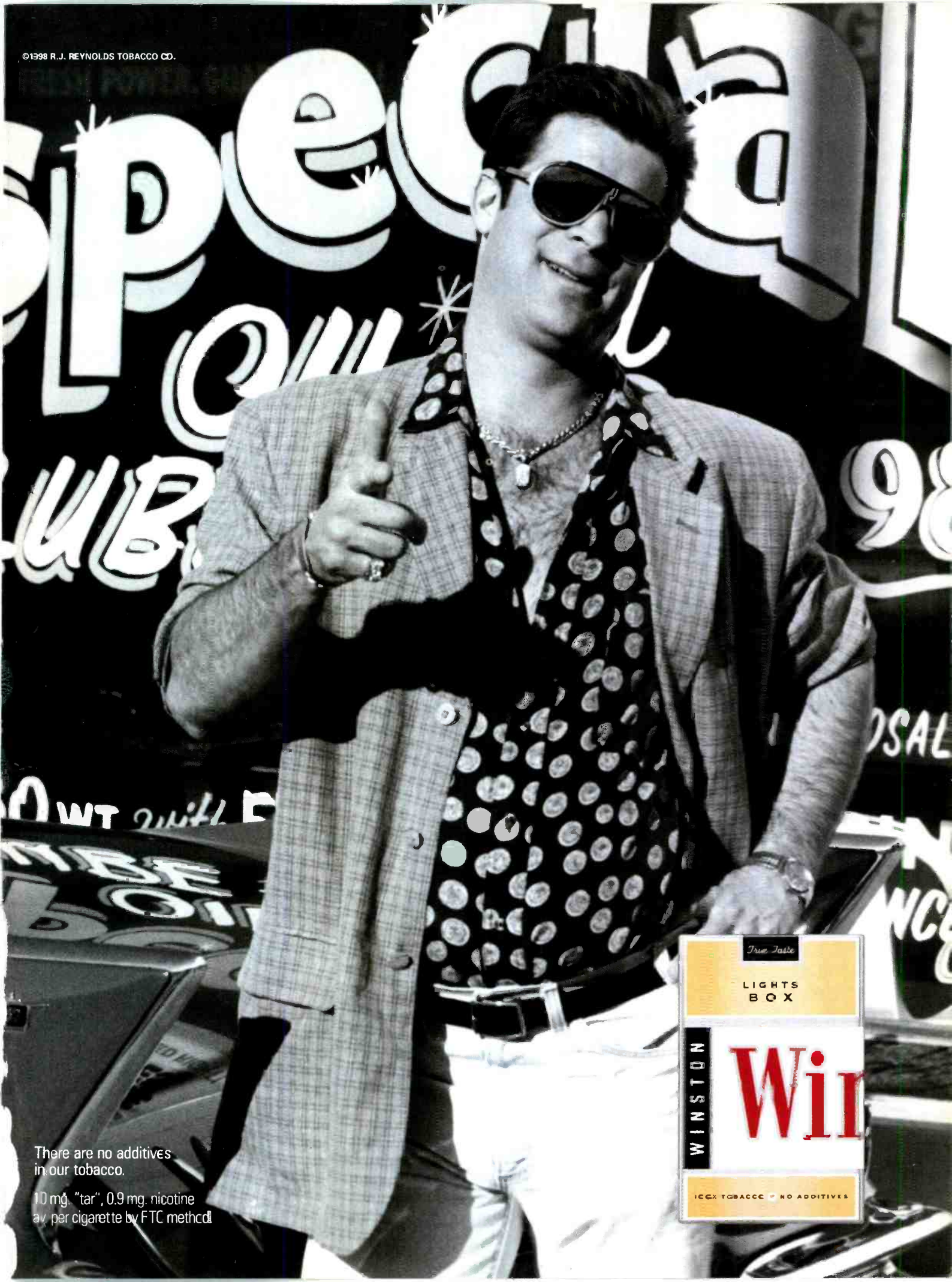
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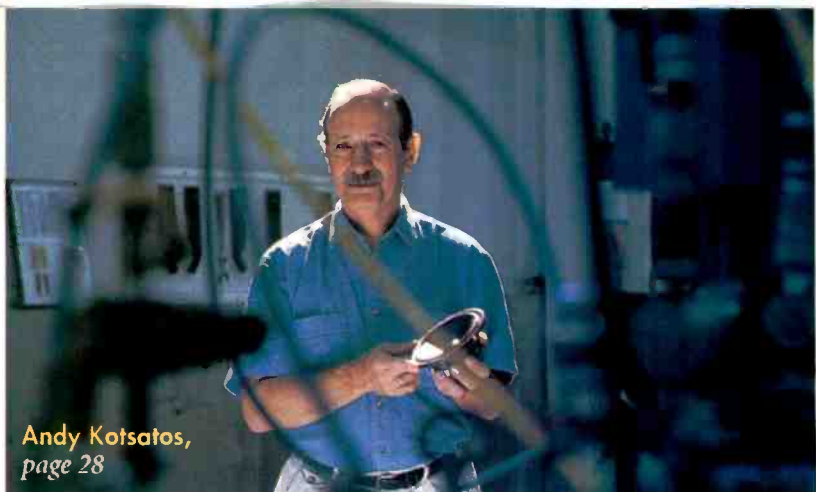
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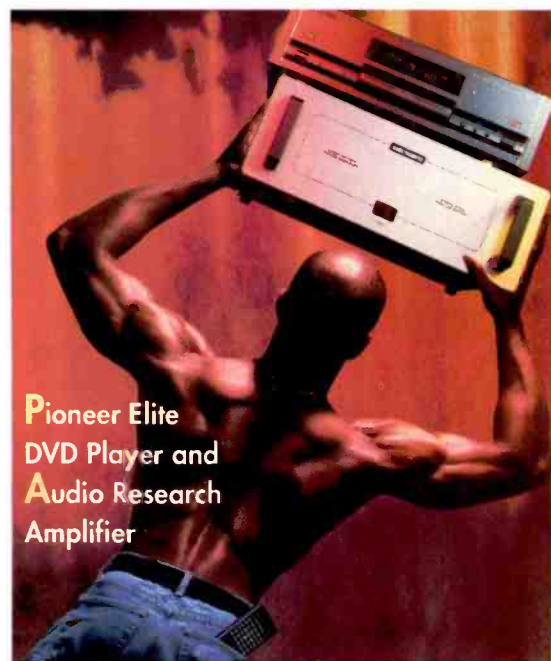


# AUDIO

THE EQUIPMENT AUTHORITY



Andy Kotsatos,  
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Pioneer Elite  
DVD Player and  
Audio Research  
Amplifier

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TYRA ON THE MAKE.

**A**lmost 10 years ago, I wrote my first and so far only book, a slender volume titled *Understanding Audio and Video*. It is out of print now and, in any event, rather out of date in quite a few respects. Occasionally I am tempted to update it, but then I remember how much time and work went into the first go-round. Writing the book in the first place gave me new respect for people who write books! And as I said, it wasn't even a very big one.

The reason I bring this up is that I get asked on a fairly regular basis to recommend a good introductory book on audio, and just as regularly I come up blank. Most of the time there just isn't one available—at least, not one that I'm aware of. Recently, however, a couple of books have crossed my desk that might fill the bill.


The first is Howard Ferstler's *The Home Theater Companion* (Schirmer Books, 1633 Broadway, New York, N.Y. 10019). It provides a surprisingly comprehensive survey of what a prospective buyer needs to know about audio and video gear and how it goes together in a system. Title notwithstanding, this book is just as good for someone interested in putting together a strictly music-oriented system as for the budding home theater aficionado. And while the main body of the text is largely nontechnical, boxes are sprinkled throughout that explain key concepts in more depth. It also contains a very complete glossary as well as a substantial bibliography.

There are occasional lapses (such as a paragraph that discusses fiber-optic cables as if they were for analog rather than digital connections), and I suspect just about any regular reader of *Audio* would find things to quibble with here and there. But this is a book written for the person who might someday become an *Audio* reader rather than for one who already is; for that person, I don't currently know of any better introduction to the subject.

The second book, though also an introductory text, is of quite a different sort and far more likely to hold the attention of readers who already know

quite a bit about audio. It is Tomlinson Holman's *Sound for Film and Television* (Focal Press, 313 Washington St., Newton, Mass. 02158-1626, www.bh.com/fp). Tom wrote this as a textbook for his film-sound course at USC. One might thus naturally assume that the book is of interest only to future film and television sound engineers. However, the first three chapters are excellent introductions to sound, psychoacoustics, and the basics of audio. In addition, the approach is often fresher and more informative than is common in books about audio. The rest of the book is more specialized, but I think you will still find plenty to enjoy. I can dip into it almost at random and pick up some interesting tidbit. As a bonus, it comes with a CD containing demonstrations relevant to various topics covered in the book. I expect audiophiles will find the examples of various microphone models and polar patterns particularly intriguing.

Finally, just as I started writing this column, I received from Harvey Rosenberg a copy of his book, *The Search for Musical Ecstasy* (Image Marketing Group, P.O. Box 4744, Stamford, Conn. 06907). Harvey is best known to audiophiles for his years as proprietor of New York Audio Laboratories and his coincident evangelism of the Futterman OTL tube amplifier circuit. This book is not an introduction to audio. In fact, although there is a lot of stuff about audio equipment and related subjects scattered through its pages, I would be hard put to say that it is *about* audio at all. (Take this section heading: "What the Hell Is an Expanded Gizmological Metacontext?") *The Search for Musical Ecstasy* is more like a quirky audiophile memoir, containing such things as instructions on how to listen to music, a map of the average male brain, and an account of Harvey's sexual awakening. Taken in small doses, it's a fun read, however you wind up categorizing it.



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### Floor Show

I enjoyed Don Keele's comparison between the Paradigm Reference Servo-15 and Velodyne F-1500B subwoofers in your April issue. However, I believe you gave the Paradigm an unfair advantage by stacking the Velodyne on top. Any subwoofer will perform better with floor placement!

Product comparisons are very interesting but must be free of such bias. *Steve Hepp via e-mail*

*Author's Reply:* Even know-it-all reviewers can get in trouble on this aspect of subwoofer usage. Thanks for pointing out that a subwoofer's output depends heavily on its position in the room. Of course, I realized this, but I thought I knew my room well enough that stacking the two subwoofers one on top of the other would be close enough for a valid comparison. It wasn't!

Your letter, plus a phone conversation with the marketing manager of Velodyne (I just happened to be reviewing the HGS-12) prompted me to redo the comparison. I placed both subwoofers on the floor side-by-side but symmetrically positioned with respect to the corner. The Paradigm still noticeably outperformed the Velodyne in maximum output, but the difference was not as dramatic as before. As a second check, I switched the locations of the two subwoofers and got the same results. Doing this location switch with the original stacked setup would have immediately revealed its problems. But hey, those big subwoofers are really heavy and I was lazy!—*Don Keele*

### Hold the 'Phones

Having subscribed to *Audio* for several years, I learn a lot from your articles and reviews and hope that this letter does not sound too critical. I also do not mean to imply anything negative toward Sennheiser products, as I own a few that are fantastic. I do disagree, however, with Edward M. Long's January "Equipment Profile" of the Sennheiser HD 600 headphones.

Long begins his review with, "When I reviewed Sennheiser's HD 580, in the June 1996 issue, it was at the top of the company's extensive line of dynamic earphones (Sennheiser also makes more expensive electrostatic models), and I was convinced that it was indeed special. The HD 600 earphones, which the company has slotted above the HD 580s, are intended to be even more so. Although similar to the HD 580s, the HD 600s incorporate several refinements, use more costly parts, and carry more stringent specifications."

I have never listened to the HD 600s myself, but to say they are similar to the HD 580s without further explanation is a bit misleading. From everything I have read, the HD 580 and the HD 600 use the exact same drivers. The headphone cord (Kevlar-reinforced, with oxygen-free copper wires) is identical, the headband and cushions are the same, the earcup shape is the same, and they use the same velvet-covered, foam-filled ear cushions. One difference is that the bail (the piece that connects the earcup to the headband) is plastic on the HD 580 and made of carbon fiber on the HD 600. I guess this is what Long was referring to when he said it uses more costly parts. The bail has absolutely nothing to do with the sound; it merely helps hold the thing on your head.

The only difference, to my knowledge, that could possibly affect the sound is the mesh grille on the outside of the earcups. On the HD 580, the grille is plastic; on the HD 600, it is metal. The only way this could affect the sound, and this is really stretching it, is if the sound that bounces back to the listener's ear from the metal grille sounds different from the sound that bounces back from the plastic grille. Remember, these are mesh grilles; most of the sound is going to pass through, anyway. In a blind listening test, I doubt that even a Mr. Magic Ears could tell the difference between these two headphones.

A good portion of Long's review was devoted to comparing the HD 600s to the Stax Omega electrostatic headphones. This is

like comparing apples and oranges. While it's nice to know how one of the best dynamic headphones compares to one of the best electrostatic 'phones, this does not aid the consumer considering a purchase of a somewhat reasonably priced headphone. The HD 600 retails at \$449.95; most electrostatic headphones cost several thousand dollars. It would be of greater benefit to compare the HD 600 to other dynamic headphones. Would you consider doing a comparison of a jet plane and a car? They both get you from point A to point B, but that is pretty much where the similarities end. A plane and a car are completely different designs, as are dynamic and electrostatic headphones.

Long concludes his review by stating: "A year and a half ago, I ended my report on the HD 580s by saying, 'If you are looking for a comfortable, wide-range pair of high-quality earphones, you should check out the Sennheiser HD 580s. You won't be disappointed.' This is still valid, but now you should also check out the HD 600s and see if you agree with me that they are worth the additional hundred dollars." Well, unless Long can shed new light on the subject, I would have to disagree; I do not think they are worth the additional hundred dollars. But do not get me wrong: From my limited experience, I feel that the Sennheiser HD 580s and the HD 600s are the best dynamic headphones available on this planet. However, you have to give me more than carbon-fiber bails and metal mesh to make me spend an extra hundred bucks. It is like comparing two identical cars, with one exception: One has a sunroof, and one does not. For a 25% price premium, I can do without the sunroof.

*Ron Pruitt  
Upper Marlboro, Md.*

*Author's Reply:* Perhaps I should have amplified the fact that the HD 600 earphones "... use more costly parts, and carry more stringent specifications." Sennheiser told me that it sorts and matches the earphone drivers for the HD 600s to much tighter tolerances than for the HD 580s. I stated in the report that "The amplitude and phase responses were more uniform than were those of the HD 580 earphones," and that "Smoothness and left/right matching were even better in the HD 600 than in the 580..." The economic factors of tighter quality



control, which raises the cost, and sale of fewer of the more expensive HD 600s account for the higher price. The quality of the HD 600 will always be higher than that of the average HD 580.

I have my listening-panel members compare the sound of earphones under review to the Stax Omegas because they are considered to be the best available earphones. This gives the listening panel and the readers a consistent reference. The panel members' comments reveal that they often find the earphones under review to be better in some respects than the Stax. This indicates that the transducer type, electrostatic or dynamic, is not directly relevant to the evaluation of performance. It is how accurately they reproduce the sound of the recording that matters.

I am sorry that Mr. Pruitt hasn't listened to the HD 600. I still think it is worth the extra \$100.—*Edward M. Long*

### TV Needs Better Image

I've been a long-time fan of consumer electronics and always watch for new products that have real value. I often spend a bit more for a newly introduced product, so I jumped into CD technology right at the beginning and also bought an early Proton TV monitor, a Hi-Fi VCR, and, last year, a satellite dish system. But I feel like I've been waiting my whole life for a better TV. I can remember in the '60s wondering why they couldn't build something without the obvious lines and blurry characteristic of the then—and current—TV standard.

I recently went to a local high-end audio/video store that had completely converted to home theater systems. They demonstrated a variety of setups with DVD, AC-3 sound, and big projection-screen TVs. The sound was excellent, but the video was still distractingly poor, considering that prices ranged from \$5,000 to \$10,000. Unlike CD, where you can immediately hear improvement with decent speakers, DVD is only a little better because the old TV standard completely limits the digital recordings on any TV. Edges waver, colors appear blurry, and the lines are still so obvious as to leave no question that you are still watching a poor approximation of a film.

Some of the commentary about high-definition television (HDTV) and the use of

bandwidth for either higher resolution or more channels seems to miss the point. It is often said that most people don't care about a better picture when they watch TV, and I admit that I probably don't need more image resolution when I'm watching *Seinfeld* or *ER*. In a similar vein, I don't really care about hi-fi sound reproduction when listening to talk radio or pop music, but when I want to experience great music or movies, I don't want dull, hissy sound, and I don't want to see lines and blurry images, either.

To all manufacturers: I'm not spending any more money on fancy video hardware until a major improvement in image quality comes along. And since I've been waiting for this for so long, you can be sure the money will jump out of my pocket when it does.

*Peter Krumhansl  
via e-mail*

### The Pick

Bascom King gives a fairly complete "Equipment Profile" of the Lamm M2.1 mono amp (May). My problem with it came from too many stabilized line current readings. I find 1.5, 2.1, 4, and 8 amperes mentioned. This is (at least) one too many, even allowing for a two-position loading switch and one or two on the same power line at the same time. What gives? Also, is the output stage a follower? It's not really clear.

Hope you don't reject this "picking." I subscribe strictly for equipment reviews, and I have this fetish about consistency and things making sense.

*Don Stephan  
via e-mail*

*Author's Reply:* I think you might be confusing AC line current with output-stage DC idling current. The 1.5 and 2.1 amperes cited refer to output-stage idling currents for the 8- and 4-ohm settings on the load selector switch. The 4 amperes mentioned was the AC line current when the amplifier reached thermal equilibrium. It drew about 5 amperes when cold. The 8 amperes alluded to at the end of the review refers to the AC line current drawn by both amplifiers when warmed up and idling.

You did catch an omission on my part. I didn't mention the topology of the output stage. The MOS-FETs are connected as source followers.—*Bascom H. King*



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## Impedance and Amplifier Power Output

**Q** Will my 250-watt, 2-ohm amplifier drive a pair of 4- or 8-ohm speakers? And what would the amp's power output be into a load of 4 or 8 ohms?—Daniel Cones, Bartlesville, Okla.

**A** The fact that an amplifier can work safely into a 2-ohm load does not preclude it from successfully driving 4-, 8-, or even 16-ohm speakers. The 2-ohm rating indicates the *minimum* speaker impedance that the amp can drive without damaging its output stage or triggering protection circuitry. The power available will be at its maximum when the amp is connected to 2-ohm loads and will be reduced as the load impedance increases. Because a number of design characteristics are involved, there is no way to provide you with exact wattage ratings at different load values. However, if your amplifier is a typical Class-AB design, you can estimate, albeit very roughly, that its power output will be halved with each doubling of load impedance. For truly accurate ratings, consult your owner's manual or the amp's manufacturer.

## Defining Dielectric

**Q** I have heard the word "dielectric" used from time to time. Does it have something to do with capacitors? What is it?—Name withheld

**A** Yes, indeed, a dielectric is the insulating part of any capacitor. (Capacitors, devices for storing energy in an electric field, are used in DC circuits to store and release energy, such as a high-voltage pulse of current; in AC circuits, they can be used to block DC.) It is made up of two conductors separated by an insulator—the dielectric. When an electric current flows into the capacitor, a force is established between the two conductors separated by the dielectric. The dielectric material can be mica, paper, polyethylene, beeswax, or even air. The tuning capacitors in old analog radios are a good example. There is a series of stationary metal plates and a second set of plates that is free to move and interleave, or mesh,

with the fixed plates. The two sets of plates, although very close to one another, do not touch. This is an air-variable capacitor. The air serves as the insulator, or dielectric, between the two conductors. The tuning capacitors in analog portable radios are similar except that mica replaces the air dielectric. The plates do touch the mica, but it doesn't matter because the mica prevents the plates from shorting out.

The amount of capacitance in a capacitor is determined by a variety of factors, including the size, shape, and number of plates, their spacing, and the characteristics of the dielectric between them. Air has a dielectric of 1; mica's is much higher, between 4 and 9. If the dielectric increases, so does the capacitance (and vice versa). The use of dielectrics other than air can, and does, permit the construction of large capacitors requiring little space.

## Car Subwoofer Connection

**Q** Here in Australia, I bought a Sony car head unit (the XR-C750) because of its subwoofer output (two female RCAs, one red, the other white), but the installation guide doesn't quite answer my questions. Do the two RCAs represent left and right subwoofer outputs? And if so, how do I sum them to mono? I want to connect them to a power amp, then to Alpine Bass Engines (transducers) under the front seats of my son's car. Summing both channels to mono will give both seats the same sub-bass effect.—Senen A. Silvestre, via e-mail

**A** When I consulted Mark Weir, Sony Electronics U.S. car-audio product manager, he told me that your head unit, the XR-C750, is a 1997 model (replaced this year by the XR-C8200) and that the red and white female RCAs do indeed represent the respective right and left subwoofer outputs.

However, he pointed out that virtually all modern car stereo amplifiers (those built in the last decade or so) are self-bridging designs, with separate left- and right-channel input jacks and internal mono-summing circuitry. By connecting the positive and negative speaker leads from your subwoofer

(the Alpine Bass Engine) between the amplifier's positive (+) terminal of the *right-channel* speaker output and the negative (-) terminal of the *left channel*, the subwoofer will automatically receive a summed mono output. (Some older car stereo amps may have a summing switch that will need to be set to the mono position.)

In any case, do *not* use a Y-adaptor; connect the stereo subwoofer RCA connectors from your head unit to the left- and right-channel input jacks on the power amp.

According to the May/June 1997 *Car Stereo Review* product directory, the rated impedance of the Alpine Bass Engine is 4 ohms. Because you plan to run two in parallel, the combined impedance presented to your amp will be 2 ohms or less. Check the manufacturer's specifications for your power amp to ensure that it has low-impedance drive capability to 2 ohms and that it will remain stable doing so.

## Upside-Down Speakers

**Q** Some speakers I like from NHT use an upside-down driver array, with the tweeter mounted below the woofer. The location of my Boston Acoustics speakers puts the tweeters too high: The woofers are at ear level and the tweeters are well above that. Would inverting the speakers (to bring the tweeters to ear level) also invert the music presentation, placing the bass frequencies above the high frequencies? And what other effects might I expect? Could it damage the crossover or internal parts?—August Timmermans, via e-mail

**A** You won't damage the crossover or anything else by turning the speakers upside down, nor will the music presentation be inverted. But the speaker's overall dispersion characteristics will certainly change. If your speakers are elevated on a bookshelf or near the ceiling, inverting them, as you suggest, might well improve high frequencies at your listening position by bringing the axial response of the tweeters closer to ear level.

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



Speaker designer Ken Kantor, of Ver-  
gence Technology and the cofounder of  
NHT, notes that (all other things being  
equal) you'll get the most satisfactory fre-  
quency balance listening to most speakers  
on axis. When he designs a two-way speak-  
er, he chooses the woofer first, then the  
tweeter, considers their respective direc-  
tional characteristics and sensitivities, se-  
lects the crossover frequency and slope, and  
then calculates the constructive and de-  
structive effects of the drivers' combined  
responses with the crossover in the circuit.  
Kantor explains that sometimes mounting  
the tweeter below the woofer yields the  
smoothest combined response from the  
two drivers at the listening position; other  
times, the more common arrangement of  
woofer below tweeter produces the best re-  
sponse. "You gotta make 'em work togeth-  
er," according to Kantor, who then goes on  
to add that "you're at the mercy of the  
crossover."

Why not try experimenting with your  
Boston Acoustics speakers? You can't de-  
stroy anything, and you'll learn something  
along the way.

### To Poke or Not To Poke

**Q** Without warning, my amp will clip  
(right channel first), then go into pro-  
tection when reproducing fairly loud pas-  
sages that contain sudden peaks (e.g., an ex-  
plosion in a movie soundtrack). The same  
thing happens if I just crank it up. The amp  
has three different voltage rails and taps into  
the appropriate rail (depending on demand),  
drawing its power mainly from the trans-  
former and two smallish capacitors in order  
to produce its maximum output of 375 watts  
per channel. I suspect the transformer first  
and the capacitor (right channel) second.  
Because the amp's warranty has long ex-  
pired, I thought I'd try fixing it myself. I own  
a multimeter and am not afraid to poke  
around inside; I'm just not sure where to  
poke and what to test for. Where would you  
begin, and what would you look for?—John  
Jost, via e-mail

**A** If your amplifier has served you well  
and this problem has arisen only re-  
cently, I can rule out the transformer as a  
primary cause. Power transformers are  
rather stable devices; a winding can short  
out, or open, but usually that's it.

Before you start poking around inside  
the chassis, you should have a schematic  
and a service manual that describes the log-  
ic used for the voltage-rail selection. I  
would start by replacing the filter capacitor,  
but my gut feeling is that the problem lies in  
the logic circuits used for selecting the ap-  
propriate voltage rail.

That said, there may be nothing wrong  
with your amp. It's possible that the pro-  
gram material you're using may be too de-  
manding for your amp to handle at the lis-  
tening levels you prefer. Low frequencies  
place the greatest demand on an amp. Some  
of the explosions heard in soundtracks can  
have low-frequency components below 30  
Hz. They may not sound very loud, but the  
power level required to reproduce them can  
be very high, especially if your speakers are  
acoustically inefficient.

Ask a dealer or a friend if you can borrow  
a powered subwoofer that has internal low-  
and high-pass filters. Then you can direct  
the low frequencies to the sub, keeping  
them out of your main speakers. If your  
amp's premature clipping ceases, you'll  
have your answer. **A**

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remote control



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# WHAT'S NEW

## Harman Kardon Home Theater System



The Festival 80 comprises a seven-disc CD changer, five two-way satellite speakers, a five-channel amp with Dolby Pro Logic, an AM/FM tuner with RDS data display, and a subwoofer powered by an internal, 95-watt amp. To save space, all amps are contained in the sub's enclosure. They are rated at 60 watts into 8 ohms

(0.09% THD) to left, center, and right channels, with 20 watts to each surround channel. The Festival uses an intuitive design with a large, readable display that presents only the information needed to control the source currently playing. Price: \$2,199. (Harman Kardon, 516/496-4868)

## CAMBRIDGE SOUNDWORKS POWERED SUB/SAT SYSTEM



Intended for various listening applications, including computers, PC Works comprises two small, magnetically shielded satellites and a compact, shielded woofer with an internal three-channel power amp. Each 3-inch satellite cube contains a 2¼-inch long-throw driver for

frequencies above 150 Hz. The ported woofer, about 9 inches wide and 6 inches high, has a 5¾-inch driver for low frequencies. Features include controls for volume and woofer level and stands to angle the satellites for good imaging. Price: \$69.99. (Cambridge SoundWorks, 800/367-4434)

## B&W SPEAKER

With its smoothly curved rear/side paneling molded from 24 layers of birch, the cabinet of the Nautilus 801 is said to resist internal standing waves and resonances far better than square-box enclosures. The flared port has anti-turbulence dimpled surfaces. And the tapered, spherical shape of the midrange and tweeter "heads" is said to be diffraction-free. Standing 44 inches tall, the three-way system uses a 15-inch woofer, a 6-inch midrange driver with a woven Kevlar cone, and a 1-inch metal-dome tweeter. On-axis frequency response is rated at 29 Hz to 22 kHz, ±3 dB, with -6 dB points pegged at 23 Hz and 30 kHz. Price: \$11,000 per pair. (B&W, 978/664-2870)



## Energy Speaker

Using a rigid yet lightweight front baffle of composite copolymer that is said to be highly resistant to resonances, the e:XL 26 is a magnetically shielded, floor-standing, two-way system with dual 6½-inch woofers and a ¾-inch aluminum-dome tweeter. Frequency response is rated at 37 Hz to 20 kHz, ±3 dB, with sensitivity at about 94 dB. The polypropylene woofer cones, which have nitril-rubber surrounds, are said to reduce distortion from nonlinear cone motion. The 36-inch-tall system is available in black ash, rosewood, or light birch. Price: \$750 per pair. (Energy, c/o API, 416/321-1800)







Jazz festival

grand prize

trip for two to paris to attend the JVC jazz festival paris in october '98 (6 days/5 nights) including air transportation, hotel, concert tickets and VIP passes arv: \$7000



1st prize

JVC digital satellite home theater system the future of home theater featuring a digital surround sound system and satellite broadcast recorder arv: \$4000



2nd prize

Gibson® guitar model №ES-135 arv: \$1598



3rd prize

JVC Kaboom Box the only 52 watt CD portable with dual sub woofers to deliver body-shaking bass arv: \$330



4th prize

JVC jazz festival t-shirt arv: \$20



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# WHAT'S NEW



crossover, bass-boost circuitry, a high-

## JBL CAR AMP

One of JBL's Decade Series, the DA6502 is a two-channel amp rated at 65 watts per channel into 4 ohms, from 10 Hz to 20 kHz, at 0.1% THD. S/N is specified at 90 dB or better. The amp has variable input sensitivity, a built-in second-order Butterworth

output MOS-FET power supply, a floating-ground factory head-unit input, and Triple Threat protection circuitry, which is said to prevent damage from shorts, thermal runaway, and excessive current demands. Price: \$229.95. (JBL, 800/336-4525)

## PANASONIC IN-DASH CD RECEIVER



Designed with a rugged chassis and 10-second anti-shock memory, the CQ-DPG590 is intended to handle the pounding of a speedboat through waves or bumpy off-road driving conditions of a sports utility vehicle without skipping. A circular LED meter displays the amount of buffer memory in use as well

as settings for volume, balance, bass, and treble. The built-in four-channel amp is rated at about 40 watts per channel. Other features include 20 AM/FM presets, front and rear pre-outs, a subwoofer output, a remote, and a removable faceplate. Price: \$399.99. (Panasonic, 800/222-4213)

## PROCEED FIVE-CHANNEL THX POWER AMP



Madrigal says its Proceed AMP5 will deliver 125 watts per channel continuously into 8 ohms, from 20 Hz to 20 kHz, at 0.1% THD, with all five channels driven simultaneously. Under the same test conditions, it is rated to produce 250 watts per channel into 4-ohm loads. Heavy-duty internal heat sinks

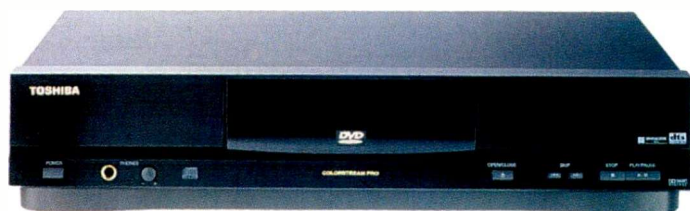
are used in this 110-pound amp. Eight gain-matched output transistors (the same as those used in the Mark Levinson No. 33H power amp) are employed in each channel. The AMP5 has balanced and unbalanced inputs. Price: \$4,995. (Proceed, c/o Madrigal Audio Laboratories, 860/346-0896)



## Marantz Integrated Amplifier

Using premium-grade resistors and capacitors and precision-wound toroidal transformers, the Reference Series PM-17 is rated to deliver 60 watts per channel into 8 ohms and 100 watts per channel into 4 ohms. The PM-17 has high current

capacity and uses discrete power-output stages and a low-impedance power supply. Phono inputs are provided for moving-magnet or moving-coil cartridges, and the bass and treble controls can be bypassed. Price: \$1,299.99. (Marantz, 607/307-3100)



## TOSHIBA DVD PLAYER

Equipped with ColorStream Pro component-video outputs, the third-generation SD7108, when mated with a Toshiba ColorStream Pro inputs, enables viewing of DVD movies

the way they are recorded—with progressively scanned images and true 480-line vertical resolution. The SD7108 also has built-in Dolby Digital decoding, DTS compatibility, a bit-rate meter, and 24-bit/96-kHz audio D/A converters. Price: \$1,199.95. (Toshiba, 201/628-8000)





*Nautilus™ 800 Series*

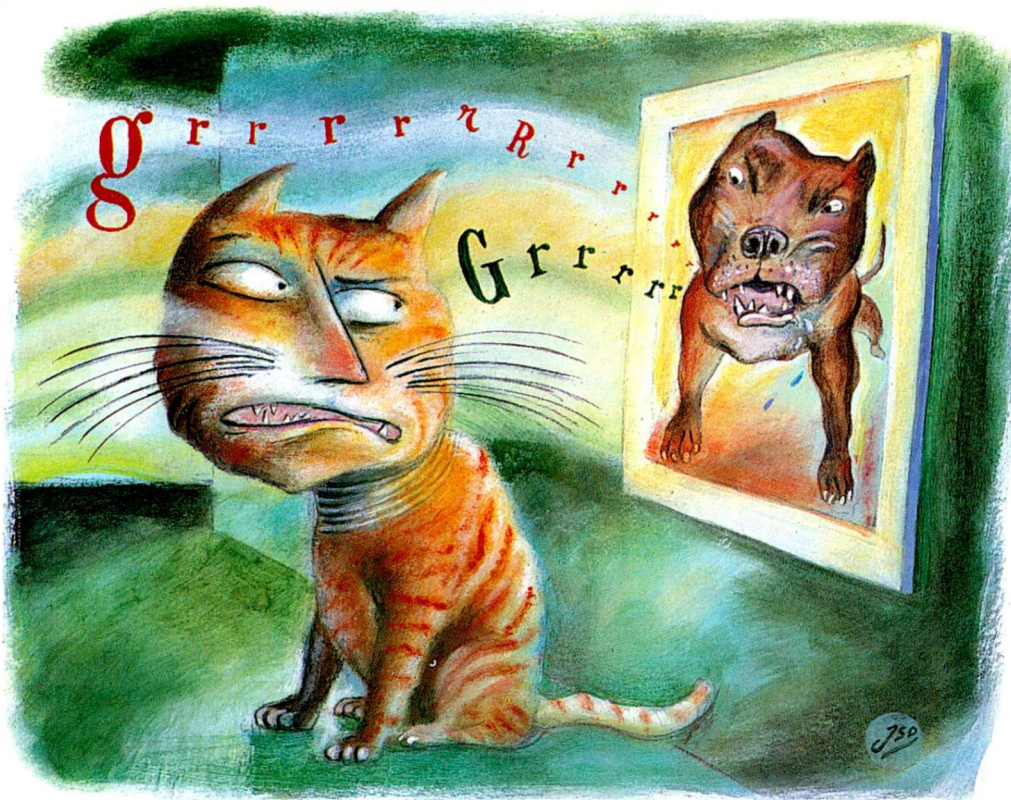
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## THIS JUST IN



Just so you don't think I like to leave you hanging, wondering what comes next after I've fed you a bunch of teasers, it's update time—especially timely when it involves something as potentially earthshaking as NXT.

While I'd rather not be thought of as one of NXT's publicists, it's worth noting that you should actually be able to buy finished, shop-ready NXT flat speakers even *before* this column sees print. The flat-panel revolution, a hot topic for the last couple of years, *is* happening. So, who's first to the post with commercially available panels? The Verity-owned Mission? Nope. It's actually Wharfedale, Mission's former sister company.

I'm writing this approximately eight weeks before *Audio* hits the stands, so it's a bit like mixing up hindsight and foresight, but bear with me. On my desk is an invitation to Wharfedale's upcoming NXT Roadshow '98, a 10-date series of exhibitions around the U.K. It's a week away at the time this is being written, so I've had to beg some details even though a press embargo is in place. Compromise, therefore, was required on Wharfedale's part, while I in turn promised not to unveil too much. In other words, I can tell you only as much as Wharfedale has revealed "unofficially" at this point.

One thing I can report, though, is the company has trademarked the name LoudPanels, which is a much

cooler name than NXT. Another is that the two debut models are pretty much finalized. What's most interesting, though, is that Wharfedale has unashamedly published the frequency response—unlike certain other key players. Instead of pretending, as others might, that NXT panels are full-range designs capable of doing justice to Charles Mingus at full whack, Wharfedale quite openly discusses them as reproducing the mid-band and treble regions.

It's like this: The WXT-04 is the ceiling-tile version of Wharfedale's NXT flat-speaker debut, a square panel 23½ x 23½ inches (595 x 595 mm) that looks exactly like the stuff in many offices with suspended ceilings. And it's only 1 inch thick, so it can be treated just like the ordinary, mute panels it replaces. You simply lift out the old one and drop in the LoudPanel. Not being a builder, I can't say if 23½ x 23½ inches is a standard size for Europe, but I'll assume it is; I'll also presume that Americans will be offered whatever is the U.S. standard ceiling-tile size, specified in inches.

As for the hi-fi stuff, the WXT-04 (remember, it fires *down* at you) has three taps for adjusting levels. You can set up the speaker for ratings of 1¼, 2½, or 5 watts, and sensitivity is stated at 78 dB SPL for 1 watt at 1 meter, 75 dB for 1 watt at 2 meters, and 72 dB for 1 watt at 3 meters. Given those specs, you're right to assume that the WXT-04 is designed to supply public-address system announcements, background music,

**WHARFEDALE**

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**NAGRA**

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*Nautilus™ 800 Series*

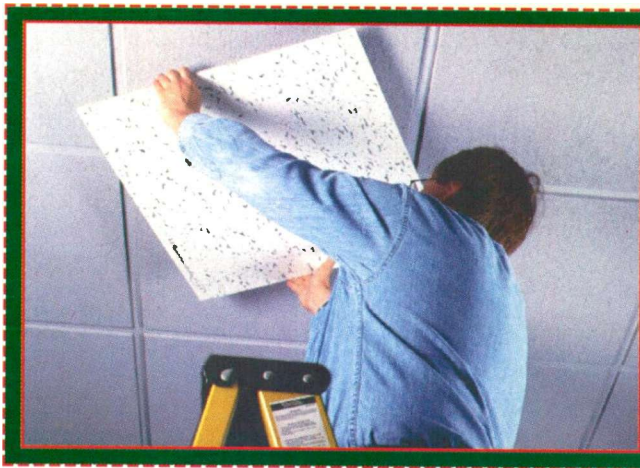
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**"We have ways of making your ceiling talk—or sing," says Wharfedale.**

and other similar needs. Indeed, this speaker is also described as providing "100-volt line operation." Its stated frequency response? An honest 200 Hz to 18 kHz.

And then there's the WXT-06, the one that looks like a painting and can even hang on the wall. [Editor's Note: Wharfedale will sell it in the U.S. as the Picture Panel—A.L.] The promotional literature states quite clearly that "it is recommended that these panels be used in systems which also include a Wharfedale powered subwoofer." That's because the WXT-06 has a frequency response of 250 Hz to 18 kHz. How's that for honesty?

The WXT-06 differs in many ways from its ceiling-mounted sibling. Its driving elements are two 25-watt Wharfedale transducers attached to the aluminum-core laminate panel. Size differs as well: The WXT-06's dimensions are about 23½ x 12½ x 1¼ inches. In addition, you can decorate it with any paper print affixed to the panel with "a normal mounting adhesive."

Then there's the pricing. Given that the official announcements were being held until the date of the NXT Roadshow, I am permitted to say only that the price for the first panels will be "under £500" (approximately \$850), but that Wharfedale is hoping to bring it down even further. Frankly, I don't think price is going to matter one bit to those who have been screaming for years for speakers that disappear into the room, take up no floor space, and don't look like wooden boxes. No bass below 200 Hz? Big deal. For interior designers and decor-obsessed wives everywhere, these speakers are the answer to their prayers. And for us audiophiles? To be frank, it all depends on how much we're forced to compromise. . . .

Now, what about the Euro launch of DVD? Don't worry: It's under control. Sony handed out Zone 2/PAL copies of *Jerry Maguire* to the assembled hacks at its Spring 1998 press conference, and we eagerly awaited the first Euro-spec DVD players for review. To that end, I hastily begged for first dibs on Pioneer's luscious DVL-909 LD/DVD combo player, a videophile buddy in the U.S. having informed me that it's *the* combo player to own.

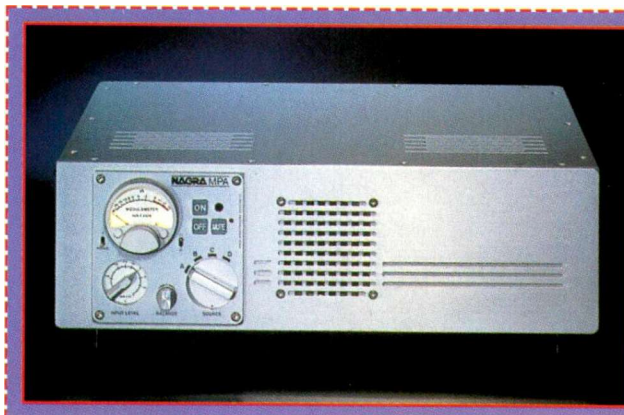
Well, the combo player was just what the doctor ordered, especially as its laserdisc portion plays both NTSC and PAL discs, while my present player is NTSC-only. The 909 has every feature I could want and more, plus it looks terrific, and even I can afford one. When it arrived, the good John Bamford of Pioneer said: "Don't worry, K.K., it's identical in every way to the machines that will be in the shops—with one exception. This one runs on 240 volts and it plays PAL laserdiscs, but it's, uh . . . Zone 1. NTSC Zone 1."

He reassured me a few times, perhaps overly concerned, that the visuals would be identical to the PAL ones. But he worried needlessly. It wasn't really an issue, as I was concerned mainly with the sound quality.

Whatever, I'm hooked on the 909, though I hasten to add that it hasn't softened my hatred of the evil swine in Hollywood who thought up the zoning feature. Oh, and I still haven't seen the Zone 2/PAL version of *Jerry Maguire* . . .

Now about Nagra, the manufacturer that still has me wishing that I had a spare \$9,000 or so for its jewel-like PL-P preamplifier. True to its word, the company has come up with the goods in the amplifier department (it was introduced in June in the United States). But Nagra's debut power amp is not the single-ended triode, 845-equipped gem we saw in Las Vegas at January's Consumer Electronics Show. No sir. Rather, the Swiss firm has followed the PL-P with the Nagra MPA, a MOS-FET power amp. The MPA is rated at 250 watts per channel into 8 ohms in Class-AB mode, which the company feels should be enough to drive any speakers on the market. However, provision has been made to enable the MPA to produce even more power (probably because Nagra is used to dealing with the sort of partially deaf animals that inhabit recording studios). Thus, the amp can be bridged for mono operation to deliver a very meaty 500 watts (into 4 or 16 ohms). Also reflecting Nagra's familiarity with the professional sector are studio-grade construction and balanced XLR connectors.

More in keeping with domestic concerns, though, is the option of ordering the MPA with remote-control and multiple input options. This enables infrared selection of four input sources as well as remote control of volume, balance, and mute. And a Nagra wouldn't be a Nagra without one of the company's famous modulometers on the front panel: On the MPA, it provides a read-out of the output power in watts, referenced to two separate scales.



**The MPA power amp has Nagra's familiar modulometer on its front panel.**



If the MOS-FET topology of the Nagra MPA strikes some of you as curious, especially because the PL-P preamp (and the other new power amp, for that matter) is shamelessly of the tube persuasion, I have been reassured by an esteemed colleague that the MOS-FET is, in certain quarters, a flavor of the month/year. I suspected that MOS-FETs were creeping back into acceptability; Nagra's choice of them for the company's first power amplifier confirms it.

As for the Eurovision Song Contest I reported on in June, well, those of you whose interest was piqued by my report on Europe's singularly most embarrassing annual attempt at re-creating the *Ted Mack Original Amateur Hour* will get a kick out of this year's results. The winning song was, as usual, an instantly forgettable slice of glossy Europop. The winning country (drum roll please): After three hours, and the tabulating of votes from 100 million viewers, the closely contested affair ended with Israel pulling ahead of Malta and Great Britain in the very last round. It was the nation's third time at the podium.

While the winning song may have been forgettable, the drop-dead gorgeous victor was not. The Gaultier-clad chanteuse, all long limbs and glistening teeth and luxurious black hair and ruby-red lips and—ahem, er, sorry—collected the prize amidst much cheering and revelry.

Oh, but there was also much wailing and gnashing of teeth, too, for the winner, songstress Dana International (crazy name, crazy gal), is a 26-year-old former drag queen who stands 6 feet 3 inches tall. Why "former"? Because Ms. International, born Yaron Cohen, has had the operation that makes her the first-ever transsexual to win the Eurovision Song Contest.

While young Israelis were waving flags and hooting and hollering across the land when International's name was announced—just like crowds in any victorious country—many in the Israeli establishment were not too pleased. Wrapped up in Israel's 50th-anniversary celebrations, some (especially the ultraright wingers) didn't react well to the country being represented globally by a surgically modified citizen.

On the contrary, however, they should have been pleased. After all, there aren't that many Eurovision winners who can boast of having been Bar Mitzvahed. . . . A

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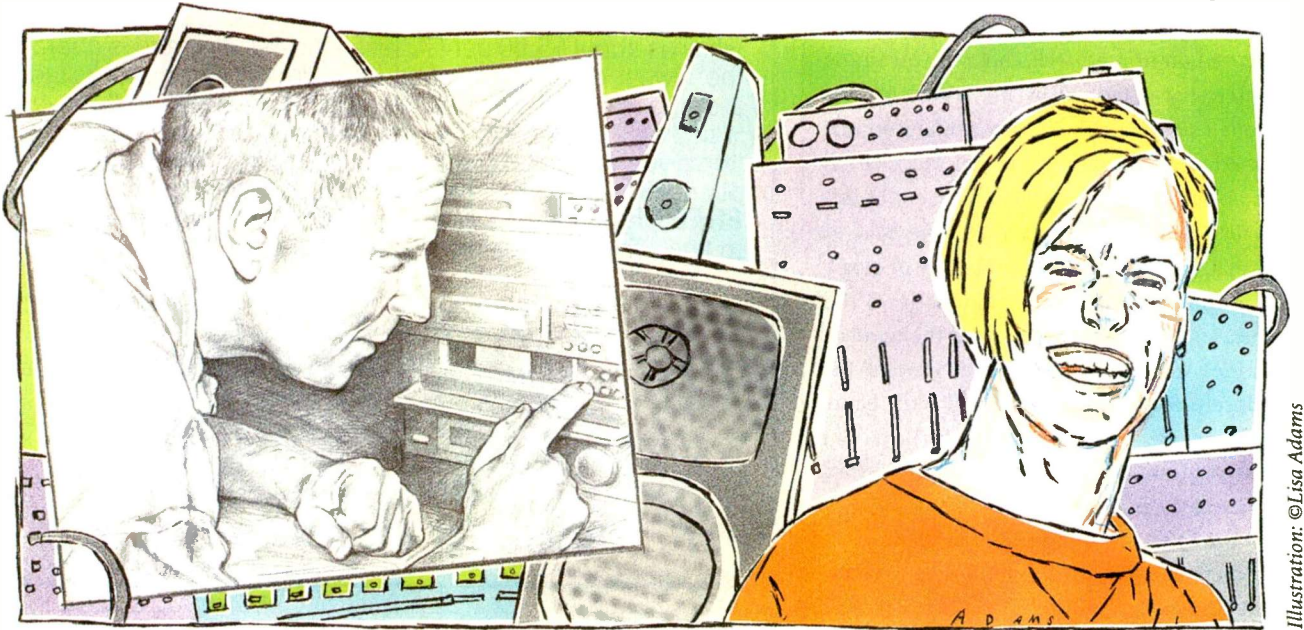
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## THE BASEMENT TAPES

The engine fueling the project-studio boom is the sudden affordability of professional-quality digital multi-track recording gear. You can now go down to a music store and take home an eight-track digital recording deck for just a couple grand. Think about that—eight tracks of CD-quality digital recording on a videocassette for less than what some middle-aged audio dorks spend on a pair of speaker



Illustrator: © Lisa Adams

keep hearing the same lament from every corner of the high end: “Where are all the young guys who used to be into hi-fi?” The answer, of course, is that all the young guys who used to be into hi-fi are now middle-aged guys who are into hi-fi. Look around, and the plain simple truth is you just don’t see nearly as many young audiophiles as you did 10 years ago.

But you know what? You’re just looking in the wrong place. Young guys today are just as into audio gear as they ever were—maybe even more so. They’re just not hanging out at the local hi-fi hut yakkin’ about cables and cartridges, and they’re not joining up with the local audiophile club to swap tales of Magnepan lust and other schoolboy crushes.

Because today’s audiophile isn’t an audiophile at all. He’s a project-studio geek!

Maybe *you* spent all your time and money on your hi-fi rig when you

were in your 20s, but these days, audio-fascinated 20- and 30-somethings are spending their time and money on their project studios—basement digital-audio recording rigs that are to these guys what a hi-fi system is to an audiophile: a toy,

a great complicated electronic assemblage of parts and components and cables that will not only play music, but also let you dick around with it in every possible dimension. Young amateur recordists are picking up where audiophiles have left off. And all it takes is a few hours spent with these kids to see that gear-head audiophilia is alive and well. It’s boys and their toys, just like before, but this time around it’s all about *making* music as well as listening to it.

**THE PROJECT-STUDIO GEEKS OF TODAY ARE STARTLINGLY LIKE THE AUDIO DORKS OF YESTERYEAR.**

cables. These modular digital multi-tracks (aka MDMs), such as the Alesis ADAT and Tascam’s DA-38, are what most of the serious project-studio geeks base their rigs on. But if you’ve got a fast Pentium II rig and a nice, fat hard drive, PC-based

recording—where you can forgo tape altogether and instead just record your eight, 16, or however many tracks you wish right onto your PC’s hard drive as digital WAV files—is another way to skin the cat that’s fast catching up to MDMs in popularity.

I don’t really consider myself that old, but what kids today have at their disposal is just astounding to me. When I was 15, I felt like the luckiest guy alive because I had the first Tascam Portastudio four-track cassette



mixer/recorder. Even with Dolby, it hissed like a steam engine and had no high end above 8 kHz, but man, was I in love with that thing! I cut my teeth on the Portastudio, learning how to flip the tape over and do backwards guitar solos, plus mix and bounce tracks . . . you name it. (Mixing and bouncing means consolidating a bunch of tracks and dubbing them to a stereo mix, thus freeing up the other two tracks for more recording—the way George Martin recorded *Sgt. Pepper*, back before studios had mega-track capability.) I'd record massive guitar armies by overdubbing four, five, twenty guitar tracks all screaming in different directions. I know, it's not quite the same white-knuckled joyride as listening to purist-miked dulcimer music on a pair of Wilsons, but hey, I was young.

That Portastudio was a great learning tool, but no way in hell did it ever sound even remotely like a professional recording.

It sounded like what it was—a crappy cassette deck. But these Tascam and Alesis MDMs don't just come close to the quality of real professional studios, they're the *same* quality. With one of these jobs

**ALL IT TAKES IS A FEW HOURS TO SEE THAT GEAR-HEAD AUDIOPHILIA IS ALIVE AND WELL.**

hitched up to a cheap Mackie mixer, a couple of mikes, and a \$300 CD-R recorder, you can record, mix, and manufacture your own finished music CDs for a couple bucks a pop! And you wonder why kids are into project studios these days instead of braying with their pals like a couple of Francis the Talking Mules about whether Yugo or NOS 6DJ8s sound better in the input stage of an Audio Research.

Still, the parallels between the project-studio geeks of today and the audio dorks of yesteryear are startling. Just as you and your audiophile buddies spent all your hard-earned bread on turntables, preamps, and speakers, project-studio geeks blow their paychecks on boutique "prosumer" microphones, mike preamps, and monitor speakers. And you should hear these guys argue about which mike preamp sounds the best with which microphone and whether or not the Alesis ADAT digital multitrack recorder sounds more "digital" than the Tascam DA-38.

I even heard one guy talking about his discovery that changing the preamp's input loading of a microphone changes the sound, just as audiophiles discovered the same thing years ago with phono preamps and cartridges.

It is the same thing—it's déjà vu all over again. The refreshing difference, though, is that instead of a bunch of creepy loners getting all hissy about things like midrange bloom and detail, project-studio geeks are, for the most part, less about BS and more about music. And while most audiophiles I know just chase their own tails when it comes to system upgrading, project-studio geeks generally enjoy a pretty steady upward trajectory as they acquire new gear and learn how better to use it all. The project-studio scene is definitely where the action is for today's young audio gear-heads.

The trouble is that while quite a few home-recording mags have sprung up in the last few years to review this gear, none of them really do a good job describing the gear from an audiophile's perspective. They give good features info, but I read these reviews and think, "Yeah, but

what's it *sound* like?" And I know many project-studio geeks scan the hi-fi mags like *Audio* to get hip to hardware they can appropriate for their own use, such as NHT's SuperOne and Paradigm's Active/20 speakers, which have gone on to become popular monitor speakers among the project-studio cognoscenti.

I'm really into this. So in addition to coverage of high-end audio and home theater gear, expect to see some further exploration of the project-studio scene in this space. My own studio is currently doing double duty as a test bed for future reviews of such products as Mackie's new powered monitor speakers, which look like serious competitors to the Paradigm Active/20s; Event's \$499 Gina sound card, which turns a PC into a 20-bit multitrack digital audio recorder; and a hot new \$200 compressor from a small company in Austin, Tex., that just may be the best-sounding studio processor I've ever heard. I'll tell you all about it next month. A

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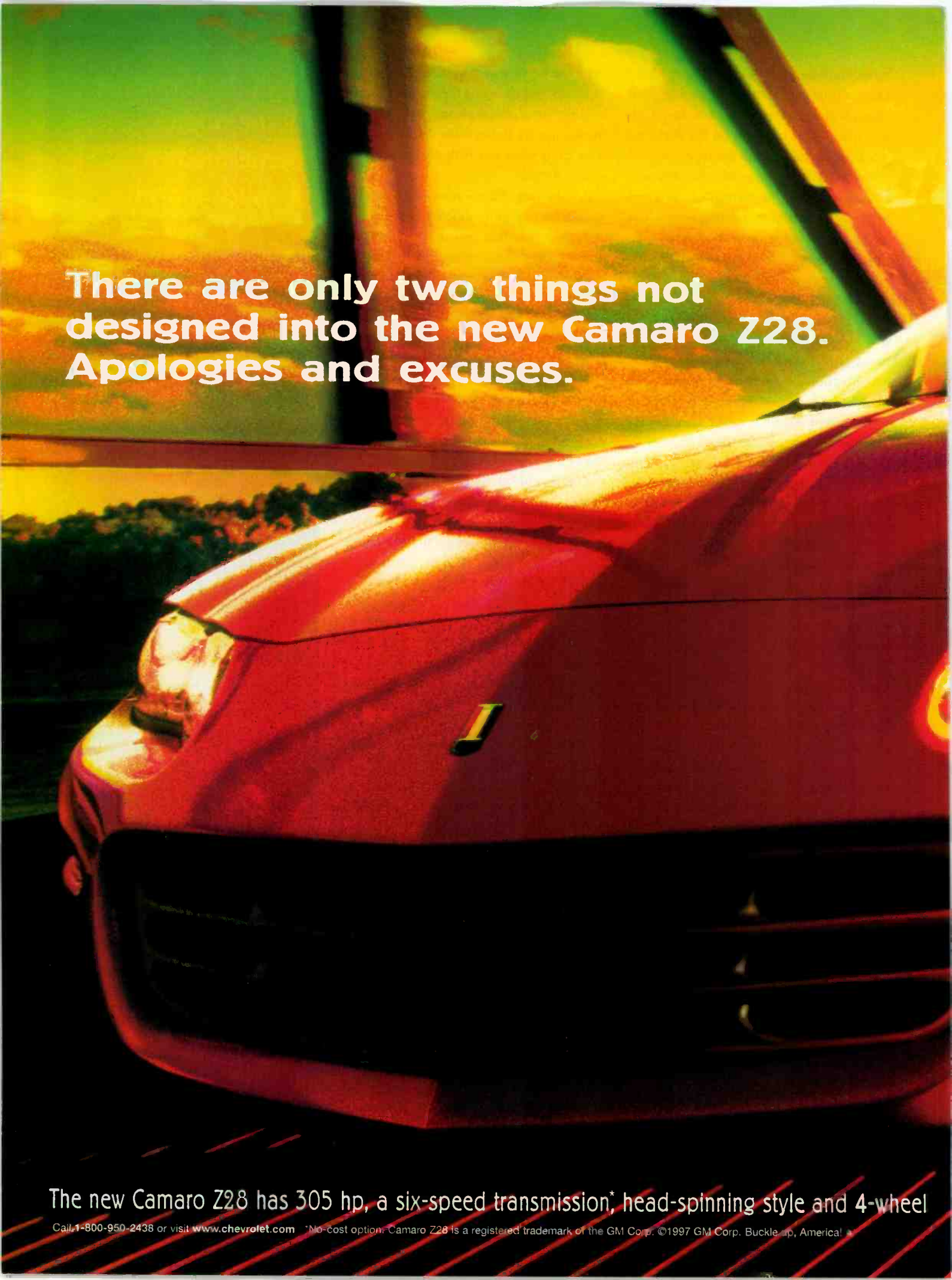
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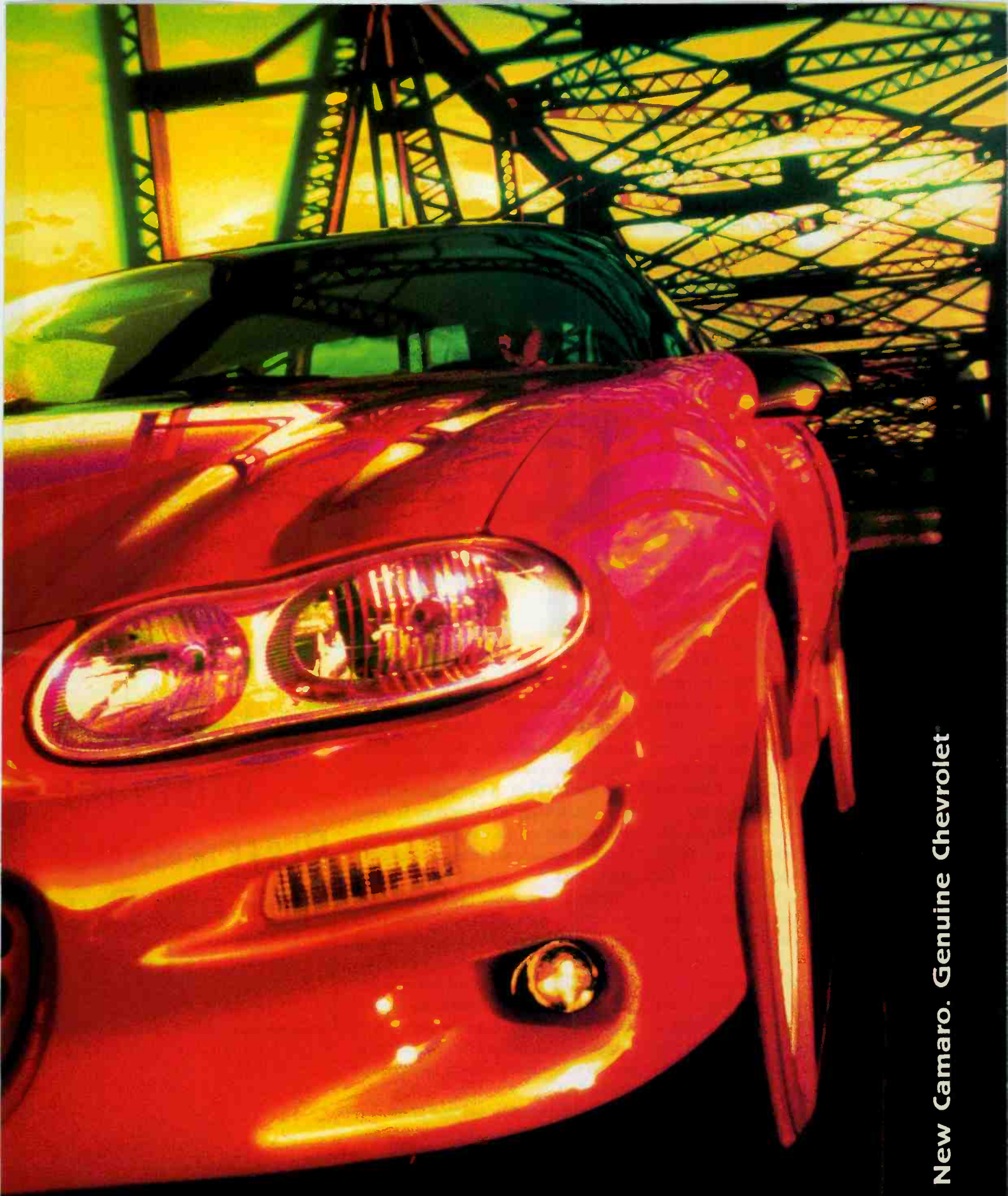


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Not content to have improved the sound quality of theaters throughout the world and to have wrought a minor revolution in home theater acoustics, the THX Division of Lucasfilm, Ltd., has embarked on a mission to do something similar for DVD video. Actually, Lucasfilm has been involved in the recording end of this process for some time through its THX Digital Mastering program. This operation monitors the transfer of film to DVD and certifies the software release as being of THX caliber. (For the record, the first THX-certified DVD release was *Twister* in 1997.) Now, however, Lucasfilm wants to go beyond that and get into home DVD player certification.

I visited Lucasfilm THX in late April to get the lowdown on this new program and to observe, firsthand, the technical deficiencies to which the THX group has found DVD players prone—and which, needless to say, are absent from THX-certified players. I also wangled a THX DVD Test Disc from them and (with much more difficulty) twisted their arm into sending me Version 0.98 of the “THX DVD Player Specifications,” which was specifically “Edited for Edward J. Foster.” (Don’t I feel proud!)

The editing seems to have shrunk the original manuscript from 50 pages to 30, with the deletions consisting mainly of the numerical technical specifications that Lucasfilm considers proprietary information. That’s perhaps understandable, as several years of the company’s time and considerable expense went into developing them. However, you will have to forgive me if I am not always as specific as you (or I) would like. I can speak of the kinds of things that Lucasfilm looks at for THX certification, but I can’t reveal the magic numbers that catapult a player into the realm of The Blessed. Nonetheless, what Lucasfilm is doing is of enough significance that I think even the outline of it is worth understanding.

To start with, Home THX certification of a DVD player involves more than merely meeting certain minimum levels of video performance. Lucasfilm says it also requires

that the player meet specified standards regarding audio performance, ease of use, and reliability. Speaking from experience, I can say that the last of these three is difficult to ensure by testing just a few samples of a product. (That’s why I don’t try to address it in reviews.) Although obvious problem areas might reveal themselves in the brief time one has a component under test, long-term reliability simply can’t be predicted from short-term performance, with or without visual inspection of the so-called

# THX meets

## LUCASFILM RAISES THE PERFORMANCE Bar FOR DVD PLAYERS

“build quality” of which some (especially British) reviewers are so enamored. To be scientifically justified, predicted reliability should be based on a calculation of the “mean time to failure” (MTF) of the device from the MTFs of its components. That’s no simple task and is seldom done for other than military or space-bound gear. Many consumer-grade parts have no rated MTF in any event.

Backing through the THX list, we come to ease of use. This is a terrific idea. DVD players are relatively complicated to operate and, especially, set up, which means that they are likely to be set up and operated wrongly! Anything that makes the use of a player more intuitive is great in my book. Of course, what’s intuitive to me may not be to you, so who’s to say what is intuitive and what is not?

Unfazed, Lucasfilm has braved the surf with a certification specification that contains user-interface guidelines. The key interface specifications are for the control hierarchy, labeling and nomenclature and how initial setup is performed. Lucasfilm calls for a three-level control hierarchy: a primary level (power, transport controls,



DVD

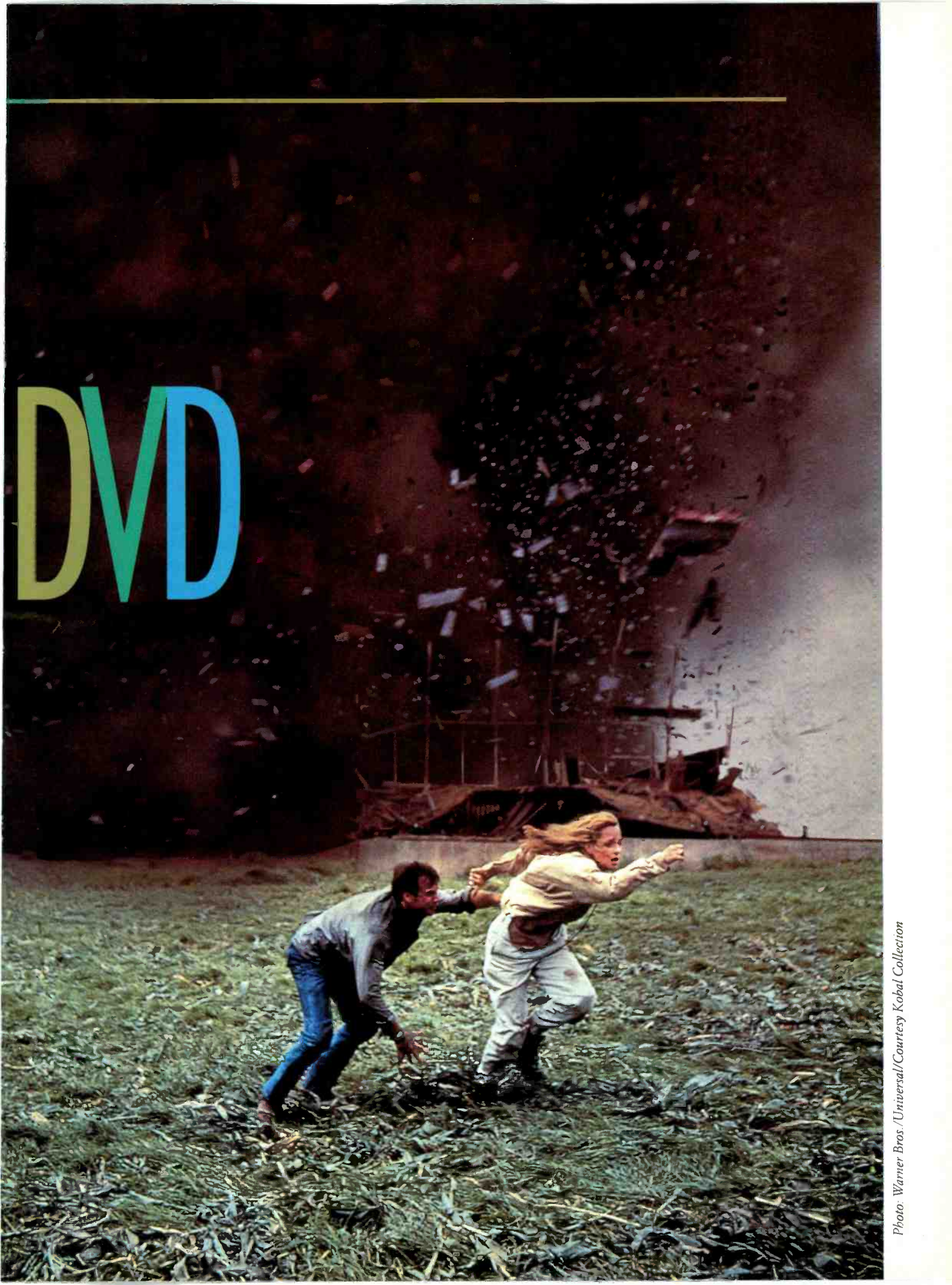


Photo: Warner Bros./Universal/Courtesy Kobal Collection



Home

THX certification

of a DVD

player involves

more

than merely

meeting certain

minimum

levels of video

performance.

etc.), secondary level (audio track selection, presentation and subtitle language selection, etc.), and a tertiary level that handles initial setup (aspect-ratio selection, etc.). Primary controls should be readily accessible from the front panel or from the main section of the remote; secondary controls should be on the remote or accessible via separate user menus. Tertiary controls are invoked via separate menu selections. Control nomenclature and labeling is judged by THX evaluators through hands-on use of the player, with and without referring to the owners' manual.

Lucasfilm says that the audio portion of the Home THX standard for DVD players "rigorously examines fundamental audio performance in regard to distortion, noise, frequency response, and digital-to-analog converter performance—as well as some other areas of unique importance in the home theater environment." In addition to frequency response, distortion, and noise, the specification addresses many of the performance characteristics routinely tested for *Audio's* DVD player reviews, including output level and impedance, hum, spurious components, phase response (which I mention only if there's something amiss), and converter monotonicity (again, mentioned only if there is some misbehavior). The THX requirements also address certain other characteristics that are not readily quantified with previously available test discs, lip sync being a prime example.

Arguably of more interest—if only because they are so new—are Lucasfilm's video performance requirements and the test DVD devised to measure them. Although the THX Test DVD carries Lucasfilm-designed multipurpose test patterns that facilitate quasi-automatic verification of the major THX certification parameters by computer-controlled measuring equipment, it also carries dozens of other video test patterns that are useful with conventional waveform monitors and vectorscopes to accomplish much the same thing. Many of the patterns are replicated using a 16:9 aspect ratio as well as 4:3, the primary test set.

But the THX Test DVD also carries audio signals, among them being individual response sweeps for each channel, all-channel response sweeps at four levels, and a number of level sweeps from +20 to -100 dBr at various signal frequencies and with triangular and rectangular dither. (Since THX's 0 dBr corresponds to -20 dBFS, the sweeps actually extend from 0 to -120 dBFS.) There's also a

twin-tone IM test and a track to check lip sync that should be useful. (I haven't had the chance to use the audio portions of the disc on a real DVD player yet, so it's difficult to comment on how these tests correlate with those made using the Dolby Laboratories test DVD.)

In addition to the audio and video test signals and patterns, the THX disc carries a number of motion picture recordings used for visual performance evaluation. Of these, one set is recorded with three 5.1-channel audio data streams of 384 kilobits/second (kbps) each, plus one two-channel audio track encoded at 192 kbps and subtitles. Another set is recorded with a single 5.1-channel audio track and very high video bit rates. In each group, the video bit rate is constrained to various levels to demonstrate the picture quality that is available under those conditions and the player's ability to decode both low-rate and high-rate MPEG-2 encoded data.

The THX disc also contains a half dozen video "trailers" that are recorded in letterbox format with specified audio content. I'd say that these were the least useful chapters on the disc (which they are) except for the fact that some so-called test DVDs have more such stuff on them than useful test signals, whereas the THX disc is loaded with technically useful goodies. Among the video technical parameters cited in the THX certification specification are video level (often called luminance level or white level), luminance linearity (termed gray-scale linearity in our reviews), sync level (the strength of the horizontal sync pulse), chroma-burst level, chroma level (measured at 75% or 100% saturation), chroma differential gain and phase, and many other performance characteristics that I hope are now becoming familiar to you.

The ideal value for many of these parameters is defined by the applicable international standard, but international standards often do not address what constitutes an acceptable tolerance. (U.S. standard-setting organizations, in particular, have traditionally opposed standardizing performance tolerances, on the basis that doing so serves to limit performance rather than to encourage better performance in the future.) The whole concept behind the THX certification program is to establish the performance bar where none exists and to raise the bar (as necessary) where one does exist, to ensure that a THX-certified player has no visual or sonic defects in its output. Thus, the unex-



purgated THX certification document establishes permissible tolerances for all parameters Lucasfilm considers significant.

Let's see how this works in practice. In a standard NTSC-composite signal, the "video" (luminance or white) level is defined to be 100 IRE and the sync level is -40 IRE. That makes the overall level 140 IRE. Such a signal should produce an output of 1 volt peak-to-peak at the composite-video jack of the DVD player, because that is what a TV set expects to get. Thus, if things go according to Hoyle, a 140-IRE NTSC-composite video signal produces an output of 1 volt peak-to-peak, which makes 1 IRE equal to 0.0071428 volts P-P. We're really dealing with a voltage at this point, but waveform monitors (the oscilloscope-like devices used to measure video signals) are calibrated in IRE rather than in volts. That is why it is customary to refer to the proper video (luminance or white) level in terms of IRE (100 IRE) rather than in terms of voltage (714 millivolts peak to peak).

Since luminance and chrominance are recorded as separate information streams on DVDs, a DVD player's NTSC-composite output must be created within the player. This makes the NTSC-composite chroma burst of particular significance because the burst, although not recorded on the disc, must be precisely correlated with the chrominance information that is recorded on the disc. If the burst level or phasing is incorrect, a properly adjusted NTSC-composite monitor will display incorrect chroma, the error being either in saturation or hue (tint), depending on whether the burst is incorrect in level or phase.

It also is important that the chrominance and luminance signals be precisely synchronized with each other. A color image can be thought of as comprising two parts, a monochrome "brightness" or "luminance" that carries the actual picture detail and etches the outline, so to speak, and a chrominance signal that sort of paints on the colors, usually with lesser resolution. If the two signals are not perfectly synchronized, the color will be applied to the left or to the right of where it should be on the detail-laden monochrome component of the image and will tend to smear or soften the picture. What could have been a high-resolution picture (based on the video response of the luminance channel) now appears soft to the eye because of the

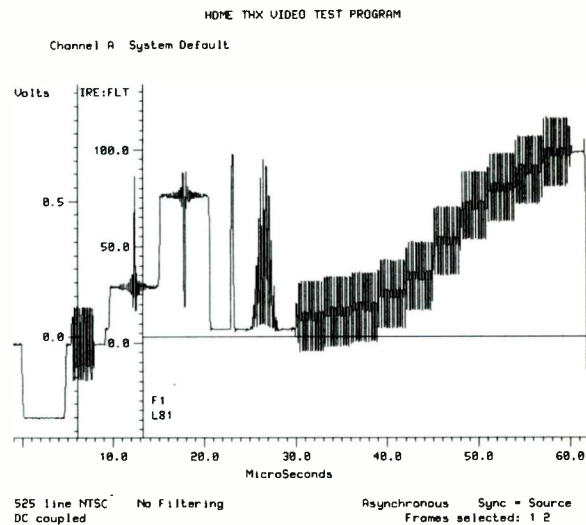
*This multipurpose test signal from the THX DVD Test Disc is used to evaluate a number of different player performance characteristics.*

improper luminance/chrominance timing. The THX disc has signals specifically designed to evaluate this important characteristic.

Black level and gray-scale linearity (what Lucasfilm calls luminance linearity) can also be of particular significance in a DVD player. In the North American NTSC television standard, the black level (sometimes called black setup) is defined to be 7.5 IRE. In other words, full black is defined as 7.5 IRE, full white is defined as 100 IRE, and all shades of gray lie in between. In the PAL standard and in the Japanese NTSC standard, full black is defined as 0 IRE. The player scales the luminance signal (after MPEG decoding) to suit the standard that applies to the region in which it is used. It's wise to check that it does so properly, which explains the need to measure black level as well as gray-scale linearity.

Chroma differential gain and differential phase are related to gray-scale linearity in that they measure changes in chroma level or phasing caused by changes in scene brightness (luminance, or white, level). Such errors cause changes in color saturation and tint, respectively, that are correlated with scene brightness. In my experience, this is rarely a problem with DVD players, but it's a good idea to make sure. The THX disc has the signals necessary to perform these measurements, and Lucasfilm has established limits that are below the threshold of visibility.

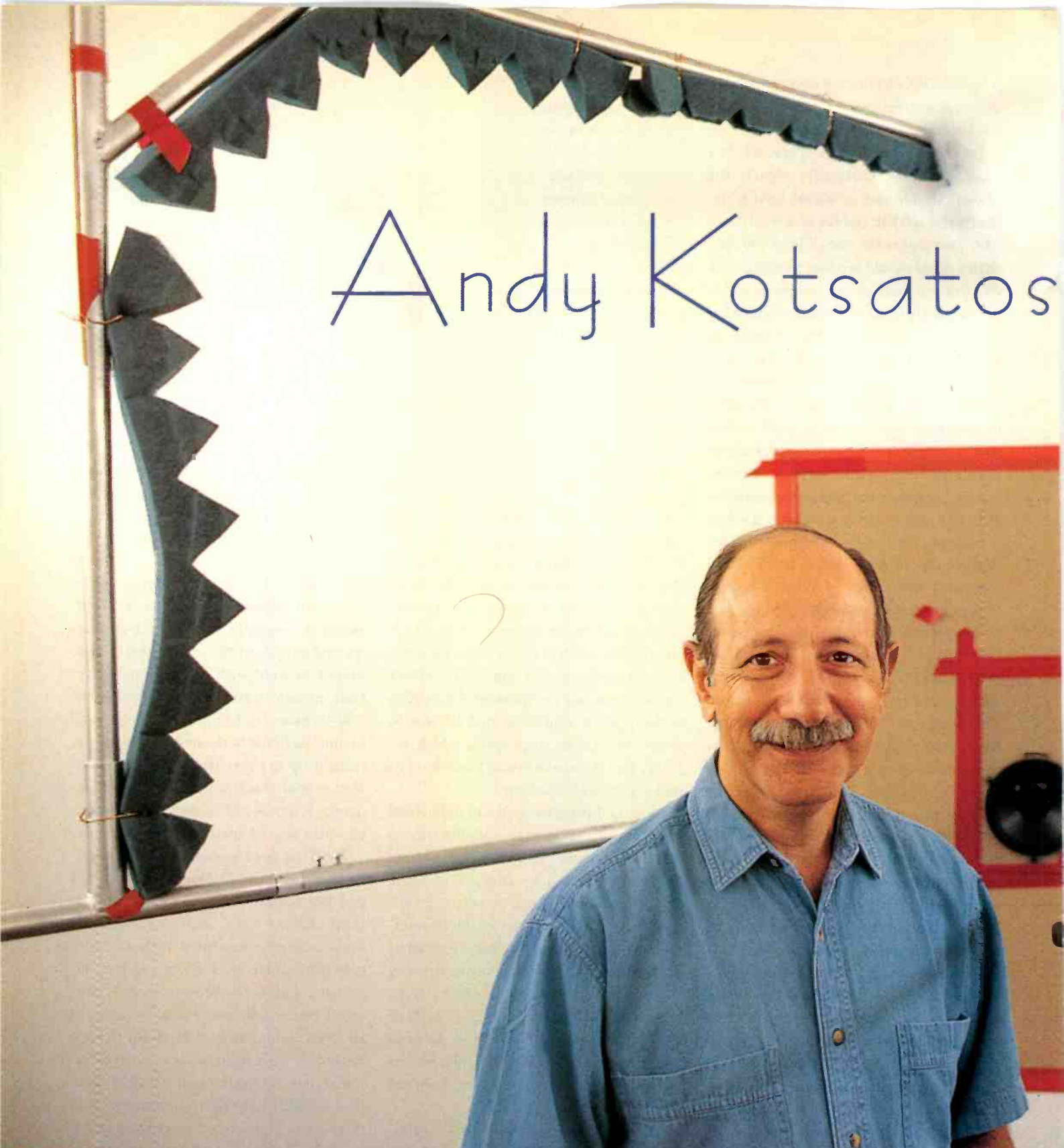
Of course, the luminance and chrominance resolutions are very important, and the THX disc carries several different signals that can be used to evaluate them. There are multiburst sets to check luminance-channel response at specific frequencies, luminance and chrominance frequency sweeps that enable more continuous (albeit usually less precise) response measurements of both channels, multipulses to



evaluate both response and chrominance/luminance time synchronization as a function of frequency, and various bars and windows that are helpful in establishing low-frequency video response ("waveform tilt"). Most of these test patterns can be used with either automated or nonautomated test equipment; one that requires spectral analysis of the video signal (and so cannot be used with conventional waveform monitors and vectorscopes) is the  $\frac{\sin x}{x}$  pulse. It contains equal energy at all harmonics of the horizontal scan frequency (usually up to a specified frequency) and is used to spot-check luminance-channel frequency response and (if the test is performed with a Fourier analyzer) phase response.

The THX disc also contains full-field color signals that can be used to measure AM and PM (amplitude- and phase-modulation) chroma noise. Luminance channel noise is usually measured with a 50-IRE gray field. There are shallow mid-level luminance ramps to check video D/A converter monotonicity and shallow ramps at all levels (with chroma) to widen the test range. There are windows at a variety of luminance levels (20 through 100 IRE) that I find useful in checking overshoot. And there are a number of other tests that go beyond the scope of what I can discuss here. In all, there are some 52 different test signals for evaluating video performance in the 4:3 aspect ratio alone, and many of these serve multiple purposes.

All in all, the THX Test Disc is a magnificent piece of work and signifies a big step forward for DVD. Kudos, hats off, and thank you, Lucasfilm!



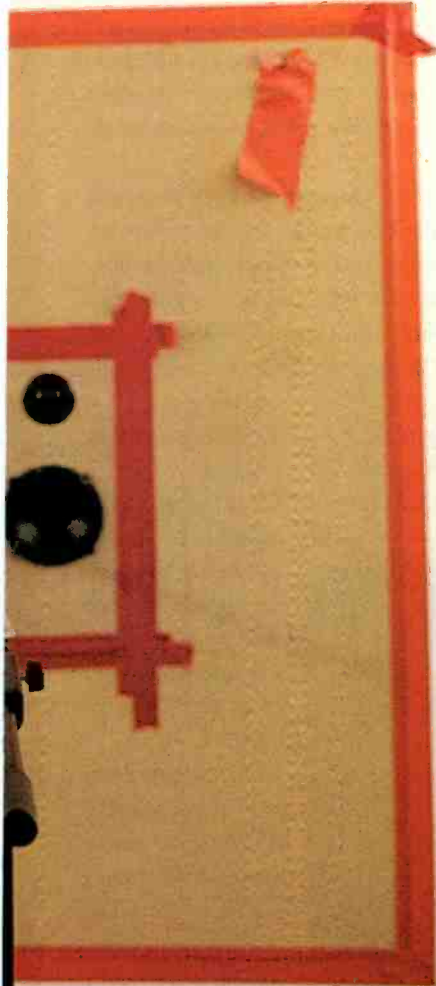
Andy Kotsatos

PROPER BC

*Photography: ©1998, Michael Malyszko*



by David Lander

*of* Boston Acoustics

Istanbul was Constantinople when Andy Kotsatos' mother, an ethnic Greek who emigrated to America as a child, was born there. Kotsatos, too, used to be known by another name: Andy Petite. The previous surname, he had to explain countless times before reclaiming his actual family name in 1994, evolved from a nickname, Le Petit. His father had acquired it at the French restaurant in Manhattan where he worked after coming here from Greece as a boy. ✕ The youngest of three sons, Kotsatos was born in Baltimore in 1940 and attended public schools before leaving for Harvard, where he majored in English and minored in biochemistry. Though Kotsatos took college courses that would qualify him for medical school (in part because his father, a lawyer, had warned him there was no money in his own profession), he soon decided against it. "I volunteered to work at Mass General [Massachusetts General Hospital] in the emergency ward," he remarked during a recent conversation, "and the first time they brought in a bloodied patient, I nearly passed out." ✕ At about the same time, Kotsatos was also discovering how much he enjoyed music and high fidelity, the electronic medium that conveyed it to him. He became what he calls a hi-fi "showroom gypsy," spending an inordinate amount of his free time in audio stores (which included the original Radio Shack on Boston's Washington Street). That led to a job at a Harvard Square store, Audio Lab, and subsequent positions at both KLH and Advent, where Kotsatos worked with and learned from master speaker designer Henry Kloss. In 1979, Kotsatos and Frank Reed founded Boston Acoustics, an immediate success that has just kept on growing. *D.L.*

T H E A U D I O  
I N T E R V I E W

*Did you listen to a lot of music while you were growing up?*

No. In fact, high fidelity was the vehicle through which I became acquainted with music. For me, the pivotal event was seeing *Around the World in Eighty Days*, which had a six-channel soundtrack. Surround

was taking a music appreciation course; it must have been my junior year. We had these listening assignments, and one week in December or January we were supposed to listen to Mahler. So when a girl in the class said that the Boston Symphony Orchestra was performing Mahler, we went to

Boynton for a job. I remember Dan saying, "I was either going to offer you a job or ask you not to come in anymore." At the time, there was just Dan and a fellow named Bruce Humphrey. Bruce later went to work for Harvard and ran their language lab; I think he still does live recordings. He was the repair person, and I became the part-time salesman. Dan was the full-time salesman; his wife, Janet, used to bring him lunch.

*The Advent 300 receiver had a modern yet retro look.*



*Audio Lab nurtured several people who later went on to bigger industry jobs. Janet Boynton was one; she helped start NAD in this country. In fact, wasn't the Boynton home the company's first American headquarters?*

That's correct. Later on, a bunch of people went to work for Audio Lab who went on to bigger and better things, but the only one during my time working for the Lab was Joe Hull, who's now at Dolby. Later on, Joe hired Roger Parker, who became an ad-

sound—in the '50s. I remember just being blown away by the sound and the whole experience. I ran out and bought the soundtrack recording and played it on my parents' RCA console. It didn't sound anything like the movie. First of all, it was mono. And second, the set was pretty bad, an expensive thing but a piece of furniture with mediocre stuff inside it. At that point, I decided there had to be something better. A close high school friend talked about these hi-fi components, which I thought were really weird: You would buy a phonograph in parts. You know, people who grew up in New York and Boston and Chicago, where there were retailers selling hi-fi components, were exposed to them. But Baltimore was notorious for not having any good hi-fi dealers. So I was part of the great unwashed until I had this disappointing sonic experience and thought, well, maybe my friend really does have something that I ought to pay attention to. When I went away to college in Boston, my freshman roommate had a component system. That was the first time I actually lived with a component system, and things sounded a lot better than they had ever sounded in my house.

*What kind of music attracted you?*

I was very curious and wanted to learn about jazz and classical music. In those days, Boston had four or five classical music stations competing for the same minuscule FM audience—remember, it was the late '50s—and I got exposed in a way I had never been while growing up in Baltimore. I remember vividly the first concert I went to. I

an open rehearsal—it was the first BSO concert I ever went to—and I heard Mahler's Second. I immediately fell in love with Mahler, Mahler's Second, and the Boston Symphony. In fact, we went to the rehearsal on a Thursday and were glued to the radio on Saturday night when they broadcast it live.

*Kotsatos helped "voice" the original and Smaller Advents.*



vertising guru for independent audio retailers.

*Larry Daywitt, who would later head up the marketing effort at ADS, worked there as well.*

Joe, Roger, and Larry all worked there together.

*It's tempting to compare some of these Boston-area audio manufacturing companies to the turn-of-the-century European aristocracy, a group of people who were quite of-*

*ten related to one another. We can trace the corporate genealogy as easily as we can that of the English monarchs: AR spawned KLH, KLH spawned Advent, etc. To push the comparison, King Henry VIII had six wives, and Henry Kloss, the most important professional influence on the Boston school and on you, has so far had five companies: AR, KLH, Advent, Kloss Video, and Cam-*

*It was about that time that you began hanging around in hi-fi showrooms. How did store personnel react to seeing you so frequently?*  
They were friendly, but I think they were a little puzzled as to why I came in so much and never bought anything. Finally, midway through my junior year, in November of '59, I asked [Audio Lab owner] Dan

ten related to one another. We can trace the corporate genealogy as easily as we can that of the English monarchs: AR spawned KLH, KLH spawned Advent, etc. To push the comparison, King Henry VIII had six wives, and Henry Kloss, the most important professional influence on the Boston school and on you, has so far had five companies: AR, KLH, Advent, Kloss Video, and Cam-



bridge SoundWorks. How and when did you meet him?

I can't remember specifically the first time I met Henry. He may have come into the store to pick something up on his way home. Even before I went into the retail business, I had become very fond of KLH speakers. I was really enamored with KLH and thought it was a neat company. I had this desire, this wish, this dream that some day I would go to work for KLH.

Yet when you decided to leave retailing, you went back to Baltimore and taught English at your old high school. What prompted that?

I decided to do the other thing that I really loved, which was teaching. During Christmas vacation, I came up to Boston to see my friends, and I asked Dan Boynton if I could buy speakers at the employee price.

I THINK THE THING  
THAT SURPRISED  
US WAS HOW  
FAST ADVENT  
SELF-DESTRUCTED.  
IT WAS NOTHING  
WE DID; THEY DID  
IT ALL THEMSELVES.

Dan said they wouldn't extend that discount to me because KLH had a firm company policy about it, but the company might offer me a job. I jumped and went over and interviewed. They offered me the job, so I left teaching after the first semester. That was 1964, and the business was still dominated by Zenith, Magnavox, and RCA. The hi-fi component industry was tiny compared to them. It was hard to see the component industry becoming mainstream, because our parents, who had all the money, wanted what Stan Pressman [a KLH colleague] used to call a monument to music in their living rooms.

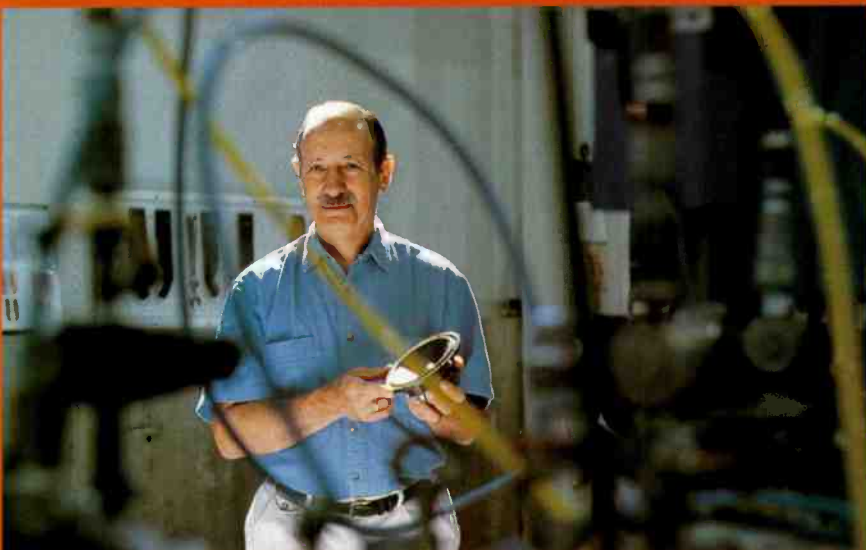


Photo: ©1998, Michael Malyszko

Just as you did, though, a lot of people discovered music while in college.

True. Even when I first joined KLH, our major markets weren't the conventional ones. We had really significant business in Ann Arbor, Michigan; Madison, Wisconsin; Iowa City, Iowa; and every other college town you could name that had a decent hi-fi dealer.

You left KLH in 1969. Why?

Singer [the sewing-machine maker] had bought the company around the time I joined. The positive was that they had the funds to finance significant growth for KLH. KLH subsequently came out with more three-piece music systems. The Model 20, at the top of the line, had a stereo FM radio built into the turntable base and powered two full-size bookshelf speakers.

You've said that these systems helped bridge the gap between components and traditional one-piece consoles, that they furthered the acceptance of components.

Yes. They were easier to buy than components and easier to use. And you couldn't buy anything else at the price. We used to sell these products not only to hi-fi dealers but also to

*The Boston A40 broke the \$100 sound barrier.*

quality department stores. Almost every major department store eventually became a KLH dealer.

But you were still unhappy at the company. Singer put their own person in charge of KLH, and the corporate culture changed. We didn't use the term "corporate culture" in those days, but that's exactly what happened. Henry's employment contract carried him through '67, at which point he told Singer that he was interested in exploring large-screen television. They had no interest, so he formed Advent to develop it. By 1969, he wanted to generate some cash flow. I was part of a group ready to walk out of KLH—it included Stan Pressman, Fred Goldstein, Vinnie Fried, and Frank Reed—and Henry figured, well, here's a top-notch sales/marketing organization that doesn't come along very often. He decided to satisfy his need and our need.

... by putting Advent in the speaker business



THE AUDIO  
INTERVIEW

and hiring all of you. You were a sales executive at KLH and you went to Advent to head up sales, but your career at that point began to veer toward speaker design. How did that happen?

I took the prototype Advent Loudspeaker home, and I wasn't completely convinced that it had the right tonal balance, so I came back and discussed it with Henry. He gave me an old Blonder-Tongue equalizer and said, "Take this thing home and change the sound. We'll talk about it tomorrow." I came back with a change that was pretty subtle but made the improvement I thought should be made. Henry accepted the change and incorporated it into the speaker system. Because it was so successful, he agreed to get me involved at an earlier

him, like the big-screen television. He designed the woofer and chose the tweeter, and I did the network and the voicing. After Henry left, I did the New Advent and the Advent/1. Between Advent and Boston Acoustics, I think I've probably been responsible for the voicing of more of the component hi-fi loudspeakers that have been sold than anyone else.

*Partly because the company's projection television effort was ahead of its time, Advent became mired in financial problems. In 1974, the company was on the verge of bankruptcy, and*

*a financier named Peter Sprague stepped in. Who was he?*

Peter operated like a lot of venture capitalists, in that he often got involved in companies that were in trouble and raised money for them. The one big success he had was National Semiconductor. He came in and eventually got control of Advent, but he and Henry got along like oil and water. Peter basically forced Henry out, and Advent went through the same kind of culture change as KLH had.

*You've said that Boston Acoustics wouldn't exist had it not been for your partner, Frank Reed [who died in*

*1996 at age 63]. He was certainly well known to industry insiders, but I doubt very many people outside the business know who he was. Frank was trained in economics, and the two of you met at KLH. What did he do there?*

Frank was the credit manager at KLH and did the same thing at Advent in the beginning, but he was highly respected by the dealers. He not only collected money, he showed them ways that they could manage their money better and manage their businesses better. He actually started selling

WE TEND TO BE  
ENTRY-LEVEL TO  
MID-PRICED BECAUSE  
WE'RE SO EFFICIENT  
AND ARE COMPETING  
AGAINST COMPANIES  
THAT ARE FAIRLY  
INEFFICIENT.



**The A150III was representative of the original Boston Acoustics design concept.**

stage on the second product, the Smaller Advent, and I ended up doing the crossover network, which essentially was the voicing. I could see Henry losing interest with the next speaker, the Advent/2. He's the kind of person who gets his kicks out of new challenges, and doing another speaker was not necessarily the most exciting thing when he had other issues before

while he collected money, and he eventually became sales manager and ultimately vice president of sales for Advent. I made the transition out of sales and into marketing and product development.

*A lot of people have said that you and Frank left Advent to go into business together, but he left the company before you, didn't he?*

Actually, Frank was fired, a fact of which he was very proud. He was fired while I was on vacation—on a Greek island, unreachable—and when I came back to civilization, I called the office and had an urgent message to call Frank at home. He said to me, "Let's go into business together." I told him that I wasn't sure that I really wanted to leave.

The reason I had taken the vacation was that I wasn't enjoying work anymore. I was working 70-, 80-hour weeks, and I thought I just needed a vacation. When I finally got back to the office, I quickly realized I hadn't needed a vacation, I needed to get out of there. The company had really changed. So I resigned on November 1st, 1978, and was out of there December 1st. And then Frank really started calling me.

*The first Boston Acoustics speaker, the A200, was not at all like the speakers you worked on at Advent.*

That was one criterion, although we weren't so hypocritical as to say that, suddenly, everything Advent had was bad. But the A200 was a product designed to deal effectively with speaker/room interface, part-



ly through driver location but also with a large baffle to minimize reflection off the wall behind it. As a result, it was a very thin, wide loudspeaker. Conversations I had with Peter Snell [the late speaker designer and manufacturer] influenced my going in this direction. Snell Acoustics had started, I think, the year before, and Peter and I discussed product-design philosophy.

*When did your second product appear?*

February of 1980. Now, bear in mind that was a year after Frank and I had left Advent, and Advent dealers were becoming so unhappy that they wanted to switch loyalties. So we changed our timetable and came out with the second product, the A100, which was designed to compete with Advent.

*Boston Acoustics grew very quickly. Did this surprise you and Frank?*

I think, in all candor, the thing that surprised us most was how fast Advent self-destructed. It was nothing we did; they did it all themselves. It ended up that we actually had to scramble to fill out our product line to supplant theirs. That was the biggest surprise.

*Do you see any of the first Boston products as landmarks?*

I think the real landmark was the A40,



Photo: ©1998, Michael Malyszko

which we brought out at the end of '81. Although there had been, in the '60s and early '70s, a small number of well-recognized, really good loudspeakers under \$100 each, by the early '80s there were none. The A40 was the first good under-\$100 loudspeaker in a long time. It was \$75.

*In home speakers, you're positioned as an entry-level to mid-priced brand, yet in car speakers many people perceive you as skewing toward the high end.*

In the case of home, we tend to be entry-level to mid-priced because we're so efficient and we're competing against companies that are fairly inefficient. We've spent a lot of money, all through the history of this company, improving our manufacturing techniques. I think we're the smallest company in the world that has the kind of automated loudspeaker manufacturing machinery we have. If you actually took the price tags off, I think you'd find that our home speakers compete against far more expensive speakers. In fact, they have to in foreign

markets, and they do so very effectively. One reason we're priced where we are in home speakers is that I get my kicks out of redefining price/

performance, and, if you don't make expensive things, then you're not a high-end company. In the car audio market, we compete in the mainstream, but we also manufac-

ture the ProSeries, which we intended to be the best car speakers possible. We pretty much started with a clean sheet of paper and said, "Okay, cost no object, what can we do to significantly improve the performance of car speakers?" The ProSeries came out with die-cast aluminum baskets, high-performance crossover networks, and very expensive materials. We were the second company to use neodymium in a car tweeter; the first company beat us by only a matter of months, and it's no longer around.

*Why did you approach car speakers and home speakers differently?*

For one thing, it was easier to innovate in car. We were the first company in the world to come out with a full line of car component speakers. And there's another thing that differentiates the car market: It's still an enthusiast's market.

*Just as the home hi-fi business was when you got into it.*

Exactly.

*Though car audio enthusiasts, for obvious reasons, accept flush-mount speakers, flush-mount models for home use haven't attained the same status. Is it possible to recreate a musical performance accurately with in-wall speakers?*

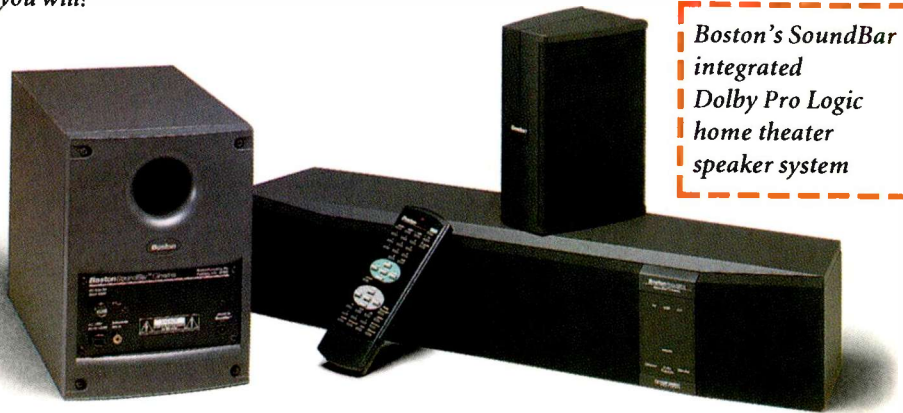
Yes. The main problem with in-wall speakers is structural resonances you're exciting in the wall itself. If you use a subwoofer and a high-pass filter to limit the bass going to in-wall speakers, you can eliminate that. Just keep the troublesome frequencies out of the in-walls; have them come out of the subwoofer.



*The Boston VR970 has a built-in 100-watt amp for its side-firing 10-inch woofer.*

## THE AUDIO INTERVIEW

*You acquired Snell in June 1996. Was your intent to put Boston Acoustics solidly into the high-end home speaker market with the brand, to make it the corporation's Lexus, if you will?*



*Boston's SoundBar integrated Dolby Pro Logic home theater speaker system*

We see Snell as a separate, autonomous brand.

*Why did you buy the company?*

Part of it was emotional. Peter Snell and I had discussed a lot of issues related to speaker design, and I had a lot of respect for his work. He was a very principled, dedicated guy and, on a couple of occasions, turned to Frank for financial advice. After Peter's death, we admired the fact that the company was able to maintain its reputation, and when Snell came up for sale, it looked like we could easily fix the things that were broken. The company needed capital. It needed operational expertise. One positive was that it was local; it's a half hour away. The product line, though still great-sounding, was considered very long in the tooth, so we've spent a year or so completely revamping it. Dave Smith is running the company. He's an engineer who had been at McIntosh, KEF, and JBL, and he's really a great designer and a sensible guy. We've invested close to \$4 million now, in both infrastructure and product development—tooling, things like that. The first new products came out last October, and the company's turning the corner.

*Does your relationship with Peter Snell tell us something about the Boston-area speaker manufacturing community? There seem to be bonds there that transcend rivalry. Didn't Roy Allison help you when you were starting your company?*

When we first went into business, in the very beginning when I was doing the proto-

type work, I didn't have a magnetizer. I called up Roy, and he was nice enough to let me come over and use his magnetizer for my woofer magnets. There is a communal

sense. I've always felt part of it is that, if you're a speaker designer, you encounter problems that you can't even talk to your wife about. She just won't be interested, but another speaker designer will be.

*You're selling Boston-brand speakers to Gateway, the computer company. What credentials does a hi-fi speaker maker need to gain admission to that fraternity?*

If you're going to sell computer speakers, you are going to make them in the tens of thousands. There's a lot of risk for a computer company doing business with anybody in the hi-fi speaker business.

You have to demonstrate you can make the quantities they need at the quality level that you said you can make them at.

*Is the difference in sales between computer speakers and hi-fi speakers really so vast?*

No comparison. In the first six months we sold half again as many computer speakers—in one model—as we sell of all our home speakers in a year.

*Has your experience with the Gateway program spilled over into music and home theater areas?*

Our second computer speaker system, the MediaTheater, was the first in the world to create the sound of a Dolby Pro Logic home

theater out of two loudspeakers. It uses digital signal processing; it's an algorithm we license from Dolby. It's easy to imagine a phantom center, but the surround is mind-boggling.

*You first expressed your enthusiasm for surround sound to me back in the '70s, when Advent, ADS, and Audio Pulse were showcasing time-delay. You said then that once listeners were exposed to it, they wouldn't want to be without it.*

If people can accommodate the additional speakers, it's much more convincing and satisfying to listen to multichannel sound. One of our newest products, the Destination MediaTheater, is a full Dolby Digital surround system—five small satellites, a subwoofer, and a universal remote that will operate your TV set, a cable box, and a VCR. We're not just putting amplifiers in

IF YOU'RE A SPEAKER  
DESIGNER, YOU  
ENCOUNTER PROBLEMS  
THAT YOU CAN'T EVEN  
TALK TO YOUR WIFE  
ABOUT. SHE JUST WON'T  
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the speakers, we're also doing all the decoding: The decoder is in the center-channel speaker. For the Dolby Digital decoding, we're using a new Zoran chip, but the rest of the circuitry had to be pretty much designed from scratch. Once you become involved with digital signal processing, there's a lot of software that has to be developed, too; you have to program the chips and the volume controls, among other things. A year ago, we had one or two electronic technicians. Today, we have eight electronic engineers, a couple of whom are digital guys, and we're looking for a full-time software programmer. A





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# PIONEER ELITE DV-09 DVD PLAYER



I'm amused by Wall Street analysts who refer to Pioneer as "a Japanese audio company." Sure, it's that, but Pioneer was also among the first to acknowledge the importance of high-quality video as well and to foresee their joining together as "home theater." Today, Pioneer is as much renowned for its projection TVs as for its audio products. And, while others

dallied with VCRs of marginal quality, Pioneer championed high-resolution laserdisc players, even producing the only DVD players with laserdisc compatibility. So it's no surprise to find Pioneer again leading the way with the Elite DV-09, the world's first DVD player with Home THX certification (a subject in and of itself—See "THX Meets DVD" in this issue). For the purposes of

this review, let's just say that it extends Home THX audio certification into the video realm and that DVD players carrying the THX logo are expected to meet Lucasfilm's criteria for video performance, audio performance, and ease of use.

You can't help but be impressed by the Pioneer Elite DV-09 as soon as you lift it out of the box. It's heavy—almost 35 pounds, four or five times more than run-of-the-mill players. Its high-gloss front and side panels (typical of Pioneer's Elite line) fairly scream quality, as do the tasteful gold-on-black Pioneer and THX medallions adorning the front panel. (Unfortunately, the same can't be said of the garish red DTS logo sticker, which I hope will be replaced by something more appropriate before this player actually hits dealers' shelves.)

Although the DV-09 doesn't play laserdiscs, it accepts most other forms of home-entertainment optical discs, including audio CDs, Video CDs, and DVDs of both 3-inch (8-cm) and 5-inch (12-cm) size, carrying audio with Dolby Digital or DTS encoding or, for that matter, linear PCM at bit rates and depths as great as 96

**IT'S NO SURPRISE  
THAT THE FIRST  
HOME THX-CERTIFIED  
DVD PLAYER IS  
FROM PIONEER.**

kHz and 24 bits. The DV-09 does not deliver 5.1-channel analog output from Dolby Digital or DTS discs, but it does pass both on, in digital form, for downstream decoding. The DV-09 has only two analog audio output channels; when you play stereo CDs, the output is plain stereo; when you play video CDs or Dolby Digital DVDs, surround information is matrixed into the two channels, to feed your Pro Logic decoder.

**Dimensions:** 18½ in. W x 5¾ in. H x 14½ in. D (46 cm x 14.4 cm x 37 cm).

**Weight:** 34.8 lbs. (15.8 kg).

**Price:** \$2,000.

**Company Address:** P.O. Box 1540, Long Beach, Cal. 90801; 800/746-6337; [www.pioneerelectronics.com](http://www.pioneerelectronics.com).

Photos: Michael Groen



To make this final leap into the analog domain, the DV-09 uses Pioneer's latest dual 96-kHz/24-bit Hi-Bit Legato Link digital-to-analog converters.

When the player is off, the main display blacks out totally, disappearing so completely into the high-gloss black front panel that the only sign of life is a small red "Standby" LED above the power switch. When the unit is on, the panel displays sharp, clean, bright, amber numerals that

**TECHNICALLY ORIENTED  
USERS WILL LOVE SOME  
OF THE DV-09'S  
MORE FAR-OUT  
FEATURES.**

are easily discernible from across the room. Although the alphanumeric legends in the display aren't large enough to see from a distance, they provide a remarkable breadth of information. Display brightness can be reduced in two steps, or quenched entirely so it won't distract attention from your video screen. When you reduce the display's brightness, the other panel indicators darken proportionately, and, when the display and LEDs are off (but the player remains on), a dim "Display Off" lamp appears. Very nice!

Two red LEDs ("Digital Data Off" and "Component Frame DNR") suggest operating conditions that might otherwise escape notice. "Digital Data Off" lights if you have disabled the digital-audio outputs during setup; "Component Frame DNR" indicates that you have adjusted luminance or chrominance noise reduction. And a remarkable number of those parameters are adjustable. You can separately vary horizontal and vertical picture sharpness over a nine-level range, adjust chroma level on the composite- and S-video outputs (also over a nine-level range), choose between two settings for black level, set noise reduction for composite video as well as for luminance and chrominance individually, and even tweak the relative timing of the chrominance and luminance channels. Not only that, four memories are provided for these settings, so you can quickly change the DV-09's setup for different viewing

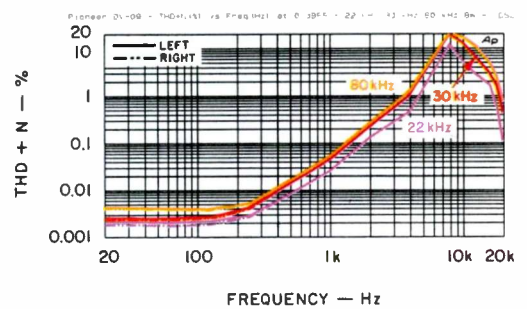
conditions or different family members' preferences.

The final panel indicator is a bright blue "DVD" lamp that blinks when you load or unload the tray and lights constantly when the mechanism has no disc in it (rather strange!) or is loaded with a DVD. The lamp goes out when an audio CD is loaded.

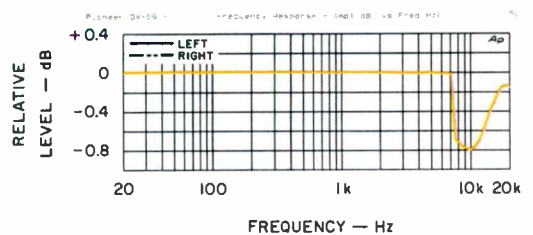
The DV-09's transport mechanism lies behind a sort of air lock. When a disc is loading, the front-panel seal slowly lowers out of the way, the tray emerges silently at a tortoise-like speed, you load a disc, and the process reverses. All told, it takes about 15 seconds; it seems an eternity at the time, but you can't help but be impressed by the style. The only controls on the front panel (besides the power switch) are buttons to open and close the drawer, a pair to skip forward or back by chapter or track (depending upon the type of disc), and a bar to play or pause the transport. On the rear are two stereo pairs of "Audio Out" RCA jacks, two composite-video and two S-video output connectors, one set of component-video RCA output jacks, a coaxial digital audio output dedicated to PCM signals, and an optical (Toslink) and a second coaxial jack that can convey PCM, Dolby Digital, and DTS signals to downstream decoders. Finally, there are miniplug "Control" input and output jacks to link with Pioneer equipment bearing the "SR" mark.

It should be noted that, since the DV-09 does not have its own DTS decoder, DTS signals must be conveyed via a digital output to a downstream converter to play DTS CDs or DTS soundtracks on DVD (if and when such become available), as the analog audio outputs don't function, even in stereo, when DTS soundtracks are played. This "limitation," if you wish to call it that, is common to all DTS-compatible players presently on the market and is not peculiar to the DV-09.

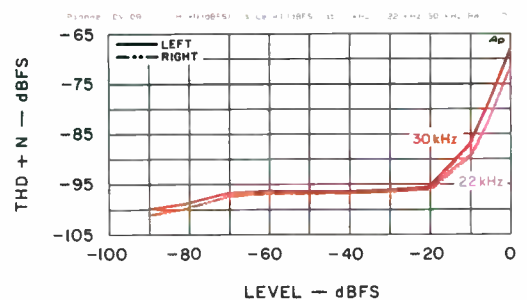
The supplied remote is dedicated specifically to operation of the DV-09; it doesn't



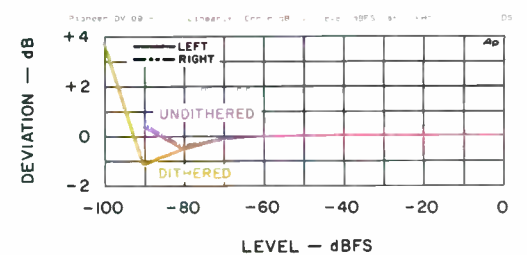
**Fig. 1—THD + N vs. frequency.**



**Fig. 2—Frequency response; see text.**



**Fig. 3—THD + N vs. level.**



**Fig. 4—Deviation from linearity.**

know about any other piece of equipment, Pioneer's or anyone else's. Considering its vast array of similarly shaped, non-illuminated buttons and the player's wide-ranging feature set, I'm not sure it would have been wise to tax this remote with additional jobs, anyway.

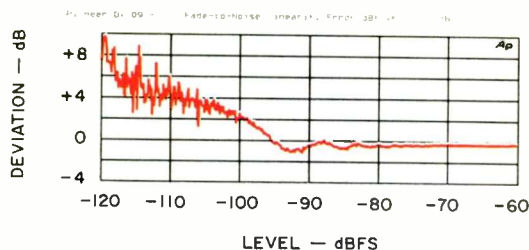


Fig. 5—Fade-to-noise test.

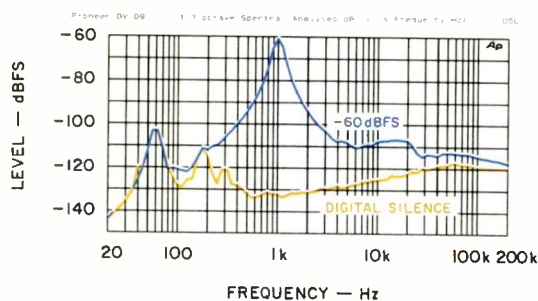


Fig. 6—Noise analysis.

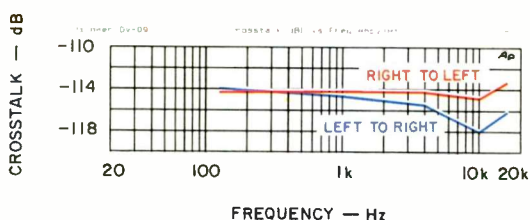


Fig. 7—Stereo crosstalk.

Every button on the remote is accessible; nothing is hidden under doors, flaps, or anything else. At the LED-firing end are 35 identical-size buttons in seven rows of five, clustered about a central “Enter” pad and four directional arrows (which aren’t shaped all that differently from the buttons surrounding them). Behind this grouping are the transport-control buttons: fast “REV,” “Play,” and fast “FWD” in one row, “Jog Mode,” “FL Dimmer,” “Mode,” “Stop,” and “Pause” in the next. Except for the final four, these have different shapes. Backing it all up is a jog dial and concentric shuttle ring. You need a lot of ambient light and sharp eyesight to operate this remote.

That said, Pioneer’s Elite DV-09 does offer a full range of DVD features, including still frame, frame advance, slow play, repeat play, random play, program play, multiple aspect ratios, multi-angle, choice of dialog and subtitle language, multilevel parental lockout control, and audio dynamic-range

control for nighttime listening use. You even get a choice of whether to freeze on a single field or a full frame when the disc is paused!

The DV-09’s “Last Memory” feature can memorize the point at which you stopped playback for the last five DVDs you’ve played, as well as the operational settings that were in effect at that time. When any of these discs is reloaded, playback automatically picks up from where you left off. As usual, this feature only works with those codes (including position) that the disc supports, but the DV-09 also offers “Condition Memory,” which stores the aspect ratio, subtitle language, and audio language settings that you normally use and recalls them for any disc.

The Elite DV-09’s setup options go far beyond the usual parental-control settings, DVD language choice (for menus, audio, and subtitles, separately), and aspect-ratio choice (on discs offering these features). Less common choices include selectable background colors for menu screens, a screen saver that prevents “burn-in” when an image has been frozen for an undue length of

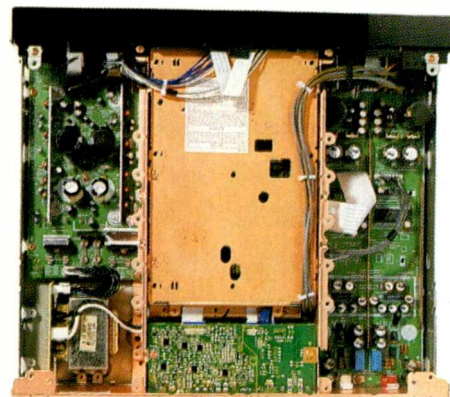
time, and the ability to choose the position of the on-screen display (OSD) and whether it will be in English, French, or Spanish. (The OSD language is independent of the DVD language choices, which are determined by what’s available on the disc.) You can also activate an on-screen symbol that indicates which scenes offer multiple viewing angles.

The output setup menus enable you to select the digital audio signal you want to come from the optical and PCM/Dolby Digital coaxial outputs. You can turn these signals off, force them to be linear PCM for Dolby Digital as well as PCM sources (for decoding by a Pro Logic system), or have the player automatically deliver whatever’s on the disc—Dolby Digital, DTS, or linear PCM. You can further choose whether any 96-kHz PCM audio on the disc should be sent to the digital output as is or, if your DACs can’t handle that, downsampled to 48 kHz. Last, but not least, don’t forget the

DV-09’s remarkably versatile video adjustments referred to earlier. While not everyone will (or should) take advantage of these options, they certainly will appeal to the technically oriented viewer. Clearly, this is one far-out DVD player!

#### Measurements

My audio tests were made at the Elite DV-09’s main stereo outputs, using the CBS



**LEGATO LINK  
ISN'T REALLY AN ISSUE  
FOR THE A/V SYSTEMS  
THE DV-09 WILL  
PROBABLY BE USED IN.**

CD-1 disc as the program source. The results are unusual in several aspects; some might even be considered shockingly bad unless interpreted in light of Pioneer’s Legato Link processing. Legato Link is said to restore harmonics lost to the relatively low (44.1-kHz) sampling frequency of the CD format, so it must add harmonics that are not in the recorded signal—and instruments register any harmonics added by the device under test as distortion.

You can see this in Fig. 1, where the DV-09’s total harmonic distortion plus noise (THD + N) turns up rather sharply at frequencies above 250 Hz. For the 22-kHz analysis bandwidth commonly employed for this test, THD + N reaches a peak of 12.5% at 8 kHz. Frequency analysis of the output at this frequency, and 0 dBFS indicated that the distortion was predominantly third-harmonic, with some fifth-harmonic content as well, producing a waveform that looked quite similar to that



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resulting from a severe case of crossover distortion.

A 22-kHz analysis bandwidth reduces the odd-harmonic content of 8-kHz and higher signals, so I retested THD + N versus frequency with two wider bandwidths. As you can see in Fig. 1, measuring with bandwidths of 30 and 80 kHz did not greatly change distortion level, but it did let me see the harmonic content more clearly. With an 8-kHz signal, the third harmonic clearly predominated; the next strongest was the fifth, at a level 10 dB below the third. There were traces of second and fourth harmonic as well, but they were negligible. With a 10-kHz signal, the third harmonic predominated once again, and the fourth and fifth were approximately equal in level but about 15 dB lower than the third. There also was a minor amount of second-order distortion and noticeable trash throughout the spectrum, presumably caused by intermodulation of the various by-products with the sampling carrier.

At lower frequencies, 1 to 4 kHz, the distortion components were exclusively odd-order and were confined to the octave between 22 and 44 kHz. For example, with a 4-kHz signal, the predominant harmonics were the 7th, 9th, and 11th (28, 36, and 44 kHz), their strengths diminishing in that order. With a 2-kHz signal, the strongest component was the 11th harmonic, with 13th, 15th, 17th, 19th, and 21st harmonics present in gradually descending strength. And with a 1-kHz test tone, the strongest harmonic was the 23rd (23 kHz), with gradually decreasing harmonics through the 33rd at least.

**VIDEO PERFORMANCE  
WAS AS CLOSE  
TO PERFECT  
AS I'VE SEEN, SETTING  
A NEW STANDARD.**

Common wisdom has it that odd-order distortion is more obtrusive than even and that the psychoacoustic annoyance factor increases radically with the order of the harmonic (some suggest, as the power of the order), which makes one wonder why anybody would want this behavior. I don't

## MEASURED DATA

### PCM AUDIO

**Line Output Level:** 2.01 volts.

**Channel Balance:**  $\pm 0$  dB.

**Line Output Impedance:** 465 ohms.

**Frequency Response:** +0, -0.8 dB, 20 Hz to 20 kHz.

**THD + N at 0 dBFS, 20 Hz to 20 kHz:**

With 22-kHz measurement bandwidth, less than 12.5%; with 30-kHz measurement bandwidth, less than 17.6%; with an 80-kHz measurement bandwidth, less than 21.0%.

**THD + N at 1 kHz:** With 22-kHz measurement bandwidth, below -71.1 dBFS from 0 to -90 dBFS and below -95.5 dBFS from -30 to -90 dBFS; with 30-kHz bandwidth, below -67.4 dBFS from 0 to -90 dBFS and below -95 dBFS from -30 to -90 dBFS.

**Maximum Linearity Error:** Undithered recording, 0.54 dB from 0 to -90 dBFS; dithered recording, 0.2 dB to -100 dBFS.

**S/N Ratio:** A-weighted, 114.3 dB; CCIR-weighted, 106.6 dB.

**Quantization Noise:** -95.8 dBFS.

**Dynamic Range:** Unweighted, 95.9 dB; A-weighted, 99.3 dB; CCIR-Weighted, 89.7 dB.

**Channel Separation, 125 Hz to 16 kHz:** Greater than 113.7 dB.

### DVD VIDEO

**Luminance Frequency Response:** +0.3, -0.2 dB from 0.5 to 4.2 MHz and less than 1.9 dB down at 5.5 MHz.

**Luminance Level:** 101 IRE (+1%).

**Black Level Accuracy:** No measurable error.

**Gray-Scale Accuracy:** No measurable error.

**Chrominance Channel Response:** -6 dB or better at 2.75 MHz.

**Chroma Level Accuracy (Multiburst Method):** -0.7 dB.

**Chroma Level (Vectorscope Method):** 100% to 103%, depending on color.

**Chroma Phase Accuracy:** Within 2°, depending on color.

**Chroma Differential Gain:** No measurable error.

**Chroma Differential Phase:** No measurable error.

**Chroma-Luma Time Displacement:** With THX disc, no measurable error; with Sony disc, chroma delayed by 80 nanoseconds.

**Overshoot:** On 20-IRE window, 2.5 IRE; on 40- through 100-IRE windows, 0 IRE.

**Chroma Burst Level:** 37 IRE peak to peak (-0.7 dB).

**Sync Pulse Level:** 41 IRE (+0.2 dB).

presume to answer that question, but Pioneer clearly goes to considerable effort to produce precisely this effect with Legato Link, and, just as clearly, it must have a following or the company wouldn't be doing it. You can also see an effect of Legato Link in the DV-09's frequency response (Fig. 2), which is absolutely ruler-flat to 7 kHz and then abruptly drops by 0.8 dB in the region where the strongest harmonics are generated.

Legato Link harmonic generation may be level- as well as frequency-sensitive. The DV-09's THD + N at 1 kHz (Fig. 3) drops from an unusually high -67.4 dBFS (using a 30-kHz analysis bandwidth to include the harmonics revealed by the spectrum analysis) to -95 dBFS (arguably a lot lower than the norm) when the signal level drops by 20 dB. With a 1-kHz signal, most of the meaningful harmonics lie below 30 kHz, so there

was no point showing data taken with an 80-kHz bandwidth.

You can see from the graphs of the DV-09's linearity error versus level using dithered and undithered 1-kHz recordings (Fig. 4) and fade-to-noise linearity error at 500 Hz (Fig. 5) that Pioneer's converters are quite linear down to -90 dBFS but deviate more than today's best delta-sigma ("1-bit") noise-shaped DACs at signal levels at and below -100 dBFS. Of course, not everyone agrees that noise-shaped DACs produce the best sound, and third-octave spectral analyses (Fig. 6) suggest that Pioneer prefers to forgo extensive noise shaping. The AC-line component and its odd harmonics shown suggest some magnetic leakage, probably from the power transformer, but their levels are too small to worry about. As you can see in "Measured Data," signal-to-noise ratio, quantization noise,



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and dynamic range are all very good. Channel separation (Fig. 7) is superb.

The DV-09 is the first DVD player I've had an opportunity to evaluate with the new THX test disc (which Lucasfilm generously supplied) as well as with my "old" Sony disc. The THX disc enabled me to take more measurements and modify some procedures (often using more than one approach) to ferret out video performance more thoroughly than I could before. In future DVD-player reviews, I expect that I will further revise my test procedures, adding measurements that promise to yield pertinent information and dropping others that don't. Bear with me.

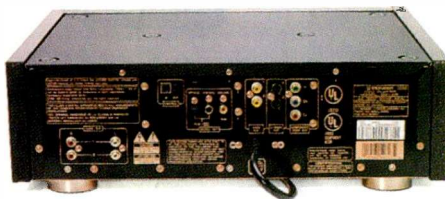
To say that the video characteristics of the Pioneer Elite DV-09 are outstanding would be an understatement. It establishes a new benchmark in just about all regards. In every case where I have grounds for comparison, the DV-09's video performance is as near perfect as I have ever experienced. As you can see from "Measured Data," luminance-channel frequency response, measured using a multiburst pattern, was within +0.3, -0.2 dB, from 500 kHz to 4.2 MHz, and then only because of a small response ripple in the region between 1 and 2 MHz. This ripple also showed up when I evaluated luminance-channel response with a frequency sweep, so it's clearly there—but clearly negligible, too.

Using a sweep signal, which extends to a higher frequency than the multibursts, I could explore how the player responded to fine horizontal detail. Above 4.2 MHz, the response fell smoothly but gradually and was down less than 1.9 dB at the 5.5-MHz sweep limit. Clearly the DV-09 can provide excellent horizontal resolution on monochrome source material that calls for it.

The DV-09's luminance ("white") level was high, but only by 1%, and black level was as accurate as I can measure. After adjusting for the overall black-to-white range, gray-scale was perfect at all intermediate steps. The horizontal sync pulse was a tad stronger than necessary, but that's no problem. The chroma burst was 0.7 dB low, as measured using the multipulses recorded on the THX disc. The chroma level, measured with a vectorscope while playing the EIA 75% color bars on the THX disc, was effectively spot on target; I'd not trust the vectorscope for measurements closer than

1% or 2%, anyway. Chroma phase accuracy, within 2° for all colors, was about as good as it gets. (As a reminder, chroma *level* relates to the saturation or intensity of colors while chroma *phase* correlates with hue, or tint, accuracy.) Chroma differential gain (variation in color saturation due to differences in scene brightness) and chroma differential phase (changes in tint as a function of scene brightness) were completely absent.

Chrominance/luminance timing error (a new measurement that suggests whether color images will appear as sharp as monochrome ones) was unmeasurable when I used the THX disc, but the chroma signal



**IN MY BOOK, THE DV-09  
CERTAINLY QUALIFIES  
AS A WORLD-CLASS  
REFERENCE PLAYER.**

was delayed by approximately 80 nanoseconds relative to the luminance when I used the Sony disc. I have no ready explanation for this difference; we'll have to wait and see whether it continues to show up on different players. Whichever disc is "correct" (and I have no reason to suspect that the THX disc isn't), the Elite DV-09 is the first player I've found in which the user can control this parameter.

The Lucasfilm disc also carries a set of white windows recorded at various brightness levels. I used these to measure overshoot at the transitions between black and white. Only the 20-IRE window elicited any overshoot at all, and it was relatively minor, albeit noticeable on the monitor.

#### Use and Listening Tests

I have not liked Legato Link in the past; it's sounded harsh and raucous to me, especially with music that was bright and loud to begin with. I still don't like it, but I accept

that others do. Still, technical tests are technical tests, and, in this review, I am faced with the issue of THX certification. I know that Lucasfilm has specific restrictions on permissible levels of harmonic distortion, frequency-response deviation, and other characteristics adversely affected by Legato Link conversion. I do not know what those tolerances are, because Lucasfilm releases that information only to its licensees, but I'd be surprised if the folks at The Ranch considered distortion of 12.5% to 21% (depending upon analysis bandwidth) to be within them.

And yet, in the type of system in which the Pioneer Elite DV-09 is likely to be used, Legato Link is a nonissue! Any home theater with a \$2,000 DVD player will certainly have a 5.1-channel surround-sound system, which in this case means that it will have a downstream Dolby Digital (or DTS) surround decoder, because the DV-09 doesn't provide 5.1-channel analog output. That downstream box, not the DV-09, will establish sound quality, so let's just put Legato Link aside. If you like Legato Link, buy a Pioneer Elite decoder with Legato Link conversion and enjoy; if not, buy a different decoder and enjoy the Elite DV-09's video performance.

And, in a word, that performance is fantastic! In my book, the Elite DV-09 certainly qualifies as a world-class reference DVD player. Resolution is outstanding. Colors are bright, sharp, and clean as a whistle.

I'm not sure you'll have great use for certain of the more special features. For example, with the discs I used, I had no need for the various noise reduction options—but my source material was very clean, and there may be occasions where noise reduction comes in handy. The chrominance/luminance time-shift adjustment may well prove useful with some discs. It had a noticeable effect on the test patterns I displayed, and some discs seemed to benefit from a slight shift in setting.

Although I can't give the highest marks to the DV-09's remote, or to its menuing and manual, I'd willingly compromise convenience for this kind of performance. Make no mistake about it, the Pioneer Elite DV-09's video performance is truly of the highest rank, and I'd be happy to give this player a starring role in my home theater any time, any day. **A**

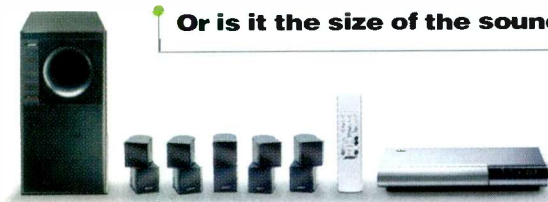


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D. B. KEELE, JR.

## HSU RESEARCH TN 1220 HO SUBWOOFER



I first met Dr. Poh Ser Hsu and heard his subwoofers during the 1992 Winter Consumer Electronics Show (CES) in Las Vegas. His demonstration setup was very modest: a portable CD player, an inexpensive receiver driving the main speakers (a set of small bookshelf speakers from Radio Shack), and an electronic crossover and similar receiver driving the tall, cylindrical, bottom-firing vented subwoofers. I was impressed by how good this unpretentious system sounded—and even more impressed when Dr. Hsu told me how inexpensive his subwoofers were! I subsequently included the smaller of

**DEEP BASS OUTPUT FROM THE TN 1220 HO WAS IMPRESSIVELY HIGH, BORDERING ON SCARY.**

the two subwoofers I had heard, the HRSW 10s, in a “Subwoofer Shoot-out” (*Audio*, November 1992), and liked them quite a bit.

Hsu Research now offers, by mail order only, five subwoofers (one of them powered) for home use, two power amplifiers, an electronic crossover, and several automotive subwoofer systems and drivers. Two of these home systems, the HRSW 12V and HRSW 10V—wide, short, cylinders that Hsu refers to as “coffee-table” models—are magnetically shielded.

The TN models are similar to the earlier Hsu subwoofers—cylinders with very small

footprints and bottom vents. However, the drivers in the TN models fire up from the enclosure tops. The smallest model, the TN 825, has an 8-inch driver and a rated frequency response that extends to 25 Hz. Next up is the TN 1225 HO, which has the same low-frequency limit but delivers higher output thanks to a 12-inch woofer. The TN 1220 HO, reviewed here, is the largest in the series and one of Hsu’s highest-output subwoofers. It, too, has a 12-inch woofer, but its rated frequency response extends down to 20 Hz.

The TN 1220 HO is housed in an acoustically inert tube of fiberboard, 47½ inches long, with a 12-inch inner diameter. The tube’s walls are only ⅛-inch thick, but its cylindrical shape makes it extremely strong and rigid. The enclosure’s simple shape and fiberboard construction are major reasons for the subwoofer’s low cost. The 12-inch woofer is mounted in top of the tube.

The bottom-firing port tube is very long at 28 inches. This 4-inch-diameter tube is also generously flared on both ends, expanding to a 6-inch diameter. The enclosure is stuffed with fiberglass to damp internal resonances and is entirely covered with black grille cloth. Surprisingly, the grille cloth does not cover the driver; instead, the owner’s manual gives the Radio Shack part number for a grille you can add if desired. On the bottom are a single pair of double-banana input terminals and three heavy-duty, pointed spikes, 2½ inches long and ⅝ inch in diameter. The spikes must be used to raise the enclosure enough for unimpeded airflow through the port.

**Rated Frequency Response:** 20 Hz to crossover, ±1 dB.

**Rated Sensitivity:** 93 dB at 1 meter, 2.83 V rms applied in the mid to upper bass.

**Rated Impedance:** 4 ohms, nominal.

**Rated Power Handling:** 250 watts, 18 Hz and up.

**Dimensions:** 51½ in. H (with spikes) x 12 in. diameter (130.8 cm H x 30.5 cm dia.).

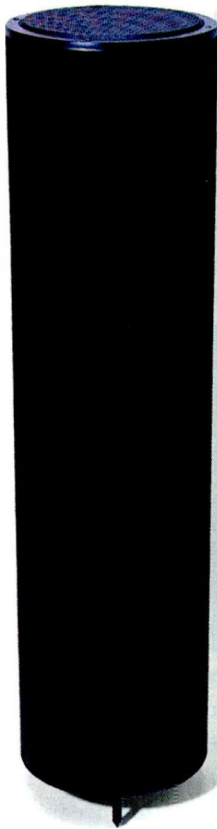
**Weight:** 32 lbs. (14.5 kg) each.

**Price:** \$450 each.

**Company Address:** 14946 Shoemaker Ave., Unit L, Santa Fe Springs, Cal. 90670; 562/404-3848.



Despite its 51-inch height, the TN 1220 HO's column enclosure weighs just 32 pounds.



**THE HSU 1220 HO'S BASS RESERVE, SMOOTHNESS, AND EXTENSION WERE ALL EXCELLENT.**

The TN 1220 HO's 12-inch woofer is a very beefy long-throw driver with a vented pole piece, a stamped frame, and two stacked ferrite magnets, 5¼ inches in diameter and ¾-inch thick. The cone is made of conventional felted paper, with a stiff foam surround.

While more and more subwoofers now have built-in amplifiers, Hsu offers external power amps with built-in crossovers for all its woofers except the TN 825, which has an amplifier built in. (A \$50 discount is offered to those buying a subwoofer and an amp together.) Hsu takes this path because external amplifiers run cooler than those built into woofers, permit use of short line-level cables to the subwoofer amp (though you must then use longer speaker cables), and enable you to place the subwoofer amp's controls conveniently near those of your other components.

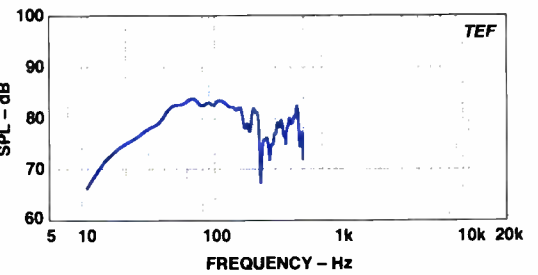
I did not test a Hsu amplifier, as the company is replacing its more elaborate, 250-watt amplifier with a model that will produce about 400 watts and should sell for about \$550. The existing 150-watt amplifier, which remains in the line at \$225, has a variable low-pass filter with a 12-dB/octave slope. However, the old and new high-power amps have built-in Linkwitz-Riley crossovers with 24-dB/octave slopes; the standard crossover frequency is 91 Hz, but plug-in resistor modules are available for frequencies from 28 to 155 Hz.

The new amp/crossover was not available when I tested the TN 1220 HO. But essentially the same crossover is available separately for \$450. So, I used that with an amp of my own. The Hsu Research Electronic Crossover (it has no model number) is very compact, about the size of a 5-inch stack of letter-sized envelopes. It has a subwoofer-level control and switches for polarity and bypass. The crossover's high-pass filter uses discrete FETs with zero feedback, and its subwoofer filters feature bi-FET op-amps with high slew rates, all biased in Class A. All the capacitors are 2% polypropylene film types, and 1% metal-film resistors are employed exclusively. Connections are unbalanced, via gold-plated RCA jacks.

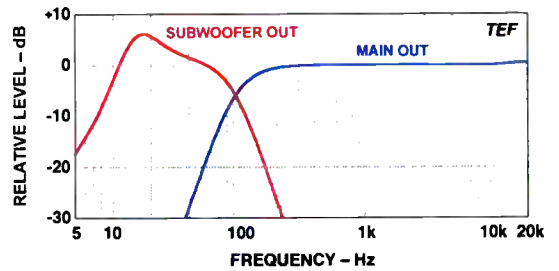
#### Measurements

To assess the Hsu Research TN 1220 HO's frequency response, I made ground-plane measurements, placing my test microphone 2 meters from the port and the driver. The results are essentially identical to those from standard, 1-meter, anechoic measurements.

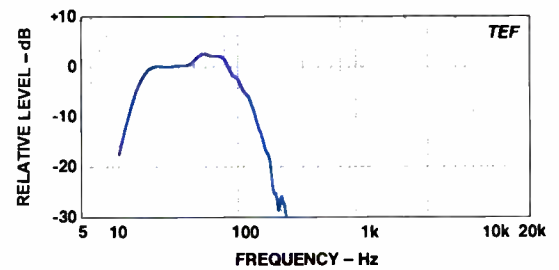
Figure 1A, made with no crossover filtering or equalization and no curve-smoothing, shows fairly flat response between 45 and 160 Hz, with a 6-dB/octave rolloff below 45 Hz that becomes steeper below 15 Hz. Above 160 Hz, the response is quite rough and choppy. The high-Q dip at 230 Hz reflects the primary organ-pipe reso-



A



B



C

**Fig. 1—Frequency response of subwoofer (A), electronic crossover (B), and subwoofer with crossover (C).**

nance of the port tube, whose length is approximately one-half this wavelength. Averaged over the 1220's flat-response region, sensitivity is 82.5 dB SPL for the 2.83-volt input signal, significantly below Hsu's 93-dB rating.

The Hsu Electronic Crossover's response (Fig. 1B) confirms that it uses the classic Linkwitz-Riley alignment, whose outputs sum to unity gain when combined. (The acoustical outputs of speakers will generally not combine so neatly, of course, because of variations in their individual magnitude and phase characteristics.) The rapid, 24-dB/octave slopes should minimize response overlap between the subwoofer and satellite speakers. At the other end of the subwoofer output's bandpass is an underdamped, second-order 12-dB/octave high-pass filter with a 6-dB peak at 17 Hz. This filter rolls the response off rapidly below the woofer

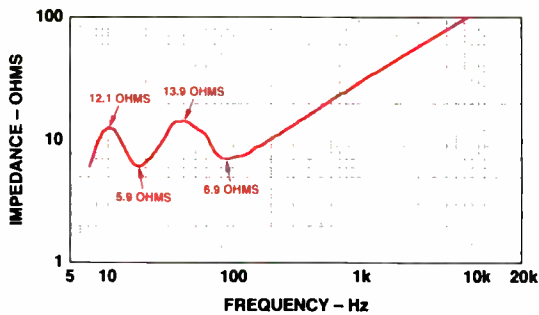


Fig. 2—Impedance magnitude.

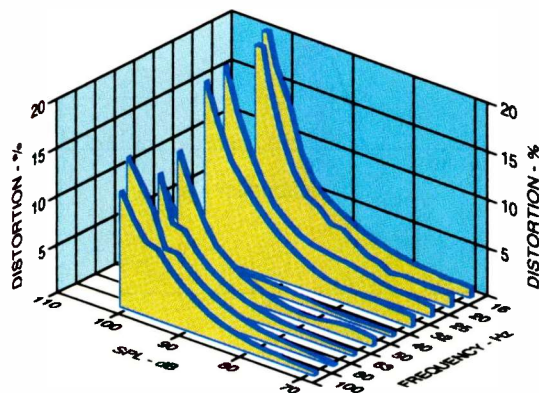


Fig. 3—Harmonic distortion vs. SPL and frequency.

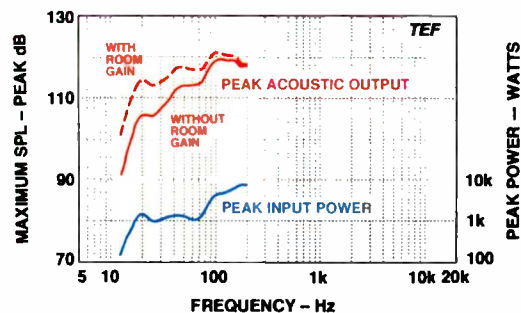


Fig. 4—Maximum peak input power and sound output.

system's tuning point, to minimize cone excursion at infrasonic frequencies. It also adds a touch of equalization, flattening the subwoofer's low-frequency response.

This flattening can be seen by comparing the subwoofer's response with the crossover (Fig. 1C) and the unequalized response seen in Fig. 1A; the  $-3$  dB points are now at 15 Hz, which is quite low, and 91 Hz. The upper rolloff point coincides exactly with Hsu's rated crossover frequency (even though the electrical crossover seen in Fig.

1B is 95 Hz), and the rolloff itself eliminates the upper-frequency roughness seen in Fig. 1A.

A plot of the TN 1220 HO's impedance magnitude (Fig. 2) displays the double humps typical of vented boxes. The impedance minimum, 5.9 ohms, occurs at 17.5 Hz, the approximate vented-box tuning frequency. The peaks of 12.1 and 13.9 ohms are reached at 10 and 40 Hz. The voice coil's inductance causes the steady rise in impedance above 200 Hz. Below 200 Hz, the impedance variation is only 2.4 to 1 (13.9 divided by 5.9). To keep cable-drop effects from causing response peaks and dips greater than 0.1 dB, an extremely tight spec for a subwoofer, cable series resistance should be limited to a maximum of about 0.12 ohm. For a typical run of about 10 feet, that would correspond to 18-gauge (or larger) cable.

The effects of frequency and output level (including room gain) on the TN 1220 HO's harmonic distortion are shown in Fig. 3. Note that the lowest test frequency is 16 Hz, not the 20 Hz I've used in prior subwoofer reviews. The distortion presented is the sum of the first 10 harmonics, expressed as a percentage of the power in the fundamental. This method yields essentially the same results as total harmonic distortion (THD), but uses only the first 10 harmonics and does not include noise.

Although the measured distortion reached 10% to 20% at full power, the TN 1220 HO sounded quite clean because the second and third harmonics predominated. Distortion at 40 Hz was significantly lower than in the other bands, reaching only 7.2% at a high 108 dB SPL, the highest sound level reached at any of the frequencies exhibited here. At 16 Hz, the fundamental rose to an impressive 104 dB, although distortion was a fairly high 22% at that level. Very few subwoofers have much usable output at 16 Hz, but the Hsu had enough output there (and at 20 Hz) to

vibrate every loose object in my listening room.

When I drove the TN 1220 HO with a high-level swept sine wave, its cylindrical cabinet exhibited no wall vibrations whatsoever—surprising rigidity, considering its large size and very light weight. Nor could I hear any wind noise caused by vent turbulence, even at the highest input levels and

**FEW SUBWOOFERS HAVE MUCH USABLE OUTPUT AT 16 Hz, BUT THE HSU RATTLED THE ROOM AT THAT FREQUENCY.**

near box resonance, where air velocity through the port is highest. A strong dip in the woofer's excursion at 18 Hz confirmed that the speaker's box resonance was at about that frequency. In free air, the woofer's maximum excursion was about 1 inch peak to peak at 20 Hz. When the woofer was remounted in the box and energized at high levels, I observed some inward dynamic offset between 60 and 80 Hz.

I've plotted the TN 1220 HO's short-term peak power input and sound output (Fig. 4) from 12.5 Hz up instead of from the 20 Hz I've used for other subwoofers. The Hsu's peak power input capability starts fairly high, at 150 watts at 12.5 Hz, then rises through 660 watts at 16 Hz to a high of 1.35 kilowatts at 20 Hz, then stays at about 1 to 1.2 kilowatts from 25 to 75 Hz. At higher frequencies, the input power rises rapidly, reaching 6,550 watts at 200 Hz.

With room gain, the maximum peak acoustic output starts with a very high 101 dB SPL at a very low 12.5 Hz, passes through 110 dB SPL at 16 Hz, then rises rapidly to a local peak of 114 dB at 20 Hz. After a slight dip to 113 dB SPL at 25 Hz, the output rises to 117.5 dB at 50 Hz, heading up (after another slight dip) to 120 dB at 95 Hz before falling slightly to 118 dB at 200 Hz.

The Hsu Research TN 1220 HO's output at 25 Hz is the loudest, if perhaps not the cleanest, of any subwoofer I have tested. At 30 Hz and above, however, several speakers and subwoofers can play louder. Overall, the Hsu's low-frequency output is still well



into the top 10% of all subwoofers and speakers I have tested.

### Use and Listening Tests

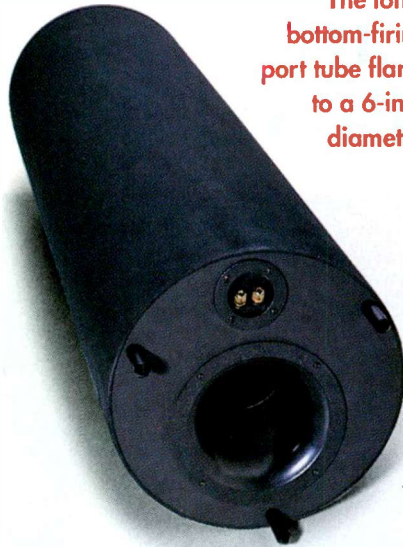
The tubular Hsu TN 1220 HO is distinctively different from the usual cube subwoofers. When I unpacked the Hsu, I was pleasantly surprised at its light weight. It's very easy to pick up and move around: Just lift it, bear-hug style, and move it where you want it. To move it farther distances, you can flip it on its side and carry it under one arm. The speaker's grille-cloth cover may shift and wrinkle if you use the bear-hug technique, but it can easily be smoothed out.

One of the first things I did when I unpacked the subwoofer was to check the length of its port tube by physically reaching into the port with my hand and arm and trying to find its end. The port handled the full length of my arm without my hand touching its end; long indeed! (Actually, I was glad I was easily able to get my arm out. I would look stupid with my arm stuck in the bottom of the latest subwoofer I was reviewing for *Audio!*)

The top-mounted driver, however, makes the 1220 quite top-heavy and susceptible to tipping, as the brief owner's manual warns. The manual covers unpacking procedures and subwoofer placement, as well as troubleshooting, and it adequately explains how to connect the subwoofer to many types of home theater and music systems. In addition to the warning about tipping, the manual cautions you not to set the 1220 upright on hard floors, such as tile or concrete, without putting a throw rug, felt pads, or rubber cups under the pointed feet to keep them from vibrating. Apparently, the cabinet's rigidity helps the driver's reaction forces travel to the floor, but its weight is too low to keep those vibrations from making it jump around when the 1220 is playing loud!

I evaluated the Hsu subwoofer in my home theater setup with both video soundtracks and music, feeding the output of the Hsu Electronic Crossover through a Crown Macro Reference amplifier that powered the TN 1220 HO through a 5-foot length of 16-gauge zip cord. For comparisons, I used the Paradigm Servo 15, the best-performing subwoofer I have reviewed to date (*Audio*,

April 1998), which I fed through its own crossover and amp. The other speakers in my home theater setup were all KEFs: Reference Four main speakers, a Model 200C in the center, and Reference Twos for surround. I set up the Paradigm and Hsu subwoofers side by side in one corner at



The long, bottom-firing port tube flares to a 6-inch diameter.

**IT PLAYS LOUD,  
IT GOES DEEP,  
YET YOU CAN STILL  
CARRY IT EASILY.**

the front of the room. The Paradigm's woofer and the bottom center of the Hsu were each approximately 2 feet from the corner. (Hsu's manual suggests that placing the TN 1220 HO near your listening position may also work well.)

Initially, I listened to selections culled from Hsu's very useful list of CDs and laserdiscs carrying deep bass signals. The TN 1220 HO demonstrated that it could keep up with the best subwoofers I've had in my listening room; its output at very low frequencies was second to none, while its bass reserve capabilities, smoothness, and extension were excellent. On a broad range of program material, the TN 1220 HO was able to handle, most capably, just about everything I threw at it. And although I listened mostly to CDs, the first 10 minutes of the *Terminator 2: Judgment Day* laserdisc demonstrated how ably the TN 1220 HO could handle even the

very demanding low-frequency effects in the "Future War" chapter.

The Hsu subwoofer competed very well with the Paradigm, its maximum clean output being a bit greater at the lowest frequencies and about equal at the higher end of its range. The Paradigm was somewhat cleaner in the upper bass, but I could hear this difference only on music that hadn't much upper-frequency content to mask it; it was audible on solo bass guitar or pipe-organ pedal notes, but not when the organ had all its stops out.

On band-limited pink noise in the 16- and 20-Hz bands, the Hsu's output was impressively high, bordering on scary—enough, actually, to shake the walls and almost everything attached to them.

Hsu's larger amplifier has a soft limiter that matches the capabilities of the Hsu subwoofers (so will its replacement, though without the current model's limiter-defeat switch), to minimize overload problems. With my amp, which has no such limiter and is about twice the power of Hsu's larger one, I could audibly overload the TN 1220 HO when I played bass-heavy recordings very, very loud.

The larger Hsu amplifiers, old and new, are also designed to drive two subwoofers in parallel. Although I didn't have a Hsu amp, I did have a second TN 1220 HO. I therefore did some listening with both subwoofers set up side by side, which increased the bass reserve quite significantly. At normal bass levels, the 1220s just coasted along, but on such demanding material as pipe-organ pedal notes, they delivered louder, deeper bass than any other subwoofers I had available. Two TN 1220 HO subwoofers and a single Hsu amp would give you a very cost-effective subwoofer system with very high output for less than \$1,500.

The Hsu Research TN 1220 HO is distinctively different from most other subwoofers. Its combination of slim tubular styling, light weight, small footprint, high output down to the lowest frequencies, and very modest price make the TN 1220 HO a winner. It does what a real subwoofer should do, providing large amounts of butt-kicking bass, all the way down to the 15-Hz region. It will please both the classical pipe-organ enthusiast and the rock 'n' roller. Still not enough bass? Buy two—they're inexpensive enough! **A**

BASCOM H. KING

# CLASSÉ AUDIO CAP-80 INTEGRATED AMPLIFIER AND CDP.3 CD PLAYER



About a year ago, I reviewed another Classé Audio integrated amplifier and CD player (the CAP-100 and CDP.5, July 1997). The CAP-80 and CDP.3 reviewed here are about 30% less expensive.

Even so, the CAP-80 has at least one feature not found on the CAP-100, an input selector that can be operated by the remote. The CAP-80's front panel includes a two-button input selector that cycles both ways through the five unbalanced ("Reg 1" through "Reg 5") and one balanced ("Bal 1") inputs. Three more pushbuttons turn on power, the tape monitor, and muting. Volume is controlled by the sole knob on

the front panel, and relative volume level is indicated on an adjacent display in 121 steps. There is no balance control. The supplied remote control has separate pushbuttons for selecting each signal input and for power, muting, up/down volume adjustment, and display brightness (adjustable in three steps). On the rear panel are the connectors for the unbalanced and balanced inputs, the tape and preamp outputs, five-way binding posts for speaker connections, and an IEC power-cord connector.

The CDP.3, like the CDP.5, has a simple, elegant, and attractive front panel that bears the usual drawer, display, and transport controls. A red LED to the right of the display window glows when an HDCD disc is being played and decoded. The player's

supplied remote, larger and shaped differently from the CAP-80's, has additional control functions, such as a button to switch the display from track elapsed time to total remaining time or elapsed time from the beginning of the disc.

## Measurements

The CAP-80 integrated amplifier's two channels performed almost identically on many of my tests, so I'm mainly showing data for only one channel, the left. Test signals were applied to an unbalanced line input unless otherwise noted.

The CAP-80's frequency response does not change much with loading, whether you're looking at the power-amplifier or preamp output. In both cases, the small change in output when the load is changed demonstrates that the impedance is quite low at either output.

The effect of changing the amplifier section's load is more noticeable above the audio range (Fig. 1A). This is typical of most amplifiers; it is caused by reduced negative feedback at high frequencies and by the resistor-inductor output-buffering network, whose series impedance rises with frequency.

The preamp section's frequency response (Fig. 1B) also shows more loading effect at higher frequencies, but not much, even on the expanded vertical scale used here. As can be seen, the bandwidth of the preamp section is considerably greater than that of the CAP-80's power amplifier section. Results were essentially the same using the

## AMPLIFIER

**Rated Power:** 100 watts/channel with 8-ohm loads; 150 watts/channel with 4-ohm loads.

**Dimensions:** 19 in. W x 4 $\frac{3}{8}$  in. H x 14 $\frac{1}{4}$  in. D (48.3 cm x 11.1 cm x 36.2 cm).

**Weight:** 25 lbs. (11.3 kg).

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

## CD PLAYER

**Dimensions:** 19 in. W x 3 $\frac{3}{4}$  in. H x 12 $\frac{7}{8}$  in. D (48.3 cm x 8.6 cm x 32.7 cm).

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

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

**Company Address:** 5070 François Cusson, Lachine, Que. H8T 1B3, Canada; 514/636-6384.

Photos: Michael Groen



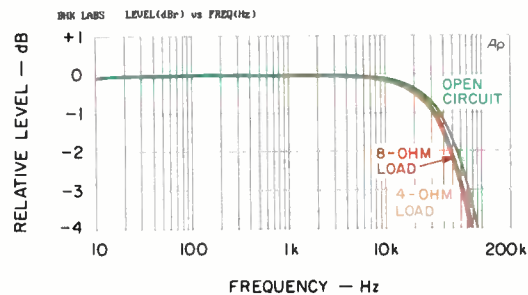
balanced input. The impedance of the pre-amp output was low, about 105 ohms, which explains why the output signal was little affected by the capacitance in the IHF load. The impedance at the tape outputs was about 500 ohms. For the unbalanced inputs, impedance was a high 300 kilohms; for the balanced input, it was 21 kilohms.

The power-amp section's bandwidth dominated the rise and fall times and the

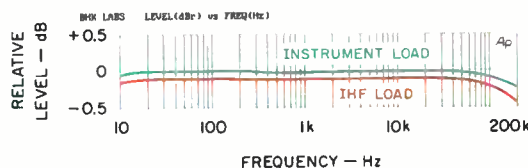
these harmonics are reasonably low in amplitude. For these distortion tests, the volume control was set at around 32, close to the midpoint of its numerical range.

Digitally controlled electronic volume controls such as the Crystal CS3310 used in the CAP-80 will overload at some input level, regardless of the volume setting. This control circuit's overload levels can be read from Figs. 5A (for unbalanced input) and 5B (for balanced output), which show how the pre-amp section's distortion changes with input level and frequency. (These tests were run with the volume reduced to 18.5, keeping overall gain low enough to ensure that the power-amp output would not clip when this input overload occurred.) As is most often the case, distortion increases at the highest frequencies, but here overall distortion is quite low and the preamp's ability to withstand input overload is more than adequate for any normal signal source.

Plots of THD + N versus level for analog circuits traditionally express the THD + N as a percentage of the signal level rather than a percentage of some fixed value. Distortion typically varies with signal level, while a circuit's noise level is fixed. As the signal level drops, this noise level becomes a larger and larger percentage of the total and then eventually dominates the readings. Once that point is reached, THD + N rises at 6 dB per octave as the level keeps dropping. So the straight-line portion at the left of these curves represents noise, not distortion. Only where the curves deviate from this 6-dB/octave slope does actual distortion dominate the reading. This happens at about 1 to 2 volts in Fig. 5A and at about 2 to 4 volts in Fig. 5B. The results were essentially the same with instrument or IHF loading on the preamp output. (For digital circuits, we measure THD + N in dB relative to full-scale output, or dBFS, so this potential misunderstanding does not arise.)

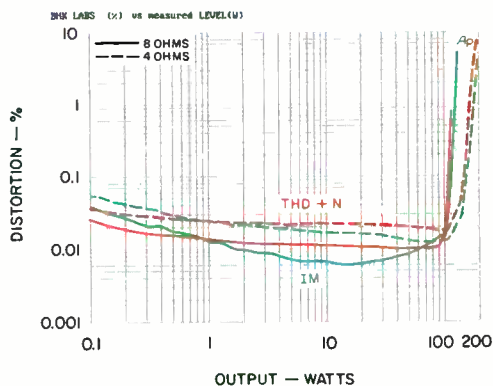


A

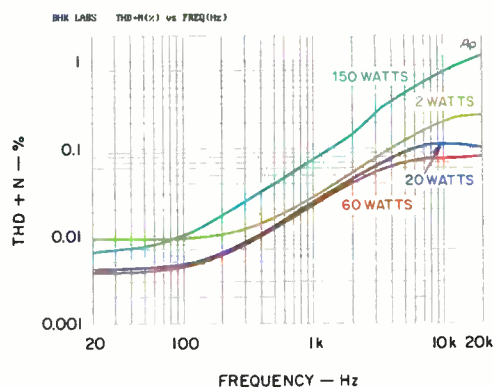


B

**Fig. 1—Frequency response of CAP-80, measured at amplifier output (A) and preamp output (B).**

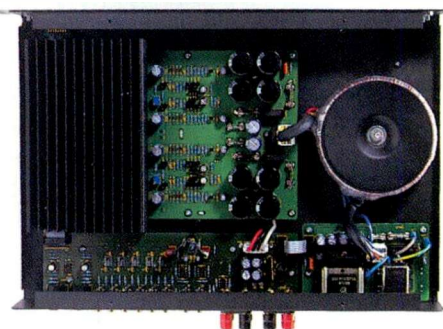


**Fig. 2—Amplifier THD + N and SMPTE IM vs. output.**



**Fig. 3—Amplifier THD + N vs. frequency, 4-ohm load.**

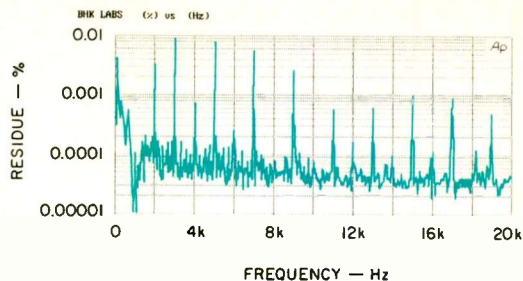
The preamp section's IHF S/N ratios via the unbalanced inputs were 104.3 dB for the left channel and 104.5 dB for the right. For balanced inputs, the ratios were 96.2 and 92 dB. For the amp as a whole, the dif-



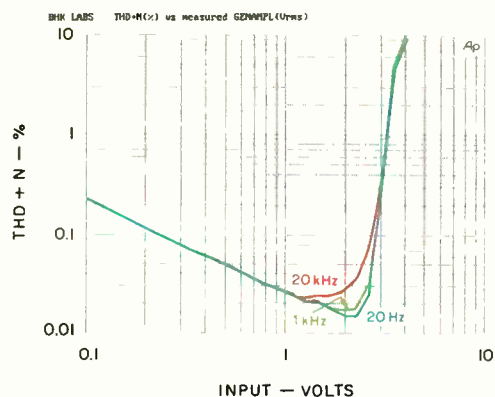
**THE CAP-80 AMP  
EASILY DROVE MY  
DUNLAVY AUDIO LABS  
SC-III SPEAKERS TO  
VERY LOUD LEVELS.**

square-wave response. The former were 5.2 microseconds for an output of  $\pm 5$  volts into 8 ohms (rise and fall times at the preamp output were a fast 400 nanoseconds at  $\pm 1$  volt out). As to the latter, a 10-kHz square wave had a perfect exponential shape into an 8-ohm load. When 2 microfarads of capacitance were added to the load, ringing was very low, about 8% overshoot that damped out in one cycle. A 20-Hz square wave had just noticeable tilt.

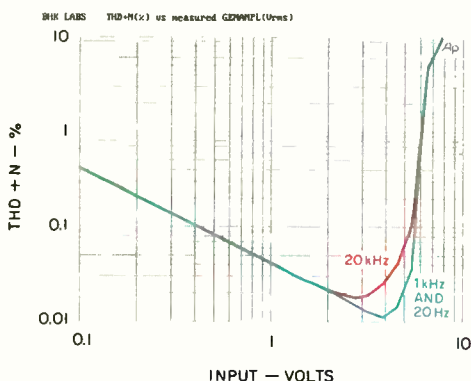
From Fig. 2's curves of the CAP-80's power versus total harmonic distortion plus noise (THD + N) at 1 kHz and SMPTE IM distortion, it appears that this amp meets its 8- and 4-ohm power output specs. But above 1 kHz, THD + N into 4-ohm loads is higher (Fig. 3); with 8-ohm loading, the distortion was somewhat lower, reaching a maximum of 0.14% at 12.5 kHz. A harmonic-distortion spectrum for a 1-kHz, 10-watt signal into 8 ohms is plotted in Fig. 4. The harmonic spectrum is rather complex, consisting principally of odd harmonics extending out to 20 kHz and beyond, but



**Fig. 4—Amplifier distortion residue for 10 watts into 8 ohms at 1 kHz.**

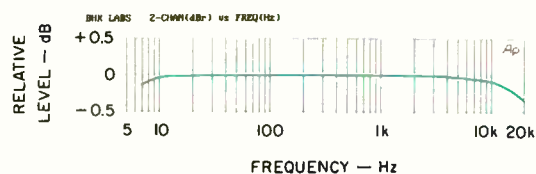


**A**



**B**

**Fig. 5—Preamp distortion vs. input level for balanced inputs (A) and unbalanced inputs (B).**



**Fig. 6—Frequency response of CDP.3 CD player.**

ferences between unbalanced and balanced inputs were smaller. The S/N via unbalanced inputs was 89.8 dB for the left channel, 90.2 dB for the right; with balanced inputs, the ratios were 89.4 and 87.2 dB. The CAP-80's interchannel crosstalk measured a little better than -70dB over most of the audio range. At 20 kHz, it increased to about -64 dB from left to right and -68 dB from right to left.

As mentioned earlier, the output impedance of the CAP-80's power-amp section is very low. Consequently, the damping factor was quite high, measuring greater than 500 at frequencies up to about 600 Hz and decreasing smoothly to about 41 at 20 kHz.

The CAP-80's dynamic power into 8-ohm loads was 156 watts at the beginning of the 10-millisecond IHF tone-burst signal and 138 watts at its end; with 4-ohm loads, the beginning and end powers were 253 and 210 watts. Using the values at the beginning of the burst, the dynamic headroom figures work out to 1.9 dB for 8-ohm loads and 2.3 dB for 4 ohms. Clipping power at 1 kHz (measured at the visual onset of clipping, about 0.8%) was 118 watts with 8-ohm loads and 168 watts into 4 ohms, for clipping-headroom figures of 0.7 and 0.5 dB, respectively.

When the CAP-80 is powered on, the volume indicator counts down from 20 to 0, at which time the "Reg 1" input is selected and the muting light comes on. The AC line current drawn is about 380

milliamperes after warmup. Sensitivity measurements for the CAP-80 are listed in Table I.

Turning to the CAP.3 CD player, output at digital full-scale (0 dBFS) into instrument loads was just over 2.01 volts for the unbalanced outputs and about 4.025 volts for the balanced outputs. IHF loading reduced the unbalanced output level by a mere 0.04 dB and the balanced output by 0.08 dB. The unbalanced output's impedance was 45 ohms, and the balanced output's was 90 ohms.

The CD player's frequency response with unbalanced output and instrument loading

**THE CAP-80'S BASS WAS TIGHT AND DEFINED, MIDS AND HIGHS WERE SMOOTH, AND IMAGING WAS VERY GOOD.**

(Fig. 6) was no different from its balanced output's response, and IHF loading didn't alter the response shape for either output. Frequency response with de-emphasis engaged was essentially the same, too, indicating a negligible de-emphasis error. Square-wave output had the usual linear phase characteristic, i.e., symmetrical ringing about the vertical center line of each half cycle of the wave. The ringing on a 1-kHz, 0-dBFS (full-scale) square wave was not clipped off, which is characteristic of the Pacific Microsonics HDCD decoding/digital filter chip used in the CDP.3. The polarity of both unbalanced and balanced outputs was correct.

Figure 7 shows the CDP.3's THD + N versus frequency at 0 dBFS for two meas-

**TABLE I—Input sensitivity, CAP-80 amp, for 500 mV into 10 kilohms + 1,000 pF or 1 watt into 8 ohms.**

	Sensitivity	
	LEFT	RIGHT
Unbalanced In to Preamp Out	41.1 mV	40.5 mV
Balanced In to Preamp Out	80.4 mV	81.2 mV
Unbalanced In to Tape Out	529.6 mV	528.4 mV
Balanced In to Tape out	1.0641 V	1.0641 V
Unbalanced In to Power Amp Out	7.66 mV	7.74 mV
Balanced In to Power Amp Out	15.3 mV	15.5 mV
Preamp Out to Power Amp Out	96.4 mV	96.6 mV



## ASSOCIATED EQUIPMENT USED

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

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

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

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

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

**Amplifiers:** Arnoux Seven-B stereo switching amplifier, Quicksilver Audio M-135 mono tube amps, and Audio Note Conqueror single-ended stereo tube amp

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

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

urement bandwidths. The data plotted is for unbalanced output and instrument loading; results for balanced output and IHF loading were about the same. Commendably, high-frequency distortion does not rise much with the wider measurement bandwidth; this is frequently not the case. In Fig. 8, THD + N is plotted as a function of level for a 400-Hz tone, with an IHF load on the unbalanced output.

The CDP.3's deviation from linearity when playing a 500-Hz tone (Fig. 9) is greater in the right channel than in the left below about -80 dBFS; this characteristic will affect some of the measurements to come. In Fig. 10, for example, a third-octave sweep of the audio range with a -80 dBFS, 1-kHz signal, the right channel's greater deviation from linearity manifests itself as greater harmonic distortion (especially the third harmonic, at 3 kHz). But the complete absence of 60-Hz hum components is notable.

Interchannel crosstalk was very low, measuring less than -100 dB from 125 Hz to 16 kHz from right to left and about -90 dB from left to right. Several other readings were better in the left channel: Dynamic range measured 99 dB in the left channel and 95.1 dB in the right; quantization noise was 93.6 dB in the left channel and 89.6 dB in the right; and S/N (re 0 dBFS with the transport in pause) was 84.7 dB wideband and 106.7 dB A-weighted for the left channel versus 84.2 and 102.4 dB for the right.

The jitter spectrum in Fig. 11 was measured, with the transport in pause, at the latch-enable pin of one of the CDP.3's DAC chips. In multibit DACs like the ones used in this player, it is said to be primarily the jitter at this pin that affects the reconstructed audio signal. On this plot, 0 dB represents a jitter of 10 nanoseconds peak to peak or, assuming a sinusoidal jitter waveform, 3.54 nanoseconds rms. An individual spectral component down, say, 60 dB would be 3.54 picoseconds rms. The rms sum of all the jitter components above 70 Hz in frequency and -70 dB in amplitude is about 6.7 picoseconds, which is quite good.

### Use and Listening Tests

I used the CAP-80 as my system amplifier for a considerable time, along with the CDP.3 CD player. Most of my listening was with the Dunlavy Audio Labs SC-III speak-

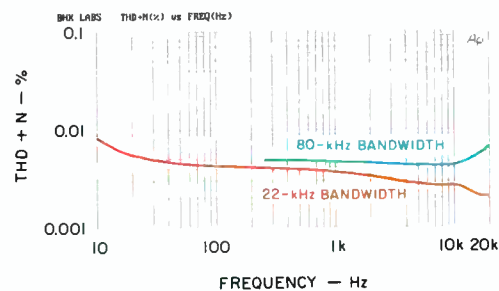


Fig. 7—CD player THD + N vs. frequency, for narrow and wide measurement bandwidths.

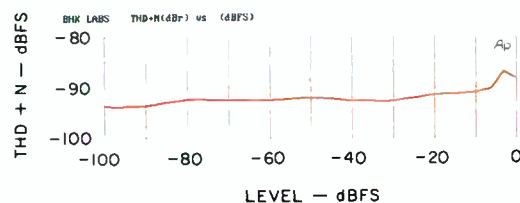


Fig. 8—CD player THD + N vs. level.

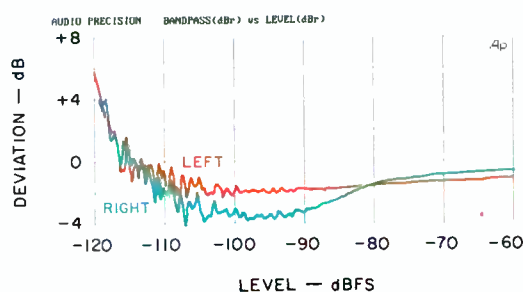


Fig. 9—Deviation from linearity.

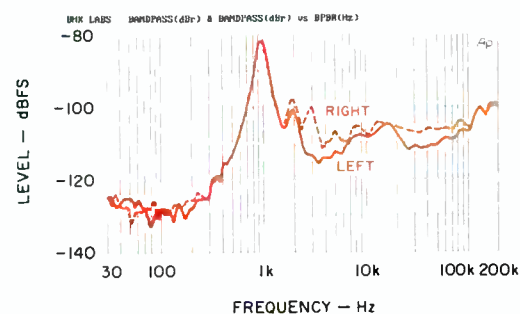


Fig. 10—CD player noise spectra.

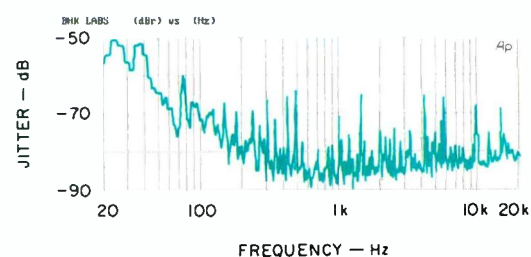


Fig. 11—Jitter spectrum.

## TECHNICAL HIGHLIGHTS

The Classé CAP-80's circuitry is distributed among four boards. The board carrying the line-level inputs and outputs, signal selection, and preamp circuitry is mounted at the rear of the enclosure. A smaller board, also at the rear, is an auxiliary power supply that keeps the amp's control microprocessor powered up so that it can respond to control inputs from the front panel or remote. The microprocessor itself is on a board behind the front panel, which also connects to the front-panel controls and display. The power amplifier board and generously sized toroidal power transformer occupy the rest of the interior.

The preamp and signal-selector circuits are always powered by the auxiliary supply. When the front-panel power switch is turned on, a relay on the auxiliary supply switches AC power to the toroidal transformer that feeds the power amplifier section.

Preamplifier gain and volume are handled by a Crystal CS3310 chip on the signal-selector and preamp board. (It and the op-amps in the CAP-80 are powered by a  $\pm 5$ -volt supply.) This chip, a reasonably good-sounding device, can vary level from  $-95.5$  to  $+31.5$  dB in 0.5-dB steps, but the CAP-80 uses only 97.5 dB of this range. From full volume (shown as "60" on the display) down to an indicated level of "7," volume changes in 0.5-dB steps; below that, the steps grow larger until there's a 12-dB level difference between steps "1" and "0.5," and the last step mutes the signal completely. Solid-state switches handle signal selection. Burr-Brown OPA2134 dual op-amps take care of signal buffering and convert differential, balanced input signals to unbalanced ones.

The CAP-80 has no power-amp input and no way to break the link between its preamp and power-amp sections, yet there is a preamp output.

The power-amplifier circuitry uses only discrete parts. Each channel has its own rectifiers and filter capacitors. These capacitors are 4,700-microfarad, 63-volt filter capacitors, two paralleled per supply polarity for each channel. The supply for the preamp section has its own transformer winding, rectifier, and filter capacitors. Driver and output transistors are mounted on the heat sink, their leads soldered to the p.c. board. One pair of output transistors is used in each channel.

The CDP.3 CD player's transport mechanism is decoupled from the chassis with elegant little rubber isolators. An internal metal enclosure shields the transport electronics. A p.c. board at the rear of the unit handles digital filtering, HDCD decoding, and D/A conversion. The filtering and HDCD decoding are done with the Pacific Microsonics PMD100 chip; the DAC chips are Burr-Brown PCM 1702s, and Burr-Brown OPA604 and OPA2604 op-amps handle analog filtering and convert unbalanced signals to feed the balanced outputs. A number of three-terminal regulators provide various voltages for the digital and analog circuitry on this board. A toroidal power transformer sits behind the CD transport. Another board, which is behind the front panel, interconnects the front panel's pushbuttons and display window with the player's control microprocessor.

Both of these units are very nicely made with high-quality parts. *B.H.K.*

turn-off thump displaced the drivers to a worrisome degree, nearly  $\frac{1}{2}$  inch. This thump should not be a problem with drivers of normal sensitivity, however.

I found the CDP.3 musically satisfying with most of my CDs. The sound was highly detailed, though through the CAP-80 it seemed to lack a little weight in the lower midrange relative to my other (much costlier) CD sources. When I used the Classés with the Lowther speakers, the sound was quite detailed, though occasionally somewhat bright and edgy.

Both components' remote controls worked well. I was particularly impressed with the taper of the CAP-80's volume control, which made the degree of volume



**THE CDP.3 CD PLAYER'S  
TRANSPORT IS DECOUPLED  
FROM THE CHASSIS  
WITH ELEGANT  
RUBBER ISOLATORS.**

change seem unusually well matched to the degree of control rotation. It did feel odd, though, that volume did not change unless I rotated the knob at some minimum rate; this was no problem in normal use but mildly annoying when I was trying to set precise levels for my lab tests. I also would have preferred the CDP.3's drawer to extend about a quarter of an inch further outward, so it would be less easy to scrape CDs on the front panel when loading and unloading. And I felt the player was a bit slow getting from track to track and beginning play.

But those are only minor reservations. Overall, the Classé CAP-80 and CDP.3 performed very well and should provide good musical satisfaction in systems appropriate to their price range. *A*

ers, which I sometimes augmented by using B&W 801 Matrix Series 3s as subwoofers. I found that the speaker cables I used made a noticeable difference in the sound; I settled on the Madrigal Audio Laboratories HF2.5C wire as giving the best, fullest, smoothest sound.

The CAP-80 amp proved highly listenable. When I cranked it up on recordings

with heavy bass, it easily drove the SC-IIIs to very loud levels. The bass was tight and defined, midrange and highs were smooth, and imaging and sense of space were very good. It did, however, tend to sound etched and a little thin in the lower midrange. When I used the CAP-80 to drive the Lowther speakers, which have unusually high sensitivity (about 102 dB), the amp's





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D. B. KEELE, JR.

# MISSION 750 LIMITED EDITION MINI-MONITOR SPEAKER



**M**ission is a British manufacturer of high-performance loudspeakers, which are among the top sellers in the company's native land; for nearly a year, now, they have been distributed in the U.S. by Denon. The 750 Limited Edition (LE) mini-monitor is at the bottom of the company's upscale 75 Series. Despite its moderate price, it is not a stripped-down model made for the cost-conscious but, as company founder Farad Azima says, "a celebration speaker" to mark Mission's 20th anniversary last year. Azima calls the 750LE "a product central to the very core of Mission's philosophy—a blend of leading-edge technology and impeccable aesthetics but with that extra something that animates the

very soul of music," adding that "Above all we wanted our celebration speaker to be modestly priced, to include... our customers whose investment in our products and constant encouragement have sustained us from the beginning." The 750LE appears to be all of this and more.

The Mission 750LE is a small, two-way system with a 5¼-inch woofer and a 1-inch fabric-dome tweeter, both developed specifically for this speaker. The enclosure is vented to the rear via a molded plastic tube with a flared mouth; the tube has an inner diameter of 1¼ inches and is 2¾ inches long. Real wood veneer covers the cabinet's top, sides, and much of its front panel. Except where the top meets the sides, all edges are either rounded or beveled.

Mission made heavy use of computer-aided solid modeling techniques to design a rigid cabinet that it says is self-braced and self-damped. The cabinet panels form two U-sections that interlock to form the complete cabinet. Tolerances are said to be so close that joints are virtually airtight even before the cabinet is bonded. The top and side walls are made from an uncommonly thick, 1¼-inch, medium-density fiberboard (MDF), into which swirling grooves have been machined. The machining lowers the panels' mass (to reduce stored energy) and increases the cabinet's internal volume but doesn't significantly reduce the thick panels' inherent rigidity. The groove pattern is also said to disperse internal reflections and reduce the effect of standing waves. The front, back, and bottom of the cabinet are made from MDF in a more conventional, ¾-inch, thickness.

Most of the front panel is covered by a molded plastic plate whose surfaces are smooth and rounded, to reduce diffraction. Instead of being attached to the cabinet front panel, as the woofer is, the tweeter is attached to the molded plate, to mechanically decouple it from the woofer. The 750LE's grille, of molded plastic covered with black cloth, snaps into rubber-grommeted holes in the front plate.

The 750LE's woofer has a molded plastic frame, a ferrite magnet 2¾ inches in diameter and 0.6 inch thick, and a cone made from Aerogel, a patented material composed of short strands of carbon fiber and Kevlar suspended in an acrylic polymer gel.

**Rated Frequency Response:** 70 Hz to 20 kHz,  $\pm 3$  dB.  
**Rated Sensitivity:** 86 dB at 1 meter, 2.83 V rms applied.  
**Rated Nominal Impedance:** 6 ohms.  
**Recommended Amplifier Power:** 30 to 100 watts.  
**Dimensions:** 11 in. H x 6½ in. W x 10¾ in. D (28.0 cm x 16.5 cm x 26.2 cm).  
**Weight:** 9.4 lbs. (4.25 kg) each.  
**Price:** \$500 per pair, in rosewood veneer or black.  
**Company Address:** Mission, c/o Denon Electronics, 222 New Road, Parsippany, N.J. 07054; 973/575-7810; www.denon.com; www.mission.co.uk.

Photos: Michael Green



According to Robin Marshall, the 750LE's designer and engineer, Aerogel is 50% more rigid than average paper cones yet has 75% less mass, giving it an extremely high stiffness-to-mass ratio. Marshall also states that it has a high internal loss factor, which damps surface resonances and helps prevent energy storage.

The woofer's cone is attached to the frame with a rubber surround. Instead of a dust cap moving with the cone, there's a stationary phase plug around which the cone and voice coil move. This is said to further lower cone mass and to improve off-axis phase characteristics.

The 750LE's tweeter is a 1-inch, coated-fabric dome driven by a powerful neodymium magnet. A star-shaped molded plastic clamp assembly holds it to the molded front plate.

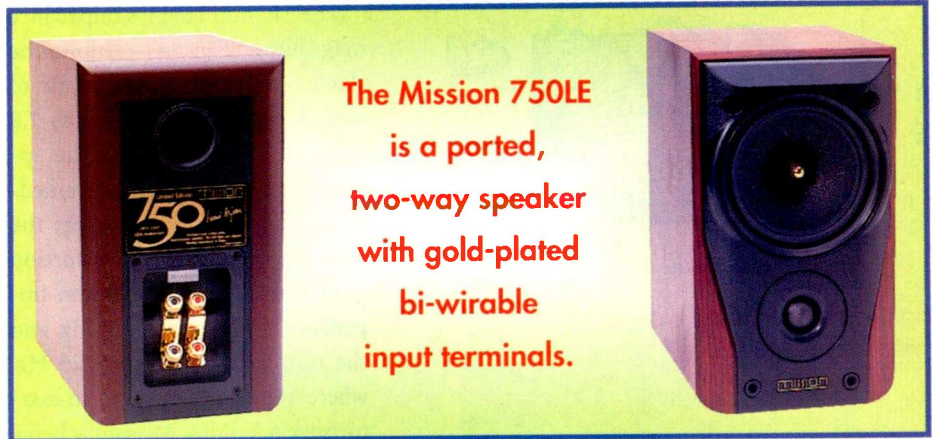
**THE 750LE IS  
A "CELEBRATION SPEAKER"  
IN HONOR OF MISSION'S  
20TH ANNIVERSARY.**

The crossover is wired point-to-point on the back of the input connection cup, on the rear panel. The low-pass section is a first-order series-inductor design with a resistor-capacitor (RC) impedance-compensation network across the woofer. The high-pass is a second-order filter consisting of an RC network in series with the tweeter and an inductor in parallel with it. The woofer's inductor has a powdered-iron core, the tweeter's an air core. All parts are of high quality.

The bi-wirable terminals are heavy-duty gold-plated binding posts. Although the posts are spaced the standard 3/4 inch apart, you cannot insert double (or even single) banana plugs without prying out small plastic plugs that close off the posts' end holes. The plugs are required by European safety regulations, because some European AC power plugs are similar to double banana plugs.

#### Measurements

The Mission 750LE's frequency response curve (Fig. 1) with its grille off fits a fairly



**The Mission 750LE  
is a ported,  
two-way speaker  
with gold-plated  
bi-wirable  
input terminals.**

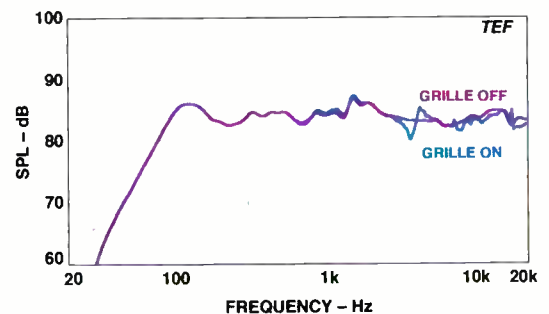
tight, 4.7-dB, window from 87 Hz to 20 kHz. Enlarging the window to 6 dB extends the lower frequency limit to 80 Hz, quite close to Mission's rated frequency response. However, the curve is somewhat uneven, exhibiting peaks at 125 Hz, 1.45 kHz, and 12.5 kHz and dips at 230 Hz, 700 Hz, 6 kHz, and 15.5 kHz. Averaged from 250 Hz to 4 kHz, the 750LE's sensitivity measured a moderate 84.4 dB. The grille causes a +2-, -3-dB ripple between 3 and 4 kHz and reduces overall level by about 1 to 1.5 dB above 7 kHz. The two speakers matched within a very close  $\pm 0.5$  dB. (The curves in Fig. 1 combine ground-plane bass measurements and measurements taken in a large anechoic chamber, and the "Grille Off" curve was smoothed. The test microphone was midway between the two drivers axes.)

When the tweeter and woofer sections of the crossover were driven directly through their separate input terminals, the two drivers' acoustic outputs crossed at about 2.45 kHz, the apparent crossover point. The measurements also indicated that the woofer rolled off at 12 dB per octave above 2 kHz, while the tweeter rolled off at 6 dB per octave below about 4 kHz. Experimentally reversing the signal polarity to one driver produced an octave-wide rejection dip of about 15 dB between about 2 and 4 kHz. This demonstrates that, when the sections are connected normally, the drivers' outputs are pretty much in phase acoustically through the crossover region and lobing should be minimal.

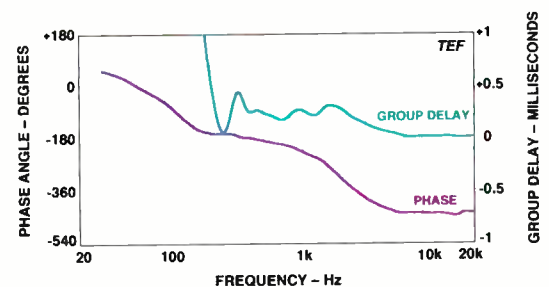
When a direct-radiator speaker's drivers share a common surface,

the low-frequency drivers are usually delayed behind the high-frequency drivers, and the 750LE's phase and group-delay responses (Fig. 2) show such a delay. The phase continually falls as frequency increases, while the group-delay curve has an offset of about 0.25 millisecond between about 300 Hz and 2 kHz. This measured delay is due partly to physical offset between the two drivers and partly to delay inherent in the crossover that drives the woofer.

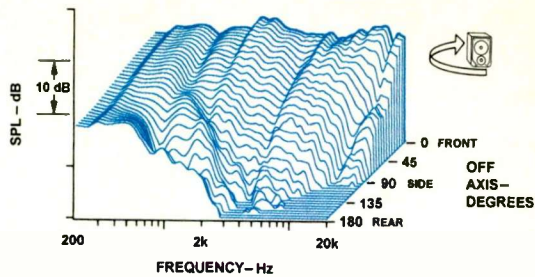
The 750LE's horizontal off-axis responses (Fig. 3) are extremely uniform all the way to 20 kHz within the main,  $\pm 15^\circ$ , listening window. Farther off axis, the response narrows above 13 kHz.



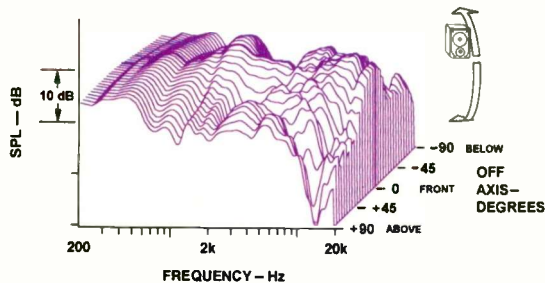
**Fig. 1—Frequency response.**



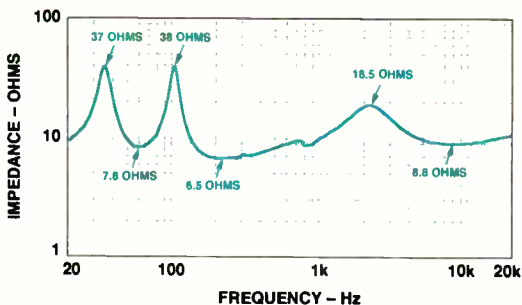
**Fig. 2—Phase response and group delay.**



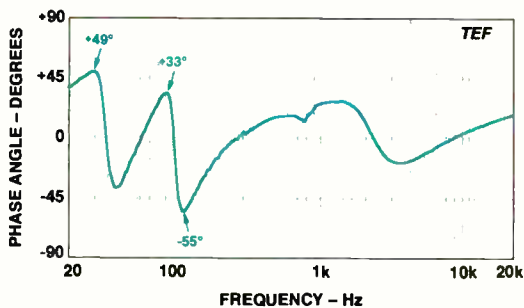
**Fig. 3—Horizontal off-axis frequency responses.**



**Fig. 4—Vertical off-axis frequency responses.**



**A**



**B**

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

The 750LE's vertical on- and off-axis responses (Fig. 4) are fairly uniform except in the crossover region, between 2 and 4 kHz. In the main listening window,  $\pm 15^\circ$ , the responses are quite uniform. Farther off, between  $30^\circ$  and  $45^\circ$  above and below the axis, a deep null develops between 2 and 4 kHz (not clearly visible in the graph).

The Mission 750LE's impedance magnitude (Fig. 5A) exhibits the classic dual-peak characteristic of vented enclosures. The dip to 7.8 ohms at 60 Hz indicates the approximate location of the vented-box tuning frequency, where the woofer's excursion and distortion is minimized. The maximum impedance is 38 ohms, at 105 Hz, and the minimum occurs at 225 Hz, where impedance drops to an easy-to-drive 6.5 ohms. Mission is being a bit hard on the 750LE by calling it a 6-ohm speaker; judging from the overall curve, it could honestly be rated at 8 ohms. Between 20 Hz and 20 kHz, the impedance range is a moderate 5.8 to 1 (38 divided by 6.5). Cable series resistance can therefore be as high as 0.09 ohm without cable-drop effects causing response peaks or dips greater than 0.1 dB. For a typical run of about 10 feet, that would correspond to 16 gauge (or heavier), low-inductance cable. The impedance phase (Fig. 5B) reaches a moderate maximum of  $+33^\circ$  (inductive), at 90 Hz, and a minimum of  $-55^\circ$  (capacitive), at 120 Hz. The 750LE should be an easy load for any amplifier, and you can even safely connect two of them in parallel to the same amp output.

A high-level sine-wave sweep revealed that the cabinet was quite rigid, although its sides did vibrate at 315 Hz, causing a slight buzz. The  $5\frac{1}{4}$ -inch woofers are capable of about 0.38-inch peak-to-peak excursion and overload gracefully. Excursion reached its minimum at about 63 Hz (another guide to the vented enclosure's resonant frequency), and no dynamic-offset distortion was evident.

I measured the 750LE's raw and smoothed 3-meter room response (Fig. 6) with the test microphone at ear height (36 inches) and the speaker aimed at it from a 30-inch stand. Above 750 Hz, the smoothed curve fits a tight, 4.8-dB, window. Except for a 145-Hz peak and 630-Hz dip, the smoothed curve fits a fairly tight, 13-dB, window. Below 750 Hz, where room effects

predominate, several large peaks and dips are evident. This is not a fault of the speaker, but shows how the room would affect any small acoustic source in the same place.

The 750LE's  $B_1$  (61.7-Hz) harmonic distortion is shown in Fig. 7. I choose the higher frequency  $B_1$  tone rather than my usual  $E_1$  (41.2-Hz) tone, because  $E_1$  is significantly below the 750's rated operating range and also below the vented enclosure's tuning frequency, too low for the speaker to handle much power. At a maximum power of 50 watts (17.3 volts rms into the rated 6-ohm load), the second harmonic rose to a moderate 12.7%, while the third rose only to 5.6%. Higher harmonics were 1.9% or lower. At 61.7 Hz, a 50-watt input to the 750LE generated a quite usable 93 dB SPL at 1 meter in a free field.

The  $A_2$  (110-Hz) harmonic distortion (Fig. 8) consisted only of a low, 2%, second harmonic, 2.1% third, 3.2% fourth, and

**THE CONSTRUCTION AND DESIGN OF THE 750LE'S CABINET ARE UNUSUALLY INNOVATIVE.**

higher harmonics less than 1%. At 110 Hz, a 50-watt input drove the 750LE to a fairly loud 103 dB SPL at 1 meter in a free field.

The Mission's IM distortion for a 50-watt signal was a moderate 9.3% that was, nonetheless, clearly audible at this power level. The test signal consisted of 440-Hz ( $A_4$ ) and 61.7-Hz ( $B_1$ ) tones of equal power; once again, I substituted the  $B_1$  tone for my usual  $E_1$  because of the 750LE's low-frequency restrictions.

The 750LE's short-term peak power input and output are shown in Fig. 9. The peak input power starts out quite low, at about 2.5 watts at 20 Hz, but above 30 Hz it rises quickly, reaching a plateau of 125 watts between 60 and 120 Hz. After a rise to 800 watts at 250 Hz, the peak power falls somewhat to 300 watts at 700 Hz, then rises quickly to a very high 8 kilowatts in the tweeter's range, above 2 kHz. Why did the tweeter handle much higher power than the woofer? The woofer's peak power handling above 150 Hz seemed to be limited by in-



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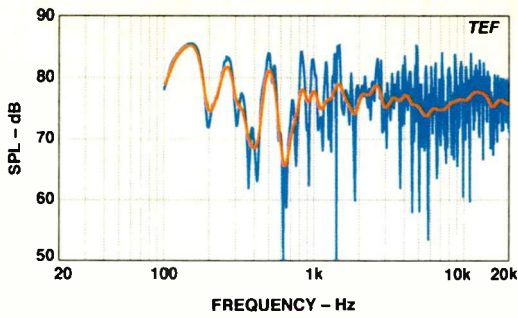
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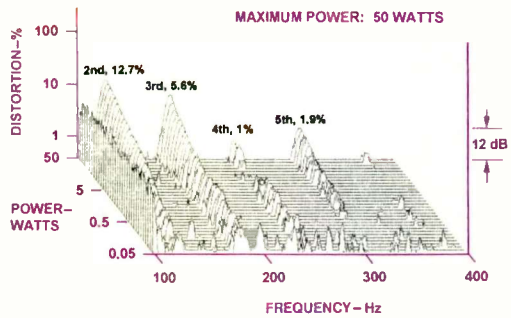
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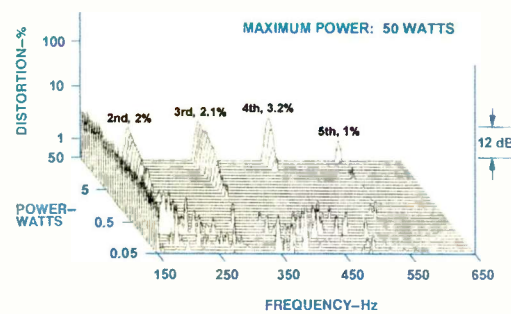




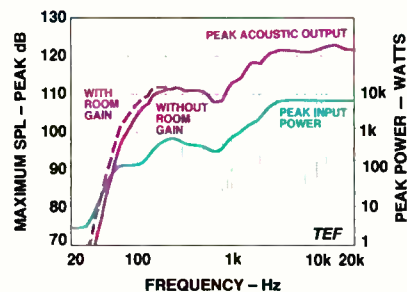
**Fig. 6—Three-meter room response.**



**Fig. 7—Harmonic distortion for B<sub>1</sub> (61.7 Hz).**



**Fig. 8—Harmonic distortion for A<sub>2</sub> (110 Hz).**



**Fig. 9—Maximum peak input power and sound output.**

ductor saturation in the woofer leg of the crossover. I did not bypass the crossover inductor as I sometimes do, but I inferred the saturation from the pointed waveshapes of the woofer's acoustic output when it was overdriven.

With room gain, the peak acoustic output starts at an unusable 70 dB at 30 Hz but rises rapidly through 100 dB at 60 Hz and 110 dB at 130 Hz. The output decreases somewhat to 108 dB at 700 Hz, then rises steeply to a loud 122 dB above 2 kHz. The 750LE's bass output is average for a speaker of its size and driver complement.

#### Use and Listening Tests

As I've said before, it's a pleasure to evaluate a small speaker once in a while, and the Mission 750LE mini-monitor is quite diminutive compared to the tower speakers I usually review. That makes it easier to move around, set up, and measure, although, naturally, you lose the deep-bass power of which larger speakers normally are capable.

When I first unpacked the Missions, I was so impressed with their looks that I showed them off to everyone around. Every detail looked quite impeccable. The rosewood finish blended very well with the molded plastic front plate. The woofer looked quite exotic, thanks to its polished, brass-colored central phase plug and the iridescent, crystalline appearance of its Aero-gel cone. The smoothed and beveled surfaces of the cabinet and faceplate lent a quite pleasing quality to the 750LE.

Mission's instruction manual, which covers the whole 75 Series, is jam-packed with useful information, including a three-page mini-dictionary of speaker terms. (Although detailed and informative, the dictionary has a decidedly high-end orientation and includes a considerable dose of Mission promotion.)

The manual suggests placing the speakers 5 to 8 feet apart, spaced 8 inches away from the wall behind them and a minimum of 1.5 feet from the side walls, and that the speakers should be aimed straight ahead, not canted in. I followed these recommendations in most respects but placed the Missions more than 8 inches from the wall, closer to where I usu-

ally put speakers. I put the 750LEs on stands, which raised them so that each one's bottom was just about even with the top of the comparison B&W 801's woofer enclosure. The high frequencies sounded most natural to me with the 750s canted in slightly, not aimed straight ahead. I also broke the speakers in overnight, as the manual suggests, before I did my serious listening. To do this, I fed them a low-passed feed of pink noise from a CD, adjusting the level to provide a healthy excursion of the 750's woofer.

All of my listening was done with standard single-cable connections. Ancillary gear included an Onkyo CD player, Krell KRC preamp, Crown Macro Reference power amplifier, Straight Wire Maestro cabling, and B&W 801 Matrix Series 3s as reference speakers. For some of my listening, I used a Velodyne HGS-12 subwoofer (June 1998) with the Missions; I fed the 750LEs through a high-pass filter for some of my later trials, but at first I used no filter, so both the Mis-

**THE MISSION 750LE  
SOUNDED BALANCED AND  
SMOOTH, WITH SUPERB  
CLARITY, IMAGING, AND  
SOUNDSTAGING.**

sions and the sub reproduced frequencies below 80 Hz.

From the first, the Mission 750LE sounded balanced, smooth, and even, but with the attenuated low bass you'd expect from a speaker its size. Imaging, soundstaging, and center-channel stability were excellent. The Mission's high-frequency extension, clarity, and balance were a pretty close match to the B&W's. The Missions could be played loudly but were not quite as clean as the B&W's at the same level, particularly with recordings that had any appreciable bass content. Played at more moderate levels (i.e., not at levels that had my wife saying "turn that thing down!"), the 750LEs' balance of low and high frequencies was surprisingly good. A couple of times I even thought the subwoofer was operating when it was not.

On the low-frequency third-octave band-limited pink noise test, the 750LEs generated no usable output in the bands



from 20 to 40 Hz, some usable output at 50 Hz, and stronger output from 60 Hz up. At 40 Hz and above, wind noise from the port was quite audible at my listening position, adding an irritating buzz. The noise appeared to stem from turbulence at the end of the port tube inside the enclosure. Plugging the vent with a small washcloth eliminated the buzz but reduced bass output and increased distortion from the woofer cone. However, I could hear the wind noise on almost none of the music I played, even when I was listening for it; most recordings with bass, unlike my narrow-band test signals, have significant upper-frequency energy that masks the noise.

When I played wide-band pink noise, I could hear hardly any upper-midrange tonal changes when I stood up, which is very good. The 750LE's performance just about equaled the B&W 801's nearly perfect behavior on this test. Its spectral balance on pink noise was quite good, albeit with some midrange and treble tonality. The 750's voicing was quite similar to the 801's, but with slightly more energy at the very highest frequencies.

Big-band recordings, as long as they did not contain heavy bass, sounded well balanced even when played loud. The Mission speakers handled the horn sections cleanly and with much expression. At the highest volume levels they did, however, sound slightly more congested than the B&Ws.

The Missions really shined on choral music. When I played Mozart's Mass in C

**THE MISSION 750LE  
DELIVERS GOOD LOOKS  
AND HIGH-QUALITY  
SOUND AT MODEST COST.**

Major, K257, performed by the Kings College Choir (Argo 421 365, a favorite of mine), the cathedral soundstage was wide and expansive, while the individual choral sections were clearly delineated. The overall sound was quite involving. On well-recorded female vocalists, the 750LEs sounded quite effortless and clean, with no undue

sibilance. The center image and its spectral stability were first-rate.

The speakers could play loud rock and country, but not when accompanied with heavy bass, where IM intruded on the presentation. However, when I hooked up the 750s via the Velodyne subwoofer's high-pass filtering, all my reservations were put to rest. With the bass off-loaded to the subwoofer, the Missions could play loud and clean. At more moderate levels, the Missions could play this material very well without subwoofer assistance, sounding quite well balanced but, as you'd expect, without gut-thumping bass.

The Mission 750LEs provided high-end and near-high-end sonic performance on almost everything I listened to. Their very small size and admirable appearance make them first-rate choices anywhere high-quality sound, good looks, and modest cost are important. A pair of 750s coupled with one of the new small, high-output subwoofers, such as the Velodyne or Sunfire, can provide very high performance from a listening system that takes up hardly any space at all. A



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## AUDIO RESEARCH VT50 POWER AMPLIFIER



**H**owever familiar a brand becomes, you should never grow complacent about it or discount its potential for surprises. As all of us think we know a lot more than we actually do, we tend to presume what a new component will sound like, based on previous experience or prejudices. I've personally owned, auditioned, or reviewed at least a couple of dozen models from Audio Research over the years, so I thought I *knew* what I would hear—but the

**Company Address:** 5740  
Green Circle Drive, Minnetonka, Minn. 55343; 612/939-0600;  
[www.audioresearch.com](http://www.audioresearch.com).

VT50 caught me with my guard down. And I'm not complaining. What we're talking about could be one of those future classics; it's certainly one of the company's best-kept secrets.

Confusion preceded epiphany because I couldn't figure out why or how Audio Research went away from its numbering system. The VT50 costs *more* than the VT60, the latter remaining Audio Research's entry-level stereo power amp despite producing slightly more wattage. However, the VT50 shares more with

costlier models in the range than it does with the sweet if prosaic 60. Billed as one of the least expensive of the latest-generation VT series of vacuum-tube power amplifiers, the VT50 is rated at 45 watts per channel from 30 Hz to 15 kHz, but its "actual power at clipping" is 50 watts per channel, hence the model nomenclature. But why does it come in above the VT60? Because it's fully balanced and it's more, uh, sophisticated.

Because the VT50 is based on the same circuit design as the VT100 and VT200, it uses a true dual-mono circuit layout all the way back to its very large power transformer; this certainly distances the VT50 from the less costly, more powerful VT60. The hefty power transformer is mounted at the front, centrally, behind the faceplate and on/off switch, but the amp's overall weight of 41 pounds is pretty evenly distributed because the separate output transformers are fitted to the back.

Inside, mounted horizontally in what now appears to be Audio Research's favorite location, are two matched pairs of 6550C output tubes, one pair per channel, with four 6922 twin triodes used as input and driver tubes, two each per channel. Constant-current-source technology found in the Reference Series maintains output-stage balance and headroom under dynamic music conditions. The VT50's distributed power supplies yield a total energy storage of 354 joules, nearly double that of the CA50 integrated amplifier.

Unlike the plug-ugly VT60, the VT50 is luxuriously appointed and

**WHAT STRUCK ME FIRST  
WAS THE VT50'S  
TRANSPARENCY, WHICH  
LETS YOU HEAR SUBTLE,  
LOW-LEVEL DETAILS.**

unmistakably an Audio Research amplifier. The chassis design and dimensions are a not-too-large 19 x 7 x 15 inches (not counting the handles,

which stick out a further 1½ inches). But the first surprise for me was the color. I don't know about other Au-

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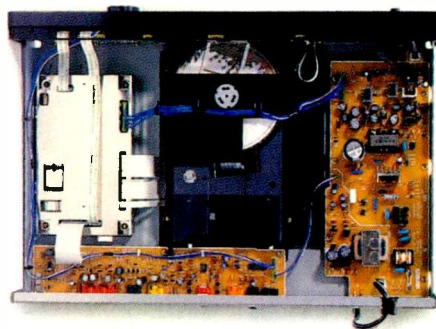
dio Research fans, but I've always been torn between the classic, natural-metal finish with black legends and the classier black with white legends. Now there's a new finish on the block, simply called "gray" in Audio Research parlance but closer to titanium. It's the color worn by the review sample, and it's simply gorgeous, making the VT50 look like it costs a whole lot more than \$2,995. Because this color is available throughout the line, my dream of a Reference 1 preamp and a pair of Reference 600 monoblocks has been altered slightly. Purists, of course, should ignore this option and stick with the original hue, lest they suffer an identity crisis.

As for the rest, it's typical Audio Research through and through, with only a simple rocker switch on the front for power on/off and a small green LED to indicate the former state. The rear panel contains meaty, all-metal, gold-plated, multi-way output terminals with a choice of 4-, 8-, and 16-ohm taps, which don't like banana plugs but are perfect for spade connections. The aforementioned balanced inputs are accessed with XLR connectors; gold-plated single-ended inputs are provided, too, but more about that anon. Also on the back panel is an IEC-type AC power socket—Audio Research supplies a good 14-gauge, three-core cable—and a user-replaceable AC mains fuse. Setup involves simply fitting the tubes (their bias is set at the factory). Warm-up from cold to optimum operating temperature seems to take a mere 15 or 20 minutes.

While some would deem it heresy to use a solid-state preamp with an all-tube power amp, I did use Krell's sublime KRC-3 to test single-ended versus balanced. The latter won out, even though my technically astute betters tell me that the difference should be apparent only with long cable runs. Rubbish: With only 3 feet of Transparent MusicLink Super interconnects (and with playback levels matched using a digital SPL meter), balanced operation sounded clearly more refined, more coherent, and more precise.

And refinement is what it's all about; after all, this isn't the amp to turn to if you're a horsepower junkie. Not only will it *not* rock the rafters, its bottom registers aren't exactly a sonic analogy for earth-moving equipment. On the other hand, neither is it a lightweight. Rather, it's a series of blissful contradictions, just like its position in the Audio Research hierarchy.

Quite clearly, the VT50 is aimed at customers with moderate or highly sensitive speakers. While I would never accuse Audio Research of marketing cynicism (despite those years when the company drove its users crazy with innumerable upgrades that endowed their models with suffixes more typical of computer software), it strikes me that the VT50 is perfect for exploiting the sort of speakers designed to coddle owners of single-ended triode amplifiers. The sin-



**THE VT50 SOUNDS IN  
FULL CONTROL WHETHER  
PLAYING AT  
BACKGROUND LEVELS  
OR BLASTING OUT AT ITS  
MAX.**

gle-ended triode craze has resulted in a flood of speakers boasting very high sensitivities, some horns delivering as much as 96 or 98 dB sound pressure level (SPL) for a single watt input, and they have but one virtue: the ability to work with stupid little amplifiers producing naught but 3, 5, or 7 watts. While the VT50 isn't in that anorexic category, neither is it suffering a surfeit of juice.

Far from feeling that it is restricted by the number of speakers that could fully exploit it, I prefer to think of the power limitations as simply narrowing the field of possibilities to high-sensitivity dynamics or most electrostatics. And this is a good thing, because it makes life simpler for the easily bewildered, confidence-lacking consumer. (To quote the great Gilbert Briggs, "The customer confused buys nothing.") Ditto the harried reviewer. I soon learned that my time would best be served using Quad electrostatics, both the original and the ESL63, the Rogers LS3/5A (to best test the 16-ohm tap), the Wilson WATT/Puppy V.1, and New Audio Frontiers' high-sensitivity

transmission-line speaker, the Reference One S; conversely, I haven't owned any real amplifier-eaters since I said farewell to the Apogee Divas.

I would have used the LS3/5As anyway, but what they did was emphasize the need to pay attention to the choice of impedances. While it's well known that an amplifier's electrical behavior—especially its power transfer—will be affected by impedance mismatches, some might discount the degree of sonic degradation resulting from as simple a mistake as connecting an 8-ohm speaker to a 4-ohm tap (or vice versa). The differences *are* audible. I tried speakers requiring each impedance as well as mixing them up (for example, a 15-ohm speaker on the 4-ohm tap) and soon learned that (1) the matching of nominal impedance to the correct tap is the safest and easiest way out, but (2) that Audio Research is right to state in its instruction manual the following: "In the case of speaker systems with significant variations in impedance throughout the frequency spectrum, such as most electrostatic types, the best impedance match should be determined by listening." If in doubt, consult your dealer.

In the end, I settled on the Krell KAV-300cd CD player fed into the Krell KRC-3 preamp for balanced listening, with the Krell KAV-300cd driving the Jadis DPL2 preamp in single-ended mode. Most of the time, I used the old Quads and the New Audio Frontiers speakers. Whatever the system, the following emerged with repeatability and consistency:

As I said before, the VT50 is no brute. Neither, though, did I force it into clipping, because I was able to keep the volume control between 10 o'clock and 1 o'clock and still hear 85 dB SPL at 2 meters. What struck me first was the transparency, which in turn lets you hear subtle, low-level details. More delicious still was the openness and sense of air and space. If you *really* love the effect of your speakers disappearing (as much a part of the speaker's design and positioning as anything else), the VT50 will help to achieve this. It consistently delivered a wide and deep soundstage that—and here's the neat thing—remained constant regardless of the playback levels.

This was the VT50's slickest trick, its ability to sound commanding and in full control whether playing at background levels



or blasting out at its max. Given the remote control facility of the Krell KRC-3, I was able to stay in the listening seat with eyes closed, gradually increasing the volume, instead of hopping out of the chair each time. It was this facility that enabled me to detect another aspect of the VT50's consistency: Not only did the soundstage retain its dimensions regardless of level, so did the bass quantity and quality.

Quantity and quality are the key words here, because the VT50 trades a little of the former to provide the latter. As one known for *not* craving overwhelming bass, I barely noticed the sacrifice. Okay, so the "Theme from Shaft" lost some of its impact around the 2-minute mark, and I quickly abandoned attempts at rattling the windows with "Little Green Bag," but so what? What remained was tight, controlled, free of lumps and overhang—just the way I like it.

But it's the mid-band that makes me want to hang onto the VT50. It possesses clarity,

**THE VT50 CONSISTENTLY DELIVERED A WIDE AND DEEP SOUNDSTAGE, REGARDLESS OF THE PLAYBACK LEVEL.**

just the right amount of warmth without screaming "here be tubes," and (almost) enough richness to counter any sense of loss down below. Whoever did the final tuning or "voicing" on this must love vocalists of the Sinatra/Dino/Nat "King" Cole variety, because this sucker could wear a purple Capitol badge and I wouldn't have raised an eyebrow.

So, those of you who lust not for maximum SPLs and who can live without Godzilla-footfall bass, here at last is a tube amplifier that fills the gap between the big mutha push-pull designs on one hand and the severely power-limited single-ended triodes on the other. It's a wholly satisfying way of driving high-sensitivity loudspeakers without resorting to the mismatches of either too much or too little power. And it just *loves* electrostatics. The VT50 is, by my reckoning, a way of having your cake and eating it, too—with no calories to fret about whatsoever. A

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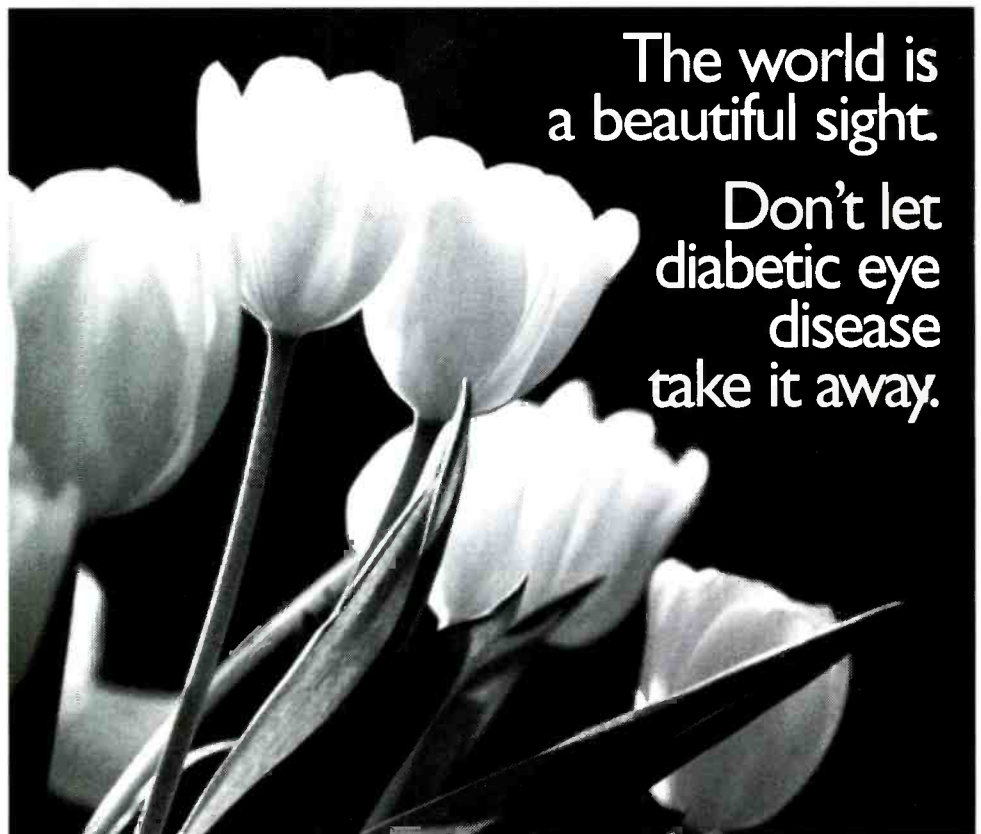
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AURICLE

JOHN GATSKI

## LEGACY AUDIO CLASSIC SPEAKER



In 1983, engineer Bill Duddleston, owner of Reel to Real Designs, introduced a speaker line that sold factory-direct, offering high-end speakers at lower than high-end prices. Thus, the Legacy speaker line was born, with the original Legacy-1 as its flagship.

Today, the company—now called Legacy Audio—still sells factory-di-

rect, with a dozen audition locations scattered around the country and one in Canada. The line has grown to 12 speakers, including the well-received Focus, Signature III, Accent, and Whisper models; the pint-sized Studio; a variety of center-channel speakers; a couple of subwoofers; and the most popular speaker in the line, the \$2,695-per-pair Classic.

The Classic is a floor-standing, four-way column system that exudes quality, especially for its price range. Available in standard finishes of black, walnut, or medium oak (as well as in a variety of optional premium finishes), the Classic contains a front-mounted, 10-inch polypropylene composite woofer, a 7-inch Kevlar midrange driver, a 1¼-inch titanium-dome tweeter, and a 4-inch ribbon super-tweeter. On the rear baffle are a second identical woofer and tweeter, which are said to augment the bass and enhance ambience. The front drivers are covered by a removable grille; the rear drivers are bare.

The Classic's factory specifications list a frequency response of 22

**YOU WOULD HAVE  
TO SPEND A LOT  
MORE MONEY  
TO ECLIPSE THE  
LEGACY CLASSIC'S  
PERFORMANCE.**

Hz to 30 kHz,  $\pm 2$  dB, sensitivity of 90 dB/1 watt/1 meter, and crossovers at 120 Hz, 2.8 kHz, and 10 kHz. The recommended amplifier power is from 25 to 300 watts continuous.

The Classic is 44 inches tall, 12 inches wide, and 12 inches deep. At 110 pounds, it is no lightweight. The hardwood cabinet is extremely dense: Rapping it with bare knuckles yielded no hollow ringing. On the bottom rear panel is an array of five toggle switches that engage passive internal filters and control driver selection for fine-tuning the speaker to the room. The switches for the passive filters become active only in their down positions, yielding a flat response when toggled up, according to Legacy's informative owner's

Company Address: 3023 East Sangamon Ave., Springfield, Ill. 62702; 800/283-4644; [www.legacy-audio.com](http://www.legacy-audio.com).



manual. When you toggle it down, the first switch is said to reduce the level of the speaker's midrange and treble by 2 dB, which is "passively equivalent to bass boost," the manual states. The second switch notches the bass output by 3 dB at 70 Hz. The third reduces output in the lower treble region, while the fourth changes the speaker impedance from 4 to 6 ohms—the latter to make the load easier on smaller amps. The fifth switch defeats the rear-firing tweeter.

The two pairs of binding posts are linked by heavy copper jumpers for use with a conventional stereo amp, or the terminals can be used separately for biamping. On the bottom are factory-installed, gold-plated spikes.

I auditioned the Legacy Classics for several months with a variety of amps, preamps, and program material. Eventually, I settled on a pair of 100-watt Pass Aleph 2 Class-A MOS-FET amps, a Pass Aleph P MOS-FET preamplifier, a Denon CD transport with a Parasound D/AC-2000 HDCD D/A convertor, and Alpha-Core Goertz speaker cables and line-level interconnects. I also did some rudimentary room measurements with an AudioControl R130 real-time analyzer (RTA) to see how the speakers interacted with my listening room.

After using a lot of muscle to move the 110-pound speakers into the room, I positioned them as recommended by the factory. When placed at least 3 feet from the front wall, the Classics are designed to yield flat frequency response at far-field listening positions 10 feet or more away. I found that at least 3 feet of space from the side wall was necessary in order to prevent audible heaviness around 80 Hz in my listening room. On some material rich in upper-bass energy, I used the bass-reduction switch to lighten the bottom end. For the most part, though, I preferred the flat settings for these switches. With the aid of the RTA, I got the Classics to produce fairly flat response at the listening position and noted that the speakers had substantial bass output at 20 Hz. That's not too shabby for two 10-inch woofers.

**DEPENDING ON YOUR  
AMP, THE LEGACY CAN  
PLAY AS CLEAN  
AND LOUD AS DESIRED  
WITHOUT STRAIN.**

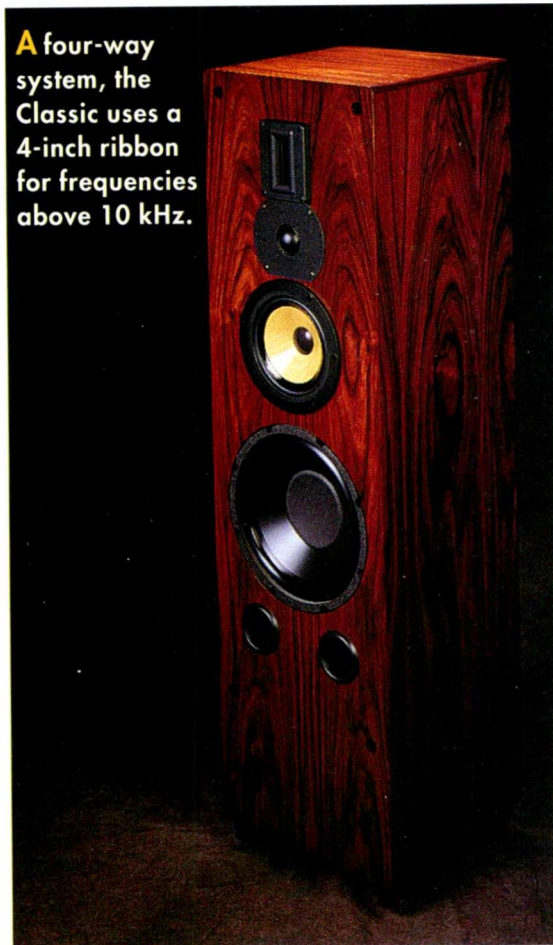
My initial impressions of the Classic were quite good. The speakers produced an excellent soundstage with an openness and uncolored midrange and treble that I am accustomed to hearing only from high-quality ribbon-driver speakers. The bass was deep and tight, and the rear dome added an ambience that audibly collapsed (the degree depended on the source material) when I switched it off. I ended up keeping it active. I listened to some of my favorite audiophile discs, representing a range of musical styles. I first tried out the western-swing country music of Wylie & The Wild West Show's *Get Wild* (Cross Tree Records 9405). This CD contains classic, reverb-soaked Telecaster twang and pedal-steel embellishments ("Devil Woman" is a prime example) that can be clearly heard with a high-quality speaker. These characteristics were duly delivered by the Legacy. Bass and drums were deep and tight without strain at high levels. Depending on your amp, the Legacy can play as clean and loud as desired without strain.

On Johnny Frigo's *Debut of a Legend* (Chesky JD119), the violin tone was about as good as I have heard. Recording engineer Bob Katz's selection and careful placement of microphones for this performance made nuances of Frigo's violin playing (e.g., plucked strings) stand out with the Classics. The liveness of the room was also preserved with these speakers.

I also listened to numerous recordings of orchestral works, solo violin, guitar, and lute, dating from the 1960s to present-day. They all sounded strong. I especially liked the precision of the plucked lute in Ronn McFarlane's *The Distant Shore* (Dorian DOR-90242). Again, I really just cannot say enough about the sound of a well-implemented ribbon tweeter. It just adds that small degree of extra treble articulation without undue edginess.

On the other hand, the one liability of the Classic's ribbon is its somewhat narrow vertical dispersion. If your listening position is above or below the ribbon's ideal transmission path, high frequencies can sound a bit muted. Consequently, you need

**A four-way system, the Classic uses a 4-inch ribbon for frequencies above 10 kHz.**



to sit in the sweet spot. I obtained the best sound with my ears about even with or just a few inches below the ribbon.

As an aside, I recently had recording/mastering engineer Tom Jung visit my house, and we sampled some of his just-completed audiophile jazz CDs, using the Legacy Classics as monitors. His general opinion, without having other speakers on hand, was that the Classic was in good company with more expensive Thiels and B&Ws. I agree. You would have to spend a lot more money to eclipse the performance of these speakers. I suppose that qualifies them as a genuine bargain.

As I mentioned earlier, Legacy sells factory-direct. You call them up, give them a credit card number, order a pair of speakers, and try them out for 30 days. If you like them, no problem. But if you're unhappy, you can return them and your account is credited. While I don't mind shopping that way, others may feel safer auditioning speakers in a showroom. I have bought gear from Legacy in the past, and the service was quite reliable. If you can live without the tire-kicking ritual of the retail hi-fi buying process, the savings can be substantial. **A**

AURICLE

ANTHONY H. CORDESMAN

## VMPS SUPER TOWER III SPECIAL RIBBON EDITION SPEAKER



**T**o be honest, I never expected a product this close to the absolute state of the art from VMPS. I have always been impressed with VMPS speakers for combining value for money and true, musically natural deep bass. My daughter, for example, bought the VMPS Tower II because

ing, room placement, or even moving the big speaker around).

The Special Ribbon Edition of the VMPS Super Tower III gets its superb sound from some of the most advanced ribbon drivers around, enough woofers to provide the last word in bass, and an enclosure large and heavy enough to minimize driv-

er coloration. Its technology and sound quality are comparable to those of super reference speakers that cost at least \$25,000 to \$40,000 a pair, yet it's almost affordable in comparison. Alas, in the high end, "almost affordable" has become frighteningly expensive. The Super Tower III Special Ribbon Edition sells for \$16,400 (including electronic crossover) in piano black or piano white, or more if your taste runs to one of the 78 optional veneers.

If Cheney weren't doing it for you, setting up and placing the VMPS Super Tower III would be an adventure. The speaker is 6 feet, 4 inches tall, 19½ inches wide, and 17 inches deep. Under its veneers, the enclosure is made from synthetic granite, and the entire system weighs 450 pounds a side—hardly a speaker you casually move around. Yet it's not a huge, visually intimidating box that makes you think someone has wired Dracula's coffin for sound. Its external ribbon midrange and the shape of its damping foam make it look striking enough to be interesting, and it has a nice finish.

However, VMPS has never aimed for the stratosphere of the high end before, so I did not expect to get real authentic reference-quality sound from the Super Tower III Special Ribbon Edition (the only current Super Tower III) until it showed up for review. Brian Cheney, owner of VMPS, showed up with it—as he does for every buyer, to custom-tailor the speaker's performance to the system it will be enhancing and the listening room it will be in (thus allaying any worries about tun-

ing, room placement, or even moving the big speaker around).

The VMPS Super Tower III Special Ribbon Edition is built in mirror-image pairs. Each cabinet has a midrange ribbon toward its inboard edge, a ribbon tweeter near its center, four 12-inch woofers along the out-

er coloration. Its technology and sound quality are comparable to those of super reference speakers that cost at least \$25,000 to \$40,000 a pair, yet it's almost affordable in comparison. Alas, in the high end, "almost affordable" has become frighteningly expensive. The Super Tower III Special Ribbon Edition sells for \$16,400 (including electronic crossover) in piano black or piano white, or more if your taste runs to one of the 78 optional veneers.

**Company Address:** Itone Audio,  
3429 Morningside Dr., El Sobrante,  
Cal. 94803; 510/222-4276.



board edge, and a 12-inch passive radiator firing down from the bottom. The electronic crossover and its power supply are separately housed.

The core of the speaker is an extraordinary midrange ribbon, 75 inches high and 4½ inches wide. This push-pull driver's frequency response is given as 99 Hz to 7 kHz between -3 dB points; it provides some of the most detailed and transparent midrange I have ever encountered, crossing over with remarkable smoothness to the bass and treble. Behind the ribbon is an open-backed compartment lined with foam, to absorb longer, nondirectional, waves while passing sounds with shorter wavelengths. This minimizes the comb filtering that is characteristic of dipoles, while retaining the airiness and open soundstage that are their strengths. Perhaps because of the back-wave treatment (or perhaps because the midrange's tall, narrow shape gives it line-source directional control), it provides tightly focused, almost holographic imaging, never exaggerating the size of the image as some other dipoles are prone to do.

The tweeter is a 6-inch, free-swinging monopole ribbon that offers good dispersion and excellent dynamic range. It takes over at 7 kHz and is flat to well beyond audibility, with a specified -3 dB point of 30 kHz. Because of its good dispersion and high crossover frequency, there is only a trace of discontinuity between this point-source tweeter and the line-source midrange, and even that trace is not apparent at reasonable listening distances. The VMPS Super Tower III does not pin you down to a small listening area; it is one of the few supermonitors I know of that lets you move relatively freely without losing touch with the music.

The size and sound of the bass array are stunning. The four 12-inch woofers, made by VMPS, all have cones of woven carbon fiber, large magnets, phase plugs, and damped baskets, but each of the four has a different resonant frequency. The 12-inch passive radiator, which also uses a damped basket, has user-adjustable mass loading to change its Q. This mix of bass drivers extends the rated response of the VMPS Super Tower III to -3 dB at 14 Hz.

The electronic crossover's filter frequency is adjustable from 50 to 200 Hz but is set

at the factory to 108 Hz. This crossover's level setting is exceptionally precise, using a 10-turn pot for each channel, to help tailor the bass for the best performance in any listening room.

But with the Super Tower III, this tailoring is done for you. Cheney not only tweaks crossover settings but also adjusts the mix of bass drivers and damping to your specific room, speaker placement, and listening position. However, even this personal touch could not compensate for all of my listening room's problems, although it certainly corrected overall bass response in a far more musically natural way than any electronic equalization I've yet heard. While some speakers provide far more useful forms of advanced phase and Q adjustment, or advanced servo-correction, I know of no other speaker (with the possible exception of the \$156,000 Wilson Audio Specialties WAMM) whose price includes manufacturer setup and adjustment.

But, as I said earlier, I consider the ribbon drivers (most especially the midrange) to be the core of the Super Tower III. Together, the ribbon midrange and tweeter provided superb overall response, though I should also credit the outboard passive crossover, whose 12-dB/octave slopes produced an exceptionally seamless transition at both ends of the midrange. A calibrated control on this rear-mounted crossover enables you to adjust the tweeter level (if you dare change Cheney's settings).

The only comparable-sounding ribbon drivers I've heard are those of the larger Apogee Acoustics and Magnepan speakers. Those speakers may produce a bit more open soundstage and may be a bit more forgiving in the upper octaves, but the Super Tower III seems to have flatter frequency response and more accurate timbre, and its soundstage is better focused and more three-dimensional. The Super Tower III's ribbons also seem to sound a bit more detailed and to have faster transient response than the ribbons used in the larger Genesis Technologies speakers, although both sound very musical. The main practical difference is that the midrange and upper

octaves of the Super Tower III bring you a bit closer to the performance, while the Genesis sounds more like you're sitting mid-hall.

Furthermore, the Super Tower III gave the best reproduction of ultralow bass I have ever encountered. I not only went through my full range of bass spectaculars but also spent a great deal of time listening to organ music to hear how well the speaker resolved the different low frequencies in extremely demanding passages. The VMPS Super Tower

III did exceptionally well with different recordings of Saint-Saëns's Third Symphony, whose climax many other speakers turn into a blurred acoustic mess. The speaker also did very well with nonspec-

tacular organ recordings, which test the limits of the speaker's bass realism, clarity, and dynamics. Examples of this include *John Balka Plays the Great Organ of Saint Mary's Cathedral* (TBG Productions CD8509), *Bairstow, The Complete Organ Works of Francis Jackson at the York Minster* (Amphion PHI CD 143), and *Gerard Brooks Plays the Organ of St. Ouen* (Priority PRCD 558). Most speakers simply can't get the best out of these recordings—the Super Tower III can!

As an ex-drummer (albeit a very bad one), I was impressed with the tightness, detail, and natural sound of percussion at all frequencies, but I found it great fun to simply let the Super Tower III run at top volumes with bass-drum spectaculars like the opening passages of "Fanfare for the Common Man," on Copland's *The Music of America* (Telarc CD-80339). No sane audiophile is likely to hit the Super Tower III's bass limits when listening to music. Its specifications indicate that it can produce sound-pressure levels of 120 dB down to its cutoff frequency of 16 Hz, and it got as low as any speaker I have ever tried. Wildly unreliable as bass measurements in the home are, my third-octave measurements of the VMPS Super Tower III's ranked with those I made of the Genesis 300 and the subwoofers in the Polk Audio Signature Reference Theatre system as the smoothest I have ever garnered.

THE 75-INCH RIBBON DRIVER PROVIDED SOME OF THE MOST DETAILED, TRANSPARENT MIDRANGE I'VE EVER HEARD.

The Super Tower also provided superb ultralow bass performance from test tones, including the excellent subwoofer test band (track 18) on Chesky's *Gold Stereo and Surround Sound Set-Up Disc* (CHE151) and the more complex mix of tests on tracks 47 to 50, 58, and 59 of *My Disk: The Sheffield Lab/A2TB Test Disc* (CD451). These tracks make it easy to test both bass frequency and pitch, and I was still getting clean sound down to 25 Hz at over 95 dB SPL, plus a clean infrasonic presence down below 20 Hz. They also make it easy to tell which speakers actually deliver the ultralow bass response claimed for them, particularly at truly loud volumes. Such revelations can be heartbreaking, but not in the case of this VMPS speaker.

All in all, the VMPS Super Tower III did a superb job of integrating all of its drivers to produce reference-quality sound. Hybrid speakers are always difficult to design properly, but the crossovers in the Super Tower III are both low and high enough so that you get the best out of the ribbon midrange. The shift in driver size between the midrange and treble ribbons was not ever apparent from normal listening positions, and their radiating pattern was wide enough to lock in a truly exceptional soundstage over a listening area three people wide as well as provide good off-axis performance without bouncing too much sound from the side walls. This is an audiophile-friendly supermonitor, not one with an ideal listening area so small that friends are excluded and head motions change the apparent imaging and mix of upper-octave energy.

The Super Tower III's driver integration was a great strength with recordings of large musical groups (e.g., jazz bands, orchestras, and opera companies), where the speaker must tie everything together musically from deep bass to upper treble, provide every possible detail, and deliver a natural soundstage with three-dimensional imaging. The VMPS also did very well with deep male voices, solo piano, and cello, which quickly show up problems in driver integration and timbre.

The VMPS Super Tower III is remarkably revealing. This has great merit when your system has a top-quality front end, electronics, and cables. However, you will also hear any bad along with the good. Every adjustment, system tweak, and strength and weakness in the rest of your system will be clearly audible. Further, this is a speaker designed to get the best out of good recordings and not to forgive bad ones. There is no soothing rolloff of the upper midrange and treble, no euphonic blurring of detail, and no forgiving touch of added warmth. This VMPS is just about as accurate as your recordings and your system permit.

While it may not be directly relevant to musical listening, this aspect of the Super Tower III's performance is a godsend to reviewers. The VMPS's superior transparency superbly revealed differences between 24-bit, 96-kHz recordings and their 16-bit, 44.1-kHz counterparts, differences that

were less clear and musically natural with a number of competing speakers. This was particularly impressive with subtle classical string music, as on the 24-bit, 96-kHz and the 16-bit, 44.1-kHz versions

of David Chesky's *Three Psalms for String Orchestra* (Chesky CD163).

Similarly, the Super Tower III is exceptionally good for revealing sonic differences between cables. These differences are normally very subtle, and some speakers make them musically insignificant. I was most impressed with the way the speaker's clean midrange and treble resolved the differences between the Kimber Select KS-1010 and KS-1030 unbalanced interconnects and between the KS-1120 and KS-1130 balanced versions. These are all exceptionally clean, transparent interconnects, and few speakers would enable me to consistently distinguish, say, the transparency and low noise of the KS-1130 over the KS-1030. The Super Tower III made this much easier for me, and for non-audiophiles in blind listening tests. (I'd be doing a disservice if I did not tell you that these interconnects were clearly superior to any others I've tried; the only problem was that the sound of the KS-

1030 and KS-1130 was too good to resist, and such jewels among interconnects don't come cheap.)

Similarly, the Super Tower III's exceptional bass helped me differentiate speaker cables, as the ultralow bass is an area where these differences actually do matter. I had good luck with AudioQuest, Monster, and Kimber and got very good performance for the money out of the Wireworld Atlantis cables.

Aside from the VMPS Super Tower III's ability to reveal system defects, my only caveat is that you do need to be conscious of room size and setup. (No amount of adjustment, though, can correct basic room problems.) The Super Tower III should be 2 to 10 feet from the front wall and at least 2 feet from the side walls. Listeners also need to be at least 7 to 9 feet from the speaker for the sound from its drivers to fully integrate. You will need to experiment with speaker angles to get the best soundstage, although the setup visit from VMPS should solve this problem. Nonetheless, as good as the sound in my room was, listening to the Super Tower III in a dealer's much larger showroom demonstrated that the bass could be even better.

If you have the money and a reasonably large listening room, and care enough to work closely with VMPS during the setup visit, I can promise you superb sound. I don't know of any other speaker that gets you as close to the limits of what speakers can do for anything approaching the same price.

Those who don't have the money, however, should be aware that much of the Super Tower III's same technology will soon be available in the form of the Special Ribbon Editions of the VMPS FF1/SRE (\$11,000) and FF3/SRE (\$8,400), both of which will feature 52-inch midrange ribbons. (I reviewed the earlier FF1, which had planar midrange drivers and dome tweeters, in the June 1994 issue.)

Buyers of these slightly less exalted products won't get every feature of the Super Tower III or a personal visit to adjust the bass and help with setup, nor will they get every feature found in the Super Tower III, but they will get most of these features. The smaller VMPS speakers will also be easier to fit into small to medium-sized listening rooms (and easier to lift). A

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THAT COMES AS CLOSE  
TO THE ULTIMATE  
FOR ANYTHING LIKE  
THE VMPS'S PRICE.



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# CLASSICAL RECORDINGS

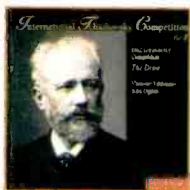


man John Ogdon (a 1959 prizewinner in Liverpool) were already seasoned professionals when they joined the 50 other competition entrants. Before he left the U.S.S.R. in 1962, Ashkenazy was, in fact, well embarked on an international career. (I was fortunate enough to hear his splendid Carnegie Hall debut in 1958.) Rather against his will, however, he was persuaded by an insistent Soviet establishment to participate, and he and his compatriot colleagues in the Soviet Union were rigorously groomed, Olympic-style, beforehand. The unusual thing in the competition's outcome was that both pianists were awarded a shared first prize (the second prize was also a tie, between Susan Starr from the United States and China's In'Chen-Tssoon). The rather extroverted Tchaikovsky Piano Concerto No. 1, as well as the solo Dumka: "Scenes from Russian Country Life" are thrilling performances, though I cannot help feeling that Ashkenazy was doing his utmost throughout to produce the kind of massive sonori-

Painting: ©SuperStock Collection

**Tchaikovsky: Piano Concerto No. 1 in B-flat Minor, Op. 23; Dumka, Op. 59; Liszt: Piano Concerto No. 1 in E-flat Major; Mephisto Waltz No. 1**

Vladimir Ashkenazy (Tchaikovsky), John Ogdon (Liszt), piano; U.S.S.R. State Symphony Orchestra; Konstantin Ivanov (Tchaikovsky Concerto) and Victor Dubrovsky (Liszt Concerto), conductors  
BMG CLASSICS MELODIYA  
09026-68910, CD; ADD; 71:14  
Sound: A-/C, Performance: A+/A-



**B**illed as the *International Tchaikovsky Competition, Vol. I: The Draw*, this important disc documents that event's 1962 competition, the most exciting musical match since Van Cliburn's 1958 victory. This CD should be in the library of anyone interested in piano performance.

Vladimir Ashkenazy (with important wins behind him in both the 1955 International Chopin Competition and the Queen Elisabeth Concours the next year) and the English-

The first thing that will grab you about this record is that—uniquely for a lieder recording in my memory—the pianist gets top billing.

There doubtless are a number of reasons for doing this. First, though the singers are very fine, Leon Fleisher certainly enjoys the most familiarity with a wide audience. Second, his long stint as a pianist of the left hand alone and the very recent rehabilitation of his right rouse curiosity about his restored powers. Rest assured that you will hear unfettered pianism in these accompaniments, which was not true of the first performances following his rehabilitation. Third, perhaps, Fleisher is not a self-effacing accompanist; while he does not overpower his vocalist

colleagues, he does project a muscular individuality.

The three song cycles on this CD are among Schumann's most beloved creations, and deservedly so. John Shirley-Quirk is not the steadiest of singers, but he does bring to the *Liederkreis* and *Dichterliebe* a slightly rough-edged drama that is quite attractive. Phyllis Bryn-Julson is a bit dry-voiced in the middle cycle, *Frauenliebe*

and *-leben*, but her approach is knowing and ultimately convincing.

The sound, captured in a Maryland church, is quite close, with a nice ambient "envelope." The notes include full texts in German and English, but in type that doesn't encourage reading. *Robert Long*

**Schumann: Lieder**

Phyllis Bryn-Julson, soprano (*Frauenliebe und -leben*); John Shirley-Quirk, baritone (*Liederkreis and Dichterliebe*); Leon Fleisher, piano

ARABESQUE RECORDINGS  
AR Z6700, CD; DDD; 72:59  
SOUND: A,  
PERFORMANCE: B/A





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**Zemlinsky: Lyric Symphony;  
Berg: Lyric Suite; Five Orchestral  
Songs After Texts from  
Postcards, Op. 4.**

James Johnson, baritone;  
Vlatka Orsanic, soprano;  
SWF Symphony Orchestra, Michael Gielen  
ARTE NOVA 74321 27768, CD; DDD; 66:07  
Sound: A-, Performance: A

Alexander Zemlinsky (1872-1942) and Alban Berg (1885-1935) were close associates and friends. Berg's lush yet acerbic Lyric Suite uses a musical quote from Zemlinsky's arch romantic Lyric Symphony, which is actually a song cycle in structure based on texts by R. Tagore. Some of the budget-label Arte Nova recordings have been disasters, but all the ones with the SWF Symphony led by Michael Gielen, its music director, have been outstanding. This one is an absolutely first-rate presentation of the music it contains. Both the soloists are excellent, and the well-recorded orchestra plays with precision and virtuoso flair. At a list price less than the cost of a movie, this CD is a super bargain. Alas, there's a small price to pay when saving big bucks: There are no texts whatsoever, and very skimpy notes. *Rad Bennett*



ties that might have been expected of him. Technically, he is brilliant, but the most pleasurable moments come from the more introspective, poetic passages.

John Ogdon (1937-1989) was a performer of the most far-ranging and often unorthodox musical interests—Alkan, Busoni, Elgar, Messiaen, Sorabji, Tippett, and his own music vying with works by the more usual Beethoven, Chopin, Liszt, Mendelssohn, Grieg, Scriabin, and Rachmaninoff in his large discography. I would urge anyone intrigued by his career to investigate the illuminating series of articles on him in the Spring 1998 issue of *The International Piano Quarterly*, which describe in detail his unique abilities as well as his tragic, schizophrenia-dominated existence (rumor had it that his death in a mental institution at the age of only 52 was a suicide). What one hears here, following his shared win, is a Liszt concerto that can bear comparison in its astounding brilliance, incredible accuracy, sonorous rhetoric, and poetic delicacies with the likes of Martha Argerich and Sviatoslav Richter in their acclaimed recorded performances. The end of the concerto can only be described as spectacular, but even more of an adrenaline-rouser is the stunning and spontaneous Mephisto Waltz, more mercurial and temperamental than the commercial recording Ogdon had made for EMI a year earlier and which has just now been reissued on the Testament label.

Considering the source date, the sound of the Tchaikovsky concerto is surprisingly good, full-bodied, with decent imaging. This, like both Liszt pieces, was done in stereo at a recording session after the competition's conclusion, but the eight-minute-long Dumka, a mono recording, is obviously live and from one of the competition rounds. Less sonically satisfactory is an overly bright orchestra (more dryly recorded than in the Tchaikovsky concerto), as well as a clattery piano treble in the Liszt. The Mephisto Waltz, in particular, could have benefited from a bass boost (although, depending on the venue and where one is seated in an auditorium, pianos often do sound this bass-shy). *Igor Kipnis*

**Mendelssohn: Paulus Oratorio, Op. 36**

Royal Scottish National Orchestra  
and Chorus, Leon Botstein  
ARABESQUE RECORDINGS Z6705  
Three CDs; DDD; 1:40:32  
Sound: A+, Performance: A

In the 20th century, Mendelssohn's *St. Paul* has been somewhat eclipsed by his *Elijah* as the ideal Romantic oratorio. Yet the former's premiere in 1836 was an enormous success for the 27-year-old composer. *St. Paul* was soon performed with acclaim throughout Europe. Robert Schumann summed up the prevailing praise with the comment, "Here you are turned to faith and love, and again learn to love mankind."

This was Mendelssohn's first major choral work after his historic revival of the Bach *St. Matthew Passion* in 1829, and it was not entered upon lightly. The story of Paul's dramatic conversion to Christianity touched Mendelssohn deeply. As he composed, he wrote, "I must not make any mistakes." His letters speak of a "holy zeal" to complete the project, and in the process he devoured everything he could read on Greek and Church history, as well as on daily life in the time Paul lived.

The same zeal for detail is evident both in the Carus-Verlag Edition of *St. Paul*—which reunites the score with many "lost movements"—and in this fine recording of the work. The soloists are well chosen, and the bass Mark Beesley gives a heart-rending rendition of the aria "Gott, Sei Mir Gnädig Nach Deiner Gute" ("God, Have Mercy on Me According to Your Loving Kindness"). Leon Botstein draws a huge sound from the Royal Scottish National Orchestra, and the recording clearly brings out the many woodwind solos in contrast to the richness of a rather oversized string section.

Perhaps the most notable aspect of this recording is the chorus performance. These



Scottish singers enunciate German impeccably. Their diction is so meticulous that each word is easily discernible, even through the many contrapuntal passages. Credit for this achievement must be equally given to chormaster Christopher Bell, the well-balanced acoustics of Glasgow's Henry Wood Concert Hall, and the engineers of Arabesque Recordings.

This CD gives us Mendelssohn's *St. Paul* as the composer himself must have attempted: Even in the most complex passages, the text of this dramatic story is rendered with both intelligibility and passion. *Patrick Kavanaugh*

**Microtonal**

Easley Blackwood, polyfusion synthesizer;  
Jeffrey Kust, guitar  
CEDILLE RECORDS CDR 90000 018  
CD; DDD/ADD; 56:00  
Sound: A+, Performance: A-

For three decades, Easley Blackwood has been with the the University of Chicago music department. He is perhaps best known as an excellent pianist, but he also has a strong background in composition, having studied with Oliver Messiaen, Nadia Boulanger, and Paul



Hindemith. His talents as a composer, theorist, and pianist combine in the present recording project, which began when Blackwood was awarded a grant from the National

Endowment for the Humanities to investigate the properties of microtonal tunings.

For the layman unfamiliar with "microtonality," a word of explanation: Virtually all Western music performed today is based on 12-tone equal temperament. That is, the most natural interval given to us by nature, the octave, has been equally divided into 12 parts. The resulting smaller intervals combine to give us the harmonies and melodies that we are used to hearing in most styles of music. The music on this CD asks the question, "What if we divide the octave into more than 12 parts?"

Blackwood answers this question with an entirely new world of hair-raising dissonance and exquisitely tuned consonance. Each étude is performed electronically with a different division of the octave, from 13 to 24, the latter giving the better-known "quarter-tones." The guitar suite—sensitively performed by Jeffrey Kust—is less stark and innovative, yet the instrument's 15-note temperament is still bewitching.

This is a fascinating CD for the courageous audiophile who desires to explore the deeper realms of pitch systems. Whether you like Blackwood's style or not, these pieces break new ground that will doubtless be followed by many composers to come. *Patrick Kavanaugh*



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# ROCK ~ POP RECORDINGS



Photo: Leslie Williamson

### III

#### *The Grassy Knoll*

ANTILLES/VERVE 314 557 087, 63:26  
Sound: A, Performance: A

Sometimes leader Bob Green of The Grassy Knoll thinks like Brian Eno. At other times he's thinking a la Ornette Coleman—or like DJ Shadow, Sonic Youth, James Brown, Portishead, King Crimson, or even like Miles Davis during his *Bitches Brew* era or like Tortoise. But on *The Grassy Knoll*'s third album, simply titled *III*, he mostly thinks like all of them, all at once.

This post-apocalyptic sample-scape of staccato-funk groove, white-noise weirdness, and vamping saxophone begins with "A Beaten Dog Beneath the Hail." The piece sets the template for the all-instru-

mental, avant-jazz-hop song cycle that is *III*.

"Every Third Thought" eases the album's gravitational pull with its synth-and-cello ooze and guest Thurston Moore's guitarabesques. Like a slowly rotating kaleidoscope, "Of All Possible Worlds . . . Pt. II" produces ever-evolving color combinations, gently oscillating in the void between psychic space and cyberspace or between man and machine. "The Violent Misery of Everything Lost" superimposes oceanic keyboard washes and Superfly-style wah-wah on shadowy sci-fi scenery. "Safe" features technobeat intrusions and amorphous ambient effects—abuzz like a thousand alien cicadas—that are beamed in seemingly from the far end of the galaxy.

### YNGWIE MALMSTEEN

#### Face the Animal

MERCURY 314-536737, 59:38  
Sound: B-, Performance: C-

### JOE SATRIANI

#### Crystal Planet

EPIC EK 68018, 67:44  
Sound: B, Performance: B+

Now that alternative music is once again a true alternative and we're seeing a slew of cloying pop bands climb the charts, heavy metal is preparing for a rebirth. Bands like Megadeth and Limp Bizkit are selling out arenas, and the Ozzfest is one of the most eagerly awaited summer tours. And where there's metal, you can bet the once-banished guitar gods aren't far behind—which explains why Yngwie Malmsteen is back on a major label with *Face the Animal* and why Joe Satriani graced the covers of guitar mags as his new disc, *Crystal Planet*, hit the shelves.

There's no denying that Malmsteen's solos are stupefyingly intricate, but technical prowess alone does not an enjoyable album make. Take away the speed-of-light hammer-ons, pull-offs, and modular pentatonamajjiggy scales, and you're left with an unremarkable album that lacks melody, dynamics, and structure. With the exception of the surging "Sacrifice" and the weepy instrumental "Air on a Theme," most of the songs are either forgettable anthems or overindulgent Paganini-meets-Ritchie Blackmore ballads. *Face the Animal*, and you'll find that its bark is by far much more intimidating than its bite.

Satriani is a different animal altogether. Most guitar virtuosos revel in playing mind-numbingly fast and complex solos, whereas Satriani happily subordinates speed for melody, dynamics, and empathy. His latest album, *Crystal Planet*, is technically precise and musically challenging, but it grooves and breathes as effectively as that of any traditional hard-rock band, creating stirring imagery without the aid of vocals. There's no question that this is his finest effort since *Surfing with the Alien*. Eat Joey's dust, Yngwie.



Jon Wiederhorn



Occasionally, such as on "Blue Wires" and "A World Reduced to Zero," with their choppy counterpoint and linear alternation of disparate modes, Green forgets that the key to great deconstructionist art is not wink-wink juxtaposition but inventive integration and provocative recombination.

For the most part, though, Green alchemizes his many and diverse influences on The Grassy Knoll's *III*. All of them are served up—all at once—to dazzling effect. *Greg Siegel*

### Sketches for My Sweetheart the Drunk

Jeff Buckley

COLUMBIA C2K 67228

Two CDs, 1:31:55

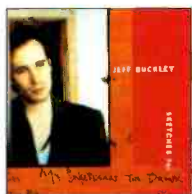
Sound: B, Performance: A-

Perhaps the most surprising thing about Jeff Buckley's *Sketches for My Sweetheart, the Drunk*—a posthumous compilation of demos and works-in-progress—is how "finished" much of it sounds. Though they sometimes contain instrumentally Spartan passages, the 10 songs on the first disc, in particular, evince little of the compositional gaps and tentative performances that usually characterize music that's in the making. Apart from the fact that it marks one of Buckley's rare stabs at sociopolitical expression, "The Sky Is a Landfill" could fit comfortably alongside anything on his debut, *Grace*. The same could be said for the R&B-fueled slow jamming of "Everybody Here Wants You," the snappy shimmer of "Witches' Rave," the hard-edged crunch of "Yard of Blonde Girls," and the eerie romance

of "Nightmares by the Sea." Chalk it up to Buckley and Co.'s fastidious preplanning, producer Tom Verlaine's deft touch, and mixer Andy Wallace's gift for studio polish.

Disc Two represents the other end of the spectrum: Whereas the first disc was recorded with a full band in a real studio, the second gathers low-fi home recordings and sundry experiments. For the casual fan, melodically challenged abstractions like "Murder Suicide Meteor Slave" and "Back in N.Y.C." might be asking a bit much. But for the devotee, these tracks offer tantalizing insight into Buckley's artistic mind unchecked by hindsight, band input, or producer tinkering. Indeed, one of the disc's true revelations is "Your Flesh Is So Nice," on which the late singer doffs his spiritual nimbus in order to address his carnal concerns—a humanizing gesture reinforced by the music's glam-punk sizzle.

Truth be told, Buckley was not a masterful pop songwriter, at least not in the Beatlesque sense of hooks, melodies, and pithy economy. Rather, he was a consummate sonic architect and a singer of extraordinary control and range, from Joan Armatrading emotional to castrato technical to Nusrat Fateh Ali Khan ethereal to back-porch colloquial. "When my life is over and my time has run out . . . I'll leave this old world with a satisfied mind," he sings on "Satisfied Mind," the collection's closer. Amen to that. *Greg Siegel*



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## DAVE MATTHEWS

### Before These Crowded Streets

RCA 67660, 70:23

Sound B+, Performance B+

Just before The Dave Matthews Band paints itself into a permanent corner as a fey, toothless, college-crowd jam band, it comes up with *Before These Crowded Streets*, its third studio recording and best effort by a landslide. Unlike *Crash*, whose bland jazz- and art-rock pretenses overshadowed any reasonable melodic impressions, *Streets* comes out of the box as an aggressive and overwhelming statement, full of Matthews' growl ("Don't Drink the Water" and "Halloween") and musical adventurousness (the Middle Eastern-flavored "The Last Stop"). Produced by long-time colleague



Steve Lillywhite—and recorded without the benefit of road-testing—*Streets* feels fresh and spontaneous, without the belabored pains of past efforts.

Instrumentally, the band is joined by interesting guests. Bela Fleck decorates the record with his saw-toothed banjo, the Kronos Quartet shows up on the thoughtful "Halloween," and Alanis Morissette sings haunting background vocals on "Spoon."

Matthews offers his best lyrical composition with two politically and morally motivated songs: "The Dreaming Tree," about taking life for granted, and the bold lead single, "Don't Drink the Water," which describes the plight of Native Americans.

To the band's credit, none of these departures veer far enough to require explanation. They just reveal that rather than being content with its considerable fan base, The Dave Matthews Band has begun to reach out to new styles, new ideas, and best of all, new fans. *Bob Gulla*



# JAZZ ~ BLUES

## RECORDINGS



Painting: Freshman Brown/SuperStock

### The Midnight Blues (Standard Time Vol. 5)

Wynton Marsalis

COLUMBIA CK 68921, 76:01

Sound: A, Performance: A+

his gorgeous collaboration between jazz's preeminent trumpeter Wynton Marsalis and arranger Robert Freedman reprises the chemistry the two established on Wynton's highly successful 1984 album *Hot House Flowers*. Freedman's arrangements for a 31-piece string orchestra work perfectly with the trumpeter's heroic playing, never upstaging this great "singer" of songs. Think of Sinatra with Nelson

Riddle more than Miles Davis with Gil Evans.

Wynton plays quite melodically throughout this ballad-dominated set. Familiar melodies like "The Party's Over" and "You're Blase" are delivered in straightforward, unhurried fashion by Marsalis and his quartet of bassist Reginald Veal, drummer Lewis Nash, and pianist Eric Reed, who is also given some significant solo space throughout. And Freedman's lush strings swirl around the trumpeter in near subliminal fashion, creating an elegant yet subdued backdrop for some brilliant playing—like black velvet against a diamond.

The players take "After You've Gone" at a snail's pace, turning that

oft-recorded swing-era barn burner into a sensuous invocation. The mood on "Glad To Be Unhappy" is profoundly sorrowful yet teeming with soulful declarations and some of Marsalis's most dazzling playing, particularly his breathtaking cadenza. He evokes feelings of his hometown with mute and plunger on a lazy, laid-back "Baby, Won't You

### RAHSSAN ROLAND KIRK

#### Aces Back to Back

32 JAZZ, 32060, four CDs, 2:53:14

Sound: A, Performance: A to B

There are multi-reed players, and then there's Rahsaan Roland Kirk—a jazz anomaly, to be sure, who pumped two, often three, horns simultaneously, while deploying a circular breathing technique that enabled him to hold a note for up to two hours (which he proved at a London performance in the '70s). This wasn't gimmickry, although Kirk certainly imbued his recordings and concerts with something verging on the carnivalesque compared to what typically appeared then at New York's Carnegie and Avery Fisher halls.

When he embarked on his signature, often bizarre but nonetheless brilliant verbal soliloquies, Kirk veered into something closer to performance art, and even comedy. Yet, the novelty never eclipsed Kirk's pure, unhindered expression—music that's still seemingly uncategorizable, although everyone files it under "jazz."

The latest addition to this file is *Aces Back to Back*, a compilation of four out-of-print (and never before released on CD) Kirk albums from the '70s: *Left & Right*, *Rahsaan Rahsaan*, *Prepare Thyself to Deal with a Miracle*, and *Other Folks' Music*. All were released on Atlantic back when it was still the best record company in the universe. Kirk traverses a range

of sonic colors, using African instruments (kalimbas, various flutes) and Afro-Cuban percussion combined with Junior Walker-influenced R&B and (heard on *Aces Back to Back*) more "orchestral" type instrumentation. Ultimately, *Aces* (and all of the performer's '70s Atlantic activity) upholds Kirk's legacy as one of jazz's most original, adventurous, and free-thinking figures.

Mike Bieber





# CLAIRE MARTIN

## Make This City Ours

LINN RECORDS

HON CD 5066, 58:03

Sound: A, Performance: B+

With traditional jazz vocals fast becoming a rarefied art, it's great to welcome U.K. native Claire Martin, a relative newcomer making the scene with her third major release in the States in as many years. Husky of voice—scorched in the lower registers, crystal in the higher—Martin plays a



rather conventional and comforting foil to torchier, more soulful songstresses like Nnenna Freelon and Diana Krall. Her phrasing's impeccable, and her pitch, especially in her playful repartee with trumpeter Gerard Presencer on Blossom Dearie's charming "Bye-Bye Country Boy," are both spot on. Elsewhere, the results are equally impressive. Saxophonist Antonio Hart helps out to good effect on the excessively uptempo "No Moon at All." A crackling rendition of the Arlen and Mercer standard "Anyplace I Hang My Hat Is Home," and "Empty Bed," her own sultry composition co-written with pianist Gareth Williams, demonstrate Martin's considerable range and emotional depth.

Martin's band also gets some space to flex, with Presencer stretching out on Milton Nascimento's "Make This City Ours Tonight," and Williams, bassist Peter Washington, and drummer Gregory Hutchinson all getting some time on Gino Vannelli's "Gettin' High."

Martin may not take many chances, and she works too frequently in the same key, but that doesn't spoil the many pleasures of *Make This City Ours*. *Bob Gulla*

Please Come Home," as the strings blow gently around him like a hot August breeze in New Orleans. With horn open, he kicks into some bold statements that hearken back to the early masters. His virtuosity is apparent throughout, yet it never undermines the melodic integrity of these bittersweet love songs.

Freedman's arrangements, like some ethereal hovering presence, remain strictly in the service of the song and conjure up an elegiac quality on "Ballad of the Sad Young Men" and the melancholy title track. There the great trumpeter offers up the universal sound of a

pained low moan before resolving to a more buoyant bluesy statement of affirmation. Wynton adds some rococo touches to "I Guess I'll Hang My Tears Out To Dry," bursting into brief double-time flourishes. And his rhythm section summons up a tango feel underneath the haunting melody of "I Got Lost in Her Arms."

Recorded live in The Grande Lodge of the Masonic Hall in New York City (using no isolation booths whatsoever), *The Midnight Blues* has a remarkably pure sound that suits the heartfelt character of this unusual, romantic project. *Bill Milkowski*

## Global Warming

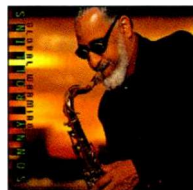
Sonny Rollins

MILESTONE MCD 9280, 50:22

Sound: A, Performance: B+

Tenor saxophonist Sonny Rollins likens *Global Warming* to his highly regarded *Freedom Suite* from 1958. In addition to delivering six individual jazz statements, *Global Warming* is Rollins' way of once again accentuating a plight, this time that of the environment. The titles of some of the songs—"Echo-Side Blue" (as in ecocide), "Global Warming," "Mother Nature's Blues," and "Clear-Cut Boogie"—leave no doubt as to his well-intended message as they fall under the grooves of ballad, calypso, medium swing, and shuffle, respectively.

"Echo-Side Blue" may well be the highlight of the disc. It's deceptively rhythmic intro unfolds to reveal a ballad of dynamic proportions. Knowledgeable Rollins fans may even find the intervallic leaps and congenial harmonies to be reminiscent of an earlier classic Rollins album (featuring guitarist Jim Hall): *The Bridge*. With excellent contributions from pianist Stephen Scott, bassist Bob Cranshaw, and drummer Idris Muhammad, Rollins' minimalistic composition is masterful.



"Island Lady," first released in 1976, is revived here with a twist of Horace Silver-ish playful funk. This cut adds percussionist Victor See Yeun, drummer Perry Wilson, and appropriately displays the evolving solo chops of long-time Rollins cohort, trombonist Clifton Anderson. The latest obscure standard that Rollins unearths is Irving Berlin's "Change Partners," and it is a wonderful take.

With original material conducive to the inventive, robust improvisations we've come to expect, Rollins' first album in more than two years will not disappoint. It's not *all* magic, but contains enough to reaffirm faith in an icon who has been away from the studio far too long. *James Rozzi*

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# DVD REVIEWS

## THE STING

**The Sting** 1973; PG rating; one-sided (1.33:1 aspect ratio); English/French/Spanish Dolby Digital two-channel monaural; Spanish subtitles; English closed-captioned. UNIVERSAL 20165, 2:09:00, \$24.98  
Picture: A, Sound: B, Content: A

**T**his movie found the director George Roy Hill and stars Paul Newman and Robert Redford following up the successful formula they established with 1969's *Butch Cassidy and the Sundance Kid*, in which crooks and rascals were made into lovable heroes. Thousands of fans, so deeply distressed by the freeze-frame implied demise of Butch and Sundance, were rewarded by having their rogue heroes, recast as Henry Gondorff and Johnny Hooker, live through a sting caper in which they take a more serious crook, played by Robert Shaw, for half a million dollars.

A revival of Scott Joplin's classic ragtime music happened to be starting at the time *The Sting* was being filmed, and composer/adaptor Marvin Hamlisch seized on several of his tunes, notably "The Entertainer," as the focal point of his score. No matter that a movie so rich in authentic period visual detail of the Depression Era 1930s should use music from an entirely different period—the early 1900s. This was Hollywood, and it all worked, seemed appropriate, won Hamlisch an Oscar, and catapulted Joplin to the forefront of American pop culture. For once, we might well thank a Hollywood composer for being historically inaccurate, since the fruits of his labor furthered a Joplin revival that saw everyone

from E. Power Biggs to Itzhak Perlman performing the ragtime composer's music. Even his neglected opera, *Treemonisha*, received a splashy, and successful, 1975 revival by the Houston Grand Opera.

Universal's DVD brings back all those memories as well as the highly entertaining movie



itself in a spiffy transfer that looks newly minted. The movie was shot 1.33:1 to be shown theatrically cropped at 1.85:1, so for once Universal's often misused "full frame" designation on the back cover proves accurate. The images are sharp and clean, doing full

justice to the Oscar-winning sets and costumes. The audio transfer is more than adequate, just not quite up to this DVD's exceptionally high video standard.

If you love this movie, which also won Oscars for best picture and director, don't hesitate to acquire this fine edition. If you've never seen it, don't wait another minute to see it.

Rad Bennett

Photo: Universal/Kobal Collection



## ROBBIE ROBERTSON

**Robbie Robertson: Going Home** 1995; one-sided (1.85:1 aspect ratio); Dolby Digital two-channel stereo. LASERLIGHT 82 016, 1:10:00, \$14.95

Picture: A-, Sound: B+, Content: A

**T**his superior tribute to one of rock music's stellar songwriter/performers comes from an unlikely source, as Laserlight enters the DVD market. Originally shown on the Disney Channel, the program begins in the present, with Robertson's return to his Native American roots as the leader of The Red Road Ensemble, then flashes back to his beginnings in 1950s rhythm and blues, moving on to his time with The Band, with an excursion into his association with Martin Scorsese and film music.

Documentaries of this sort, which inevitably interrupt the music with voice-overs, usually frustrate, but this one is so well paced and informative that I didn't mind its construction at all. There are lots of great, his-

toric film clips and special moments. My favorites turned out to be a two-man guitar-and-voice jam with Willie Dixon (who quips "you know, the blues are the roots, and other music are the fruits"), mid-1960s shots with Bob Dylan, and Eric Clapton performing with Robertson and The Band at their induction into the Rock and Roll Hall of Fame.



The video is variable because of the use of stunning, sharp recent footage alongside the older original source material. The sound is quite serviceable.

At its low price, one expects bare bones DVD features, and there are no extensive biographies or such. But when you highlight an individual chapter in the menu, you get an audio preview of it. Pretty neat at a price about that of an average CD.

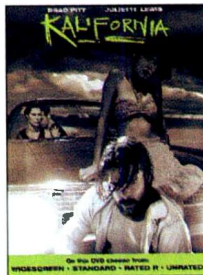
R.B.



**Kalifornia** 1993; unrated and R rating; two-sided (one side 2.35:1 letterboxed, other side pan-and-scan); English or French Dolby Digital two-channel matrix surround; Spanish subtitles; includes behind the scenes documentary. POLYGRAM 440 043 299, 1:58:00, \$29.98  
Picture: A-, Sound: A-, Content: B+

In *Kalifornia*, an author and his photographer girlfriend (David Duchovny and Michelle Forbes) traveling cross-country to gather firsthand information on serial killers while photographing the scenes of their crimes encounter the real thing when they take on charming yet menacing Early Grayce (Brad Pitt) and his girlfriend (Juliette Lewis) as riders. The quartet of first-rate actors turns in an ensemble performance of astonishing depth, with several star turns along the way that raise this movie far above the usual "psychopath movie" level. Many viewers will find it interesting to see how good Duchovny and Forbes can be outside their far better-known roles in popular TV series (Duchovny on *The X-Files* and Forbes in *Homicide*).

The video transfer is first-rate, clean and crisp, and though the audio mix is just two-channel stereo with matrix surround, it does sound better than some 5.1 mixes, doing special justice to Carter Burwell's jazzy, kinky film-noirish music score. There also seems to be some great new DVD feature at every turn these days, too. On a single disc, this DVD offers the viewer a choice among four versions: widescreen R-rated and widescreen unrated on one side, pan-and-scan R-rated and pan-and-scan unrated on the other. Not that everyone will want to see each, but the math makes that come out at about \$7.50 a version, a pretty good deal. R.B.



**The Hunchback of Notre Dame** 1939; black-and-white; one-sided; English/Spanish Dolby Digital one-channel mono; English/French/Spanish subtitles; trailer documentary. WARNER HOME VIDEO 12058, 1:57:00, \$24.95  
Picture: A-, Sound: B+, Content: A

The DVD format can breathe new life into classic movies. A good print viewed on a projection TV in a superlative, crisp, grain-free DVD transfer like this one can re-create the original theatrical thrill. Movies that merely seem "old," when interrupted with commercials in late-night network or cable presentations, are restored to full classic status and provide entertainment equal to, or beyond, that delivered by most current movies.

Surely Charles Laughton's performance as Quasimodo, the physically deformed bellringer in *The Hunchback of Notre Dame*, seems as rich as ever, eclipsing most of what was celebrated at this year's Academy Awards ceremonies. Laughton didn't win one of the statuettes for this film, and one of the DVD supplements lists all the great movies released in 1939, showing just how stiff the competition was. Additional supplements give bios and filmographies for almost the whole cast, as well as for the producer, director, and Alfred Newman, the composer of *Hunchback's* music score. There's also an interesting documentary that features an interview with Maureen O'Hara, who made her debut in this movie as Esmeralda, the beautiful gypsy who shows compassion and pity for Quasimodo. R.B.

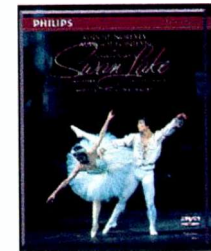
**Tchaikovsky: Swan Lake** 1966; no rating; one-sided; Dolby Digital 5.1; two-channel stereo. PHILIPS 440 070 201, 1:46:30, \$29.98  
Picture: A-, Sound: B, Content: A

This DVD captures Rudolf Nureyev and Margot Fonteyn at the height of their artistic partnership in a 1966 Unitel taping of Tchaikovsky's *Swan Lake*. The duo, one of the great pairings in ballet history, is a marvel to behold. Though the choreography by Nureyev was new for the time, the overall production looks solidly traditional.

The video from a film over 30 years old is pretty amazing as well. The colors are vibrant, and the definition is sharp and clean. Sound is excellent for the most part; only big orchestral tuttis show some signs of congestion. Passages scored for smaller forces come across just fine; the all-important harp sounds quite realistic. The 5.1 mix just adds some rear reverberation and overall sounds leaner and cleaner.

If you want a more opulent, lush sound that is slightly less transparent, switch to the two channel, an alternate choice thoughtfully provided. Though based on a stage presentation, the performance was apparently taped without an audience, so you can listen to the audio only without any distracting applause.

At its list price, this DVD costs no more than a full-price, audio-only CD, yet provides video as well. Philips proves in this release that classical music and DVD were made for each other. I hope others quickly follow suit. R.B.



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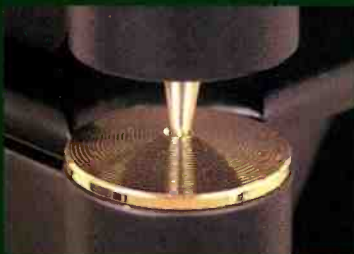
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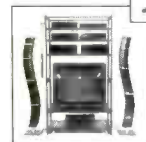
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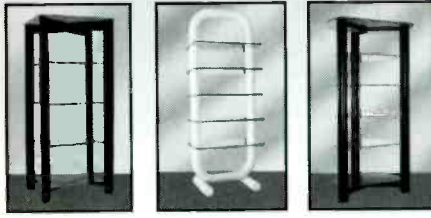
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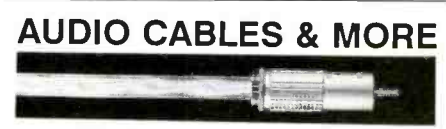
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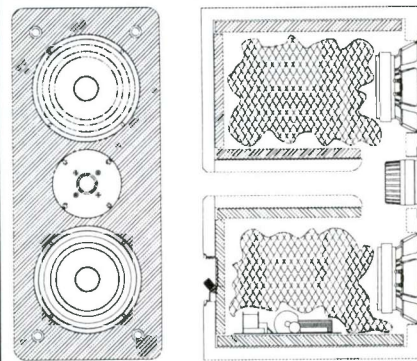
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**Tweeter:** The Seas Excel T25-001 tweeter is a 25mm Sonotex fabric dome, with silver voice coil wire, a machined aluminum face plate and a rear chamber to eliminate unwanted reflections. The silver wire improves electrical conductance to provide better sensitivity to fine details in the musical signal.

**Cabinets:** The cabinets are oak veneer with a slot loaded rear vent and full black textile grills. Cabinets are available with a clear finish or ebony finish. Cabinets are 22" high, 9 1/2" wide and 14 1/2" deep. The cabinets, grills and crossovers are fully finished and assembled. You receive all parts necessary to construct the kit.

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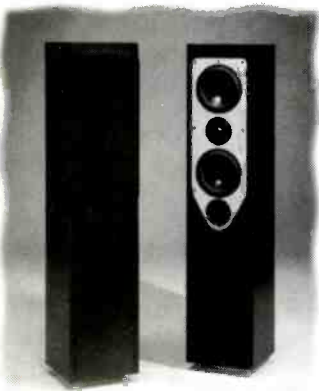
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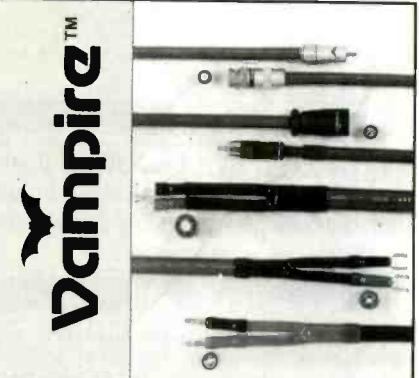
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# PlayBack

## ROGUE AUDIO EIGHTY-EIGHT AMP

Rogue Audio's Model Sixty-Six tube preamp, which I reviewed in the December 1997 issue, delivered great sound, considering its moderate price. Rogue followed up by sending me its Model Eighty-Eight tube power amp, and again I experienced fine sound.

Priced at \$1,395, the Eighty-Eight is rated at 60 watts per channel and operates in Ultra-Linear or triode mode, selectable by an internal switch. The amp has a nice retro look, with a detachable cover vented at the top and sides. The tube complement includes four Svetlana 6550C output tubes, four EI 12AU7s for the driver stages, and two Sovtek 12AX7s for the inverter stages. The tube circuits are self-biasing. The power and output transformers are large, which is consistent with the amp's relatively high output power.

At the rear are sturdy binding posts and an AC-cord receptacle. An ultra-quiet fan pulls cool air from the left vent holes across the output tubes and out the right vent holes.

The Model Eighty-Eight lost a couple of points, however, on build quality: Sturdier mounting of the



GRADE: B+

p.c. board would prevent its flexing when you change tubes. And some ergonomic characteristics could be improved—e.g., moving the internal triode/ Ultra-Linear switch from the p.c. board to a more convenient location on the front panel would be quite helpful. I would also prefer a separate 4-ohm speaker output or an 8-ohm/4-ohm switch. I had to swap wires to the speaker posts from the inside to enable 4-ohm operation.

The Model Eighty-Eight's sound is grade-A. It delivers accurate audio with tube smoothness, yet the bass is tight and fast. Regarding triode or Ultra-Linear operation, I preferred using Ultra-Linear for pop and triode for jazz and acoustic music. In either mode, this amp sounds better than many old tube amps that audiophiles lust after. Weighing price against performance, I think the Model Eighty-Eight is a bargain. (Rogue Audio: 2827 Avery Rd., Slatington, Pa. 18080; 610/760-1621; www.rogueaudio.com.) John Gatski

## ZEFIRO INBOX MIKE PREAMP/ADC

Remember cassette decks and reel-to-reel recorders from the '70s and '80s? They had front-panel microphone jacks so you could do home recording. Most of today's state-of-the-art home recorders—MiniDisc, DAT, CD, and analog cassette—don't have them. To record with mikes, you need a mixer or an outboard mike preamp with an unbalanced output. The Zefiro InBox represents a different approach: a mike preamp with a 20-bit analog-to-digital converter. It's intended for use with low-cost DAT, MD, and CD recorders and computer workstations.

Priced at \$295, the InBox is compact (just 5¼ x 3 x 1¼ inches) and portable (its snap-in 9-volt battery lasts up to nine hours). It has two Neutrik XLR balanced mike inputs (not phantom powered), a mono mini-jack connector for S/P DIF coaxial digital output, a Toslink optical digital output, left- and right-channel gain controls, and a handy belt clip. An LED signals battery-replacement time.

Zefiro's optional accessories include a wall-wart AC adaptor, an RCA-to-XLR adaptor for line-level recording, and an extra box that provides phantom power for professional condenser mikes.

Using two Shure SM57 dynamic mikes to record acoustic guitar, I tried the Zefiro with a Sony consumer DAT recorder and a Pioneer CD recorder and found it could provide plenty of gain without noise. The A/D converter was pretty good as well, yielding a fairly accurate recording of the acoustic guitar.

My one caveat is the mini-jack coaxial digital output: None of my 75-ohm digital cables have mini-plugs, so I had to buy an adaptor from Radio Shack for the InBox end. Overall,

though, this is one neat little device, and the price is right. (Zefiro Acoustics: P.O. Box 50021, Irvine, Cal. 92619; 714/551-5833; www.zefiro.com.)

GRADE: A-



## SONY AN-LP1 SHORT-WAVE ACTIVE ANTENNA

The AN-LP1 is designed for apartment-dwellers and travelers who want to listen to short-wave radio but can't use traditional outdoor antennas. The receiving element is a 19-inch steel hoop (when unfolded), held together by a fabric disc, with a small cord carrying a suction cup and a clip for hanging the antenna. Despite its size, the AN-LP1 is great for traveling, because the hoop twists down into a circle only 6½ inches in diameter, its rim held by a plastic shell that also houses the connections.

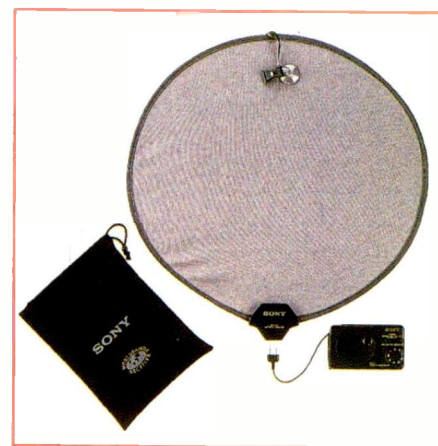
A tunable RF amplifier in a pocket-sized box makes this antenna active. Its only controls are a frequency selector (calibrated for 4, 5, 6, 7, 10, 12, 14, and 20 MHz, corresponding to the 75- through 13-meter bands) and a power switch. The antenna is connected via a 12-foot, 8-inch cable that unreels from the amplifier case; a 9-inch cable that wraps around the case connects to your radio, and a small adaptor is provided that connects the cable to your radio's antenna mast if the radio has no antenna input. A cigar-sized filter can be plugged between the antenna

and its cable to prevent interference from electrical appliances. With the antenna folded, the whole system fits into a small soft case and weighs just a few ounces.

Sitting on my porch, with the antenna suction-cupped to the window behind me, I found the AN-LP1 helped tremendously on some bands, very little on others. But when I moved indoors, where fewer stations can penetrate, it made quite a large difference. The filter, however, seemed to make no difference at all. Considering the AN-LP1's \$99.95 cost and extreme portability, I'd highly recommend it, especially to anyone who travels with a short-wave radio. (Sony: One Sony Dr., Park Ridge, N.J. 07656; 201/930-1000.)

GRADE: A

Ivan Bergner





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