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THE EQUIPMENT AUTHORITY

JULY 1997



TESTED

Ed Foster
Reviews

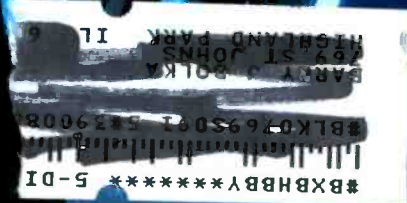
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SHACK, MY DONUT
MY DRAG

OF DOOM.

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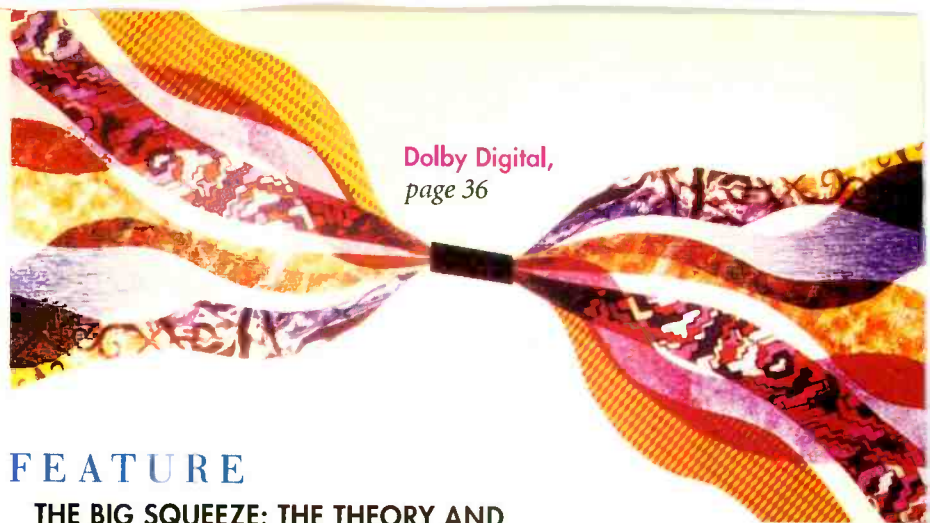
ITS DASHBOARD

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THE EQUIPMENT AUTHORITY



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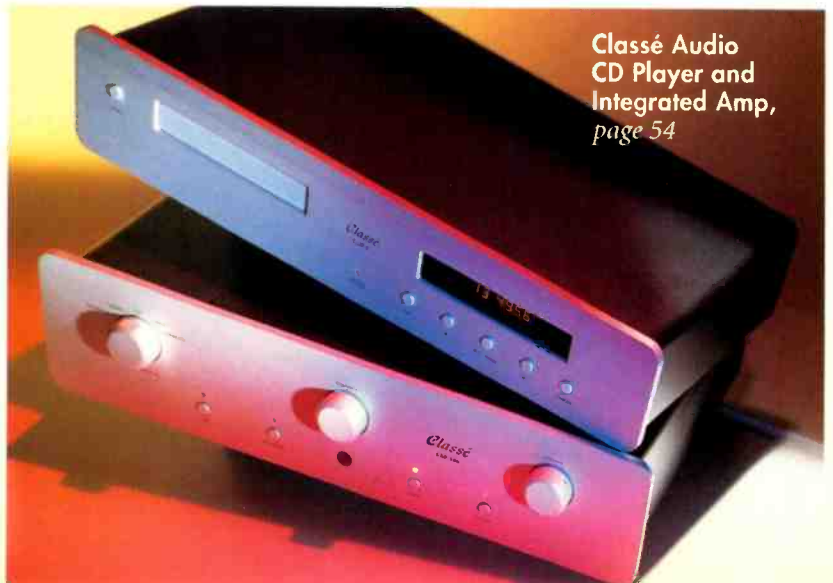
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"ESL Raves"

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Alvin Gold

Hi-Fi Choice Magazine

Jan 96

Martin-Logan makes it harder for high ticket loudspeakers to justify their cost

John Atkinson

Stereophile Magazine

Oct 93, v16n10

I cannot give Martin-Logan enough praise

Anthony Cordesman

Audio Magazine

Feb 94

Shattering industry standards yet again

Larry Rock

Audio Engineer

Extraordinary speakers & exceptional value

Sam Tellig

Stereophile Magazine

Jun 93, v16n6

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Bruce and Jenny Bartlett

High Performance Review

Jun 95, v12n2

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In audio, the price of progress is more wire. Or so it seems. My first system required only about half a dozen connections: a pair (plus ground wire) from turntable to preamp, another pair from preamp to power amp, and a final pair from power amp to speakers. Even allowing for the fact that each speaker connection involved two terminals, it was not a complicated or in any way confusing setup. And the worst I ever expected it to get was from the addition of a tuner and a tape deck—six more connections.

Fast-forward from then till now, and suddenly there are more cables from preamp to power amps than there were in my entire system 25 years ago. The sources have also multiplied, with some delivering video or digital audio (or both) in addition to analog audio. The video connections come in a couple of flavors, as do the digital audio links. Add to all that the rather cramped quarters into which most of my home gear must fit these days, and you're looking at an interconnect nightmare. Component upgrades have become serious undertakings, not to be taken lightly; flashlight-battery replacement, bourbon consumption, and copious swearing may be involved.

Whatever one may think of the competing claims made for various approaches to cable design, at least one benefit of the emergence of the high-end cable industry is that there are now a lot of alternatives that have merit on purely practical grounds. So I thought I'd mention a couple that helped me out in a recent system renovation.

As intimated above, I don't have much clearance behind some components, which means that cables sometimes have to make rather tight turns. That makes flexibility highly desirable. But given the close quarters and all the RF generated by digital and video components, I also want good shielding. And for digital and video connections, maintaining correct impedance is important.

One company that pays particularly close attention to all these considerations is

Gordon J. Gow Technologies in its Tributaries line of cables. Some of you undoubtedly will remember the name Gordon Gow from McIntosh Laboratories, which he helped start and ran for many years. Gordon J. Gow Technologies (located in Orlando, Florida) was founded by his widow, Paula Gow, and Joseph Perfito, who also had a long association with McIntosh. The heritage is evident in the new company's products, which manifest the same conservative engineering and attention to detail that built McIntosh's reputation over the years. The Tributaries cables I've used—primarily for digital audio, S-video, and composite-video connections—have combined excellent construction with a degree of flexibility unusual to the genre. The company says it uses low-friction slip sheets between the layers of a cable's internal structure to make the interconnect easy to bend without altering its impedance in the process. Everything else about the Tributaries cables is pretty straightforward—good basic engineering, well executed and reasonably priced by today's standards. And they work very well.

My other handy helper was Monster Cable's AV Pod, which wraps composite-video and stereo audio lines in a single sheath. The name comes from the disc (pod) at each end of the cable, from which sprout connectors for the three interconnects on separate short (but not too short) cables. This is a terrific idea that makes it much easier to keep track of which cables are going where and with which others. And it makes the installation neater. The pods even have molded-in clasps that can be used to hold them in tidy stacks. Monster Cable AV Pod interconnects are available in two grades and various lengths.

Yours for happy hookups,



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SONY

Give Me Liberty...

Dear Editor:

I enjoyed Bascom H. King's review of Liberty's Audiosuite 2.0 (LAUD) computerized measurement system (February). I have been a user of the company's LAUD and IMP audio measurement tools in all their incarnations for several years and agree with King that the LAUD 2.0 is clearly a winner in its class. But there are a few things I'd like to clarify.

King expressed annoyance at the polarity reversal of the microphone. I want to point out that the latest update (LAUD 2.12) has a software switch that lets you toggle the polarity of the mike signal. Another potential source of annoyance King mentioned was all the screen redraws that occur when "backing out" of some menus. I concur here, even though it is usually my own fault that this happens and not LAUD's. Liberty has provided a hot key, "*" (asterisk), to take you from anywhere within the menu structure to the top, bypassing the redraws. If only I could remember to use it.

Also, King's test of the RTA instrument's response (Fig. 8) showed it to be pretty dismal, falling off 4 to 5 dB at the upper and lower limits. I configured my system as described by King, performed the same test, and got considerably better results. My measurements showed about ± 1 dB for the $\frac{1}{3}$ -octave mode and ± 2 dB for the $\frac{1}{6}$ -octave mode. The MLS instrument is much faster, more accurate, and shows more detail than the RTA. I use the MLS signal in about 70% of the measurements I make; the rest of the time I use swept sine waves.

Kim Girardin
Wadenhome Sound
Winona, Minn.

Author's Reply: After reading Mr. Girardin's letter, I set up the LAUD again to recheck the flatness of the RTA function when fed from its pink-noise source. The results? I essentially duplicated those shown in Fig. 8



of the review. I then contacted Bill Waslo of Liberty Audio Instruments. He reported that there is indeed some rolloff of the low frequencies in the RTA mode. This is caused by a peculiarity of the Analog Devices software as implemented in the Echo sound card (even with the factory modifications) when it is used at the higher sampling rates, as in the LAUD RTA mode. This doesn't seem to affect the low-frequency response in the SINE and MLS modes or when lower sampling rates are used. The sound cards used by Waslo and Girardin (who, by the way, is a consultant for Liberty on its microphones) include an additional modification, added earlier during some experiments with accelerometers. In their systems this modification was coincidentally correcting the low-frequency rolloff in the RTA mode.

Further information regarding this can be found on Liberty Instruments' Web page (www.libinst.com).—*Bascom H. King*

Subilicious

Dear Editor:

Regarding comments made in "Letters" (April) concerning the Sunfire subwoofer: My subwoofer began life with an eviction notice. Diana, my wife, said to me, "If you want a woofer in our living room, it has to be invisible."

So I designed my woofer for high output, deep bass, and small size. Respected reviewers throughout the world have testified to this, with Julian Hirsch saying that it produced "The flattest, deepest bass response I have ever heard or measured."

Every single reviewer I know who measured my woofer found it to put out well over 110 dB; this includes Peter Aczel of *The Audio Critic*, Alvin Foster of the *B.A.S. Speaker*, and Joseph Cierniak of *The Sensible Sound*. In fact, when corner-loaded and evaluated at 1 meter using ground-plane measurements, both Dr. Foster and *The Sensible Sound* measured over 120 dB, averaged from 18 to 35 Hz.

How loud is a dB? The dB scale is sort of like the Richter scale—a small change goes a long way; a woofer with 100 dB SPL output is very modest indeed. A good 8-inch driver in a bass reflex box can do 100 dB from 25 Hz up, as reported by D. B. Keele, Jr., in the March *Audio* ["Profile," BIC America Venturi V-604 Speaker]. Ah, but a unit with 110 dB is a majestic powerhouse. The additional 10 dB represents 10 times more bass power, and 120 dB is almost beyond belief.

Finally, Dick Sequerra said of the Sunfire, "Very few systems put out the energy that this subwoofer puts out!" And then he exclaimed, "God help you if you put it in the corner. It would blow your living room apart."

Bob Carver
Sunfire
Snohomish, Wash.

Great Scott—They're Alive!

Dear Editor:

In your May issue, on page 56 of "Glorious Beginnings," David Lander states that "Still other names associated with the nascent hi-fi industry—some little known, some as recognizable as that of H. H. Scott—have faded into silence." That is not entirely true. As of a few months ago, at least one H. H. Scott model was available at Sun TV stores.

To my knowledge, the H. H. Scott trademark was bought by Emerson Radio in 1991. After a year or two of production by Emerson, the name disappeared, so I can see where it would be assumed gone. Late last year, at Sun TV, I spotted an H. H. Scott MM600 micro stereo system (not much, but proof that the name is still in use). It's basically a \$99 stereo with features of top-of-the-line equipment: a drawer-loading CD player with calendar display, 32-track programming, and remote control; a preset equalizer with a big display; digital tuning; and more. The system is displayed with the new H. H. Scott motto of "Perfection Is Our Standard." The back of the instruction manual indicates there may also be Scott VCRs, TVs, and other components. So the brand is not dead. It has gone the way of many other companies—bought and switched around—but is still out there.

Also worthy of mention: Garrard isn't quite dead either. I don't know the current

owner of the trademark, but if you go into a Service Merchandise store, you'll find everything from fully loaded mini stereos and boomboxes to clock radios, portable CD players, receivers, and turntables, all by Garrard. I have the current Garrard 1212 turntable, an automatic with preamp, which I bought for the nice price of \$100.

So some names that brought us early hi-fi still live on in some respects. No longer in their glory days, they are trying to renew themselves with fancy features and prices.

*Erick M. Beljan
via e-mail*

Macrovision: Tough on the Eyes?

Dear Editor:

Congratulations on Edward J. Foster's fine article, "DVD Unraveled" (April), which contains more valuable and accurate information than I've seen anywhere else!

However, there is one aspect not covered, possibly because of the late adoption of standards: analog copy protection. I understand that Hollywood's insistence on anti-copy measures has forced the inclusion of the dreaded Macrovision scheme into the hardware. Macrovision is not benign; my problem is that it causes bending of vertical lines at the top of my TV screen (Sony KV-32XBR96S). Others have reported an eerie glow behind dark scenes.

Laserdisc owners have not had to deal with Macrovision and its side effects; they would be wise not to jump into DVD without dealer assurance that they can jump out again if their equipment reacts badly to Macrovision.

*Harold W. Cornelius
Arlington, Va.*

Editor's Reply: DVD decks do contain Macrovision circuits that turn on when told to do so by the disc being played. This means the video outputs from the players will not *always* carry Macrovision processing, but often they will (it is already very commonly used on tape releases), so it is a potential concern. Most modern TV sets tolerate Macrovision well and do not exhibit any side effects; some (particularly old models) do have problems, however, the most common being the bending at the top of the screen that you describe.—M.R.

Micro-Groovy

Dear Editor:

Congratulations on your May issue, which included a wonderful history of home audio. No doubt you are being inundated with many personal recollections of the good old days of audio, but let me add one of my own.

I wonder how many of your readers are aware of the 78-rpm micro-groove recordings issued in the early 50s. The best of these were recorded by E. D. Nunn (of the Nunn Bush shoe company) of Saukville, Wisconsin, and released under the Audiophile label. The liner notes modestly stated that if you could hear distortion on the recordings, your equipment needed to be inspected. The records were pressed on clear red vinyl and were superior in fidelity to anything else around.

I still have about half a dozen of these Audiophile recordings, as well as a couple of others produced by Turntable Recordings of Hollywood. I recently upgraded my old two-speed turntable to a new three-speed model equipped with an elliptical-stylus cartridge. Guess what? They all sound better than ever and present a real challenge to most CDs.

*Matthew L. Stephens
Albuquerque, N.M.*

Big Mac Attack

Dear Editor:

While leafing through the April issue of *Audio*, I was pleasantly surprised by the disdain for the PC and love for the Mac that Ken Kessler expressed in "Mondo Audio." It's nice when a contributing editor of a hard-core audiophile magazine writes appreciatively about the Mac. It would be great if *Audio* could review the musical capabilities of the new 20th Anniversary Mac, which boasts the first serious speaker system.

*Wise Young
via e-mail*

Picky, Picky, Picky

Dear Editor:

Here's one for your "picky reader" pile: In Len Schneider's "Auricle" on the Coincident Digital Master speaker (February), he writes that Coincident claims that its Asymmetrical Wall Enclosure design, along with "...the absence of internal bracing and damping material, eliminates internal

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standing waves and sonically destructive reflections.” Wouldn’t the *presence* of bracing and damping material eliminate standing waves and sonically destructive reflections?

Ken Ketler
via e-mail

Author’s Reply: The key phrase here is “Coincident claims. . .” Normally, the effects of standing waves in speakers can be diminished by using proper dimensions with primarily nonparallel walls, providing internal diffractive and diffusive surfaces, and damping selected areas so that sound waves are absorbed rather than reflected back into the enclosure.

Although I did not remove the Digital Master’s drivers to measure internal dimensions, its exterior measurements led me to believe that we weren’t dealing with a major problem here. The enclosure’s nonparallel surfaces are a valid (and relatively expensive) approach to controlling deleterious standing waves.

The lack of internal damping material in the Digital Masters is more intriguing. Although well documented in the literature, undamped enclosures are, at least in my experience, difficult to execute properly.

I see the lack of internal bracing as a double-edged sword. Bracing is needed on large enclosures to enhance dimensional stability. Given the Digital Master’s compact size, enclosure wall thickness, and generally high level of cabinetry, I suspect that even extensive bracing would not have a significant effect on enclosure rigidity.

Bracing’s effect on internal standing waves is much more difficult to assess. Put enough bracing in to have a significant effect on standing wave distribution, and you might end up with a loudspeaker enclosure that’s large enough to develop wall resonance modes that would *need* bracing to control them!—*Len Schneider*

Leaving a Legacy or Two

Dear Editor:

I want to share an experience I had with one of *Audio*’s advertisers. I recently bought a pair of used speakers through Audioweb’s website. The speakers seemed to work fine in the seller’s living room. After I got them home that evening, one speaker was not working properly. I called the original owner and told him about the problem. Since

the warranty applied only to him, I appeared to be stuck. But he contacted the manufacturer on my behalf, and the company said I should send back the speakers for repair. Two weeks later, I received a new pair at my doorstep. This was more than acceptable to me. The company I am referring to is Legacy Audio, which went out of its way to ensure my satisfaction. I commend Legacy for its excellent customer support and standing by its fine products.

Kevin D. Olson
via e-mail

Dynamic DVD

Dear Editor:

I read with interest Ian Masters’ “Auricle” review of the RCA RC5200P DVD player (March) and finally was able to obtain one. In addition to its fine video performance, its sound quality with CDs is superb, as pointed out by Masters. In fact, I have put my existing CD players and D/A converter in the closet for the time being. There’s a good chance these DVD players may make most current CD and D/A converter components obsolete!

Regarding error correction, I found that the RC5200P could track 2-millimeter dropouts on the Pierre Verany test disc, including those on its narrow-pitch tracks and on the tracks that contain two dropouts per disc revolution. This is better than most CD players’ performance.

The audio quality was even better when I fed my amp from the DVD player’s headphone output (using an adaptor cable, Radio Shack’s No. 42-2613) instead of its main audio output. That might be because the headphone jack’s output impedance is only 50 ohms, as opposed the main output’s 1,100 ohms. And by using the headphone jack, which has a volume control, I was able to connect the DVD player directly to a power amp.

Bernard A. Engholm
Carlsbad, Cal.

Kudos for Chick and Keith

Dear Editor:

In your March issue, Robert Long’s review of the Mozart concertos by Chick Corea and Keith Jarrett was on the mark. When I bought these sets, I knew I was going to get something special from the world’s two premier jazz pianists.

Listening to Jarrett’s interpretation, I got a sense of careful exploration and technical proficiency. Corea, on the other hand, was delightful and sparkly. Jarrett was more powerful and dynamic in his Bach and Handel interpretations; this is his classical forte, and he, perhaps more than anyone else today, has brought the art of improvisation to a level that may never be equaled. I applaud his verve for bringing back the true art of classical creativity, even if his styling is more suited to the Blue Note than the bluebloods. Fans of Corea must include this gem in their classical library. Or is that jazz? Doesn’t matter. This is probably just how it was done back in 18th-century Vienna. I hope more musicians like these two take the plunge. Refreshing!

Randall L. Collins
via e-mail

New Light Shed

Dear Editor:

I very much enjoyed reading the 50th Anniversary issue of *Audio*. Both the articles and the advertisements from eras past were informative.

I did notice one technical error, however. In Robert Long’s “50 Years of Follies—Ideas That Didn’t Fly,” he describes the use of light to trace the analog grooves of a record, in order to play the record without wear. Long states that the idea goes back to a Philco console phonograph made just after World War II.

Although this phonograph did indeed use a beam of light to reproduce sound, it used a conventional stylus to trace the groove. The vibrations were transferred from the stylus to a mirror, and the vibrations of the mirror were read with a beam of light.

Just like any other stylus, this one caused record wear. The beam-of-light pickup did not offer any advantage over crystal or magnetic pickups, and it was discontinued.

In contrast, the Finial Technology laser turntable did truly trace the groove with a beam of light.

Donald Borowski
Spokane, Wash.

Erratum

In our May issue, the phone number for Apogee Acoustics on page 104 was incorrect. It is 508/988-0124.

“Of the interconnects I know well, my top choice is Esoteric’s Tech 2ii series...”

Lawrence B. Johnson
Stereophile Guide to Home Theater, Vol.1, No.1, 1995



...Only From Esoteric Audio.

Lawrence Johnson knows cables. A reviewer of his status receives an abundance of high end cables for review. So we were honored that he selected our Tech 2ii as his top choice for his recommended \$25,000 “Pink Cadillac” system, for its “robust construction and amazing flexibility.” Esoteric Audio cables are unequalled by any other brand, and so is Esoteric Audio the company. We are the only cable manufacturer that is serious enough about high end cables to be “hands on” involved in every phase of design and engineering, materials selection, manufacturing, hand-crafted assembly, and testing, with strict quality control employed at each step.

So, it’s your choice. You can demand the “state of the art” cable brand built by the world’s leading cable manufacturer, or you can settle for second-rate brands from other cable suppliers that are made by someone else in somewhere unknown. Lawrence Johnson chose Esoteric Audio for his system. You should for yours. Available at premier audio retailers in your area. Call us for your nearest one.



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CIRCLE NO. 7 ON READER SERVICE CARD

WHAT'S NEW



Jensen Car Amp

With discrete bipolar output transistors and stable operation into 2 ohms, Jensen's XA 6040Lx can drive four channels (at 75 watts per channel continuous output), three channels (two channels at 75 watts each and one channel at 150 watts continuous output),

or two channels (at 150 watts each).

The amp has built-in low-pass crossovers and high- and low-level inputs, an automatic on/off sensor, short-circuit and thermal overload protection, and a MOS-FET power supply. Price: \$349.95. For literature, circle No. 102



large cone excursion and very high power handling with low distortion. Aura Systems, the parent company, says this Neo-Radial Technology has been part of its professional line for years. Pictured here are the MR62 (left), a coaxial design

AURASOUND CAR SPEAKERS

A mixture of Kevlar, paper, and polypropylene forms the TriComposite cone for Aurasound's Mobile Reference series of car speakers. Powerful and lightweight neodymium ring magnets are said to enable

with a 6½-inch woofer and 1-inch silk-dome tweeter, and the MR52, a coaxial with a 5¼-inch woofer and a ¾-inch silk-dome tweeter. Prices: MR62, \$279.95 per pair; MR52, \$249.95 per pair. For literature, circle No. 100

LINEAR POWER CAR PREAMP

The PA2 preamp is said to be so clean and versatile that its manufacturer has dubbed it the Audiopath Enhancer. Measured at maximum output (10 volts), its rated S/N ratio is greater than 102 dB. Besides volume and fader controls, the half-DIN-sized preamp has



controls for bass, midrange, treble, and subwoofer level. Fading can be done between two inputs or internally with one input. The front panel, which has LEDs for power on and clipping, is available with green, amber, blue, or white backlighting. Price: \$449. For literature, circle No. 101

KENWOOD CAR CASSETTE HEAD UNIT

To disguise itself and outwit potential thieves, the KRC-953's MASK faceplate revolves and leaves a blank panel in the dashboard. Full-bandwidth power of its built-in amplifier is specified at 20 watts x 4 at less than 1% THD. The FM tuner

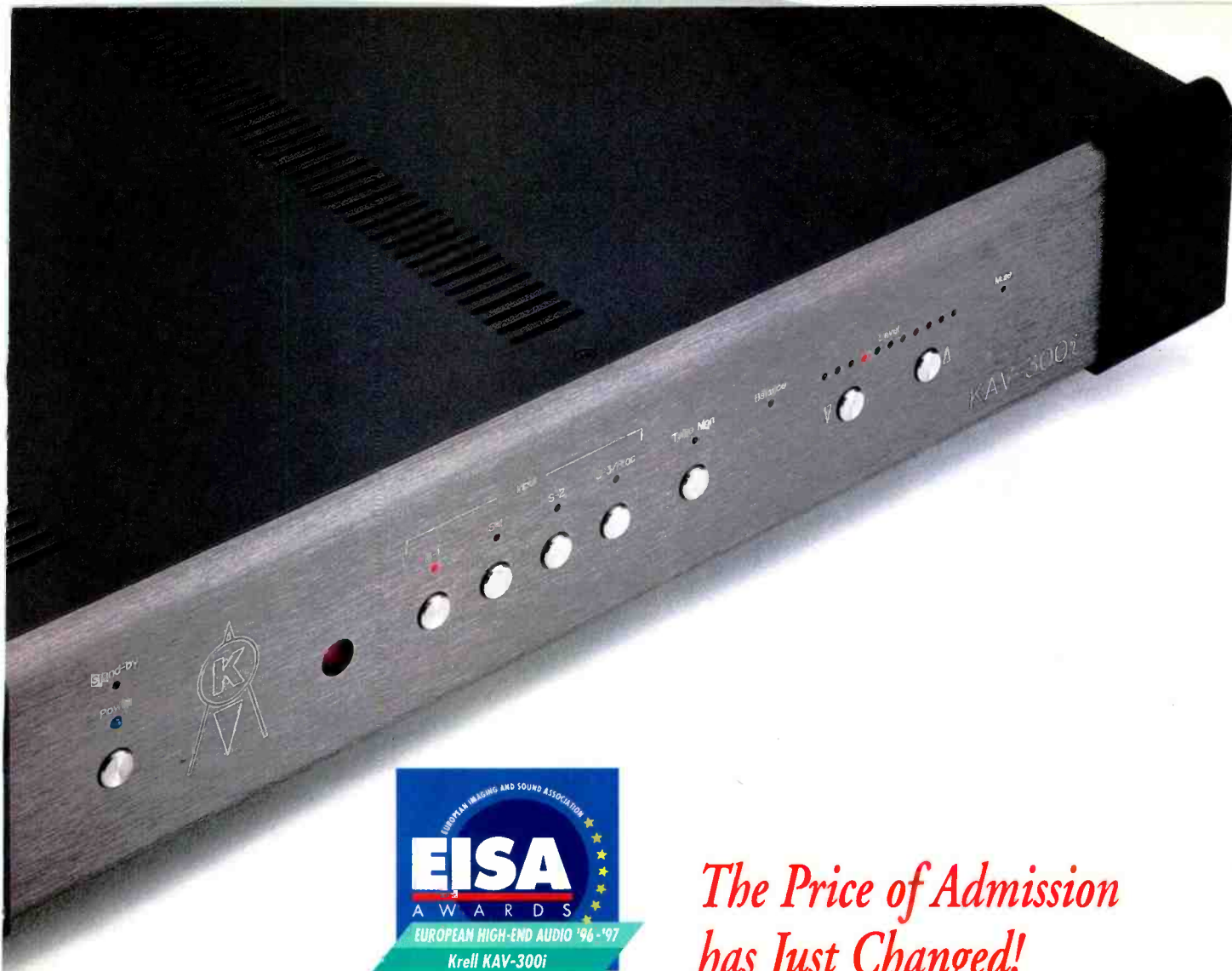
features Radio Data System (RDS), 24 FM/AM presets, and a selectable multipath-control circuit. The KRC-953 enables CD-changer control with alphanumeric disc titling, the latter performed with a supplied 10-key remote. Other features include an auto-reverse tape transport with Dolby B noise reduction and gold-plated RCA pre-out jacks. Price: \$450. For literature, circle No. 103



CERWIN-VEGA CAR SUBWOOFER

Designed for a small, sealed enclosure or bandpass box in a car, the Stealth Series-3 S-12.8 driver has a 12-inch moisture-proof paper cone and a nominal impedance of 8 ohms (it's also available in 4- and 12-ohm versions). The driver's high-energy magnet has a tight tolerance within the voice-coil gap, which Cerwin-Vega says results in increased sensitivity (95 dB/1 watt/1 meter) and power handling (up to 250 watts). Rated frequency range is 30 to 500 Hz. Price: \$160 each. For literature, circle No. 104





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WHAT'S NEW

Tandberg Integrated Amp



Despite its external simplicity—a passive, four-source input selector and volume knob are its only controls—the Troll stereo integrated amplifier is said to have sophisticated circuitry

inside. Rated at 25 watts per channel into 8-ohm loads, the Troll uses multiple low-order feedback loops and regulated gain stages that produce almost no heat. Thus, it fits into a 4¾ x 4¾ x 6-inch chassis, which

Tandberg claims makes it ideal when space is at a premium, sound quality is essential, and cool operation is vital. Prices: \$599 in black, \$649 in maple. For literature, circle No. 105



HOUSTON AMPLIFIER

With a complement of four KT100 output tubes, the GSP-02 stereo power amp is rated to produce 60 watts per channel into 4- or 8-ohm loads, from 20 Hz to 20 kHz, with distortion specified at 0.15% (8 watts out). Noise is rated at 90 dB below 60 watts out.

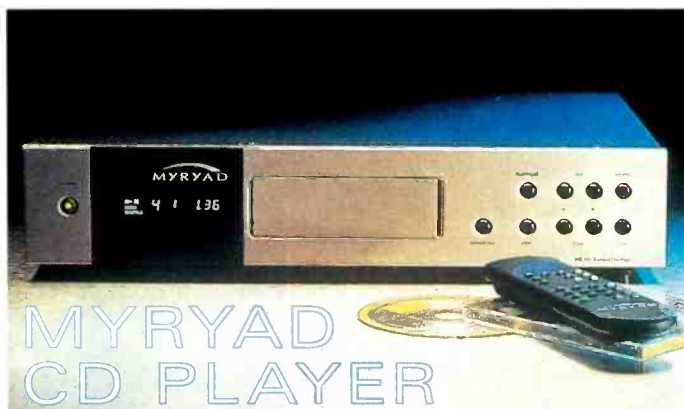
Houston says that, like the Teflon circuit boards, all parts are chosen on the basis of sonic merit after lengthy evaluation and that each amplifier undergoes extended burn-in and listening tests. Power and output transformers are hand-wound with copper wire and have 6-millimeter-thick solid brass side plates. Price: \$960. For literature, circle No. 107

Case Logic CD Organizer



Moving around a large CD collection can be a real pain, so the CDW-152 CD Organizer seems a sensible solution. Its reinforced carrying handle, great capacity (152 CDs and booklets), and small size let you easily tote your music collection to a vacation home or a car or RV. Price: \$49.95.

For literature, circle No. 108



A master clock running at 33.8 MHz, synchronized to the CD mechanism and the 1-bit D/A converter, is said to eliminate jitter from the MC 100 CD player's output signal. A 32k RAM buffer, combined with digital servos, is said to provide excellent tracking of damaged discs, and discrete

Class-A push-pull circuitry is used in the analog output stage. Frequency response is specified at ±0.3 dB from 20 Hz to 20 kHz, with THD at 0.003% at 1 kHz. Besides analog outputs, the MC 100 has a 75-ohm coaxial digital output jack. A remote is included. Price: \$1,200. For literature, circle No. 106

FAROUDJA VIDEO PROCESSOR

With technology derived from Faroudja's professional line doublers and quadruplers, the VP100 is said to significantly improve image quality of front- and rear-projection TVs or large-screen direct-view TVs. A proprietary adaptive comb filter processes

luminance and color elements, another circuit fine-tunes color alignment, and a third enhances edge sharpness and detail. The VP100 has a composite video input, dual S-video outputs, and detail and color controls. Price: \$799. For literature, circle No. 109



GFA

5802



Before you buy an expensive power amplifier, read the fine print.

Adcom's dedication to uncompromising sonic reproduction, innovative circuit design, and the highest quality electronic parts guarantee that, dollar for dollar, you're getting the best value in the audio world. At 300 watts per channel into 8 ohms and 450 watts per channel into 4 ohms*, our new GFA-5802 combines innovative all MOSFET circuitry with a tremendous power supply to out perform the so-called 'super amps' retailing for two to three times the price.

To produce this remarkable amplifier, Adcom started with an enormous toroidal power transformer. Totally separate secondary windings and independent ground connections assure each channel is completely isolated from crosstalk and AC line interference. Lots of clean power for lots of clear and powerful sound. Even the neighbors will enjoy it.

In addition to the GFA-5802's main toroidal transformer, a separate front end transformer is also used. This additional device isolates the front end input stages from the main output section so any peak demands from the output stages will not decrease the operating voltages for the input sections. This design also contributes to improved separation at the inputs for precise soundstaging and imaging.

Adcom's new GFA-5802 power amplifier also has exceptionally large capacitors to store large amounts of DC current for supply to the speakers. This large storage capacity means that the amp won't be starved for power when you're driving low impedance and/or inefficient speaker systems. Now your speakers and your music can sound the way you expect them to. All the time.

The well organized and simple design of the GFA-5802's glass epoxy circuit boards assures outstanding and reliable operation. Class 'A' circuitry in the front end, the Adcom GFA-5802 delivers the pure sound that other amplifiers can only talk about. All devices are precision matched for maximum performance, negligible distortion, and higher output currents.

We use only International Rectifier Hexfet transistors in the signal path of the Adcom GFA-5802. These Hexfet circuits are reference grade, hybrid MOSFET transistors which reproduce all the punch and muscle of bipolar devices but with the musical sound of tube amps. And since the GFA-5802 has only three gain stages it out performs comparable amps which usually have five stages or more. The shorter the path of power resistance, the better the sound.

The GFA-5802 comes with versatile binding posts for easy speaker hook-ups. Accepting either standard stripped or 'tinned' wires, single or dual banana plugs or spade lug connectors, the GFA-5802 is a great match for any system. And since it can drive virtually any speaker system regardless of its impedance, even the most demanding speakers will sing beautiful music. Additionally, the GFA-5802 also comes equipped with two sets of binding posts for each channel. These extra binding posts allow the GFA-5802 to accommodate speaker systems that have 'bi-wire' capability.

Adcom makes sure that the sound created by your other components can be flawlessly transferred to the GFA-5802's balanced power and optimum circuit technology. The GFA-5802 is equipped with two types of input connectors for complete compatibility, high quality gold-plated RCA jacks and XLR jacks. The GFA-5802's professional grade three pin XLR jacks provide both positive, negative and shield properties. The result is a balanced line connection between the GFA-5802 and your other components. This connection is essentially immune to electromagnetic and radio frequency interference and provides a significant reduction in 'common mode noise'.

Dependable technology and efficient use of the highest quality parts make the GFA-5802 one of the most sought after audiophile products in recent years. And because it's an Adcom component it will benefit from a high resale value and an outstanding dealer service network. After you hear the GFA-5802 you'll agree that it's an incredible value in high end audio.

The most important detail to look for before you buy your next amplifier is the Adcom name. Adcom audio and audio/video components are designed to be second to none. It's this driving passion for accurate, musical sound and performance that has made Adcom components sought after by the discriminating audiophile. Through a combination of technology and innovative engineering techniques, the Adcom GFA-5802 is quite possibly the best amplifier you may ever hear. From its toroidal transformer and giant capacitors to its reference grade Hexfet circuitry, the Adcom GFA-5802 is built to be the best amplifier money can buy.

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CD Pre- and De-Emphasis

Q What is the function of pre-emphasis and de-emphasis on a Compact Disc? What factors are considered in the decision to use pre-emphasis?—Ray Segura, New Orleans, La.

A In order to reduce noise, some CDs are recorded with high frequencies boosted, or pre-emphasized. During playback, a digital “flag” embedded in the CD bitstream tells the CD player to engage a complementary de-emphasis circuit, which restores flat frequency response and reduces high-frequency noise by an amount equal to the pre-emphasis.

Nowadays, however, pre-emphasis is seldom used. Given the Compact Disc’s S/N ratio of about 96 dB and a player’s residual noise floor of (usually) considerably better than that, the noise reduction conferred by pre-emphasis simply isn’t needed. Moreover, flaws in a CD player’s de-emphasis circuitry can introduce potentially audible frequency response errors to a medium otherwise notable for its exceptional linearity. Incidentally, pre-emphasis and de-emphasis are used in FM transmission and FM tuners to reduce noise that would otherwise be obtrusive.

More on Car Speaker Gaskets

In the April '96 issue, Ken Massey wrote about applying silicone rubber as a substitute for a car speaker’s inadequate cardboard gasket. Audax at one time sold Nosorex rubber gaskets for use with its drivers, which would probably fit other speakers of the same nominal sizes. A cheaper and easier solution that may also work is sealing drivers with rope caulk (such as Mortite), which is used to weatherproof windows.—Brian Dettling, Akron, Ohio

To replace a car speaker’s gasket, ask at car audio shops or electronics superstores for XTC baffles. They come in various standard speaker sizes, from 4-inch to 6 x 9-inch, and cost about \$12 per pair. The XTC baffle is basically a closed-cell foam basket with a flange that goes between the speaker and the mounting surface; any excess can

be trimmed off. If you use an XTC baffle in a moist environment (such as a car door), cut a ½-inch opening on the bottom of the baffle to let water drain. The baffle is not much larger than the speaker, so in a dry mounting area you may find it best, for sonic reasons, if you remove the baffle’s back altogether.—Nick Johnston, Vancouver, B.C., Canada

TV’s High-Frequency Response Limits

Q Because the upper frequency range of FM stations is limited to 15 kHz in order to minimize interference with the 19-kHz stereo pilot signal, does this mean that the sound of TV broadcasts is limited in the same way?—Steven Matthews, Louisville, Ky.

A Like their FM radio counterparts, highs in TV transmissions are limited to 15 kHz because of similar pilot-signal considerations. However, for network TV programs distributed across the country via satellite, the upper audio cutoff frequency may vary depending on the technical characteristics of the particular satellite relay stations. Some programs are relayed by analog systems, others by digital equipment. For the latter, the upper limit of audio frequency response would be set by the sampling rate of the digital system.

Using a Car Antenna for FM Reception

Q I am getting very good FM reception by using a car antenna indoors. It is connected to a VHF antenna booster. What do you think of this approach?—Frank Keenan, Hendersonville, N.C.

A I have not used a car antenna for FM reception indoors. These antennas are shorter than a quarter wavelength at the midband of the FM broadcast spectrum. Thus, even if your VHF booster has an impedance of 50 or 75 ohms, the antenna’s impedance would be higher. The resulting impedance mismatch will result in signal loss. If the booster has a balanced input, you will have even more problems unless you ground the free terminal of the antenna

input circuit, thereby unbalancing it and providing the necessary ground reference needed by a quarter-wave antenna.

I suspect that a conventional, 300-ohm folded dipole will yield better reception because it simply puts more copper in the path of the desired signal. Unlike a vertically oriented car antenna, which is omnidirectional, the dipole has the further advantage of being bidirectional. Therefore, it can be oriented to improve reception of a desirable signal and suppress or null an interfering signal.

Another problem with your setup is the VHF booster. I have tested many of these devices and found their circuitry to be no quieter than the front ends of good FM tuners. The booster will amplify the signal but will also amplify the noise along with it. Thus, you may find a dipole alone will work better than the booster or even that the car antenna itself will outperform the booster.

Incidentally, although the evidence is purely anecdotal, some of my friends report that tunable indoor FM antennas (some of which may include boosters) can work quite well.

Matching a Subwoofer to Main Speakers

Q I want to use a subwoofer with a pair of floor-standing speakers I’m thinking of buying, even though they’re not intended for use with a subwoofer. I think these fine speakers will sound even better if they are not forced to produce heavy bass. Will it be okay to do this? In order to get the best sound from the entire system, must I buy a subwoofer of the same brand as the main speakers?—Tim Anzalone, Streamwood, Ill.

A If you find a subwoofer whose bass response extends lower than that of the full-range loudspeakers, that’s fine. All too many subwoofers are no better—or are only marginally better—than a good full-range speaker (i.e., the sub may produce significant output down to 40 Hz but little or no output below that). A lot depends on

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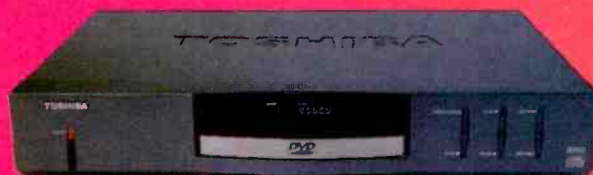
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the performance of your full-range speakers as well as that of the subwoofer. You must decide not only how *deep* you wish the bass to extend (25 Hz? 18 Hz?) but also how much bass output you want your system to produce. Some fine full-range speakers, for example, may have strong bass output down to 40 Hz. However, their output may have declined by 3 dB or more by 30 Hz, and there may be little useful output at 25 Hz. Adding a good sub, one that costs from \$500 to \$800, would likely buy you impressive output from 70 to 25 Hz and relieve the main speakers of low bass duties, which should result in less distortion, especially at peak levels. Deeper bass extension and greater output can be obtained, but it will be expensive—probably \$1,500 or so. In fact, some pipe organ and home theater enthusiasts prefer two subwoofers to obtain enough bass output to shake the walls.

You don't have to buy a subwoofer from the same maker as your full-range speakers. However, if the company just happens to produce good subwoofers, there may be an advantage: The sub's low- and high-pass filters may integrate smoothly with the response curves of other speakers the company manufactures.

You need to audition subwoofers using program material that you know to have good low-frequency content, and it would be better if you could audition the subwoofer at home, trying it out with your main speakers. Do some research (I suggest reading Tom Nousaine's article, "Boom for the Buck: How Much Woof Does a Sub Buck Buy?" in the January issue), and scrutinize subwoofer test reports.

After you select the subwoofer, choose an appropriate crossover frequency. This point should fall within the flat portion of the curves of both the subwoofer and the main speakers. To start, set the subwoofer's low-pass filter to 70 Hz and the high-pass filter for the main speakers at 120 Hz. Then experiment with different settings to achieve a smooth transition between the main speakers and the subwoofer.

Slim Two-CD Boxes

In the item "Proper Storage of CDs" in the February issue, you mention you've not been able to locate a source for thin two-disc boxes. They can be obtained from Bags Unlimited

(7 Canal St., Dept. A, Rochester, N.Y. 14608; 800/767-BAGS; www.frontiernet.net/bags). Bags Unlimited calls the boxes Double Slim-line CD Cases, and they may be ordered in quantities of 5, 10, 25, 50, 100, or 200. The unit cost, of course, goes down sharply for the larger quantities. I ordered 100 boxes for \$65 (shipping included) and was very satisfied. It's amazing how much shelf space you can save with these little gems.—Klaus Halm, via e-mail

Volume-Control Mistracking

Q When I set the volume control very low on my new A/V receiver, sound comes from only the left-channel speaker, yet when I turn up the control a bit, sound comes from both speakers at equal levels. The dealer twice replaced the receiver, but they all exhibited the same problem. Should it be cause for worry? Why would a reputable company use a cheap potentiometer (if this is indeed the cause of the problem)?—Mark D. Mina, Huntington Beach, Cal.

A In all fairness, it is difficult to design a volume control for use in a mass-produced receiver in which the parts of the control act perfectly uniformly throughout its range. Inasmuch as you've tried several samples of the same model, and each has misbehaved in the same manner, it's apparent there is a small error in the tracking of the control at the bottom of its range. It is not a cause for concern so long as the channels are properly balanced over the remainder of the volume control's range.

Try this test: Sit exactly midway between the left and right speakers and gradually raise and lower the volume level. Use a mono center image (e.g., an FM announcer's voice) and listen for a pronounced shift of the voice to the left or right as you vary the level. If you hear such a shift, there is reason to complain to the manufacturer. Otherwise, I wouldn't worry about it. A tweak of the balance control should correct any minor imbalance between channels.

Directly Recording an Electric Guitar

Q How do I record the output of an electric guitar, directly from the guitar output jack or from the guitar amp's headphone output? Connecting the latter to my tape deck's line input worked, but I was worried

that the resulting hum might damage my hi-fi system's speakers during recording or playback. I also tried connecting the guitar amp's headphone jack to the mike input on my portable radio/recorder. Doing so produced a loud buzz that was recorded with the guitar sound. Should I be concerned?—Dave De Federicis, via e-mail

A A guitar pickup usually doesn't produce enough signal level to drive the line input of a tape deck for recording. However, the guitar amplifier's headphone output should yield ample signal level, and it also lets you use the guitar amp's effects to modify the instrument's sound to your taste.

A better alternative is to use an effects loop (if your guitar amp has one), which consists of a set of preamp out/amp in jacks. Connect the preamp output to the line-level input of the tape deck. Things should be fine, although you must juggle the record level control on the tape deck as well as that on the instrument amplifier to get the best signal-to-noise ratio. Other options include placing a small, battery-powered preamp effects box (less than \$50) between the guitar output and the tape deck or recording the guitar with a microphone positioned directly in front of the guitar amplifier's speaker, a technique favored by many professional guitarists.

Your hum and buzz are likely caused by hum induced into the guitar pickup or by a ground loop between the guitar amp and your tape deck. Reversing the AC line cord in the wall outlet for the guitar amp or the tape recorder may reduce or eliminate the buzz. You might also try cutting the shield at one end of the cable to the deck.

As with all electric guitars, keep the instrument away from electrical equipment during recording in order to minimize hum pickup. Careful orientation of the instrument should also minimize hum. Whatever residual hum you have when listening to the playback should not damage anything. Incidentally, do not connect the guitar amp's headphone output to the mike input of your tape deck. The headphone signal will overdrive the mike input, producing lots of distortion and noise.

Horn Harshness Remedy

I can help the reader whose letter, "Harshness in Classic System," appeared in the De-

ember 1996 issue. The reader mentions having horn tweeters in a circa-1962 system. I believe the speaker may be the Altec-Lansing Valencia or 844a, in which case new diaphragms will eliminate the harshness in the treble. The parts are still available from Altec in Oklahoma City, Okla. (405/324-5311). The diaphragm voice coil is wound with aluminum ribbon; over time, humidity causes corrosion to build up on the coil, causing it to stick in the magnet's gap. The voice coil on the old diaphragms can be cleaned with WD-40 and then methanol to remove some of the gunk, but the problem will recur because the enamel coating on the coil is damaged by the aluminum oxide.—Martin Eich, Edmonton, Ky.

Dynamic vs. rms Power

Q What is the difference between rms power output and dynamic power? Why is dynamic power always higher than the rms output?—Name withheld

A Although widely used, the term "rms power" is incorrect: rms (root-mean-square) properly applies only to voltages. What you are really asking about is an amplifier's *continuous* power output and how that differs from its dynamic output.

Continuous power output is a measure of the maximum power (in watts) that an amplifier can deliver continuously into a fixed resistance (commonly 8 ohms) before it distorts or "clips" a sine-wave test signal. However, when an amplifier isn't required to sustain high output power continuously, it is often able to generate short bursts of output power significantly greater than its continuous power rating because the power supply doesn't have time to sag.

You might have heard the terms "peak power" or "music power." Dynamic power output (sometimes called dynamic headroom and expressed in decibels) falls in the same ballpark as these terms. It is intended to simulate the real-world demands of a music signal, with its sudden changes from soft to loud. Rarely does music require high output power on a continuous basis. Dynamic power is measured by feeding brief (20-millisecond) tone bursts twice per second to the amplifier's input and observing the output waveform on an oscilloscope to see when it clips. The amplifier's output immediately before clipping is its dynamic power, which takes care of peaks in the program material. **A**

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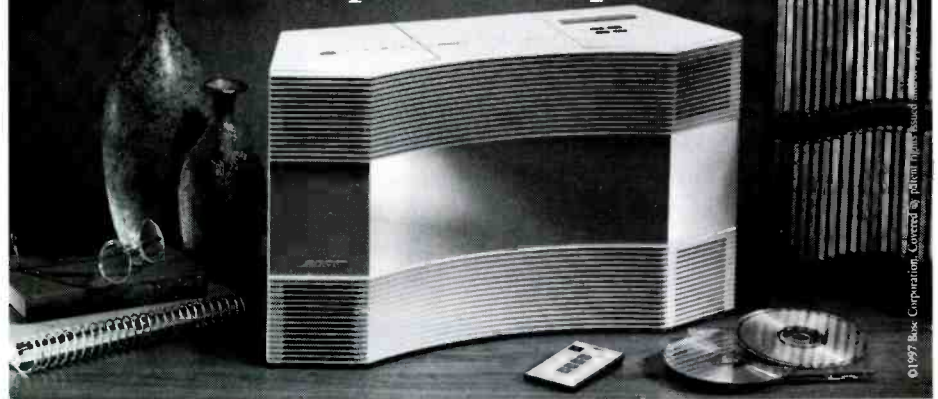
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With both RDS and ID Logic, Pioneer's Supertuner V units make it easier to find your favorite music when you're traveling.

The fight for the right to fill your dashboard's stereo slot is heating up again. A very high proportion of those slots are already filled by factory-installed OEM (original-equipment manufacturer) head units, which is why the world's two biggest makers of car stereos are GM/Delco and Ford Audio. But the OEMs want more. And they seem to be getting it.

In part, that's because of the OEMs' strategic moves, making stereos that consumers feel less need to replace (yay!) and putting them in slots that only their own products can fit (boo!). But the main reason is that more of us are leasing cars (28% in 1996, 50% by the year 2000, according to Sony's Martin Homlish).

Unless the aftermarket companies come up with breathtakingly creative new ideas (which they've always been better at than the OEMs), they'll have a harder and harder time selling head units. The innovations I've seen at this year's trade shows have been merely noteworthy, not breathtaking.

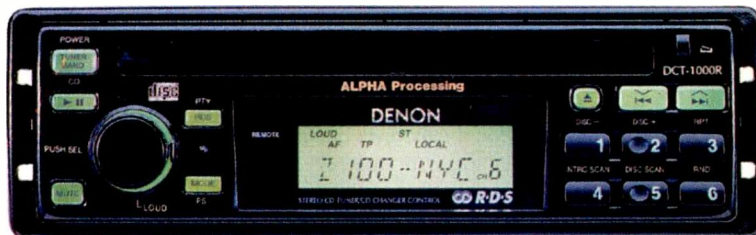
What impressed me most was Pioneer's Supertuner V, the first tuner circuit to combine two earlier innovations that logically belong together, RDS and ID Logic. Both systems help you find the programs you want when you get beyond the range of your local stations, in complementary ways: RDS uses codes transmitted by FM stations, whereas ID Logic reads station and program info from a built-in database. RDS relies on transmitted codes, so it works only on FM stations that transmit RDS

traffic tie-ups, and can reset your radio's clock. With its fixed database, ID Logic can't identify stations until it's "told" where the radio is and it doesn't track station changes. On the other hand, it will work on *all* stations, AM and FM.

In addition to Pioneer, RDS car stereos are available from Denon, Kenwood, and Clarion. Denon's new DCT-1000R and several Kenwood models are the first car stereos that can display RDS RadioText messages; so far, however, few stations (at least around New York) transmit any text worth reading.

Most aftermarket head units are DIN-sized. These stereos fit about 40% of all new cars sold, although GM, Chrysler, Saab, and a few others sell almost as many cars that take a different size, about 1½ DIN slots high and a bit narrower. Surprisingly few aftermarket stereos have been made in this size or in the double-DIN size that fits many Acuras, Nissans, Toyotas, and other Japanese cars. That's changing: Audiovox, Jensen, Pioneer, and Premier now have models in the GM/Chrysler size, and Alpine, Clarion, and Pioneer have double-DIN models. Nor are these the dull offerings that used to be the only models available for

Jensen now offers two models to fit GM and Chrysler cars.



Denon's DCT-1000R displays text messages from RDS-equipped FM stations.

It's not a good idea to cut speaker holes and such in cars we'll have to return, and few of us want to spend a lot on audio installations in cars we aren't keeping.

information. However, because that information is constantly updated, an RDS radio will automatically adjust to changes in station call letters and formats, can carry alerts about

oversized slots. Alpine now offers its three-CD in-dash changer in the double-DIN size, while Pioneer has Supertuner V and DFS Alarm+ circuitry in its GM/Chrysler models.

"The Servo-15 Rules!"

-Andrew Marshall, Audio Ideas Guide

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- Andrew Marshall, Audio Ideas Guide



With years of design expertise and a state-of-the-art in-house R&D facility, Paradigm engineers and acousticians set out to build the world's finest subwoofer, regardless of cost! The result is the Paradigm Reference Servo-15... a highly advanced patented design using revolutionary new Closed-Loop-Servo technology. This spectacular new subwoofer system singlehandedly redefines high-end bass performance.

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CIRCLE NO. 13 ON READER SERVICE CARD



Alpine's 3DA-W880 double-DIN unit has a three-CD changer always available and a cassette player hidden behind the flip-down display.



Kenwood's MASK front panel flips around so thieves will pass it by and slides down for CD loading.

The Jensen and Pioneer models also have detachable faceplates for security. (The OEMs rarely offer them, less because OEM head units don't attract many thieves than because detachable-face contacts that go bad on an OEM radio make customers unhappy with the car itself.)

Thieves know that people often hide removable faceplates in glove compartments rather than carrying them around (I know I sometimes do). So last year, Kenwood introduced Stealth, a system that automatically covers some models' faceplates when you turn the car's ignition off; this year's MASK system flips the faceplate over instead of covering it, sliding it partway down for CD or tape loading.

Another security introduction last year was DFS Alarm, which works whenever the front panels of some Pioneer and Premier head units are removed; in case of a break-in, the speakers set up a shriek inside the car that drives the thief out without waking the neighborhood. This year, some Pioneers and Premiers have DFS Alarm+, which now can disable a car's starter, work with optional glass-break or motion sensors, and work with some cars' keyless entry systems.

Several Alpine head units can display the operating status of the company's SEA-8081 security system. That display is espe-

cially detailed on Alpine's CVA-1000 monitor/receiver, so-called because it has a fold-out, 5.6-inch LCD color screen. Its big display also shows the status of every audio function, including operation of an optional CD changer, settings of an optional equalizer, and time-coordination settings of an optional digital crossover. More significant, the screen can display maps from an optional navigation system. Clarion has two models with fold-out 5-inch screens, one DIN-sized and the other double-DIN. However, Clarion bills them as multimedia devices, more to be used with an optional TV tuner or video-cassette player than for navigation.

Other companies are using voice communication, so you can keep your eyes on the road. The Voice Support feature of some JVC head units vocally confirms commands you enter, so you'll know without looking if you've entered the right command. I think it would drive me bats, but I suspect, is Pioneer's Voice Commander system, an accessory for its new CDX-P5000 changer. The changer holds 51 discs (50 in a magazine plus one in a "Swap Slot"), too many to remember which slot holds the disc you want to hear. So if you record disc titles on the Voice Commander, it will say those titles aloud as you scan through the discs or search for a particular CD you call out for.

Despite relatively large screens and vocal interfaces, we'll still be interacting with our stereos by touch for quite some time. Which is why I'm sorry to see volume-control knobs disappearing (with a few exceptions, mainly Alpines); knobs are ideal controls to use in moving cars. That said, some of the new interfaces do look promising, such as

Push a button on this JVC KD-GS929, and a voice tells you what you've pushed.

Pioneer's sculpted remote controls, concentric-knob remotes from Sony, and remotes from Blaupunkt, Kenwood, and Pioneer that fit on your steering wheel. Audiovox's GM/Chrysler-sized GC-600 works with the steering-wheel audio controls on some 1996 and 1997 Chevrolets and Pontiacs, and another Audiovox model can be operated by the in-dash stereo controls of some Ford Taurus and Mercury Sable cars. SoundGate has a gadget for interfacing some Sony stereos to Taurus/Sable controls and plans to introduce interfaces for GM and Chrysler cars.

The most unusual dashboard unit I've seen this year is the one that does the least. It's DIN-sized and holds only a 4,096-color display and a tuner; what makes it interesting is the \$17,000 Sony XES Reference sound system it works with. The main controller is a concentric-knob wired remote, which mounts close to the driver's hand; passengers can use a wireless remote. During setup (which requires plugging in a laptop computer), the display shows menus, equalization curves, and other data; once you're on the road it just shows disc and station info. The tuner has diversity reception, using two antennas with separate RF sections for each.

The XES system's CD changer has Wide-Capture shock protection. Like other CD shock-protection systems, it sends signals from the transport into a buffer, from

The flip-out screen of Alpine's CVA-1000 can display control status or maps.



It's Obsolete? Great! We'll Give You \$1000* For It!

A dream? Nope. In fact you'll want to be wide awake for this one. Because if you snooze, you'll lose.

Bring your old, obsolete A/V gear into a participating Lexicon dealer and receive a \$1000 credit towards the incredible new DC-1 Digital Controller equipped with Dolby Digital. Sound too good to be true? Read on, it gets better.

A good deal becomes a *great* deal when it's for something you truly desire.

And in case you're not already lusting for a DC-1, consider this; the Lexicon DC-1 is *the* benchmark surround processor. Why? Performance, value, and ease of use.



J. Gordon Holt, the Venerable Dean of high end reviewers (Stereophile Guide to Home Theater), positioned the DC-1 as *"The best-sounding, most versatile, user friendly surround processor I've used."* And, Home Theater Buyer's Guide calls the DC-1 *"The most advanced digital processing you can buy."*

Stereophile magazine honored the DC-1 as Home Theater Component Of The Year and Stereophile Guide To Home Theater ranks the DC-1 as the only surround processor worthy of a Class A rating

(particularly interesting when you consider the DC-1 is less expensive than 80% of the Class B surround processors).

Ken Kessler, in Hi Fi News & Record Review, totally enthused about the superb surround performance of the DC-1, stated, *"To me, it's like getting a video switcher, a pre-amp, and a DAC, with an ADC thrown in for free. I absolutely loved it."* This seems to be a common reaction.

J. Gordon Holt summed up his review with,

"...I liked it? No, I loved it."

So, sounds great? But why such an outrageous deal on such a hot product? Simple.

Lexicon has built an enviable reputation by delivering

the world's best digital audio processors for over 25 years. Our equipment is found in over 80% of professional recording studios around the world. The list of proud Lexicon owners reads like a veritable "Who's Who" in the music industry. We'd like to add your name to that list and earn you as a loyal customer for our next 25 years.

So, visit your nearest Lexicon dealer and hear for yourself what the industry is raving about. Then bring us your poor, your tired, your obsolete, and be prepared to make the deal of your life!

* The fine print. Not all Lexicon dealers are participating in this program. The a/v product you bring in must be in good working order. Quantities are limited and prior sales are excluded. This program valid from June 1, 1997 thru August 31, 1997. Dealer reserves the right to refuse offer.

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CIRCLE NO. 15 ON READER SERVICE CARD





Pioneer's CDX-P5000 changer can recite the titles of each of its 51 discs and play the discs whose titles you request aloud.

which data can be drawn when the transport loses its place after a bump. Conventional systems run the transport at high speed until the buffer fills and then pause the transport until more data is needed; Sony says this start/stop action can interfere with signals. The Wide-Capture transport runs at high speed until the buffer's full; it then keeps running, at normal speed, until the buffer needs replenishing. (Some new JVC portable CD players do this, too—but to prolong battery life, not make the sound more seamless.) A new interface between the CD changer's transport and D/A converters is said to convey signals with 24-bit resolution.

The CD changer's D/A converters are housed in its preamp section, which also has a digital crossover with time correction and a digital 10-band parametric equalizer whose 10 memories can be linked to specific CDs. The DSP engine behind these functions uses a combination fast Fourier transform (FFT) and finite impulse response (FIR) filtering on a single chip, instead of the more common infinite impulse response (IIR) filtering, which can introduce phase shifts. The preamp also has analog and Toslink digital inputs, so you can add another digital source, such as a MiniDisc player, and an analog cassette player.

The XES system's amps, which are said to deliver 50 watts/channel into 4-ohm loads

To paraphrase the National Rifle Association, equalizers don't make audio systems sound bad; equalizer users do. Yet the basics of using an equalizer to improve your system's sound, instead of screwing it up, are simple.

First, ignore purely local problems. A speaker's response changes as you get off axis, and your room's acoustics affect the sound still further. Fixing a problem you hear in only one spot will probably cause new problems elsewhere. For example, if you equalize to overcome the treble rolloff 30° off axis, you'll probably boost already adequate on-axis response to shrillness. (I've heard professional concert sound systems that suffered from this error.) And cutting the treble for the live side of your room will dull it for the dead side; you'd do better to adjust the room's acoustics or try other speaker positions.

The problems an equalizer can fix are the ones shared by all the listening positions in your room. Move around the room while listening to pink noise to identify these problems. A real-time analyzer (RTA) can be a big help in finding just what the trouble frequencies are, but any problems worth fixing will be audible.

Next, use your equalizer to cut all unwanted peaks before you even *think* of boosting anything. Frequency response peaks are more noticeable and obnoxious than dips are. And cutting them not only improves your sound but takes a load off

your amp and speakers, giving them a bit less amplitude to handle. Make gentle changes, frequently checking the equalized sound against the original so you can be certain each change is an improvement. For broad peaks, you'll need to adjust two or more adjacent controls. And, again, check the sound at all listening positions before you settle on a change.

Once you've cut all the peaks, try filling in the dips—*very* cautiously. Some dips are caused by suckouts, cancellations that occur when sounds of opposite phase meet. A suckout cannot be cured by equalization; boosting the frequency band where it occurs will just drain power from your amp, overload your speakers, and cause unwanted boosts in frequencies around the suckout. If 3 dB of boost doesn't affect the problem, 12 dB won't, either; you might as well cut the boost back to zero. And boosting even a curable dip is certain to cause unwanted peaks somewhere in your room.

Last, remember that every change you make with an equalizer has unintended consequences. The anomalies you're trying to correct virtually never coincide with specific equalizer bands; a cut or boost affects all frequencies in the selected band, not just those that give you problems. And adjustments you make in one band will affect adjacent bands. So it's usually best to use an equalizer to tame, not kill, your sonic problems.

(or 200 watts/channel into 1 ohm), use no negative feedback. The main driver in each channel's speaker covers an unusually wide frequency range, 78 Hz to 6.3 kHz, after crossover; by itself, it could cover 40 Hz to 12 kHz. One reason for its wide range is an unusually light voice coil, which also gives the speaker a power-maximizing 1-ohm impedance. The frequency extremes are handled by ribbon tweeters and a 12-inch subwoofer with dual voice coils.

The in-dash section of Sony's \$17,000 XES Reference doesn't do much, but the rest of the system does plenty.

As the Sony system shows, not all the interesting stuff goes into dashboards. But I'll leave amps, speakers, and other downstream products for another time. A



“...by a wide and clearly audible margin, the Micro90t is the best small-satellite home theater speaker system I have ever reviewed.”

—David Ranada, *Stereo Review*, February 1997

Boston Acoustics Home Theater Options

Micro Reference

Big theater sound from small, sculpted satellites.

Compact Reference

Incredible sound from compact speakers.

Lynnfield VR™

Audiophile sound with the full impact of Dolby® Digital.

Boston Acoustics THX®

Dubbing-studio-quality sound.



The experts at *Stereo Review* listen to literally hundreds of home theater speakers each year. So it stands to reason that the Micro90t must be pretty special to warrant such praise.

The reason for this enthusiasm? Good old-fashioned engineering know-how.

Take the Micro90 satellites, for example. They feature a die-cast aluminum housing of incredible strength and rigidity. So the drivers' energy is projected as pure, clean acoustic output instead of being wasted as cabinet vibration. The result: a satellite that can fit in the palm of your hand, and still fill a room with astonishing sound.

Its anodized aluminum tweeter with AMD handles lots of power, yet reproduces highs with virtually zero distortion. And its swivel-mount pedestals make for simple shelf or wall mounting. The Micro90 powered subwoofer, with its clean 75-watt amp and 8-inch DCD™ bass unit, produces ample amounts of deep, tight, powerful bass.

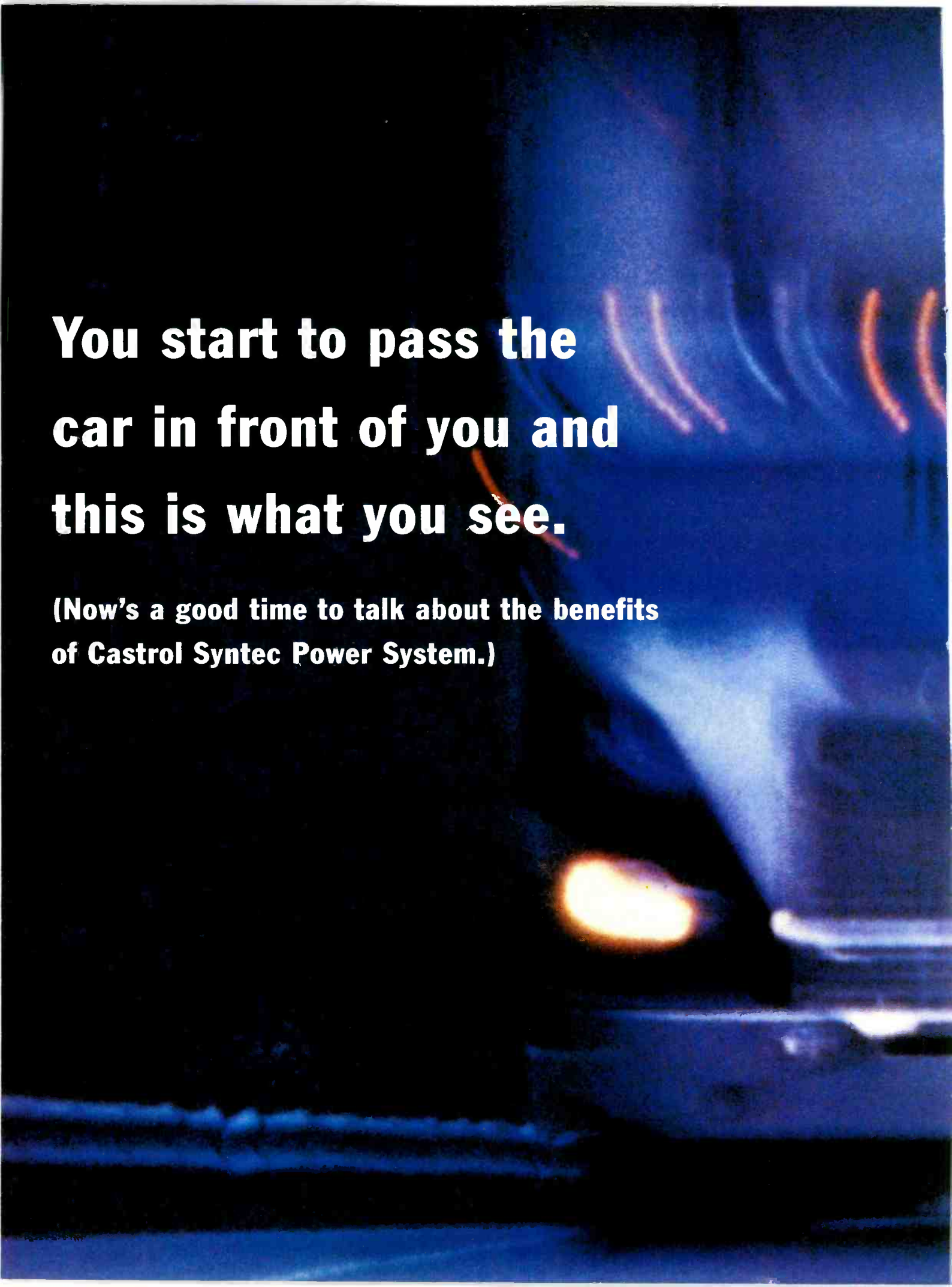
Add the tonally matched Micro90 center channel and either direct or diffuse-field surrounds and you've got a system that beats all other satellite home theaters "by a wide and clearly audible margin." You can test-listen the Micro90t at your local Boston dealer. But rest assured, you won't be the first to listen with a critical ear.



This Micro90t home theater system includes: Two Micro90 satellites, sonically matched center channel, powered subwoofer, and a pair of VRS Micro diffuse-field surrounds (available separately).

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this is what you see.**

**(Now's a good time to talk about the benefits
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**Introducing a new kind of
fuel system treatment that
can improve acceleration.**



We've all experienced it before. That moment of truth when you realize you need all the acceleration you've got. Well rather than just stepping on the accelerator and praying, now there's a better option. Introducing Castrol Syntec Power System—an entirely new kind of fuel system treatment. Power System's unique synthetic cleansers reduce carbon deposits and can improve acceleration in today's advanced cars.

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**POWER WHEN
YOU NEED IT.**

EMI HITS 100



Caution prevents me from declaring EMI the oldest record label in existence. Some smart-ass or *über*-pedant will think of some other company still active, one with sole or separate rights to the names Edison or Berliner, just to prove me wrong. What's true, however, is that 1997 is EMI's 100th anniversary, and the company is celebrating its centenary in style. Which is only fitting when you happen to be the company that owns Capitol Records, The Beatles' entire catalog, and the Virgin and Chrysalis labels, not to mention the rights to the cream of Nat "King" Cole and Frank Sinatra, the amazing Liberty and Imperial catalogs, and loads more. From Callas to Queen, von Karajan to The Sex Pistols, EMI has one of the richest vaults in recording history. And whether your preferred poison is black vinyl or

CD, the company intends to make 1997 a costly year for collectors.

Founded in 1897 as the British wing of Emil Berliner's United States Gramophone Company, the English Gramophone Company survived the First World War and the Great Depression, merging with its greatest rival, the Columbia Gramophone Company, in 1931. After the merger, the company name became Electric and Musical Industries (EMI). Among the bits of lore that always fascinate historians are the trials and tribulations of Nipper, the dog that became the shaded emblem of RCA in the United States, of JVC in Japan, and of HMV in the United Kingdom. One thing missing from EMI's stack of celebratory literature is a corporate family tree, which would likely be as convoluted as any. It's only after you study these incredibly diverse anniversary releases that you

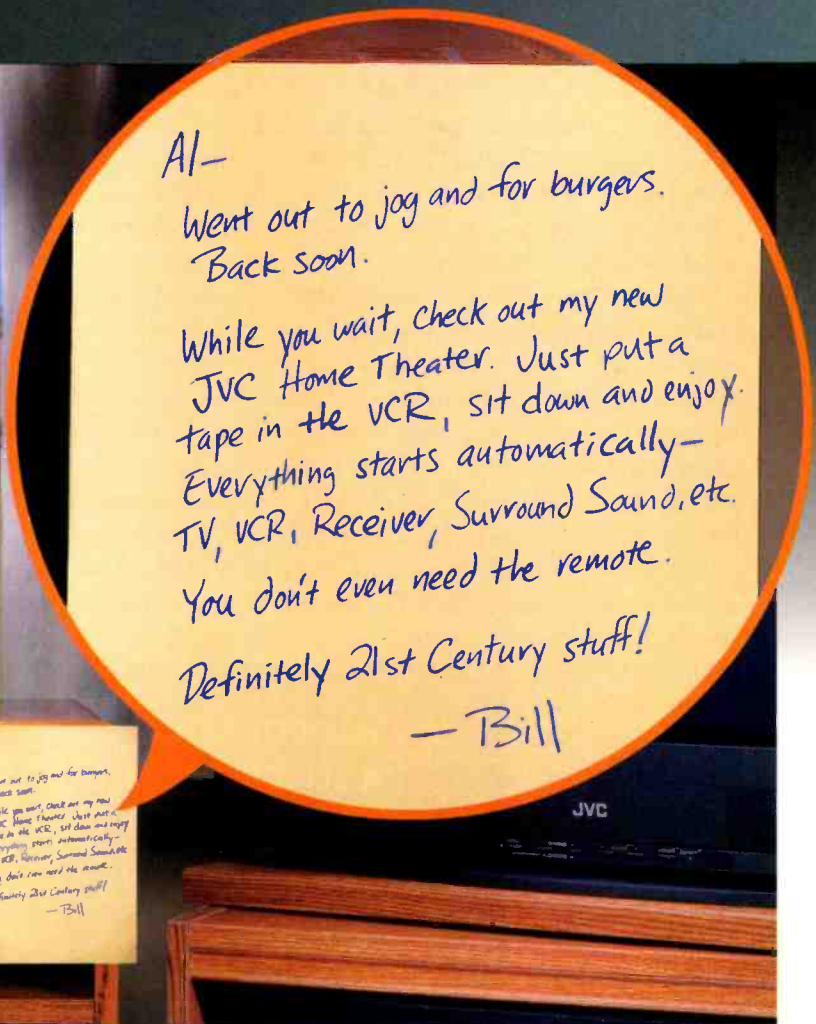
realize what a giant melting pot EMI really is.

Probably the most impressive (and expensive) item to mark EMI's anniversary is an 11-CD box set, *The Centenary Edition, 1897-1997* (EMI CMS5 66182), an awesome 13-hour study of the company's classical music treasures. Each of the first 10 CDs covers a decade and includes highlights from that time. The 11th disc, a "bonus," is a documentary history of EMI's classical music achievements, narrated by Thomas Hampson. Lavishly packaged, the set includes a 96-page booklet with prologue by Lord (Yehudi) Menuhin, whose own involvement with the label represents 66% of its lifespan.

Classical fans will lap this set up, but the added treat for audiophiles is the way that it illustrates the evolution of recording technology. The earliest of the 204 tracks dates from 1898, with the closing taking us up to 1995. In between? Caruso circa 1904, a primal electrical recording from 1925, and an early Blumlein stereo recording. Face it, gang: Until the Smithsonian or some other learned body produces something as comprehensive, this box may be the best way to follow the entire history of recording.

And then there are the nonclassical releases. EMI has cooked up several series of reissues to drive collectors nuts. These are mostly limited editions and will be available for only a short time. (Do you hear your credit card screaming for mercy?) Check them out:

The Added Value Series: These 12 CDs are being released one per month during the centenary year. All of them are regarded as rock and pop masterpieces from world-class artists, and all have been "sensitively upgraded." Tracks have been added (studio outtakes, B sides, live versions, remixes, and the like), and the albums have been remastered. They've also been repackaged, with extra photographs, extensive discographies, more detailed notes, and a booklet outlining EMI's history.



AI-
Went out to jog and for burgers.
Back soon.
While you wait, check out my new JVC Home Theater. Just put a tape in the VCR, sit down and enjoy. Everything starts automatically—TV, VCR, Receiver, Surround Sound, etc. You don't even need the remote. Definitely 21st Century stuff!
—Bill

If you're like Bill, you don't like "the process" either. You've rented a movie, but first you have to turn on all your components, select the proper video source and set the surround mode, balance and level on your AV receiver. Next, you hit PLAY and then—as always—have to get up and re-adjust everything so it's perfect. Getting a balanced budget through Congress is easier.

At JVC, "the process" is history.

To watch a movie on a JVC Home Theater System with AV COMPU LINK, just put in the tape. Period.

Our AV COMPU LINK technology lets the RX-882VBK Dolby Pro Logic receiver talk to all JVC TVs, VCRs and other components. Pre-set at the factory, the RX-882VBK is ready to go right out of the box. And if you do choose to adjust the sound, AV COMPU LINK automatically remembers everything you've done. So whenever you load a video tape, CD or cassette, your system instantly plays exactly as you want it. Every time you want it.

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RX-882VBK DOLBY PRO LOGIC RECEIVER

- 120 Watts x 3 (Front) / 60 Watts x 2 (Rear)
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Among the releases are Tina Turner's *Private Dancer*, Deep Purple's *Machine Head*, Kate Bush's *Hounds of Love*, Crowded House's *Wood Face*, Kraftwerk's *Man Machine*, Queen's *A Night at the Opera*, and John Lennon's *Imagine*, the last to be released just in time for Christmas.

Centenary Vinyl Series: EMI has reissued 20 all-time-great LPs not currently available on vinyl. All have been Direct Metal Mastered, pressed on virgin vinyl (probably 180-gram), and packaged in thick laminated-cardboard sleeves. All have stickers that say "The Vinyl Collection," and the EMI 100 logo is printed—not stickered—on the back of each sleeve, below the bar code. The artists featured in this series are The Beach Boys (*Pet Sounds*), John Lennon (*Rock 'n' Roll*), David Bowie, Frank Sinatra, Roxy Music, Genesis, Pink Floyd, Queen, and a dozen more. The rumor is that these discs were mastered from the digital tapes. If true, that would be a shame, but then again,

EMI's attention to audiophile concerns has been practically nil. Hell, if every audiophile on earth dropped dead tomorrow, EMI's books would barely register a blip. The Spice Girls alone have sold over 10 million albums this past year; do you think EMI gives a hoot about a bunch of cranks who know what VTA is?

In Profile: This is a series of CDs and cassettes of music, narrative, and interview material, not unlike radio documentaries, covering the careers of important artists; Tina Turner and Iron Maiden are among the first to be singled out. The *In Profile* series, says EMI, is intended to develop into an "authoritative, definitive, and official quality brand" of its own.

100 Years of Comedy: Okay, so you really do have to be an Anglophile to give a damn about this three-CD (or four-cassette) collection covering EMI's archive of British comedy. It starts with the creaky Music Hall tradition (sort of like a British version of vaudeville) of George Robey and Marie Lloyd and goes on to Max Miller and the ukulele-plucking George Formby. Next we hear from Flanders and Swan, Spike Milligan, Peter Sellers, Kenneth Williams, More-

combe & Wise, Peter Cook & Dudley Moore, and then—relief!—The Bonzo Dog Band and Monty Python before getting to the present-day antics of Rory Bremner, Ben Elton, and Murray Lachlan-Young. Hey, I've lived in the U.K. for 25 years, and I still don't find Milligan even remotely funny, while Formby makes the late Minnie Pearl seem like Lenny Bruce. You have been warned.

Sale of the Century: This won't mean anything to Americans, who pay less for CDs than anyone else on earth, but for the British it's a godsend: the cream of the EMI and Virgin full-price catalogs reduced to £9.99 (\$16) per disc. The batch includes 100 albums from The Beatles, Pink Floyd, Queen, Bowie, The Rolling Stones, and

many more, most of which would normally cost around \$21 each. (Remember that the next time you bitch about CD prices.) To make it even more attractive, buyers get one of four specially produced

compilation CDs every time they buy two of the £9.99 specials. And these collections will likely shoot up in value.

Replay 100: This "one-off opportunity" is the last call for 100 mid-priced CDs that are normally available only on import in the U.K. or that have been out of print for a number of years. There are 25 tasty Blue Note jazz titles and a load of Capitol releases, including the bulk of The Band's catalog, all of Linda Ronstadt's work for Capitol, and some Steve Miller and Be-Bop DeLuxe. Then, boom! They won't be available again until the next century.

Sgt. Pepper's 30th Anniversary: Given that anything to do with Beatles reissues involves enough lawyers and meetings to add a new BMW to a few dozen garages, I can't wait to see what's planned for the 30th anniversary of what EMI describes as "perhaps the most important LP ever." Deluxe packaging? Extra tracks? We should know around the time this issue hits the stands.

Food Box 100: One of EMI's strongest divisions—hip enough to be mistaken for an indie label—is Food Records, which will release its 100th single this year. To celebrate,

EMI will issue a 100-track, five-CD box set containing all of the 100 singles' A sides. Forty Top 40 hits are included (from such artists as Blur, Shampoo, Jesus Jones, Dubstar, and Strangelove), while the other tracks feature Voice of the Beehive, Zodiac Mindwarp, Brilliant, The Woodentops, Crazyhead, and Diesel Park West.

From Abbey Road: EMI owns "the most famous studio in the world." To celebrate this relationship, a series of four single-artist compilations will be released, featuring the cream of the acts from the 1960s, such as The Hollies. The albums will include rare and unreleased material, alternate takes, and, where appropriate, "studio banter." These compilations should be highly collectible.

That's only a part of it. There are special concerts planned, books to be published, and even a charity to support (the Music Sound Foundation, created by EMI to help fledgling musicians). Shops throughout the U.K. are festooned with EMI promotional materials.

Alas, the neatest item of all is not for sale. It's a promo-only to die for: *EMI 100: 1997—The First Centenary*, a double CD containing 45 tracks and a delightful booklet. More than anything else, it covers EMI's scope and span. Disc one starts with Montague Borwell singing "Soldiers of the Queen" in 1898, proceeds to Caruso in 1902, continues through both World Wars, and ends with Nat "King" Cole, Herbert von Karajan, and Frank Sinatra with Nelson Riddle and Orchestra. Disc two spans the rock era, with Gene Vincent rubbing shoulders with Nigel Kennedy, Blur, Tina Turner, Queen, The Sex Pistols, The Beach Boys, Cliff Richard, Pink Floyd, and—appropriately—The Beatles on one track. The fact that this set also includes solo material from Paul McCartney and John Lennon is enough to make it desirable. But a Beatles track? They rarely, if ever, appeared on compilations. Don't be surprised to find this CD set appearing in *Goldmine* classifieds with a scary price.

Which begs the question: Why didn't EMI make *EMI 100: 1997—The First Centenary* available commercially? After all, it celebrates the company's achievements better than any other item in its huge catalog of anniversary specials.

Maybe The Beatles wouldn't let 'em? A

**EMI HAS COOKED UP
A SELECTION
OF REISSUE SERIES
TO DRIVE
COLLECTORS NUTS.**



Built to rock.

The culmination of the latest advances in high technology, revolutionary design, the finest materials, perfect balance, and a dedication to the most refined sense of taste.

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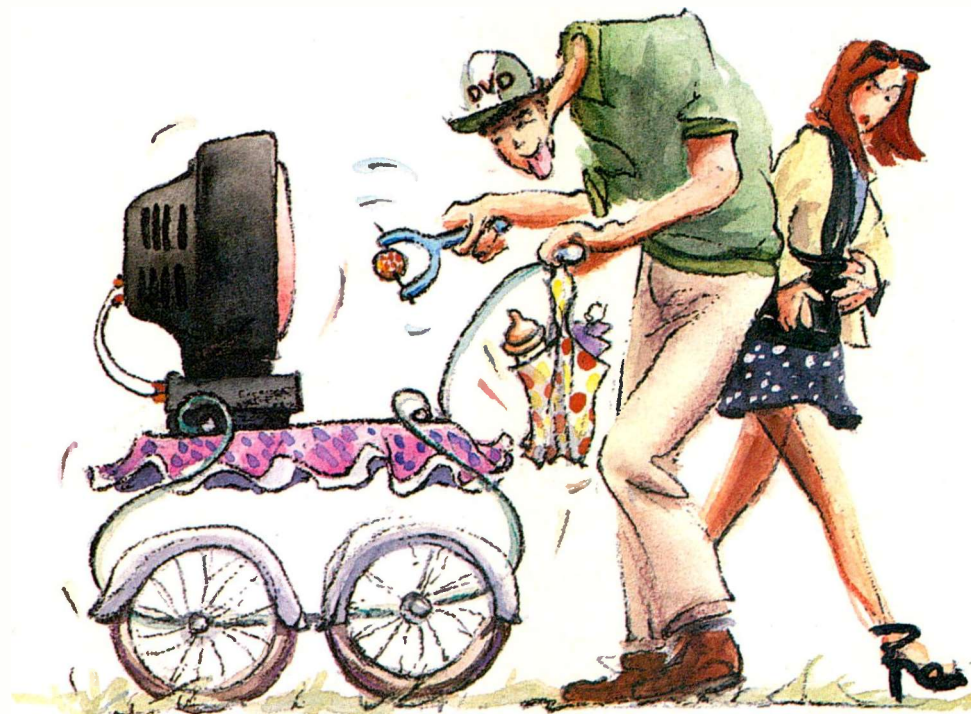
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BRINGING UP BABY



When it comes to babies in my family, every “woops” is greeted with unrestrained joy all around. Baby pishes in his diaper, and roses are tossed onto the stage as champagne corks pop in every direction and balloons rain down from the rafters. Legend has it that once when my grampa was changing my diapers on the kitchen table, I let loose with a high-arching stream that caught some good air, hung above the table in amber repose, and then splashed down quite neatly in his egg salad. To hear the elders tell it, the entire borough of Brooklyn coughed up whole lungs as the laughter lasted well into the High Holy Days.

But there’s babies, and then there’s A/V gear. When you bring home a new toy and take it out of its swaddling clothes, you want that baby to grab a hat and a cane and

start dancing like the WB frog. What you want is a no-brainer OBE, or Out-of-Box-Experience. What you *don’t* want is a “woops.” Even from a brand-new baby toy. I bring all this up because playing with DVD’s first-generation hardware and software has got me caught somewhere between unrestrained joy and feeling like I’ve just pished in my Huggies.

In terms of raw entertainment value and performance, DVD totally rocks. I’ve got the Pioneer Elite DVL-90 DVD/laserdisc model and Toshiba’s SD-3006 player, along with a dozen of the first wave of titles, and I am seriously loving this stuff. DVD looks fantastic—easily better than even the best laserdiscs in

IN TERMS OF RAW ENTERTAINMENT VALUE AND PERFORMANCE, DVD TOTALLY ROCKS.

my collection. From the first scene, it was obvious that DVD’s noise-free MPEG-2 digital video comes a lot closer to the performance of the professional D-1 and D-2 video decks I was used to in my broadcast days than analog laserdisc video ever has. It seems like every month I hear some loser in the high-end press repeating the Sad Sack mantra of “Consumers don’t care about picture quality beyond VHS,” and I want to kick him where it hurts because you’d have to be Mr. Magoo not to see and covet the obvious improvement DVD has even over good laserdisc when viewed on any decent TV. Throw in the Dolby Digital 5.1-channel soundtrack and the magic \$20 street price for the discs, and it’s no wonder that players and discs have been flying off the shelves like nobody’s business. Consumers don’t care, my ass. *Mr. Magoo* don’t care. The dealers at the Professional Audio Retailers Association (PARA) conference I recently attended told me they’re selling every DVD player they can get their hands on, even the \$1,750 Pioneer Elite combi player.

But I have to say, as much as I love DVD’s performance, its first-generation OBE leaves a bit to be desired. The promise of DVD was that my mom could take the player out of the box, plug it into her TV, and be watching *Funny Girl* by the time her tuchus hit the Ethan Allen. Instead, I’m find-

ing these first players have just enough of a woops factor to annoy even this professional tech geek.

The main beef I have is with the ridiculous subtitle situation. For some reason, the Pioneer player (and others, I’m hearing) default to subtitle mode. In other words, when you play a disc, you get the English-language soundtrack—with the English-language subtitles! (The Toshiba does this too, but with it, at least, you can

Illustration: Philippe Lechien

go into the setup menu and reset the default to no subtitles.) What were they thinking? It's like a free "Hooked on Phonics" lesson every time you sit down to watch a DVD. Any player sold in the United States should default to English soundtrack and *no* subtitles when you load a disc unless set up by the user to do otherwise. This is such a no-brainer that it puts a topspin on a minor glitch and elevates it into the realm of the absurd.

The hardware guys tell me it's a software issue, that the disc masterers should be setting the subtitle flags so that subtitles don't pop up unless you ask for them. Hmm, I wonder what's more likely to occur: all the various DVD plants adhering to the same subtitle flag protocol or my hooking up with Fuzzy Zoeller at the next Snoop Doggy Dog concert? I don't care who's pointing fingers at whom: The hardware manufacturers should ignore the subtitle flag and simply default to no subtitles unless the user calls them up via the onscreen menu.

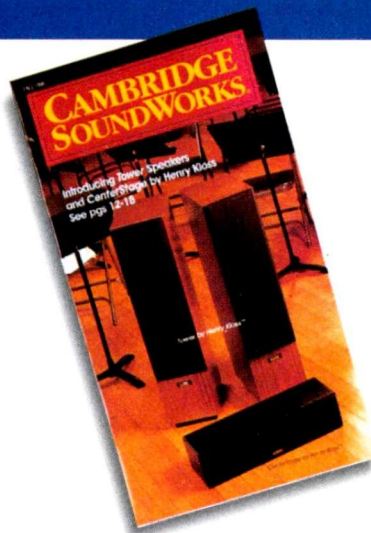
To be fair to the hardware manufacturers, part of the reason the subtitle situation is so annoying is that some of the first movie discs have laughably inept English subtitles. (If you want to cough up some lung of your own, take a look at the subtitles for *Seven*. I was laughing so hard at how ridiculous this disc's subtitles are, I was pounding my thighs.) I can see how translating subtitles might require a little reworking of the dialog to account for linguistic differences, but the only reason I can see for any discrepancy between the English soundtrack and the English subtitles is that the guy who did them is Dick Arney. Oh c'mon, studios, if Toshiba and Sony and the rest of the DVD alliance can make this bumblebee fly, the least you can do is get the simple details of the software right. Minimum wage is \$4.50/hour. Hire a fry cook away from Long John Silver's to do correct subtitles. Arney's got important, progressive legislation to block and doesn't have time to moonlight.

Another thing: If you're judging DVD's picture quality from demo discs at a store, forget about it; they suck. Pioneer's is the worst. The picture looked so pixelly, I thought I was watching *Hollywood Squares*. [Pioneer is preparing a new demonstration disc.—*Ed.*] And the ones I've seen of movie trailers at record stores looked just as lousy. Apparently these demo discs were produced

more than a year ago, when few production houses knew how to burn good-looking, variable-rate MPEG-2 video on a DVD. Pretty much any of the first wave of movies will blow away even the best of the demo discs I've seen, so make sure you're watching a real movie DVD instead of a demo when you're shopping for a player. Otherwise, it'll be like trying out a high-end turntable with a flexi-disc from a cereal box.

Now, don't get me wrong. When everything is set right on the player and I can just drop in a disc and watch a movie, this is magic stuff. But I don't like having to physically remove the disc from the player and then reload it if I want to change from pan-and-scan to widescreen mode, as I do with certain combinations of disc and player. And what I *really* don't like is being unable to skip past the stupid red FBI warning at the beginning of a movie. Before, I had no idea why the Branch Davidians had such a beef with the Feds; now I understand all too well. The FBI warning comes up on the screen and stays there well past the time it would take The Spice Girls to read it more than a few times. You click and click and pound and scream at the remote, but you're powerless to skip it. What's up with this? Did the Feds insist on it? Why? It's lunacy. C'mon, Japan, I thought you hated America telling you what to do! Don't cave to these insolent fools! Defy the directive and fix the second-generation DVD players so we can skip the FBI warning. We let you dumb down our youth by opening our shores wide to every Sega and Nintendo you can build, so at least you can let us adults skip over the FBI warning.

See, here's the deal: I really, really love DVD. Picture and sound-wise, it is completely and totally killer. That's why these little—and not-so-little—ergonomic frustrations need to be addressed in the second generation of players and software. People want a no-futz format. And DVD is the first format that has the potential for ridiculously high-quality sound and picture coupled with the same ease of use as CD. I thought for sure that the hardware and software sides would have dotted all the i's and crossed all the t's while we were waiting and waiting for DVD to hit the street. The OBE could be better, so now it's time to change baby's diaper for the next generation of players and get rid of the pish. **A**



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Dolby Digital Surround, also known as AC-3 (for Audio Coder 3), is a technology developed to enable the practical storage, transmission, and reproduction of multichannel sound in applications that require high audio quality from a restricted data bandwidth. These now include cinema, laserdisc, and DVD soundtracks; digital cable set-top boxes; HDTV audio; computer multimedia; and audio over the Internet.


Work on AC-3 started in the early 1990s in response to the challenge of developing digital sound systems for HDTV and film. HDTV, in particular, offered the opportunity to incorporate multichannel sound in its basic architecture (rather than perhaps try-

ing to tack it on as an afterthought) by exploiting recently developed perceptual coders capable of conveying audio signals with CD quality at a fraction of the standard CD data rate. The initial expectation was that such sound systems would be built

Mark F. Davis received his Ph.D. in psychoacoustics and electrical engineering from MIT in 1980. Subsequently, he worked at dbx, designing the Soundfield One loudspeaker system and the noise-reduction system for MTS stereo TV. Since 1985 he has been at Dolby Laboratories, working on DSP audio, filter banks, coding techniques, and related fields. He wrote the initial version of the AC-3 coder.

big squeeze

theory and Practice of Dolby Digital



using a multiplicity of single-channel coders, but, as a matter of basic design philosophy, Ray Dolby felt that the proper way to code multichannel signals was as an integrated ensemble, allowing greater coding efficiency than would be possible with a simple array of single-channel systems (such as Dolby's own AC-2 coders). AC-3 was introduced to the public in July 1992 with the release of the Warner Bros. film *Batman Returns* in Dolby Stereo Digital.

Although closely associated in the public mind with 5.1-channel movie soundtracks, Dolby Digital AC-3 was designed as a flexi-

PHOTOGRAPH: DAVID HAMSLEY

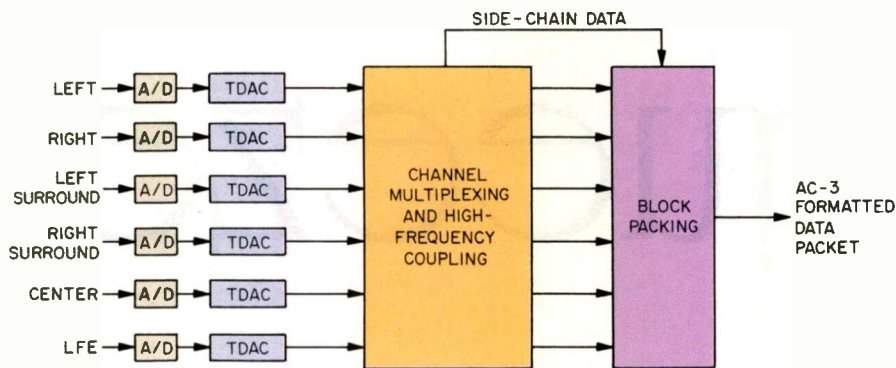


Fig. 1—AC-3 encoding. Although an analog-to-digital stage is shown here, this conversion is done outside the encoder, which takes PCM inputs. Each channel is individually processed by a TDAC FFT filter bank. The resulting signal components are analyzed for relative audibility and quantized accordingly, which yields the primary data reduction. Interchannel processing is then applied, and the data is packed into blocks that form the single, multiplexed output bitstream. Maximum output data rate is 640 kilobits per second; 320 kbps is used for 5.1-channel film soundtracks, 384 kbps for laserdisc 5.1-channel soundtracks, and 384 or 448 kbps for DVD 5.1-channel soundtracks.

ble coding system, capable in principle of handling just about any number of channels. Current hardware implementations of the coder support from one to 5.1 channels. (By “5.1” channels, we mean six discrete channels, five full-bandwidth together with a sixth low-frequency effects channel. The LFE channel has limited bandwidth, albeit full dynamic range. The usual arrangement of the full-bandwidth channels is left front, center front, right front, left surround, and right surround.)

Beyond getting Dolby Digital AC-3 to perform its basic multichannel coding chores, much thought went into enhancing it as a practical sound-delivery medium.

This led to the inclusion of such additional features as dialog level normalization, optional volume compression, and the ability of decoders to downmix, when necessary, to fewer channels than were originally encoded for surround.

DOING IT THE EAR'S WAY

Like virtually all perceptual audio coders, AC-3 works by trying to imitate the operation of the human ear. It anticipates what components of the sound will be audible and codes and transmits those elements with requisite precision while discarding information that would be inaudible or perceptually irrelevant. Although modern understanding of the human hearing mechanism and the availability of powerful, low-cost digital signal processing (DSP) make it possible to do a very good job of this acoustical winnowing, it is not a trivial undertaking. The human ear is actually a great deal more complex and subtle than the psychoacoustic models built into Dolby Digital AC-3, so the coding routines have been designed to err, if they err at all, slightly on the conservative side in order to maintain audio quality even at the cost of some coding efficiency. Still, the data rates for which Dolby Digital AC-3 typically is used (320 to 448 kilobits per second for 5.1-channel soundtracks) don't allow much margin for error, so reasonably close adherence to the ear's operation is highly desirable.

The structure in the ear that has probably had the greatest influence on the design of perceptual coders is the basilar membrane in the inner ear, which functions as a kind of filter bank. The effective bandwidths of

the filters on the basilar membrane are referred to as critical bands and tend to scale with the center frequency of each band, occupying about a third of an octave (about 25% of the center frequency, or four semitones on a piano). All of the brain's aural processing is performed on the neural output signals from the basilar-membrane filter bank, so it is not surprising that a central component of most perceptual coders is a filter bank designed to imitate the action of the basilar membrane filters, typically splitting the input signal into sub-bands of approximately critical bandwidths. In this way, the signal is made to look to the coder the way it would to the ear, which greatly facilitates decisions regarding the audibility of each signal component.

For computational efficiency, AC-3 uses what is known as a transform-based filter bank. The input normally consists of 16- to 20-bit pulse-code modulation (PCM) signals at a 48-kHz sampling rate. Incoming PCM samples are collected in a buffer until there is a block of 256 new samples for each channel. The coder then combines that block with the preceding 256-sample block for that channel and performs a fast Fourier transform (FFT) on the amalgam. The FFT acts like a bank of 256 separate filters, which is good; unfortunately, the output values are complex numbers, which is not so good, so a post-processing routine called time-domain alias cancellation (TDAC) is used to convert the complex FFT outputs to 256 real spectral values, or transform coefficients, which is the primary information to be coded. The transform process is reversible: The decoder, upon recovering the transmitted transform coefficients, performs an inverse TDAC transform to reconstruct the 256 PCM samples for that block. In 5.1-channel operation, Dolby Digital AC-3 encoders and decoders perform separate transforms for each channel; there is no sharing of data or processing among channels at this stage of the algorithm.

At middle and high frequencies, the individual TDAC filters are narrower than a critical bandwidth, so their outputs are analyzed in groups corresponding to critical bandwidths. However, their finer grain structure is exploited in subsequent processing to improve coding efficiency.

Once the signals have been transformed, the AC-3 coder can analyze the relative au-

dibility of their components. Signal components that would be plainly audible have to be coded with high precision to avoid introducing audible quantization noise. Sound components that are lower in level or that

was started 22 years ago on the strength of Ray Dolby's A-Type noise-reduction system, still produced, which uses four bands of compression on each of two channels in a chassis originally the size of a breadbox.

Dolby Digital AC-3 incorporates two additional processes that exploit the presence of multiple channels. One of these is simply using a common pool of bits to fund the quantization of all the channels. If one or more channels are making only modest demands with respect to quantization precision, the surplus bits can be applied to the other channels, providing an extra margin of coding safety.

When substantially all of the channels are making heavy bit demands, an additional multichannel data-sharing process is engaged, which Dolby engineer Craig Todd has dubbed high-frequency channel coupling. Channels are coupled by separating their information into fine-grain and envelope structures. The fine-grain information, which serves only to impart a kind of "high-frequencyness" to the sound, is combined across channels in each band, requiring only one channel's worth to be coded for each band, a significant data savings. The envelope information—which conveys tonality, texture, and localization

TREATING MULTICHANNEL SIGNALS AS AN INTEGRATED ENSEMBLE ENABLES GREATER CODING EFFICIENCY.

will be partially obscured by other sounds can be coded with less precision, while sound components that are too quiet to be heard by themselves or that will be completely obscured by other sounds need not be coded at all. In this process, the coder exploits the finer-than-critical-band structure of the TDAC filter bank to isolate and discard unnecessary signal components within critical bands.

After identifying the necessary coding precisions, AC-3 processes each transform coefficient with a quantizer that discards nonessential bits from the representation of the transform coefficient and rounds off the remaining quantity. The effect of this quantization is to add noise to the signal, so the quantizer can be thought of as a noisy channel, like an unaided analog tape machine. To overcome this, AC-3 borrows a tried-and-true technique from analog signal processing: noise reduction. The outputs of each transform filter are processed with amplitude compression before being quantized—that is, soft sounds are made louder and loud sounds are made softer. During playback, the decoder applies exactly compensating amplitude restoration.

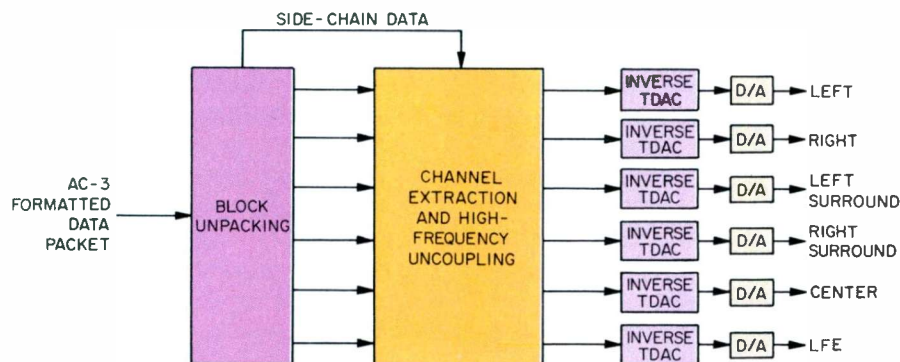
The general power of the digital signal processing used in the AC-3 coder can be appreciated by considering that Dolby Labs

AC-3, a latter-day descendant, provides 256 bands of compression, among other things, on each of six channels, all via a single DSP chip. Plus, the digital medium enables transmitting the compressor gains as independent side-chain information, keeping the encoder's compression and the decoder's expansion locked in sync, something that is not practical with analog noise-reduction systems.

MULTICHANNEL OPERATIONS

All the coding operations described above are performed on each channel individually. To further enhance its efficiency,

Fig. 2—AC-3 decoding. The decoding procedure is the inverse of the encoding process. Incoming data blocks are unpacked into separate channels and transformed back to conventional 48-kHz PCM digital outputs. These signals are then passed through digital-to-analog converters to yield the final analog output signals.



information—is kept discrete and conveyed individually for each channel.

Beyond its basic coding functions, Dolby Digital AC-3 has been designed as a mature sound-delivery system, with a number of features that materially improve its utility. For one thing, AC-3 multichannel decoders can render a 5.1-channel coded bitstream into any smaller number of channels, including stereo, mono, and a Dolby Pro Logic-compatible L_r/R_r channel pair.

AC-3 encoded bitstreams also carry a level-normalizing signal to assure consistent average dialog levels. This ensures that, for example, you won't suddenly get blast-

ed out of your chair when surfing HDTV channels.

In a similar vein, the AC-3 coding standard includes a suggested compression signal, optionally used in decoding when a narrower dynamic range is desired—as,



for example, when watching a movie late at night with quiet playback levels. Suggested surround mix-down levels are also transmitted, so content producers can exert some control over how the soundtracks will sound if mixed down to fewer than 5.1 channels.

The Dolby Digital (AC-3) Surround coding and sound-deliv-

The Dolby DP5-561 multichannel audio coder looks like a desktop computer with rack-mounting ears.

AC-3 WORKS BY TRYING TO IMITATE THE OPERATION OF THE HUMAN EAR.

ery system has made digital, high-quality, discrete multichannel sound reproduction a practical reality in a variety of consumer and professional audio applications. Our hope in developing it was to establish the infrastructure for a veritable revolution in sonic realism and aesthetics, enabling composers, producers, and performers to explore hitherto unattainable realms of multichannel sound presentation and reproduction. The results should be interesting, to say the least. A

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SONY SDP-EP9ES DOLBY DIGITAL SURROUND PROCESSOR



Let's start with a bit of recent history. Manufacturers knew that DVD was coming and that it would carry Dolby Digital Surround (AC-3) as a digital bitstream. But laserdiscs with Dolby Digital soundtracks got here first. Laserdisc players can't handle the requisite digital bitstream directly, so they carry Dolby Digital Surround as a radio-frequency signal (supplanting the RF signal that would otherwise carry one channel of the stereo analog soundtrack). Demodulating

Dimensions: 17 in. W x 3¾ in. H x 11⅞ in. D (43 cm x 48 cm x 35.6 cm).
Weight: 14.3 lbs. (6.5 kg).
Price: \$750.
Company Address: Sony Dr., Park Ridge, N.J. 07656; 201/930-1000.
 For literature, circle No. 90

this RF signal yields the AC-3 bitstream, which must then be decoded.

Some early Dolby Digital Surround adaptors had no inputs except an RF connector for a laserdisc player. Once it was demodulated to produce the AC-3 bitstream, the input signal was decoded to produce the analog signals for 5.1-channel surround. Yet despite having decoder circuitry that could also work with DVD's AC-3 bitstream, these adaptors had no inputs for it. Adaptors having only bitstream inputs, which required an external demodulator for an RF signal, were the best a laserdisc owner with his eye on DVD could usually find.

**SOUND MATTERS MOST,
AND THE SOUND
OF SONY'S SDP-EP9ES
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Sony's eyes see beyond DVD, to HDTV and other AC-3 sources to come. So the SDP-EP9ES Dolby Digital decoder has an RF input and *four* bitstream inputs. It can also perform Dolby Pro Logic decoding on stereo digital signals matrix-encoded with Dolby Surround. About the only major thing it can't do is decode analog surround signals, but it will pass them through from an analog surround decoder. Therefore, you can connect the SDP-EP9ES between an A/V preamp and power amplifiers or feed it into a Dolby Digital-ready A/V receiver or integrated amp that has the necessary inputs.

When the SDP-EP9ES is off or is in its pass-through ("Bypass") mode, it's utterly transparent to the analog signal path and your receiver or preamp controls volume, signal selection, and so on. When the Sony processor is on and one of its five inputs is selected, it becomes the audio controller, with its own volume, tone, and surround adjustments. Video signals must be selected and routed by your system's other components.

The Sony SDP-EP9ES offers numerous enhancements to straight stereo or Dolby Surround. Among these "Digital Cinema Sound" effects are "Enhanced Surround" (which produces a stereo-like effect in the mono surround channel of Dolby Surround sources), "Large Theater" (said to reproduce the acoustics of a standard movie theater), three "Cinema Studio" modes (which simulate the acoustics of two theaters and the scoring stage at Sony Studios), two "Virtual Rear" modes (which modify the apparent number and placement of surround speakers), and two "Virtual Enhanced" modes (which synthesize surround speakers when none are used). In addition, there's a "Large Hall" mode for music listening and a "Live House" mode for simulating surround effects from a mono source. You can adjust the level of any of these special effects from the remote.

The SDP-EP9ES's digital inputs are an RCA jack for "AC-3 RF," three Toslink optical jacks, and a coax (RCA) jack. What you feed to these last four inputs is up to you, since the decoder automatically recognizes stereo, matrixed Dolby Surround (Pro Log-

Photos: Michael Groen

ic), and Dolby Digital Surround (AC-3) signals and processes them accordingly. The SDP-EP9ES locks onto a digital sampling rate of 48, 44.1, or 32 kHz (but not 96 kHz) and recognizes the seven variants of Dolby Digital encoding (1/0, 2/0, 2/1, 2/2, 3/0, 3/1, and 3/2, with the first numeral designating the number of front channels and the second the number of surround channels). Output connections are a Toslink optical jack for driving a stereo digital audio



SONY'S D/A CONVERTERS SEEM FREE OF THE DIGITAL ARTIFACTS THAT PLAGUE SOME OTHERS' DACs.

recorder and analog jacks for all 5.1 channels (front left/center/right, left and right surround, and low-frequency effects). Dual parallel-connected jacks are provided for the center and LFE channels. All input and output RCA jacks are gold-plated, and all Toslink jacks have protective plugs.

On the SDP-EP9ES's front panel are a volume control, two "Digital Processing Control" knobs (one to select a processing menu, the other to progress through that menu's possibilities), four "Digital Cinema Sound" pads ("Bass Boost," "Dolby SURR," "Mode," and "Off"), and an input selector with buttons for the five digital inputs and "Bypass." At the upper left is the power switch and, at the upper right of the display, a small "Set Up" button. The SDP-EP9ES can also be operated from its 28-button remote. This often requires navigating through nested menus and submenus; since the processor neither generates nor handles video, these menus appear only on its display panel, not on your TV screen.

With the "Set Up" menus, you adjust the SDP-EP9ES to match your speaker layout. The options cover the presence or absence of center and surround speakers and subwoofers; the use of large or small main, cen-

ter, and surround speakers; rear or side placement of your surround speakers; and the distances from your main, center, and surround speakers to your viewing position.

Using the speaker-distance data you've entered, the processor automatically sets delays for the signals fed to the various speakers. The speaker-size information enables the processor to redirect bass energy to the speakers most capable of handling it. (The default crossover point for this redirection is 120 Hz, but it can be adjusted from 60 to 200 Hz, in six steps, for each channel.)

When setting delays, the SDP-EP9ES assumes you're sitting equidistant from your left and right front speakers and equidistant from your left and right surrounds, so the speakers of each pair are delayed identically. Delays are based on speaker distances, which you enter in steps of 0.1 meter (the default) or 1 foot. You can enter distances of 1 to 12 meters for the main speakers. The center and surround speakers are assumed to be closer to you than the main pair, and their distances are set relative to the main speakers' distance; the center speaker can be as much as 1.5 meters closer to you and the surrounds as much as 4.5 meters closer than the main pair.

Pushing the "Menu" knob on the front panel cycles you through two menu modes, "Basic" and "Expand," for further adjustments. Turning the knob selects various submenus, whose settings are chosen with an adjacent "+/-" knob. Either mode also gives you the choice of using the front-panel "Digital Processing Controls" or the more convenient keys on the remote to set up and balance the system. If you dislike the settings you select, "Memory Clear" restores everything to the factory settings, asking you for confirmation before doing so.

In "Basic" mode, you can adjust the speaker levels, the degree of dynamic range compression for late-night listening, the bass and treble tone controls, and the display

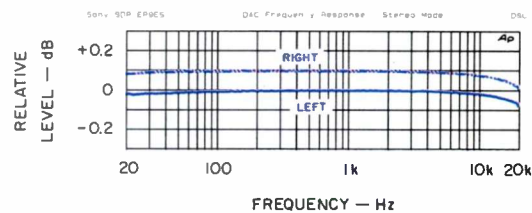


Fig. 1—Frequency response.

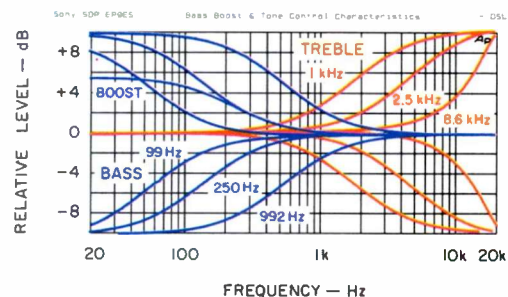


Fig. 2—Bass-boost and tone-control characteristics.

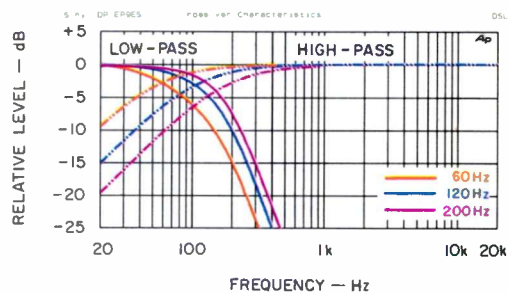


Fig. 3—Crossover characteristics.

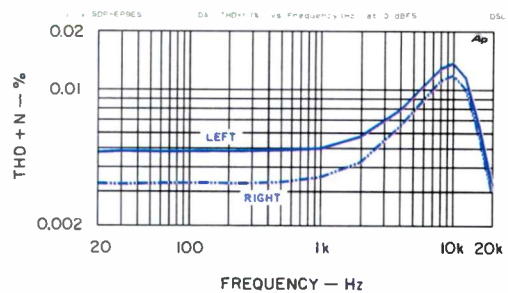


Fig. 4—THD + N vs. frequency.

brightness (in 1% steps!). You can also set subwoofer level and turn muting on or off.

In "Expand" mode, you can adjust bass and treble separately for the main, center, and surround speakers. The tone adjustments are quasi-parametric, with a range of ± 10 dB (in 1-dB steps) and with 21-step adjustments for turnover frequency (99 to 992 Hz for bass, 1 to 8.6 kHz for treble). Other

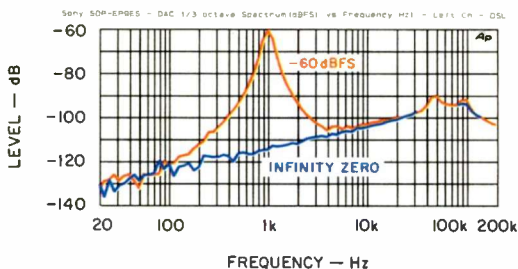


Fig. 5—Noise spectra.

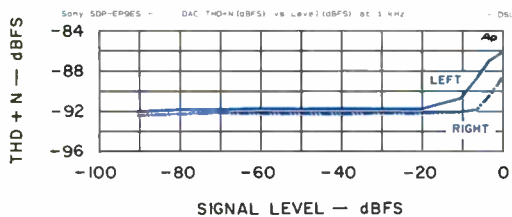


Fig. 6—THD + N vs. signal level.

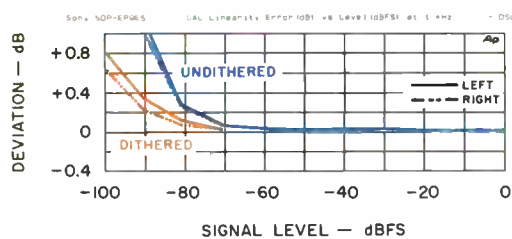


Fig. 7—Deviation from linearity.

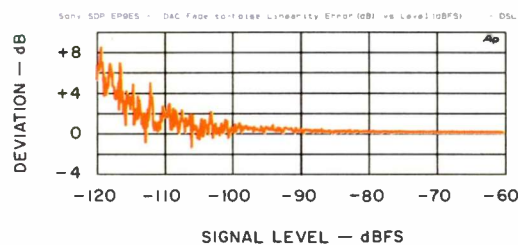


Fig. 8—Fade-to-noise test.

options are selecting whether speaker distances will be in feet or meters, adjusting levels for each digital input (“Input Trim”), and specifying whether the digital inputs will automatically switch from AC-3 to PCM mode or treat all signals as AC-3 and mute PCM.

Measurements

The digital-to-analog converters in some surround processors and A/V receivers I’ve reviewed recently have performed below par. This is no trivial matter; it strikes me as idiocy to buy a CD or laserdisc player because of its internal DACs’ sound quality,

then hand the digital signal off to an external device that uses inferior DACs. Happy to say, the converters in Sony’s SDP-EP9ES are very good indeed.

I made all my basic measurements with the Sony decoder’s volume set at -16 , which came closest to producing the quasi-standard 2-volt output from a 0-dBFS digital signal. If you turn the volume up, the SDP-EP9ES can deliver more than 9 volts prior to clipping, far more than you need to drive a power amp. Clipping apparently occurs in the analog output stage (as it should), because the clipping point is essentially independent of the “Input Trim” setting. Channel balance is excellent, and output impedance is admirably low.

Frequency response, in stereo mode and with the tone controls and bass boost off, is shown with a greatly expanded vertical scale in Fig. 1. As you can see, it’s excellent—flat as a board to about 10 kHz and down a mere 0.1 dB, at most, at 20 kHz. Note the absence of ripples in the treble range, even on this expanded scale. That’s evidence of an excellent digital filter.

Figure 2 is a composite of the tone-control and bass-boost characteristics. For clarity, the left channel’s behavior is presented; the right was identical. For this graph, I used the “Expand” menu’s “Equalizer” submenu to set the bass and treble controls to their maximum and minimum points and took curves at the lowest, middle, and highest turnover frequencies (99, 250, and 992 Hz for the bass and 1, 2.5, and 8.6 kHz for the treble). Each control has a maximum range of about ± 10 dB at the frequency extremes and, more or less, a shelving characteristic. The bass boost, a simple on/off affair, also has a shelving characteristic; its maximum effect, 6 dB, occurs at 20 Hz.

The last set of response curves (Fig. 3) shows the crossover between the left front channel and the subwoofer when the SDP-EP9ES is set for small front speakers and the subwoofer is switched on. I repeated the test, setting the crossover to its lowest, mid-

dle, and highest frequencies (60, 120, and 200 Hz). The -3 and -6 dB points of each filter at each of these crossover settings are listed in “Measured Data.”

Now let’s turn to the DAC characteristics, the Achilles’ heel of several components I’ve tested recently. Figure 4 shows the SDP-EP9ES’s total harmonic distortion plus noise (THD + N) versus frequency at 0 dBFS for the main channels. Note the expanded scale and the absence of aliasing “spikes” at all frequencies. As usual, the data was taken with a 22-kHz low-pass filter in the analyzer so as to include potentially audible aliasing components but eliminate

**FREQUENCY RESPONSE
IS RIPPLE-FREE
AND FLAT, EVIDENCE
OF AN EXCELLENT
DIGITAL FILTER.**

ultrasonic spuria. The shape of the curve—in particular, the smooth decrease in THD + N above 10 kHz—suggests that the distortion mechanism (what there is of it) is a simple second-order nonlinearity and that the Sony’s converters are free of the digital artifacts that plague some other converters.

Figure 5 shows third-octave spectrum analyses for playback of the “infinity-zero” (a.k.a. “digital-zero”) track on the CBS CD-1 test disc and the same disc’s 1-kHz, -60 dBFS track (which is also used for measuring dynamic range). The curves were taken on the left front channel; those for the right front were essentially identical. Note the almost complete absence of the 44.1-kHz sampling frequency and its second harmonic (which may be a concomitant of the converters’ freedom from aliasing) and the utter absence of power-line-related hum components. No wonder the results for quantization noise and dynamic range are as good as they are!

Figure 6 plots THD + N versus level for the main channels at 1 kHz. By -10 dBFS, THD + N drops below -90 dBFS even in the poorer channel, and, from -20 dBFS on down, it is -92 dBFS in both channels. Very respectable indeed!

Figure 7 shows the DAC’s linearity error versus level. I used the same set of un-

dithered test tones as I did for Fig. 6 as well as dithered tones to assess linearity error from -70 to -100 dBFS. Again, I expanded the vertical scale, since the results (especially with the dithered tones) were so good. As Fig. 7 indicates, the left front channel's performance is slightly inferior to that of the right front, so I'm presenting the fade-to-noise plot for the left front only (Fig. 8). An error of less than 6 dB at -120 dBFS is mighty good!

I measured the SDP-EP9ES's AC-3 RF performance using a Dolby Labs digital surround laserdisc, the only test-signal source I had at the time. Frequency response—to the extent that the Audio Precision System One can track this disc's fast-changing signals—was identical to that of the D/A converter (Fig. 1). The Sony's THD + N for a 1-kHz signal at 0 dBFS, the sole point where it can be measured on the main channels using this disc, was reasonably consistent with the raw data obtained for Fig. 4; I expect that a plot of THD + N versus frequency would be similar to Fig. 4 if it could be made. (If you convert decibels to percentages, or vice versa, you'll see that the distortion readings in "Measured Data" are higher for the AC-3 RF input than for the D/A converter section, but this may have been caused by slightly higher noise rather than distortion.) The distortion is a good bit higher in the low-frequency effects channel (measured at 30 Hz) than in the main channels; this is not terribly surprising, especially in light of that channel's almost 10 dB higher output. Show me the subwoofer than can deliver a 30-Hz fundamental at anything near 0.062% THD, and maybe then I'll worry about the performance of this processor's LFE channel.

The balance between all main channels in AC-3 RF mode was reasonably good, with a worst-case spread of ± 0.14 dB. Channel separation at 1 kHz (the only point where it can be assessed with the test laserdisc) ranged mostly between 100 and 115 dB. Worst-case leakage (between the left and right surrounds and between the left and right main channels) was about -75 dB.

Use and Listening Tests

I hooked up the Sony SDP-EP9ES between a Citation 7.0 A/V preamp/surround processor and my power amps. Video sources were primarily a Yamaha CDV-

MEASURED DATA

Unless noted or implied, all data is for worst-case conditions. Data taken on one channel was for the left front. Measurements were made with the volume control at -16 and the input level control set at zero. Measurements of the D/A converters were made in the two-channel mode. Dolby Digital measurements were made using the RF input.

D/A CONVERTER SECTION

Output Level at 0 dBFS: Maximum at clipping, 9.37 V; as tested (volume at -16), 2.14 V.

Channel Balance: ± 0.05 dB.

Output Impedance: 100 ohms.

Frequency Response: 20 Hz to 20 kHz, +0, -0.1 dB.

Tone-Control Range: Bass, at 250-Hz setting, ± 6.5 dB at 100 Hz and ± 9.8 dB at 20 Hz; treble, at 2.5-kHz setting, ± 8.6 dB at 10 kHz and ± 10 dB at 20 kHz.

Bass Boost: +5 dB at 100 Hz, +5.7 dB at 50 Hz, and +6 dB at 20 Hz.

Crossover Frequencies (-3 dB): 60-Hz setting, low-pass at 62 Hz and high-pass at 56 Hz; 120-Hz setting, low-pass at 103 Hz and high-pass at 112 Hz; 200-Hz setting, low-pass at 137 Hz and high-pass at 187 Hz.

Crossover Slopes: Low-pass, 18 dB/octave; high-pass, 6 dB/octave.

THD + N at 0 dBFS: Less than 0.0136%, 20 Hz to 20 kHz.

THD + N at 1 kHz: Below -86.3 dBFS from 0 to -90 dBFS and below -91.8 dBFS from -30 to -90 dBFS.

Maximum Linearity Error: Undithered signals, 1.14 dB to -90 dBFS; dithered signals, 0.82 dB to -100 dBFS.

S/N, A-Weighted: 95.6 dB re 0 dBFS for infinity-zero signal.

Quantization Noise: -92 dBFS.

Dynamic Range: Unweighted, 91.7 dB; A-weighted, 94.4 dB.

Channel Separation: Greater than 52.1 dB, 125 Hz to 16 kHz.

DOLBY DIGITAL (AC-3) SECTION

Maximum Output Level at 1 kHz: 2.16 V at 0 dBFS.

Channel Balance, Relative to Left Front Output: Right front, center, and surround channels, within +0.12, -0.16 dB; LFE channel, +9.61 dB.

Frequency Response: Main channels, 20 Hz to 18.7 kHz, +0, -0.04 dB; center channel, 20 Hz to 18.9 kHz, +0, -0.08 dB; surround channels, 20 Hz to 18.3 kHz, +0, -0.03 dB; LFE channel, 13 to 107 Hz, +0.09, -0.05 dB.

THD + N for 0-dBFS Signal: Main and surround, 0.0047% at 1 kHz; center, 0.008% at 1 kHz; LFE, 0.062% at 30 Hz.

Channel Separation at 1 kHz: 74.8 dB or greater.

W901 laserdisc player and the Panasonic DVD-A300 DVD player I reviewed for the April issue. My home theater speakers (all from Paradigm) include full-range towers as the main front pair, a center speaker with far better than average bass response, dipole surrounds situated across from and above my viewing point, and a powered subwoofer. I set the SDP-EP9ES for large main speakers, a small center, and small surrounds and used the (default) 120-Hz crossover to the subwoofer. I played music CDs, conventional laserdiscs, Dolby Digital laserdiscs, and my growing (but nonetheless limited) DVD collection, paying more attention to the video sources than to the pure-audio sources.

It was easy to set up and balance the SDP-EP9ES via the remote's controls for center, surround, and subwoofer levels and for front and surround balance. However, winding my way through nested menus without an on-screen display was bothersome. Although there's some logic behind the way the menus are nested, it's easy to wander down dead ends when you can't see the full lineup of choices. And I question whether having separate "Basic" and "Expand" menus that do pretty much the same things isn't a needless complication.

On to the positive. Sony's "Digital Cinema Sound" effects are, for the most part, plausible, but I must admit preferring to sip

Continued on page 53

EDWARD M. LONG

JOSEPH AUDIO RM7si SPEAKER

When Jeff Joseph, the owner of Joseph Audio, was working for Harvey's in New York City in the mid-1980s, the hi-fi store began selling a loudspeaker that used an unusual Infinite Slope crossover. The speaker was built by JS Engineering, and the crossover was invented and patented by Richard Modafferi and licensed to JSE. (Modafferi, who earned a reputation as the designer of the McIntosh MR78 tuner, is an independent consultant who operates Modafferi Acoustical Labs.) Joseph was impressed by the sound of the JSE speaker, as were the store's customers, who bought them in large quantities. JSE stopped producing the speaker, and eventually Joseph asked Modafferi about the possibility of licensing the patent. Modafferi agreed, so in 1991 Jeff Joseph established Joseph Audio to manufacture a loudspeaker with a crossover designed by Modafferi: the RM20, an 8-inch, two-way tower. (An intriguing footnote: When I called Joseph to get details about the RM7si and the background of his company, I asked if he was a relative of Bill Joseph. He told me that Bill was his uncle. Bill Joseph and Frank Rob-

Rated Frequency Response: 45 Hz to 20 kHz, ± 2 dB.

Rated Sensitivity: 86 dB SPL at 1 meter for 1-watt input.

Recommended Amplifier Power: 30 to 150 watts per channel.

Dimensions: 9 in. W x 15 in. H x 11 $\frac{1}{2}$ in. D (22.9 cm x 38.1 cm x 30.2 cm).

Weight: 25 lbs. (11.4 kg) each.

Price: \$1,299 per pair in oak or black, \$1,499 per pair in rosewood.

Company Address: 2 Pineridge Rd., White Plains, N.Y. 10603; 800/474-4434.

For literature, circle No. 91



bins invented the RJ enclosure, which was quite a sensation when it was introduced in 1952 at the New York Audio Fair. It's gratifying that Jeff Joseph is carrying on the family tradition of producing unconventional loudspeakers.)

The Joseph RM7si is a two-way speaker that uses a 6 $\frac{1}{2}$ -inch woofer with a glass-fiber cone and a 1-inch tweeter with a silk dome. A port on the front panel, 2 inches in diameter and 3 inches long, tunes the system. A removable, half-inch-thick grille with black cloth covers the front baffle. Behind the baffle, just above the woofer, is a $\frac{3}{4}$ x 1 $\frac{1}{2}$ -inch panel-stiffening brace and Owens-Corning R-19

acoustical material, which helps absorb sound from the back of the woofer. Delayed output might otherwise be reflected back through the cone and blur the sound.

On the back of the enclosure is a 4 $\frac{3}{8}$ x 3 $\frac{3}{8}$ -inch input plate with two angled steps, each with a pair of custom, gold-plated, five-way binding posts that accept wire as thick as 12-gauge. Unlike many other binding posts, the RM7si's nicely accommodate the large spade lugs found on audiophile-

grade cables. Additionally, these posts won't come loose or turn when they are tightened. To enable bi-wiring, the two pairs of binding posts are connected separately to the crossover's low- and high-pass filter sections. This lets you drive the bass and treble with separate speaker cables (or even separate power amplifiers). For normal operation, the two red and two black terminals are connected by removable gold-plated straps.

The high- and low-pass filters are built on separate p.c. boards attached to the speaker's side panels. The high-frequency filter uses five inductors, 10 capacitors (ef-

**LISTENERS FOUND
THE RM7si'S SOUND
TO BE CLEAR, PRECISE,
AND DETAILED.**

fectively six, since some are paralleled), and five resistors; the low-frequency filter has three inductors, 10 capacitors (effectively four), and four resistors. I noticed that the high-quality polypropylene and polycarbonate crossover capacitors are hand-marked with their tested values. Each section's total capacitive value is precisely adjusted by combining separate capacitors. The inductors are also produced to very precise values. This precision isn't just icing on the cake; it's necessary because of the steep crossover slopes. Unless the high- and low-pass filters are exactly matched, there will be a dip in frequency response if the slopes are too far apart and a bump in response if they overlap.

The filters' circuitry is not like other crossovers'; the use of multiple inductors wound on the same laminated iron core exploits their mutual inductance to produce the steep filter slopes. Cardas cables are used for the internal wiring between the input and the crossover boards and from them to the woofer and tweeter.

The Joseph RM7si owner's manual explains how to connect the speakers, including bi-wiring them. It also discusses the drivers, the unique crossover, amplifier power requirements, and the effects of room placement on the RM7si's sound.

Measurements

Using a B & K 4133 microphone at a distance of 1 meter, I measured the Joseph RM7si under free-field conditions, away from reflecting surfaces, for all tests except the distortion measurements. (Free-field conditions allow the loudspeaker to radiate sound in all directions, as if it were in the center of an unrestricted sphere.) I measured distortion by placing the RM7si and the microphone on a concrete surface, which restricts the sound radiation to a half-sphere and increases the sound pressure level (SPL) by 6 dB. (This is sometimes called a ground-plane, or half-space, measurement, although a more technically correct description is "2-pi steradians conditions." The more technically correct terminology for free-field measurements is "4-pi steradians conditions.")

Figure 1 shows the frequency response of the bass and treble drivers with the grille in place and the speaker's overall response without the grille. (With the grille, the

RM7si's overall response was virtually the same below 2.5 kHz and identical to the tweeter curve above that. Since the grille did affect the output, all other measurements and the listening-panel evaluations were made with it in place.) The woofer's output drops almost 30 dB in the octave between 1.5 and 3 kHz, and the tweeter exhibits a complementary rolloff between 2.5 and 1.5 kHz. While the crossover slopes aren't "infinite," they are much steeper than those found in conventional loudspeakers. The outputs of the woofer and the tweeter combine at the 1,937-Hz crossover frequency to produce response that is about 4.5 dB greater than either driver separately. If the outputs of the woofer and tweeter were perfectly synchronized, which they are not, the total output would be 6 dB greater than that of each driver separately.

The response measurements were made at 1 meter with an input of 2.83 volts rms, equivalent to 1 watt into 8 ohms. Joseph Audio specifies an output of 86 dB SPL for 1 watt at 1 meter, but the curves in Fig. 1 reveal that the output is less than that in the midrange.

Figure 2 shows the individual phase responses of the bass and treble drivers. Although not visible, their phases are 307.5° apart at the crossover frequency; the tweeter output is +22°, while the woofer output is -285.5°. If the outputs of the two drivers were 360° apart at the crossover, they would also combine to give 6 dB more output than each individually, but only with steady-state signals; transient outputs still would not be synchronized. The 30-second sweep signal I used is slow enough to appear almost steady-state as it moves across the crossover frequency. (I chose a 30-second sweep to obtain more detailed information about the output of the RM7si in the frequency domain, especially at low frequencies. If you want high resolution in the frequency domain,

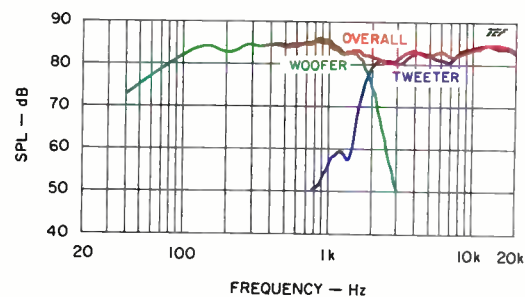


Fig. 1—Frequency response (drivers' responses made with grille, overall response made without it).

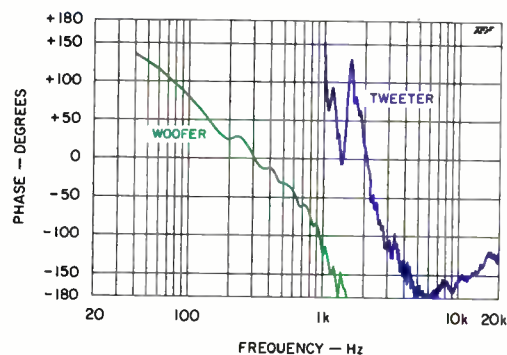


Fig. 2—Phase response.

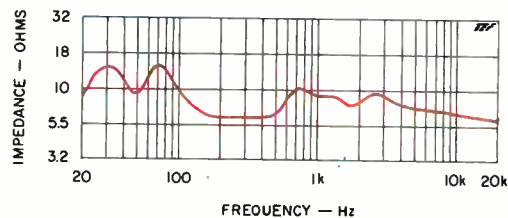


Fig. 3—Impedance magnitude.

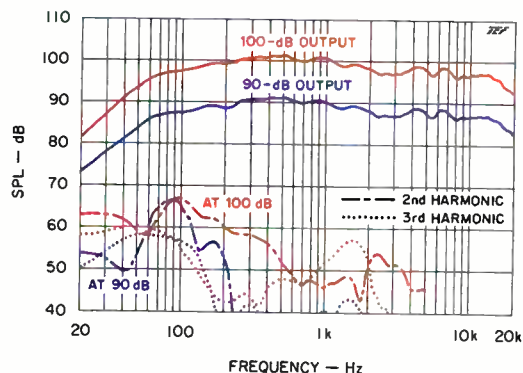


Fig. 4—Ground-plane frequency response and second- and third-harmonic distortion.

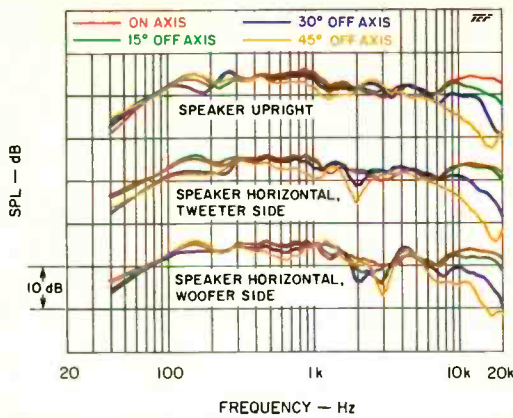


Fig. 5—On-axis and horizontal off-axis responses.

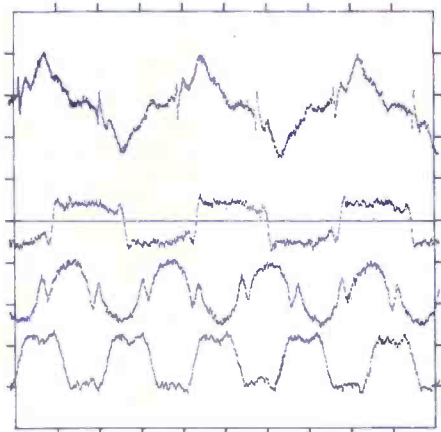


Fig. 6—Square-wave response at (from top) 300 Hz, 1.2 kHz, 1.6 kHz, and 5 kHz.

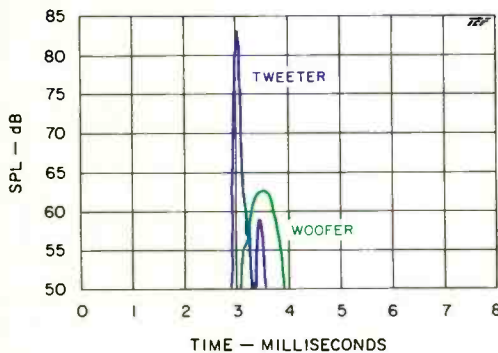


Fig. 7—Energy-time responses; woofer response has been raised 10 dB for clarity.

you have to give up resolution in the time domain, and vice versa.)

Figure 3 shows how the RM7si's impedance varies with frequency. The two peaks in the bass reveal that the RM7si is a classically tuned, ported system; the dip between

them indicates that the speaker is tuned to 49 Hz. The maximum impedance, 14.5 ohms, occurs at 73.1 Hz; the minimum impedance, 6 ohms, is at 300 Hz. The RM7si should be a very easy load for any amplifier.

Distortion at output levels of 90 and 100 dB SPL is shown in Fig. 4. At the 100-dB level, the second-harmonic distortion at 100 Hz is only 3%, and the third-harmonic distortion is 1.6%. This is very good performance, considering the size of the woofer.

The on-axis and horizontal off-axis frequency responses of the Joseph RM7si, with the speaker upright and on its side, are in Fig. 5. The off-axis response is excellent with the speaker upright (top), especially at a 30° angle. Although I concur with Joseph Audio's recommendation that the RM7si's be placed on 24-inch-high stands, with the tweeter above the woofer, the middle and bottom sets of curves show that if you must place them horizontally on shelves, they should be oriented with their tweeters toward the inside. The dip near 2 kHz in the middle set of curves is at a fairly extreme angle of 45° off the center axis; at lesser angles, it all but disappears.

Because music and speech are complex transient signals, I consider transient test signals to be as important as, if not more important than, steady-state test signals (unless you like to listen to recordings of someone whistling or playing an ocarina). A square wave is not, strictly speaking, a transient signal, but it does consist of a fundamental and a number of harmonics that have specific amplitude and phase relationships. If a speaker system is fed a square wave, with the fundamental and

the first few harmonics reproduced by the woofer and the upper harmonics reproduced by the tweeter, the arrival of the sound from the two drivers must be synchronized, or phase integrity will be lost. This will result in poor square-wave repro-

duction, which implies that complex music and voice reproduction will be less than ideal.

Fig. 6 shows square waves reproduced by the Joseph RM7si. The downward slope of the 300-Hz square wave (top) indicates that some low-frequency phase shift is occurring below this frequency, which is not unusual, and that the high-frequency harmonics are arriving before the fundamental. The 1.2-kHz square wave (middle of graph) is very good, but in this case only the fundamental is reproduced by the woofer while the harmonics are reproduced by the tweeter. The 1.6-kHz square wave

**THE BASS
FROM THE RM7si
WAS VERY GOOD
FOR A SYSTEM
OF ITS SIZE.**

(second from bottom), just below the crossover frequency, reveals that the fundamental and the harmonics are not synchronized. In the bottom trace, of a 5-kHz square wave, the tweeter is reproducing both the fundamental and the harmonics of the square wave; the result is better than from most other tweeters I have tested.

Figure 7 shows the energy/time curves of the two drivers. The difference between the tweeter signal's arrival and the woofer's about 460 microseconds, which corresponds to an offset of about 6¼ inches. I increased the signal input to the woofer by 10 dB to make its curve easier to see. (The test signal is weighted to produce more output as frequency is increased, naturally favoring the tweeter.)

The cosine-pulse test (Fig. 8) confirms that the Joseph Audio RM7si produces a very tight energy package, with no high-frequency ringing, and that the system is well damped. (The time span for this graph is 511 milliseconds.)

I also measured the near-field output of the woofer and the port as well as the combined output of both. There was a dip in the woofer's output at 41.1 Hz, where the port tunes the system. The port output was strongest slightly above the tuning frequency. The combined output of the woofer and

the port was very uniform down to 60 Hz and was down only 3 dB at 53 Hz.

My accelerometer measurements of cabinet panel vibration showed very little output except for a plateau of energy from 400 to 500 Hz. This tapered off gradually to a minimum at 700 Hz and higher frequencies. The outputs of the two RM7si speakers matched within 0.5 dB across the audible spectrum, which may account for the excellent images they produce, especially the solid center image.

Use and Listening Tests

I asked members of my listening panel to note comments as they compared the sound of a compact reference speaker (which has a uniform bass output and is down only 3 dB at 32 Hz) to that of the Joseph RM7si. Most listening was done individually, but each panel member heard the same music and vocal selections. As recommended by Joseph Audio, these speakers were placed on 24-inch-high stands (roughly the same height as the reference speakers) and positioned away from reflecting surfaces.

Although I didn't ask the members of the panel to listen for effects of absolute polarity, I did check it myself. On some music and voice program material, I found it difficult to determine; on other recordings, I thought reversed polarity sounded slightly more real. Perhaps the relatively large negative-going pulse evident in the cosine-pulse test (Fig. 8) might explain this (for the listening tests, the RM7si was connected with the polarity used for that measurement). It also may account for some of the comments made by the listening panel that certain transients sounded slightly duller on the RM7si than on the reference speaker. If you are a critical listener, try reversing the polarity of the connections to the RM7si while listening to program material with sharp transients: You may hear a difference.

Listening to the RM7si speakers on the selection "Birdland," played by pianist Earl Hines on the CD *Fatha: Earl Plays Hits He Missed* (coupled with *For Duke by Bill Berry and His Ellington Orchestra* and packaged as Realtime RT-5001), panel members noted: "piano clear and precise," "piano more centered," "brushes on drums more muted," "rim hits on drum slightly duller," "bass is good but less deep," and "tuba

breath sounds more prominent." For the selection "Bantu," by Andrew York, performed by the Los Angeles Guitar Quartet on the CD *Surround Spectacular* (Delos DE 3179), comments about the RM7si were: "imaging is good but less spacious," "guitars sound more mellow," "guitars more centered," "drums less reverberant," and "drums very tight." Palestrina's "Alma Redemptorisi," sung by the Voices of Ascension and conducted by Dennis Keene on the same CD, prompted the panel to comment: "very detailed but slightly less spacious," "better imaging," "individual voices more distinct," and "the group sounds less wide and more forward."

When panel members heard the RM7si's reproduce Kodaly's "Viennese Musical Clock" on the *Audio Plus Sampler CD* (Audio+ CDX007), they noted: "chimes more recessed," "chimes brighter, with more ringing," "trumpet slightly constricted," "brass slightly muted," "flutes are light and airy," "instruments seem more distinct," and "high sounds are smoother and more extended."

There seemed to be a consensus from the panel that the RM7si's bass was very good for a system of its size but less deep than the reference speaker's, which was hardly surprising because the reference is down only 3 dB at 32 Hz. The lack of deep bass was most noticeable on movie soundtracks having low-frequency effects. Use of a subwoofer with the RM7si is recommended when listening to such movies.

After the listening panel completed its evaluations, I received review samples of the new Signature version of the RM7si, which costs about \$400 more per pair. Its sound was quite similar to that of the standard RM7si but had more clarity in the voice and treble range. The RM7si Signature made dialog on movie soundtracks much more articulate and easier to distinguish, especially when other sound effects were occurring simultaneously. The Signature's reproduction was definitely brighter and less recessed.

The RM7si is a very good loudspeaker that incorporates some notable technology. The infinite-slope crossover's low-pass filter does indeed provide a very steep rolloff, albeit with the attendant low-frequency delay associated with such a steep slope. All low-pass filters introduce delay, so the

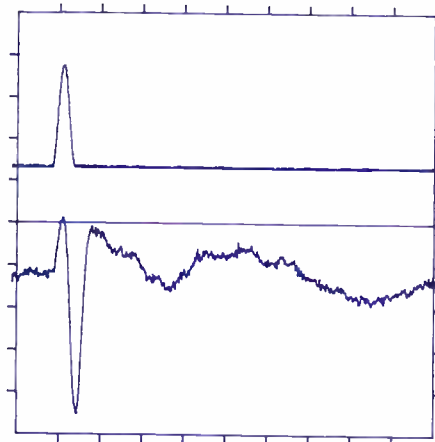


Fig. 8—Response to a 20-kHz cosine pulse; input (top) and output (bottom).



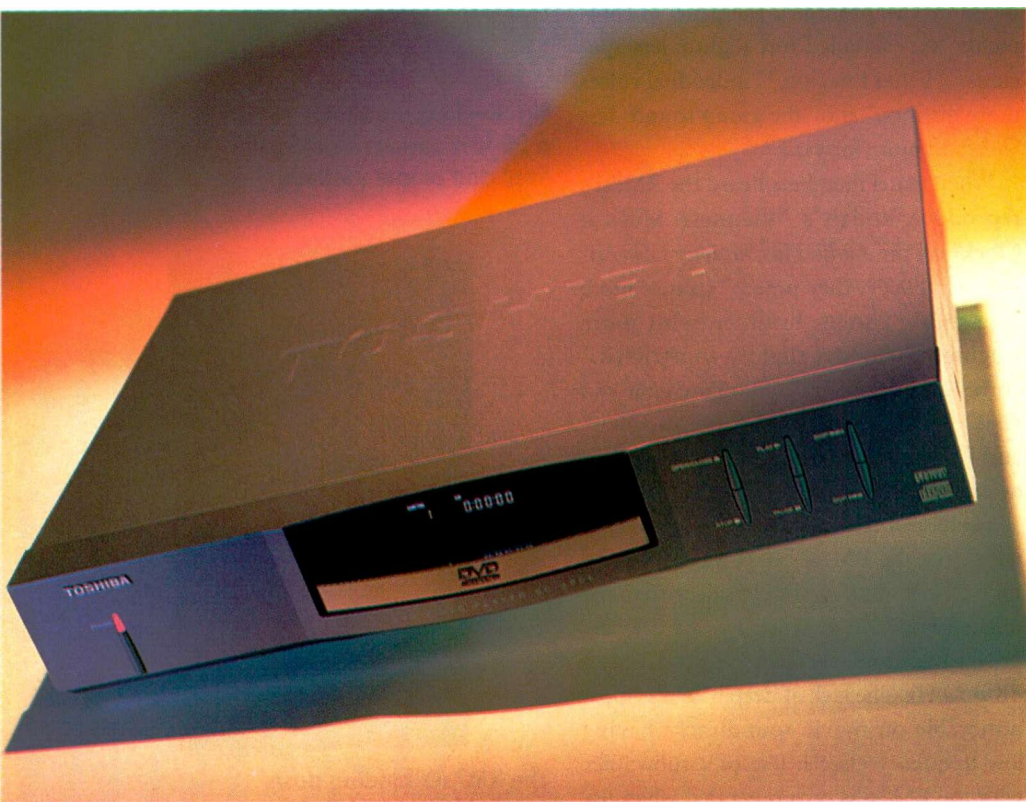
The RM7si's binding posts can hold large spade lugs or 12-gauge wire and stay tight.

trade-off between greater delay and greater attenuation of energy fed to the RM7si woofer may be acceptable.

I found the Joseph Audio RM7si to be very pleasant and enjoyable for long-term listening. The sound was very precise; in fact, it reminded me of the clarity that I've heard in a dry, reflection-free environment. The RM7si definitely sounds different from most other moderate-sized loudspeakers, and I recommend that you visit an audio dealer and listen to it. Take along music with which you are familiar, including voice recordings, and remember my suggestion about switching the polarity on program material having sharp transients. And don't be in too big a hurry; you may discover you'll like this speaker a lot. **A**

EDWARD J. FOSTER

TOSHIBA SD-3006 DVD PLAYER



Considering Toshiba's sheer size (\$48 billion in revenue worldwide), vertical integration, world-class technology, and pre-eminent position in laptop computers, it's surprising how little presence it's had in the high-end consumer electronics market here. After all, this is the company that, with Time Warner, envisioned DVD pretty much as it turned out and clearly was the technological brains of the relationship. With the launch of its premiere DVD player, the SD-3006, Toshiba lays its claim to future pre-eminence in DVD.

For audio, the SD-3006 has both digital and stereo analog outputs. When you play DVDs with 5.1-channel Dolby Digital Surround, the analog output signal is a matrixed mixdown of the original AC-3

recording, compatible with Dolby Pro Logic decoders. To take full advantage of 5.1-channel Dolby Digital recordings, you'll need an external Dolby Digital decoder fed from the SD-3006's digital output jack. This is the sensible way to handle Dolby Digital Surround; the 5.1-channel decoding logically belongs in the preamp, integrated amp, or receiver, where it can serve every Dolby Digital source. It's simply a waste to have a full-featured AC-3 decoder and half a dozen D/A converters in each source.

I confess to being entranced by the beauty of the SD-3006's sculptured buttons and front panel, its embossed top, and even its matte gray finish (a welcome relief from the ubiquitous black). Its transport controls are elongated teardrops, arranged in pairs to the right of the disc tray and the display. The "Power" teardrop stands by itself, at the far left.

On the Toshiba's back are two pairs of gold-plated RCA jacks for the left and right analog outputs, another RCA jack that provides a "PCM/AC-3 Digital" audio output to drive an external D/A converter or Dolby Digital decoder, a sixth RCA jack for composite-video output, and three more for the Y, Cr, and Cb component-video signals. And there is also a multipin S-video jack. A switch located above the component-video jacks selects the composite- or component-video outputs. Another slide switch, near the digital audio jack, is marked "AC-3 (Analog Off)" and "PCM (Analog On)." You set this switch to "AC-3 (Analog Off)" when you're using an external Dolby Digital decoder and to "PCM (Analog On)" if you wish to use a digital link to a subsequent piece of equipment that does not have an AC-3 decoder. The object of this switching is to prevent confusing the next device by feeding it an AC-3 data stream that it cannot understand.

The panel above the rounded, protruding disc tray displays a two-digit "Title" number (DVDs carrying multiple titles often number them), a three-digit chapter or track indicator, and a five-digit time display (elapsed, total, or remaining). In addition, there are status indicators for operating mode and disc type (CD or DVD), for whether "Memory" (programmed title or track sequence), random, or repeat play modes are active, and for whether repeat is between memorized points ("A-B"), by chapter or track, or by title number. When a DVD is loaded, the display also indicates if it's been mastered with multiple camera angles.

The SD-3006's 38-button/four-pad remote is preprogrammed to command TVs, cable boxes, and VCRs as well as the DVD player itself. You set it for the desired device via a four-position slide switch. The remote is preset for Toshiba equipment, but you can reset each switch position individually for other manufacturers' components by entering a code on the remote's numeric

Dimensions: 16 $\frac{7}{8}$ in. W x 3 $\frac{1}{4}$ in. H x 12 $\frac{1}{2}$ in. D (43 cm x 8.3 cm x 30.8 cm).

Weight: 8.9 lbs. (4 kg).

Price: \$699.

Company Address: 82 Totowa Rd., Wayne, N.J. 07470; 800/631-3811.

For literature, circle No. 92

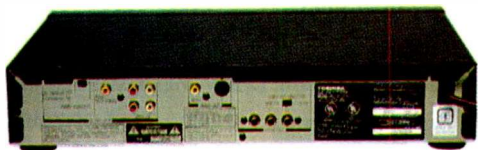
Photos: Michael Groen

keypad (the codes are listed in the owner's manual).

The numeric keypad, programming buttons ("Memory," "Repeat," "A-B RPT," and "Clear"), and controls for random play and slow motion are behind a sliding panel at the base of the remote. (You slide the panel completely off to change batteries.) Slow-motion playback operates at half, one-eighth, or one-sixteenth speed, depending on how many times you press the button.

The remote's main transport controls, which are always accessible, include an unusual function, "Last Play." It's used to resume DVD playback from a point slightly before the one where the player had previously been stopped. (For "Last Play" to work, the player must have been left on in the interim and with the disc still loaded.) When you tap the buttons for fast forward or reverse, the disc is scanned at double speed; tap the button again, and the scan shifts to eight-times-normal speed.

Three buttons, located above the remote's transport controls, are used in conjunction with the four-way pad and the "Return" and "Enter" controls to select the camera angle, subtitle, and audio (sound-track language) functions for DVDs that



**STILLS, SLOW MOTION,
AND HIGH-SPEED SCAN
WERE SMOOTH
AND SOLID, AMONG
THE BEST I'VE SEEN.**

support these features. You also use the four-way pad (together with the "Title," "Menu," "Setup," "Display," and "Subtitle" buttons) to navigate through onscreen setup menus as well as through whatever disc titles, subtitles, and so on are recorded on the disc. You can select DVD titles and chapters and CD tracks directly (i.e., numerically) via the keypad under the sliding door. You can also use this numeric pad to enter child lock-out codes, with the four-way pad selecting among lock levels; again,

this feature works only for DVDs encoded with the necessary information.

Measurements

Since my last DVD player review, Dolby Laboratories has issued a Dolby Digital test DVD and Sony has finalized its video test DVD. I used both to test the Toshiba SD-3006. Although the finalized Sony disc (the only video test DVD I know of) is similar to the preliminary version (which I no longer have), it differs enough that you can't directly compare the lab results for the Toshiba SD-3006 with those reported in my last DVD player review in the May issue.

When tested with the multiburst signals on the new Sony DVD, the frequency response of the SD-3006's luminance channel (which is related to horizontal resolution) was essentially flat up to the highest test frequency. Response droops of less than 1 dB are negligible in the video world and about as small as one can measure with much accuracy. (Under "Measured Data," I've listed the response obtained with multiburst signals but not with the Sony disc's frequency sweep, as I'm not convinced the latter results were accurate.) A degree of aliasing seemed to occur at high video frequencies, but I can't be sure whether this is attributable to the player or the test disc, since this is the first time I've used the disc.

Overall, the SD-3006's video performance was excellent. The luminance level was spot on, and the gray scale was perfectly linear on both the staircase and sweep recordings. Chroma level was high, but any decent monitor should compensate for that. Chroma phase error was negligible (less than 2°); after compensating for the higher-than-standard chroma level, all chroma vectors lay within the inner targets on the vectorscope, within professional tolerances. Sony's new video test DVD makes it difficult to determine chroma differential gain and phase, but within the limits of the test signals, I didn't detect any error.

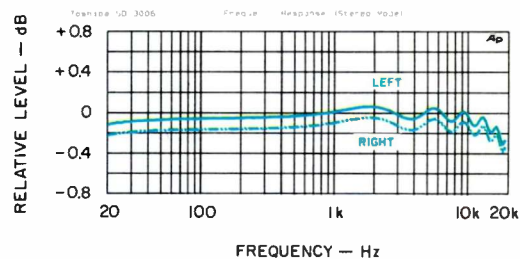


Fig. 1—Audio frequency response.

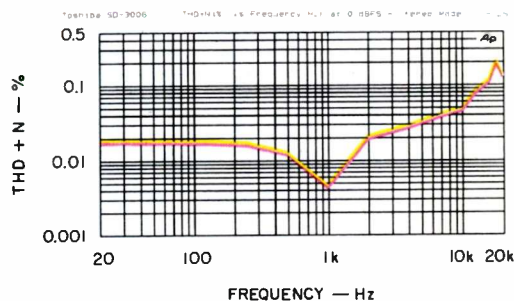


Fig. 2—THD + N vs. frequency.

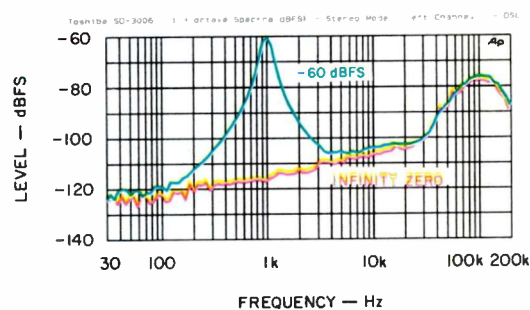


Fig. 3—Noise spectra.

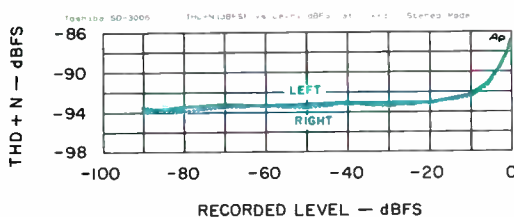


Fig. 4—THD + N vs. recorded level.

As to the audio, it's fortunate that the SD-3006 is designed for use with an external Dolby Digital decoder, since its D/A converters are not up to the current state of the art. I used the standard CBS CD-1 test disc to measure performance of the player's internal DACs and used the Dolby test DVD to explore performance of the main channels with AC-3 signals. I've based the curves and test data on results with the CBS

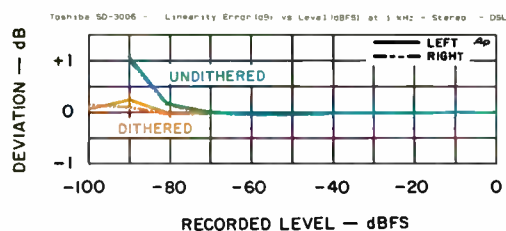


Fig. 5—Deviation from linearity.

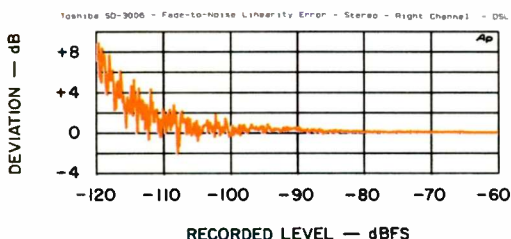


Fig. 6—Fade-to-noise test.

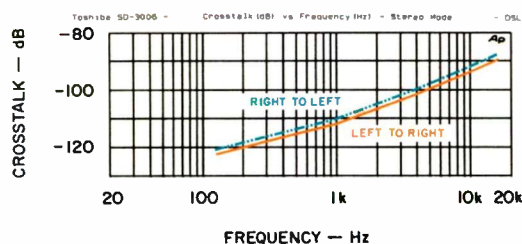


Fig. 7—Channel separation.

disc because it is a familiar test bed for which we have substantial comparative data. For now, I will accumulate data obtained using the Dolby test disc but will hold off publishing it until I have a reasonable basis for comparison.

Suffice it to say that the Toshiba's frequency response, output level, and channel balance as measured with the Dolby DVD were essentially identical to the corresponding data I got with the CBS CD-1. Crosstalk was sufficiently comparable that discrepancies could be attributed to the different recorded levels on the two discs. I did, however, find substantive differences in dynamic range that warrant further investigation. The Dolby and CBS discs do not use the same test frequencies for measurement of this characteristic, but I doubt that this explains the difference; more likely it is due to AC-3 encoding itself. But to be certain, the performance of other DVD players must be established for comparison.

In "Measured Data," I've added CCIR-weighted results for both signal-to-noise ratio and dynamic range, because CCIR-weighting

may reflect the audibility of low-level noise more accurately than traditional A-weighting. The CCIR-weighted figures don't look as "good" as the A-weighted data, so always be sure when reviewing these figures that you're comparing apples with apples.

Now on to the Toshiba SD-3006 itself. Figure 1 shows the stereo frequency response: not bad, but there's about 0.25 dB of high-end droop and observable filter ripple, which increase the tolerance on the response to +0.05, -0.32 dB from 20 Hz to 20 kHz. Channel balance (also observable in Fig. 1) is quite good, within ± 0.05 dB. Output level was exactly on the "standard" 2 volts, and the output impedance, 330 ohms, was well chosen.

Figure 2 shows total harmonic distortion plus noise (THD + N) versus frequency at 0 dBFS; the curves for the two channels overlaid so perfectly that only one curve can be seen. The shape of these curves, especially the sharp notch at 1 kHz, is unusual for a modern converter. Apparently, there's considerable aliasing with the carrier at audio

frequencies above 10 kHz; the contamination at 16 kHz exceeds 0.2%, which I consider to be subpar these days.

The spectrum analyses in Fig. 3 suggest that the D/A converter is a low-bit, noise-shaping type. These curves are quite good, especially vis-à-vis the absence of hum components at the 60-Hz power line and its harmonics.

For measurements of THD + N versus level (Fig. 4), I used undithered tones at 1 kHz (actually, 997 Hz). This frequency corresponds to the point of minimum distortion in Fig. 2 and therefore shows the converter in its best light. The results are quite good here: THD + N of only -86.8 dBFS

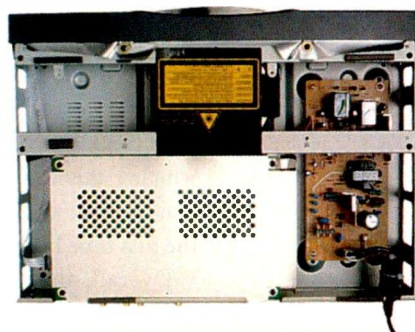
(0.0046%) at 0 dBFS, quickly dropping below -92 dBFS at -10 dBFS and below -93 dBFS at -30 dBFS.

Linearity error (Fig. 5) barely exceeds 1 dB at -90 dBFS with undithered signals and is less than 0.25 dB, worst case, with dithered recordings between -70 and -100 dBFS. Figure 6 shows linearity error on the fade-to-noise test, using a 500-Hz dithered recording that fades from -60 to -120 dBFS. Figure 6 was measured from the right channel, which was, by a very slight margin, the poorer of the two. Crosstalk (Fig. 7) is approximately equal in both directions.

Use and Listening Tests

In my home theater, I connected the analog outputs of the Toshiba SD-3006 to a Citation 7.0 preamp/surround processor and the digital output to the Sony SDP-EP9ES Dolby Digital decoder reviewed in this issue. The loudspeakers were the same Paradigm setup and powered subwoofer I've used for some time. With this hookup, I could compare the sound quality of the Toshiba's D/A converters, fed through the Citation's Dolby Pro Logic decoder, with the Dolby Digital track as decoded by the Sony SDP-EP9ES.

When it comes to movies, that's a one-sided comparison: Dolby Digital wins hands down, as it should. The stereo surround and the robust bass of the LFE channel don't make it through the analog mix, even though those who have not experienced 5.1-channel Dolby Digital sound are likely to find the SD-3006's Dolby Surround mixdown quite impressive. And on movie soundtracks, I seldom was aware of the imperfections of the Toshiba DACs. On music CDs, however, the sound was noticeably less detailed and less transparent through the SD-3006's analog outputs than when the Sony SDP-EP9ES was doing the decoding.



THE SD-3006 HAD NO PROBLEM HANDLING TEST TRACKS WITH DIFFICULT BITSTREAMS.

For the record, the Toshiba SD-3006 does not recognize home-recorded CD-Rs, but that's true of any DVD player that doesn't use separate lasers for DVD and CD playback.

I put the SD-3006 through its paces on my slow-growing DVD movie library; I also checked visual and sonic performance with the Sony and Dolby Labs DVDs I used for bench testing. In all of its operations, the Toshiba performed flawlessly. Still-frame, slow-motion, and high-speed scanning were smooth and solid—among the best I've seen from DVD. The picture was perhaps a tad "softer" than from other DVD players I've used, but without having them available for comparison, I can't be sure.

What I called "video aliasing" on the test bench was visible on my TV as a beat pattern in the structure of densely packed lines. Although the pattern could be seen when playing the chapters of the Sony disc that I used for bench testing, I can't say that I ever saw an anomalous pattern appear in a real movie. And though some of the same moving pictures I used with other players struck me as slightly soft when reproduced on the Toshiba, on still pictures the SD-3006's video response extended well beyond 4.2 MHz; on the Snell & Wilcox test pattern, for example, response was solid to the topmost, 5.75-MHz, band. Whether the slight difference in sharpness was caused by motion or my imagination, I can't say. Suffice it to say that the picture was sharper than laserdisc's and a pleasure to view.

The Dolby test disc contains a series of recordings that have "difficult bitstreams," which tax a decoder's computational power. The Toshiba SD-3006 cleared them all through to its analog output and supplied a solid enough bitstream to the Sony SDP-EP9ES that it had no difficulty either. And the Toshiba's 5.1-channel to Dolby Surround downmixing was right on, as judged using the Dolby disc's test signals.

The Dolby disc also has signals to check reaction to uncorrected data errors. It's not clear what level of performance Dolby Labs expects of a player in this regard; the company merely suggests that the observer "Record the nature of the disruption in the audio output for each of these 5 chapters." Dolby goes on to say that a "player may repeat blocks or frames at the time of the error, but under no circumstance should it cease decoding audio." On that basis, the

MEASURED DATA

PCM AUDIO

Output Level: 2 V at 0 dBFS.

Channel Balance: ± 0.05 dB.

Line Output Impedance: 330 ohms.

Frequency Response: 20 Hz to 20 kHz, +0.05, -0.32 dB.

THD + N at 0 dBFS: Less than 0.205%, 20 Hz to 20 kHz.

THD + N at 1 kHz: Below -86.8 dBFS from 0 to -90 dBFS and below -93.1 dBFS from -30 to -90 dBFS.

Maximum Linearity Error: Undithered recording, 1.07 dB to -90 dBFS; dithered recording, 0.24 dB to -100 dBFS.

S/N Ratio: A-weighted, 97.3 dB; CCIR-weighted, 88.2 dB.

Quantization Noise: -75.1 dBFS.

Dynamic Range: Unweighted, 92.8 dB; A-weighted, 96.4 dB; CCIR-weighted, 86.7 dB.

Channel Separation: Greater than 87.5 dB, 125 Hz to 16 kHz.

DVD VIDEO

Luminance Frequency Response: +0, -0.9 dB, 0.5 to 4.2 MHz.

Luminance Level: No measurable error.

Chroma Level: +2.3 dB.

Gray-Scale Linearity: No measurable error.

Chroma Phase Accuracy: Within 2°.

Chroma Differential Gain: No measurable error.

Chroma Differential Phase: No measurable error.

Toshiba SD-3006 passed the test, since it never ceased decoding. However, it did mute on a regular or irregular basis (depending on the test) and on some chapters interrupted the sound with machine-gun rapidity. I need to use this disc with more players to know whether the SD-3006's reaction was good or bad. And, of course, uncorrected data errors should be an unusual occurrence in normal playback, anyway.

Some say the "V" in "DVD" stands for "versatile," and versatility has its flip side: operational complexity. Thanks to extensive cross-referencing between diagrams of the various controls and the pages on which their functions are described, Toshiba's manual strikes me as far better than average. Added to the player's fine performance, that goes a long way in making the SD-3006 a joy to use. A

SONY, continued from page 45

my soundtracks neat. The engineers who made them presumably knew what they were doing, so why should I smother their creations with artificial enhancement? Obviously, opinions differ, and not all movies are mixed with the same degree of taste. For video use, it's fair to say that Sony gives you a reasonably wide assortment of preset modifications, though you can't mix your own cocktail, as you can with some other digital processors.

But the most important characteristic of any digital signal processor is how it sounds, and the Sony SDP-EP9ES sounds great. It uses Motorola Symphony DSPs for Dolby Digital decoding, but I doubt they're the reason for the great sound. Decoding AC-3 is a strictly mathematical process, and any DSP that follows the decoding rules laid

**THE SDP-EP9ES'S SOUND
GIVES EVEN THE FINEST
CD AND LD PLAYERS
A RUN FOR THEIR MONEY.**

down by Dolby Laboratories ought to deliver the same six digital PCM bitstreams. It's what happens after that—digital filtering, conversion to the analog domain, and analog amplification—that governs sound quality. And in my book, the digital filters and Current Pulse D/A converters in the SDP-EP9ES are flat-out better than those found in the average CD or laserdisc player. Thus, patching the Sony into your system is more likely to improve sound quality than degrade it. I think you'll find that the SDP-EP9ES gives even the finest CD and laserdisc players a run for their money.

The SDP-EP9ES doesn't provide every nicety that the advanced videophile might want. THX aficionados are likely to miss their favorite Lucasfilm-blessed enhancements, couch potatoes may object to yet another remote to manipulate and having to select audio and video separately, and almost everyone will probably rue the lack of on-screen displays. That said, I still consider the Sony SDP-EP9ES the best way I've found of readying an existing audio system for the new digital surround age. A

BASCOM H. KING

CLASSÉ AUDIO CDP-.5 CD PLAYER AND CAP-100 INTEGRATED AMP



I was particularly interested in reviewing these two relatively affordable Classé Audio products because I've been using a Classé DAC-1 D/A converter for some months and have been very impressed with its performance.

The CAP-100 amp, rated at 100 watts per channel into 8-ohm loads, has a pair of balanced inputs, a front-panel switch that selects operation as an integrated amplifier or as a separate preamplifier and power amplifier, and a remote control. (The phono preamp board, which is optional,

was supplied with the unit I tested but not with the one *Audio* photographed.)

The CDP-.5 CD player's remote control can also operate the volume and muting controls of the CAP-100 and Classé's remotely controlled preamps. The player's assortment of outputs is unusual, consisting of balanced and unbalanced analog jacks but only an AES/EBU balanced digital jack.

Both components have attractive, silver-anodized front panels, 3/8 inch thick, with simple layouts. The CAP-100's front panel is symmetrical, with knobs for the selector

switch, the balance controls, and the volume control and with buttons and LED indicators for the tape monitor, separate or integrated operation, muting, and power. On the rear panel are eight pairs of high-quality RCA jacks, two XLR balanced input jacks made by Neutrik, left and right five-way speaker binding posts, and an IEC power-cord connector.

Like the CAP-100, the CDP-.5 has a pleasing front-panel layout, with the CD drawer and display window matched in size and placed symmetrically. The drawer is opened and closed by the "Load" button, just to its left. Buttons under the display control the normal transport functions and "Standby" (on/off). The supplied remote carries the "Standby" button and the same basic transport controls (stop, previous track, play/pause, and next track) as the front panel. The remote also has buttons for audible fast forward and reverse, disc scanning, repeat and random play, programming, and muting and volume for the amp.

Both units have nice, logical layouts, beautiful build quality, and many high-quality parts.

Measurements

The CAP-100 amplifier's frequency response is plotted in Fig. 1 for the preamp and amp sections together (with 8-ohm loading) and for the preamp alone (with

AMPLIFIER

Rated Power: 100 watts/channel into 8 ohms, 150 watts/channel into 4 ohms.

THD + N at 1 kHz: Preamp section, 0.006% at 0.7 V rms out; amp section, 0.002% at 20 V rms out.

Dimensions: 19 in. W x 17 in. D x 5 in. H (48.3 cm x 43.2 cm x 12.7 cm).

Weight: 34 lbs. (15.5 kg).

Price: \$1,995; optional phono stage, \$200.

CD PLAYER

Dimensions: 19 in. W x 11½ in. D x 4 in. H (48.3 cm x 29.2 cm x 10.2 cm).

Weight: 16 lbs. (7.3 kg).

Price: \$1,995.

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

For literature, circle No. 93

**CLASSÉ'S AFFORDABLE
AMP AND CD PLAYER
HAVE LOGICAL LAYOUTS
AND BEAUTIFUL
BUILD QUALITY.**



**THE CAP-100 AMP'S
SQUARE-WAVE RESPONSE
WAS EXEMPLARY
AT BOTH HIGH AND
LOW FREQUENCIES.**



IHF loading); the preamp's response was essentially the same when I used an instrument load. The response shown was measured via the unbalanced inputs; response via the balanced inputs was about 1 dB higher at 200 kHz. The frequency response remained virtually unchanged for volume-control positions from fully clockwise all the way down to 50 dB of attenuation—good performance.

Rise and fall times of the CAP-100's preamp section at ± 2 volts were 4 microseconds. With the output level at ± 5 volts, slewing occurred, at a rate of about 2.3 volts/microsecond with either instrument or IHF loading. Square-wave response of the output amplifier was exemplary, with no low-frequency tilt visible at 20 Hz. High-frequency square-wave response was essentially unaffected by the 1,000-picofarad capacitance in the IHF load, and square waves retained their normal, exponential, shape up to the onset of slewing.

The preamp section's total harmonic distortion plus noise (THD + N) versus frequency is shown in Fig. 2 for instrument loading; it was the same with an IHF load and was little different with a 600-ohm load except for clipping about half a volt sooner. With this kind of load independence, the CAP-100's preamp section should be able to competently drive any interconnect cable and power amplifier.

The common-mode rejection ratio of the CAP-100's balanced inputs was excellent, better than -75 dB from 20 Hz to 20 kHz. Volume-control tracking was within 0.6 dB at settings down to -50 dB, within 1 dB from there to -60 dB, and within 5 dB at -80 dB. The line section's interchannel crosstalk measured less than -74 dB from 20 Hz to 1 kHz, rising at the usual rate of 6 dB/octave to -50 dB or so at 20 kHz, depending on channel and volume-control position.

The impedance of the main preamp output was 46 ohms. At the tape outputs, impedance was a rather high 4.7 kilohms. Input impedance was 32.5 kilohms for the unbalanced jacks and 23.5 kilohms for the balanced jacks. The power amplifier section's input impedance was 124 kilohms.

RIAA equalization error of the CAP-100's phono section, measured at the tape outputs, is plotted in Fig. 3 for MC mode; it was virtually the same in MM mode. Overload (2% THD + N) versus frequency was essentially textbook perfect in both MM and MC modes, with output constant at 8 volts rms from 20 Hz to 20 kHz. The 1-kHz input levels for 2% THD + N were 85 millivolts in MM mode and 23 millivolts in MC mode. Reproducing a wideband, pre-equalized square wave, the preamp exhibited symmetrical high-frequency compression, starting at an output of about 1 volt, peak to peak, in MM or MC mode. Measured distortion was quite low in either mode, less than 0.01% from 20 Hz to 20 kHz at an output of 2 volts or less. Interchannel crosstalk in either phono mode was generally down more than 70 dB from 20 Hz to about 4 kHz, increasing to about -58 dB at 20 kHz. Worst-case crosstalk, -54 dB, occurred at 8 kHz in MM mode with a dummy MM source.

For the amplifier as a whole, frequency response was essentially the same as in Fig. 1 for loads other

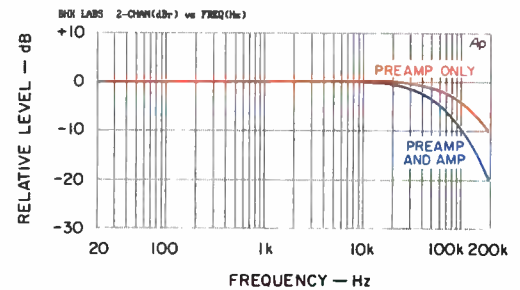


Fig. 1—Frequency response of CAP-100 preamp section with IHF load and of entire amp with 8-ohm load.

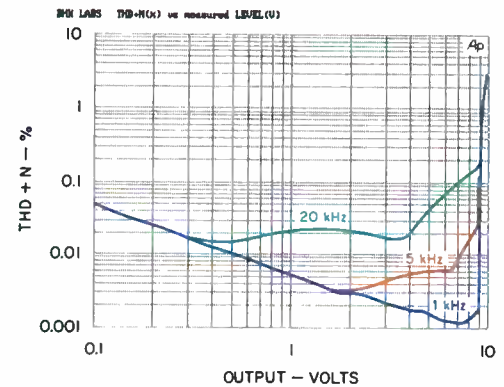


Fig. 2—THD + N vs. preamp output, instrument or IHF load.

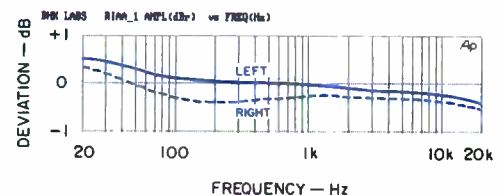


Fig. 3—RIAA equalization error, MC phono mode.

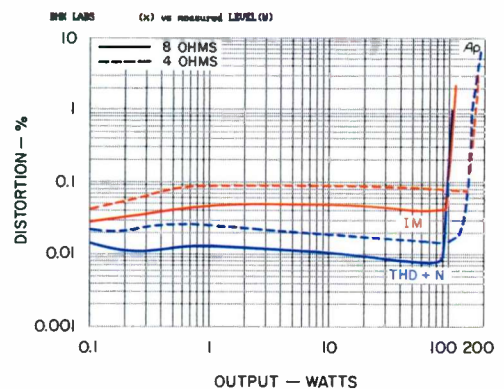


Fig. 4—Amplifier distortion vs. power output.

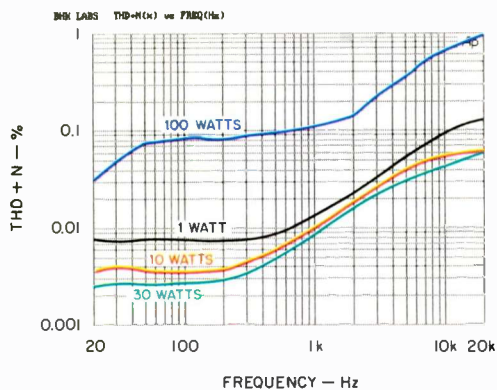


Fig. 5—Amplifier THD + N vs. frequency, 8-ohm load.

Table I—Gain, CAP-100 amplifier.

	Gain, dB	
	LEFT	RIGHT
Preamp Section with IHF Load		
Unbalanced In to Main Out	15.44	15.43
Unbalanced In to Tape Out	-5.31	-5.35
Balanced In to Main Out	9.42	9.41
Balanced In to Tape Out	-7.94	-7.98
MM Phono In to Main Out	57.44	57.27
MM Phono In to Tape Out	36.69	36.5
MC Phono In to Main Out	68.21	68.0
MC Phono In to Tape Out	47.45	47.22
Power Amplifier Section	29.32	29.31

Table II—Sensitivity, CAP-100 amplifier.

	Sensitivity, mV	
	LEFT	RIGHT
Preamp Section with IHF Load		
Unbalanced In to Main Out	84.49	84.62
Unbalanced In to Tape Out	921.83	925.93
Balanced In to Main Out	168.98	169.2
Balanced In to Tape Out	1,247.5	1,253.13
MM Phono In to Main Out	0.67	0.68
MM Phono In to Tape Out	7.32	7.48
MC Phono In to Main Out	0.19	0.2
MC Phono In to Tape Out	2.12	2.18
Power Amplifier Section	96.76	96.83

than 8 ohms. For the power amp section alone, the upper bandwidth limit (-3 dB point) was about 70 kHz. Rise and fall times were 5.2 microseconds into 8-ohm loads at an output level of ± 5 volts. Compared to most amplifiers, there was quite a bit less ringing than usual when I connected a 2-microfarad capacitor across an 8-ohm load. Overshoot was about 4%, and there was no subsequent ringing, which is excellent. At

the low-frequency end of the spectrum, square waves at my standard test frequency of 40 Hz had no discernible tilt.

The CAP-100's frequency response and output level didn't change much with load, signs of a high damping factor. Sure enough, I measured the CAP-100's damping factor at just under 300 in the left channel and 200 in the right channel up to about 300 Hz; it decreased smoothly to about 45 in either channel at 20 kHz.

The amplifier's distortion (THD + N at 1 kHz and SMPTE IM) is plotted in Fig. 4 as a function of power output. Figure 5 shows THD + N as a function of frequency at several power levels.

Interchannel crosstalk in the power amp section was similar in both testing directions. It was down more than 70 dB from 20 Hz to 3 kHz, rising to -55 dB at 20 kHz.

Dynamic power attainable was 126 watts into 8-ohm loads. With a 4-ohm load, it was 210 watts at the beginning of the 20-millisecond tone burst and 200 watts at its end. These results correspond to a dynamic headroom of 1 dB for 8-ohm loads and 1.5 dB for 4-ohm loads. The onset of visible clipping on my oscilloscope was 105 watts at 8 ohms and 150 watts for 4 ohms, for clipping headroom of 0.21 and 0 dB, respectively. The CAP-100 drew about 0.5 ampere of AC at idle.

Gain measurements for the power amp, and for all preamp input/output combinations, are listed in Table I. To obtain overall gain, add the power amp section's gain to the preamp section's gain from the desired input to the main output. Similarly, for overall sensitivity, multiply the appropriate preamp measurement in Table II by 0.1936.

The worst-case IHF signal-to-noise ratios for the amp as a whole were 75.6 dB via either balanced or unbalanced line input,

73 dB for MM phono, and 63.5 dB for MC phono. For the preamp section alone, the readings were 88.3 dB for unbalanced line input, 86.2 dB for balanced line input, 75.6 dB for MM phono, and 63.5 dB for MC phono. The S/N of the power amp section alone was 91.8 dB.

Figure 6 shows the CDP-5 CD player's frequency response for recordings without pre-emphasis (the usual case) and with it (which is rare, except for early CDs). These measurements were made with instrument



THE CLASSÉ AMP HAD EXCELLENT DIMENSION, RESOLUTION, DETAIL, AND SPACE PLUS IMPRESSIVE BASS.

loading and the player's unbalanced output. IHF loading dropped the output level by 0.05 dB but did not change the shape of the curves, and response at the balanced output was identical. Square-wave response had the usual linear polarity characteristic, i.e., symmetrical ringing about the vertical center line of each half cycle of the wave. The ringing on the 0-dBFS (full-scale) square-wave test signal was not clipped off, which seems to be characteristic of Pacific Microsonics' new PMD-100 digital filter and HDCD decoder (see "Technical Highlights"), as opposed to the more commonly used NPC digital filters. The CDP-5 did not invert signal polarity.

The player's THD + N versus frequency at 0 dBFS is plotted in Fig. 7 for a 22-kHz measurement bandwidth. Figure 8 shows THD + N at 1 kHz as a function of digital signal level. Distortion was essentially the same with instrument or IHF loading. De-

ASSOCIATED EQUIPMENT USED

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

CD Transports: Sonic Frontiers SFT-1 and PS Audio Lambda Two Special

CD Electronics: Genesis Technologies Digital Lens anti-jitter device; Sonic Frontiers SFD-2 MkII and Classé Audio DAC-1 D/A converters

Phono Equipment: Oracle turntable, Well Tempered Arm, Accuphase AC-2 moving-coil cartridge, Vendetta Research SCP-2C phono preamp, and phono stage of Anthem Pre 1 preamp

Additional Signal Sources: Nakamichi ST-7 FM tuner, Nakamichi 250 cassette deck, and Technics 1500 open-reel recorder

Preamplifiers: Sonic Frontiers Line-3 and Forssell balanced tube line driver

Power Amplifiers: Sonic Frontiers Power-3 mono tube amplifiers, Sumo Gold Class-A amplifier (updated by its designer, James Bongiorno), Houston GSP-02 stereo tube amp, and Arnoux 7B digital switching amp

Loudspeakers: Audiostatic ES-500s and B&W 801 Matrix Series 3s

Cables: Digital interconnects, AES/EBU balanced Illuminati DX-50; analog interconnects, Transparent Cable Music-Link Reference (balanced), Tara Labs Master and Music and Sound (unbalanced); speaker cables, Transparent Cable MusicWave Reference and Tara Labs RSC Master Generation 2

viation from linearity for low-level signals is revealed by the fade-to-noise test (Fig. 9). Overall, the CDP-.5's distortion and linearity are reasonably good but are not state of the art.

This CD player's dynamic range measured 100.1 dB for the left channel and 99.9 dB for the right; quantization noise was -90.5 and -90.3 dBFS, respectively. Signal-to-noise ratios remained essentially the same whether the CDP-.5 was paused or playing the infinity-zero track of the CBS CD-1 test disc, which is unusual. Wideband S/N was 98.4 dB for the left channel and

96.4 dB for the right; A-weighted S/N was 108.1 and 105.9 dB, respectively. The excellent wideband figures attest to the player's effective filtering of out-of-band sampling-frequency and harmonic components; a third-octave spectrum analysis of output noise up to 200 kHz verified this.

Output voltage at digital full scale was 1.944 volts in the left channel and 1.947 volts in the right, for the player's unbalanced analog outputs with instrument loading. For the balanced analog outputs, also with instrument loading, the corresponding readings were 3.886 and 3.880 volts.

Interchannel crosstalk was outstanding, measuring less than -100 dB from 125 Hz to 16 kHz. Impedance at 1 kHz was 45 ohms for unbalanced analog output and 89 ohms for balanced.

In the jitter spectrum (Fig. 10), which I measured from the latchenable signal at the DAC chips with the CD transport on pause, 0 dB corresponds to 10 nanoseconds, peak to peak, equivalent to 3,540 picoseconds rms. (On this scale, a jitter component 60 dB down would be at 3.54 picoseconds rms, a component at -70 dB would represent 1.12 picoseconds, and so forth.) Between 200 Hz and 20 kHz, the CDP-.5's jitter is mostly random and very low—better than in most of the separate D/A converters I've measured and exactly what you'd hope for in a well-designed, all-in-one CD player. Summing all the components above -70 dB yields an rms jitter of about 14.6 picoseconds, which is good.

Use and Listening Tests

I first used the Classé Audio CAP-100 as a power amplifier driving Audiostatic ES-500 loudspeakers. The sound, which was quite good, had excellent dimension, resolution, and detail.

Next I used the CAP-100 as an integrated amplifier with B&W 801 Series 3s, which present a more

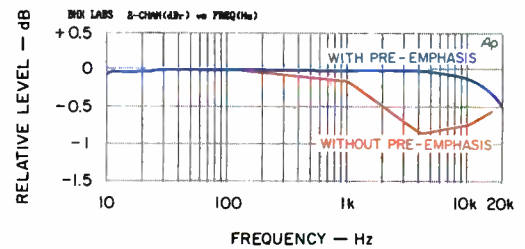


Fig. 6—Frequency response of CDP-.5 CD player.

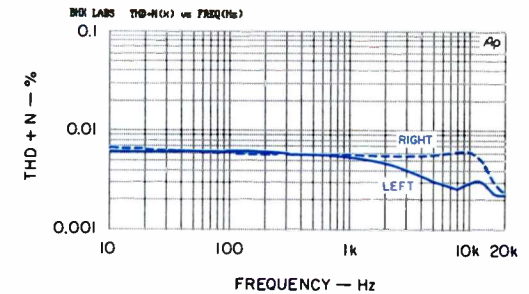


Fig. 7—CD player THD + N vs. frequency.

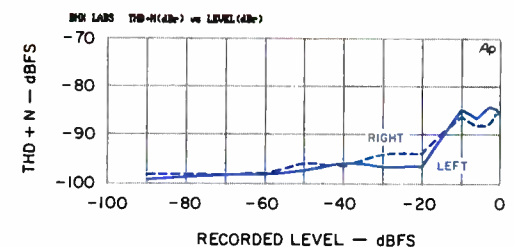


Fig. 8—CD player THD + N vs. level.

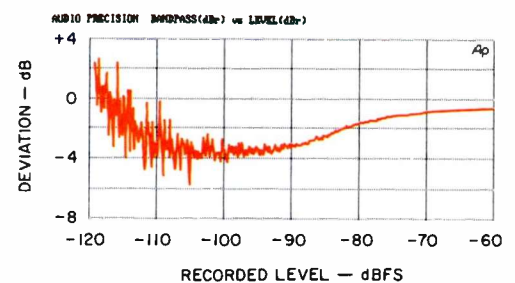


Fig. 9—Fade-to-noise test.

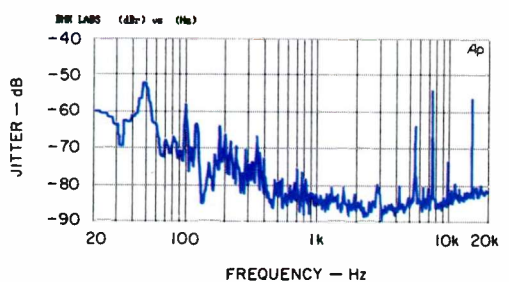


Fig. 10—Jitter spectrum.

TECHNICAL HIGHLIGHTS

The Classé Audio CAP-100 amplifier's input and output jacks are hard-wired to a small circuit board that carries switching relays and, for the balanced inputs, op-amp circuits that convert differential to single-ended signals. The relay-selected signal is fed to another board, just behind the front panel, which carries the line stage's circuitry and the volume and balance controls. The line amplifiers appear to be op-amp circuits utilizing PMI OP27s, whose outputs are buffered by complementary Darlington transistors. A pair of 15-volt regulators on this board supplies voltage to the line amps.

The optional phono preamp, when supplied, mounts on top of the input/output board, at the rear of the CAP-100's chassis. Like the line amp's board, it uses OP27 op-amps (two per channel) and a pair of TO-220 output transistors. However, the 15-volt regulators for the phono section reside on the input/output board.

No op-amps are employed in the power amp section, which has only discrete components. This circuit appears to be a fully complementary design using J-FETs at the input, bipolar transistors for the intervening voltage amplification stage, a pair of MOS-FET driver devices, and a pair of large plastic Sanken bipolar output transistors. The power-supply circuitry for these output transistors, on a p.c. board just in front of the generously sized toroidal power transformer, has a separate rectifier and bank of filter capacitors for each channel. Each filter bank consists of six 4,700-microfarad, 63-volt capacitors. Another rectifier and a single pair of these capacitors supply power to the power amp section's initial stages. A fourth rectifier and a pair of 2,200-microfarad, 35-volt filter capacitors provide DC power for the preamplifier section.

The power for the input/output board's signal-switching relays is sup-

plied from a board at the left rear of the CAP-100's chassis. A small auxiliary power transformer on this board, which is always connected to the power-cord socket, drives a relay that turns on the amp by switching on the main power transformer's primary when you push the front-panel "Power" button.

In designing the CDP-.5 CD player, Classé consulted with UltraAnalog, maker of well-known DAC and digital receiver modules used in many top D/A converters. The transport mechanism is the Philips CDM 12.4 (also used in many other current CD players and transports), which is controlled by UltraAnalog servo circuitry. The CD decoder chip is clocked by a low-jitter crystal oscillator that has its own linear power-supply regulator. The decoder feeds data, master-clock, bit-clock, and left- and right-channel clock signals to a Pacific Microsonics PMD-100 digital filter/HDCD decoder chip. This chip upsamples the data to eight times the 44.1-kHz CD sampling frequency and then feeds it to two Burr-Brown PCM 1702 digital-to-analog converter chips. Following the DACs, two Burr-Brown OPA 604 op-amps per channel handle current-to-voltage conversion, output filtering, and buffering. Extra current is pulled from these op-amps to the negative supply, a fairly well-known trick that makes the op-amps' output stages act somewhat as if they were biased in Class A.

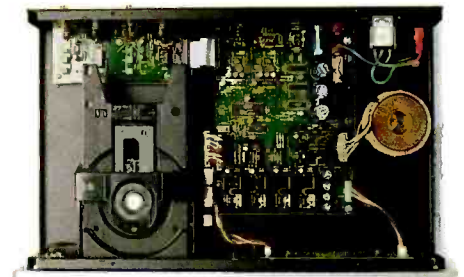
Much thought went into the design of the CDP-.5's power supply and its grounding scheme. The transformer is a toroidal type with multiple secondary windings. Three separate rectifier and filter-capacitor supplies, and many voltage regulators, isolate the various digital circuits from each other and from the widely varying demands of the transport mechanism's current-hungry servo circuits. *B.H.K.*

typical load; with these loudspeakers, the amplifier had plenty of punch and drive and could play much louder than my normal listening levels. The bass was impres-

sively good and plentiful, and the overall sound was smooth and listenable, with relatively little irritation. The amplifier did not sound as transparent and revealing as the

Sonic Frontiers Line-3 preamplifier in combination with some other power amplifiers; then again, the Classé costs considerably less than the separate components. I thought the CAP-100 sounded better as a power amplifier with the Line-3 preamplifier than it did with its own preamplifier section. On the other hand, the Classé's phono section reproduced records surprisingly well, with low noise.

The CDP-.5 CD player sounded quite good, with very solid bass and good space and dimensionality. As much as I want to believe that a properly designed and constructed CD player can theoretically be better than a separate CD transport and D/A converter, I thought that the combination of the PS Audio Lambda 2 Special transport, Genesis Digital Lens anti-jitter device, and Classé Audio DAC-1 D/A converter had superior resolution and delicacy—but again, the price is much higher.



THE CDP-.5'S JITTER IS MOSTLY RANDOM AND IS LOWER THAN IN MOST SEPARATE D/A CONVERTERS.

I was mildly bothered that the LEDs on the CAP-100 glow red for normal operation and green for its converse (i.e., green when muted and red when unmuted), but then, Classé has always done this. My other nitpick is that the amp has no connection for a ground wire from a turntable.

The CAP-100 and CDP-.5 performed flawlessly, in the lab and in my listening room. They are well-designed and well-made components that should give years of trouble-free musical enjoyment to audiophiles who don't want to go to the expense and complexity of separate power amps, preamps, CD transports, and D/A converters. A

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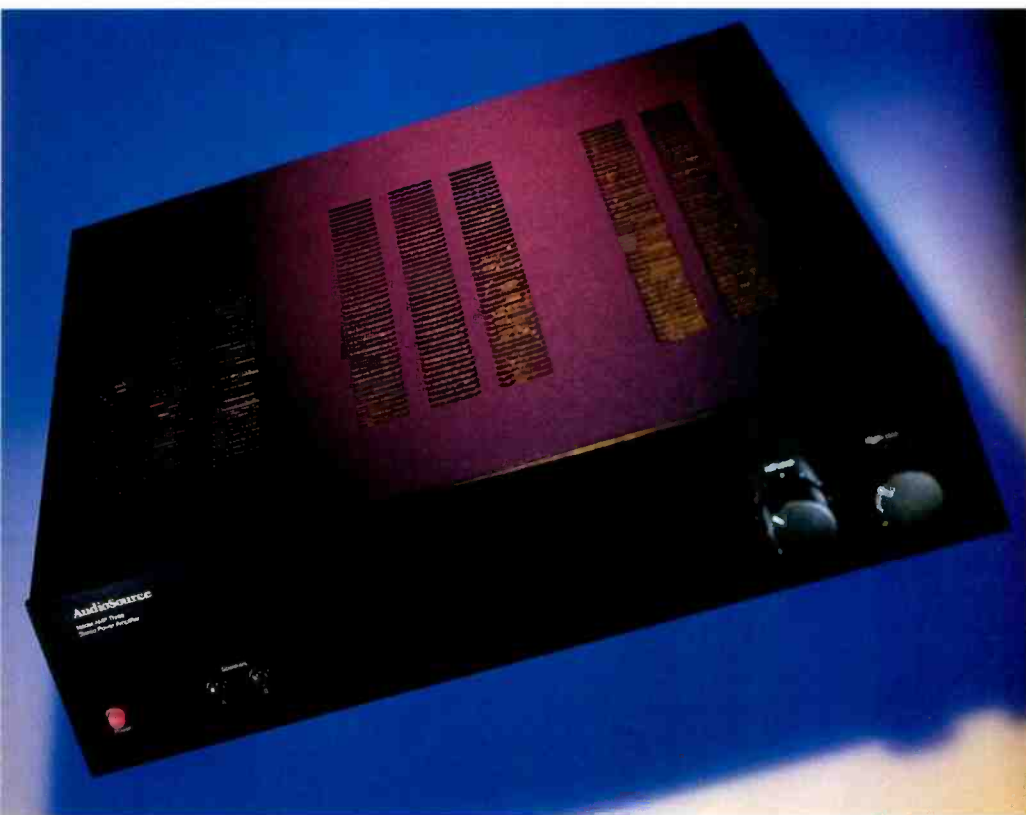
PURE MISCHIEF.

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DANIEL KUMIN

AUDIOSOURCE AMP THREE AMPLIFIER



For more than 20 years, AudioSource has quietly been producing high-value, good-performing audio and home theater equipment. The San Francisco-based company is probably best known for its affordable surround sound decoders and processors, components that may not garner a lot of attention but have likely introduced thousands to the pleasures of serious surround sound. Rather less well known is AudioSource's lineup of traditional audio separates: preamps, tuners (and a tuner/pre-amp combo), equalizers, and power amplifiers. The focus of my attention here is the AMP Three power amplifier.

**THE AUDIOSOURCE
WAS VERY, VERY QUIET,
YIELDING NOT
A WHISPER OF NOISE
AT ANY VOLUME LEVEL.**

This model is a very straightforward proposition: a no-frills, two-channel power amplifier designed to deliver substantial wattage with a minimum of fuss and for a minimal cost. The AMP Three is rated to produce 150 watts per channel, both channels driven, from 20 Hz to 20 kHz. Curiously, AudioSource's specs, at least as they appear in the AMP Three's owner's manual, omit the usual interdependent power and distortion stipulations: THD is listed as "less than 0.04%," but no mention is made of the wattage to which this figure is guaranteed. Nor does AudioSource's power spec include a maximum distortion figure. (On the test bench I

found that the two do indeed appear to go together in the usual way.) Also conspicuous by its absence is any reference to the load impedance used to derive these figures (my tests suggest 8 ohms).

The AMP Three's front panel is dominated by two sizable knobs on the right that manage input attenuation with continuous, unstepped control. On the left is the main power button, which has a concentric LED that changes from green (standby) to red (on), the opposite of what you might expect. Two adjacent switches handle speaker selection and are also equipped with illuminated telltales. Around back are two sets of five-way binding posts for speaker output, corresponding to the speaker switches on the front. These are parallel wired, permitting either-or-both operation; the manual warns that total impedance should not fall below 2 ohms but offers no guidance on how to derive this important data. Also on the rear panel are two pairs of unbalanced RCA input jacks, "Line In" and "Line Out." These are simply parallel-wired jacks, so either pair can serve either function. This pass-through arrangement could be beneficial where multiple amps or an active subwoofer are part of the system, obviating the need to use Y connectors. A tiny toggle switch selects bridging mode, which combines the AMP Three's two channels into a monaural amplifier rated at 400 watts (again, no specs for distortion or bandwidth were in evidence). A small slide switch, set flush into one corner of the rear panel and marked "Manual/Auto Power," invokes the automatic on/off sensor mode, in which the AMP Three powers itself up automatically from standby mode in response to a signal at its inputs—a nice convenience.

Rated Output: Stereo, more than 150 watts/channel, both channels driven; bridged mono, more than 400 watts.

Rated Distortion: Less than 0.04% IM or THD.

Dimensions: 16½ in. W x 4 in. H x 13¼ in. D (41.9 cm x 10.2 cm x 33.7 cm).

Weight: 28.3 lbs. (12.8 kg).

Price: \$499.

Company Address: 1327 North Carolan Ave., Burlingame, Cal. 94010; 415/348-8114.

For literature, circle No. 94

MEASURED DATA

Measurements were made with both channels driven and a bandwidth of 20 Hz to 80 kHz, except where noted. Data is for worst-case channel.

Output Power at Clipping (1% THD + N at 1 kHz): Into 8 ohms, 165 watts per channel; into 4 ohms, 247 watts per channel; into 8 ohms bridged, 495 watts.

Dynamic Power: Into 8 ohms, 210 watts per channel; into 4 ohms, 338 watts per channel; into 8 ohms bridged, 510 watts.

Dynamic Headroom: Into 8 ohms, 1.5 dB; into 4 ohms, 1.3 dB; into 8 ohms bridged, 1 dB.

THD + N, 20 Hz to 20 kHz: Into 8 ohms, less than 0.07% at rated output and less than 0.04% at 10 watts out; into 4 ohms, less than 0.07% at 10 watts out.

Frequency Response at 1 Watt Out: 20 Hz to 20 kHz, +0, -0.4 dB; flat to below 10 Hz; -3 dB at 30 kHz.

Sensitivity: 110 millivolts for 0 dBW (1 watt) into 8 ohms and 1.29 V for rated output.

A-Weighted Noise: -93.5 dBW (into 8-ohm load).

Input Impedance: 34 kilohms.

Output Impedance at 1 kHz: 44 milliohms.

Damping Factor re 8 Ohms: 172 at 50 Hz and 157 at 20 kHz.

Channel Separation at 1 Watt: Greater than 52 dB, 20 Hz to 20 kHz.

Channel Balance at 1 Watt: Better than 0.01 dB at 1 kHz.

AudioSource assembles the AMP Three on a very simple all-metal chassis that has conventional sheet-metal panels, a wrap-around top/side cover, and bolt-on front and rear panels; it is made in Taiwan. Metalwork is of average gauge and rather plain, but its quality is workmanlike. The amp is finished simply, in black-spatter paint with a black-anodized fascia.

Under the hood the AMP Three appeared quite conventional. I had no information regarding design, but based on an admittedly superficial visual inspection, I took it to be a standard Class-AB layout. Six

bipolar output devices for each channel were arrayed on the heat sinks, which were fully enclosed inside the vented chassis. One-third of the interior held the power supply, a single, hefty-looking toroidal transformer and four 6,800-microfarad storage capacitors. Parts quality was typical of today's value-designed gear, with run-of-the-mill components appearing in most locations and a handful of higher-spec parts at critical circuit points. A bit unexpectedly, the AMP Three appeared to be an all-discrete design; numerous individual transistors were in evidence but only a single IC op-amp per channel, which I assume performs the DC-servo chores. Wiring quality and care of assembly looked quite good, although the board and connectors looked generally unremarkable.

AudioSource's AMP Three includes protective speaker relays wired internally behind the speaker binding posts. Further, 8-ampere slow-blow fuses are located between the transformer and the power supply. Another relay interrupts the power supply in response to the automatic turn-on circuit or, in manual mode, to the turn-on delay. Each channel's heat sink carries a thermal sensor, which AudioSource informed me is used to reduce the drive level in response to overheating. As best I could tell, I was unable to trigger this protection mechanism, either on the bench or in the listening room.

Measurements

An afternoon spent at the test bench with the AMP Three produced results that for the most part were very fine and seemed predictable for a high-value, high-power amplifier.

Frequency response (Fig. 1) is exceptionally flat, even for a power amp. It's perfectly linear, though down 0.4 dB at 20 kHz. Even more notable is channel balance of better than 0.01 dB—essentially perfect. (The AMP Three's input attenuators are unstepped, so checking channel balance at levels other than full-up would be meaning-

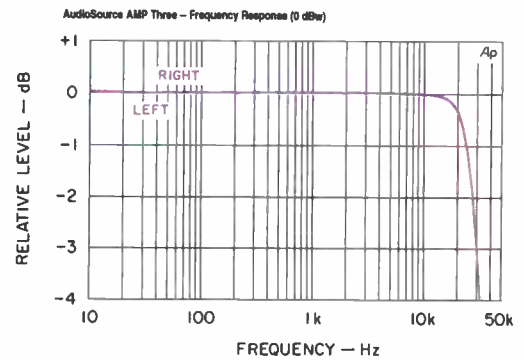


Fig. 1—Frequency response.

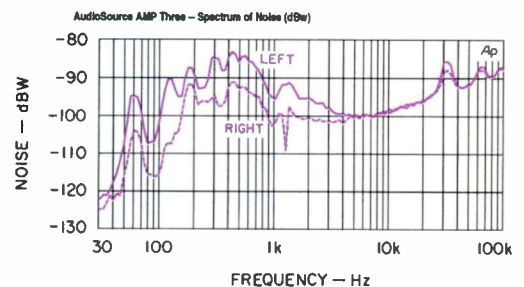


Fig. 2—Noise spectra.

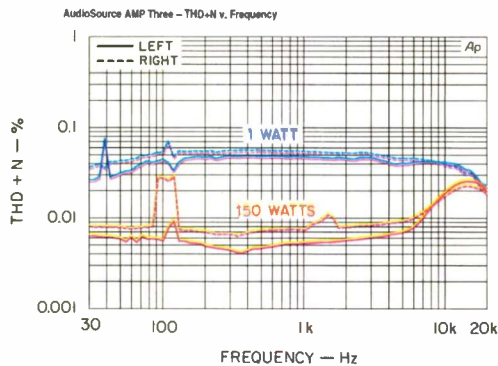


A switch on the AMP Three's rear panel enables automatic power-up from standby mode.

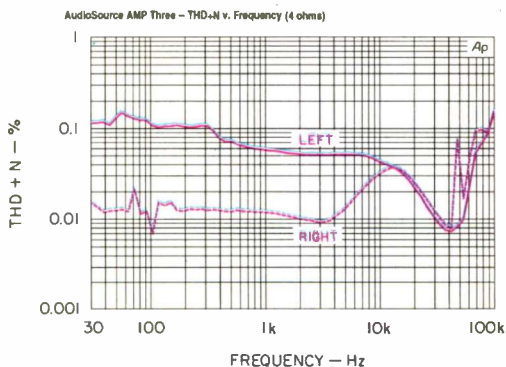
less.) The AudioSource rolled off at almost exactly 18 dB per octave above about 30 kHz, which I assume was the effect of an input-stage ultrasonic filter. Such a filter is not, generally speaking, a bad idea in my book, because in our digital age you never know what ultrasonic hash is coming from upstream.

Figure 2 is a spectral analysis of the AMP Three's noise at idle, in dBW (referred to 1 watt output). Though this performance does not equal the best I've seen from more costly amps, it is quite respectable and safely better than -90 dB at almost all frequencies. I did not find the power-line bumps at 60, 120, 180, and 300 Hz to be audible under any listening conditions.

My signal-to-noise tests confirmed the noise spectra in Fig. 2: 95 and 93.5 dB,



A



B

Fig. 3—THD + N vs. frequency in stereo mode into 8 ohms (A) and in stereo mode into 4 ohms at 175 watts (B).

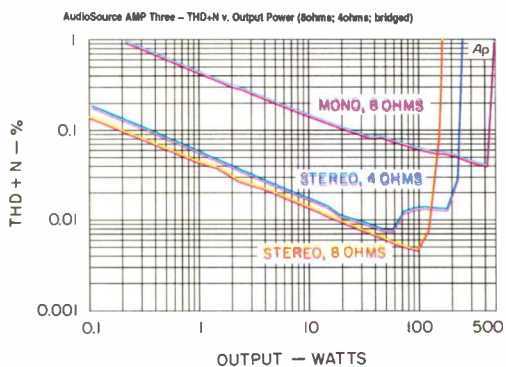


Fig. 4—THD + N vs. output at 1 kHz.

A-weighted, for left and right channels, respectively. Channel separation was also very good, with a minimum of about 52 dB at high frequencies and a maximum of about 80 dB at low frequencies (at full output); the channels matched closely.

Figure 3A shows total harmonic distortion plus noise (THD + N) versus frequency at outputs of 1 and 150 watts, both into 8-ohm loads. Distortion at other power levels fell quite neatly between these two

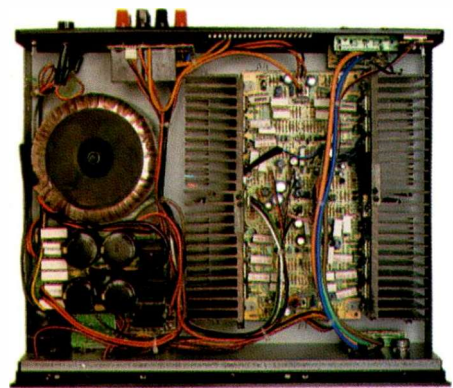
curves. When I measured THD + N into 4-ohm loads, the AMP Three twice blew its output fuses when I attempted testing high-frequency distortion at power levels above 200 watts. Since I assumed these fuses were present as much to protect the output transistors as the loudspeakers, I decided not to proceed any further down that road. Figure 3B, therefore, is for a single test level, 175 watts, into 4 ohms. The two channels differ by an order of magnitude up to about 10 kHz. This might be caused by component-tolerance variance or by different temperature levels, as the AudioSource's layout is not symmetrical (one heat sink faces the power transformer, the other the outside world).

Figure 4 displays curves of THD + N versus output level at 1 kHz under several conditions: in stereo with 8-ohm loads (both channels driven), in stereo with 4-ohm loads (both channels driven), and in mono into an 8-ohm load. When I measured the distortion from 20 Hz to 20 kHz for the 8-ohm mono and stereo tests and from 20 Hz to 3 kHz for the 4-ohm stereo test, the results were so similar that they would merely have cluttered the graph. The curves presented are pretty typical for bipolar solid-state amps, as were most of the other results I obtained (see "Measured Data").

Use and Listening Tests

I installed the AMP Three in a very simple system, connecting a Proceed CDP Compact Disc player directly to the amplifier via a pair of top-quality RCA interlinks and using the Proceed's volume control to adjust levels. Loudspeakers were the B&W 803 Matrix Series 2s.

The AudioSource was very, very quiet, yielding not a whisper of noise audible from my normal listening position at any volume level. This invoked a dramatic sense of dynamic range, allowing subtle sounds to rise from seemingly total silence. The AMP Three did not seem to impose any



**THE AMP THREE
CLIPPED GRACEFULLY,
WITHOUT PRODUCING
ANY OBVIOUS CRUNCHES
OR OTHER NOISES.**

strong, characteristic sound of its own, though it struck me as quite free of top-octave harshness and on occasion even possessed a touch of warmth.

On rich material, the AMP Three delivered all the expected weight and depth in the bottom few octaves. In particular, it preserved good definition of choral and instrumental voices in Prokofiev's *Alexander Nevsky* (Telarc CD-80143), a rather dense recording. Lighter fare sounded equally good. On Newman and Oltman's *Passions* (Sheffield 10058-2-F), a favorite guitar-duo disc, the treble and plucked transients were clear and balanced. (Here, however, I was not sure if I heard quite the full transient "air" I remembered from my usual amp; switching back and forth was inconclusive.) And the AMP Three delivered plenty of grunt to the B&W speakers. On The Holmes Brothers' latest, *Promised Land* (Rounder CD 2142), I heard lots of very natural impact and "thunk" from the drums and bass, yet this straight-ahead recording's quite fine vocal sound was still retained.

The AMP Three clipped relatively gracefully, without producing any obvious crunches or other untoward noises (or frying any tweeters!) when pushed beyond its limits, but its sound *did* rapidly constrict and harshen in classic clipped fashion. I also felt the amp began sounding a bit

Continued on page 66

The New SCS2— THIEL High Performance for Small Spaces Everywhere



The new SCS2 delivers full-range, high performance sound throughout the home as a stereo, front, center, or rear-channel speaker. Utilizing a coaxially/coincidently mounted tweeter, the SCS2 can deliver complete time and phase coherent reproduction from any position and to any listener location. By eliminating the need for listening in a "sweet spot," the SCS2 provides greater clarity and spatial realism in a wide variety of applications, adding flexibility to true high performance sound. We invite you to try them *anywhere* in your home.



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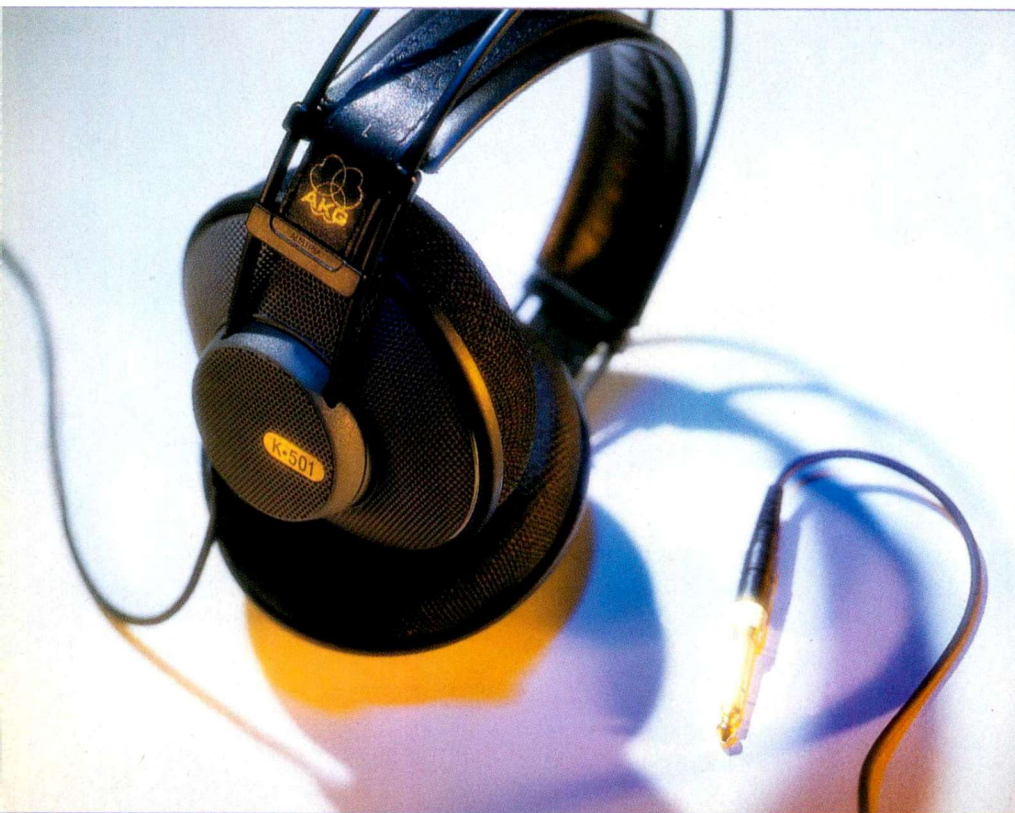
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EDWARD M. LONG

AKG K501 EARPHONES



For many years AKG Acoustics has produced microphones and earphones for consumer audio and professional use from its engineering and manufacturing facilities in Austria. Now a Harman International company, AKG recently introduced three new models to its consumer audio line: the K301 (\$129), the K401 (\$149), and the top-of-the-line K501 (\$179). The K401 and 501 use what AKG calls Varimotion, which incorporates some novel techniques that overcome a longtime problem in the design and manufacture of earphone diaphragms.

The diaphragm moves the air that produces the sound, so it should move uniformly to yield smooth, distortion-free response. That is the goal, but there are conflicting requirements that must be overcome to achieve it. If an earphone diaphragm (AKG calls it a membrane) is too

thin, it can generate separate and conflicting resonant modes across its surface that will cause ragged response and harsh sound. If it is too thick, the annular portion (the outer rim) won't be flexible enough to allow uniform motion, so unwanted distortion results. AKG's Varimotion system allows the center portion of the diaphragm, which must be stiff, to be made thicker than the outer rim, which must be flexible. The center of the K501 diaphragm is 80 micrometers thick; the outer rim is half that and has a series of radial, hand-crimped corrugations with a trapezoidal shape, which AKG says increases the rim's flexibility and enhances its stability. Each of the K501's diaphragms is said to be hand-selected and precision-matched to ensure that the left and right earphones are identical. My measurements verified this: The left and right channels were within 0.3 dB,

which is remarkable. Considering the complexity of the manufacturing process, the AKG K501 earphones are modestly priced.

The ear cushions of the K501 are circumaural and completely encircle the pinna (outer ear); their inside diameter is about 2½ inches, large enough to fit comfortably over my ears without clamping them. The cushions appear to be filled with foam and are covered with a black cloth netting. The inside face of each earcup is also covered with the same material, to protect the transducers from damage or contamination. The rear of the plastic earcups has a grille pattern consisting of a large number of tiny holes. The earcups have a solid feel yet permit sound to pass freely from the rear of the diaphragm to the outside air without reflecting back to the ears, which might contribute a "canned" coloration to the sound. (The K501's sound has very little of this resonant character. If you put your hands over the rear of the earcups while listening, you can hear what they would sound like if they were closed to the outside air.) However, because the rear of the earcups is open, outside sounds can be heard quite easily. For listening in a relatively quiet environment, the K501s are very good. But if you are recording live music, it's advisable to use closed earphones for monitoring unless you are in an acoustically isolated location.

The gimbal arrangement of the K501 enables the earcups to swivel about 15° vertically, while the flexible bails permit about the same scope of horizontal swivel adjustment. I liked the way the leather headband compensated automatically by moving up into the best position when I put the earphones on my head. Overall, the K501 permits a generous range of adjustment to help you achieve maximum comfort.

Transducer Design: Dynamic.
Coupling to the Ear: Circumaural (open air).
Rated Frequency Range: 16 Hz to 30 kHz, -3 dB.
Rated Impedance: 120 ohms.
Weight (Without Cable): 8.3 oz. (235 grams).
Price: \$179.
Company Address: c/o Harman Pro North America, 1449 Donelson Pike, Nashville, Tenn. 37217; 615/399-2199.
 For literature, circle No. 95

Photos: Michael Groen

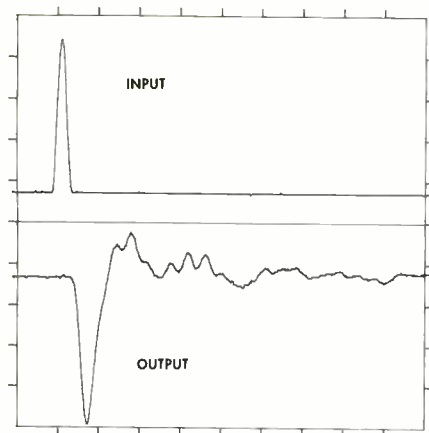


Fig. 1—Cosine-pulse test.

The very flexible earphone cord, which is made with 99.99% oxygen-free copper wire, is about 8 feet (3 meters) long and is permanently attached to the left earcup through a strain relief. The other end of the cord has a gold-plated, 1/8-inch stereo mini-plug with threads; a separate gold-plated, 1/4-inch stereo phone plug can be screwed on over the mini-plug. The 1/4-inch adaptor permits the K501s to be used with standard earphone jacks on most components, while the 1/8-inch plug enables use with mini-jacks on portable CD and tape players.

I measured the K501 earphones before I conducted the subjective evaluations with my listening panel, to ensure that there was nothing obviously wrong with them that might skew the results of the subjective evaluations.

Although AKG specifies an amplitude-versus-frequency range extending from 16 Hz to 30 kHz—albeit without tolerances—I measured the K501 only to 20 kHz. The frequency response exhibited a downward slope above about 5 kHz, with a reasonable phase response to 20 kHz. The frequency response was elevated between 2 and 8 kHz, with the greatest output occurring at 5 kHz. This response shape is highly desirable; it is intentionally designed that way (as in other good 'phones) to compensate for the manner in which the ear hears sounds from earphones as opposed to how the pinna shapes the spectrum of outside sounds heard in nature or from loudspeakers.

The K501 reproduced square waves below 1 kHz reasonably well. As mentioned previously, the left and right earphones matched within 0.3 dB, which is the best I've ever measured. Driving the K501 from

a 100-ohm source lowered the output by 5.3 dB but didn't change the response, so the earphones should perform consistently with different audio components and diverse source impedances.

The 20-kHz cosine pulse (Fig. 1) indicates that the K501 earphones have a negative absolute polarity. The negative-going output is wider than the input pulse, which verifies the downward slope of the frequency response above 5 kHz. But the quick recovery shows that the AKG K501 has extended low-frequency response with very good damping.

The sensitivity of the K501 earphones was 95.3 dB for a 1-milliwatt input, 1.3 dB better than AKG's specification. The left and right earphones had virtually identical measured impedance, 117.0 and 117.1 ohms, respectively, which confirms that the voice coils are wound to a very tight tolerance. The precision-matched voice coils and diaphragms are the reason the left and right channels of the K501 earphones exhibit such closely matched frequency response characteristics. Consequently, the placement of instruments in the sound field should be very good; in fact, listening panelists comment-

ed on how easy it was to pinpoint individual instruments when they were auditioning the K501.

My own listening comparisons between the AKG K501 and the Stax Omega electrostatic earphones disclosed that the K501 earphones have a diffuse-field response similar to that of the Omegas. Each panel member also compared the K501's sound to that of the Omega. When listening to George Gershwin's "Rialto Ripples," on *Solid Brass, Gershwin to Sousa* (a binaural

recording available direct from Joseph Grado Signature Recordings, 973/701-0674), the panel members commented: "good sense of space," "brass very bright," and "brass overtones less than

reference" for the AKGs as compared to the Stax 'phones. (Incidentally, this recording was made by Joe Grado with his experimental sphere microphone and a Nagra D digital recorder, and it produces excellent stereo and binaural sound from speakers and earphones, respectively.)

When panel members listened to the K501 reproduce the "January 9th" excerpt from Shostakovich's Symphony No. 11, played by the Helsinki Philharmonic under

**THE LEFT AND
RIGHT CHANNELS
MEASURED
WITHIN 0.3 dB,
WHICH IS REMARKABLE.**

EARPHONE EVALUATION

PARAMETER	RATING	COMMENTS
Overall Sound	Very good	"Very close to reference 'phones except in extreme top"
Bass	Very good	"Very tight," "Bass not as deep as Stax," and "Bass very good"
Midrange	Very good	"Voice is clearer," "Brass is bright like reference," and "Brass lacks upper sheen"
Treble	Fair	"Brushes more muted" and "Slightly duller than reference"
Overall Isolation	Low	"Very little isolation from outside sounds"
Bass	Low	"Outside rumble is easy to hear"
Midrange	Low	"Conversation is possible when wearing the K501s"
Treble	Fair	"High-frequency sounds are muffled"
Comfort	Very good	"Very comfortable" and "Seem very light"
Value	Excellent	"Excellent value for this price"

GENERAL COMMENTS: Instrument placement in the sound field is excellent. Comfortable for long-term listening. Excellent value.

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**THE AKG K501'S SOUND
IS CLOSER TO THE STAX'S
THAN I WOULD HAVE
THOUGHT POSSIBLE.**

James DePriest (Delos DE 3080), they wrote: "less edge on trumpets," "snare drums more muted," "bowed strings good but with less rosin," and "bass drum very good." Panelists also noted of the AKG and Stax 'phones that "both sound good on loud, congested passages."

Irving Berlin's classic "Puttin' on the Ritz," sung by Margie Gibson on *Say It with Music* (Sheffield 10036), prompted the listening panel to comment: "voice clearer than reference," "good articulation on voice," "piano very clear," "very tight bass," and "brushes more muted."

Panelists also listened to excerpts from a great new binaural recording made with a Neumann KU-100 binaural mike: the "Ritual of Abduction" and "Spring Rounds," from Stravinsky's *Le Sacre du Printemps*, with Jorge Mester conducting the Pasadena Symphony (Newport Classic NCAU-10002). The panel remarked: "bass good but not as deep as reference," "brass is bright but lacks upper sheen," and "strings more defined than reference." (This CD also sounds impressive over a surround sound system with a subwoofer.)

I believe that the results of my own listening tests and the listening panel's comments indicate that the AKG K501 earphones are significantly better than their predecessors. They are lightweight and comfortable for long listening sessions, and the K501's sound is closer to that of the Stax Omega's than I would have thought possible, especially at the price. They are decidedly worth a listen. A

AUDIOSOURCE, continued from page 62
"cloudy" some 10 dB or so before the onset of discernible clipping; this, too, is not so unusual in my experience.

To complete my tests, I played the AMP Three at very high levels into the B&Ws with an 8-ohm dummy load paralleled to each output. No matter how hard I tried, I couldn't induce the fuse-blowing that had occurred in the lab (although in the best interests of my speakers I chose not to let the amp play at severe clipping for too many minutes). I therefore concluded that the AMP Three's current limitations come into play in the presence of unnaturally high levels of high frequencies, as occur in pure-tone testing, but are not normally a factor when playing music into 4-ohm loads.

The only real complaint I can dredge up concerned the amp's automatic turn-on, which required too much signal to trigger. Consequently, if I played music at a quite soft level, the amp would shut off after about seven minutes if no high-level passages came along. AudioSource says the

**ON RICH MUSIC,
THIS AMP DELIVERED ALL
OF THE EXPECTED WEIGHT
IN THE BOTTOM FEW
OCTAVES.**

AMP Three is set to turn on with 10 to 20 millivolts of signal at 100 Hz; I measured turn-on at 7 millivolts and still found it problematic. Of course, if the trigger level is lowered you risk unintended turn-on instead. Automatic input sensing is almost always tricky to design, which is why so many remote turn-on circuits use DC triggering instead. For normal operation, I would advise using this amp's power switch or simply leaving it on.

Overall, the AudioSource AMP Three's performance was clearly up to the standard set by its brisk competition. While it was by no means the test-bench champ of its class, its performance was quite good. Moreover, the AMP Three is one of the most aggressively priced 150-watt stereo amps on the market. Its combination of performance, fine sound, and ample power rates it a good value any way you slice it. A

Life in *so* uncertain terms.

It's like some bizarre nightmare. One day you're feeling pretty good. The next day you can't walk. Or you can't see. Or you can't even get out of bed. You never know when it will strike. Or how long it will last. That's the diabolical thing about multiple sclerosis: its uncertainty. It's a disease that preys upon the mind as well as the nervous system, fraught with frustration. And anguish. In this, the 50th year of the fight against MS, progress toward treatment is moving forward more quickly than ever. But the battle's not over yet. To find out how you can help, or for more information, call 1-800-FIGHT-MS. For 50 years, those with MS have depended on us. Now we're depending on you.



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Photography courtesy of Lisa Spindler





B-60

"Bravo, Bryston! A landmark...a reference...a triumph...a steal!" *Stereophile*, May 1997

The remarkably compact, Bryston B-60 Integrated Amplifier provides 60 watts per channel at 8 ohms and 100 watts per channel at 4 ohms.

There are provisions for four high level inputs, (CD, Tuner, Video and Aux) in addition to one tape loop and a pre-out/main-in feature. A headphone jack is also provided.



B-60 Integrated Amplifier

If your requirements are for sonic excellence in a versatile, convenient package, without compromises in performance, value and reliability, look

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AUDIO

see a specialist

Q When I buy a high quality projector, can I use any screen?

A Yes, but screen integrity can make as dramatic a difference in picture quality as the projector itself. Reflected images vary greatly with screen materials, consistency of reflected light and gain. In a virtually dark room almost any surface, even white wall, may produce a watch-able image. However, any inconsistency in viewing surface will create noticeable defects in image quality, including shadows or "light distortions." Screens of inferior quality usually have less consistent reflectivity patterns, produce hot spots, and unnatural colors. So image quality becomes unpredictable from various viewing positions. If you're investing in a quality projection system, just remember, the screen is what you're actually watching, and what can give you that "picture perfect image."

—Chris Buhr
Audio By Us
Belleville, IL



*Audio by
US*

Q Why is having component video output an advantage with a DVD player and what makes it better than any other video output?

A Component video output provides one very important benefit if you are connecting your DVD player to a television or projector with component input. That is namely a superior picture that utilizes the full capability of your DVD player. Component video is an attempt to make your TV picture quality comparable to that of the original studio camera output signal. The component video output from your DVD player uses 3 individual 75 Ohm cables connected between the DVD player and your TV. The purpose is to bypass the NTSC decoder that is present inside every TV and return the picture signal to the studio camera's original red, green, and blue (RGB) format. In our own in-store comparisons, DVD software has been consistently superior to laserdisc versions of the same titles. Detail, edges, and color saturation are visibly better.

—Tim Campbell &
Larry Zolata
Hi-Tech Hi-Fi and Video, Inc.
Lyndhurst, OH

**HI-TECH-HIFI
& VIDEO, INC.**

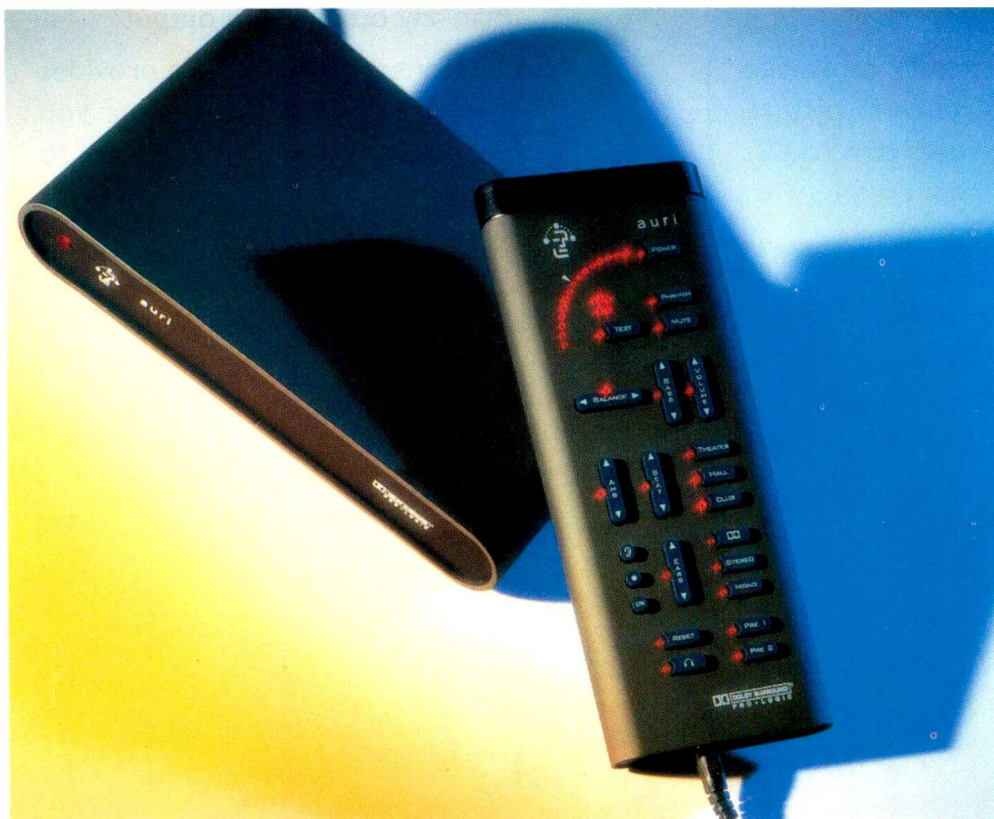
Each month, Audio Magazine's feature "See a Specialist" showcases the finest audio/video dealers from across the country. The dealers, chosen as a result of recommendations from equipment manufacturers, Audio Magazine staff and industry organizations, exemplify the best audio/video dealers from New York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

If you would like to submit questions to dealers in your area please write to:
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AURICLE

JOHN SUNIER

VLS AURI HEADPHONE SURROUND PROCESSOR



If your busy life is anything like mine, you may find that about the only time you can collapse in front of your audio or home theater system is at the end of a long day—say, sometime between 10 pm and midnight. By then the rest of the house has either gone to bed or is on the way. After spending all that money and effort on setting up a killer surround sound system, you are forced to plug in

headphones and listen in plain (exaggerated) stereo so as not to disturb anyone. A good wireless headphone system can make the task more comfortable, but usually there are sonic losses and interference problems, and you are still stuck with sound pasted to your two ears.

There have been headphones with double (front and rear) drivers at each ear to generate a surround sound experience, but for various reasons, they have not been totally successful. Now Virtual Listening Systems (a division of Tucker-Davis Technologies, a leading manufacturer of auditory instrumentation for hearing and acoustic science) has introduced the Auri (\$499), a personal

home theater entertainment system that produces virtual five-speaker Dolby Surround sound over any headphones plugged into a small, wireless receiver/remote control.

The principles of binaural hearing are the basis for VLS's patented Toltec processing—the DSP-based “convolver” that enables the Auri to do its stuff. Toltec manipulates the information in the four channels of a Dolby Surround signal, or even in a standard stereo or mono signal, to create a headphone listening experience that approximates what you'd hear using speakers. This is achieved by exploiting head-related transfer functions (HRTFs). These represent the frequency-response alterations introduced by the head and pinnae (outer ears) according to the direction from which a sound originates. The sound reaching your eardrums will have one set of spectra if it comes from in front and a different set if it comes from, say, the side. Your brain uses these differences to help it localize sounds, especially vertically and front to back. But since no two people have exactly the same size and shape head and pinnae, everyone's HRTFs are unique. This has been the biggest stumbling block to getting products like the Auri to work, since our brains are very finely tuned to our own personal HRTFs.

VLS has a soundproofed chamber at its Gainesville laboratories where it can exactly measure any individual's specific HRTFs in about 20 minutes. But since it's not practical to fly every Auri buyer to Florida for measurement, how can VLS make the processing work well for a wide range of people? The company solved the problem by measuring and analyzing the HRTFs of hundreds of people to find a relatively small number that users could select among to achieve a reasonable match to their own HRTFs. These were then stored in a ROM that resides in the Auri. The user fine-tunes the Toltec processing to suit his own ears, because what sounds right to you may be completely wrong for

Company Address: Virtual Listening Systems, 4637 N.W. 6th St., Gainesville, Fla. 32609; 352/379-0807.
For literature, circle No. 96

Photograph: Michael Groen

someone else. (The process is something like fitting the correct pair of eyeglasses.) Having the computer power in your hand to do this is what makes the Auri a breakthrough product.

The procedure involves four buttons on the remote. Pushing the one with a small ear on it starts the selection process. Pushing the asterisk button plays the test signal, which, for the best-matching HRTF set, should sound directly in front of you, centered, about an arm's length away and level with your eyes. Then, pressing the largest button ("Ears"), you move through the different sets of HRTFs, searching for the one that places the test signal most specifically in front of you. It took some time scrolling through all 15 for me to identify two that sounded nearly identical; both placed

the signal roughly in front, at eye level. (Many of the other choices put the test tone clearly above or behind my head.) When you have found the best setting, you press the fourth button, "OK." You store

your HRTF selection in either of two presets, "PRE 1" or "PRE 2," by pressing the button and holding it until an LED stops blinking. Thus, the Auri can store HRTF settings for two people, which can then be selected by the push of a button.

VLS engineer Tim Tucker found that the selection process can be difficult for some listeners. (High-frequency hearing loss can make discernment of the differences difficult, and much of the population has such hearing loss.) Others found that all the HRTFs sounded the same to them. Originally VLS was expecting to store about 50 different HRTF sets in the remote, but the number was reduced to 15 in the production model.

There are a great many buttons and red LEDs on the Auri controller, but the unit is handsomely designed and easy to use. Between the announcement of the Auri last year and actual production this year, several upgrades have been made based on feedback from the field. One is a nose cone on the front of the remote to enhance its range and sensitivity. Another is replacing the original AA batteries with nickel-cadmium

batteries that hold a charge for about six hours. A stereo Y adaptor is now included to enable two people to use the Auri simultaneously (though they both get the same HRTF processing in that case). It is also possible to buy a second remote from VLS, so two listeners can have independent control of volume, balance, and muting. These recent changes are described in a second owner's manual, which you are instructed to read before the original manual.

Some of the other buttons on the Auri remote are "Balance," "Bass," "Power," and "Test." The last circulates a tone to each of the five virtual speaker locations. The "Phantom" button should really be labeled "Bypass," but Dolby licensing requirements force the confusing name. It totally turns off the Toltec processing, sending the stereo

input channels directly to the headphone earpieces.

Two vertical buttons are labeled "Ambiance" and "Seat." Next are three smaller horizontal buttons—"Theater," "Hall," and "Club"—to select

DSP simulations of the acoustics of different types of venues. The first is obviously for movies, and the other two are for music listening ("Hall" is suggested for classical music); I found very little difference among them. "Ambiance" controls the level of reverb in the simulations, and "Seat" moves your apparent position in the simulated room forward or back.

The remote also has buttons for Dolby Surround, standard stereo, and mono. The first is for Dolby Surround-encoded material and is the only one giving the full five-speaker Dolby Surround effect. The stereo and mono settings merely create a pair of virtual front speakers. (Most surround processors with a mono enhancement feature produce a very peculiar effect when headphones are plugged in; the Auri, being designed for headphones, is free of this.)

The Auri's base unit can sit just about anywhere that's convenient to your TV or audio system. It comes with its own separate wall-wart power supply. The inputs to this unit are the stereo outputs from your TV, VCR, preamp, or whatever. It contains the Motorola DSP chip that performs the

Dolby Pro Logic decoding and the Toltec virtual speaker processing, plus a 900-MHz digital transmitter that sends the processed signals to the remote. The volume, balance, and muting controls on the remote can be operated without pointing it at the base unit, but for all other functions, the remote should be pointing directly at the base.

One button on the remote may at first be unexpected. It sports a small drawing of a pair of headphones—again a confusing choice, since what this does is turn off headphone operation completely and cause the Auri base to function as a small Dolby Pro Logic decoder for actual loudspeakers. On the rear of the base are five RCA jacks for left, center, right, and surrounds, which can be connected to amplifiers to power speakers. In this mode, only three of the remote buttons continue to operate, but their functions change. "Test" sends a signal separately to each of the five speakers. In the test mode, "Volume" sets the individual speaker levels; in normal use, it controls the level of all five speakers together. Lastly, that pesky "Phantom" button now lives up to its name by switching center-channel operation on and off.

For my evaluation, I used Sennheiser HD 320 and Grado SR-60 and SR-80 headphones. (The ability to use the headphones of your choice is a great, great feature, since typical wireless headphones are of lower quality than the best wired models.) Broadcast TV was my first source for Auri listening. Shows with good Dolby Surround—such as *Star Trek: Deep Space 9*, *The X-Files*, and even *Letterman*—were a pleasure.

The "Ambiance" control can easily be set to excessive levels, but at reasonable settings the Auri's virtual speaker setup sounded natural and enveloping with Dolby Surround sources. When I surfed to channels with poorer stereo or mono sound, the results were less enjoyable. The host on the QVC channel sounded like he was pitching his ugly figurines from inside a large barrel, for example.

Next up were some movie laserdiscs, including *Forrest Gump*. Even more than with most of the TV programs, the experience was greatly enhanced by the dialog seeming to come from the general direction of the screen rather than from inside my head. In action movies, crashes and explosions carried almost as much impact as if there were

**THE VLS AURI
IS AN INGENUOUS WAY
TO ENJOY
SURROUND SOUND
PRIVATELY.**

a pair of powered subwoofers in the room. However, switching the processing in and out demonstrated a considerable modification of the two-channel sound's frequency spectrum.

Before going on to plain stereo and Dolby Surround-encoded music CDs, I checked out some background noises I had been hearing with the Auri. One was a tendency for the remote to produce static and popping when moved around during operation; it is not designed to be held in your lap or carried around the room. However, I didn't hear even a hint of the distortion and tuning problems I have run into with other 900-MHz wireless components.

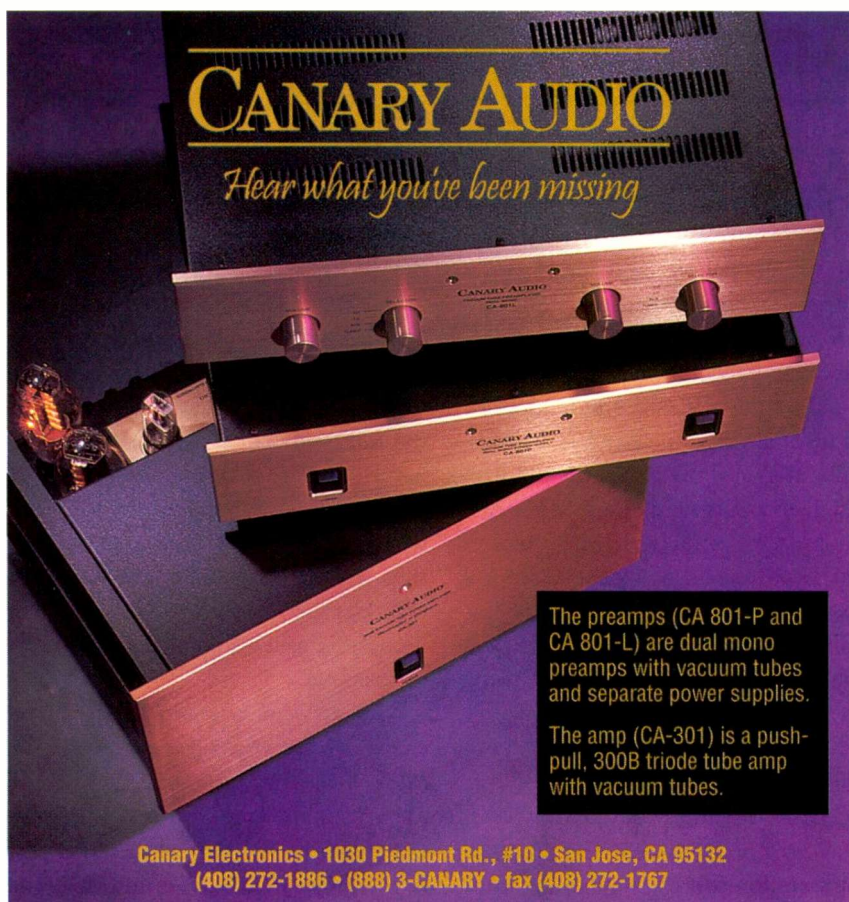
Other noises seemed associated with the Auri's processing activity. There was a low digital hash sort of sound, perhaps 50 dB or so down, that increased as I advanced the volume control to its highest setting. Originally I fed the base unit from my ProScan monitor's headphone jack; when I switched to the audio out jacks on the rear of the monitor, the noise diminished and changed in character but was still there. I was surprised to find that this noise was most

prominent in the mono setting, less so in the stereo mode, and least noticeable in Dolby Surround mode. It was also much louder in the "Phantom" (bypass) mode, which seems just the reverse of what one would expect. There was also an audible increase in hiss as I advanced the "Seat" setting toward the front of the virtual hall; other settings didn't affect the hiss level. Finally, when playing CDs or laserdiscs with the volume raised to the highest settings, I heard a high-pitched tone when the processing was engaged, but again, it was 50 to 60 dB down.

Results with music-only CDs and laserdiscs were disappointing, primarily because of the timbral alterations introduced by the Toltec processing. In Pro Logic mode, there was a serious high-end rolloff and a strong mid-bass boost, plus a loss of transparency compared with plain stereo playback through the 'phones. The timpani "whaps" in the opening of Telarc's *Also Sprach Zarathustra* turned to thuds with the processing engaged. Without the Toltec processing, localization of all sounds was at the sides of my head (or inside my head at

the sides), but sounds were actually more distinctly located in those areas than with the processing. The differences were something like switching from a pair of wide-range, high-end loudspeakers at your sides to five bargain speakers placed around you in a Dolby Surround layout. (Since the mono and stereo modes create only one or two virtual speakers and have even more bass boost than the Pro Logic setting, their contributions to headphone listening are less useful.) In bypass (Toltec processing disengaged), I found the Auri's headphone amp stage to have an edgy quality, with reduced low bass and clarity relative to the sound from the headphone jack on my Philips laserdisc player.

Although you may not want to do all your headphone listening through it, the VLS Auri is an ingenious and wonderful means of enjoying a private surround sound experience with movies and TV. For home theater, it is a definite step up from ordinary headphone listening. And there is a less expensive (\$299) wired version of the Auri, which probably would have lower noise than the wireless version. **A**



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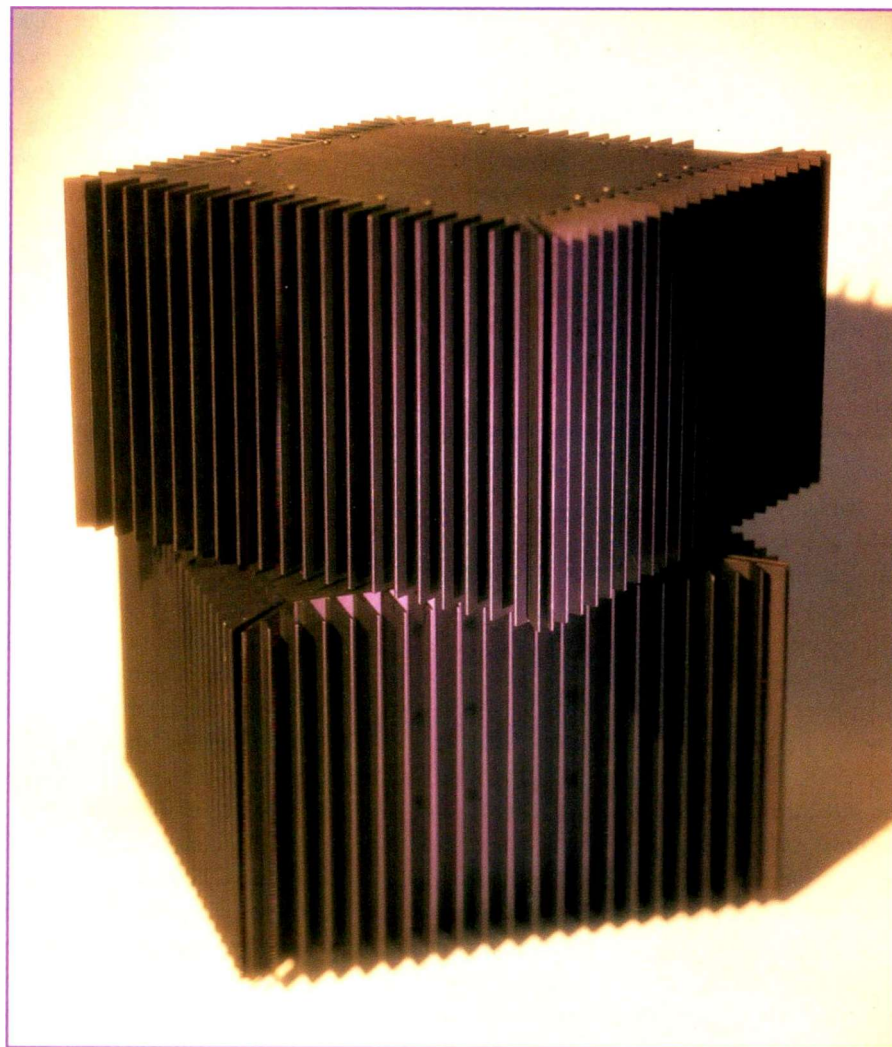
PASS LABORATORIES ALEPH 1.2 MONO AMP

As a reviewer, I can't decide whether it's more interesting to find an exciting new product or watch existing state-of-the-art products evolve. Entirely new products often bring significant changes in sound quality, whereas evolving products generally educate me about fine nuances of sound quality, demonstrating that even the best can somehow get better.

The Aleph mono 1.2 power amplifier is definitely a case of evolution at work. Ever since Nelson Pass established Pass Laboratories, he has explored the limits of single-ended Class-A operation in solid-state amplifiers. Each new circuit has moved further into sonic minimalism, to the point where the Aleph 1.2 has only two gain stages and a touch of feedback. The 1.2's input signal goes through a resistor to the input MOS-FET, through another resistor to a bank of paralleled output MOS-FETs, and finally through a power resistor to the load.

It is hard to get a power amplifier's signal path much simpler than that. While single-ended tube amplifiers also emphasize minimal circuit topology, many high-end transistor power amplifiers have twice as many gain stages. Even the original Aleph 1 (which I reviewed in the February 1996 issue) had three gain stages and more total feedback. Further, the Aleph 1.2 does not have the auxiliary circuit that enabled the Aleph 1 to deliver very high currents into low-impedance loads. As a result, the Aleph 1.2 does not deliver increased power into loads of less than 4 ohms, but its purer circuit can drive any load impedance or reactance, even a short circuit.

The Aleph 1.2's minimalism, however, is confined to its circuitry. The 1.2 is a rugged high-powered amplifier capable of delivering 200 watts into 8-ohm loads and 300 watts into 4 ohms; its maximum output current is 10 amperes. It measures only 16½ x 16½ x 10½ inches, but it weighs a solid 130 pounds—a weight



as hefty as its price tag of \$14,000 a pair. (I wish the 1.2 had a removable handle; its sound may be light as air, but this amp is heavy!)

The chassis contains a power supply with a toroidal transformer rated at 2,000 watts (10 times the amplifier's power rating) that charges 100,000 microfarads of capacitance with 500 joules of energy. Pass Laboratories rates this unregulated supply as restricting ripple to only 0.5 volt

in the current fed to the output transistors at full power.

The Aleph 1.2 uses MOS-FETs for both gain stages because Pass Labo-

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(24449 Foresthill Rd.),
Foresthill, Cal. 95631; 916/
367-3690;
www.passlabs.com
For literature, circle No. 97

ratories believes that MOS-FETs have the best transfer characteristics for a single-ended design and that they allow high-current operation with minimal circuit complexity. Each amplifier's P-channel input and N-channel output MOS-FETs are matched within a tolerance of 2%.

The amplifier's balanced input, whose common-mode noise rejection is specified at 60 dB, feeds the input stage through a passive network, with no additional active circuitry; the unbalanced input feeds the input stage directly. The input MOS-FETs are pulse-rated at 8 amperes and are followed by output devices with pulse ratings of 50 amperes each.

The output stage is biased by a current source at 5 amperes. This current source's circuit requires no internal bias-setting adjustments, so the bias will not change over time. The amplifier's power draw is 500 watts, and since its MOS-FET output devices can handle a total of 3.6 kilowatts, they draw, at most, 14% of their rated power. However, that 500 watts is drawn at all output levels from 0 to 200 watts, the inefficiency you'd expect from single-ended Class-A operation. To dissipate unused energy, the Aleph 1.2 has truly massive heat sinks, rated at 0.05° heat rise per watt. It scarcely runs cool—a pair can easily heat a small room—but it is never more than hot to the touch if it is given proper ventilation. The amp is protected from overheating by a 75° C thermal switch and from internal failure by a slow-blow fuse.

The Pass Labs Aleph 1.2 is rated at a maximum of 1% distortion at full rated power, although distortion into 4- and 8-ohm loads is said to be well under 0.01% at most power outputs. The amplifier's bandwidth extends to 100 kHz (the -3 dB

point). Gain is said to be 23 dB from the balanced input and 29 dB from the unbalanced, and the rated damping factor is 70.

More important than the Aleph 1.2's specs is that it sounds significantly better than the Aleph 1. Pass's circuit changes have transformed a great amplifier into the stuff of legends. With two minor caveats, which I'll get back to later, the Aleph 1.2 is competitive with, or superior to, any power amplifier I have heard at any price.

The most striking improvement in the Aleph 1.2 lies in its dynamics and detail. It has superb resolving power at every level of musical energy. During the months I have auditioned this

amplifier, I have been constantly struck by its ability to provide an extraordinary level of musically natural information. It is, in fact, almost the ideal amplifier for testing the resolving power of loudspeakers.

It pushes even the best ribbon, electrostatic, and cone speakers to the limits of their resolution, and it seems almost totally indifferent to speaker load. You get the same musical resolving power with the most demanding speaker load as you do with the simplest.

Unlike some other transistor amplifiers, the Aleph 1.2 does not make you pay for this resolving power by inflicting a touch of excess upper-midrange energy. Its frequency balance and timbre are neutral in virtually every respect, with upper-midrange and treble details harmonically integrated and natural and a sound remarkably free of listener fatigue. Few amplifiers, for example, get such musically convincing results from recordings of "difficult" instruments, like the harpsichord and modern violins, without softening or blurring important musical detail.

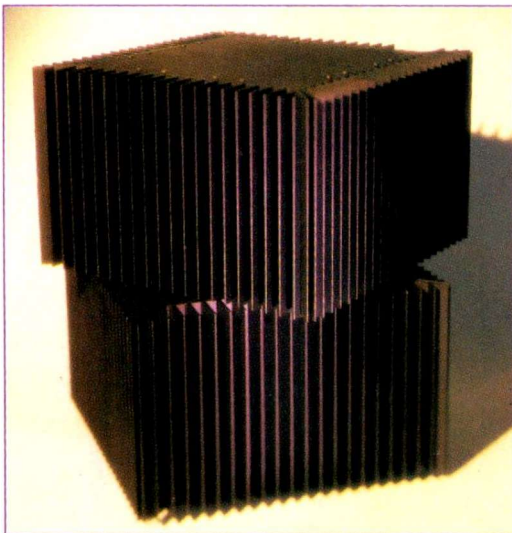
The Aleph 1.2 also demonstrates its superiority in the way it reproduces choral music, massed strings, and complex symphonic music. I had thought the Aleph 1 did an excellent job of handling such music, but the Aleph 1.2 showed that problems I had blamed on the recording or loudspeaker were, in fact, in the power amplifier.

No one is ever going to make a perfect recording of Mahler's Symphony No. 8, and no home system is ever going to provide perfect reproduction of that vast work's musical complexity. Nevertheless, the Aleph 1.2 demonstrated that a truly great amplifier can get more detail from existing recordings of the Eighth than I had believed possible. This was true of performances ranging from Bruno Walter's classic version to my favorite modern recording, by the Boston Symphony under Seiji Ozawa (Philips 410607). The Aleph 1.2 also got the best results I have heard to date from the complex choral work on Robert Shaw's version with the Atlanta Symphony (Telarc CD-08267).

I had thought the Aleph 1 was pretty close to a reference standard, but the Aleph 1.2 is one. It adds a degree of life and air that I normally associate with the midrange of the best single-ended triode amps driving highly efficient speakers—except the Aleph 1.2 provides these dynamics down to the low bass, with no rolloff in the treble, at full symphonic power levels and into virtually any speaker around.

I'm not sure whether a phrase like "dynamic articulation" helps explain how good the Aleph 1.2 really is or is simply another audio cliché. I find it difficult to believe, however, that anyone can really listen to this amplifier in a top-quality high-end system with high-quality recordings and *not* hear what I mean by this phrase. You need not share my love of classical music to reach the same conclusion; while I neither understand my sons' interest in rock nor want to, they both made it clear that they were equally impressed by this amplifier's detail and dynamics.

The Aleph 1.2 provided some of the best reproduction I have ever heard of AudioQuest, Chesky, and Telarc jazz CDs. I would particularly recommend that you audition the Aleph 1.2 with AudioQuest's recordings of Mighty Sam McLain (AudioQuest/JVCXR-0012) and Bennie Wallace (AudioQuest/JVCXR-0013), made with JVC's



**THE PASS LABORATORIES
ALEPH 1.2 HAS
ONLY TWO GAIN STAGES,
ABOUT AS SIMPLE
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XRCD process. I would also suggest the Chesky recording of Carlos Herida's gypsy flamenco music (Chesky WO126) or the Jacques Loussier trio's recent jazz recordings of Bach (Telarc CD-83411) and Tele-mann (Telarc CD-83417). If "dynamic articulation" still sounds like a reviewer's cliché after such auditioning, well, either get your ears checked or send me an angry postcard!

I can't say that the Aleph 1.2 has a lower apparent noise floor than the Aleph 1, but I do believe it can resolve more information near that floor; I have yet to hear any tube or transistor amplifier that can do better. The Aleph 1.2 demonstrates that it is now possible to get high-power amplifiers that sacrifice nothing in terms of low-level resolution yet effortlessly take you up to the limits of symphonic peaks or the limits of your loudspeaker.

Imaging and depth are significantly more realistic in the Aleph 1.2 than they were in

the Aleph 1. The 1.2's soundstage is in no way romanticized; a recording that is flat, multiprocessed, or shallow will sound that way. But this amp gets an amazing amount of lifelike soundstage detail

from natural acoustic recordings. If you like a bit of humanity with your music and you have favorite recordings with concert hall ambience and those little noises that prove the performers are actually alive, the Aleph 1.2 is likely to provide more of this detail, with more realism, than virtually any other amp around.

My only caveats—mere nitpicks—concern the Aleph 1.2's deep bass and its dynamics at the highest power levels. The Aleph 1.2 does not have all the bottom-octave power and detail of a Krell or the large Mark Levinsons and Rowlands, nor does it have the sheer "slam" of some competing high-power amplifiers. And while its dynamic contrasts are superb, the 1.2 doesn't quite match the best of its competitors when massive amounts of musical power are required for the most forceful dynamic peaks.

Naturally, the level of sonic purity and musical resolution you get from the Aleph 1.2 will depend on the quality of your signal

sources and your loudspeakers. And you will certainly need to use an extraordinarily clean and neutral preamp with this amplifier; Pass Laboratories' Aleph P preamp (\$4,000) is a perfect match for the Aleph 1.2; there's an unbeatable synergy between the two units.

To demonstrate how good the Aleph 1.2 can be, I would want a speaker that has extended, quick, and detailed upper-octave performance and excellent dynamic range and life. However, although an amp's overall timbre and bass energy and detail are often determined by its interactions with specific speakers, the Aleph 1.2 is considerably less speaker-sensitive than most amplifiers I've auditioned.

I found it difficult to make sweeping judgments about the advantages of the Aleph's emphasis on circuit minimalism. In comparing the Pass Labs amp to others, I found that amplifiers as different in their circuit complexity as the Aleph 1.2 and the

Krell KSA-300S provided exceptional musical information in my different reference systems, though they presented that information in different ways. Those two differed significantly in their upper-mid-

range dynamics, with the Pass consistently having a bit more energy in that region than the Krell. Ironically, the Aleph 1.2's upper-midrange timbre and dynamics sounded more like those of the Marantz Model 9 than those of the KSA-300S, although the Pass and the Krell are Class-A transistor amplifiers and the Marantz is a Class-AB tube amplifier.

But if you move around a concert hall, you are almost certain to find seats where the sonic nuances sound more like those of the Pass Aleph 1.2 and other seats where the nuances sound like those of competing reference-quality amplifiers from such high-end brands as Audio Research, Conrad-Johnson, Krell, and Mark Levinson. In short, it is far easier to state that the Aleph 1.2 is a true reference amplifier than it is to state definitively that it is "better" than the competition. At some point, you have to put down the magazine and actually go listen to the equipment!

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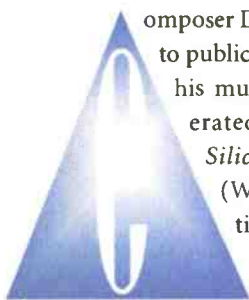
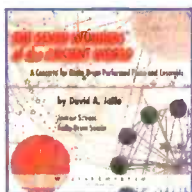
CLASSICAL RECORDINGS



Jaffe: The Seven Wonders of the Ancient World

(A Concerto for Radio-Drum-Performed Piano and Ensemble)
 Andrew Schloss, Drum-Piano; ensemble of harp, mandolin, guitar, bass, harmonium, harpsichord, and percussion

WELL-TEMPERED PRODUCTIONS
 WTP 5181; 1:10:46
 Sound: A+, Performance: A



Composer David A. Jaffe first came to public attention in 1982 with his music for computer-generated plucked strings on *Silicon Valley Breakdown* (Well-Tempered Productions WTP 5614), which quickly became a landmark in computer music. Crediting Charles Ives, Carl Ruggles, and Henry Brant for his musical aesthetics, Jaffe stresses diversity and draws on a vast range of music sources.

The Drum-Piano is a hybrid acoustic instrument that translates

the gestural language of a percussionist into the sound-production mechanics of a piano. To accomplish this, antennas in the drum (actually a foam-covered surface) and transmitters in the drumsticks detect the sticks' movements and generate low-frequency radio signals. The signals from the Radio-Drum are translated to MIDI by a Macintosh computer running software written in MAX, an object-oriented programming environment for MIDI. The Yamaha Disklavier, an acoustic grand piano designed to be played by MIDI, then plays the musical directions sent by the computer.

Although some may feel this is an awful lot of technology to throw at a fairly simple musical task, soloist Andrew Schloss says that the Drum-Piano's ability to follow his hand movements "allows me to explore the frontiers of musical instrument development with a sense of integrity, continuity, and a sensitivity to thousands of years of musical practice."

Quite aside from the advanced technology involved, Jaffe's new seven-movement work is a different sort of piano concerto. Each movement represents one of the Seven Wonders of the World, from the Egyptian pyramids to the Pharos of Alexandria. Programmatic would not be the proper designation here; only by reading the booklet's explanations of each movement do you begin to understand the music's connection to a particular Wonder (and in most cases, the connection is tenuous). For the temple of Artemis, for example, Jaffe envisions a religious procession of pilgrims from various parts of the ancient world. To portray this, he draws on today's musical culture—jazz, folk, and pop.

The Seven Wonders of the Ancient World is wild stuff indeed, usually not grating to the ears. Its avant composition, unique solo instrument, and unusual orchestral backing route a procession of musical sounds through your speakers that they have probably never before re-

produced. *John Sunier*

Illustration: Horacio Cardo

Bach

English Suites, Nos. II, III, and IV

Stefan Hussong, accordion
 DENON CO-78836; DDD; 59:21
 Sound: A, Performance: A+

Johann Sebastian Bach's music played on an accordion? This disc is in the you-gotta-hear-it-to-believe-it category. Listening to this fascinating recording takes you through three stages. First, you smile at the novel sound of the English Suites being played on an accordion. Then, as you notice Stefan Hussong's incredible virtuosity, you ask, "How can he do that?" Finally, you marvel at the beauty of his sensitive nuances and intelligent interpretation. This CD is much more than an oddity; it's a serious musician's performance of the ever-transcribable Bach. *Patrick Kavanaugh*



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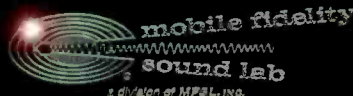
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**Respighi: The Pines of Rome,
Roman Festivals, and
The Fountains of Rome**

Anthony Newman, organ; Pittsburgh
Symphony Orchestra, Lorin Maazel
SONY CLASSICAL SK 66843; DDD; 63:35
Sound: A+, Performance: A

**Saint-Saëns: Symphony No. 3
("Organ"), Phaëton, Danse Macabre,
and Bacchanale**

Anthony Newman, organ; Pittsburgh
Symphony Orchestra, Lorin Maazel
SONY CLASSICAL SK 53979; DDD; 58:58
Sound: A+, Performance: A to A+

Sony producer Steven Epstein, who was in charge of both of these recordings, has gone back to basics, with superb results. The orchestra was recorded in Heinz Hall for the Performing Arts in Pittsburgh, using only a pair of B & K 4009 omnidirectional mikes to maintain the purest of stereo perspectives. According to Epstein's notes in the booklets, the mikes were spaced 5 feet apart and hung 8 feet behind the conductor and 15 feet above stage level. The soundstage thus achieved is detailed, deep, and spectacularly unequivocal.



For the Saint-Saëns "Organ" Symphony and less obviously in the Respighi, Anthony Newman plays the similarly miked organ of St. Ignatius Loyola in New York City; the offstage brass in two movements of the Respighi trilogy was captured with three Neumann TLM 170 cardioids. Aha!—multitracking, you say? Yes, but you'd never guess it from the sound. Whether as soloist in the symphony or as part of the orchestral fabric in the Roman trilogy, Newman sounds as though he and his organ had been transported to the engaging acoustics of Heinz Hall.

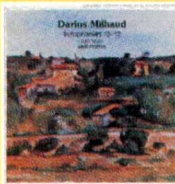
Also consistent with Epstein's ultra-fi aspirations is the absence of detectable dynamic range reduction. As a result, you may think the opening of *The Pines* ("Villa Borghese") is a bit wimpy. Turn it up to a natural level, and the climax of the final *Pines* piece ("The Appian Way") is likely to make the hair stand on the back of your neck. It's magisterial!

The fine orchestra plays its heart out, and Lorin Maazel goes for the jugular throughout. Other readings may be subtler or suaver, but few are as effective, let alone as splendid sonically. He makes exceptional sense of the Saint-Saëns symphony, a work that usually generates more heat than light. The tone poem (*Phaëton*) on the same disc is the only relative rar-

DARIUS MILHAUD

Symphonies Nos. 10, 11, and 12
Radio Symphony Orchestra of Basel,
Alun Francis
CPO 999 354; DDD; 59:14
Sound: A, Performance: A

Though Darius Milhaud wrote many works in every genre and introduced a number of innovations, including polytonality and the use of jazz and blues in a symphonic work, most of his music is in a style immediately identifiable as his very own. He wrote Symphonies Nos. 10, 11, and 12 during the early 1960s, when



he was shuttling between positions at Mills College in Oakland, California, and the Paris Conservatory. At the time, he was writing in a more conservative style than he had in many of his earlier works. These symphonies combine neoclassicism and polytonality with vivacious rhythms. They sit somewhere between the standard tonal world and the atonal; don't expect catchy melodies à la Milhaud's many works in a Latin American vein. *John Sunier*

ity here; perhaps it was included to counterbalance the overly familiar "Danse Macabre" and the "Bacchanale" from *Samson et Delila*.

This, indeed, is my only real reservation about these CDs: They lean pretty heavily on the hackneyed—exciting repertory, perhaps, but doubtless chosen with sonic blockbusterhood in mind. Let's hope that in the near future Epstein & company can feel free to apply the same techniques to music of more substance and less obviousness. *Robert Long*

**Dvorák: Slavonic Dances,
Op. 46 and Op. 72**

Silke-Thora Matthies and Christian Köhn,
piano four-hands
NAXOS 8.553138; DDD; 72:16
Sound: A-, Performance: A

Music for pairs of pianists at a single keyboard was a big seller to the amateur market in the 19th century, and Antonín Dvorák was an important contributor. This second Naxos volume of his work in the genre comprises 16 Slavonic Dances—the original versions, pre-



orchestration. Many of them work much better in this form, Dvorák's abilities as an orchestrator notwithstanding. The performance and recording are excellent, though slightly hard-sounding, which I tend to attribute to the latter. *Robert Long*

**Bach: Brandenburg Concertos
(complete)**

Chamber Music Society of Lincoln Center
DELOS DE 3185; two CDs; DDD; 1:33:26
Sound: A+, Performance: A+

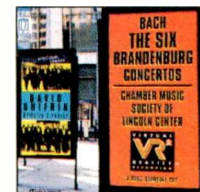
In searching my memory for a set of Brandenburg Concertos as satisfying as this collection by the Chamber Music Society of Lincoln

Center, I have to go back more than a half-century to the Busch Chamber Players' sessions for British Columbia. The exuberant joy in collaborative music-making expressed in those recordings was almost unattainable during the days following World War II, when all such recordings were made with symphony orchestra, more or less. And, until this Lincoln Center effort, the recent quest for authenticity has led, all too often, to preoccupation with means at the expense of the end product: the music.

Neither the Lincoln Center crew nor the Busch Players have paid much attention to authenticity. (Adolf Busch even had an in-law pianist, a young fellow named Rudolf Serkin, playing continuo, since harpsichords were all but unknown in concerted work in the '30s.) Theirs are performances by and for contemporaries, playing the historic scores in the style that comes naturally to them, with the verve and focus that can derive only from unbuttoned freedom from academic constraint. I hope I will not be misunderstood if I say that they "swing."

There is no reason that period performances can't swing in the same sense, and some do. But the prerequisite is for the performers to get the historical style and method so "under the skin" that they no longer require conscious attention—a musical nirvana few period performers have attained. My one tiny reservation about the present performance, in fact, is that harpsichordist John Gibbons sometimes slips into a fussy rubato that, however fashionable in period circles, sounds halting and unsure in this context. Fortunately, it is obvious only in the extended cadenza of No. 5, where he is alone and therefore impeding nobody's momentum but his own.

The recording is one of the Delos VR² (Virtual Reality) jobs in 20-bit Dolby Surround.



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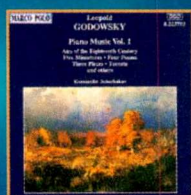
Piano Music, Vol. 1

Konstantin Scherbakov, piano
MARCO POLO 8.223793; DDD; 68:27
Sound: A, Performance: A

Leopold Godowsky is remembered primarily as a virtuoso pianist who recorded for Columbia in the teens and for Brunswick in the '20s. Here, in the role of composer, he is represented by six suites of short pieces and four stand-alone numbers. Call them "salon music" if you must, but they range from winsome to sensational. Siberia-

born Konstantin Scherbakov not only understands this Polish-American composer's delights but has the technical skill to pull them off. With diaphanous pianissimos and glittering, whirlwind arabesques, he plays these endearing little works like a veritable Leopold Godowsky. The recording, in a British church, has an attractively unobtrusive sense of space.

Robert Long



Even without the surround processing and extra speakers, which are not part of my auditioning system, I found the soundstaging superb. The perspective was quite close, with the musicians firmly placed in a continuous swath that extended a bit beyond my speakers. Rather than capture the group "at home" in Lincoln Center's Alice Tully Hall, Delos chose the more fulsome acoustics of the Concert Hall of the Performing Arts Center of the State University at Purchase, N.Y.—by now a mecca for classical recording. Bravo! In fact, *bravi tutti!*

Robert Long

Cras: Journal de Bord, Âmes d'Enfants, Légende pour Violoncelle et Orchestre, and Concerto pour Piano et Orchestre

Henri Demarquette, cello; Alain Jacquon, piano; Luxemburg Philharmonic Orchestra, Jean-François Antonioli

TIMPANI 2C2037; two CDs; DDD; 1:25:37
Sound: A+, Performance: A-

Like Claude Debussy and Jacques Ibert, Jean Cras had a fascination with the sea; like Nikolai Rimsky-Korsakov and Albert Roussel, he spent part of his life as a naval officer. His greatest work was his three-movement "Ship's Log," of 1927, which depicts his feelings and impressions about being alone with the immense sea. Although there are many similarities to "La Mer," the primary difference is that Debussy created a nature painting, whereas Cras charted a more personal/spiritual path. His ingenious work is no less a masterpiece and would be an appropriate companion piece for "La Mer."

"Souls of Children" is a trio of innocent children's songs for orchestra. In the brief "Légende," the cello takes the storyteller role

in an ancient Celtic folk tale. The piano concerto, written in 1931, is a lovely, brimming-with-melody Romantic excursion framed in the French style.

Both instrumental soloists are superb on these works, which are receiving their premieres on CD. The sound of this HDCD is exceptionally clear and detailed.

John Sunier

Loewe: Lieder and Ballads, Complete

Vol. I: Andreas Schmidt, baritone;

Cord Garben, piano

CPO 999 253; DDD; 64:34

Vol. II: Iris Vermillion, mezzo-soprano;

Cord Garben, piano

CPO 999 318; DDD; 74:42

Vol. III: Roman Trekel, baritone;

Cord Garben, piano

CPO 999 304; DDD; 66:40

Vol. IV: Gabriele Rossmannith, soprano;

Cord Garben, piano

CPO 999 260; DDD; 64:31

Vol. V: Edith Mathis, soprano;

Cord Garben, piano

CPO 999 334; DDD; 64:26

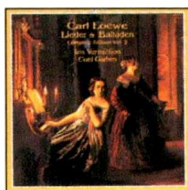
Vol. VI: Kurt Moll, bass;

Cord Garben, piano

CPO 999 306; DDD; 57:34

Sound: A, Performances: A to B

It is both inevitable and regrettable that this series will be compared to the Hyperion Schubert Edition. Inevitable, because the one thing many music lovers know about the work of Carl Loewe is that his setting of Goethe's poem, "Der Erlkönig," was preferred by Goethe to Schubert's much more famous setting. Inevitable, as well,



because the series format is the same: A single pianist but a different singer on each volume, with the songs evidently assigned on the basis of their appropriateness to the singer. And regrettable because, fine as this series and the ballads of Carl Loewe are, they seem second best when compared to the superlatives accruing to Schubert and the Schubert Edition.

But this series is everything one has a right to expect of such a compendium. The singing varies, naturally. Kurt Moll is superb, both baritones are excellent, and the women are generally almost as good (though Edith Mathis no longer is as poised a singer as she once was). The accompaniments leave very little to be desired. Full German texts and English translations are supplied. The broadcast studio sound is well above average; on some volumes the recording almost persuades me that I'm hearing a good recital hall.

Robert Long

Rózsa: Concerto for Violin and Orchestra; Concerto for String Orchestra, Op. 17; Andante for Strings

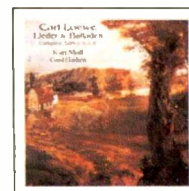
Igor Gruppman, violin;
New Zealand Symphony Orchestra,
James Sedares

KOCH INTERNATIONAL CLASSICS
3-7379; DDD; 65:02

Sound: A, Performance: B+

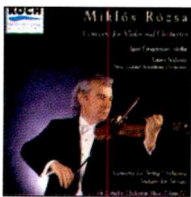
It is surprising that Miklós Rózsa's stunning and tuneful violin concerto hasn't become a 20th-century performance and recording staple. The only other recording of it that I know of was made in 1956 by Jascha Heifetz, who commissioned the Hungarian composer to write the concerto in the first place (RCA Gold Seal 796). Although he was one of the leading Hollywood film scorers from 1937 to 1981, Rózsa also wrote a lot of abstract concert music. Most of it, including the three works on this disc, showed a strong influence of Hungarian folk music without actually quoting folk songs.

In comparing the original Heifetz recording and the new Igor Gruppman version, I have to give the edge for captivating sound to the earlier recording—not for higher fidelity but sim-



ply because of Heifetz's gorgeous violin tone. Though the new recording has greater clarity and transparency overall, Heifetz's wonderful violin sound cannot be denied. For such a delightful violin concerto, why not have two versions to play?

The Concerto for String Orchestra is also full of stirring Rózsa melodies and dramatic impact. Spatial interest is heightened in the excellent recording via the composer's assignments of different contrapuntal themes to various string sections.



John Sunier

Ev'ry Time We Say Goodbye (American song recital)

Samuel Ramey, bass;

Warren Jones, piano

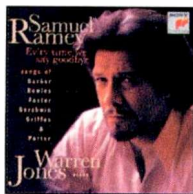
SONY CLASSICAL SK 68339

DDD; 71:22

Sound: A, Performance: B to A+

Would that all recitals, in the hall or on disc, were prepared with as much imagination and commitment as this one. Samuel Ramey sings groups of songs by Samuel Barber, Stephen Foster, Charles Griffes, George Gershwin, Paul Bowles, and Cole Porter, in that order. It takes guts, and it works. There are a few old favorites, such as the title tune (by Porter), but there is much more that is undeservedly unfamiliar. As a very personal cross-section of American song, the collection has no parallel I can think of.

Ramey is a consummate artist; few singers could put over some of these songs with his perfect aplomb. That said, his voice is not as steady as it once was, and he occasionally loses focus altogether. It hardly matters, given all that he presents for us to admire, but it must be acknowledged.



The recording was made in the Théâtre des Champs-Élysées in Paris—live, which may

account for some minor lapses. What the French audience made of some songs, particularly Foster's "Don't Bet Your Money on the Shanghai," is hard to imagine, unless they had far more explicit notes than we do. The booklet does contain full texts in English plus interesting but generalized notes in English, German, and French. I would like to know much more about some of these songs.

The sound is basically excellent: close-up, but spacious. There is off-putting evidence of manipulation, however. No hint of a live audience intrudes until the end of the Barber songs. Then, as elsewhere, the applause begins enthusiastically but ends quickly—much too quickly for the opening enthusiasm. And right

up to Porter's "Tale of the Oyster," which inevitably draws a few well-suppressed snickers, the audience remains silent during the songs. Can it really have sat through Foster's "If You've Only Got a Moustache" without a murmur? Somebody has fudged something and, as a consequence, introduced an unwelcome artificiality akin to that of a laugh-track sitcom. It doesn't compromise the music, but it does affect the overall listening experience.

The recording—and, it seems, the concert—were underwritten by James Hennessy & Co. One page in the booklet draws a parallel between this company's cognac and classical music. It is, in fact, a Hennessy ad. While I applaud the company for supporting so worthy a recital, I hope this isn't the beginning of a trend toward slathering Madison Avenue graffiti across our CD booklets. Hennessy is very low-key about it, but if the idea catches on with less circumspect sponsors. . . Robert Long

Martin: Preludes and Fugues

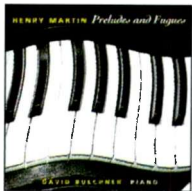
David Buechner, piano

GM RECORDINGS GM2049CD

DDD; 62:55

Sound: A, Performance: A+

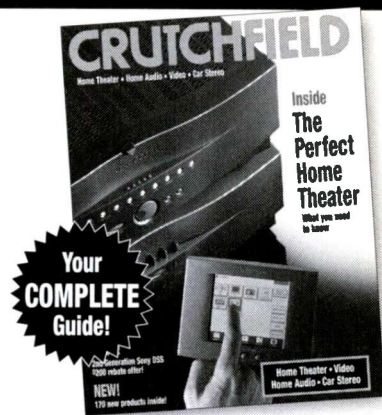
Among the composers inspired to create homages to Bach's monumental The Well-Tempered Clavier, a collection of preludes and fugues in all key signatures, were Chopin, Shostakovich, and Castelnuovo-Tedesco (for the guitar). Now comes composer/pianist Henry Martin, who studied with Milton Babbitt but specializes in tonal composition and jazz. The jazzy flavor of many of Martin's preludes and fugues might be expected from a musicologist whose latest book is *Charlie Parker and Thematic Improvisation* (Rutgers University and the Scarecrow Press). One critic described Martin's music as "Bach meets Jelly Roll Morton." Some of the pieces here are straight homages to Bach's models, some are inspired by Chopin, and the contrapuntal/rhythmic intricacy of others reminds me of Conlon Nancarrow's superhuman exercises for piano rolls. Scott Joplin's spirit is not a stranger to certain pieces, and other references—from Beethoven to Schumann—will be heard. And unlike Bach's original preludes and fugues, these are not all single-line progressions; many explode in passages of octaves and big chords.



Pianist David Buechner flies through the technical hoops of these eclectic exercises with the greatest of ease, and the recording's clarity is exemplary. I can't think of a more impressive recent contemporary keyboard work. It will doubtless provide many fascinating hours of listening.

John Sunier

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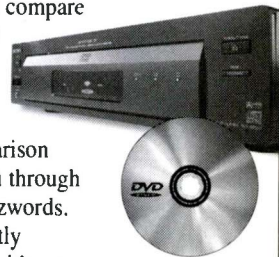
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RECORDINGS



Photo: Vincent McDonald

Orblivion

The Orb

ISLAND 314-524 347, 63:07

Sound: A, Performance: A



It's the end of the world as we know it, and "Dr." Alex Paterson appears to be feeling just fine. Returning with his seventh release under the moniker The Orb, the father of ambient house music and master of transcendental techno has made the cheeriest album about millennial tension and apocalyptic craziness you're ever likely to hear. Not since Prince's 1999 has the beginning of the end sounded so damn fun.

With industry institutions from MTV to *Billboard* rushing to proclaim electronica as the next "next big thing," the contributions of such veterans as Paterson and Richard James (a.k.a. Aphex Twin) are being

overlooked while such relatively slight talents as The Prodigy and The Chemical Brothers are being lauded. The same thing happened when grunge took off: No one had the time of day for pioneers Hüsker Dü or The Replacements. Such is life. Meanwhile, Paterson is at his turntables, leading a new version of The Orb (with associates Andy Hughes and Thomas Fehlmann), and the group is making some of its best music ever.

On 1991's *The Orb's Adventures Beyond the Ultraworld* and 1992's *U.F.Orb*, Paterson merged the sounds of Brian Eno's ambient efforts, Pink Floyd's interstellar overdrives, a bit of Hawkwind's space rock, and cutting-edge electronic dance music. But he seemed to lose his way with the bleak industrial tones of 1994's *Pomme Fritz* and the bland, almost-New Age Muzak of 1995's *Orbus Terrarum*. Part of the problem was that those recordings

lacked a coherent narrative. But for *Orblivion*, Paterson has returned to the conceptual shenanigans of older songs, using well-chosen samples to tell the story and set the scenes for his imaginative and hypnotic soundscapes.

Over the ominous sounds of "S.A.L.T.," a paranoid Scottish preacher predicts that the "number of the Beast" described in the Book of Revelations is showing up on our credit cards. Elsewhere, a solemn voice intones that "the rocket is waiting," and a perplexed weather girl stumbles when she reads that temperatures tomorrow will be sub-zero and "continued mild." Throw in a snippet from Joseph McCarthy's red-baiting Senate hearings and an

SUPERGRASS

In It for the Money

CAPITOL CDP 8 55228, 43:30

Sound: C-, Performance: A

Leaving behind the juvenile brashness of its '95 debut, *I Should Coco*, Supergrass has taken a stunning stylistic leap toward maturity. Bristling with soaring harmonies, irresistible melodies, and hints of melancholy cynicism, *In It for the Money* is an ambitiously potent pop gem that shows the Oxford, England, trio further defining its influences into a signature sound. Supergrass' roots (The Beatles, Badfinger, The Buzzcocks, and even ABBA) still show, but the group has evolved into a powerful songwriting team, able to create glam-drenched rockers ("Tonight," "Sun Hits the Sky") as well as moodily beautiful acoustic pieces ("Late in the Day," "It's Not Me"). Unlike Oasis, which crafts every verse/chorus with studied calculation, Supergrass displays enough confidence to create prolonged jams, adding strings, horns, and even Moog synthesizer at will. Except for muddled production that emphasizes the midrange and mars overall detail, *In It for the Money* glistens.

Ken Micallef



hysterical commercial jingle with a bouncy chorus about "the youth of America on LSD," and you may find yourself rushing in panic to the bomb shelter.

Once you get there, *Orblivion* will certainly keep you entertained. Considering the subject matter, it's ironic that "Delta MK II," "Asylum," and "Toxygene" contain some of The Orb's happiest hooks ever, as well as the fluid and jazzy mid-tempo grooves that characterize the combo's live performances. Like the doomed ravers who attempt to greet the aliens with a rooftop party in *Independence Day*, Paterson, Hughes, and The Orb are going out dancing. And in their warped though wonderful vision, the end of the world is just one more groovy trip. *Jim DeRogatis*

Livin' or Dyin'

Jack Ingram

RISING TIDE/UNIVERSAL RT 1009, 43:45

Sound: B+, Performance: B+

Let's face the cold hard facts, buckaroos: Country music, as a genre, has sucked more eggs lately than a raccoon with a key to the henhouse. And it's largely the fault of generic-sounding crooners decked out with the *de rigueur* custom Stetson hats, big shiny belt buckles, acid-washed jeans, and, naturally, cowboy boots. And all, of course, are mining the same satchelful of bland publishing house pap. Aside from true-blue talents like Vince Gill and Pam Tillis, Nashville's Music Row is, lately, only about big business.

But there's no pretension with newcomer Jack Ingram and his debut *Livin' or Dyin'*; the guy looks like a substitute high school teacher, sings like a more hillbilly Steve Earle (who co-produced this record), and—like Shawn Camp and Aaron Tippin before him—writes from a rural, working-class perspective that's 100% believable. The few covers Ingram attempts ring true as well, among them Guy Clark's "Rita Ballou," Jimmie Dale Gilmore's "Dallas," and the old roadhouse standard "Dim Lights, Thick Smoke (and Loud, Loud Music)." The instrumentation is also roadhouse simple—pedal steel in a few proper places, a booming Duane Eddy guitar lead here and there, and a softly plucked acoustic when the mood is right.

On "Nothin' Wrong with That," Ingram draws his goofy metaphor for wrong-side-of-the-tracks love ("I'm a beat-up Ford, you're a Cadillac"), but it feels perfect, hitting you right in the gut like good cheap beer. And *Livin' or Dyin'* is like this throughout. It proves that while country may be lying wounded on the street, all battered and bloody, it's being rescued by artists like Ingram. Soon it'll be okay to order eggs again. *Tom Lanham*

AUDIO/JULY 1997

83

Tara? Frankly, my dear, I don't give a damn.



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West

Mark Eitzel

WARNER BROS 9 46602, 53:44

Sound: B+, Performance: A

Mark Eitzel's a depressive type. He can deny it all he wants, but even a casual perusal of his ever-expanding catalog turns up an unusual number of not-so-beautiful losers. As the leader of the brilliant American Music Club, Eitzel couched his powers of negative thinking in a mesmerizing haze of skittish pedal-steel, dissonant guitar figures and halting beats. Striking out on his own with last year's *60 Watt Silver Lining*, Eitzel emerged a difficult crooner: able to swoon about the hazards of love but doing so with a pathologist's sense of detail.



West, his second solo album, is a collaboration with Peter Dinklage of R.E.M. Buck apparently caught an Eitzel set at the Crocodile in Seattle and sensed a possible partnership. Eitzel's husky growl still puts forth his elliptical thoughts, but the music is seasoned with unexpected buoyancy. "Free of Harm," "In Your Life," and "Move Myself Ahead" all shimmer with a fresh collaboration's glow. Other tracks on *West* suggest Buck wanted nothing more than a chance at writing the perfect Mark Eitzel song. "If You Have To Ask" is an amazing simulation.

Despite a few recognizable names among the album's contributing musicians (Barrett Martin of Screaming Trees, Mike McCready of Pearl Jam, and Steve Berlin of Los Lobos), the playing is never ego-centered. Instead, the concentration is on keeping a minimalist, jazzy groove for the slow numbers and a more Buck-like jangle for the upbeat tunes. Eitzel's got another winner on his hands, but will people finally listen?

Rob O'Connor

The Full Sentence

Pigeonhed

SUB POP SP 373, 66:04

Sound: B-, Performance: B

Some will know Pigeonhed principal Shawn Smith from his stellar vocalizing with Seattle bands Brad and Satchel. Some will recognize Pigeonhed's other principal, Steve Fisk, from his work with Beat Happening or instrumental icons Pell Mell, or perhaps from his early production chores with The Screaming Trees. But no familiarity with either of these talents—or even with Pigeonhed's first record—will prepare you for Smith's and Fisk's work together on *The Full*



Sentence, a soul-spiked punchbowl of canned beats, tape loops, and '70s soul/funk.

"Battle Flag," "P-Street," and "The Full Sentence" unite Smith's Prince-derived vocal style with trippy drum tracks; "Keep on Keepin' On" suggests Marvin Gaye, had he fronted Traffic; and "31st of July" and "It's Like the Man Said" sound like the king of '70s funk, George Clinton, raisin' the roof with a booty-boppin' synth beat. Still, not all sense of rock is lost, as guest guitarists Kim Thayil (of Soundgarden), Helios Creed, and Jerry Cantrell (of Alice in Chains) deliver some electricity on a few cuts.

For the most part, however, this is faux funk, the kind of white-boy soul that grooves okay, at least superficially. But it begs for an audience more interested in a challenging listen than a sweaty dance.

Bob Gulla

Albino Alligator

Michael Brook

4AD 9 46504, 48:13

Sound: A-, Performance: B+

Of all the musicians saddled with the New Age tag, few are as undeserving of it as Canadian composer Michael Brook, even if his solo albums are not exactly party music.

Like his occasional collaborators Daniel Lanois and Brian Eno, Brook is more interested in the complexities of sound than he is in making aggressively visceral music. His earlier solo albums, 1985's stunning *Hybrid* and

the chemical brothers

Dig Your Own Hole

ASTRALWERKS ASW 6372, 63:29

Sound: B, Performance: A

The Chemical Brothers are sonic manipulators dealing in twisted beats and crazed melodicism. Unlikely figures in the current electro-dance revolution, these two geeky DJs (Tom Rowlands and Ed Simons) have created a supercharged amalgam of '70s phat-footed disco energy and '90s sampling scavengery. Alternative rock may be dead, but rock 'n' roll lives on in The Brothers' sweaty, LP-spinning hands. On their 1995 debut, *Exit Planet Dust*, their soaring melodies, bass bombs, and drum loops were like *Soul Train* exploding the Woodstock Nation. The album seemed an impossible act to follow.

But *Dig Your Own Hole* matches *Dust's* excellence. Rowlands and Si-



mons weave tracks together with sound-effect swooshes that recall rockets flying overhead. A backward loop kicks off the title track—five-plus minutes of Sly & The Family Stone-like R&B. The pace quickens to a fast techno rhythm on "Elektro Bank," slowing a notch with the fractured "Piku." "Setting Sun," with Oasis's Noel Gallagher, is a Beatles-esque hallucination with warped vocals and maniacal seagull screams that are reminiscent of "Tomorrow Never Knows." "Get Up on It Like This" is the album's centerpiece, an irresistible slab of hyper drumming, blistering horns, and hip-hop slang.

Like a good party, *Dig Your Own Hole* quiets down near the end. But The Chemical Brothers know how to chill as well as thrill, being sure that once your pulse settles, you'll dig in once more.

Ken Micallef

1992's not-so-stunning *Cobalt Blue*, were subdued affairs. Both were effective as studies in sound and as unobtrusive background music, more dependent on the ethereal glissando of Brook's guitar effects and his compositions' hypnotic qualities than on melody or structure.



Albino Alligator, a soundtrack album, is Brook's most diverse and engaging work to date. Perhaps because of his stints producing records by artists as different as Nusrat Fateh Ali Kahn, The Pogues, and Mary Margaret O'Hara, he reaches into an unpredictable bag of sounds and themes for this accompaniment to Kevin Spacey's directorial debut. As a result, *Albino Alligator* careens back and forth between typical soundtrack inconsequentiality and bold artistic expression. While "The City" is dryly cinematic, other tracks are much more than mere accompaniment (the Middle Eastern tinged "Miscalculations," the digital Delta blues in "Slow Train," and the spacey ambience of "The Promise"). The barnburner that closes out the album, "Ill Wind," has Brook on guitar, Flea (yes, *that* Flea) on bass, and Michael Stipe and Jimmy Scott on vocals. It's beautifully bizarre and perfectly illustrates the extreme confluence of styles that makes this album more substantial than your average soundtrack.

Jason Ferguson

Hand It Over

Dinosaur Jr

REPRISE 46506, 45:22

Sound: A-, Performance: B+

Like Neil Young, Dinosaur Jr's J Mascis understands that a twisted, dirty electric guitar can sound every bit as beautiful as a choir. Mascis' creepy, croaky falsetto vocals and exploding guitar tones on *Hand It Over* often tread so close to Young's territory that Dinosaur Jr might be called Crazy Horse Jr. But that doesn't hide the fact that Mascis is a clever, highly original songwriter with a keen sense of melody, humor, and irony.

Mascis plays all of the guitars and drums on many of the tracks, with some assistance from Mike Johnson on bass, George Berz on drums, and a smattering of guests. Recorded primarily at Bob's Place, Mascis' home studio in Amherst, Massachusetts, *Hand It Over* has a remarkably huge, in-your-face sound. From the power chords of the album's opener, "I

Don't Think," Mascis' guitar sounds as though it's filtered through a wall of amplifiers, all turned up to 11.

That's not to say that there aren't any mellow moments. Although *Hand It Over* is not as introspective as Mascis' 1996 solo album, *Martin and Me*, a few songs, such as "Alone" and "I'm Insane," do lighten the load with keyboard and horn embellishments. And one song, "Gotta Know," is driven by a rollicking banjo. It's as close as the band has ever come to countrified, bluegrass-style rock. Nonetheless, *Hand It Over* is a loud, rocking album. Fans of Dinosaur Jr's caterwaul will not be disappointed, and anyone worried about the possibility that Mascis has sold out can rest assured—he hasn't.

Chris Gill

Pop

U2

ISLAND 314-524 334, 60:13

Sound: C, Performance: D

When U2 held a press conference at K-Mart a few months ago to announce that it had reinvented itself as techno, the media dutifully wrote it down and reported back verbatim: "U2 has reinvented itself as techno!" But *Pop* is really just another U2 album and not even a good one, at that.

U2's actual reinvention occurred in 1991 with *Achtung Baby*, when Bono finally dropped all vestiges of his flag-waving earnestness and the band placed enough trust in producer Brian Eno to let him erase everything that sounded like the old U2. But Eno isn't around for *Pop*, replaced by Flood and triphopper Howie B., who give everything the

same harsh digital sheen. The band may think its new music is hot and horny, swirly and psychedelic. What it really has is the cold, cruel impact of a bucket of icy water in February.



Achtung Baby was the sort of trick a band can pull off only once: How

can Bono expect us to forget that during the '93/'94 *Zooropa* tour—the last time we saw him—he adopted the persona "Mister Macphisto, the Last Rock Star"? The band and the media can call *Pop* a brave new move, but it's just dinosaur rock. "Mofo" is a plodding and inferior rewrite of "One"; the chiming guitar break in "Discothèque" should be familiar to anyone who's ever heard U2's 1980 debut, *Boy*; and "Last Night on Earth" is U2 circa 1987's *The Joshua Tree*, tarted up with some electronics.

Lyrically, Bono is still "Lookin' for to fill that God-shaped hole," as he sings in "Mofo." But he's mistaken if he thinks he'll find an answer among the pop-culture icons catalogued in "The Playboy Mansion" or the lame synthesizers and drum patters that U2 is trying to pass off as inspiration.

Jim DeRogatis

FAST TRACKS

Incoherent (Anxious Hippy Music 6601, 48:19). "There's a problem in my pants, and you're invited," but hey, enter at your own risk. NHT VP Ken Kantor's 50-minute experiment in raw, low-fi, occasionally backwards, often looped, and always loopy garage-esque pop is as interesting as it is indulgent. (Available from Anxious Hippy Music, Box 2133, Orinda, Cal. 94563.)

M.B.

In Utero: Nirvana (Mobile Fidelity UDCC 690, 41:24). Kurt Cobain cited 1993's *In Utero* as being truest to his aesthetic (or something like that). And, not surprisingly, it's Nirvana at its rawest, angriest, and noisiest. There's nothing polished about this gem, and MoFi's remastering of engineer Steve Albini's low-fi recording only enhances the potency of this rage fest.

M.B.

Sweetheart of the Rodeo: The Byrds (Columbia/Legacy CK 65150, 58:55). With Gram Parsons added to the lineup (following David Crosby's and Michael Clark's defections), The Byrds abandoned its folkie/psychedelic beginnings and began its foray into country and roots music. *Sweetheart of the Rodeo* started country rock in 1968 and is, arguably, the finest of The Byrds' Nashville-inspired period. This new reissue benefits from excellent remastering.

M.B.

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JAZZ ~ BLUES

RECORDINGS



Remembering Bud Powell
Chick Corea & Friends
 STRETCH 9012, 73:51
 Sound: A, Performance: A

Even during his most electrified periods, his fusion heyday with Return to Forever in the '70s and with his Elektric Band in the '80s, keyboardist Chick Corea always spoke with reverence of bebop piano pioneer Bud Powell, who died in 1966, and the huge impact he had on a generation of pianists. Essentially, Powell's astounding right-hand speed was the pianistic counterpart to Charlie Parker's proficiency on the saxophone around the same time. And it was Powell's innovative left-hand comping style that liberated rhythm sections from the strict time of the swing era, pointing the way to a brave new world of bebop.

Powell's towering influence is apparent in Corea's trio outings with

bassist Miroslav Vitous and drummer Roy Haynes, which resulted in the 1968 landmark album *Now He Sings, Now He Sobs* and the '80s ECM recordings *Trio Music* and *Trio Music Live in Europe*. And on Re-

membering Bud Powell, a collection of Powell's standards plus one Corea original, Corea immerses himself in Powell's style on an album that sizzles with fervent energy.

For this project, Corea has assembled a dream band of some of today's hottest players: saxophonists Kenny Garrett and Joshua Redman, trumpeter Wallace Roney, and bassist Christian McBride. Elder statesman Roy Haynes, now 71 years young, plays drums. After establishing a tight chemistry through extensive touring last summer, the ensemble recorded the 10 pieces here with requisite fire and flare. Corea seems particularly inspired, comping creatively behind the incendiary soloists and generating some heat of his own with fluid, breathtaking improvisation on the knuckle-buster "Oblivion" and a searing rendition of "Tempus Fugit." He imbues "Mediocre" with jaunty stride piano stylings that hint at Powell's roots. "Dusk in Sandi" is a dramatic showcase for Corea in a trio setting, allowing his cascading, Powell-influenced lines to come to the fore. And his tender side is revealed on a romantic interpretation of Powell's ballad "I'll Keep Loving You."

Photo: Tatsuo Kusumogo

OSCAR PETERSON

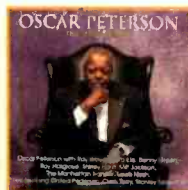
A Tribute to Oscar Peterson: Live at the Town Hall

Various Artists
 TELARC CD-83401, 72:39
 Sound: B+, Performance: B+

In the liner notes to this star-studded recording, pianist Benny Green describes Oscar Peterson's virtuosity as "instrumental mastery as a means to convey a very beautiful soul." Unquestionably, the elder pianist's musical and personal warmth anchors *A Tribute*, recorded last fall at the Town Hall in New York. Performers include Green, pianist/vocalist Shirley Horn, drummer Lewis Nash, trumpeter Roy Hargrove, and, most notably, Peterson's associates in his

original trio from 1956, bassist Ray Brown and guitarist Herb Ellis. The reunited trio swings with authority on "Anything Goes" and "Reunion Blues" (the latter including Green). Milt Jackson's vibes converse gleefully with Peterson's solos on "Bag's Groove." And Hargrove (playing flugelhorn) and saxophonist Stanley Turrentine add spicy sweetness to "My Foolish Heart" and "In a Mellow Tone," respectively.

Indeed, all the participants successfully match Peterson's elasticity, including the vocal group Manhattan Transfer, which, appropriately, resisted its trademark cutesy twists on the Nat "King" Cole vehicle "Route 66," instead delivering simplified harmonies and controlled vocalization. *Marie Elsie St. Léger*



Corea, who has demonstrated his playful side in recent collaborations with singer Bob-McFerrin, engages in some spirited dialog with Haynes on "Oblivion." And he brings Powell's compositional gifts to light in covering such obscure gems as the haunting, macabre "Glass Enclosure," the lovely but dark "Willow Grove," and the quirky "Mediocre." Corea's own heartfelt homage, "Bud Powell," has a distinctly Monkish feel. Corea's solo piano rendition of Powell's "Celia" closes the collection with elegance and élan.

The choice of material, superb interplay of the ensemble, and heroic solo work by all the players (Roney particularly) will ensure this recording a high spot on my year-end top 10 list.

Bill Milkowski

Natty Dread

Charlie Hunter Quartet

BLUE NOTE 7243 8 52420, 41:23

Sound: B, Performance: B

In 1996, Herbie Hancock attempted to update the jazz canon with *Standard Time*. That was an album of contemporary pop material arranged for jazz, with very mixed results. San Francisco's Charlie Hunter—with his eight-string guitar that doubles as a bass—may have pulled off what Hancock only hinted at, although with a completely original reading on a record that's hardly contemporary. Bob Marley's seminal 1975 album *Natty Dread* may seem like an incongruous match for Hunter's rare-groove jazz, especially considering that it contains some of Marley's darkest tunes. But when you strip away the Biblical imprecations and stark one-drops,

Marley's melodies are light, full of bounce, and thoroughly adaptable to jazz. Nowhere does Hunter try to duplicate the righteous Rasta skank; instead, he swings, jumps, and tosses in Latin elements. "Lively Up Yourself" chugs along in a hep cat shuffle, with Hunter's guitar sound emulating an organ and the quartet (guitar, drums, tenor, and alto sax) shouting out ad-libbed vocals. The same pseudo-organ strategy unearths a deep vein of funk in the wistful "Rebel Music," while a high-speed Afro-Cuban version of "Them Belly Full" is a daring standout.

But it's *Natty Dread*'s heart-wrenching ballads, including "No Woman No Cry," that give Hunter pause. His sensitive, country-flavored reading, while nowhere near as godawful as Hancock's trapeze through Nirvana's "All Apologies," unfortunately sounds like a karaoke soundtrack. And "So Jah Seh" and "Revolution," even with the Hunter Quartet's

tasteful treatment, come up a dreadlock short in comparison to the original, transcendent versions. Still, it's when Hunter's uncovering the surprising melodicism of Marley's tunes and running them through the quartet's groove machine that *Natty Dread* truly works as a jazz record.

Mark Schwartz

Cold Spell

Wayne Horvitz & Zony Mash

KNITTING FACTORY WORKS

KFW CD 201, 45:05

Sound: A-, Performance: B+

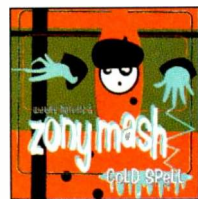
South Delta Space Age

Third Rail

ANTILLES 314-524 328, 51:50

Sound: B+, Performance: A-

There's nothing more funky than a Hammond B-3 organ, an instrument equally at home in a church or a strip joint. Its popularity in jazz music dates back to the '50s, when Jimmy Smith and Jack McDuff began making organ-trio records. Wayne Horvitz and Zony Mash—as well as James Blood Ulmer's new band, Third Rail—are now bringing that funky B-3 sound into the '90s.



Horvitz and Zony Mash (named after an obscure Meters tune) pile the twisted grooves high on their debut CD, *Cold Spell*, while guitarist Timothy Young's toe-to-toe exchanges with Horvitz and his B-3

get downright frothy. Traces of Jeff Beck's *Wired* and a funk-ed-up Emerson, Lake & Palmer are heard on "The Gift" and "Sex Fiend." The funk-noirish title track casts long, dark shadows as Young's scratchy guitar dances across Horvitz's sleek underpinnings. This versatile quartet covers a lot of ground, with its moody, loopy sound triggering numerous pop associations.

Although Zony Mash's roots extend no farther south than downtown Manhattan, Third Rail is the real New Orleans deal. Ulmer trades in his usual Harmolodic-style guitar for something far funkier. His unexpectedly hot-but-tered vocals roll over organ wizard Bernie Worrell's grooves. This band, with Meters veteran Ziggy Modeliste on drums and Bill Laswell on bass, simply cooks. Worrell's damn near unstoppable on "Grounded," and "Blues March" could be the funkateers parade theme. Ulmer's oh-so-soulful vocals make the ballad "Please Tell Her" sound like a lost Isaac Hayes gem. Third Rail has worked out all the kinks but retained all the raunchy avant-funk.

Steve Guttenberg

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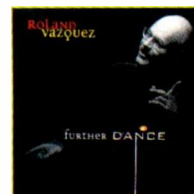
Further Dance

Roland Vasquez

RVCD RVD7005, 76:59

Sound: A+, Performance: A

Every few years, New York drummer/percussionist/composer Roland Vasquez releases a self-produced CD that fuses Latin rhythms with jazz improvisation. And *Further Dance*, on his own RVCD label, is his most satisfying album to date. Here he's accompanied by pianist Mark Soskin (Sonny Rollins' pianist for the past two decades), the vastly underrated saxophonist Walt Weiskopf, Ricardo Candelaria on congas and percussion, and Anthony Jackson on contrabass guitar.



Vasquez's original compositions put a contemporary spin on old-school *montunos* and *songos*, a fresh-sounding funk/salsa/be-bop hybrid. The result is exhilarating on percolating fare like "Las a Mediosas," "Tu Sabes?" and "The Path of Change" and is affecting on alluring ballads like "The Price" and "Beyond This Dream," both of which showcase Weiskopf's lyrical, big-toned tenor sax and Soskin's cascading piano lines. "Sum Fum Dango" is a spirited percussion jam between Vasquez and Candelaria. On "Duo 2" the percussionist goes toe to toe with virtuoso bassist Jackson.

Recorded live to 20-bit two-track at Clinton Recording in New York, *Further Dance* is a brilliant document of how much Latin jazz has evolved since the 1940s, when Dizzy Gillespie and Chano Pozo helped establish the genre. Try to imagine Latinized Brecker Brothers, and you'll get a clear picture of where Roland Vasquez is at. (Available from RVCD, 924 West End Avenue, Suite #1, New York, N.Y. 10025.)

Bill Milkowski

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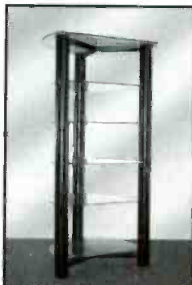
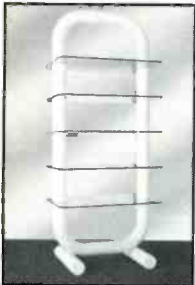
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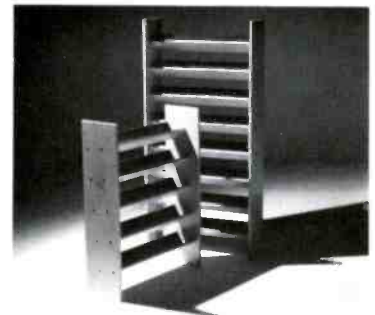


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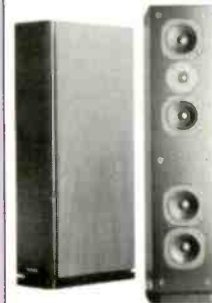
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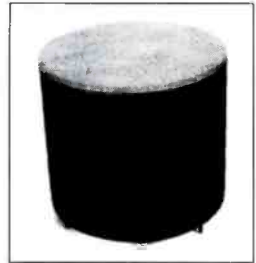
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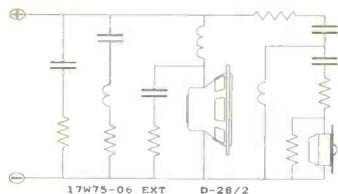
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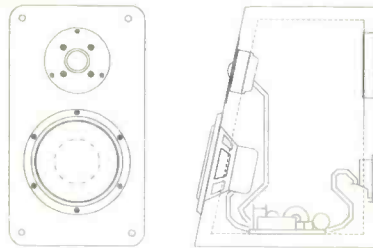
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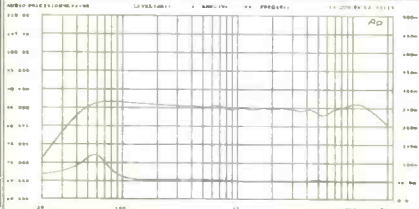


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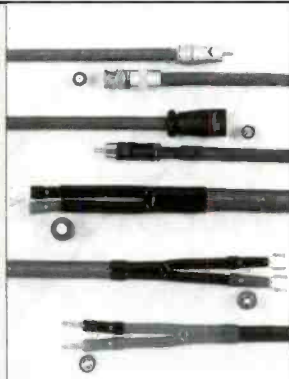
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PlayBack

Monster Cable Light Speed 100 Toslink Digital Interconnect

The Toslink connection is not generally considered the best type of interlink for digital audio gear. The ideal is considered to be the AES/EBU professional standard, which uses XLR balanced connectors; unbalanced coaxial, which uses RCA connectors, is next in the line of desirability. However, few consumer audio components have AES/EBU connections, and not all have the consumer coax connection, either. So if you are limited to using Toslink, you might as well use a high-quality cable, such as the Monster Cable Light Speed 100. I could not confirm Monster's claim that it would improve audio compared to conventional Toslink cables, but the Light Speed 100's premium housing and nifty locking connectors should make it much more durable than most over the long term. The connectors lock precisely to Toslink ports and feel secure. Each connector also has a protective jacket where the cable enters it, to provide strain relief for the optical fiber. The cable comes in lengths of 1 meter, 2 meters, or 20 feet; price for a 1-meter cable is \$39. The Light Speed 100's combination of price, performance, and durability put it at the top of my list. (Monster Cable: 274 Wattis Way, South San Francisco, Cal. 94080; 415/871-6000.)



Rotel RR-990 Remote Control

By now, everyone is familiar with universal or learning remote controls designed to operate multiple components from various manufacturers. Unfortunately, just about any such remote aspiring to reasonable completeness has suffered from overpopulation; finding the right button often proves as tedious as finding the right remote would have been.

Lately manufacturers have been trying to break out of that box, most notably by creating touchscreen remotes that change their displays and functions based on the selected component. The first reasonably priced, separate learning remote of this genre is the Rotel RR-990 (\$199.90), which has quickly become my favorite universal remote control. It has eight permanent selectors along the bottom for TV, VCR, CD, laserdisc, amp, tape/tuner, and two other unspecified components. Pushing any of these buttons calls up a screen with an array of control icons appropriate for the selected component. (Screens for the two unspecified selectors can be created by copying from whichever of the others is closest in function.) In addition, you can switch between complete and simplified screens for each component and even create custom screens by deleting unwanted icons from the complete screens.

GRADE: A-

And you can assign multiple-command macros to any button. These macros must consist of commands already memorized to other buttons, but the command string can span screens, enabling you to reset numerous components with a single touch. The screens automatically backlight when touched.

There are a few curious omissions, such as no disc change button on the CD screen, but you can assign such functions to other buttons if you don't mind the consequent mislabeling. You have to jump between screens sometimes to get to all the commands you need, and it would be nice to be able to build custom screens from scratch. These are mere quibbles, however, relative to the convenience of having only the currently relevant controls before you at any given moment, which makes the RR-990 exceptionally easy for almost anyone to use. (Rotel: 54 Concord St., North Reading, Mass. 01864; 800/370-3741; www.rotel.com) Michael Riggs

For literature, circle No. 121



Tekna Sonic C-12 Subwoofer Vibration Absorber

Loudspeaker manufacturers try to control enclosure wall vibration by using thicker panels, denser and more rigid materials, and clever bracing schemes. But vibration still exists, radiating from the enclosure walls as delayed acoustic output that colors the sound. Tekna Sonic has developed a series of damping devices that attack the problem by absorbing vibration energy and dissipating it as heat. There are models that you can attach to speakers and subwoofers of various sizes or place in walls containing speakers; Tekna Sonic also sells speaker stands with the dampers built in. I tried the C-12, a \$50 unit for use with subwoofers, that is designed to absorb vibrations below about 500 Hz. I used an accelerometer to measure the panel vibrations of a subwoofer with and without the C-12 attached. Temporarily mounting a C-12 to the top of the box reduced vibrations between 100 and 200 Hz; attaching one on each side of the subwoofer reduced them even more. The C-12s seemed to tighten the subwoofer's sound and made it even harder to localize. Most subwoofers have enclosures small enough to preclude panel resonances in their intended operating range, but reducing vibration above 100 Hz appears to be worthwhile. (Tekna Sonic: 442 Houser St., Suite E, Cotati, Cal. 94931; 707/794-1512.)

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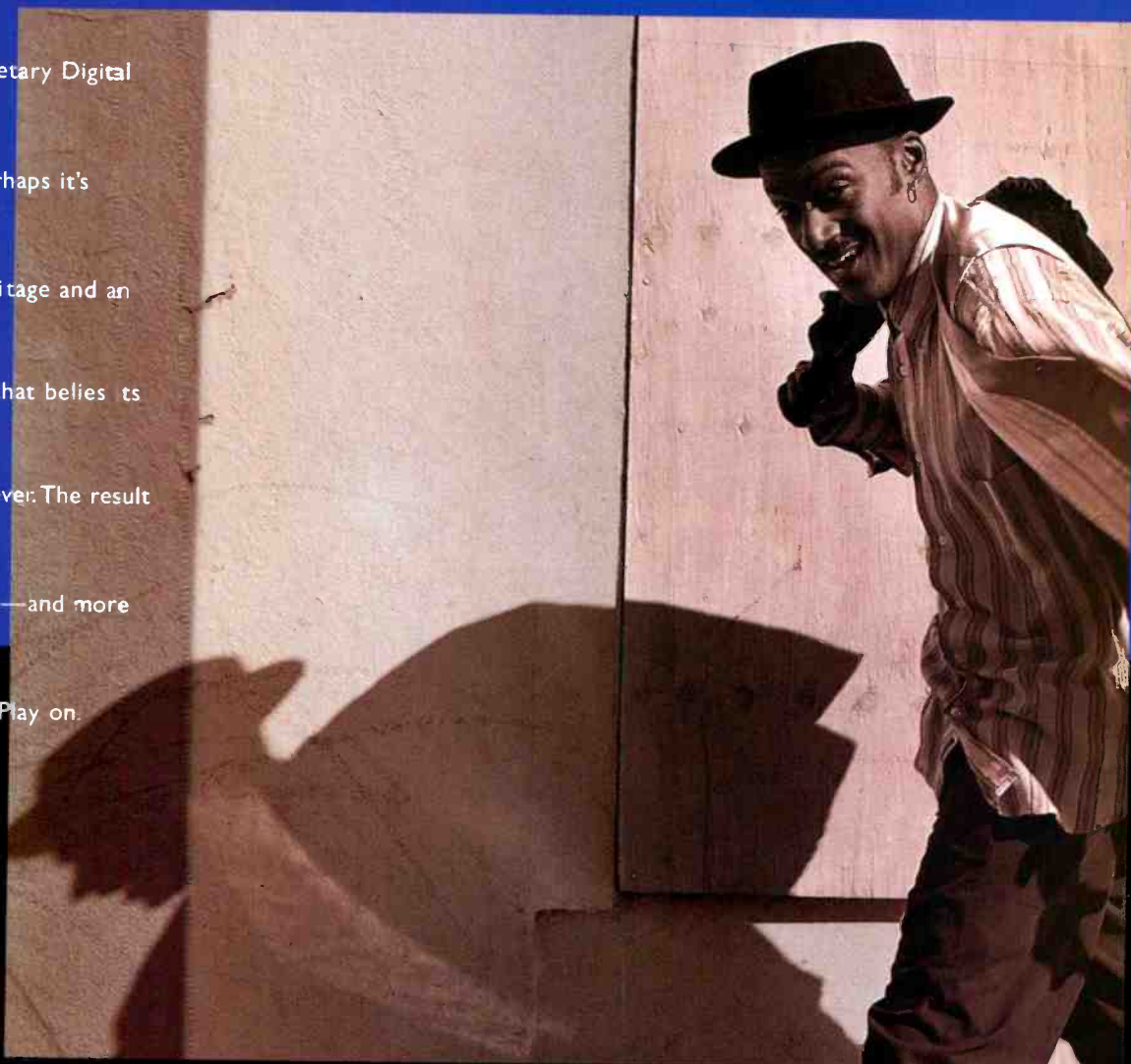
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Any cable can transmit electrical signals from one video or audio component to another, or from amplifiers to speakers. But, for a great viewing or listening experience, with sharper, more lifelike pictures and richer, more musical sound, you need more than just cable. Ordinary video and audio cables, even "high-end" types, can alter critical signal timings and phase relationships, irreversibly degrading picture and sound quality.

That's why MIT's founder literally invented high-performance interconnects and speaker cables, creating a new category of components called Interfaces. MIT's fundamental patents in high-performance cable design mean that only MIT can bring you Interfaces scientifically designed to eliminate the non-linearities and distortions caused by other, ordinary cables, no matter how expensive they may be.

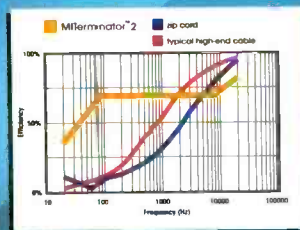
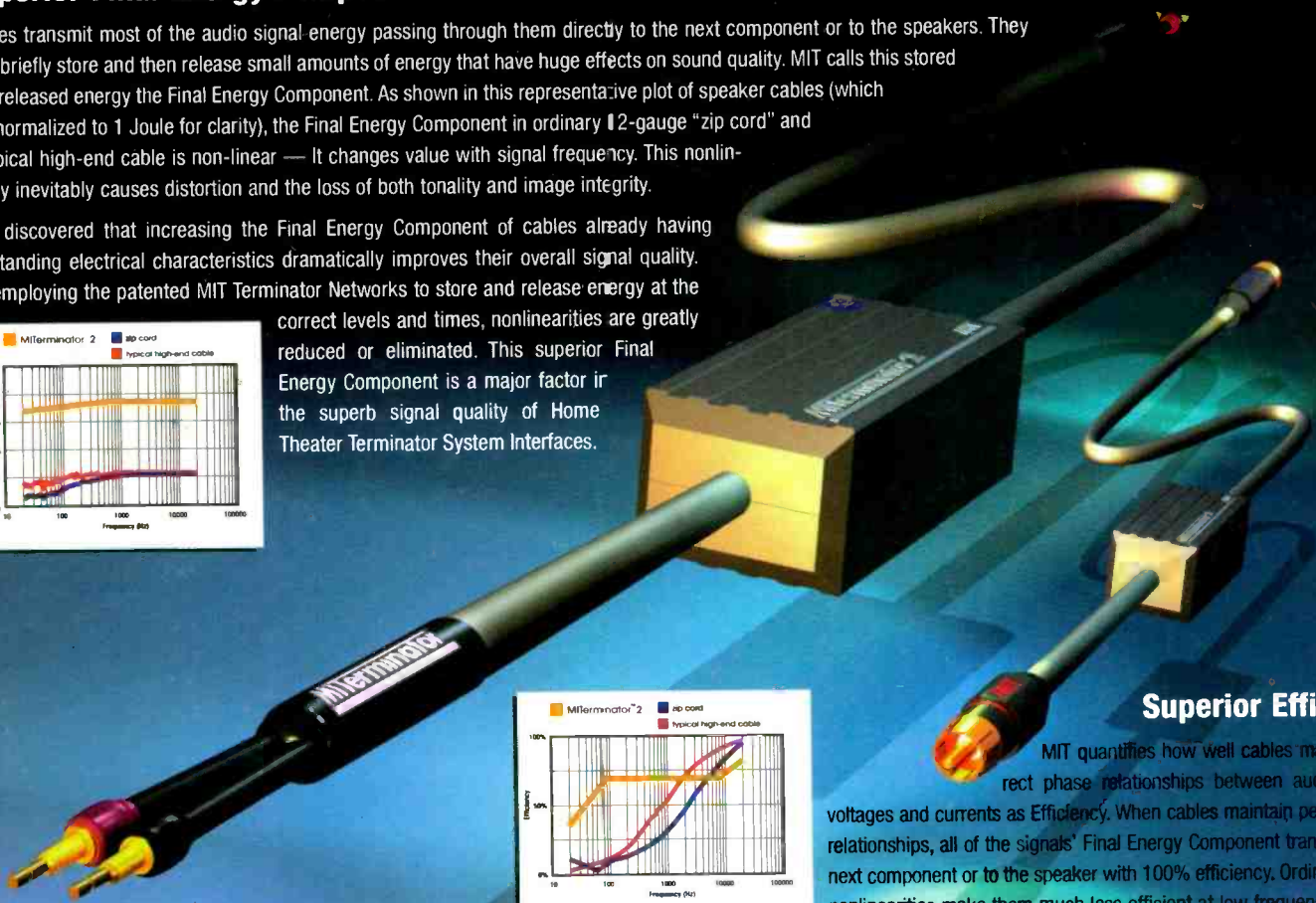
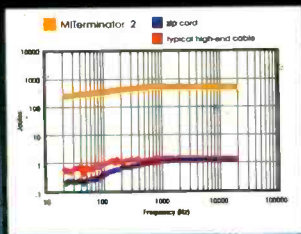
If you watch and listen for the subtleties of picture and sound quality that are the hallmarks of great viewing and listening experiences, you need MIT's Home Theater Terminator System Interfaces. The hard science behind MIT's remarkably affordable Interfaces reveals the full potential of your high performance home theater system. Until you use MIT Interfaces, you'll never know just how good your system can be.

Superior Final Energy Component

Cables transmit most of the audio signal energy passing through them directly to the next component or to the speakers. They also briefly store and then release small amounts of energy that have huge effects on sound quality. MIT calls this stored and released energy the Final Energy Component. As shown in this representative plot of speaker cables (which are normalized to 1 Joule for clarity), the Final Energy Component in ordinary #2-gauge "zip cord" and a typical high-end cable is non-linear — It changes value with signal frequency. This nonlinearity inevitably causes distortion and the loss of both tonality and image integrity.

MIT discovered that increasing the Final Energy Component of cables already having outstanding electrical characteristics dramatically improves their overall signal quality.

By employing the patented MIT Terminator Networks to store and release energy at the correct levels and times, nonlinearities are greatly reduced or eliminated. This superior Final Energy Component is a major factor in the superb signal quality of Home Theater Terminator System Interfaces.



Superior Efficiency

MIT quantifies how well cables maintain correct phase relationships between audio signals' voltages and currents as Efficiency. When cables maintain perfect phase relationships, all of the signals' Final Energy Component transfers to the next component or to the speaker with 100% efficiency. Ordinary cables' nonlinearities make them much less efficient at low frequencies than at high frequencies, as shown for "zip cord" and for an ordinary high-end speaker cable. The sonic results are noise, distortion, loss of image quality, and excessively "bright" treble sound.

As you can see from the plot, MIT's patented Terminator Networks give the Home Theater Terminator System Interfaces a huge advantage over ordinary cables, raising low-frequency efficiency and "flattening" the overall curve. This means that MIT Interfaces deliver far more accurate picture and sound quality, with lower noise than ordinary cables can. Although the plot shows speaker cables, the results also apply to audio interconnects.

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