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AUDIO

THE EQUIPMENT AUTHORITY

MAY 1995

IN-DASH REVIEWS

**DENON
KENWOOD**

PRO TESTING ON THE ROAD

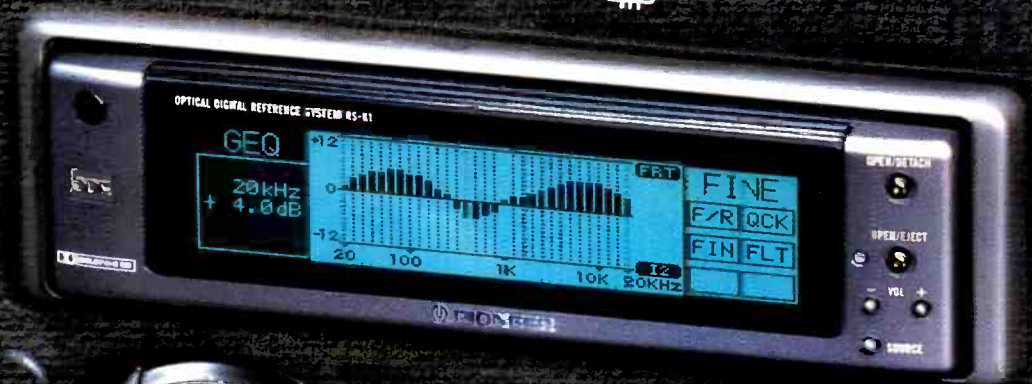
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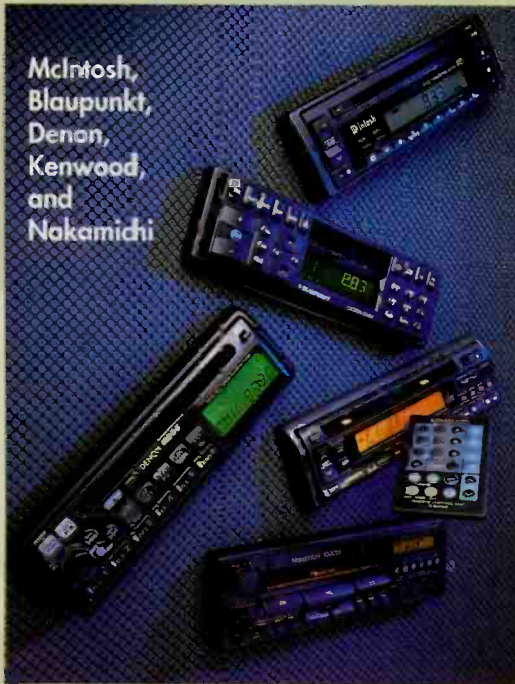
AUDIO

THE EQUIPMENT AUTHORITY

Road-Testing Tuners, page 34



Gold Line,
page 74



McIntosh,
Blaupunkt,
Denon,
Kenwood,
and
Nakamichi

features

TUNERS IN TRANSIT: HOW BLAUPUNKT ROAD-TESTS RADIOS Mike Stosich 34

CAR AUDIO: GET YOUR HEAD INTO IT
Richard Clark and David Navone 38

equipment profiles

DENON DCT-950R CAR STEREO
Edward J. Foster and Ivan Berger 44

KENWOOD KDC-PS900 CAR STEREO
Edward J. Foster and Ivan Berger 50

PHASE TECHNOLOGY PC 10.5 SPEAKER D. B. Keele, Jr. 56

SENNHEISER IS 850 DIGITAL INFRARED EARPHONE SYSTEM Edward M. Long 64

auricles

AUDIO RESEARCH VT150SE MONO AMP, LS5 MKII PREAMP, AND BL2 INTERFACE Anthony H. Cordesman 66

LISTENING WITH SAM:

QUICKSILVER GLA AMPLIFIER Sam Tellig 70

GOLD LINE DSP-30 PORTABLE REAL-TIME ANALYZER
Edward M. Long 74

departments

FAST FORE-WORD Eugene Pitts III 4

WHAT'S NEW 6

AUDIO ETC Edward Tatnall Canby 8

CURRENTS John Eargle 16

MONDO AUDIO Ken Kessler 19

ROADSIGNS Ivan Berger 24

AUDIOCLINIC Joseph Giovanelli 26

SIGNALS & NOISE/ERRATUM 30

recordings

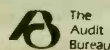
CLASSICAL 76

ROCK/POP 82

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playback

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SONY TC-K615S DOLBY S CASSETTE DECK

MOTOROLA POWER SERIES CELLULAR MODEM 96



Roadsigns, page 24



The Experience

"I'm particular."

While engineering recordings for many clients, among them the Chicago and St. Louis Symphonies, I heard of Martin-Logan's special electrostatic precision and clarity from several of my colleagues. So, I installed a pair in my studio.

What happened next was amazing. Every change in the recording process became apparent. Details of space in the hall, microphone placement and even converter qualities were instantly perceived. Yet, the superior dispersion of their curvilinear transducer allowed remarkably easy room placement, even in my studio.

After using Martin-Logan products for years, I am excited to introduce the new advanced SL3, shattering industry standards yet again.

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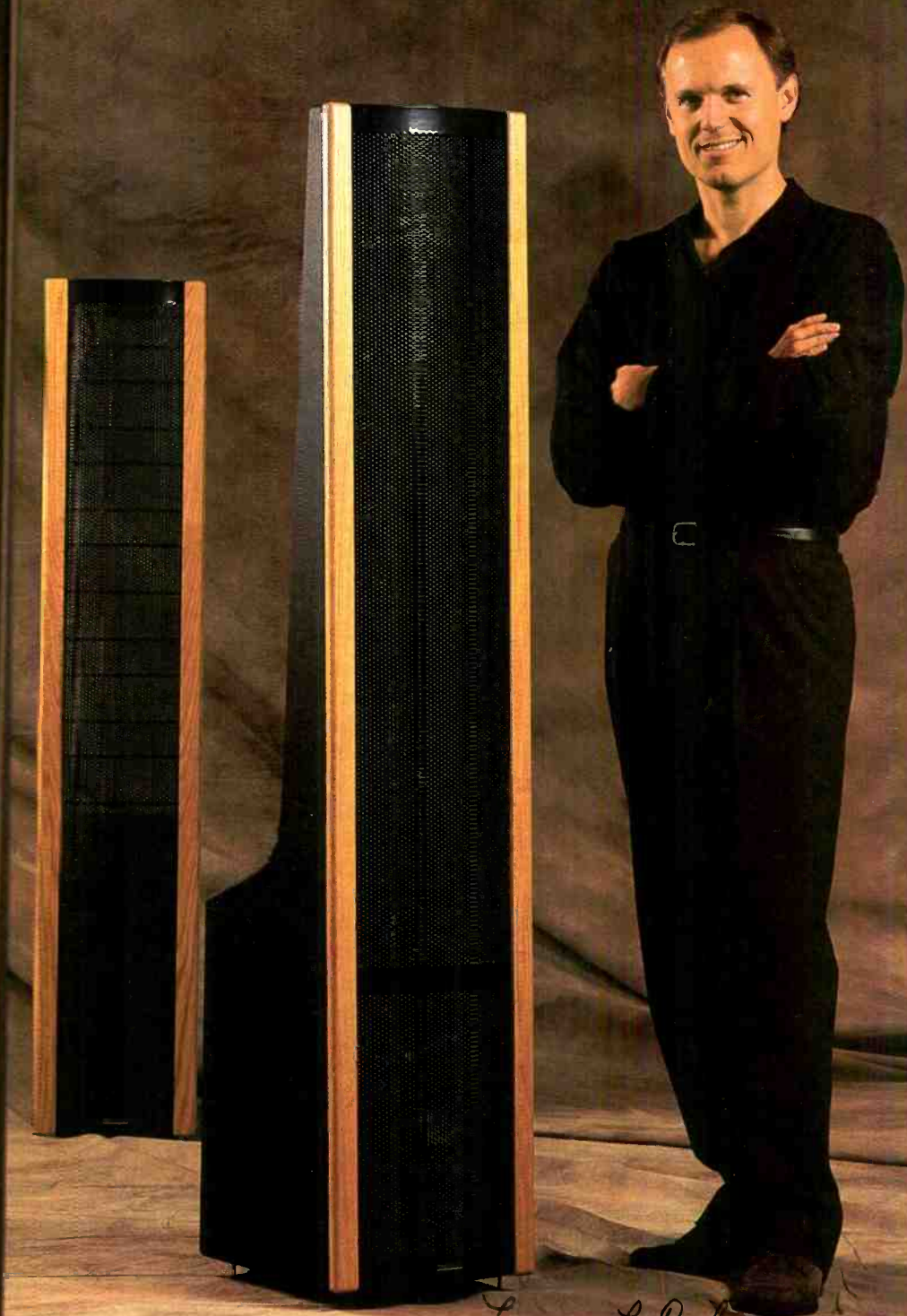
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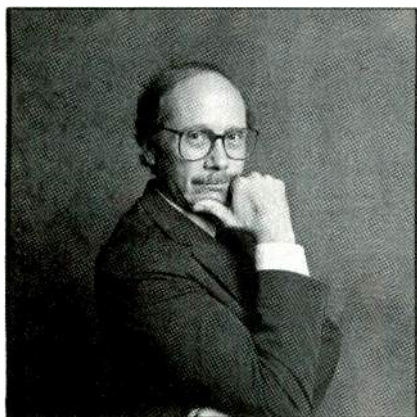
Following is a sampling of Larry's works:
WFMT Fine Arts Network weekly broadcast of the Chicago Symphony Orchestra, Erato, RCA/BMG, CBS/Sony, Koss Classics, Marco Polo, New World, Crystal, Peregrine, Pro Arte, Summit, Centaur, Orfeo, Musical Heritage Society.

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Sometimes there are too many timely and newsworthy things to include in just a single editorial. Thus, I have decided to make this editorial one of "rahs!" and "bahs!"

First, a "double rah!" for Tsutomu Shimomura, the computer security expert who helped track down Kevin Mitnick, one of the FBI's most-wanted computer-hacker outlaws. Mitnick was arraigned in mid-February on charges of stealing more than 20,000 credit-card numbers via the Internet global computer network. Shimomura got involved with the chase after Mitnick allegedly broke into Shimomura's home computer on Christmas Day last year, leaving insulting messages. I think Shimomura's a national hero, and I would love to find out what kind of hi-fi system he has.

I give a heartfelt "rah!" to two industry figures who are supporting musicians who might otherwise not be noticed. Gene Czerwinski, the founder of Cerwin-Vega, is also the founder of MAMA, the acronym of Musical Archives, Musical Archives. In addition to honoring the memory of his wife, Lois Czerwinski, Gene's objectives were to preserve culturally significant music that would not otherwise make it commercially, to distribute this music, and to provide support and technical assistance for artistic experiments. I commend to your attention the MAMA Foundation's CD of Bob Curnow's L.A. Big Band playing *The Music of Pat Metheny & Lyle Mays* (MMF 1009). This band is in the Kenton style and does some truly fine ensemble

horn playing. Write MAMA at 555 East Easy St., Simi Valley, Cal. 93065.

Another "rah!" goes to Cello's Mark Levinson for his help to the Music Maker Relief and Recording Foundation. The foundation has released a compelling CD, *A Living Past*, in an attempt to help forgotten Southern blues and folk musicians. This recording was done by Timothy Duffy and has a strong freshness, a presence and an immediacy that I have rarely heard in any recording. For a contribution of \$100 to the Foundation, which was started in January 1994 by Levinson and Duffy, the donor will receive the CD, mastered to good effect on Cello equipment, and a large-format booklet with background, lyrics, and photos. Write Duffy at Rte. 1, Box 567, Pinnacle, N.C. 27043.

A "bah, humbug!" goes to the U.S. Congress for its threat to end funding for the Corporation for Public Broadcasting, which could end National Public Radio. While public television certainly has great potential for raising funds through commercialization of "Barney" the dinosaur and of Sesame Street figures, NPR has no such leverage. The federal underwriting for the whole of the CPB is \$300 million, says Rep. David Obey (D-Wisc.), or 3/1,000 of 1% of the federal budget. Delano Lewis, NPR president and CEO, notes that NPR costs the taxpayer only about 29 cents per person per year. Further, Lewis says, each "dollar in federal funding... leverages \$5 in other funding." To me, this seems like extremely cheap pump-priming of quality radio programming by the federal government.

In closing, let me draw your attention to the Quicksilver amp review by a writer, Sam Tellig, who is well known but new to our pages. Welcome, Sam.

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Yamaha Cinema DSP gives dialogue more definition. Music, more dimension. And sound effects, far greater realism, more graphic detail and superior placement. This breakthrough in realism is no small feat.

It's accomplished by multiplying the effects of Digital Sound Field Processing and Dolby Pro Logic.[®]

Digital Sound Field Processing is Yamaha's unique technology that electronically recreates some of the finest performance spaces in the world.

While Dolby Pro Logic places sound around the room, precisely matching the dialogue and sound effects with the action on the screen.

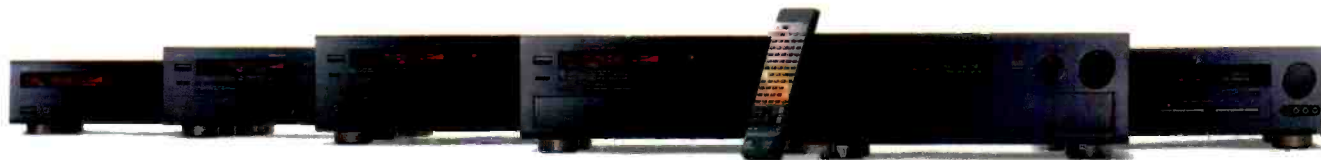
Together, these two technologies allow Yamaha to offer a complete line of home theater components that outperform other comparatively priced products on the market.

After reading this ad, if you get the feeling that watching a movie with Cinema DSP makes a world of difference, you're absolutely right.

But don't just take our word for it. Hear it for yourself. Stop by your local Yamaha dealer for a demonstration today. It's one demo that's bound to change the way you look at movies forever. Or at least for a very, very long time. For the dealer nearest you, call 1-800-4YAMAHA.



Only Yamaha Cinema DSP creates phantom speakers that fully replicate the experience you get in multi-speaker movie theaters. It sounds so real, you'll swear you hear sounds from places you don't even have speakers.



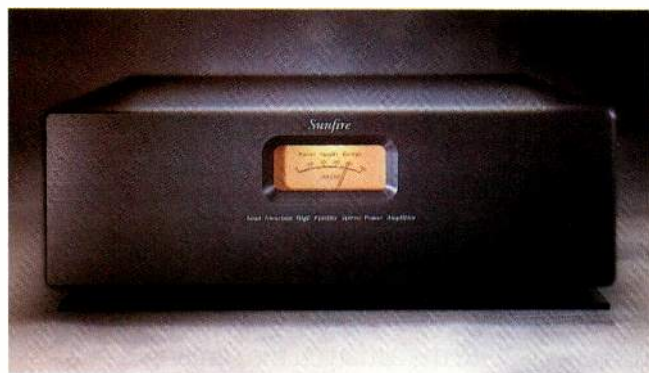
WHAT'S NEW



Esoteric Sound Transcription Turntable

For collectors of old radio transcriptions, Esoteric Sound's ATEN handles discs up to 16 inches in diameter. Speeds are 33.33, 45, 71.29, 76.59, 78.26, and 80 rpm (with stroboscopes for 33, 45,

and 78); a pitch control allows $\pm 8\%$ variation. The turntable comes with a magnetic pickup and styli for both LPs and 78s, an arm, and a dustcover. Price: \$530. For literature, circle No. 100



Sunfire Amplifier

From Bob Carver's newest company comes the Sunfire amplifier, a load-invariant design that produces 300 watts per channel into 8 ohms and 600 watts per channel into 4 ohms. On an interval-limited basis, it can also produce 1,200 watts per channel into 2 ohms and 2,400 watts per channel into 1 ohm. Dual outputs are provided, one

acting as a voltage source, the other as a current-source output for sound more typical of tube amps. The two outputs can be bi-wired, says Sunfire, to deliver solid-state sound to the bass and more tube-like sound to the midrange and treble. Both standard and direct-coupled unbalanced inputs are available, as are balanced inputs via gold-plated XLR connectors. Price: \$2,175. For literature, circle No. 101



AudioSource Surround Decoder

Designed to ease the upgrading of an audio system to surround, the AudioSource SS-Five processor has built-in amplifiers for center and surround, as well as a wireless remote control and an

automatic power control that turns the unit on and off with your TV and VCR. The surround circuitry, using an 18-bit chip, has 105-dB dynamic range and better than 55-dB separation. Surround modes include Dolby Pro Logic, Hall, and Matrix. Price: \$299.95. For literature, circle No. 102



Samsung A/V Player

The KCD-1 five-disc carousel changer can play not only audio and CD+G titles but also Samsung's new CD-OK format, which uses the Musical Instrument Digital Interface (MIDI) for musical information, MPEG video

compression for images, and a proprietary graphics system for lyrics and cues. A CD-OK disc can hold up to 3,000 songs and 4,000 images. The KCD-1 uses dual 18-bit DACs with eight-times oversampling. Price: \$1,199.

For literature, circle No. 103



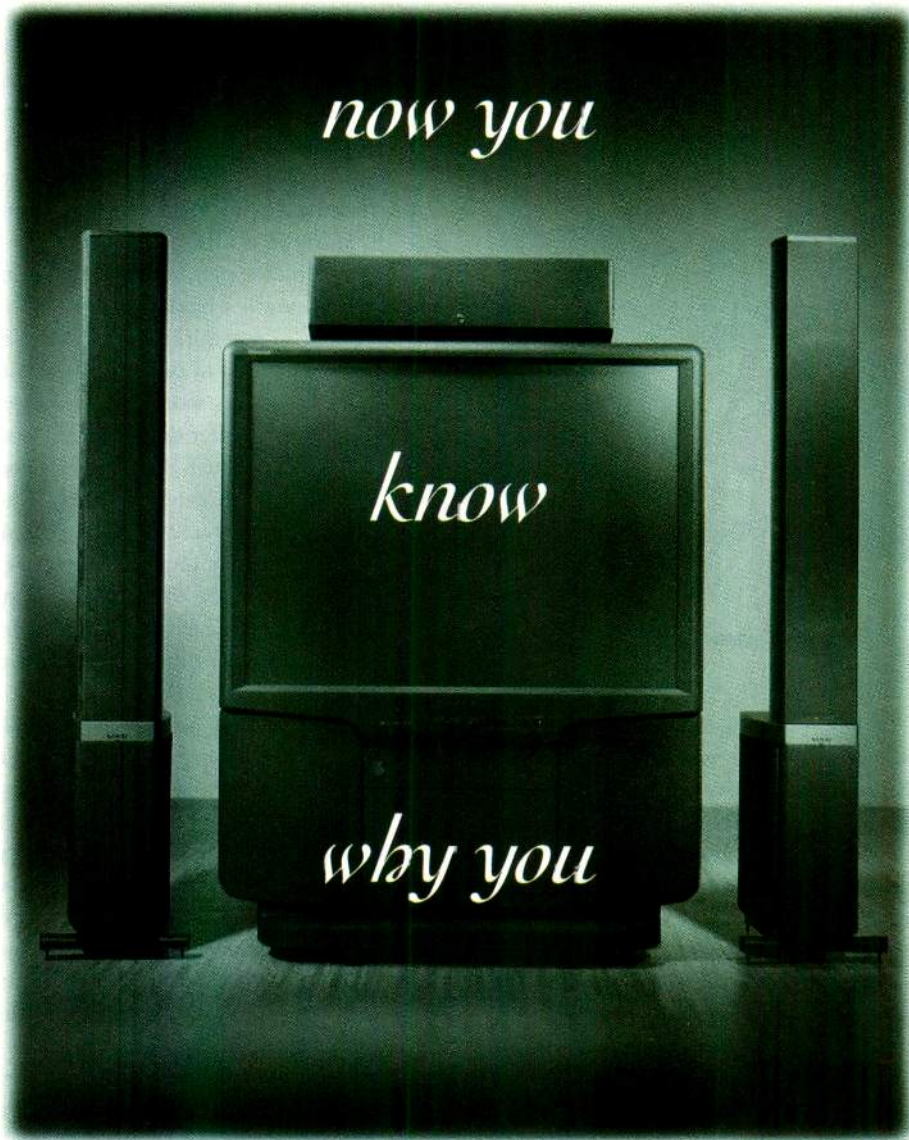
Multiwave Innovation Multifformat CD Player

The MovieWave Station, from Multiwave Innovation, plays CDs in six formats—audio CD, Video CD, CD-I full-motion video, karaoke CD, CD+G, and Photo CD. It also includes built-in surround decoding. Among its features

are microphone inputs, echo, musical-key shift, and voice cancellation for karaoke; zooming for Photo CDs, and MPEG video and audio decompression. Both NTSC and PAL composite video outputs are provided. Price: \$399.

For literature, circle No. 104

Well,



waited.



You finally purchased the big screen TV. And while it sounds good, you know it could sound incredible if you added surround sound. But you've been holding off, because until now home theater has seemed just too complicated. Now you'll be glad you waited.



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streamlined design enhances the decor of a room where others overpower it. And because we built in so much of our leading-edge Infinity technology, COMPOSITIONS is timeless.

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long time to come. To hear and feel a demonstration visit your Infinity dealer. For more information call 1-800-508-5588.

 **Infinity**

EDWARD TATNALL CANBY

SPEAKERS, SEPARATE AND OTHERWISE

medium for personal communication." A platitude is an utter obviousness. Did you know, then, that hi-fi, post-World War II, began with components? Separate units, we called them at first, as contrasted with the long-established "complete" one-piece radios and radio-phonos—table, mantelpiece, or console—that were the longtime sonic standard? And are you aware that in those heady times a speaker was a *speaker*, i.e., a metal frame surrounding a cone with a magnetic driver at its center (an electromagnet or, as magnetic materials improved, a permanent magnet)? Well, of course, and obviously. For anyone who was around at that time. There aren't too many of us left.

Interestingly, what we are seeing now is a modified return to the very spirit of that approach, out of the late '40s, which was as soon as we could get started after the end of the war, and on through the '50s. (More on that in a later column.) The speaker-unit-by-itself, indeed, was of immense market significance in the whole development of hi-fi equipment, because it determined the very nature of what our manufacturers produced.

There were no speakers sold already built into matched enclosures, as is the norm today. (Well, almost none.) You bought your speakers separately, large or small, multiples or just one. And you bought just

one enclosure, for mono, into which, as in virtually all the cabinets, any one of numerous different speaker models could fit.

The enclosure business was an independent area, pretty far removed from the specialized business of speaker manufacture. Completely separate companies, with differently trained engineers. So help me, this is basically the truth.



silent parts of our audio chain, the most vital

links to the consumer are the transducers at each end, the "leaders-across," to go back to the Latin: The microphone and the speaker. Of these two equals, the mike is professionally inclined (in spite of all those mikes that are built into various consumer tape recorders, for example), whereas the speaker (along with its sibling, the headphone) is always at the heart of the receiving end, out where the public (main reason for our existence) is listening. Or not listening.

Once again, it seems strange to me to find myself uttering platitudes! Like, say, "The telephone is a useful

After last month's somewhat dismal disquisition on the impermanence of civilization's present records (which I hope has generated some controversy, leading to further and constructive thought!), it is a pleasure to return to what is usually spoken of as the Good Old Days, specifically in audio. You know they are always simpler, better, more down-to-earth.

A few years back, I chose the loudspeaker, the most critical and the most ubiquitous audio component, as a taking-off point for some of my various excursions into our audio past. It was a good way to get started, and continues the same. For all of the incredible, complex, and wonderful technologies involved in the

**WHEN HI-FI BEGAN,
FIRST YOU BOUGHT YOUR
SPEAKER, THEN YOU
BOUGHT YOUR BOX.**

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brings the drama of home theater to your fingertips. Preprogrammed DSP (Digital Signal Processing) modes such as Concert Hall, Nightclub, Stadium and Five-Channel Stereo surround, let you create a variety of custom-tailored, psychoacoustically correct listening environments.

These features couple ideally with the GTP-600's advanced, programmable remote which lets you command up to eight additional

system components for complete home theater control.

Surround yourself now at your Adcom dealer.

Preview the new GTP-600 tuner/preamplifier at your authorized Adcom dealer today. But be careful, you might want to leave the lights on.

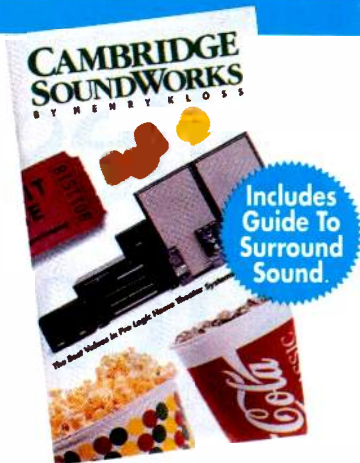
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I can hear our younger generation snorting. How stupid! How grossly amateurish in respect to acoustic design. How could you have a “universal” enclosure, to take any old speaker unit? Highly unscientific. Any old speaker would *not* do in today’s ultra-carefully designed enclosures! How could it have been that way? It just was.

On further thought I’m wondering about a few deliberately complete units, speaker-matched to a specific enclosure and sold mounted inside same. For the life of me I can’t recall any brands, though some of my contemporaries could possibly produce a few. Another odd thought occurs to me, and is unresolved: Were there cabinets that via some sort of surround insert would even take different sizes of speaker? Eight-inch, 10-inch, 12, maybe even 15-inch? Seems highly unlikely. My first big speaker, for instance, was a fat Altec Lansing 15-incher; no, not the one with the coaxial tweeter that wowed everyone in the pre-stereo years but its cheaper twin, minus tweet, all I could afford at the time. What cabinet did I mount that monster in? I have not the faintest memory. I know only that it came by itself, like (almost) all other speaker units.

Another platitudinous thought strikes me. All our speaker enclosures were oblong, with straight, parallel sides! Can you believe it? what a preposterous restriction—as of now. Did we think so then? Of course not.

There were a few exceptions—the first of the great Klipschhorns, enormous exponential-horn enclosures, definitely not oblong, and for excellent reasons. What better way to achieve real bass, if you didn’t mind taking up an acre or so of floor space. This was definitely not a tower speaker. It zoomed forward horizontally, ever wider and wider, until you could almost stand in it. That was okay for many buyers, so long as stereo held off. But *two* Klipschhorns?? That nearly undid the man.

I remind you that when Paul Klipsch finally had to come to terms with stereo and produce “conventional,” i.e., oblong, boxes in pairs, his rueful name for the product was the Heresy. Betraying his own principles. I loved his honesty.

Now we get back to business. Did Paul Klipsch, in his first big horns, *provide a built-in speaker?* To the best of my memory, no. It was, again, a universal-type enclosure

to an extent, as feasible. The driver, the speaker unit, came separately. You see how universal, in the new hi-fi area, this system was. Unthinkable to produce and sell in any other way. It was what everybody did as a matter of course.

The whole *business* of hi-fi was set up for this mode of manufacture. Until, in a very short time (and still well before the stereo revolution), the plug was pulled. The waters of convention thereupon ran out of the hi-fi bathtub, leaving a lot of audio people high and dry. And making fortunes for a

UNRELATED OUTFITS PRODUCING A SPEAKER SYSTEM WAS STILTED AND CLUMSY, BUT IT WAS ALSO PROGRESS.

few who did the plug-pulling. I’ll bet you never thought of it this way, assuming you were even around then, which was quite a long time ago.

What a brilliant new idea! Speakers and enclosures integrated. They began to come together. A tremendous innovation, even though they weren’t made by the same companies or the same type of designer. It was for a while a very stilted and clumsy interchange, you can be sure. Unrelated outfits producing what amounted to a joint product. Yet the trend grew irresistible, and in no time at all the separate enclosure box, minus driver unit, simply vanished. Of the hundreds of brands, I don’t remember which died and which shifted gears and survived, but it was mayhem indeed, as a few survivors will tell you.

But I *can* tell you about a handful with whom I worked and, if you will, fraternized in a journalistic way. Their life and death in the speaker biz was crucially affected by what I have described. I’ve written about these before, but here’s a new slant on them. The first and original “bookshelf” speaker system was the R-J, Robbins and Joseph. Robbins was, of all things, a cartoonist but a lot the unexpected genius as well; I’m sure R-J was his idea. Joseph (last name) was a solid audio engineer, with the know-how to carry out and refine Robbins’ unusual designs. The smallish box they

How Do You Improve On "The Best Value In The World"?

Cambridge SoundWorks Introduces *New Ensemble*, *New Ensemble II* – and a new member of the family, *Ensemble III*.

Audio magazine once said our *Ensemble*[®] speaker system may be "the best value in the world." Since then, numerous critics have applauded our *Ensemble* and *Ensemble II* systems. Designed by Henry Kloss (founder of AR, KLH and Advent), they became best sellers by offering quality construction and accurate, wide-range music reproduction — at factory-direct prices.

We're pleased to introduce new versions of our *Ensemble* and *Ensemble II* systems, as well as our new, ultra-compact *Ensemble III*.

The New Ensemble

New Ensemble is an improved version of our original dual-subwoofer/satellite speaker system. *New Ensemble* maintains the dual subwoofer design, which allows for maximum room placement flexibility. Placement of bass and high-frequency speakers in a room (and how those speakers interact with the room) has more influence on the sound quality of a music system than just about anything. *New Ensemble's* ultra-slim (4 1/2") subwoofers give you more placement flexibility than any system we know of.



So What's New?

New Ensemble maintains the tonal balance, frequency range and quality of construction of the original. There are two basic differences.

1. *New Ensemble* uses a new 8" woofer with a very long "throw" for linear cone excursion and more accurate bass. An integral heat sink provides improved power handling.

2. *New Ensemble's* satellite speakers use the same speaker drivers and crossover as the original, but with new midrange and high frequency balance controls.

The midrange control lets you choose the same output in the key 800-1600 Hz octave as in the original, or you can emphasize that octave by 2 dB. *Ensemble* satellites have relatively less output in this range to avoid the "boxy" sound typical of many speakers. This results in an "open" sound on large-scale symphonic works. For small-scaled music, the higher output position proves a "warmer" sound.

A high frequency control has three positions: A) The same balance as original *Ensemble*. B) A 2 dB high frequency increase. C) A 2 dB high frequency decrease. The switch can subtly increase the system's "airiness" (Increase) or it can reduce any tendency towards "edginess" (Decrease).

In terms of "real life" performance, we believe our *New Ensemble* system competes head-on with speakers selling for hundreds more. Available with black-laminate subwoofers for \$629, or with vinyl-clad subwoofers for \$549.

The New Ensemble II

New Ensemble II is an improved version of our best-selling speaker system. It's more affordable than *New Ensemble* because it uses one cabinet to house both subwoofer speakers. *New Ensemble II* maintains the tonal balance, frequency range, power handling and construction quality of the original *Ensemble II*. But its satellite speakers use the same tonal balance controls as *New Ensemble's*.

New Ensemble II also uses a new flared subwoofer port. The subwoofer cabinet encloses two 6 1/2" long throw woofers mounted in a sealed "acoustic suspension" chamber. They project into a second chamber fitted with the flared port, which provides smoother air flow, eliminating extraneous noise on strong bass notes.

Stereo Review said the original *Ensemble II* "performs so far beyond its price and size it can be compared only with much larger speakers at substantially higher prices." *New Ensemble II* carries on this tradition, outperforming other speakers in its category, including well-known models for about twice the price. Factory-direct price, \$439.

The Ensemble III

Now you can bring the clear, balanced wide-range sound of *Ensemble* speakers to a small, crowded room. Our new *Ensemble III's* satellite



speakers are only 4 1/2" x 6 1/2" x 3" and its subwoofer is 8" x 8" x 15".

Compared to *New Ensemble II*, *Ensemble III* gives up a little in power handling, low bass range, and efficiency. Unlike the "cube" satellite speakers you'll find in most similarly priced systems, *Ensemble III's* satellites are two-way speakers. *Ensemble III's* 6 1/2" woofer uses two

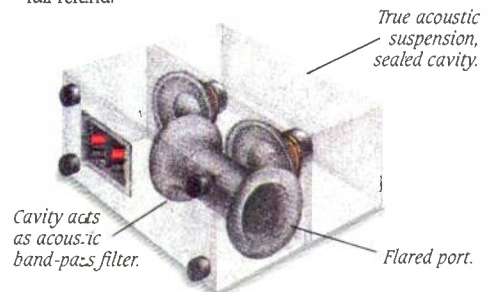
voice coils in a cabinet with a flared port for smooth air flow.

With most recordings *Ensemble III* will sound virtually identical to *New Ensemble II*. It simply won't play as loud. Its construction quality is normally found only in much more expensive speakers.

Factory-direct price, including connecting wire, cutter/stripper and Hook-Up Guide, is only \$329.

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built—later, a number of different models of various sizes—produced a then-startling amount of true bass in a then very small enclosure. Briefly, the speaker unit was loaded out in front with a carefully calculated and quite curious wavy-looking baffle, mathematically determined, along with, if I remember rightly, a port into the inside, thereby integrating and balancing the surrounding acoustic forces. A very real innovation, and for a time the R-J was a sensation. I got myself so enthusiastically involved that my then-Editor had to call me

off, tactfully. The bullfrog bass—wasn't that R-J's slogan? It's been so long that I am not entirely sure of the R-J details, but my description of the front loading, I think, will hold. I remember actually holding the original "bookshelf" box in my hands at an Audio Fair (hi-fi show) demonstration while it played to an admiring audience; it was after this episode that the Editor gently put me on a leash! Correctly so, I admit.

The R-J came before the Acoustic Research (AR) speaker, and it was smaller and produced at least a comparable big bass,

unique for the time. I wonder whether any of our readers remember it. For, you see, the R-J died, and quickly. A more profound sensation hit us in the speaker area—the AR. Same area. A considerably bigger bookshelf speaker (too big for *any* bookshelf, that one!) with even better bass and a more fundamental restructuring. The AR and its successor models had an enormous impact, and the line has never left the market as far as I know, though it is sold now as part of the Jensen interests.

Why this immense difference between two similar and really fundamental speaker developments, so close together? Yes, of course, there were technical contrasts, and

**ACOUSTIC RESEARCH
TURNED OUR WORLD
UPSIDE DOWN BY
MAKING THE DRIVER
A PART OF THE BOX.**

the newer AR went further and did things better. But there could have been room for both, I think, as differently useful approaches, to a similar concern: Clean bass in a small space. Why didn't it happen? Many complicated ancillary business reasons, no doubt. But as I see it, there was one basic cause. So simple. The R-J people made a ghastly mistake merely by following the then-normal procedures. They designed their boxes to sell *without built-in speaker units*. That is what really killed R-J! In this one respect they stuck to convention, just as convention was about to go down the drain. Unfortunate moment! Could they have converted? More likely, it was too late.

As for Acoustic Research, it turned our world upside down, and no more so than in the fact that the speaker unit, the driver, was not only built in but made an integral part of the box acoustics (thanks to a limp cone and a sealed air spring behind it, for stiffness). In a way, this was simply a product of the design. Nevertheless, it started the landslide—the bathtub drain—that changed our entire speaker market.

Even today, going on a half-century later, few speaker drivers outside the professional fields are sold separately. Revolution? Just a platitude. But a big one. A

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Writing in the February 1995 issue of Stereo Review, Technical Editor David Ranada said "You'd have to spend twice as much to get significantly better than the AV-716's Dolby Pro Logic performance..." In addition to its sound, the review praised the 716 AV Receiver as being one of the easiest to operate—an NAD hallmark.

Many CD Carousels claim to not sacrifice performance for convenience. But they don't have a DC coupled output stage, separate power supply regulators for the digital and analog circuitry or MASH D/A conversion. The NAD 513 does, which is why nationally syndicated

reviewer Harry Somerfield said the NAD 513 3-Disc Carousel "makes little compromise in terms of sonic sophistication."



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High-quality digital video for the home has been a long time coming, primarily because the high data rates required for it taxed the available consumer media beyond reasonable limits. The earliest efforts led to the MPEG-1 Standard, which was basically intended as an adjunct to interactive TV, and for which purpose it is more than adequate. ("MPEG" stands for Motion Picture Experts Group, a standards board that has been guiding development in digital video data reduction for several years.)

It has been the development of the MPEG-2 Standard, with its variable data rate, that has brought us to the brink of a wonderful new era in video, absolutely free of ghosts and gross color problems. In fact, the small satellite-dish systems now available for home digital pickup will soon be changing over from MPEG-1 to MPEG-2, so the new age is already here!

During the recent Winter Consumer Electronics Show in Las Vegas, Sony demonstrated its latest collaborative effort with Philips, a new CD-

sized digital videodisc (DVD). In demonstrations for manufacturers and the press, they went into considerable technical detail about DVD and conducted split-screen demonstrations, comparing it with VHS tape, LaserDisc, and the D-1 uncompressed digital master tape from which the DVD was made. What we saw was superb: DVD easily bested VHS, and its color and sharpness were more than a match for the LaserDisc. If any observers thought they saw any visual artifacts, these artifacts were pretty ephemeral and quickly out of the way. More to the point, the DVD really stacked up well in comparison to its D-1 source.

The DVD is the size of a standard CD, so minimal changes in manufacturing methods will be required for mass production. Its video information is encoded via the MPEG-2 Standard; this advanced data-reduction technique provides a variable data rate so that static scenes take up

less information space than do active scenes. Sony claims that the amount of information on the single-sided disc is 3.7 gigabytes, roughly five times the capacity of the audio CD. The added information capacity results from the use of a shorter laser wavelength of 635 nanometers (a red laser, rather than the infrared laser used with the standard CD) and a tighter recording pitch on the disc

(that is, a smaller distance between successive modulation "grooves").

The disc can accommodate a 135-minute video program, assuming that the data-rate requirements average out to about 3 megabits per second.

(The instantaneous data rate here can vary from 1 to 10 megabits per second.) The target of 135 minutes for play time was requested by the motion picture industry, which stated that the vast majority of films are under that time length.

The audio is 5.1 channels (left, center, right, split surround channels, and a sub-woofer channel). Sony

did not state which standard was used here, but it would have to be Dolby AC-3 or the MPEG Musicam Standard. The data rate for the audio channels is a modest 384 kilobits per second.

There is a provision for a variable high data rate for special video applications, which yields a 30-minute disc at an average data rate of 10 megabits per second. Sony also stated that its format is compatible with a double-layer disc in which the second layer is read by refocusing the laser. This future development, using technology now being developed in



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- R.E.M.: Eponymous (I.R.S./MCA) 00701
- Best Of Dire Straits: Money For Nothing (Warner Bros.) 00713
- Fleetwood Mac: Greatest Hits (Warner Bros.) 00796
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- James Brown: 20 All-Time Greatest Hits (Polydor) 01342
- Credence Clearwater Revival: Chronicle: 20 Greatest Hits (Fantasy) 01520
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- Sait-N-Pepa: Very Necessary (London) 01595
- Snoop Doggy Dogg: Doggystyle (Interscope) 01692 #
- Mazzy Star: So Tonight That I Might See (Capitol) 01735
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- John Mellencamp: Dance Naked (Mercury) 04906
- L7: Hungry For Stink (Reprise/Slash) 05795 #
- Neil Young & Crazy Horse: Sleeps With Angels (Reprise) 05880
- Seal (1994) (Warner Bros./Sire) 05907
- Big Head Todd & The Monsters: Stratemgem (Giant) 06161
- Peter Gabriel: Shaking The Tree - 16 Golden Greats (Geffen) 11089
- Aerosmith: Get A Grip (Geffen) 20814 #
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- U2: The Joshua Tree (Island) 35001
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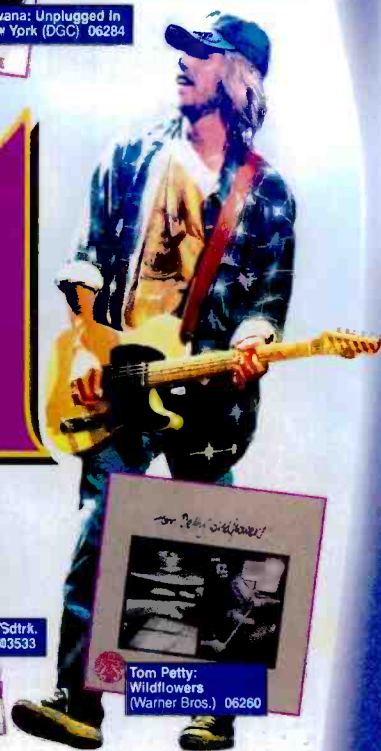
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Sheryl Crow
Sting |
| 5. <input type="checkbox"/> CLASSICAL (☆)
Luciano Pavarotti
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Pat Metheny
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Megadeth
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cooperation with 3M, will increase the disc's total capacity to 7.4 gigabytes.

By all measures, it looked as if Sony/Philips had the DVD question neatly tied up. After all, these are the people who invented the CD, unquestionably one of the greatest successes in consumer electronics of all time. Little thought was given to the rival DVD format proposed by Time Warner and Toshiba.

Three weeks later, on January 24th in Beverly Hills, Time Warner and Toshiba held a press conference to announce their version of the DVD. Their discs are double-sided, and each side contains up to 5 gigabytes of data. The MPEG-2 Standard is used here for video, with a minimum of three sets of Dolby AC-3 5.1-channel audio (to accommodate foreign languages) and four subtitle channels. This eases manufacturing of products intended for sale in many different markets.

From a performance viewpoint, the biggest difference between the two rival formats is the average video data rate. Both use MPEG-2, so we would reasonably expect the same picture quality—if the data rate is the same. While the Sony/Philips format has an average data rate of about 3 megabits per second, the Time Warner/Toshiba format has an average data rate of 4.94 megabits per second, an increase of more than 60% over the Sony/Philips proposal.

How has this increase in data density been accomplished? According to the press release: "The innovative double-sided disc is formed by back-to-back bonding of two 0.6-mm-thick, 5-inch discs. The bonding process employs proven techniques derived from 15 years of industry-wide LaserDisc manufacturing experience and does not add either cost or production time to the process. The advantage of a 0.6-mm disc is that a laser can read data with more precision through a thinner disc than through a disc of 1.2-mm thickness. Additionally, a greater density of data can be encoded on a thinner disc than a thicker disc—approximately the difference between 3.7 gigabytes and 5 gigabytes. Finally, thinner discs permit shorter manufacturing cycle times."

Multiple video monitors in the large meeting room where the Time Warner/Toshiba press conference was held provided everyone a close view of the system in operation. As with Sony/Philips, there were

comparisons with standard analog formats as well as with the digital master. And as before, the system performed superbly. I was not aware of any substantive differences between these demonstrations and what I had seen in Las Vegas three weeks earlier. I imagine that one would have to look very closely, and for some time, before the advantages of the higher data rate would become noticeable.

An additional feature of the Time Warner/Toshiba format is the handling of various aspect ratios for viewing, including full

**DVD EASILY BESTED VHS,
AND IN TERMS OF COLOR
AND SHARPNESS IT WAS
MORE THAN A MATCH
FOR THE LASERDISC.**

screen, letterbox, or the large-format 16 x 9 ratio. There is also provision for parental lockout to keep children from viewing certain programs. The format, with its total 10-gigabyte capability, has further uses beyond movies. Various computer and high-capacity ROM applications are certainly possible. Even more to the point, Time Warner/Toshiba stated that their DVD will support high-definition television when blue-laser technology becomes available.

To its credit, the Time Warner/Toshiba camp has gotten much support from both hardware and software companies. In addition to Time Warner and Toshiba, the participating companies are Matsushita, Thomson, Hitachi, Pioneer, MCA, and MGM/UA.

Where do these developments put Sony and Philips? I doubt that we will see an all-out format war, because the entertainment industry just won't tolerate it. Richard Clancy, a spokesman for Sony, told the Associated Press, "Sony will continue to propose its standard. At least for the time being, our plans remain unchanged."

There is certainly much room here for give and take, letting all players in the game save a little bit of face. In any event, we are looking at a product launch in early 1996, with players that are targeted for the \$500 to \$600 range.

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THE WINTER SHOW, A WINNER

Just what the audio community needed: A smash hit. Given that even the industry's most Pollyanna-like *naif* would have had a hard time smiling through the catastrophe that was the 1994 Summer CES, the January 1995 event in Las Vegas seemed like a miracle. Huge? There are some, including me, who believe it might have been the biggest and best in the exhibition's history, in marked contrast to last June's non-event.

Statistics hounds are always well served by the Electronic Industries Association (EIA), and it was only a matter of weeks before the mailman delivered the post-mortem press release and the latest edition of *Consumer Electronics U.S. Sales, 1990-1995 est.* (only \$95 per copy for civilians). Both items make interesting reading. Without lapsing into minutiae like the Unit Sales of Cellular Telephones in 1991, I can tell you that 2,090 brands turned up

that the book is based on estimates from only 46 companies, over half of which are gigantic Asian or European concerns and precious few of which produce hi-fi separates.

The exhibitors at the 1995 Winter CES embraced, almost universally and unanimously, a few technologies that must surely have acquired "trend" status: High Definition Compatible Digital (HDCD) hardware and software, home cinema's forthcoming digital surround for-



Balanced Audio Technology VK-5 preamp

formats, the continuing tube revival, the continuing survival of vinyl records, jitter-busting devices, and other mini themes like the proliferation of single-ended triode amplifiers. Hey, there's even a revival in kit-building.

HDCD, an encode/decode system used for reducing distortion in digital audio recordings (developed for Pacific Microsonics by Michael Pflaumer and Keith Johnson), had its debut a few years back

in the form of encoded CDs released by Reference Recordings. Even without access to HDCD players, numerous Golden Ears who got to audition the first HDCD discs felt that they sounded "better" than their non-HDCD equivalents, *even on* conventional players lacking the HDCD chip. The Winter CES was the first to provide visitors with an opportunity to hear players incorporating the HDCD-decoding chip sets, with Spectral Audio—source of the first official demonstration—leading the way.

Counterpoint's DA-10 D/A converter has been approved by Pacific Microsonics for HDCD certification, and owners of existing DA-10s can get an upgrade card costing under \$500. The upgrade also includes the company's own new jitter-reduction circuitry to improve playback of all digital sources, not just HDCD discs. Enlightened Audio Designs' Series III products feature HDCD in conjunction with the Digital Flywheel, EAD's proprietary jitter-reduction circuitry. Also licensed to produce HDCD decoders are Adcom, Audio

THE RECENT WCES MAY HAVE BEEN THE BEST EVER IN THE SHOW'S HISTORY.

with a staggering 40,000 products, and over 1,000,000 square feet of floor space was needed to accommodate it all. Far more important, though, is this figure: 103,282 people attended the CES, representing all aspects of the home entertainment industry. And they arrived from 109 countries. Sales of *everything* covered by the Separate Audio Components umbrella come to \$1,690,000,000 for the last complete year (1993), and the EIA predicts small but significant increases this year and the next, in unit sales and in dollar value. Oh, and this follows a low point of \$1,586,000,000 suffered in 1992. But lest you think that this tasty sum is shared among the specialist or high-end brands, note

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Onkyo TX-SV727 receiver

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Martin-Logan SL3 speaker



Audio Research SDP1 surround decoder and SDA1 amp

atories and Pioneer have jointly developed LaserDiscs in which the right (analog) FM channel is replaced with the AC-3 bitstream. This digital signal provides five discrete channels of surround information and an additional bass channel from a readily available software format; blessedly, it's fully compatible with your existing LaserDisc player.

Alchemy, Classé Audio, Kinergetics, Madrigal, PS Audio, Sonic Frontiers, Theta Digital, and other major players, while Pink Triangle is the first British brand to commit to the new technology. All we need now are record companies from outside the audio community (read: major labels) to incorporate HDCD into their CD manufacturing systems.

It's hard to say whether or not there's going to be a battle, let alone a war, to decide what digital surround sound format will be chosen by the industry to become *the* standard. Then again, the word "Dolby" is not unlike a Good Housekeeping Seal of Approval, so expect the double-D logo to continue appearing on processors' front panels for a long time to come. I haven't heard all of the challengers, but it looks like Dolby AC-3 will win because of

THE WINTER CES WAS THE FIRST TO PROVIDE A CHANCE TO HEAR PLAYERS WITH THE HDCD-DECODING CHIP SETS.

sheer momentum and the public's general confidence in (and awareness of) Things Dolby. At CES, demonstrations took place not just at the Convention Center but at every show site, with both mass-market and high-end makers involved. These included Denon, JBL, Pioneer, Yamaha, and Kenwood among the majors, while purist companies like EAD and Perreux (with Monitor Audio speakers) held up the specialist end.

For those of you not reading our sister publication *Sound & Image*, Dolby Labora-

Among other hi-fi companies showing more than a passing interest in home cinema was Krell, with prototypes of a multichannel power amp (accepting up to five 100-watt modules) and a full-function home theater preamp in the wings. Apogee demonstrated a surround sound system for ribbon lovers, and Magneplan showed the sound quality of its new Magneplanar center-channel speaker by setting up two of them as main speakers. Mission unveiled an all-in-one home cinema "command center," tentatively called the AV-Gram. In one glass-fronted enclosure, which looks just like any cabinet you'd use under a large-ish TV monitor, Mission fitted five 100-watt channels' worth of Cyrus power, a surround processor (final type still to be decided), a pair of subwoofers at the sides, a center speaker, a full-function learning remote control, an AM/FM radio, and a full-function preamp. Since the system also includes rear-channel satellites, all that you add to it to complete the package are a TV (up to 35 inches in screen size), your choice of video source, and main speakers. Welcome the home cinema equivalent of the old "radiogram."

Audio Research launched the SDP1 surround sound decoder, aimed firmly at purists: The front (main) channels are completely isolated from the processing stages to eliminate any possible (main) signal degradation. The SDP1 eschews Dolby Pro Logic decoding, using instead matrix derivations which probably can be traced back to vintage (and timeless) Hafler ambi-

ence retrieval. The company also introduced a four-channel amp, the SDA1, as a companion to the SDP1. EAD's latest version of the TheaterMaster includes both HDCD D/A conversion for your audio-only CDs and true 5.1-channel surround decoding, courtesy of the Zoran 38001 decoding computer. EAD believes that it's the first company on the market with true 5.1 decoding, but they didn't count on Onkyo. This company launched a pair of new A/V receivers, the TX-SV525 and TX-SV727, plus the A-SV620 integrated amp, each featuring a Motorola 56000 DSP for true digital surround decoding.

Meridian again showed a multichannel system but avoided the use of a normal video source. (By the way, this year's played-to-death demo film was *Cliffhanger*; some diehards still used the train crash from *The Fugitive*.) Meridian used MTV-like com-



Counterpoint DA-10 D/A converter with HDCD

puter images said to make people more receptive to the music itself. Any thoughts of a '60s revival are about a year too late.

The home cinema readiness also applied to speakers, like the aforementioned Apogee and Magneplan systems and the complete Martin-Logan setup, the first view of the long-awaited Vandersteen VSM-1 side-channel speakers (with on-wall mounting at \$695 per pair), the wild KEF Ci-130DS (for dipole behavior from an in-wall design), and KEF's motorized Ci-200QT (which contains a 12-volt motor drive system to tilt the speaker out of the ceiling for play or return it to rest).

Returning to two channels, I observed a noticeable increase in CD changers,

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evidence of the increased demand for convenience and the continued growth of multiroom/install systems. Onkyo contributed a couple of six-disc machines, the DX-C320 and DX-C220, for \$300 to \$330, but the move to the \$450 to \$600 category means 100-disc changers for the price of last year's five-disc carousels. Aiwa and Kenwood have low-cost 100-disc players, Technics has a 50-CD machine, and a forthcoming model from Harman's Citation line will accept 150 discs. Pioneer's PD-F1004, at \$599, adds remote-control programming through a graphic user interface (GUI) and has on-screen display.

For the specialist high-end D/A converters and CD spinners, it was top-loaders and jitter-busters. Genesis demonstrated the Digital Lens (\$1,500), promising jitter

board power supply, a Pioneer Stable Platform mechanism, and inverted disc playback.

Among heavyweight CD transport makers, Jadis issued the JD2 at \$8,000, 25% less expensive than the awe-inspiring JD1. The company used the same transport but a different laser and a less sophisticated suspension. Up in the Ferrari class is Barclay's X1000, which weighs 100 pounds and is machined from a solid billet of aluminum. The X1000 uses the company's proprietary drive mechanism with a "tonearm" and a swing arm; drive is via belt and a heavy-duty moving-coil motor. There's a three-bearing spindle, and this top-loader doesn't require a puck.

Trends among the speaker builders? There's a mini revival in electrostatics, with Electrostatic Research showing the compact Model III. Measuring 48 inches high,



Yamaha RX-V2090 receiver

reduction below 20 pS, through the use of a temperature-compensated oscillator. The Digital Lens will show with constant real-time analysis the number of errors in the transport's timing via a front-panel display. Two new D/A converters were added to PS Audio's acclaimed lineup—the DL Three, with 20-bit architecture and Burr-Brown DACs, and the SL Three, with HDCD. HDCD also features in Mark Levinson's No. 30.5 and No. 36 converters.

Audio Alchemy's third-generation jitter reducer is the DTI-Plus, while the regular DTI now exists as the v2.0. The company's HDCD-compatible converter is the Digital Decoding Engine v3.0, and there's an absurdly inexpensive, entry-level converter called DAC-MAN. This cigarette-pack-sized decoder, which uses Crystal converters housed in a custom extrusion, has inputs for both Toslink and coaxial signal. And all for only \$159. New players from AA include the DDS III with an all-new Sony-made mechanism and "soft-touch" keys, 18-bit resolution, a one-bit DAC, and remote control; the DDS-Pro adds an out-

board power supply, a Pioneer Stable Platform mechanism, and inverted disc playback. Among heavyweight CD transport makers, Jadis issued the JD2 at \$8,000, 25% less expensive than the awe-inspiring JD1. The company used the same transport but a different laser and a less sophisticated suspension. Up in the Ferrari class is Barclay's X1000, which weighs 100 pounds and is machined from a solid billet of aluminum. The X1000 uses the company's proprietary drive mechanism with a "tonearm" and a swing arm; drive is via belt and a heavy-duty moving-coil motor. There's a three-bearing spindle, and this top-loader doesn't require a puck.

introduced a couple of ported baby hybrids, including the ESH 50 (about 5 feet high) and the ESH 100 (about 6 feet high). Martin-Logan upgraded the Sequel, now called the SL3. It's still a hybrid, but apparently everything's changed: The curvilinear electrostatic element now operates from 250 Hz to 24 kHz; vapor deposit is used to apply the 20-angstrom-thick conductive surface. Mechanical/acoustical pressure-compensation technology eliminates the need for tone shaping with an insertion loss crossover, and it's still the prettiest speaker in town.

Downsizing, too, was a hot topic. Apogee's first mini is the Ribbon Monitor; it's about 16½ inches high, 9 inches wide, and 11½ inches deep. The lower frequencies are handled by a 6½-inch woofer with a 1¼-inch high-power voice-coil and large shielded magnet, while the high frequencies, from 2 kHz on up, are the concern of the 4-inch classic Apogee corrugated ribbon. Mounted within a square frame, the ribbon can be turned 90° to allow for vertical or horizontal speaker positioning. The

Ribbon Monitor is rated at 87 dB/1 watt/1 meter, handles up to 200 watts, and will retail in the U.S. for under \$1,000 per pair.

Platinum's Solo is a gorgeous little curved-front, two-way monitor measuring 8 inches wide, 13 inches deep, and 13¾

inches high. It's available in all sorts of sexy finishes, two ports fire out of the back, and it can be bi-wired. Dzurko Acoustics featured the slope-baffled Jaguar, bearing a 1½-inch, hand-doped, Ferrofluid-cooled tweeter and 6⅞-inch fiber-coned woofer. Bass loading can be modified with the optional Environmental Adaptor Module (EAM), which installs in a tape loop or between preamps and power amps. The EAM "allows precise adjustment of bass and mid/treble balance" to match the room. Totem's latest two-way is even smaller than its existing, highly rated miniature predecessors. The Mite measures about 10⅞ inches high, 6 inches wide, and 9 inches deep, with internals of 5.6 liters, yet it sounds big enough—on a good, rigid stand—to fool you into thinking that it must measure 2 gallons, at least.

On the amp front, it really was tube-mania, with three particular models earning a disproportionate number of lustful sighs. From Italy, there was the simply breathtaking Pathos Twin Towers. This tube/solid-state hybrid is an integrated amplifier producing Class-A 30 watts/channel. The volume control is a true stepped attenuator, the chassis is a low-profile mix of chrome and wood, the two towers are befinned active stages for maximum cooling (aided by whisper fans), and the tubes are positioned in cages at the front. But that Italian styling—*molto bello!*

From Australia came the heart-stopping Micrex range, four components that I wanted to take home. The L-1 is a luscious integrated amp good for 75 watts from its Golden Dragon EL34s, the P-1 is the power-amp-only version, and there's also the R-1

**THERE MAY BE A BATTLE,
OR EVEN A WAR, OVER
WHAT DIGITAL SURROUND
FORMAT WILL BE CHOSEN
BY THE INDUSTRY.**

preamp. For the hard-core, there's the M-1 monoblock, good for 90 watts from the oft-cited Russki army tube, the 6C33C-B. All Micrex units share no-compromise build quality, elegant styling, real wood chassis, and stunning performance.

And then there's Balanced Audio Technology, probably the show's most-talked-about brand. The VK-5 line-stage preamp, built to battleship standards, features no-compromise componentry, dual-mono topology, a complete absence of relays or switches in the signal path, and eight of the very fashionable 6922 tubes and a couple of 5881s. Fully balanced in and out, zero global feedback, soft switch-on—it's aimed at the top of the heap. And it was heard driving the company's positively debonair VK-60 power amps: 60 watts/channel in stereo or 120 watts in mono, the power derived from super-macho Russki military glassware. All-triode, zero feedback, single-ended—this is one to covet.

There were also new tubes at CES. VAIC showed the VV30B, that new substitute for the 300B, along with the VV50B and VV52B. Golden Dragon announced a new KT90 based on Telefunken's EL156, available in deluxe form with titanium anodes as the KT90 LX; Quad II owners will be pleased to know that it can be purchased with KT66 characteristics as the KT66 Super. The biggest news of all? Western Electric will be reissuing the coveted 300B. For details, and to prove I haven't made it up, call 404/874-4400, East Coast business hours, or fax 404/874-4415.

Most "thought-provoking" new item? No question: The NEST (Naturally Enhanced Sound Transmission) from Bio-Inergy Systems. This is a 69-inch-high geodesic frame with four small speakers situated in the upper corners, some cushions, and a subwoofer. It's made from large-diameter aluminum tubing, and listening to music while inside this frame is supposed to... I'm not quite sure. Its benefits include M.I.N.D. (for Music Interacting with Natural Dynamics). And there's MINDSONG circuitry, which allows you to "create your own music through Sensor/Processor control. No music lesson is needed!" And A.N.D.I., the Analog Neural Digital Interface talk function to help you develop a relationship with your sensor. All yours for just under \$9,000. **A**

"Grade A....I Prefer it to all But Some Active Processors Carrying A Price Tag Of \$3,000"



HTS-1 FIVE CHANNEL HOME THEATER DECODER

John Sunier, Audio 12/94
HTS-1 Playback Report



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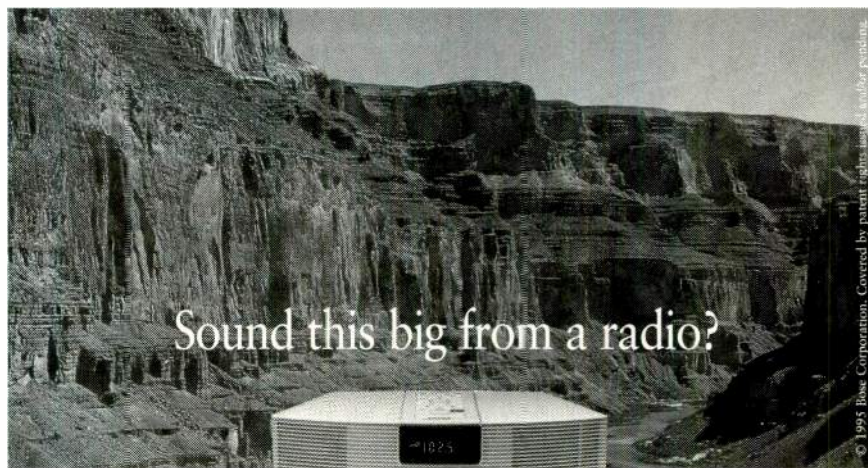
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IVAN BERGER

DIRECTIONS FROM THE DASHBOARD



Sony's CD-based NVX-F160.

Delco's GPS-based TelePath 100 uses plug-in maps (to right of tape slot) and shows directions in the radio's display.



While having a CD player in the car can get you lost in the music, some of the new players can keep you from getting lost on the road. Car CD players will soon start dishing out advice as well as music—advice like: “Turn left at Main Street, one-half mile ahead.” Car navigation systems, already on sale in Japan, are finally hitting the United States market.

The automobile navigation systems now available in Japan use the Global Positioning System (GPS) to determine a car's position from satellite data and then shows it on a map screen. Similar systems have been announced here by Kenwood, GM-Delco, Panasonic, Pioneer, and

Sony; Hertz and Avis are also beginning to offer them in some cities.

In January, at the Consumer Electronics Show, Clarion, Eclipse, Alpine, and Kenwood showed a navigation system that requires no display but gives spoken advice. The system (from Amerigon, of Monrovia, Cal.) relies on stored instructions rather than GPS or dead reckoning. You start by telling it where you are and where you want to go, and then it feeds you directions whenever you call for them through a hands-free

mike. If you get lost anyway, drive until you find a landmark, give the system your new location, and ask for directions anew. Some versions, such as Kenwood's and Alpine's, could also be hooked up to GPS for more exact positioning—at a higher price. (For that matter, Pioneer's GPS system has voice output, too).

Voice systems have the advantages of not taking the driver's eyes off the road and of making sure he knows when a turn's coming. And because spoken announcements don't require as much data as graphic maps, voice-only systems can download the information for your trip from a CD-ROM map and store it in memory, leaving the CD transport free to play music while you drive.

Since both navigation and music systems use CDs, they will probably be integrated whenever possible. Blaupunkt's Berlin RCM 303A, a multifaceted system that includes GPS plus dead-reckoning navigation (not to mention digital amps, DSP that compensates for road noise, and interfaces for cellular phones and video), is now selling in Europe for about \$5,000 and may become available here. Alpine's flagship CD Max CDA-7939 in-dash CD player, Kenwood's KDC-8003, and Eclipse's ECD-416 all interface with navigation systems.

Towns, streets, and highways aren't the only things these navigation

systems will help you find. Most of them include points of interest, gas stations, places to eat, and other information in their databases.

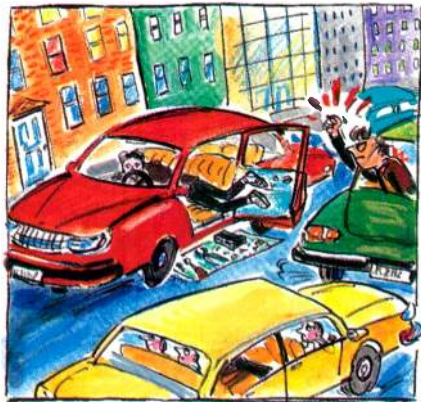
For the time being, much of the country will not appear on most of these systems' maps. Virtually every system will have maps of California and nearby states when they hit the market, to be followed by maps of the Sunbelt states and at least portions of the Boston-to-Washington

**YOUR CAR'S CD PLAYER
MAY SOON DO DOUBLE
DUTY, PLAYING MUSIC
AND HELPING YOU
FIND YOUR WAY.**

corridor. However, maps of pretty much all areas of the United States should be available by the end of this year, at least for some of the navigation systems.

Ex-Urbanite's Confession

Until recently, one of the advantages I found in writing about car stereo was that it gave me a good excuse to have a car. Most Americans don't need excuses. But for 30 years I lived in New York City, where other transport options are plentiful and parking is wickedly expensive. Nonetheless, there are enough car nuts like me and enough car commuters (not to mention commercial traffic) to clog the streets by day or night. Even in my little side street, which went from nowhere to nowhere, I could never



park outside my door—and double-parking to unload the car got me cursed by the hundred cars and cabs that then had to slow down to squeeze past.

Working on my own car stereo was just about impossible. Assuming I could find a nearby parking spot, I had to keep an eye on my tools and equipment all the time as hundreds of strangers streamed by. Going inside for a drink of water or a part that I forgot involved locking everything back inside the car, waiting for an elevator to go up to my apartment, getting what I needed, waiting for another elevator, and unlocking and unpacking my car again.

Radio reception in the city is no picnic, what with all the noise and multipath. When testing radios, I long had to drive out to the suburbs, where radio reception is more typical of America at large.

Now I've finally entered the great American traffic jam . . . er, mainstream. I have moved to the suburbs, where car ownership requires no excuse. (I don't drive my car to

work, but I frequently drive it to the railroad station.) And at last I am able to tinker with my car's system for myself, spreading my tools in my own driveway and moving operations into the garage when it rains—the normal stuff.

I already have some ideas on how to use this new freedom for future articles and columns. I'll get to them as soon as I'm unpacked enough to keep from shuddering at all the boxes and the weather has turned warm again—assuming that the lawn doesn't need mowing very often. We'll see.

Meanwhile, I've found the move has changed my in-car listening habits. As a New Yorker, I mostly used my car for long trips to the country or to other cities, which let me listen long enough to hear classical works in their entirety. In the 'burbs, I mostly do short trips and therefore listen more to shorter jazz or country and western selections. And for the first few hectic weeks when I had no chance to set up my home music systems, the car was the only place where I could hear music at all. A

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Getting That Commercial Sound

Q *I have a modest recording studio, the heart of which is a four-track cassette recorder. I also have a variety of guitars, keyboards, drum machines, etc. My recordings usually sound very good; they have low noise, good dynamics, and flat frequency response. Yet it is a different "good" than that which I hear on prerecorded materials played through the same system. What is that elusive, subtle something I hear on these prerecorded tapes but is missing in my own recordings? I really do not believe the fault lies with my recording equipment, because my own recordings sound remarkably like the original sound sources. I know it's not a matter of room acoustics, because most of my instruments are plugged directly into my mixer, with reverb added as needed. I know that many pro musicians use this same technique.*

Is there a piece of processing gear missing from my studio that might help me achieve this commercial sound? And conversely, is this sound that I am trying to achieve actually considered to be undesirable by serious audiophiles? Maybe, after years of listening to prerecorded material, I have been brainwashed into thinking that this sound is correct when, in fact, it is not.—Joshua Meredith, Portland, Ore.

A As it happens, I am an amateur keyboard man, and since two of *Audio's* editors have home studios, what follows incorporates their thoughts as well.

Commercial studios tend to have many different sound processors, such as equalizers, reverb systems, and harmonic enhancers like those made by Aphex, BBE, and others. Studios also often process each track of their recordings individually. Few home studios can afford to do all of this, though it helps that some very good all-in-one digital signal processors are now available at reasonable cost.

But there are also differences in technique. In addition to direct feeds, commercial studios use close miking of instrument amps and more distant miking that makes use of room acoustics. There are also such questions as how you program your drum

machine and synthesizers: Do you set them so every beat and pattern sound identical, or do you program in variations like those you'd hear from a live musician?

Probably the most versatile processor you could get would be an equalizer. I find that it sometimes helps to equalize in a peak between 2 and 3 kHz, to add "punch" to the sound and so that the recordings will sound acceptably good when played on modest equipment. You'll doubtless find other boosts or cuts that help you get that "commercial" sound. You can use a third-octave equalizer, but a parametric is better, as it lets you control the width and center frequency of your adjustments.

Your recorder may be a factor, too. Most studios use either 15-ips (or faster) open-reel tape or some digital format; these have greater fidelity than four-track cassette. You might consider saving up for an ADAT system, which would give you eight tracks of digital recording for less than \$3,000.

But remember, the fact that the sound you're getting is different from what you hear on commercial recordings doesn't mean it's wrong. Many producers have made names for themselves by coming up with a new and different sound.

Demagnetizing by CD

Q *I have seen ads for CDs that claim to have special tracks which are used to demagnetize all (or specific) audio system components. How do various sweep tones encoded on a CD work to demagnetize such components as moving-coil phono cartridges, cable interconnects, and even crossover networks?*—S. Campanile, Laguna Niguel, Cal.

A I can't imagine how tones recorded on a CD can demagnetize various audio components. You wouldn't even want to demagnetize a moving-coil phonograph cartridge, because any reduction in its magnetic strength would reduce its output signal level. Considering that these cartridges already produce relatively low output level, a further decrease in output would only result in a decreased S/N ratio. Also, I can't immediately see any justification for de-

magnetizing a crossover network or interconnects. I am unable to imagine how they would be magnetized in the first place.

In short, unless I'm missing something, I see no valid point to this technology. About all I can say is that I have occasionally had to retract something I originally wrote as "truth." Who knows? Maybe I'll see the light and have to do it again.

Speaker Enclosure Materials

Q *I have seen everything from plastic to medium-density fiberboard (MDF) used to build loudspeaker enclosures, and there may be others that I have not yet discovered. Many people have told me that, although it is expensive, the best material to use is MDF. I am concerned about cabinet resonance. Which is the best material to use for a loudspeaker enclosure? Can the human ear really hear resonance of the loudspeaker enclosure?*—Rick Wang, Irvine, Cal.

A As far as I am concerned, medium-density fiberboard really does minimize cabinet resonances. It is important to keep such resonances to a minimum, because you definitely can hear them.

When you listen to a speaker, you're supposed to hear only sound waves generated by the driver, either directly from the diaphragm or via ports or horns. But because drivers move the air behind them as well as the air in front of them, an enclosed woofer moves air within the cabinet, exerting pressure on all the cabinet's walls. The walls will vibrate under this fluctuating pressure, and they will also act as diaphragms, radiating sound of their own. In addition, there is direct transmission of vibration from the speaker to the cabinet walls via the surround. This secondary radiation muddies the sound, not to mention the coloration imposed by the cabinet's own resonances. You would be surprised at how little motion of the cabinet's walls it takes to produce sufficient sound to be easily heard as undesired coloration. The more the cabinet resists producing these vibrations, and the more quickly it damps them, the less it will

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

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adversely affect the sound. Cabinets of MDF do this well and inexpensively.

Burning-In Cables and Speakers

Q *Some companies sell test CDs to be used for calibration and "burn-in" of loudspeakers and cables. Is burning in really a legitimate technique?—Joseph Krisocki, Belleville, N.J.*

A Manufacturers often burn in equipment by operating it for a length of time. Their purpose is to eliminate or at least reduce the possibility of equipment failing before it reaches you. The CDs you mention contain signals which are claimed to help you do this at home.

I see no need to burn in cables. Cable characteristics are very stable, especially in the short term. Connectors can oxidize, but this is accelerated by atmospheric contaminants, not use, and will take far longer than any likely burn-in time.

As for burning in loudspeakers, the way they are constructed would generally seem to rule out changes in characteristics over a short burn-in period. Some current makers do burn in their cone-type speakers so as to

linearize the cone's surround. I did burn loudspeakers in when I was manufacturing them, feeding them a 20-Hz signal for about 8 hours, with the woofer in free air. (But I did this only to be sure there were no structural weaknesses in the voice-coil. This process did lower the cone's resonant frequency somewhat, but most of today's speakers have more supple surrounds, and I have been unable to repeat this effect with more modern speakers.) I would caution consumers against burning in loudspeakers this way because of the risk of using too much power, damaging the loudspeaker and the amplifier driving it.

Electronic equipment, if it fails, will usually do so quickly after installation. For this reason, I suggest that anyone purchasing a new device should use it frequently for a while. Thus, if it fails, it will do so within its warranty period.

Glowing Output Tubes

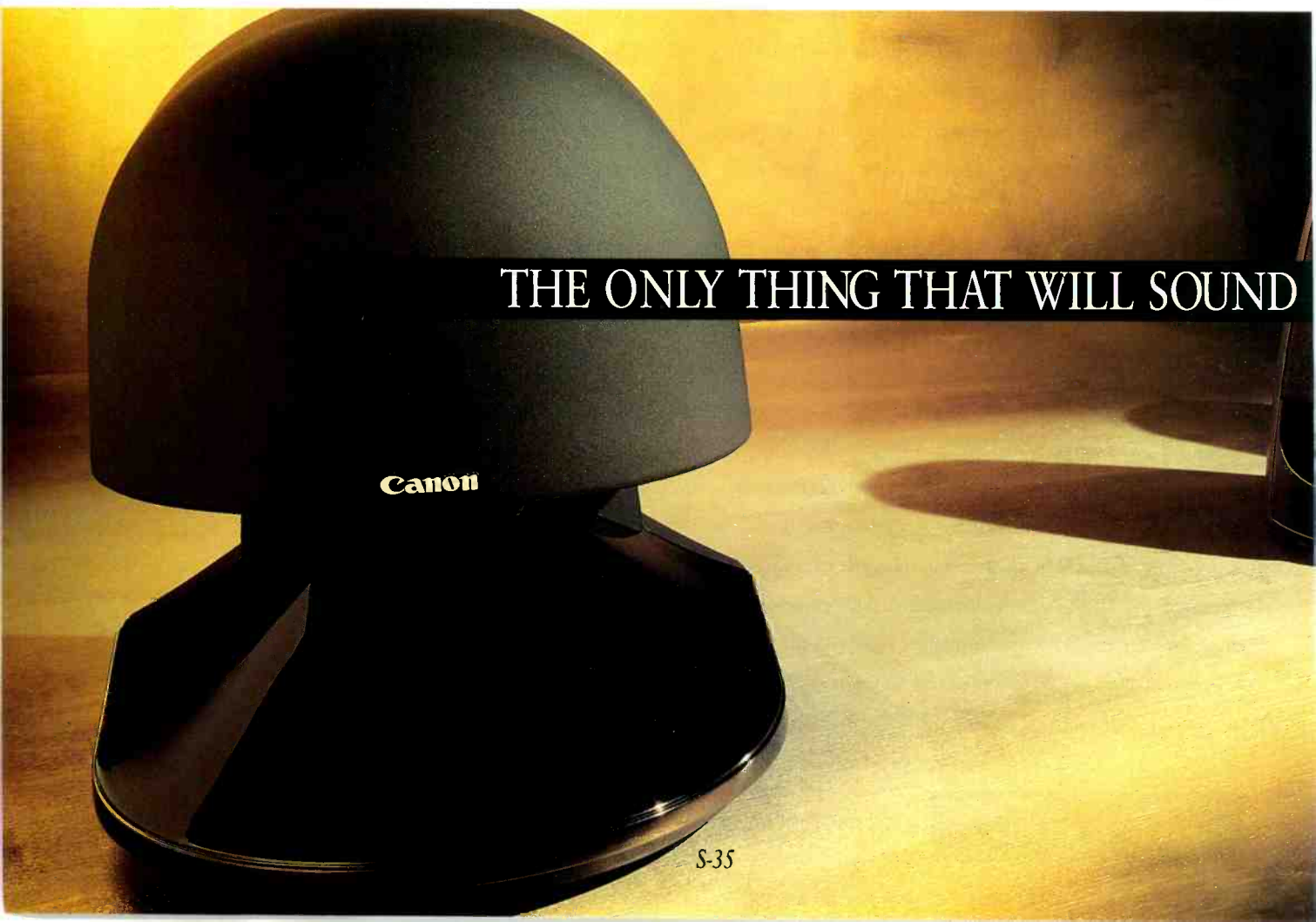
Q *I have tube power amplifiers dating from the 1960s. I sometimes see a blue or a purple color in some output tubes. Is this a harbinger of shorter tube life? Given the*

cost of output tubes these days, they're likely to be worth more than the amp!—William Luginbuhl, Bluffton, Ohio

A That glowing tube might mean something—or it might not. There is always a certain amount of residual gas within the tube, despite its maker's best efforts to remove it. Amplifier makers sometimes push output tubes to their maximum ratings to obtain as much power output as possible. When this is the case, some of this vestigial gas may ionize and you then see the glow. I have operated amplifiers with such tubes for very long periods, and the tubes didn't fail prematurely.

Sometimes, however, glowing is caused by a problem in the amplifier. You should check for such a possibility any time you see a suspicious glow. It is best to check things out and find nothing amiss than to leave them and later find your output tubes failing prematurely.

I have seen two conditions cause these failures. One is produced by leaky coupling capacitors feeding the grids of the output tubes. The d.c. forced onto the grids by such a capacitor will decrease or even eliminate



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the negative grid bias. The tubes will then draw excessive plate and screen current, resulting in a glow. If that glow is reddish, shut the unit down and check the situation out immediately!

The second condition, aging components in the bias supply, can also affect the amount of grid bias. The cure is sometimes as simple as readjusting a bias potentiometer on the chassis. (A dirty potentiometer can cause this problem. Clean the pot before attempting to adjust operating bias.) If the pot does not have any significant effect, check other elements of the bias supply, including selenium rectifiers and filter capacitors. In the case of a selenium rectifier, replace it with a silicon diode having the requisite voltage rating.

Equipment Ventilation

Q *My stereo setup includes seven full-sized components stacked on several shelves in a modified china cabinet. None of the components are power amplifiers, but they do generate some heat. I usually measure temperatures between 75° and 80° F, but if all components are powered up, I'll find temper-*

atures as high as 90°. Are my components running too hot? Do I need to provide forced-air cooling?—Bill Duff, Mukilteo, Wash.

A As you realize, the higher the ambient temperature, the greater the possibility of equipment failure of some kind. I think that 90° is too high; I don't like to see more than 80°. If you must power up all

**IF YOUR TUBES
HAVE A REDDISH GLOW
FROM EXCESSIVE PLATE
OR SCREEN CURRENT,
SHUT DOWN THE UNIT!**

your equipment simultaneously, then definitely use forced-air cooling. The fan for this purpose can be mounted to the back of the cabinet, into which you will drill holes to permit air to be sucked in; mount the fan on rubber so that its vibrations won't make the cabinet's back buzz. Keep the doors open when running the equipment, even with the fan running.

Is Old Gear Digital Ready?

Q *I listen to my CD player through a Fisher tube preamp and amp from the '60s. I use AR loudspeakers as the final link in the chain. It all sounds fine, but is this old gear "digital ready"?*—William Luginbuhl, Bluffton, Ohio

A All that "digital ready" means is that the equipment in question can take full advantage of the frequency range and dynamics of digital sources—at least, in the manufacturers' opinion. By the time the signal feeds the inputs of conventional audio gear, the digital information is converted into good old analog.

As long as the analog output from your CD player or other digital source doesn't overload your preamp's input, the sound should be at least as good as it is with analog sources, and probably better. Digital players do have higher output voltages than analog ones, but a level control on the player or preamp can correct for that.

As long as your preamp, amp, and speakers can play as loud as you like and don't add enough noise to obscure low-level details, their dynamic range is adequate. **A**

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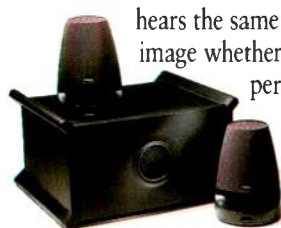
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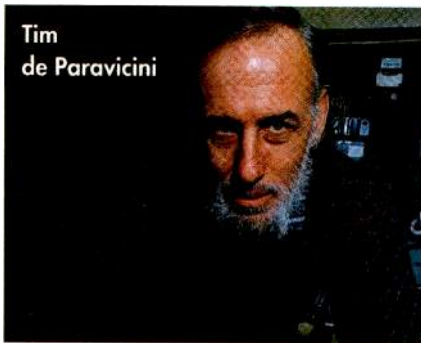
SV-15

All Things Digital

Dear Editor:

Anthony H. Cordesman's review of the Sony DTC-2000ES DAT recorder (January) contains the best testimonial I've read on the virtues and cautions of that format. I was saying "Amen" to myself all the way through. I felt that Tim de Paravicini's critique of DAT (in the same issue) was a bit more severe than is actually the case. But editing a DAT in a manner like the splicing methods of analog tape is virtually out of the question. Here, the weakness of DAT is most apparent, and an affordable approach is sorely needed, which was not anticipated by DAT designers.

The review and subsequent letters on Sony's TCD-D7 portable DAT recorder



(June, November, and December 1994) have confirmed some of my own experiences with the unit, but I'd like to offer several other good reasons for using this remarkable machine.

In long-play mode, it will record for four hours continuously. This turns out to be a great boon to taking notes in long lecture courses my college-age son sits through—no clumsy cassette changes every 45 minutes or so, and no disruptive noises to irritate some professors.

Furthermore, you can easily insert ID markers while the tape is recording and quickly skip to those locations while reviewing the lecture at a later time—no more fooling around with tape counters that are never accurate anyway.

Finally, the "Speech" limiter/compressor circuit very effectively controls gain and suppresses transients. I used the TCD-D7

recently to record a seminar series in which the lecturers fielded audience questions. Some 30 to 40 people were seated around a long conference table, and I was at the end near the lecturers. All questioners could be heard and understood clearly, regardless of their location in the room. Even traffic noise coming through an open window was controlled sufficiently so that the conversation remained intelligible above the din.

To get around the low-frequency attenuation Sony built into the mike inputs on the TCD-D7, you must use an external mike preamp and go through the line inputs instead. I've built several "one-chip" balanced-input mike preamps complete with phantom power supplies (all operated from 9-V batteries), which I think work quite well with this machine.

The latest spate of letters about digital noise, sampling rate, and digitization accuracy (the January issue in particular) reminded me again that both sides of the analog-versus-digital debate are right and wrong, but for different reasons. As a friend of mine likes to say, "Choose your distortion!" You're going to have some, no matter what.

Here are two examples, one from each camp. BMG has released a two-CD set called *Christmas with The Robert Shaw Chorale* (RCA Special Products DMC2-1217). Included are songs from three LPs originally issued in the late '50s and early '60s: *Christmas Hymns and Carols, Vols. 1 and 2* and a Britten collection featuring "A Ceremony of Carols," "Festival Te Deum," and "Rejoice in the Lamb." The CD liner notes state that remastering was done "directly from the original RCA Victor Red Seal master tapes. Except for some intermodular microphone distortion and equipment hum that was present on a few tracks of the stereo tapes, we found the masters to be in surprisingly excellent . . . condition." I don't know what "intermodular microphone distortion" is, but this CD reissue makes clear to me that what I remember hearing from the LPs so many years ago was not a worn needle, or too much/too little

tracking force, or incorrect anti-skating force, or anything else. The analog tapes were distorted! It sounded that way 30 years ago, and it sure sounds that way on these discs. The digital domain wasn't responsible for spoiling the analog sound; just because it's analog doesn't mean it's great.

From the purely digital camp, listen to the opening drums in Copland's "Fanfare for the Common Man" from an album entitled *America, the Dream Goes On* with John Williams and the Boston Pops (Philips 412 627-2). Granted, this was recorded in 1984, when digital was still a newcomer. But the decaying drum sound, not the attack of the mallets, has a sizzle like frying bacon. Perhaps we've learned a lot in the meantime about dither, A/D and D/A linearization, oversampling, anti-aliasing filters, and the like. But the problem is not the playback equipment. You can hear this grungy sound on any CD system, even at low levels or on headphones. It's gotta be the CD! Just because it's been recently recorded doesn't mean it's great stuff either.

I've done my share of amateur recording in both the analog and digital domains, and I know that great sound can be gotten in each. They both need coddling, but I find digital to be more reliable and less finicky than analog. I look forward, however, to an inexpensive digital editing console. I kind of miss the old razor blade and splicing tape of the good old analog days.

Edwin A. Karlow
Riverside, Cal.

Another Short-Wave Fan

Dear Editor:

James Boyk's comments ("Signals & Noise," December 1994) about the dearth of consumer high-frequency, or short-wave, receivers for cars are exactly on the mark. While HF by design cannot have the same quality as that of even a local AM broadcast, the variety of programming available is indeed wonderful.

Until recently, synchronous detection using phase-locked-loop reconstruction of the AM carrier wave that is lost to multipath fading (the primary cause of the periodic fade distortion in sky-wave reception) was far beyond the pocketbooks of most folks, except those adventurous enough to try hobby-magazine construction projects. Even my prized military R-390 receiver, the

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top HF receiver from the tube days, lacks this important feature as built.

As to mobile HF operation: Go to Los Angeles International Airport, hop on Singapore Airlines, and go to the end of the line. There you will find stores full of car radios, boom boxes, home "hi-fi" systems, and even pocket radios, all with HF capability to various degrees. You see, in most Asian countries, the local broadcast stations are owned and operated by the government. Since these monopolies do not wish to repeat themselves, it is not unusual to find fewer than six (sometimes as few as two) choices on the entire FM or AM band (during the day). The net result is an incredible market for alternative sources of entertainment and news. My point here is that there is a large inventory of off-the-shelf HF products in the world—but not here in the U.S., where our wide variety of local programming makes HF of little use to the average consumer. Even in other countries, however, synchronous detectors are rare, as this raises the price a bit, and we are talking about commodity products in areas of limited disposable income.

There are some quality portable radios available in the U.S., mostly in travel stores, such as the Sony ICF-2010 mentioned by Mr. Boyk. But for cars, few options exist. I don't recommend converters for standard car radios; my experience with them has been mixed, and they all depend on the car radio's i.f. circuits, which are definitely not optimized for HF reception.

I do have an idea. If some enterprising entrepreneur out there would set up a distribution agreement with some of the Asian suppliers, they could offer HF products through mail-order ads in *Audio* and other related publications.

Richard Lee
Centerville, Ohio

Kudos to Mitsubishi

Dear Editor:

I purchased a Mitsubishi VHS Hi-Fi VCR in the fall of 1993. In the fall of 1994, the unit developed some mechanical problems that required a trip to a service center. Unfortunately, the six-month labor warranty had long since expired, and the one-year parts warranty had ended only a week be-

fore the problems appeared. Since I had been extremely pleased with the performance of the VCR, I decided to invest approximately \$100 to get the unit repaired.

On a whim, I contacted Mitsubishi regarding potential reimbursement for a portion of the repair cost since the parts warranty had just expired. Mitsubishi responded by covering the *entire* repair bill.

Considering this gesture, I can assure you that I will definitely be purchasing more Mitsubishi products in the future, and I would encourage other readers to do the same. I want to again extend my thanks and appreciation to Mitsubishi for standing behind its products.

Dan Erni
Menomonee Falls, Wisc.

Erratum

In Bascom H. King's review of the Audio Alchemy DTI-PRO jitter reducer and resolution enhancer (February), the first words in the caption for Fig. 2 should have read, "THD spectra for 1-kHz signals at 0 dBfs," not -90 dBfs.

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CIRCLE NO. 2 ON READER SERVICE CARD

Most auto-sound buyers probably do not realize the degree of testing that goes into a car stereo product before it reaches them. Readers of hi-fi magazines naturally see a lot of data reflecting electronic testing—i.e., sensitivity, distortion, selectivity, capture ratio, and so on. They probably suspect that some sort of additional field test is conducted in the design process, but they may think it goes no further than “picking up weak stations.”

Some auto-sound companies with very small staffs do rely completely on conventional specifications and a spin around the block by the sales staff. For many years, however, Blaupunkt has done extensive road testing of its car radios—tests designed to reflect actual performance problems a typical or even a more esoteric listener may encounter. And of course, if a radio performs well under highly stressful listening conditions, it will definitely perform as well or better under typical ideal test conditions.

On the Road

Blaupunkt's tests are performed in a specially outfitted van. The overall sound system is good but not exotic, with a suitable power amplifier and a number of typical automotive antennas. Virtually all testing is carried out with the ordinary antenna that came with the van.

Provision is made for multiple radios. Critical to the testing are reference units—very good radios, very bad ones, or both. Radios under test are individually switched in and connected to the same antenna.

We perform a variety of road tests that correspond to lab tests, such as weak-signal performance (sensitivity) and co-channel

reception (capture ratio). Now, that sounds simple. It isn't. The test for weak-signal performance, for example, actually involves factors other than sensitivity, including selectivity, capture ratio, and limiting. Furthermore, a station chosen for weak-signal testing must be minimally affected by adjacent and co-channel stations. Although ideal test stations are almost impossible to find, nonetheless we are able to minimize complicating factors.

We have carefully chosen some test locations where reception of a desired signal is heavily compromised. (This applies not only to FM but to AM as well.) In these locations, a preponderant amount of radio interference is from a specific source. We do want some degree of interference to affect virtually all the test radios, but never enough that it will entirely obliterate reception.

The Scoring System

Much of what we call car radio testing is subjective evaluation, based on relatively objective criteria for rating reception performance. Often, we have to make judgment calls. If one radio produces a squeal, is it worse than another that produces a buzz or a loud hiss? If an adjacent-channel

TUNERS IN TRAIL

How



Blaupunkt



Road-Tests



Radios

by
Mike Stosich

Mike Stosich, senior design engineer for Blaupunkt Auto Radio in Broadview, Ill., is also active in live sound recording and vintage sound restoration, and he frequently provides restoration services for projects of the Chicago Museum of Broadcast Communications.

station produces objectionable interference, is that as bad as the tuned station just fading away?

Here's a simplification of Blaupunkt's scoring system:

0-2: Bad. Spoken words barely understandable.

2-4: Poor/Usable. Spoken words understandable, but music not tolerable.

4-6: Fair. Some interference; music and speech listenable.



6-8: Good. Slight or occasional interference; music only moderately affected.

8-10: Excellent. No significant problems observed.



An average score is calculated, to rate the radio's overall performance under stressful conditions. If a new design fails to meet the performance of an old design, red flags go up.

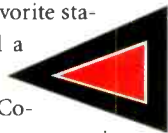
FM and the Real World

The problems of reception are more severe with car radios than with home tuners. We do not have the option of directional antennas, and reception conditions in the car are constantly changing, sometimes dramatically.

Among the most important areas of FM tuner performance in a car radio are weak-signal performance, selectivity, intermodulation, AGC (automatic gain-control) blocking, co-channel reception, multipath distortion, and ignition-noise reduction. Now, what exactly are these factors? How do they relate to specs? And what do they mean to you?

Weak-signal performance is somewhat self-explanatory, and as mentioned before, sensitivity is the characteristic of primary concern. Typical lab measurements for FM sensitivity range from 10 to 25 dBf. In the real world, many of the radio's other characteristics more significantly limit weak-signal reception. For a road test to be most meaningful, the test station should not have a significant co-channel partner and its frequency should not be close to that of another strong station.

From this, you might conclude that sensitivity measured in the lab could be more useful to rural listeners than to urban listeners; in rural areas, most stations are weak and widely spaced. This is not always true—for instance, if your favorite station is far away and a nearby station is on an adjacent channel. Co-channel reception may occur in some rural areas where all stations are far away; in this case, the radio's capture



ratio can be of primary interest (more about that later). It is not in the specifications, however, but in the listening where the real performance is determined.

Stereo signals are difficult to receive because radios typically are 20 dB worse in stereo S/N ratio than in mono S/N. For this reason, quality radios gradually reduce separation at weak signals. An abrupt switchover may be noticeable in some reception areas where signal intensity varies radically. Therefore, we specify a particular switching slope to minimize listener awareness.

A radio's selectivity is a measurement of its ability to receive only the tuned channel while rejecting stations on nearby frequencies. Most problems occur when you want to listen to a weak station that is *adjacent* to a strong local station—that is, 200 kHz away. Normally, specs are available for *alternate-channel* selectivity (stations 400 kHz apart), which is a larger value but of relatively little importance to the listener. *Adjacent-channel* selectivity usually results in measurements from 10 to 30 dB. While a spec like 15 dB or greater is preferred, there are high-quality tuners with selectivities of 10 dB or less; this is because a low FM selectivity often results in low distortion and, sometimes, low capture ratio. Therefore, if you are interested primarily in very high-quality sound with high multipath rejection and low distortion from strong, local stations, then high selectivity may not be the most important factor for you.

Intermodulation (or IM), often described as “front-end overload,” is common in a listening area where there is a multiplicity of FM and TV transmitters in close proximity, such as the downtown district of a large city. The radio's input circuitry is literally overloaded, and you hear a mixture of surrounding stations that obliterates reception or at least produces varying amounts of interfering hiss. This occurs when the tuned station's frequency is also a sum or difference frequency of two undesired stations. The exact

formula is: f_1 (interference) = $2f_1$ (frequency of a local station) - f_2 (frequency of another local station).

In one of Blaupunkt's road test locations, we use two stations that are at frequencies where at least five pairs of undesired stations can produce IM. Rejection of intermodulation is rarely specified, and when lab measurements do show differences of many dB between radios, the real-world results often are opposite. You can help your radio by reducing the length of the auto antenna while driving in the troublesome area.



Another phenomenon that occurs when you are close to an undesired station is AGC blocking. Only one station is necessary to produce the interference, which, in this case, takes the form of fading. The nearby station fools the radio into thinking that it is tuned to a much stronger station than the one actually being received. The radio's AGC circuit responds by lowering the gain of the r.f. circuits, resulting in fading and, in some cases, muting. There is no IEEE/IHFM or EIA lab

test. A 1.5-dB capture ratio means that when one of the stations is as little as 1.5 dB stronger than the other, you will hear just the stronger station. Unfortunately, about the only time you will experience co-channel reception is when receiving very weak signals—and the present test for capture ratio is performed at a much higher level. At real-world reception levels, the capture ratio of all those 1.5-dB tuners would be about 5 or 6 dB. Such a ratio would mean you would have to be a lot closer to the desired station to avoid interference. Regardless of specified capture ratio, most radios tend to perform similarly in co-channel situations. A *very* low capture ratio, however, can only help.

Multipath distortion is one of the most offensive of interference effects, a distortion

TUNERS I

Blaupunkt's test van holds radios under test, reference radios, and switching for antennas and audio monitoring.



spec for this phenomenon. Only road testing can reveal the actual behavior of radios in response to this interference.

A radio subjected to co-channel reception may produce the sound of one of two stations or both, depending on which is stronger. This is closely related to the measurement of capture ratio. The smaller the radio's capture ratio, the better its ability to receive *only* the signal of the stronger sta-

tion that is largely uncorrelated with the modulation's harmonics and is usually worse the louder and more treble-filled the music. Sometimes referred to as “picket fencing,” multipath swishes in and out, making “pfft-pfft” sounds. It is caused by the radio receiving both the original signal from the transmitter and a reflected signal. When these two signals arrive at the antenna, summation and subtraction of the signal

produces the undesired effects, especially with stereo decoders.

There are no standard lab specs for multipath distortion, but a good capture ratio indicates that a radio may tend to reject undesired reflections. Since this phenomenon

circuitry that eliminates ignition and pulse-type noise is that it tends to attack desired modulation as if it, too, were noise. This usually affects high-frequency, percussive music and the consonant sounds of spoken words. Many times, listeners think they are

hearing multipath distortion when, in fact, a misbehaving pulse-noise circuit is the culprit. Conventional lab tests usually do not reveal this distortion; careful listening is the best way to detect it. The effect of pulse-noise circuits becomes quite apparent when we drive the test van into rural areas, where signals all tend to be weak.


actively weak AM station and you are driving near the transmitter of a strong local station, then you will hear the local station in the background.

On a final AM note, listeners in downtown urban areas think the awful performance they experience is primarily due to the blocking effects of tall buildings. We all know that AM is inherently inferior to FM and that AM fades under such conditions—don't we? In fact, because the downtown area is typically the site of a city's FM and TV transmitters, what often happens is that the AM tuner is sensitive to interference from the VHF frequencies of those many close transmitters. The differences in performance between radios can be quite dramatic. As with intermodulation in AM reception, there are no standard tests for this phenomenon, and little attention is paid to it.



Don't Forget AM

Most of the factors relating to FM tuner performance are similar in AM reception, but there are some differences. Co-channel reception does not apply, as you will almost always hear an interfering AM station that is anywhere near the strength of the desired station. Multipath distortion is not a factor either, and ignition-noise suppressors have not found their way into AM tuners to any significant degree (though future AMAX-certified radios may employ them). Weak-signal performance, selectivity, and AGC blocking all affect AM and FM in very similar ways.

On the other hand, intermodulation in AM is most often exhibited in a different form. The traditional two-signal interference can occur, but the most common form of IM with AM tuners is reception of a station operating on *half* the tuned frequency—for instance, when you are tuned to 1,440 kHz, a station operating on 720 kHz. This problem has become more common in recent years because of the introduction of solid-state tuning devices that are necessary for digital tuner operation. There are no standard lab tests for this IM phenomenon, and very little attention is paid to it in common literature.

 Crossmodulation interference, usually not an FM problem, can occur with AM tuners. Here, the modulation of one station is superimposed on that of another. If you are listening to a rel-

What matters most is not specs but how well a radio is suited to your area.



is less offensive with mono signals, some radios may produce less multipath distortion when tuned to weak signals, owing to the previously mentioned stereo-to-mono switching. A radio with high stereo sensitivity will tend to have a low stereo/mono threshold. In fact, the stereo threshold will usually define the stereo sensitivity. Therefore, excellent stereo sensitivity may correlate to poor multipath performance in weak-signal areas. If the radio can be manually switched to mono operation, this can alleviate the situation in particularly bad reception areas.

Locations that are prone to multipath distortion are most often those where large buildings block the original signal and produce the reflected signals. For road test purposes, I choose areas that are close to the transmitter as well as others that are far away from it, and I average the results. Using the more distant location allows for the beneficial effects of stereo/mono switching.

There's a belief that whereas AM radio is prone to ignition noise, FM is not. Actually, most high-quality FM tuners for the car require sophisticated circuitry to keep such interference in check. The problem with

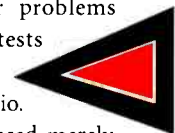
Strategies for the Buyer

While many car stereo buyers tend to base their judgments on published specs and magazine lab measurements, those figures are often only a small part of the picture. You should keep your primary driving/listening area in mind when you consider specs; differences of a few dB in a measurement will not always guarantee the expected performance. Only an actual road test can determine whether a radio is appropriate for your area.

You should make a list of performance characteristics that you don't like in your present radio and try to correlate them with published specs; there may be some specs that apply, but don't forget my caveats. Dealers and friends who have the radios being considered may also be able to provide information on the products' road performance. The reputations of the manufacturers should also be considered.

As we have seen, there are no standard lab tests for many common reception problems. Still, the customer is often protected from these and other problems through careful road tests that empirically check the performance of a radio.

Choosing a car radio based merely on its specs being a dB or two better than another's may be about as useful as throwing a dart at their lists of specifications. A





Photographs: Robert Lewis

Car Audio

Unfortunately, many audiophiles are unaware of how well a good car audio installation can meet home audio standards. Just as unfortunately, many car stereo buyers (and installers!) are unaware of the techniques needed to get that high level of sonic performance in the car.

In the car, as in the home, it's not really enough for an audio system just to let you recognize voices or instruments and hear them without noticeable distortion: Audio only reaches its highest level when it reproduces the full emotional experience of the recording. Such a system is so good that it creates a sense of

realism, projects a believable image, and literally engulfs you in the music.

Why is such a system different from the basic "20-to-20,000" system with umpteen speakers and lots of watts? First of all, the dominant component in the design of an "emotional" system must be the car itself. Any attempt to overcome the car's influ-

ence with brute-force technology will surely be met with disappointment. If musical realism is the goal, then there is simply no component, or series of components, that can guarantee results.

The psychology and physiology of hearing demand that we obey certain basic, unchangeable rules. If we really expect to achieve any

GET YOUR
HEAD
INTO IT

Richard Clark and David Navone own Autosound 2000, a test lab and technical-newsletter publisher in Burlington, N.C. Clark, an audio engineer for over 25 years, has won several national auto-sound championships. Navone, a writer, founded Rolling Sounds Car Stereo, in Stockton, Cal., which he owned and ran for 10 years, and has taught physics at the university level.

by Richard Clark & David Navone

semblance of a natural perspective of the musical image, we must always consider the listening environment—we cannot arbitrarily ignore the interaction between the components and the car.

THE INFLUENCE OF THE CAR

The first interaction we must address is the way the car governs our choice of speaker positions. In a home system we take for granted that we can sit in an ideal location—if we sat a foot or two from one speaker, as we do in the car, even the best

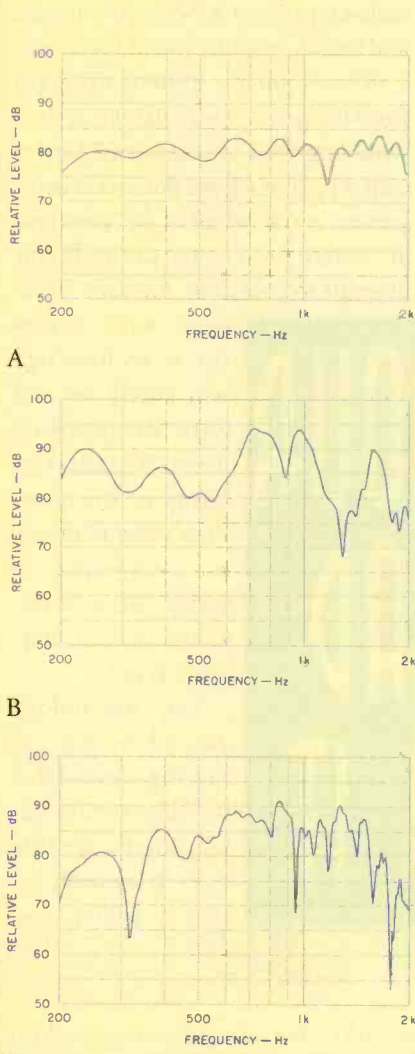


Fig. 1—Frequency response of Pioneer TS-M1RS midrange driver, mounted on flat baffle outside of car (A) and mounted in car (B), plus response of two such drivers mounted 6 inches apart in car door (C).

home speaker systems wouldn't provide much in the way of realistic stereo imaging.

So the practice of filling the car doors full of speakers, and then sitting in close proximity to one door, is doomed from the start. In a car, speaker locations that allow somewhat equal path lengths between the listeners and the loudspeakers are an absolute requirement. Electronic signal manipulation, using simple delays or even complex digital signal processing, cannot possibly compensate for poor loudspeaker placement. Of course, optimum placement may require a little ingenuity on the part of the installer. In a home system we can simply rearrange the furniture until we are satisfied—not so easy in a car. We could ask our mechanic to relocate the steering wheel to the car's center, but then we would have to sit on the console.

It is obvious to anyone who has tried to deal with the problem of speaker placement that integrating loudspeakers into a car is a compromise, at best. We must, however, make every effort possible to minimize left-to-right path-length differences. Unfortunately, all the good spots for speakers seem to be occupied by items of no musical importance, such as computers, speedometers, and brake pedals. Remember, we didn't say this is going to be easy; we just said that it can be worth the effort.

Our next basic requirement is to design the system with as few speakers as is necessary to do the job properly. As in home systems, using more than one speaker to cover a similar bandwidth leads to adverse loudspeaker interactions. These interactions often result in comb filtering and other undesirable effects. (Examine Fig. 1 to see how two identical loudspeakers interact when separated by only 6 inches.) Add this to the unequal left/right path lengths, and you'll soon see why most car audio systems sound so bad.

In home systems, we usually purchase an assembled speaker system whose performance is primarily determined by its designer. The designer usually spends many weeks or months on the design, and has access to lots of test equipment to help him refine it. The systems' drivers are usually mounted in line on the baffle, to control dispersion and imaging. The resulting speaker's component drivers, mounting baffle, and enclosure all function comfort-

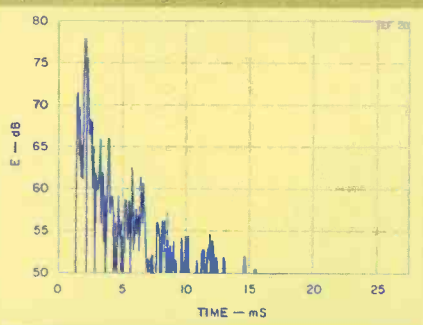


Fig. 2—Energy-time response of midrange speaker mounted in a car's dash.

ably together, synergistically, to reproduce a single coherent wave.

Trying to produce this effect in the car is difficult, because we lack the luxury of a single, in-line mounting baffle and have problems caused by the spacing between multiple speakers and the car's uneven mounting surfaces. Plus, the greater the number of speakers that must work together, the more difficult the task becomes, as seen in Fig. 1. An absolute requirement for a quality car audio system is that the number of midrange and tweeter assemblies be kept low and that the midrange and tweeter of each channel be closely spaced.

DISPERSION CONTROL

Another area of difference between home and car audio is tweeter selection and aiming. In the home, where listeners sit roughly equidistant from the speakers, loudspeaker designers look for tweeters with the broadest possible dispersion. The designers then aim those tweeters more or less directly at the listeners. In the car, aiming is different. We actually want tweeters whose response

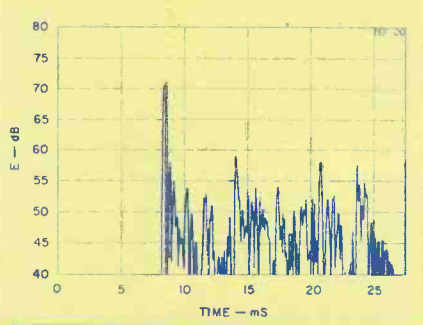


Fig. 3—Energy-time response of same speaker in a small room.

falls off rapidly the farther the listener is off axis, i.e., tweeters that beam. But since beaming has negative connotations, let's just call it "controlled dispersion." In a highly reflective environment, controlled dispersion enables us to direct the energy where we need it and helps us to minimize unwanted reflections.

For example, let's say that we want the car's audio system to image for both driver and passenger. We can take advantage of controlled dispersion by aiming the speakers on the driver's side of the car, directly at the passenger. This places the driver off the tweeter's axis, reducing the high-frequency level he'll hear from the nearer channel. It also helps compensate for the fact that sitting closer to that channel tends to make its highs sound stronger, because they would otherwise be a trifle louder and because they would arrive a trifle sooner than the highs from the opposite side of the car. Similarly, the speakers on the passenger side of the car can be aimed at the driver's ear, placing the passenger off axis.

Remember that even though we can't position the listeners in a car in ideal locations for good stereo imaging (equidistant from both the left and right speakers), at least we know the location of each listener's head. Ultimately, our goal is to use both time and intensity cues to achieve a reasonable balance between the two channels as they arrive at each listener's ears. Therefore, we see that the aiming direction of our car's high-frequency drivers can be used to our advantage, especially if the speakers have somewhat controlled dispersion.

Our "emotional" system will rarely allow for midrange and high-frequency speakers to be placed where they will detract from the front soundstage, which means not placing speakers all over the car. We place our home speakers in front of us, not behind us; why should a quality car audio system be any different? Until a program format with multichannel capability is available, there is simply no reason to have speakers in the rear of the car, provided realism is the goal. However, there is an exception in car audio: Subwoofers.

BASS INSIDE THE CAR

Once we have done our best to create a good stereo image, it is time to consider the subwoofer system. When it comes to find-

ing a place for woofers, we usually have few choices except for the rear parcel shelf or behind the rear seat. Luckily, our ability to tell where very low-frequency sounds are coming from is not nearly as acute as with the higher frequencies. Thus, if we have established a solid stereo image up front, we can get the low frequencies to blend into the front soundstage.

Creating the illusion that the bass is up front can get quite complex. Mainly, it requires a good crossover (at least 12 dB/octave below 100 Hz), a low-distortion woofer system, and a quiet, rattle-free subwoofer installation. The more sound a woofer produces above 100 Hz—including the signal, rattles, and distortion products—the easier it will be for you to tell where it is.

RESPONSE ABNORMALITIES

Even with all speakers installed as optimally as possible, you will likely still have unacceptable response abnormalities. A home speaker can be configured and sold as a system, with very predictable performance. However, the raw-component approach used in car audio leaves a lot of room for all kinds of performance variables. Due to component mismatching and adverse interactions, almost all car audio systems will benefit from the proper use of an equalizer.

But since we have large and small cars, vans, pickups, et al., the responses vary wildly between vehicles. The typical car's acoustics are a morass of very early reflections—reflections from the windows, dashboard, headliner, and other body panels near the loudspeakers. Due to the close proximity of these reflecting surfaces, the reflections are grouped very closely (typically less than 3 mS apart and sometimes as little as 1 mS or less) and occur at equally short intervals after the original sound.

Temporal fusing of the very early reflections can make listeners perceive the spectral response of a car to be different from that of a home system whose measured response is similar. If the direct and reflected sounds are separated by longer intervals (10

The dominant component in the design of a car audio



system must be the car itself.

Finding optimum placements



for car speakers may require ingenuity on the part of the installer.

mS or more, as in a home audio system), our hearing mechanism functions quite differently. Energy arriving significantly later than the direct sound is perceived more in a spatial sense than as spectral energy. You can see the difference between car and room reverberation by comparing Figs. 2 and 3. Figure 2 shows the energy/time response of a speaker, measured in a car. The curve shows a dense but rapidly decaying series of reflections (including one reflection that's stronger than the direct sound!). Figure 3 shows the same speaker's energy/time response in a home listening room; the reflection series now becomes more even and extended. (For each measurement, the microphone was placed about as far from the speaker as a listener would be: 9.6 feet for the room measurement but only about 2.4 feet for the car.)

At the lowest frequencies, tuning a car audio system's response becomes even more subjective, because we're sealed inside a small chamber along with our loudspeakers. From testing numerous subjects, we have learned that the ear's sensitivity to very low-frequency sounds is diminished when we are enclosed in a very small space. As a result, a slight rise is sometimes required in the low-frequency response of a car audio system, as opposed to the flatter system response desired in a large listening room. This requirement is further strengthened by the necessity to boost low-frequency energy to compensate for the masking effects of all the ambient noise in a moving car. Fortunately, the effect of the listeners being in a small sealed enclosure with the subwoofers gives even the most modest system extremely good low-frequency response. It is not uncommon to see a pair of 6-inch woofers actually yield decent response down to frequencies of 20 Hz or below.

REFLECTION, REVERBERATION, AND ENERGY

While car audio systems gain efficiency at very low frequencies, the opposite is usually true at the higher frequencies. Because the typical car is both small and full of car-

peting, upholstery, and other absorptive surfaces, our best description of this environment is an oxymoron: The car is a reflective anechoic chamber.

The reverberant field in a car is virtually nonexistent (refer back to Fig. 2), and the speakers, except for the woofers, are almost always small and inefficient. This means that the average car system usually requires unusually high amplifier power. Typical requirements can easily surpass those for home systems in very large rooms. And if you want to consider overcoming the higher ambient noise level of a moving vehicle (caused by things like road, wind, and traffic noise), then the power requirements can far exceed even those of large home systems.

Dynamic range poses yet another car-specific problem. There's a limit to how much we can increase usable dynamic range by adding more power; that limit is set by the maximum sound level we can listen to comfortably and safely. If our background noise level is too high, it can ruin the fidelity of the reproduction. For example, using 105 dB SPL as our peak listening level in a moving car whose background noise level is 65 dB SPL (quieter than most cars), we'd achieve a dynamic range of only 40 dB. This could literally mean getting the same dynamic range from a Compact Disc as from an AM radio station!

For this reason, it is important to consider the car itself as part of the audio system. When it comes to quality reproduction, some cars simply are better than others. If replacing your car is not an option, there are still things you can do. Adding damping material, replacing worn weatherstripping, and installing new mufflers can all contribute to improving the listening environment of the car.

Of course, the few basic guidelines discussed in this article are not all there is to a good car audio system. Although quality components certainly have their importance, the basic laws of physics cannot be ignored. Remember, no amount of technology or expenditure of money can overcome the problems rooted in flawed system design. But a good car stereo system can be a great way to extend your musical enjoyment from just the hours you spend at home to the many hours you spend in your car as well. A

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DENON DCT-950R CAR STEREO



automatically be heard when you're listening to that station's regular programming—or even to a CD, if you leave the tuner set to that station. This sounds complex, but it does let you choose whether or not to let traffic announcements interrupt your listening. When the DCT-950R is receiving a traffic-announcement station, the volume automatically returns to the level it was at when you last received a traffic

If memory serves me well, Denon was the first supporter of the Radio Data System (RDS) in the U.S., so I'm not surprised to see RDS included in the DCT-950R, a flexible, expandable, and quite competent FM/AM receiver and CD player. I'll leave it to Ivan Berger, *Audiophile's* Technical Editor, to describe how well RDS functioned on the road, since I couldn't test that in my lab. Suffice it to say that, on FM stations equipped with the necessary RDS paraphernalia, the DCT-950R displays the station name (the "PS," or Program Service name function) and its primary program genre (the "PTY," or Program Type function). In addition, stations can transmit emergency alerts, independent of the current official Emergency Broadcast System administered by the FCC, and traffic alerts.

You can tune for RDS stations broadcasting a specific program genre by pressing "AF/PTY" twice and holding it for 2 seconds. This causes the display to flash with the current program type. Pressing either of the first two station presets cycles through more than 20 possible choices of program genres. When you see what you want, "RDS/Seek" tunes in an RDS station of that ilk, and the display switches from station frequency to the station's ID, usually its call

letters. (Pressing "Mute/DISP" for 2 seconds cycles the display to frequency, "PTY," and then back to station ID.) If there's an RDS station of the desired genre in one of the presets, you can bypass the round-robin program selection by calling up that station

**THE DENON'S
AM SECTION IS HOT,
AND ITS FM RECEPTION
IS EVEN HOTTER.**

with the preset and seeking another of the same persuasion by pressing "RDS/Seek."

You can search for traffic announcements even more directly than other programming by pressing "TA/PS" and then "RDS/Seek." This will find any stations in the area that broadcast traffic announcements (TAs), even if they're not broadcasting them at the time. When you find such a station, a "TP" (traffic programming) icon shows on the display. You can then monitor for these announcements by pressing "TA/PS" again, which puts a "TA" next to the "TP" on the display. Once you've done that, any incoming traffic information will

announcement. If the traffic stations are not strong enough for adequate reception, the DTC-950R beeps a warning. Emergency alerts are detected if the radio is tuned to an RDS station that's broadcasting one; if you're playing a CD at the time, the DTC-950R automatically switches to the tuner and ramps up the volume to an attention-getting level.

Yet another RDS goodie is the "AF," or Alternative Frequency, function. In some areas of the country (and in many parts of Europe), identical programs are transmitted by a number of low-power stations. If these are RDS stations, the DCT-950R can be asked to automatically find the next one (based on a frequency list transmitted by the original station) when the signal strength of the current station weakens below a threshold.

The Denon's clock display can set itself, using signals from RDS stations that broadcast clock time (CT) signals. This includes automatic adjustments for daylight-saving time and the ability to update the clock as you cross time zones.

The "RDS/Seek," "AF/PTY," and "TA/PS" buttons are aligned above the six station presets. Also in the upper row are the "LOC/MON" button (which changes the seek threshold to exclude weak stations

SPECS

FM TUNER SECTION

Mono Usable Sensitivity: 11.4 dBf (1 μ V at 75 ohms).

50-dB Quieting Sensitivity: 20.3 dBf (2.8 μ V at 75 ohms).

Alternate-Channel Selectivity: 100 dB.

S/N: 70 dB.

Stereo Separation: 40 dB at 1 kHz.

Capture Ratio: 2.5 dB.

AM TUNER SECTION

Sensitivity: 30 μ V for 20-dB S/N.

CD SECTION

Frequency Response: 5 Hz to 20 kHz, ± 1 dB.

Dynamic Range: 96 dB.

S/N: 96 dB.

Harmonic Distortion: 0.005%.

Wow and Flutter: Below measurable level.

AMPLIFIER SECTION

Power Output: 14 watts x 4 at 1 kHz with 10% THD, 10 watts x 4 from 20 Hz to 20 kHz with 0.8% THD.

Output Voltage and Impedance, Preamp Level: 2.2 V/10 kilohms.

Bass-Control Range: ± 12 dB at 40 Hz.

Treble-Control Range: ± 12 dB at 15 kHz.

Loudness Compensation with Volume at -30 dB: $+8$ dB at 100 Hz and at 10 kHz.

GENERAL SPECIFICATIONS

Remote Output: 12 V, 300 mA maximum.

Power Antenna Output: 12 V, 300 mA maximum.

Dimensions: Chassis, $7\frac{1}{8}$ in. W x 2 in. H x $6\frac{7}{8}$ in. D (17.8 cm x 5 cm x 17.2 cm); panel, $7\frac{3}{8}$ in. W x $2\frac{1}{4}$ in. H x $\frac{7}{8}$ in. D (18.7 cm x 5.9 cm x 2.3 cm).

Weight: $4\frac{3}{8}$ lbs. (2 kg).

Price: \$499.

Company Address: 222 New Rd., Parsippany, N.J. 07054.

For literature, circle No. 90

and switches to mono reception) and "CLK" (clock) set. These five rectangular buttons are a bit smaller than the presets, to help identify them by touch. The up/down seek buttons (which double as the track advance/repeat and, when held, as fast-scanning buttons in CD mode) are round. The "Mute/DISP" button also is round but a good bit smaller than the seek pair.

Volume, bass, treble, fader, and balance adjustments are made by the same knob. Each brief press advances through the choices, with "Volume" as the time-out default. Pressing the knob for more than 2 seconds toggles the loudness compensation on and off. The "Tuner/Band" and "CD" buttons are above the control knob. "Tuner/Band" also serves as power on/off, while "CD" switches to disc playback. Each successive tap on "Tuner/Band" advances to the next six-pack of presets—three banks (18 stations) for FM, two banks (12 stations) for AM. To the right of the CD slot is the panel-detach button. The panel is pretty crowded, but the DCT-950R offers quite an assortment of features—and they must be accessed one way or another. (A wireless remote control is available as an option.)

The DCT-950R is compatible with DIN "E" and ISO mounts, and is quite expandable. In addition to its four-channel internal power amp (with a 4-ohm wide-band rating of 10 watts x 4 at 0.8% THD and a rating at 1 kHz of 14 watts x 4 at 10% THD), there are fader-controlled front and rear pre-amp outputs, a muting input for use with a cellular phone, a power antenna control line, and a dash-light dimmer lead to adjust night illumination. You can also use the DCT-950R as the controller for a Denon DCH-700, DCH-600, or DCH-500 CD changer. Its internal player features a three-beam laser pickup and dual 18-bit D/A converters fed by an eight-times-over-sampled, 20-bit digital filter and

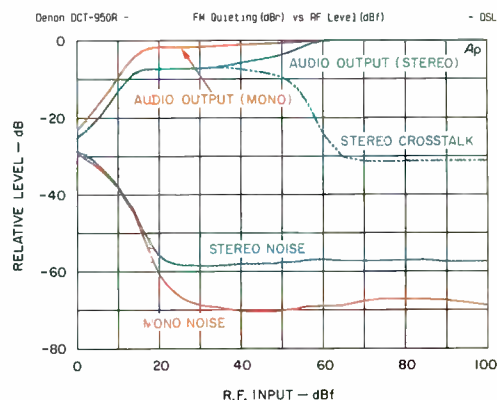


Fig. 1—FM quieting characteristics and stereo crosstalk.

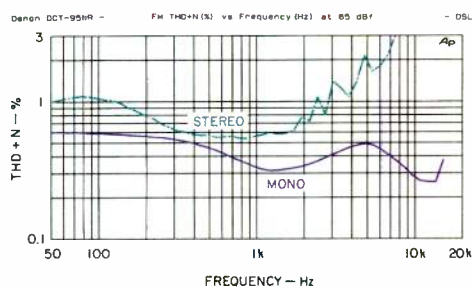


Fig. 2—THD + N vs. frequency, FM section.

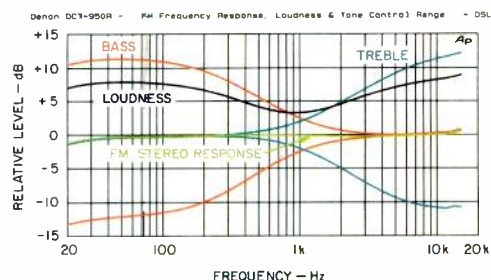


Fig. 3—Tone-control range and loudness contour.

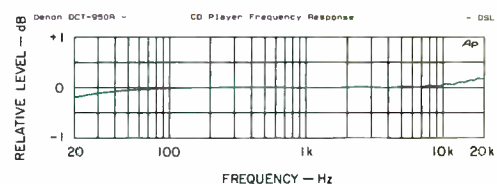


Fig. 4—Frequency response, CD section.

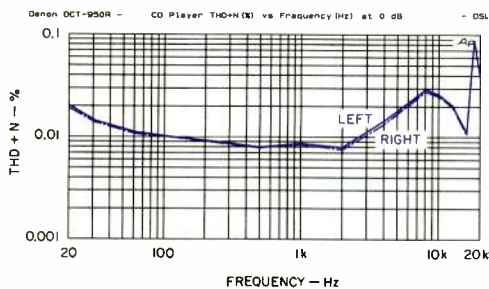


Fig. 5—THD + N vs. frequency, CD section.

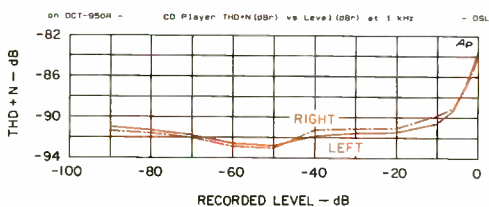


Fig. 6—THD + N vs. level, CD section.

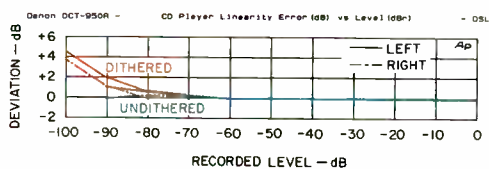


Fig. 7—Deviation from linearity.

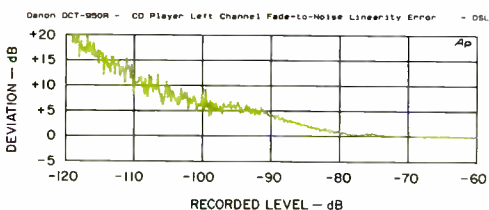


Fig. 8—Fade-to-noise test.

noise shaper. On the feature front, you have intro scan, track repeat, and random play of the single disc (or of all discs in the changer if one is connected).

Measurements

I made most of my measurements to the front preamp outputs, because I felt that many users will want to augment the internal power amps with more powerful additions. Yet if you decide to use the Denon DCT-950R straight out of the box, you'll find it delivers a shade more power than is

typical. With 4-ohm loads, I measured 13 watts per channel at clipping, by which I mean approximately 1% THD.

The FM tuner missed its IHF usable sensitivity rating of 11.4 dBf by a couple of dB; I measured 13.4 dBf. However, this is a rather meaningless specification because no one listens to stations that noisy. The more significant 50-dB mono quieting sensitivity measured 3.4 dB *better* than spec—16.9 dBf (measured) versus 20.3 dBf (specified). The mono and stereo quieting characteristics, along with stereo separation at 1 kHz, are shown in Fig. 1. As you can see, the tuner remains in mono more or less to 45 dBf and doesn't reach full stereo until 65 dBf. Thus, the stereo-broadcast noise floor remains essentially constant (below -50 dB) for all r.f. levels above 22 dBf—even though reception is mono, not stereo. As a result, there's no meaningful figure for 50-dB *stereo* quieting. The S/N ratio at 65 dBf is a reasonably good 68.7 dB in mono but only 57.3 dB in stereo.

Figure 2 shows THD + N for mono and stereo reception with a 65-dBf input. At the standard test frequencies of 100 Hz, 1 kHz, and 6 kHz, mono distortion is, respectively, 0.58%, 0.32%, and 0.45%; in stereo, the results are 1.07%, 0.58%, and 1.81% at these test points. For a car head unit, the mono figures are quite impressive, and it's normal for stereo figures to be a good bit higher.

There is a trade-off between selectivity, on the one hand, and distortion and capture ratio, on the other. Considering the DCT-950R's unusually high adjacent-channel selectivity (14.2 dB) and an alternate-channel selectivity greater than I could determine (certainly better than 71 dB), the relatively poor capture ratio (3.0 dB) and stereo distortion figures are quite understandable. Image rejection (which indicates front-end selectivity rather than i.f. selectivity) was 49.3 dB, and AM rejection was 63.5 dB. Left/right channel separation was

greater than 25 dB from 25 Hz to 5 kHz and even better in the opposite direction.

Figure 3 shows the tuner's frequency response in stereo. (The slight turn-up at 15 kHz was not present in the mono curves, which are not shown.) I've superimposed curves showing the range of the bass and treble controls and included a curve for the loudness contour. The loudness curve was taken with the volume at 20 (corresponding to a gain reduction of about 20 dB), since there was no effect with the volume set at maximum (30). I've scaled the loudness curve accordingly, so the 3.3-dB offset at 1 kHz does indeed occur as you switch the loudness in and out. With all controls flat, FM stereo response is within ± 0.75 dB from 30 Hz to 15 kHz and is -1.3 dB at 20 Hz. The response of the two channels was the same; only the left is shown. Bass-control

RDS HELPS YOU FIND
THE PROGRAMS YOU WANT
NO MATTER HOW FAR
FROM HOME YOU GO.

range at 100 Hz is +11.0, -11.5 dB (+11.4, -12.1 dB at 50 Hz), while that of the treble control is +11.4, -10.9 dB at 10 kHz. After accounting for the 3.3-dB offset at 1 kHz, the loudness circuit boosts the bass by 4.6 dB at 50 Hz and boosts the treble by 5 dB at 10 kHz.

The AM tuner's response was par for the course, i.e., nothing to rave about. Referred to 400 Hz, the response was within +0.2, -3 dB from 40 Hz to 1.5 kHz, with a -6 dB point at 3 kHz. The AM tuner is quite sensitive and reached 20 dB of S/N with a signal input of 3.0 μ V.

The CD player was rather slow when asked to skip tracks but otherwise performed well. Figure 4 shows the left-channel response (the right was identical); it's within ± 0.20 dB from 20 Hz to 20 kHz. The CD section's THD + N (in percent) versus frequency (at 0 dB) is shown in Fig. 5, and THD + N (in relative dB) versus recorded level (at 1 kHz) is shown in Fig. 6. In each case, I've shown both channels, although they're really quite similar. These curves were taken with the volume at 28, because

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the output amplifier operated close to its limits at maximum setting (30) and distortion approached 0.1%. With the reduced volume setting, THD + N at 0-dB recorded level is under 0.03% from 20 Hz to 16 kHz and reaches a peak of 0.09% at 18 kHz. The THD + N (in relative dB) versus recorded level at 1 kHz remains below -90 dB from about -10 to -90 dB and is -84 dB at the 0-dB level.

Linearity error, with and without dither, is shown in Fig. 7. The maximum error with an undithered signal is quite low, no more than 1.1 dB at -90 dB on the left channel and only 0.23 dB at -80 dB on the right. With the dithered track, the maximum error is rather greater—2.1 dB for the left channel and 1.3 dB for the right at -90 dB, rising to 4.6 and 3.8 dB, respectively, at -100 dB. The fade-to-noise error, however, is not nearly so impressive. I've shown the left-channel plot in Fig. 8; the data taken on the right was quite similar.

The Denon's A-weighted S/N for an infinity-zero track was 94.3 dB on the left channel and 94.1 dB on the right. Dynamic range clocked in at about 92.5 dB on either channel on an A-weighted (EIAJ) basis and about 90.7 dB, unweighted. Quantization noise was 94.6 dB below a 0-dB signal. Channel separation was truly superb, greater than 67.6 dB (worst case) from 125 Hz to 16 kHz.

Output level was adequate: 1.48 V from a 100% modulated mono FM broadcast, 0.43 V from a 30% modulated AM broadcast, and 2.42 V from a 0-dB CD. Because line output impedance was low (480 ohms), the DCT-950R should present no problem when driving a remote power amp.

Edward J. Foster

Behind the Wheel

The night Tony Igel of Stratford Mobile Sound slipped the Denon DCT-950R into my dash, I loaded my favorite stations into its memory and then pressed the "RDS Scan" button. In the New York area, the Denon found four RDS stations, which its display showed as "Jazz 88," "WNYC-FM," "WFME-FM," and "WNEW-FM." Then, after I pressed the "AF/PTY" button once to set the mode and held it down briefly, the Denon showed me that these four stations' program types were, respectively, "Jazz," "Classical" (shortened to fit the display),

"Talk," and "Rock." This wasn't telling me much, because I already knew these stations and their formats and had two of them already programmed into presets. The DCT-950R didn't show whether these stations' RDS text channels named the selection being played. (A later check, using Denon's TU-380RD home RDS tuner, showed they did not.)

But the worth of RDS became obvious the next morning, when I drove to Philadelphia. As New York's classical stations faded out, I pressed the button for the one classical RDS station in New York, pressed "PTY"



ALL TOLD, THE DCT-950R
LOOKED GOOD,
SOUNDED GOOD,
AND WAS A PLEASURE
TO OPERATE.

and held it down 2 seconds, and then pressed "RDS." The radio scanned until it found another RDS classical station, WFLN-FM at 95.7 MHz.

In the two weeks that I drove with the DCT-950R, I never caught an RDS traffic announcement, though I had the unit poised to receive any that were on. I did not try "AF," which finds other stations broadcasting the same program, because there never seem to be any in my area.

The day he installed the Denon, Tony made some improvements on my antenna setup that noticeably improved AM reception on my reference Alpine. But with the Denon, AM came through over a much longer range than with the Alpine—this AM section is *hot!* And the FM section proved even hotter, picking up far more stations clearly than the Alpine did.

The CD section took the bumps of New York City's frost-heaved and traffic-worn Hudson Street in stride, even though the traffic was moving with unusual briskness.

Since this was the first RDS radio I'd used, it took me a few minutes to learn how to work the Denon's unfamiliar features; good ergonomics and a more than decent manual helped. The multipurpose audio control (volume, bass, treble, balance, and fader) is a knob (which I still consider the best kind for the job), and you change its

modes by pressing the knob itself. The buttons have large markings and slant slightly upward, toward you. The five buttons in the top row are alternately concave and convex and are well marked, which made finding the one I wanted much easier. The tuning buttons and the small "Mute/DISP" stud are distinctively shaped and placed. While the six memory preset buttons are all in a row, the angling of the sixth one and the placement of the first made finding the right button fairly easy—as long as I didn't forget that first button, which is hard to see because it's tucked under the knob. About the only major function that's not reasonably obvious is switch-off, accomplished by holding the "Tuner/Band" button down for a few seconds. The tuner's up/down station buttons also switch CD tracks. The detachable face is easy to remove and replace, and is reasonably light. Illumination is good, but though the display's black-on-green characters are large, they're not as easy to read as the shorter, fatter, light-on-dark characters of my Alpine's display. I did not have the optional remote control; judging from the drawings in the manual, it should be easy to use without looking.

Overall, the Denon's sound was good, on a par with my Alpine's, both on FM and CD. I liked the sound better with loudness compensation on; even before I saw the loudness curve, I knew it was a gentle one. It's nice to have the "Mute" button on the panel instead of just on the remote. But the muting indicator is so high up on the display that I couldn't see it. The same is true of the loudness and stereo/mono indicators' placement.

Having so many station-preset banks is great for the traveller. For the stay-at-home, however, there are too many banks to scroll through when switching between AM and FM—especially if you don't hold the "Tuner/Band" switch down long enough when you're trying to turn the unit off.

All told, the Denon looked good, sounded good, and was a pleasure to operate. I was impressed by its quiet competence and almost cuddly air of doing anything to please, its way of consistently doing darn near everything just right. The RDS feature showed its worth almost the first time I used it—and it will only become more valuable as more stations start using the system. Nice job. Very nice. *Ivan Berger*

The magazine that knocks you on your ear



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It used to be simple. You had a car. It came with a radio. You listened. Period. Now you've got options. So many options, it's easy to get blown away just trying to find components that fit together—and fit your budget too. So what do you do when it's time to upgrade your car stereo?

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KENWOOD KDC-PS900 CAR STEREO



At the far left are “Audio Control” pads, which default to setting volume. Pressing the “AUD” (audio) button above the pads sequentially shifts their function to controlling bass, treble, balance, fader, and level for the “non-fading” line output. (This player has front and rear line output pairs controlled by the fader, and a third output pair not affected by it.) The function being controlled is named in the display. If you

Kenwood’s newest top-of-the-line CD player/tuner, the KDC-PS900, is said to offer “auto-sound competition-level quality.” Based on my lab tests, I see no reason to disagree—it’s a fine head unit, laying claim to a number of design elements not often found on pedestrian car stereos, plus it’s easy to use and competent. And if you confine yourself to Kenwood add-ons, its proprietary K-Bus digital control system permits adding other elements, such as a remote CD or MD changer, quite simply.

The tuner offers auto-seek, manual, and preset tuning, with presets arranged in one AM and three FM banks of six—24 in all. The supplied remote control permits direct access to stations by entering the frequency via the keypad, and direct access to CD tracks in a like manner. The CRSC (Clear Reception System Circuit), which is said to detect multipath interference and adjust the tuner’s stereo separation to reduce its audible effect, is defeatable; environmental factors in some areas can trigger it falsely.

The control panel is attractive, but I found the layout left something to be desired. (Technical Editor Ivan Berger will have more to say on that, I’m sure.) The faceplate “Release” is at the right edge,

aligned with the “Tune/Track” up/down pads and shaped so similarly I think it would be easy to press it accidentally. The “Tune/Track” pads start the auto seek when that mode is active, step through stations during manual tuning, skip through CD tracks, and, if the pad is held, conduct a fast

**THE KDC-PS900 WAS
ONE OF THE FINEST
CAR HEAD UNITS
TO CROSS MY BENCH
IN SOME TIME.**



search through the current track in either direction. In random play (activated by pressing preset 6 when playing a CD), the “up” pad randomly chooses another track. These pads also are used, in conjunction with others, to store the names of up to 10 discs in the player—a novelty I’ve seldom found worth the bother.

haven’t elicited a change in 5 seconds, the “Audio Control” pads revert to volume.

Beneath the pads is an “ATT” button that toggles the attenuator. “ATT ON” or “ATT OFF” appears briefly in the display, and an “ATT” legend blinks continuously when the attenuator is on and muting the output. As received, the attenuator causes a level drop of 20 dB. Turning the power off, holding down presets 2 and 6, and turning the power back on will change the preset attenuation to 60 dB. The “ATT” pad also toggles the display’s color between green and amber when held for more than a second.

The power switch is to the right of the “Audio Control” rocker. (I’d rather it were where the “AUD” pad is.) This switch, marked “SRC,” also serves as the source selector; to turn the system off, you must hold it down for a few seconds. Beneath the selector is “DEF,” which defeats the tone controls, a nicety all too rare in car head units.

Tone-control settings are stored separately for each source and automatically recalled when you return to that source, another nicety I much appreciate.

The tuner-band pads (“AM” and “FM”) and the six presets are arranged along the bottom edge of the panel. Each tap of “FM” advances to the next FM bank. Stations are

SPECS

FM TUNER SECTION

Mono Usable Sensitivity: 9.3 dBf (0.8 μ V at 75 ohms).

50-dB Quieting Sensitivity: 15.2 dBf (1.6 μ V at 75 ohms).

Frequency Response: 30 Hz to 15 kHz, ± 3 dB.

S/N: 73 dB.

Selectivity: 100 dB.

Capture Ratio: 1.5 dB.

Image Rejection: 70 dB.

I.f. Rejection: 120 dB.

Stereo Separation: 40 dB at 1 kHz.

AM TUNER SECTION

Usable Sensitivity: 28 dB (30 μ V).

CD SECTION

Frequency Response: 5 Hz to 20 kHz, ± 1 dB.

THD at 1 kHz, with Tone Defeat: For 2-V output setting, 0.004%; for 4-V output setting, 0.002%.

S/N: Without tone defeat, 96 dB; with tone defeat, 102 dB.

Dynamic Range: 98 dB.

Channel Separation: 90 dB.

Wow and Flutter: Unmeasurable.

AMPLIFIER SECTION

Bass-Control Range: ± 10 dB at 100 Hz.

Treble-Control Range: ± 10 dB at 10 kHz.

Preamp Output: 2 or 4 V rms (switchable) into 10 kilohms.

GENERAL SPECIFICATIONS

Operating Voltage: 14.4 V nominal, 11 to 16 V permissible.

Current Consumption: 0.9 ampere.

Operating Temperature: 14° to 122° F (-10° to +50° C).

Mounting Dimensions: 7¼ in. W x 2½ in. H x 6½ in. D (18.2 cm x 5.2 cm x 15.5 cm).

Weight: 3.3 lbs. (1.6 kg).

Price: \$600.

Company Address: P.O. Box 22745, Long Beach, Cal. 90801.

For literature, circle No. 91

preset, as usual, by pressing a preset button for a few seconds; they're recalled with a single tap. The Clear Reception System Circuit is toggled by pressing the "FM" button for more than 2 seconds; "CRSC ON" and "CRSC OFF" appear briefly in the display, and, when the CRSC is off, an "MC" legend appears continuously.

Sandwiched between the "Tune/Track" and "Release" pads and presets 5 and 6 are four small, round buttons. The one closest to the display, "NON-FAD," toggles the non-fading preamp output on and off and, when held down, permits you to set the clock with the "Audio Control" pads. The next button to the right, "Light," switches the panel illumination on and off. If it's pressed for more than a second, it enables (or disables) a beeper that will produce an audible signal when you change settings. The third round button, "LOUD," activates the loudness circuit and, when held for more than a second, toggles between auto-seek and manual tuning. Each tap on the last button, "DISP," toggles the display, in tuner mode, between station frequency and the clock; in CD mode, it cycles the display from track time, to total elapsed disc time, to remaining time on the disc, to CD name (if it was preset), and back to time. Holding this button for a second or so enters the disc-naming mode. The CD stop/eject button is on top, just to the right of the loading slot. When a disc is playing, preset 3 activates track repeat, preset 4 scans through tracks (playing 10 seconds of each), and preset 6 selects random play.

The small, thin remote provided with the KDC-PS900 has a 10-key numeric pad to access stations and CD tracks. Direct station access is requested by pressing the "Direct" pad before entering the frequency; otherwise, the first six number keys serve to select the corresponding presets. The remote allows you to

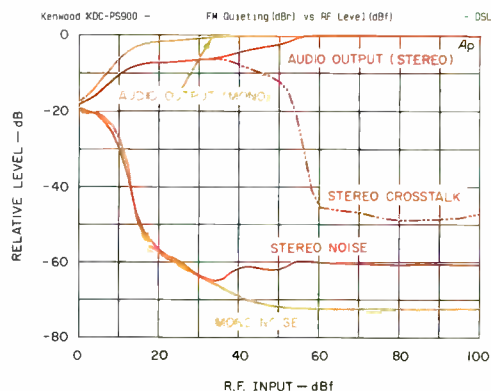


Fig. 1—FM quieting characteristics and stereo crosstalk.

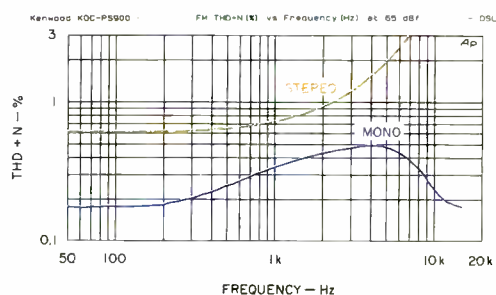


Fig. 2—THD + N vs. frequency, FM section.

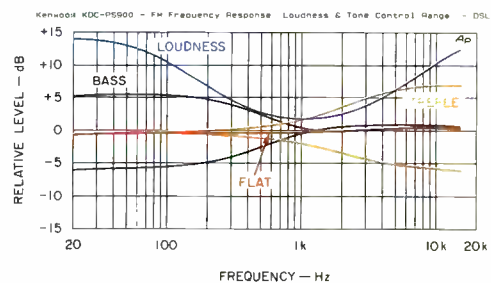


Fig. 3—Tone-control range and loudness contour.

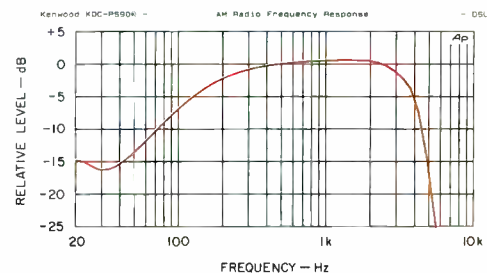


Fig. 4—Frequency response, AM section.

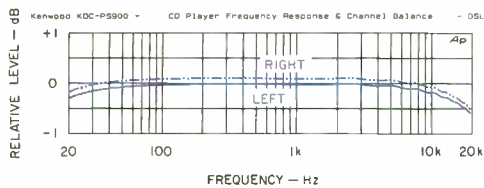


Fig. 5—Frequency response, CD section.

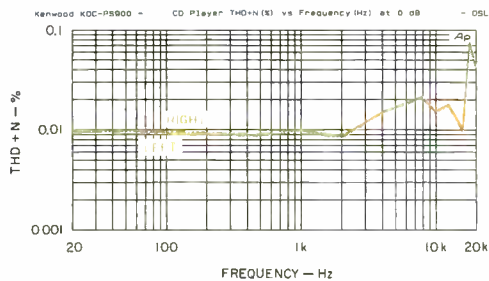


Fig. 6—THD + N vs. frequency, CD section.

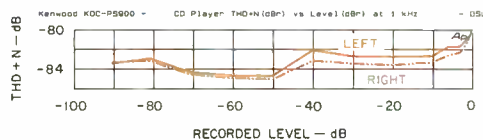


Fig. 7—THD + N vs. level, CD section.

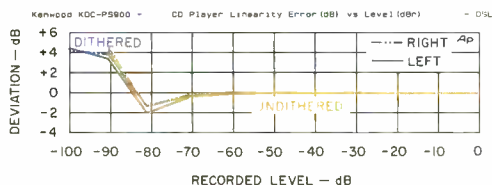


Fig. 8—Deviation from linearity.



The Kenwood's wafer-thin remote is hard to read and easy to lose, but it has several useful features not on the front panel.

control volume, access the attenuator, and choose among four sources—"Tuner," "Tape" (for a player sold only in Japan), "CD," and "CD CH" (CD changer). In CD mode, left/right skip pads permit you to advance through the disc, track by track, if you wish; in tuner mode, these pads increase or decrease station frequency. A handy pause/play control also is on the remote; many car players offer no means of pausing playback, short of stopping the disc.

You can change the tuning increment from 200 kHz on FM and 10 kHz on AM (the default settings, appropriate for the United States) to 50 kHz (FM) and 9 kHz (AM). You do this by turning off the power, pressing presets 1 and 5, and powering the unit. You can change nominal output level from 2 V (the factory setting) to 4 V by turning off power, pressing presets 2 and 4, and powering up.

In addition to the three sets of analog line outputs, there's a digital output connector on the back, a jack for the wiring harness, and antenna and K-Bus connectors on umbilical cords. The wiring provides automatic power-antenna control, a separate line for controlling amplifier power, and a third line to connect with the car's lighting switch.

Measurements

With mono signals, as you can see in Fig. 1, the FM tuner reaches 50-dB quieting with a 15.5-dBf input, very close to Kenwood's 15.2-dBf specification. Oddly, IHF usable sensitivity was worse than this (18.5 dBf), which suggests higher distortion and noise on weak modulated carriers. (I tested stereo quieting with the CRSC both on and off. There was virtually no difference between the two sets of data, so I used the "on" setting for all other measurements.) With a stereo carrier, the tuner remains in mono to 35 dBf and its separation gradually increases as signal level

improves. By 60 dBf, the tuner is in full stereo and has excellent separation, 45 dB. Since the tuner remains in mono until quieting is well over 50 dB, there's no meaningful 50-dB stereo quieting figure. The S/N at 65 dBf measures 72.1 dB in mono but only 60.3 dB in stereo.

Considering the tuner's superb selectivity (25.1 dB adjacent-channel, greater than 94 dB alternate-channel), its capture ratio of 2.0 dB is unusually good, even if it doesn't quite meet the 1.5-dB spec. Image rejection clocked in at 50.2 dB and AM rejection at 61 dB. Channel separation was superb: Better than 35 dB from 65 Hz to 7 kHz and better than 30 dB from 35 Hz to 15 kHz, worst case.

Distortion (Fig. 2) is rather low for a car head unit: Under 0.5% in mono from 20 Hz to 15 kHz and no more than 0.73% from 20 Hz to 1 kHz in stereo, rising to 2.47% at the 6-kHz benchmark.

Figure 3 shows the FM mono frequency response, tone-control range, and loudness contour. Basic response is within +0.8, -0.5 dB from 20 Hz to 15 kHz. In stereo (not shown), response turned up by 1.7 dB at 15 kHz and had a 0.4-dB channel imbalance. Bass-control range is ± 5.5 dB at 100 Hz, just slightly more at 50 Hz. The treble control manages +7.2 dB, -5.6 dB at 10 kHz. Both spreads are substantially narrower than spec—but that doesn't concern me, since I'm not a tone-control freak. The loudness characteristic was measured with a volume setting of -30 (all other tests were performed with the volume advanced fully), and I've shifted the curve correspondingly. (By the way, the Kenwood's volume indications are quite accurate, generally within a fraction of a dB of the displayed value.) Punching in loudness compensation raises 1-kHz response by 1.75 dB and boosts 100-Hz and 10-kHz response by 10.5 dB, 15-kHz response by 12.4 dB, and 50-Hz response by 12.9 dB.

The AM response (Fig. 4) is within +0.8, -3 dB from 165 Hz to 3.6 kHz and is 6 dB down at 110 Hz and 4.1 kHz. The AM tuner achieved 20 dB S+N/N with a 3.9- μ V input.

I used the 2-V factory output setting when making most measurements. Under these conditions the KDC-PS900 delivered 1.14 V rms from a 100%-modulated mono FM broadcast, 0.42 V rms from a 30%-modulated AM broadcast, and 2.24 V rms



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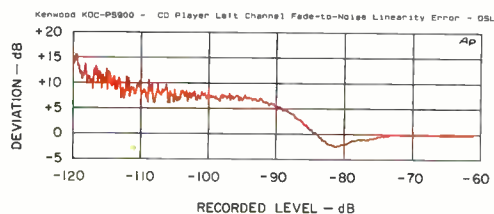


Fig. 9—Fade-to-noise test.

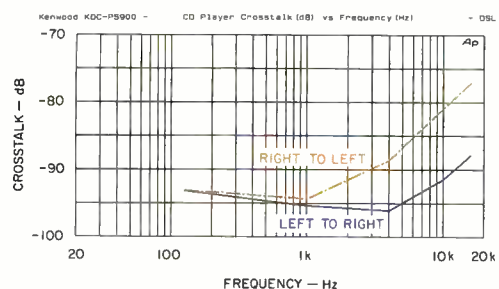


Fig. 10—Crosstalk, CD section.

from a 0-dB test CD. In the high-output (4-V) position, the levels were 1.91 V, 0.69 V, and 3.65 V, respectively. Source impedance was an admirably low 715 ohms, and the attenuator cut output level by 20.7 dB (as received) or 59.0 dB (alternate setting).

The CD player's response (Fig. 5) is flat within +0.0, -0.6 dB from 20 Hz to 20 kHz, with the right-channel output 0.11 dB above the left. The THD + N at 0 dB (Fig. 6) is no more than 0.021% from 20 Hz to 16 kHz and reaches a peak of 0.076% at 18 kHz. The 1-kHz THD + N versus level (Fig. 7) is below -80.4 dB on the left channel and below -80.2 dB on the right, from 0 to -90 dB. These figures are a bit worse than I would hope for, and may be related to the strong sampling-rate component of 44.1 kHz in the output: A spectrum analysis (not shown) of the -60 dB, 1-kHz track of the CBS CD-1 disc had a sampling component only 3 dB below the tone. The sampling component apparently varies with level; on the digital-zero track, it was -68.6 dB.

Converter linearity error with dithered and undithered signals is shown in Fig. 8. On the undithered track, maximum non-linearity at -80 dB is -2.1 dB on the left channel and -1.4 dB on the right. At -90 dB, the error is +4.2 dB on the left channel and +4.6 dB on the right. On the dithered track, the -80 dB data is essentially unchanged while the -90 dB error lessens to +3.3 and +3.7 dB for left and right, respectively. At -100 dB, the error is +4.4 dB (left

and +4.2 dB (right). Fade-to-noise tests revealed corresponding data; the data for the poorer channel is shown in Fig. 9. Channel separation for CD (Fig. 10) is the best I can recall seeing in a car head unit—even better than in most home decks: It's a whopping 94.3 dB at 1 kHz, worst case. Even at 16 kHz, separation is almost 77 dB from left to right and 88 dB from right to left.

I may have some reservations about the panel layout, and the tone-control range is rather modest, but overall I consider the Kenwood KDC-PS900 to be one of the finest head units to have crossed my bench in some time.

Edward J. Foster

Behind the Wheel

Like Ed Foster, I felt the panel layout of the KDC-PS900 left something to be desired. The tuning controls are too far from the driver. The marker bumps on the "Audio Control" rocker are too sharp, not finger-friendly. And the "SRC" selector's "All Off" position was just one more thing to go

**THE KENWOOD KDC-PS900
IS A SUPERB HEAD UNIT,
WITH DESIGN ELEMENTS
NOT OFTEN FOUND
ON CAR STEREOS.**

through when cycling between sources—not to mention the fact that it could make the unwary think they'd turned the power off when they hadn't.

On the other hand, I liked having one single button to cycle through all available sources (it automatically skips any sources not in use, such as CD if no disc is loaded), so I didn't have to remember which source-selection button was which. I appreciated having a separate "AM" button so I didn't have to cycle through unused FM bands to jump between AM and FM. I also liked the inclusion of a muting ("ATT") button on the faceplate as well as on the remote. And the position of the "Release" button gave me no problems.

The remote was useful, especially because it has features, such as CD pause and direct selection of tuner frequency or CD track number, that aren't on the front panel. But it's hard to read and easy to lose, and it doesn't turn the system on or off. You can't aim this remote as sloppily as those from some other companies.

I never use extreme tone settings, so the limited ranges of the bass and treble controls increased those controls' utility, as far as I was concerned, by letting me make finer adjustments. Having separately stored tone settings for AM, FM, and CD was also useful. The loudness button, however, added far too much treble for my taste.

In auto-tuning mode, the Kenwood stopped at every station near the beginning and end of the dial in FM, but worked fairly well on AM (a surprise, since most car radios have this problem more on AM than on FM). I'd have liked to have scan, and possibly preset-scan and auto-memory tuning facilities, but I don't consider them as useful as the functions that the Kenwood does have. I could find no station where CRSC made an audible difference, but I did not have a chance to test the KDC-PS900 where there would be enough multipath to activate it.

The display was easy to read, even in bright sunlight, especially when switched to amber illumination. I could not figure out, however, why Kenwood put in a switch to shut the illumination off completely, unless it's to keep the little lights that outline the CD slot from glaring up into the driver's eyes. Removing the faceplate will automatically eject the CD, if one is loaded—a nice touch. I could not get the LED on the front of the chassis to blink when the panel was off; it just glowed.

On FM, the Kenwood was marginally better than my reference Alpine in bringing in clear stations, and on AM it was better still. Sound quality on FM and CD was almost exactly like my reference, though on AM the treble was more rolled off.

All in all, the Kenwood KDC-PS900 gave me good performance and I had no substantial complaints, but it failed to really grab my enthusiasm. Maybe I would have been more impressed if I had tried it with Kenwood's new KCA-R7ST remote, which fits on the steering wheel; alas, it wasn't available in time. *Ivan Berger*



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PHASE TECHNOLOGY PC 10.5 SPEAKER



United Speaker Systems estimates they've manufactured more than three million loudspeakers since 1955. You've never heard of United Speaker Systems? Try these brands: Bogen, Dynaco (including the acclaimed A-25), Electro-Voice, Fisher (the XP-1), IMF, JVC, Kenwood, McIntosh, MCS (JC Penney), Pioneer, Sony, and Yamaha. United Speaker Systems has manufactured

complete speaker systems as well as components for these companies and others. Company officials believe that United has designed and manufactured more than 90 different types of soft-dome tweeters, 60 types of soft-dome midranges, and 200 woofer formats for their clients.

United was founded by engineer Bill Hecht in the mid-'50s to manufacture and sell an improved corner horn using Altec

Lansing A-7 "Voice of the Theater" components. His knowledge of Altec systems came from his involvement in developing Cinemascope stereo technology for movies in the same time period. United Speaker Systems has flourished mostly by being an original equipment manufacturer (OEM) for other companies, not by selling its own brand of speakers.

Hecht has been somewhat of an unrecognized pioneer in the audio field because of his early involvement with loudspeakers and because of the patents he has received, including ones for the soft-dome midrange and tweeter and for a solid-piston flat woofer and midrange. He works with his son, Ken, and United is one of the few family-owned and -operated speaker companies that have been around for as long as 40 years (maybe the only one).

Phase Technology is United's own brand of loudspeakers, which have been sold since 1981. The PC 10.5 is the top model in a line of nine Phase Coherent (PC) hi-fi and home theater loudspeakers. There are 21 systems sold under Phase Technology's name.

The "PC" designation of Phase Technology's line is due to a number of features that help "launch a uniform primary wavefront over the full operating range" of the system, according to a company backgrounder. These features include methods to minimize unwanted and uncontrolled reflections with the use of acoustic foam around the tweeter, and the use of solid flat-piston midrange and woofer drivers.

The PC 10.5 is a tall, floor-standing, three-way system with a distinctive rounded-corner look. The cabinet is finished on all exposed sides. When the grille is off, the flat-faced woofer and midrange are immediately apparent. A large port (4 inches in diameter and 10 inches deep) is just below the woofer.

Attention is drawn to the tweeter, at the top of the cabinet, because it is surrounded by an inch-thick, rectangular piece of foam that has a circular depression in the center. The depression forms what appears to be a short, wide-angle conical horn around the tweeter. The foam is said to act not as a waveguide but as an absorber of diffractive sound energy that "gradually stops sound waves as they emerge from the driver" and makes the tweeter "think" it is operating in

Photos: Michael Groen

free air, according to the PC 10.5 brochure. Also, the tweeter's acoustic treatment is said to minimize cabinet and grille-frame diffractions, thereby reducing frequency response anomalies and improving imaging capabilities.

The flat, solid-piston midrange and woofer cones are extremely rigid and are said to avoid the break-up distortions that traditional cones exhibit. The flat radiating surfaces of the drivers are said to launch all frequencies from the same plane, thus minimizing phase anomalies and diffraction from the drivers' edges. The midrange and bass drivers are solid, flat-fronted cones molded of Rigid Polymer Foam (RPF). This foam, which has the lowest stored energy of any material that Phase Technology has tested, is said to contribute to the PC 10.5's clean, smooth, and undistorted sound.

All drivers of the PC 10.5 are manufactured by Phase Technology. The tweeter is a soft-dome design, covered by the company's own patent, and the dome is very thin and of low mass. The midrange, which is encapsulated in Kevlar, is mounted in its

own separate sealed enclosure. The very long-throw woofer, which has a large 38-ounce magnet, is mounted in a vented enclosure and tuned low (to the region of 20 to 30 Hz). All drivers are matched to a tolerance of ± 1.0 dB.

The cabinet of the PC 10.5 is well braced. The sides and rear are constructed of inch-thick, medium-density fiberboard; the

front baffle is made of very thick, 2-inch MDF (it appears to be two inch-thick panels bonded together). The inside of the cabinet is acoustically damped with fiberglass. The grille, of half-inch-thick MDF, is covered by an acoustically transparent black material and attaches to the front panel with plastic pegs. The grille is designed to enclose the rectangular foam piece surrounding the tweeter so that a seamless, low-diffraction surface is formed when the grille is attached. Threaded inserts on the bottom of the cabinet allow you to use spikes or feet.

**A RIGID FOAM FILLING
TURNS THE WOOFER AND
MIDRANGE CONES
INTO FLAT-FRONTED,
SOLID PISTONS.**

The PC 10.5's crossover is constructed point-to-point on three separate boards mounted behind the woofer. Each board contains the circuitry for one driver. Separate mounting minimizes electromagnetic interactions between the sections of the crossover; in addition, each inductor is mounted at right angles to its nearest inductive neighbor, to further reduce interactions. In critical areas, polypropylene capacitors are used. All of the nonpolarized electrolytics are bypassed with polypropylene capacitors of low value.

The crossover contains 36 components: Five resistors, seven inductors, and 24 capacitors (nine capacitors, not counting paralleled units). Electrically, these parts make up a fourth-order low-pass for the woofer, a sixth-order bandpass for the midrange, and a third-order high-pass for the tweeter (with impedance compensation). All drivers are connected in positive polarity. Connections between crossover and speak-

Measurements

Measurements of the PC 10.5's on-axis anechoic frequency response were taken 2 meters from the front of the cabinet, at a point halfway between the midrange and tweeter. A voltage of 5.66 V rms was applied (equivalent to 8 watts into the rated 4-ohm impedance) and referred back to a 1-meter distance with an input of 2.83 V rms (equivalent to 2 watts into 4 ohms). I used a combination of ground-plane and elevated free-field measurements to derive the curves, which are shown in Fig. 1.

Without the grille, the on-axis curve is reasonably flat and fits a tight, 4-dB window (± 2 dB, referenced to 1 kHz) over the wide bandwidth from 40 Hz to 20 kHz. This on-axis response meets Phase Tech's axial response rating except for the approximately third-octave higher bass limit (40 Hz rather than 30 Hz). In a listening room, the response should easily meet Phase Tech's spec.

Averaged from 250 Hz to 4 kHz, sensitivity measured 87.1 dB, only 1.9 dB below Phase Tech's 89-dB rating. The right and left speakers matched within a close ± 1 dB from 100 Hz to 20 kHz. The grille causes moderate response changes; the greatest change is a 2.5-dB dip at 2.6 kHz.

SPECS

Type: Three-way, floor-standing, vented-box system.

Drivers: 10-in. piston woofer, 5¼-in. piston midrange, and 1-in. soft-dome tweeter.

Frequency Response: 30 Hz to 20 kHz, ± 2 dB.

Sensitivity: 89 dB at 1 meter, 2.83 V rms applied.

Crossover Frequencies: 250 Hz and 2.2 kHz.

Impedance: 4 ohms, nominal.

Minimum Amplifier Power: 50 watts per channel.

Dimensions: 39½ in. H x 13 in. W x 11¼ in. D (100.3 cm x 33 cm x 29.8 cm).

Weight: 100 lbs. (45.4 kg) each.

Price: \$2,200 per pair in dark or black oak, \$2,900 per pair in black lacquer.

Company Address: 6400 Youngerman Circle, Jacksonville, Fla. 32244.

For literature, circle No. 92



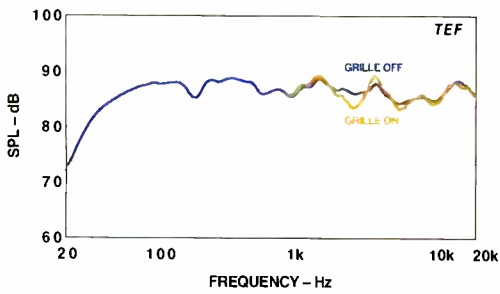


Fig. 1—One-meter, on-axis frequency response.

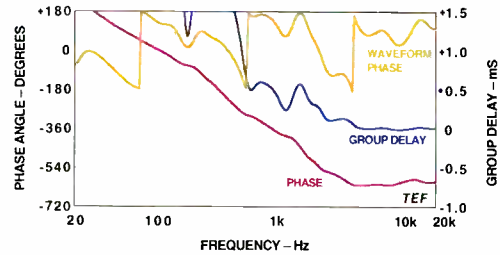


Fig. 2—On-axis phase response, group delay, and waveform phase.

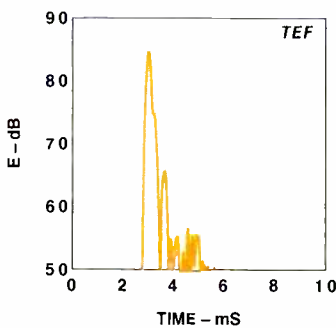


Fig. 3—Energy/time response.

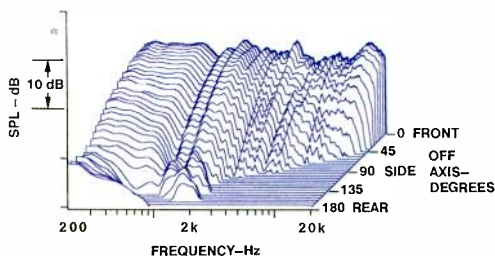


Fig. 4—Horizontal off-axis frequency responses.

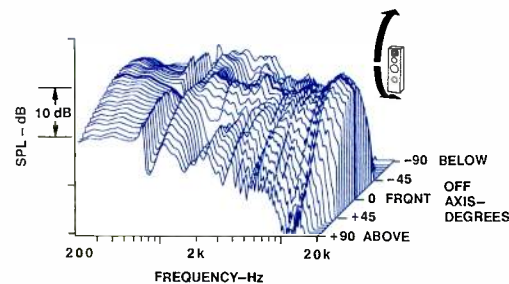


Fig. 5—Vertical off-axis frequency responses.

Figure 2 shows the phase and group-delay responses, referenced to the tweeter's arrival time. The phase curve is well behaved, with no major anomalies, but decreases 230° between 1 and 20 kHz. The group-delay curve indicates that the midrange lags the tweeter by about 400 μ s.

Also shown in Fig. 2 is my new phase measurement, waveform phase, which directly indicates whether waveshapes will be preserved in specific frequency ranges (see page 53 in the April issue). The PC 10.5's waveform phase indicates that waveshapes will *not* be preserved in any frequency range, because the values continually change as frequency increases and do not stay at or near 0° or 180° over any frequency band. The system is clearly not phase coherent, as Phase Technology's literature indicates, assuming that phase coherency means accurate waveform reproduction. Phase Technology is apparently associating phase coherency with even coverage, low diffraction, and smooth frequency response rather than reproduction of accurate waveforms. It must be said, however, that studies show the former qualities have a more direct effect on how good a loudspeaker sounds.

Figure 3 shows the PC 10.5's energy/time response. The test parameters accentuate the response from 1 to 10 kHz, which includes the upper crossover region. The main arrival, at 3 ms, is reasonably compact but is followed by a response down about 20 dB and delayed by about 0.65 ms.

Figure 4 illustrates the horizontal off-axis responses of the PC 10.5; the bold curve at the rear of the graph is the on-axis response. The off-axis horizontal responses are quite uniform, all the way to 20 kHz, although some narrowing is evident above 12 kHz.

The vertical off-axis curves are shown in Fig. 5; the bold curve in the center of the graph (front to

rear) is on-axis response. The sharp peak and dip in the off-axis responses between 700 and 800 Hz were an artifact of my using a ground-plane measurement technique. In the main listening window, 0° to 15° above axis, the curves are very uniform. Below axis, a dip developed in the response in the upper crossover region, between 2 and 3 kHz (not clearly seen in the graph). In general, the vertical off-axis responses are quite well behaved.

In Fig. 6, the PC 10.5's impedance, note the very energetic nature of the curve. A high subsonic peak of 70 ohms occurs at 9 Hz, and a low minimum of 3.1 ohms occurs at 140 Hz. Above 20 Hz, a maximum impedance of 19 ohms is reached at 33 Hz. Also note the elevated impedance in the bass range below 50 Hz. The minimum impedance at the 24-Hz vented-box tuning frequency is a high 7.9 ohms. Curiously, the impedance at this tuning point is more

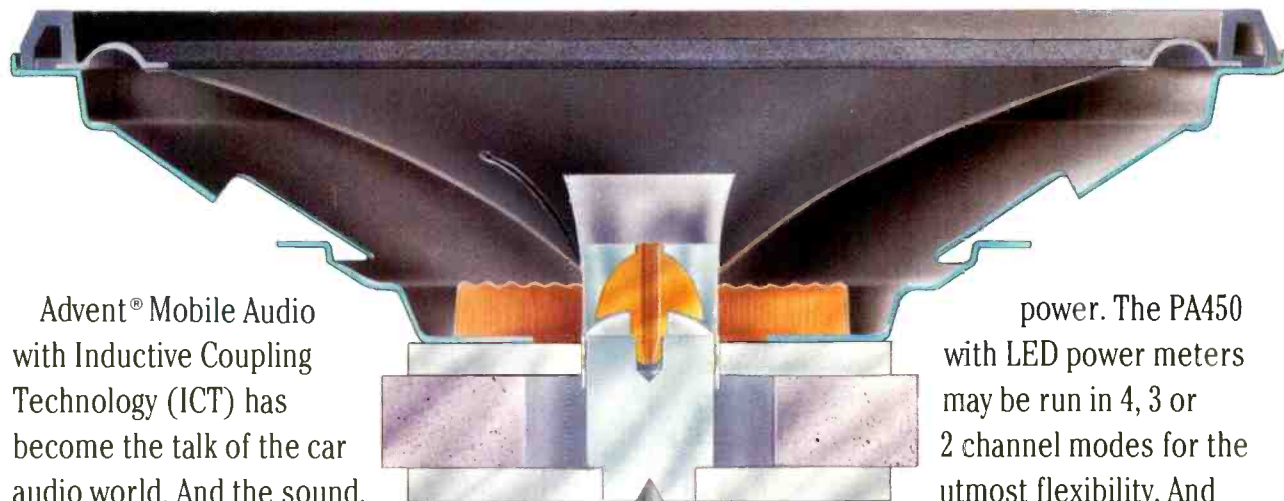
I TESTED AT 200 WATTS
(NOT MY USUAL 100)
BECAUSE THE PC 10.5
SOUNDED QUITE CLEAN,
EVEN AT THIS LEVEL.

than twice the minimum exhibited at higher frequencies. This means that Phase Tech could potentially gain some 3 dB of additional bass by lowering the speaker's impedance in the bass range.

The PC 10.5's max/min impedance variation of about 6.1 to 1 (19 divided by 3.1) means that cable series resistance should be limited to a maximum of about 0.043 ohm to keep cable-drop effects from causing response peaks and dips greater than 0.1 dB. For a typical run of about 10 feet, you should use 14-gauge (or larger diameter), low-inductance cable.

Figure 7 shows the complex impedance, plotted over the frequency range from 5 Hz to 30 kHz. The plot is dominated by a large, subsonic impedance loop. At higher frequencies, the rest of the system's complex impedance variation occurs much closer to the origin, in a series of four smaller loops that are well behaved. A very small loop exists between 400 Hz and 1 kHz, near the complex point of 4.8 ohms on the resistive

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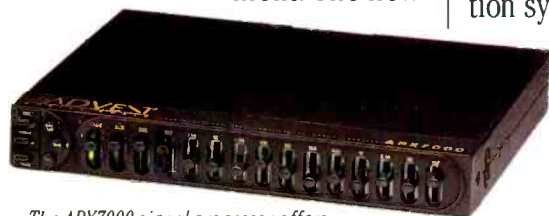


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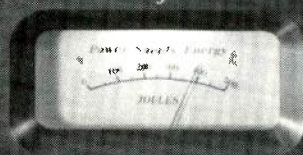
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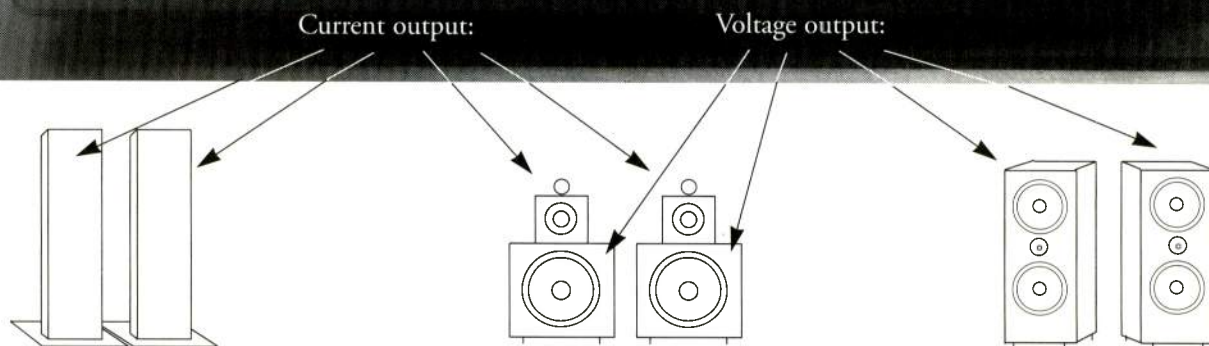


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The basis for all this is designer Bob Carver's versatility. He's worked successfully with both tube and solid state designs, as the path towards musical truth dictates.

For the new Sunfire, he insisted on an enormous 138 ampere peak-to-peak output current capability with 600 watts rms per channel continuously into 4 ohms* and 2400 watts rms into one ohm on a time-limited basis. Courtesy of 24 massive Motorola triple-diffused output devices, each capable of 20 amperes without taxing current reserves.

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scale and +0.3 ohm on the reactive scale (it's so small it is not clearly seen in the graph!).

A high-level sine-wave sweep revealed a quite rigid cabinet, except for some minor front- and side-wall activity at and near 210 and 335 Hz. The 10-inch woofer has an extremely long travel capability of about 1 inch, peak to peak, and makes no harsh sounds when it is overdriven. Significant dynamic offset distortion was evident, however. Substantial net outward displacement of the cone was noted when it was driven at 14 V rms and higher in the ranges of 18 to 24 Hz and 45 to 90 Hz. The second-harmonic distortion increased significantly when the cone moved out. Fortunately, bass second-harmonic distortion is quite benign, subjectively.

The vented cabinet works very well and reduces the cone excursion at box resonance quite significantly, by a factor of about one-third, comparing port covered to uncovered. Minimum woofer excursion occurred at 27 Hz, somewhat higher than the minimum impedance at 24 Hz. As discussed in prior reviews, I prefer to identify the vented-box tuning frequency by using the large-signal criterion of minimum woofer excursion at high input level rather than using minimum impedance, which is a small-signal criterion. The large-signal method correlates better with the distortion-reduction capability of the vented box. The PC 10.5's port wind noise was very low at high power in the bass range.

Figure 8 shows the 3-meter room response of the PC 10.5, with both raw and sixth-octave smoothed data. The speaker was in the right-hand stereo position and aimed at the test microphone, which was placed at ear height (36 inches) at the listener's position on the sofa. The system was driven with a swept sine-wave signal of 2.83 V rms (corresponding to 2 watts into the rated 4-ohm impedance). The direct sound and 13 mS of the room's reverberation are included.

Overall, the averaged curve in Fig. 8 is well behaved; it's reasonably flat and fits a fairly tight, 13-dB window. Above 450 Hz, the curve fits a tighter window of about 8 dB. Higher deviations are evident in the room-effect range of 100 to 450 Hz.

Figure 9 shows the E_1 (41.2-Hz) bass harmonic-distortion data with input power

ranging from 0.2 to 200 watts (28.3 V rms into the rated 4-ohm load). The 200-watt maximum power level was chosen because the PC 10.5 sounded quite clean, even at this high level. The second harmonic reaches 13.8%, while the third attains a somewhat lower 6.3%. At full power, higher harmonics are 3.1% fourth, 1.3% fifth, and 1.2% sixth. At 1 meter in free space with a 200-watt input, the speaker generates a loud 108 dB SPL at 41.2 Hz.

Figure 10 shows the A_2 (110-Hz) bass harmonic-distortion data with a 200-watt power limit. The predominant distortion is a low 3.3% second and 6.0% third. Higher harmonics are negligible, at 0.6% or less. With an input of 200 watts, the PC 10.5 reaches a very loud 111 dB SPL at 110 Hz.

The A_3 (440-Hz) distortion data (not shown) was run at a lower, 50-watt, power level (14.14 V rms into the rated 4-ohm load), because the midrange failed at higher power levels. At 50 watts, the distortion rose only to the low levels of 0.49% second and 0.44% third; higher harmonics were below the noise floor of my measuring gear.

In the process of testing at higher power levels, I smoked one midrange at the 200-watt level and the other at 100 watts! A pair of replacement midranges worked just fine up to the 50-watt level. Phase Technology told me that although they have not had any midranges fail in the field, they are working on a Ferrofluid-cooled version of the midrange that can handle higher power.

The IM distortion (not shown), created by tones of 440 Hz (A_4) and 41.2 Hz (E_1) of equal power and over the range from 0.1 to 100 watts, rose only to the low level of 0.9% at full power.

The short-term, peak-power input and output capabilities of the PC 10.5 are shown in Fig. 11. The peak input power was calculated by assuming that the measured peak

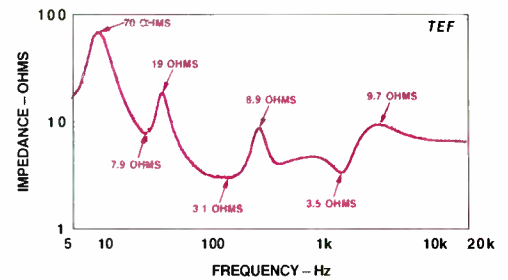


Fig. 6—Impedance.

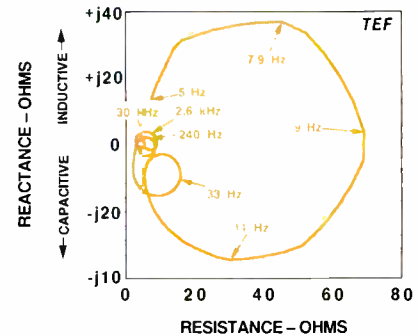


Fig. 7—Complex impedance.

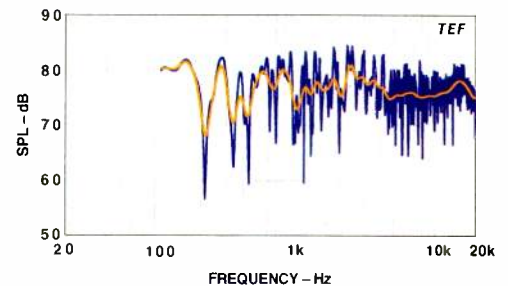


Fig. 8—Three-meter room response.

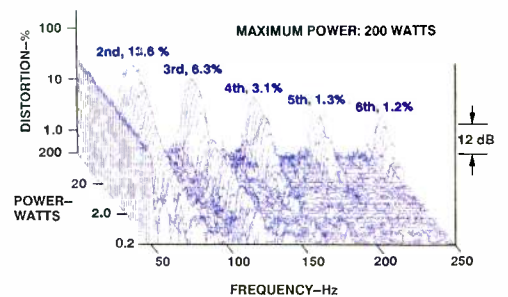


Fig. 9—Harmonic distortion for E_1 (41.2 Hz).

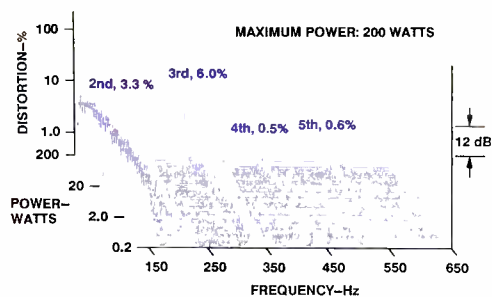


Fig. 10—Harmonic distortion for A₂ (110 Hz).

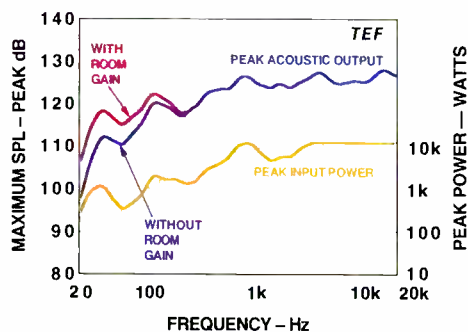


Fig. 11—Maximum peak input power and sound output.

voltage was applied across the speaker's rated 4-ohm impedance. The peak input power starts high, at about 160 watts at 20 Hz, rises to 1,000 watts at 32 Hz, falls to about 300 watts at 50 Hz, climbs to a plateau of about 1,500 watts between 100 and 250 Hz, and then rises above 5 kW at higher frequencies. After a droop to about 5 kW just before the upper crossover, the peak input power ascends to 12.1 kW (a swing of ± 220 V into the rated 4 ohms) at 3 kHz and above! The power reductions at and near 200 Hz and 1.5 kHz were due to my test amplifier running out of gas into the low impedance, rather than the PC 10.5 limiting the power! Significant net outward movement of the woofer cone was noted at the third-octave centers at 20, 25, 50, 63, and 80 Hz, due to dynamic offset distortion.

With room gain, the maximum peak output SPL of the PC 10.5 starts at a healthy 106 dB at 20 Hz, rises rapidly to 118 dB at 32 Hz, falls somewhat at 50 Hz, and then goes up into the mid-120-dB range above 500 Hz (with some ups and downs). The peak output crosses the 110-dB SPL level at a low 23 Hz and then increases above 120 dB at about 80 Hz. Its robust low-frequency output places the PC 10.5 near the top of all speaker systems I have tested.

Use and Listening Tests

My review systems were finished in black lacquer and were quite gorgeous. Finish and attention to detail in cabinet construction were first-class. The absence of input terminals on the back contributed to the good looks of the PC 10.5, as the sides and rear are a single expanse of shiny lacquer. However, because the input terminals are on the bottom of the cabinet, connecting these speakers was a chore; I had to place them on their sides to connect the input cables. If you are sufficiently clever and your cable has a double-banana plug, it can be inserted blind, by tilting the speaker over with one hand (it's heavy!) and reaching under it with the other. Without spikes, the PC 10.5 can be moved easily by one person, by rocking it.

The owner's manual, a seven-page booklet, is well written. Topics covered include connections and cabling, bi-wiring, speaker placement, floor spikes, choice of amplifiers, and service. Phase Technology recommends placing

these speakers 6 to 8 feet apart and 3 feet or more from the side and rear walls. The company also suggests that you angle the speakers in, toward your listening position.

Listening was done with gear that included Onkyo and Rotel CD players, Krell's KRC preamp and KSA250 power amp, Straight Wire Maestro cabling, and B & W's 801 Matrix Series 3 speakers as a reference. I placed the Phase Technology PC 10.5s 8 feet apart and well away from the rear and side walls (my customary locations), and aimed them toward me.

Initial listening revealed a system that competed very well with my B & W 801s. Bass was just as clean and was nearly as extended and powerful. High/low balance and

sensitivity were similar, although the Phase Technology systems were a touch brighter on highs. On male speaking voice, I preferred the PC 10.5s to the 801s because the latter speakers have a slight tendency to tubbiness in my listening room. The Phase Technology systems could also be played as loudly and cleanly as the B & Ws, which means that they can do justice to program material that needs to be played loudly for good effect, such as club dance music and rock.

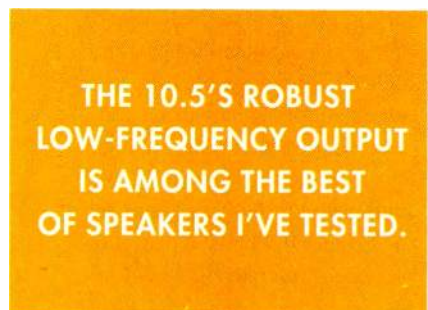
For my first listening, I selected an incredible new CD of guitar and mandolin duets of American and bluegrass music performed with a series of 32 different instruments: *Tone Poems: The Sounds of the Great Vintage Guitars and Mandolins* (Acoustic Disc ACD 10). This minimalist recording, played by David Grisman and Tony Rice, is very clean and has a very quiet background. The PC 10.5s did an excellent job re-creating the presence and "you are there" quality on this disc. The crisp sound of the strings being plucked was rendered very realistically.

Full-scale symphonic classical music with pipe organ was re-created very powerfully and cleanly on organist Jean Guillou's recording of the Saint-Saëns Symphony No. 3, "Organ" (Dorian DOR-90200). The organ pedals' underpinning in the second movement came off very well, with no hint of intermodulation of the higher frequencies by the powerful organ pedals.

The Phase Technology speakers also did notably well on another Guillou CD, Musorgsky's very demanding *Pictures at an Exhibition* (Dorian DOR-90117). Here, the PC 10.5s were bested only slightly by the 801s on the very difficult organ pedal notes. On the downside, however, this material triggered the Phase Technology woofers' dynamic offset problems (significant outward displacement of the cones) when the disc was played loudly.

For more sedate classical material, I selected *The Sound of Baroque* (Gramophone RPM CD:MISS1, a promotional CD made for another loudspeaker manufacturer, the Mission Group). The PC 10.5s' reproduction of soundstage and depth of field was quite good, with an even and smooth midrange.

On some female vocal material, the PC 10.5s did add some emphasis to sibilants



that was not evident on the 801s. The added emphasis wasn't detrimental and didn't add any harshness. The slight high-frequency emphasis was also apparent on other material, such as rock or jazz cymbals. Reproduction of high-frequency percussive sounds was very satisfying. Overall, the PC 10.5s were somewhat more forward-sounding than my reference speakers.

On third-octave band-limited pink noise, the PC 10.5 generated some usable bass output at the 20-Hz band, generated much more output at 25 Hz, and was very strong and clean at 32 Hz. Port wind noise, although evident, was significantly lower

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than what the B & W systems produce at these frequencies. The Phase Technology's output at higher bands was quite strong and clean. Significant outward dynamic offset was evident at the 20-, 25-, 50-, 63-, and 80-Hz bands at high input levels.

With pink noise, the PC 10.5s did extremely well on the stand-up/sit-down test, exhibiting very little tonal change when I stood up. They essentially equaled the excellent performance of the 801s on evenness of vertical coverage. Horizontal coverage was also quite even and was broad in the higher frequencies. Octave-to-octave spectral balance on pink noise was quite good; I detected minimal tonality. The 801s were somewhat better in their reproduction of pink noise, but not by a lot.

Phase Technology has done an excellent job in providing a good balance between performance, appearance, and price. The PC 10.5s provide a significant portion of the high-end performance of the B & W 801s but at about one-third to one-half the price (depending on finish). The bass response is notable for extension and power, while the mids and highs are of equal caliber. Particularly good are the even vertical and horizontal coverages. Consider the PC 10.5s seriously for your stereo or home theater setup.

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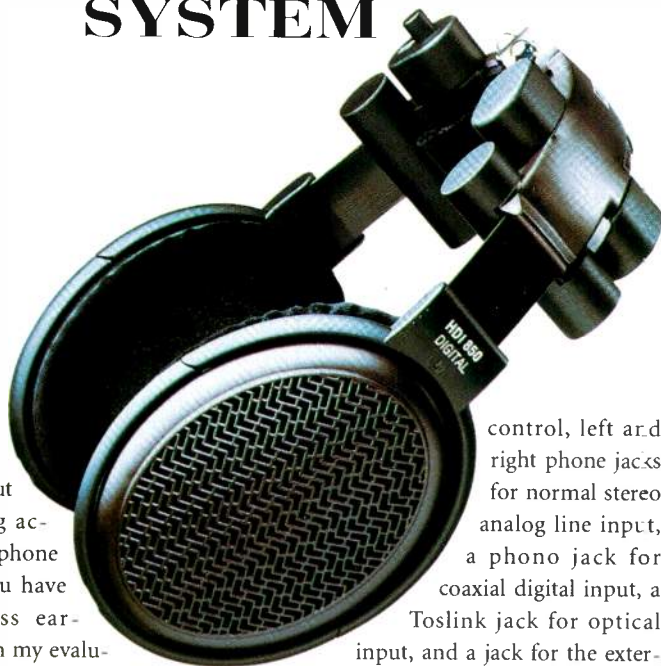
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SENNHEISER IS 850 DIGITAL INFRARED EARPHONE SYSTEM



You don't really think about the tethering action of an earphone cord until you have used wireless earphones for a while. In my evaluation of the Sennheiser IS 850 system, I learned to appreciate the fact that I could move freely without worrying about tangling a cord, knocking things over, or being restrained by a usual cord length. This freedom of movement is the main reason I found the IS 850 a real joy to use. There are a number of wireless earphones available, but the IS 850 brings a new level of quality to the genre.

The system consists of the S 850 transmitter and the HDI 850 earphones. The transmitter is housed in a molded plastic enclosure that measures 7 inches high, 3 1/8 inches wide, and 3 1/2 inches deep. The front of the box has three vertical columns of 12 infrared bulbs each; below are LEDs indicating the input connection that has been selected by means of a switch on the box's rear panel. Also on the rear are an analog input level

control, left and right phone jacks for normal stereo analog line input, a phono jack for coaxial digital input, a Toslink jack for optical input, and a jack for the external plug-in power supply (of the kind that is sometimes called a "wall wart"), which provides 12 V d.c. at 1 ampere.

If you use the analog line inputs on the S 850 transmitter, a delta-sigma A/D converter (with 64-times oversampling) converts the signal to digital. If one of the digital inputs is used, the A/D conversion process is bypassed. The digital audio signal modulates the infrared light, which is transmitted via the S 850's three columns of bulbs to the infrared detectors on the HDI 850 earphones; the received signal is then changed to an analog audio signal by D/A converters and passed to amplifiers that drive the dynamic earphone element in each earcup. The D/A converters can handle digital signals at sampling rates of 32, 44.1, and 48 kHz. Sensitivity is not specified, but I checked the IS 850 system

with different sources, including some portable CD players, and they all provided more than adequate output.

The S 850 transmitter can be set on a shelf, using the supplied metal base. A metal bracket is provided for wall mounting. I plugged the power supply into a short extension cord from a switched outlet on an AM/FM receiver; this allowed me to listen at a distance and control the total audio system with the receiver's remote control. Very nice.

The HDI 850 earphones look a little strange because of the six compartments attached to the underside of the headband and the nacelle on top. The two larger compartments each hold a single AA battery; the other four contain the D/A converters and amplifiers, a power on/off switch and LED, a volume control, and a balance control. The nacelle holds the four infrared detectors—one for each side, so that the infrared signal can be picked up no matter which way you are facing.

Four foam-filled, nylon-covered cushions are also attached to the underside of the Sennheiser's plastic headband; these cushions proved to be very comfortable. The sliding metal part of the headband has

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SPECS

EARPHONES

Transducer Design: Dynamic.
Coupling to the Ear: Circumaural.
Frequency Range: 10 Hz to 22 kHz.
Sensitivity: Not specified; see text.
Maximum Output: 115 dB SPL.
Weight: 11.6 oz. (330 grams) with two AA batteries.

TRANSMITTER

Transmission Mode: Infrared.
Modulation Mode: Pulse-code modulation (PCM).
Sampling Frequencies: 32, 44.1, and 48 kHz.
Power Input: 12 V d.c.
Weight: 7 oz. (200 grams).

GENERAL SPECIFICATIONS

Price: \$1,295.
Company Address: 6 Vista Dr., Old Lyme, Conn. 06371.
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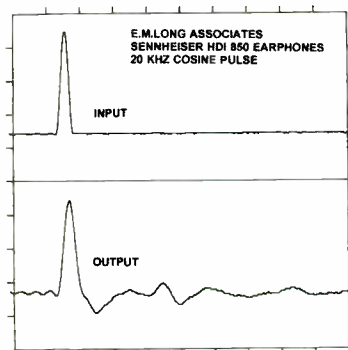


Fig. 1—Cosine-pulse test.

detents and is attached to the earcup yokes by plastic retainers.

The yokes swivel horizontally to allow the earphones to rest properly on your head; the earcups swivel as well. The outer side of each earcup is covered with nylon cloth over soft foam to keep out dust. On the inner side, foam earcushions are covered with velvet; the elliptical opening is 1½ inches horizontally and 2½ inches vertically. Although the cushions didn't completely surround my outer ears (but instead pressed against my earlobes), they still felt very comfortable, and they were deep enough to hold the earphones away from my ears. I was amazed that the earphones, with their built-in D/A converters, amplifiers, and batteries, could still feel so light! For some reason, the earcushions made a "squeaking" noise when the 'phones were being adjusted or when they slipped slightly during head movements. This could be annoying, but I became used to it and didn't find it to be a major problem.

I tried some experiments to see if the infrared system could maintain a good signal connection between the S 850 transmitter and the HDI 850 earphones under difficult conditions. I was able to walk out of a room and down a hallway without losing the signal, as long as the door was open; this was because there was enough infrared light reflecting from the door. When I entered another room, the signal was interrupted and the system shut down. As long as there was either a direct line of sight or a reasonable amount of reflected infrared energy reaching the earphones, the system worked fine.

I measured frequency response of the IS 850 system and found it to be very smooth from 200 Hz to 3 kHz. There was a gentle rise to a minor peak at 4.4 kHz; above this

frequency, there were some minor peaks and dips, with the response extending out to 17 kHz, where it fell gently to 20 kHz. Below 200 Hz, response rolled off smoothly when there was no seal around the earcup; with a reasonable seal, the response should extend to well below 40 Hz.

Figure 1 shows the output versus time response of the IS 850. The acoustical output is excellent, with no "ringing"; this indicates that the system has excellent phase characteristics, with no high-frequency time delay. The output pulse also has a positive polarity for a positive input. Although Sennheiser doesn't indicate that the IS 850 was designed to achieve a diffuse-field response, my subjective reaction was that this is the case. Response of this type tends to put sound sources back into a

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realistic acoustic space when a recording has been made with this intent. The comments by my listening panel tended to verify my reaction.

I compared the Sennheiser IS 850 system to my reference Stax SR-Omega earphones and was surprised at how close they were. As is my usual practice, I also had members of the listening panel make the same

comparison, and their comments led to the following conclusions.

On "Willow Weep for Me" from The Mann Brothers' *Mann to Mann* (dmp CD-500), the cymbals were very smooth on the Sennheiser system, albeit slightly veiled compared to their sound on the Stax earphones; nevertheless, the drums had good attack, the bass was very solid, and the timbre of the tenor sax was very realistic. The overall sound exhibited an excellent sense of space around the musicians.

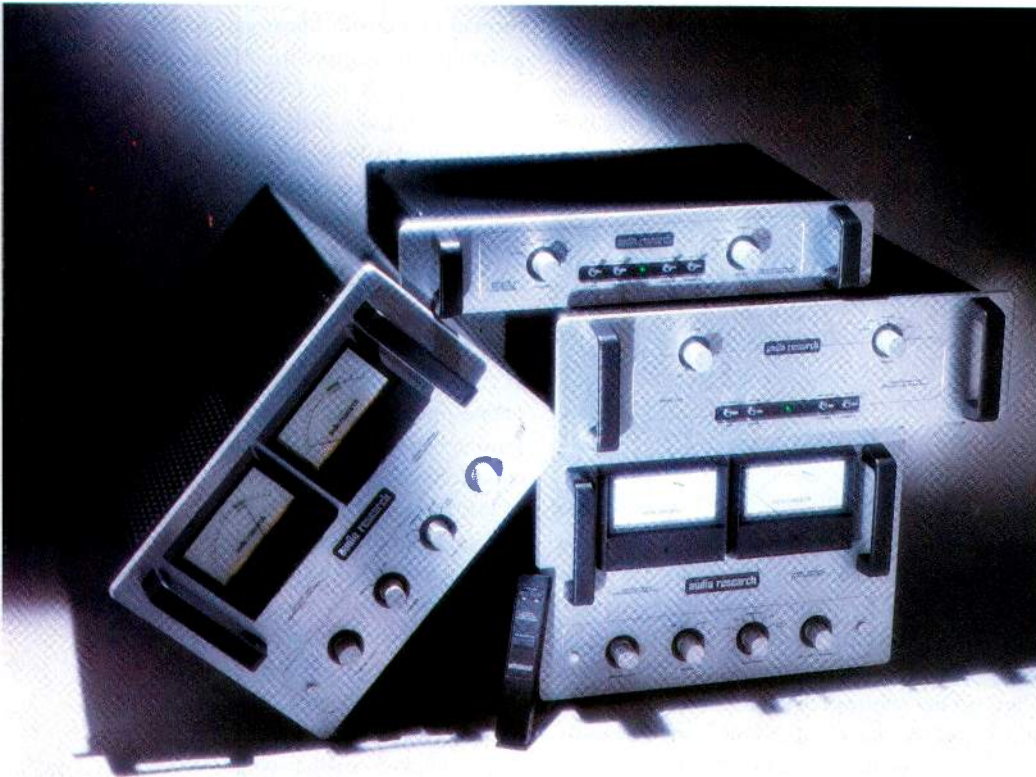
"(Sittin' on) The Dock of the Bay," performed by Lincoln Mayorga and Distinguished Colleagues on *My Disc: The Sheffield/A2TB Test CD* (Sheffield Lab 10045-2-T), has a little bit of history: It was intended to be included on a direct-to-disc album by Mayorga but had to be omitted because the kick drum caused the LP groove excursions to be too extreme! This selection has wide separation between the instruments, with guitars at left and center, electric piano and drums at center, and sax at right. The HeadRoom Supreme Headphone Amplifier and Image Processor (see January) pulls it all together when the cross-feed circuit is turned on. The sound of this track was very similar between the Stax and Sennheiser earphones, with the Stax having a slight edge in the sense of space around the instruments. (Incidentally, there are six musical selections on *My Disc*, along with 80 other useful tracks. The test CD comes with an 18-page booklet describing each track and how to use it. The disc is definitely worth having.)

Continued on page 72

EARPHONE EVALUATION

PARAMETER	RATING	COMMENTS
Overall Sound	Very good	"Close to reference," "Good sense of space," and "Powerful base"
Bass	Excellent	"Powerful," "Full and rich," and "More than reference"
Midrange	Very good	"Smooth and clear" and "Good articulation on voice"
Treble	Very good	"Smooth and extended," "Delicate highs," and good transient detail"
Overall Isolation	Low	"Very little attenuation of outside sounds"
Bass	Low	"Low-frequency outside sounds are easily heard"
Midrange	Low	"Conversation is easy"
Treble	Fair	"Some reduction of treble sounds"
Comfort	Very good	"Very light feeling," "Easy to adjust," and "Ear-pads squeak!"
Value	Good	"Excellent wireless earphones at a high price"
GENERAL COMMENTS: Excellent reproduction of complex sounds. Powerful bass. Good articulation of voices. Very good sense of space with binaural recordings. Good value.		

AUDIO RESEARCH VT150SE MONO AMP, LS5 MKII PREAMP, AND BL2 INTERFACE



The debate over tubes versus transistors is, in one respect, similar to the debate over analog versus digital: It seems likely to continue as long as there are audiophiles. However, the advocates of tubes sometimes take on the character of a cult, with some reviewers and audiophiles seeming to spend as much time worshipping the soft, warm glow of tubes as they do actually listening to them.

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At its best, the tube cult introduces many audiophiles to the reality that a musical-sounding system can often be far more satisfactory than one that merely sounds accurate. It is amazing how good some euphonic tube preamps and amps can be if blended with the right program source and speakers. Such electronics may be a bit too warm, have limited bandwidth, and convey an exaggerated sense of space, but with far too many CDs and many newer LPs, these colorations are an act of mercy. If you have to make hard choices between accuracy and musicality, it is better to err on the side of musicality.

At its worst, the tube cult produces overpriced and overstyled products of uncertain reliability. Audiophiles and reviewers fall in love with all kinds of highly colored components that may or may not be musical but that do impose their own character on every signal that passes through them. Some of these components are too underpowered to properly drive or control most modern speakers, and other examples are simply outrageously overpriced, vying with cult solid-state electronics for the title of the most overpriced items in audio—and winning hands-down in the unreliability sweepstakes.

At another level entirely, there is tube gear that offers both outstanding accuracy and superior musicality, providing a level of sound quality that has advantages not yet available from any solid-state equipment I have auditioned. Noteworthy examples of such tube equipment are now being made by a number of firms in the U.S., Europe, and Japan, but Audio Research is, to some extent, the “father” of all such designs. Audio Research kept tubes alive at a time when they threatened to disappear from the high end, and for nearly 30 years, the company has continued to help define the state of the art.

This mix of accuracy and musicality is immediately apparent when you audition the LS5 MKII, BL2, and VT150SE, which make up Audio Research’s latest top-of-the-line amp and preamp combination. The LS5 MKII is an all-balanced line-stage tube preamp that retails for \$4,995. The BL2 is a solid-state interface device designed to provide single-ended inputs and switching for the LS5 MKII, and it retails for \$1,495. The VT150SE is a 130-watt mono tube amp that sells for \$7,495 each (or, as the VT150, for \$5,995 each, without front-panel assembly and bias meters).

The LS5 MKII is truly a purist’s preamp. It accepts only balanced inputs and has a very simple control

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layout: Volume, a choice of five inputs, a choice of 12 or 30 dB of gain, a tape monitor switch, a muting switch, and an off/on switch. It is not by any means band-limited: Frequency response is specified at ± 0.5 dB from 1 Hz to 200 kHz, with a -3 dB point at 600 kHz. The distortion specifications rival those of the best solid-state preamps, with less than 0.005% at 2 V rms and less than 0.003% in the midband at most listening levels.

The LS5 MKII's circuit has too many features to describe in detail, but its power supply uses a large low-noise toroidal transformer, while its gain stages have 10 dual-triode 6922/E88cc tubes, in a fully differential circuit that operates in Class A. Two separate gain paths and a special volume control allow true balanced operation throughout the circuit.

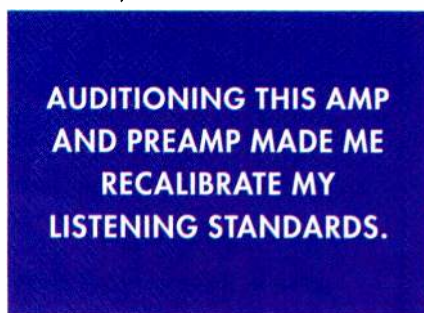
The BL2 interface, a solid-state unit, allows the audiophile who is still dependent on program sources having single-ended outputs to provide inputs to the LS5 MKII with an optimal impedance and signal-to-noise ratio. The BL2 provides five different sets of single-ended inputs, a separate input switch for tape, and switching for two tape recorders and a tape monitor loop.

The VT150SE mono amplifier is beautifully engineered, with excellent sound quality and spectacular styling. It has relatively high power for a tube amp and excellent specs. Power bandwidth is rated as (-3 dB) 12 Hz to 80 kHz, and clipping power is said to be around 145 watts at 1 kHz. The damping factor is approximately 16, slew rate is 17 V/ μ S, and rise-time is 2.0 μ S. Hum and noise are specified at -98 dB for an input of 0.5 V.

Like the LS5 MKII, the VT150SE has a fully balanced circuit from input to output. It uses Audio Research's cross-coupled driver circuitry, and the balanced front-end circuitry is servo-controlled for precise interstage balance. The tube complement includes two 6550 power-supply regulator tubes, one 12AX7 regulator amplifier tube, two 12BH7 servo-controlled direct-coupled cathode follower drivers, one 12BH7 driver, one 12BH7 cross coupler, one 6922 as an input amplifier, and another as a feedback coupler. The output stage uses partial (50%) cathode coupling, with the screen grids driven by a separate multi-filar winding in the output transformer. Audio

Research feels this method of output coupling provides relatively high power output at four times lower than normal operating impedances, and all of the benefits of Class-A output with none of the problems in terms of heat and low power. The tube complement includes four new high-quality Russian 6550 output tubes. A meter and switch allow proper biasing of each of the output tubes. The output transformer has conventional 4-, 8-, and 16-ohm output taps as well as 1-, 2-, and 4-ohm taps for systems that must be operated in the single-ended mode.

I concentrated virtually all of my listening on the LS5 MKII and the VT150SE. While the BL2 is very clean, it does not have exactly the same sound character as



the LS5 MKII and VT150SE, and it introduces a slight dryness and lack of warmth if you place it in the same signal path with tube units. Unless you have a very complex system, you may wish to consider using cables with an RCA plug at one end and a specially wired XLR plug at the other. This may not produce as good an impedance match and S/N ratio, but I did not find this to be much of a sacrifice with phono preamps or FM tuners—although “high fidelity” is a bit of a misnomer for FM in the Washington, D.C. area. Saving the cost of a BL2 also goes a long way toward allowing you to pay for an Audio Research PH2 phono preamplifier, which has a balanced output; balanced inputs and outputs are also common on semi-professional analog and digital tape machines.

In fact, I would do everything I could to minimize any coloration of the sound quality of the LS5 MKII and VT150SE. The issue is not one of tubes versus transistors but rather that the LS5 MKII and VT150SE have almost identical sound quality, and both are extraordinarily transparent and musical. The fewer things in the signal path, the better!

The transparency and resolving power of the LS5 MKII and VT150SE are particularly striking in the upper octaves. I have long since given up on generalizations about tubes versus transistors, but both the LS5 MKII and the VT150SE have the kind of upper midrange and highs that are the goal of all electronics. The upper treble clearly extends beyond the range of hearing, and the LS5 MKII and VT150SE do not have warm or rolled highs in any respect. Their upper octaves have excellent harmonic definition. They have remarkable freedom from electronic haze and artifacts and an equally remarkable ability to provide a musically convincing definition of both the basic notes of given instruments and their harmonics. With truly clean recordings, notes approach the character they have in live performance. The highs seem to emerge out of space at all listening levels.

The LS5 MKII and VT150SE have exceptional sweetness and air without sacrificing information or coloring it, and without softening the natural bite of instruments, the harshness of string tones, or the hardness of modern instruments. Timbre is unusually accurate for all types of voices, while sibilants are as musically natural as the recording allows, without either a romantic loss of realism or the slight exaggeration common in even some of the best solid-state electronics. I suspect this reproduction may be too realistic for some tube fans who want their music “sweet” and “romantic” regardless of the recording, but it is likely to draw considerable praise from audiophiles who accept music as it really is.

The lower midrange and upper bass of the LS5 MKII and VT150SE are a somewhat different story. They are slightly warmer than in most of today's solid-state electronics, although less warm than in a number of competing tube units. This timbre complements most modern recordings but may be just slightly warmer than accuracy permits. The VT150SE has a bit less definition and detail in the upper bass than some of the best solid-state amplifiers, although it does not have their slight leanness nor their apparent loss of lower midrange dynamics. These trade-offs make the lower midrange and upper bass an area where you will have to make your own choice as to which sound characteristics are most accurate, but it is certainly an area

where the LS5 MKII and VT150SE sound different from most of their competition.

The mid and deep bass of the LS5 MKII and VT150SE are very good, but it may take considerable fiddling to find out how good, in the case of the VT150SE. The LS5 MKII always has fine deep bass, trading just a slight loss of definition for richness and dynamics. The mid and deep bass are an area, however, where the amp seems to interact significantly with certain speakers and where considerable experimentation may be needed to find the best tap on the output transformer. While it's best to begin with the tap that matches a speaker's nominal impedance, I'd recommend experimenting with a range of output transformer taps to find the best sound with a given speaker.

Regardless of the tap you choose, you are not going to get the bass extension, sheer power, or control out of the VT150SE that you get from the very best transistor amplifiers. The VT150SE's deep bass is much better than that of many other tube amps, but there is a bit of bloom and looseness. The VT150SE does not seem to have quite the same ability to control a woofer or a subwoofer as do the best transistor amps, although this varies by speaker. The VT150SE brought the woofer of the Thiel CS5 to life but was less successful with the woofer of the B & W 801 Matrix Series 3. If you are a true bass freak, you should listen carefully to the mid and deep bass of the VT150SE with your specific speaker to see how well they interact—advice that is valid for all amplifiers. If you simply love music, the VT150SE's limitations in the deep bass are never worse than euphonic and are scarcely serious enough to offset its numerous strengths.

The soundstage of the LS5 MKII and VT150SE is truly state of the art. Reviewers sometimes praise electronics that exaggerate depth or add it to every recording. In contrast, the LS5 MKII and VT150SE only convey depth and the feeling of actually being in a hall when this is on the recording. They do not glamorize complex studio mixes or close-miked recordings. The LS5 MKII and VT150SE do an excellent job of imaging, providing a feeling of natural location and size from both left to right and front to back. They are superb electronics for audiophiles who like live recordings,

even if this means hearing the occasional cough, chair movement, or performance error. Even at a time when most quality high-end equipment does a good to very good job of reproducing these aspects of the soundstage, the Audio Research amp and preamp give a special feeling of being there, with only a slight rearward movement of the apparent listening position.

Both the LS5 MKII and VT150SE have an exceptional ability to resolve small changes in loudness levels and sudden changes in musical dynamics. Regardless of whether the music is solo piano or full orchestra, or whether one is listening to the loudest or softest passages, the LS5 MKII and VT150SE are extremely fast and detailed. When it comes to sheer musical power, however, the VT150SE is not quite as dynamic or natural as some of the best high-power solid-state amplifiers. It simply does not swing the same amount of power, although this will be far less apparent with efficient speakers.

Neither of my sons has ever been exposed to the debate about tubes and transistors, and both have grown up listening to so much high-end equipment that they rarely remark about the sound of any new unit unless I make a point of asking. Without any questions on my part, both sons independently praised the LS5 MKII and VT150SE as providing some of the best sound they had ever heard, and both spent considerable time listening to their favorite music when I was auditioning the Audio Research system with the B & W 801s, the Thiel CS5s, and the ribbon portion of Apogee Studio Grands.

The Audio Research LS5 MKII and VT150SE drew equal praise from other listeners, including several musicians and a number of non-audiophile friends who normally regard my "audiophilia" as a financially dangerous eccentricity. I have found over the years that this kind of spontaneous praise is the best validation a reviewer can get of his own judgments, and I feel the LS5 MKII and VT150SE earned every bit of praise they received. It was hard to let them go, and auditioning them has made me recalibrate my listening standards for all preamps and amps, whether transistor or tube. The Audio Research LS5 MKII and VT150SE are superb pieces of gear.

Anthony H. Cordesman

AUDIO/MAY 1995

69



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QUICKSILVER GLA AMPLIFIER



There are a lot of good amps retailing for between \$1,000 and \$1,500—solid-state amps from such makers as Adcom, Aragon, B & K, and Parasound, all offering excellent performance and value for money.

Tube amps are another matter altogether. But leave it to Mike Sanders, president of Quicksilver Audio, to carve himself a niche in the marketplace.

He did it a dozen years ago with the Quicksilver 8417 monoblocks, which retailed at the time for just under \$1,000 a pair. (The “8417” refers to the Philips output tube of the same name.) As soon as I saw and heard a pair of the 8417s, I bought them. My friend Lars, who also likes a bargain, did so too.

“I remember those amps very well,” Lars reminisced. “They were little yewels.”

“Yewels? For Christmas or something?”

There was a long pause.

“I’ll bet Yene Pitts is not going to let you

rest in the pages of *Audio*. It’s a serious magazine,” said Lars. “Anyway, that Sanders guy knows what he’s doing. Those were very fine amps.”

“They still are, Lars. You made a mistake selling them. All these years you’ve been upgrading your equipment, and you might

**QUICKSILVER’S AIM IS
TO BRING THE TUBE AMP
SOUND TO MORE PEOPLE,
BY MAKING IT
MORE AFFORDABLE.**

have done better to keep what you had when you started.”

“Yes, sometimes I feel like I’m on a treadmill.”

“Treadmill.”

“That’s what I said.”

“No, you didn’t. But anyway, you may be interested to hear that Mike is out with a new stereo amp called the Quicksilver GLA.” Whereupon I told Lars, as I am now telling you, about the new GLA, which stands for Great Little Amp. It’s a 40-watt/channel stereo tube amp retailing for \$1,195 in its basic configuration.

What’s the big deal, you say? Well, in case you haven’t looked lately, certain well-known manufacturers of high-end tube gear have taken the prices of their entry-level tube amps to \$3,000 and above. Tubes for the rich, transistors for the poor.

Tube amps for under \$2k are hard to find. Now here is Quicksilver with an amp that retails for closer to \$1k. Remarkably, Sanders is able to produce this amp without abandoning his design principles. No printed circuit boards—“bad for sound,” he says, especially in an amplifier (less bad in a preamp). Each amp is all hard-wired, point to point. What’s more, the GLA, like all Quicksilver amps, is all tube. “I don’t put transistors in my amplifiers, even in my power supplies. Transistors always affect the sound,” Sanders told me.

The aim of the GLA is clearly to bring the tube amp sound to more people by making such an amp available for less money. The question is, how well has Mike Sanders succeeded here?

To find out, I bought a GLA. I had no choice. Mike doesn’t send out review samples—or even press releases, for that matter. (This may be one way he keeps his prices down.) While other manufacturers may fall over themselves to send products to Sea Cliff and Santa Fe, Mike just sits there in Reno, Nevada and says, “If you want to try one, buy one.”

As it happened, my daughter wanted a tube amplifier to drive her Epos ES11 speakers. “Has to be tubes, Dad,” she said.

“Tubes? Why not solid-state?”

“Tubes sound better, Dad. You said so yourself.”

“Do you believe everything I say? Sometimes, child, solid-state sounds better. Depends on the amp. Depends on the speakers. Solid-state gives you more power for

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less money and better bass control of the woofer cones. Solid-state requires less maintenance—no tubes to replace.

“Solid-state amps run cool; output tubes run hot. And some of the best solid-state amps rival tube amplifiers in their harmonic richness and timbral beauty.”

“You can save all that stuff, Dad. I want to turn out the lights and watch the tubes light up. The music sounds more alive with tubes, voices especially. Tubes sound sweeter, richer, fuller; there’s more body and more bloom. My Epos ES11 speakers sound particularly good with tubes; you said so yourself. Besides, my brother has tubes. Should I be fobbed off with solid-state just because I’m female?”

I don’t know if many young women are buying tube amps; I tend to doubt it, since women generally seem to feel themselves excluded from high-end hi-fi. But based on what dealers tell me, many young men in their 20s and 30s are hot to have tubes. These people grew up listening to solid-state. When they see and hear tubes, something happens. Maybe it’s the sound, but I think it’s something more. It’s the look. And the lore.

Tubes are traditional. Output tubes, especially, are beautiful objects in themselves. They’re timeless. They’re as close as you’re going to get to permanent in today’s hi-fi world. A tube amplifier won’t seem obsolete in another two, three, or five years—it is already obsolete (according to some people).

Paradoxically, all the changes in technology, especially digital, seem to have driven some audio enthusiasts back to tubes—as if to recapture a sound from the past, a sound that is thought to be richer, fuller, warmer, more mellow.

Am I making this up? Few people would deny that tubes have taken off in the decade following the introduction of the Compact Disc. The problem is, most tube gear is expensive. This is especially true of amplifiers; the prices have tended to put tube gear out of reach.

“I’d like a tube amp, but I can’t afford one,” said a musician friend the other day. With the Quicksilver GLA, he can.

There’s value for money. “Little” may describe the GLA’s rated power output (40 watts/channel into 8 ohms with the standard EL34 output tubes), but the amp

weighs a hefty 42 pounds. Most of the weight comes from the transformers.

Inside, the amp is entirely hard-wired. As I mentioned, Sanders feels that point-to-point wiring sounds better than a p.c. board. There’s another benefit, too. With point-to-point wiring, you can always get the amp fixed. What you get for your \$1,195 is a classic, hand-built tube amplifier that could, with periodic tube replacements and maintenance, last a lifetime.

If someday you decide to upgrade to a bigger amplifier, you might want to keep the GLA as a backup or for use in a second system. Or you could pass it on to your kid. As Lars would say, a classic tube amplifier like this becomes a “hairloom.”

Sanders has priced the GLA à la carte; \$1,195 is the base price. For that amount,

ONCE THE GLA WARMED UP, STRING TONES WERE SEDUCTIVELY SWEET; VOICES HAD THAT QUALITY OF ALIVENESS.

you get the amp with four Chinese EL34 output tubes. If you want Chinese KT88 output tubes instead of EL34s, the base price is \$1,250. If you want a pair of chrome covers for the output transformers, add \$32. I recommend that you do, as the covers help dress up the appearance of the amp. A cage, also recommended, costs another \$48. The cage covers the output tubes, protecting both them and you.

The amplifier is self-biasing; it adjusts itself. Current from the cathode of the output tubes flows through a biasing cathode resistor, which sets the bias voltage for the output tubes. If the amp is overdriven, the resistor will tend to reduce the bias current and thus protect the tube. The disadvantage of self-biasing, as Sanders explains, is that you can’t get the maximum power out of the output tubes.

“I knew this was an entry-level amplifier, so I wanted to make it as easy to use as possible,” says Mike. He supplies four matched output tubes and emphasizes the need to used matched tube sets. If a tube goes down, you can call Mike, read him the code number off the tube box, and he will then

send you a new tube that matches the remaining three.

I did order a GLA for my daughter’s birthday, but when it arrived, I used it first. I tried it in my main system with my Quad ESL 63 USA monitor speakers, a system where I usually use the Quicksilver M135 monoblocks. It was fascinating to compare the amps: Quicksilver’s least expensive with Quicksilver’s most. (The M135s retail for \$6,500 a pair.)

Remarkably, the GLA did a respectable job of driving the Quads. Even Sanders was mildly surprised at this. The M135s put out at least 135 watts/channel into 8 ohms (depending on the output tube you use). They are massively built amplifiers with very big power supplies.

With the GLA on the Quads, the soundstage shrunk at higher volume levels—that’s what typically happens with less power. Music tended to compress more readily during loud and complex passages. Also, noticeable distortion set in at a lower level of loudness than it did with the M135s—not severe distortion, mind you, but a slight edge to the sound and a perceptible loss in clarity. (Keep in mind that a pair of mono M135s costs nearly 5½ times the price of the stereo GLA.)

What surprised me was this: At lower volume levels, and especially with chamber music or small-group jazz, the GLA and the M135s sounded nearly identical. I heard the same sweetness of tone, the same ravishing truth of timbre. I think I heard slightly more low-level detail with the M135s, but so long as I didn’t crank up the volume, the GLA came amazingly close, so close that it was hard to tell which amp was playing!

Once the GLA was warmed up (which takes about a half hour), string tones were seductively sweet. Voices had that quality of aliveness, that palpable presence, if you will, which tube amps typically achieve so well. Good jazz recordings, too, came alive with a presence that just seems typical of tubes.

Another pleasant surprise was the bass. You might not normally expect killer bass from a tube amplifier, especially from a stereo tube amp rated at 40 watts/channel. With my Quads, solid-state amps—and the M135s, for that matter—produced tighter, more extended, more powerful bass. But there was nothing excessively weak or flabby about the GLA’s downstairs department.

Until I pushed the volume levels, the bass remained reasonably tight, taut, and tuneful. There was no irritation factor.

I had several other tube amps on hand. Although some of these amplifiers sounded, superficially, more detailed and/or more dynamic than the GLA, they tended to put me slightly on edge. Possibly because this is an all-tube design, with no transistors (not even in the power supply), the GLA has a laid-back, relaxed listening quality that helps prevent listening fatigue.

I also had the opportunity to use the GLA with the Thiel CS1.5 speakers, which are recommended with amplifiers of 50 watts/channel or more. But what the heck, 40 watts is pretty close. I figured I would give it a shot.

The Thiels, because of their size, are not capable of filling a large room with music at very loud levels. But in smaller rooms, the CS1.5s really come into their own. Surprisingly, they have superb bass definition and extension; they go much lower than you

**THE GLA HAS
A LAID-BACK,
RELAXED QUALITY
THAT HELPS PREVENT
LISTENING FATIGUE.**

might think. The GLA was a perfect match, with as much power as the Thiels could use. The high resolution of the amp matched the high resolution of the speaker.

Catch this amp/speaker combination if you can. The Thiel CS1.5s, at \$1,990 a pair, resolve detail in a way that few other speakers can at this price point. You could probably put together a killer system for around \$5,000 by adding a well-chosen line stage and CD player.

When I finally presented the Quicksilver GLA to my daughter, I hooked it up to her Epos ES11 speakers. It was obvious right from the start that the combination of amplifier and speaker was going to work.

The Epos speakers can sound a little lacking in warmth and just a bit bright on top. The GLA cured this, adding that tube touch of richness and warmth in the upper bass and a sweet quality in the upper midrange and treble. The GLA helped give the speak-

ers a more refined sound—to the point where they sounded more like a \$2,000 pair of speakers instead of an \$895 pair.

What the Epos ES11s have, remarkably, is great articulation of detail and freedom from coloration. They're detailed; they're quick; they never make a muddle of the music. And they'll play quite happily on 40 watts/channel. One of the most amusing things I noticed is how my daughter's listening tastes started to change once she got the GLA on the Epos speakers. Classical discs started disappearing from my collection and finding their way to hers.

Since I had a matched set of KT88 output tubes on hand, of a type similar to the ones that Sanders can supply on request, I decided to give them a try. With the KT88s, the GLA sounded a shade more dynamic. Bass was tighter and subjectively more extended. The amp packed more punch. The treble had a very smooth and grainless quality, just as it did with the stock EL34s. But I did notice a touch of upper midrange glare; the sound was more brightly lit.

Which might you prefer? If your budget allows, you might order a set of KT88s. I personally prefer the amp with the EL34s, as the sound is slightly less insistent (I hesitate to use the term "aggressive"). Keep in mind that you can't mix EL34s and KT88s; choose one set of output tubes or the other. (You can also use 6550 output tubes. Again, match, don't mix.)

Incidentally, when ordering replacement output tubes, you should order a matched set. That way, all four tubes will each draw more or less the same bias current. The tubes will last longer, and the amp will sound better.

If you're looking for an amplifier in the \$1,000 to \$1,500 price range, give the GLA a listen. You now have an alternative to solid-state. Is 40 watts/channel enough for you? Maybe you can arrange to take home the dealer's demo amp for a weekend and decide. If you have reasonably efficient speakers and a small to medium size listening room, the GLA may be a Great Little Amp for you.

What you gain, in exchange for a sacrifice in power, is the harmonic beauty of tubes, a hand-built product, and an amplifier that could last you a lifetime. I don't know of anything else quite like Quicksilver's GLA at the price.

Sam Tellig

SENNHEISER, continued from page 65

"J'ai vu le loup," by the Baltimore Consort on *La Rocque 'n' Roll* (Dorian DOR 90177), is a good test for acoustic space and voice articulation, as it features ancient instruments and a female voice. The IS 850 system reproduced the overall sound in a clear and precise manner, with only a slight sense of moderation in the highs compared to the Stax reference 'phones. (The CD comes with a very complete 24-page booklet, and if you have an interest in early music, you should check out this disc.) I also had the panel members listen to "Introduction and Afternoon" from Manuel de Falla's *The Three-Cornered Hat*, performed by Enrique Jorda and the London Symphony Orchestra (Everest/Vanguard Classics EVC 9000). With the Sennheiser system, castanets were clear, voices were articulate, percussion sparkled, and transients were detailed and precise. (The recording was engineered by Bert Whyte; this and other Everest reissues were reviewed by John Earle in the February "Currents.")

In Act I of Prokofiev's *Romeo and Juliet*, performed by the Los Angeles Philharmonic under the baton of Erich Leinsdorf on *The Sheffield/Leinsdorf Sessions, Vol. 1* (Sheffield Lab 10043-2-G), the IS 850 system caused the woodwinds to sound slightly "darker" compared with the Stax, a very subtle difference mentioned by only one panel member. At 8:09 of track 1, the bass drum sounded fuller and more powerful with the IS 850, probably due to the earphones' overall balance, which tends to favor the bass. However, the bass drum sounded slightly deeper with the Stax. As I listened, I became convinced that the superb quality of this recording can really only be fully appreciated when it is heard over excellent earphones like the Stax SR-Omegas or the Sennheiser IS 850 system.

Sennheiser's system is certainly an engineering tour de force, incorporating advanced digital and infrared technology. The sound is very good even when compared to my reference Stax earphones. I wonder if Sennheiser's price may be a little steep; then again, the Stax 'phones are even more expensive. If you are looking for a quality wireless earphone system, I don't think you can find anything better than the Sennheiser IS 850, the best wireless system I have ever heard.

Edward M. Long

**TOM JUNG
ON
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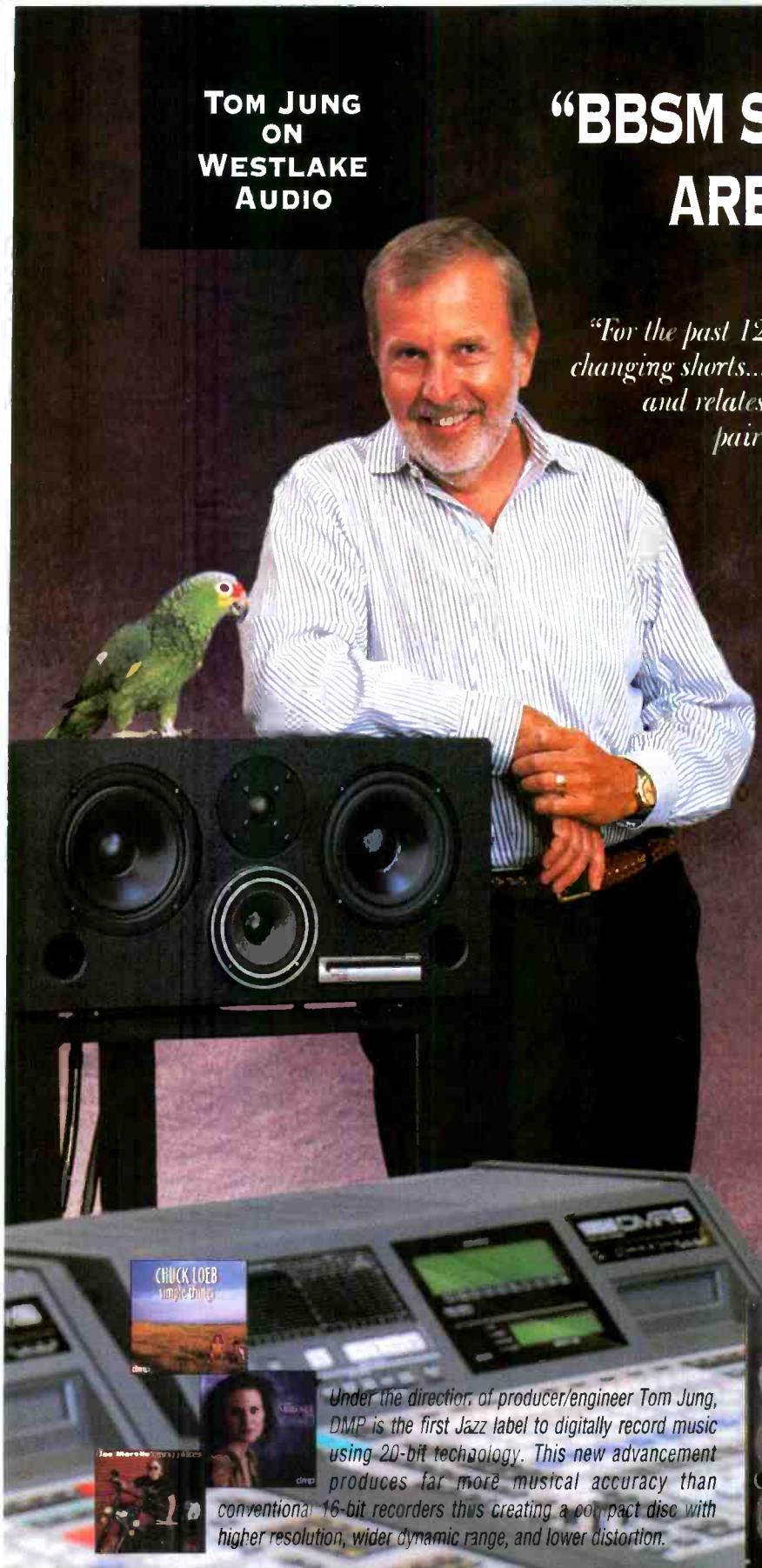
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— Tom Jung

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AURICLE

GOLD LINE DSP-30 PORTABLE REAL-TIME ANALYZER



I must admit that, at first, I was intimidated by Gold Line's DSP-30 portable digital third-octave real-time analyzer. Although it is a portable spectrum analyzer measuring only 8½ x 9 x 2¼ inches, it really is more like the main digital engine of an expandable measurement system. The DSP-30

offers such a large number of features for making electrical and acoustical measurements that I thought it would take a lot of time to master them all. The well-written 17-page manual was a great help in overcoming my trepidation.

What's more, the unit I tested had the optional OPT CVO (\$375), which includes an RS-232 serial port and a computer video interface with the necessary software. I installed the software on a Texas Instruments TravelMate 4000 WinDX2 portable computer with a 50-MHz 486DX2 microprocessor. When linked to the Gold Line, the TI portable's

screen becomes a fully annotated spectrum analyzer, with all its features easily accessible through keyboard commands; this makes the DSP-30 much easier to master. The display on the computer screen shows the DSP-30's entire 85-dB measurement range, as compared to the scrollable 45-dB window on the analyzer's own LED display. I was able to capture and store spectrum displays and print them on a low-cost Canon BJ200 BubbleJet printer. All my tests were done with this combination of equipment.

The DSP-30 truly shines as a digital signal processor when it is used with a computer; it also becomes clearer how Gold Line has designed the DSP-30 so that its versatility can be expanded through adding options. Besides the OPT CVO, there is a parallel port, the OPT PRT (\$250), that allows direct output to a printer; I didn't need this because I used the parallel port on the TI computer. Another option, the OPT NVM (\$125), adds 30 nonvolatile memories that can store measurement information even when you turn the DSP-30 off. (If you use a portable computer, you can store measurements on your hard disk or floppies, so the six active memories that come with the standard DSP-30 should be sufficient for the add and subtract functions that they provide.) More specialized options include the OPT RT60 (\$315), which allows standard RT₆₀ reverberation-time measurements; the OPT STA (\$250), for loudspeaker timing analysis in conjunction with the OPT RT60 and a test-signal source, and the OPT DAS (\$250), for testing total harmonic distortion. The Gold Line PN3A generator (\$139.95) can provide the signals required by the OPT STA plus pink noise and RT₆₀ noise bursts for reverberation testing. And Gold Line says they are working on other options to further expand the DSP-30's capabilities.

The DSP-30 can be used right out of the box to make acoustical measurements, because it comes with a

With the DSP-30 hooked to a portable PC, the display on the computer screen shows an expanded measurement range.



SPECS

Microphone Input: 600 ohms, balanced; XLR three-pin connector with 12-V d.c. phantom power for electret condenser microphone.

Measurement Range: Mike input, 27 to 125 dB SPL with supplied MK-8A microphone; to 160 dB SPL with optional MK-160 microphone and internal modification; line input, -88 to +14 dBm.

Line Input: 10 kilohms, unbalanced; ¼-inch phone jack.

Display Range: 85 dB in 45-dB LED display window, with scrolling.

Display Bands: 30 frequency bands on ISO centers; 10 LEDs per band.

Display Resolution: 0.25, 0.5, 1, 2, 3, 4, or 5 dB per division.

Display Response: Average or peak, with simultaneous peak-hold mode.

Display Weighting: Flat, A, or C.

Filter Types: Filter II, ANSI Class III; filter I, sharper than ANSI Class III.

Memories: Six active; expandable to include 30 nonvolatile memories with OPT NVM.

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low-impedance, balanced, electret condenser microphone (the MK-8A) that plugs into a top-mounted XLR jack. The mike can measure very soft sounds, down to 27 dB SPL, and extremely loud sounds, to 125 dB SPL; it gets its power directly from the DSP-30's 12-V phantom supply. With the optional MK-160 mike (\$229.95) and some modification, the DSP-30 can measure SPLs as high as 160 dB!

The DSP-30 has an automatic scaling feature that adjusts the measurement window; as soon as you turn on the unit, you will be measuring the average SPL in the "Real-Time Analyzer" mode with 5-dB/step scaling, a zero reference of 100 dB SPL, and flat weighting. You can change any of these parameters, including auto scaling, by using either the touch-sensitive

buttons on the flat surface of the DSP-30's front panel or your computer's function keys. When a ¼-inch phone plug is connected with the line input jack, the line input takes precedence over the mike input. This line input has an impedance of 10 kilohms and a rated range of -88 to +14 dBm (although it should be rated as dBV, not dBm, because the impedance isn't 600 ohms). The 0-dB reference is 0.775 V rms, which means that the maximum input of +14 dBV would be 3.88 V rms.

Because the DSP-30 can be set to record level differences as small as 0.25 dB, you

I RECOMMEND
THE GOLD LINE DSP-30
TO ANYONE SERIOUS
ABOUT GREAT SOUND.

can measure the frequency response of amplifiers, preamplifiers, audio cassette recorders, and CD players. Besides testing some cassette recorders, I was able to capture the spectrum of music on CDs and FM radio stations.

The DSP-30 has selectable filter bandwidth. Filter "II," which Gold Line compares to triple-tuned filters, is designed to have ANSI Class III characteristics; my measurements showed that its adjacent bands were down 20 dB, which is very good. Using the sharper, filter "I" setting, I obtained measurements of adjacent-band responses that were down 30 dB in the 100-Hz band, down 40 dB at 1 kHz, and down 45 dB at 10 kHz; this is excellent resolution for testing notch filters, acoustical standing waves, and so forth. If I were an audio dealer or a home theater installer, I would definitely want to have a DSP-30. Serious audiophiles and clubs should also consider the DSP-30 because it can be used to test each component of an audio system as well as the acoustical response of the loudspeakers in a listening room. If you change the location of your loudspeakers or outright replace them, the DSP-30 can help you optimize the sound.

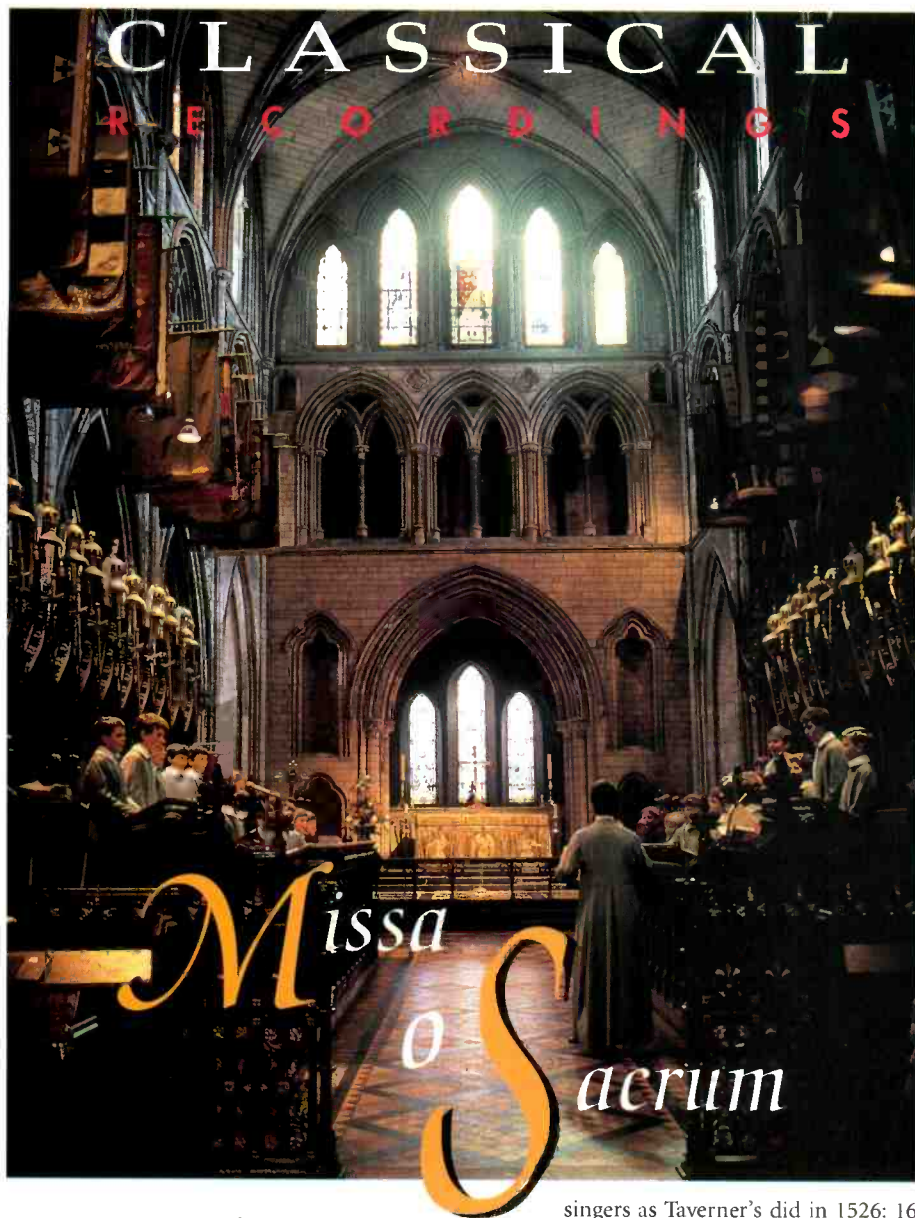
I recommend this Gold Line analyzer to anyone who is serious about achieving and maintaining great sound. *Edward M. Long*

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Palestrina: Missa O Sacrum Convivium

Christ Church Cathedral Choir, Oxford,
Stephen Darlington
NIMBUS NI 5394, CD; 57:57

Stephen Darlington took on this venerable choir quite recently, succeeding an unbroken line of directors back to one John Taverner in 1526, a generation before Elizabeth I became queen. Only a few years ago, I heard the choir sing another Palestrina mass *in situ*, with a different director. Some changes!

When the English want authenticity, they get it. The present choir has exactly the same complement of

singers as Taverner's did in 1526: 16 boys and 12 men, unaccompanied. My performance went much more slowly than this, if beautifully sustained—a holdover from the habits of the 19th century. Darlington has speeded the music up to a degree that still is entirely reasonable for a large reverberant church, much like the space for which Palestrina composed the music. This, as you may guess, reflects a new and more perceptive attitude: Palestrina is taken down from his saintly pedestal and restored to a proper artisanship. A very worldly genius indeed was he, a canny salesman, businessman, and publicist in his own interest. This was a composer who could turn

down exalted offers from royalty when the pay wasn't right.

All of which does not in the least denigrate Palestrina's ability, nor his voluminous production! He wrote hundreds of works for sacred occasions, a few madrigals on the side—140 or so—and by present knowledge 104 authenticated Masses, each a major, long work, like the one on this CD. (When, years ago, I went to the New York Public Library to pick Palestrina for my chorus, I found 80 Masses, a huge, dizzying pile of fat volumes. I left with just one.) Also, there are some 250 short motets for specific church events (of which I have conducted five or six, more than most directors!).

What is really astonishing is the unflinching quality of all this enormous output of music—the sublime Palestrina sound. One piece is just as serenely appropriate for its text as another. Not a potboiler anywhere. That is true musical artisanship on the genius level.

Thank the Lord, this present Mass, then, is not one of the "standard"

Photograph: George Mundy/Picture Perfect USA

**Tchaikovsky & Arensky:
Piano Trios**

Yemin Bronfman, piano; Cho-Liang Lin, violin; Gary Hoffman, cello
SONY CLASSICAL SK53269
CD; 76:13

Despite his explicit dislike for the classic piano-trio form, Tchaikovsky produced an astonishing work when he finally tackled it: An "elegiac" curtain-raiser, followed by a soul-scouring set of variations that hint at Beethoven's Op. 111 as a possible model. The Arensky trio, though his best-known work and a welcome companion to the Tchaikovsky, is less imposing. The poise and expertise of the three performers are beyond question. The sonic perspective is that of a top-notch studio recording—which is to say that I miss the ring of a more refulgent acoustic space. Not a big winner, but certainly a fine job nonetheless.

Robert Long





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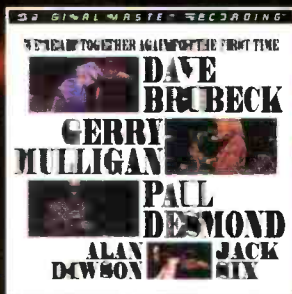
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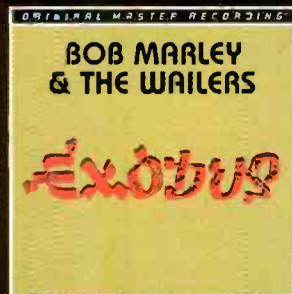
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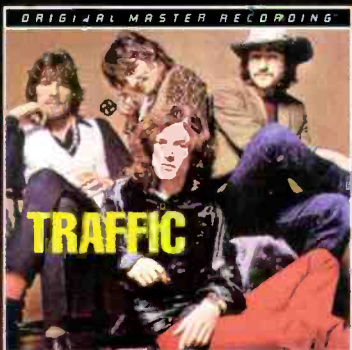


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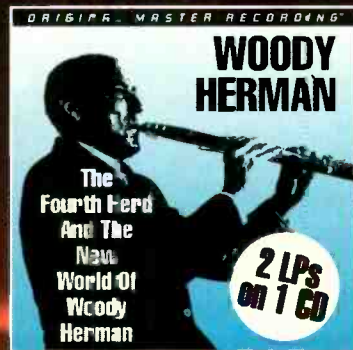
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works, sung by choir after choir merely because everyone else sings it. The "standards" are lovely too, but why not something different? Or at least not so standard. You have it from Nimbus, right here. Your ears will hear what I describe: A splendid, beautifully recorded disc. Nimbus has matured from its somewhat irregular beginnings.

Edward Tatnall Canby

Lansky: More Than Idle Chatter
BRIDGE BCD 9050, CD; 59:00

Is it classical, or isn't it? My solemn conclusion is that at least it is real contemporary.

First, what does it sound like? Starts off with "Idle Chatter," a vast mix made of one woman's voice (the composer's wife's) multiplied into dozens—maybe hundreds—complete with a fixed beat, so you can tap your foot to it. This goes on for almost 10 minutes, by which time my foot was tired.

Then we go on to number two, "Word Color," a slow piece that takes nearly 13 minutes. Then comes "just_more_idle_chatter," some eight minutes plus, and, after "The Lesson," "Notjustmoreidlechatter." No, not a misprint:



There are nospacesinthetitle. The man is a humorist. Each piece brings in more instrumental colors and more shades of pop, in both beat and harmonies. Some of these are vaguely jazz-like but less interesting; in fact, for this jaundiced ear, not interesting at all. At the prospect of "Memory Pages," the last 13 minutes of the recording, I quailed and quit. I find very little musical originality in this stuff, in spite of the engineering.

Engineering! All the very, very latest, and all in the best of good humor, 1985 to 1993. "Idle Chatter," the oldest, was done on an IBM 3081 mainframe; then came a DEC MicroVaxII, using Linear Predictive Coding, granular synthesis, and a variety of stochastic mixing techniques. Finally, a NeXT computer and Cmix, only a year or so ago. Everything is digital, of course.

Please note that Tod Dockstader, in his "Luna Park" more than 30 years ago, mixed voices in similar ways using simple manual tape editing, the real original for this technique. Compare the two, and you will see.

I must add that there is no harm at all and a lot of good fun in these works, which have clearly pleased many people. The elaborate notes by the composer are a pleasure to read. And for many the music itself—if it is that—may be an equal pleasure. As Lansky says, generally, "In the end I hope a good time is had by all. . ." Amen!
Edward Tatnall Canby

Familiar Pieces by Haydn, Schumann, Tchaikovsky, Stephen Foster, Vivaldi, Rimsky-Korsakov, Mendelssohn, Offenbach, and anonymous

The All Star Percussion Ensemble II,

Harold Farberman

GOLDEN STRING GSCD 013, CD; 46:35

While the cover proclaims these are "Classic [sic] As Never Heard Before," truth is they were heard in the early '80s on the first All Star Percussion Ensemble album on the Moss Music label.

Conductor Harold Farberman started his career as a percussionist in the Boston Symphony. His early percussion piece, "Evolution," changed the direction of his career, toward both composition and conducting.

The percussion ensemble has now emerged as an independent performing entity with an astonishing sound spectrum—sonorities that are a natural for audiophile-oriented recordings. Farberman selected seasoned professional percussionists, capable of superb "do it once" recording performances, from the Boston, Pittsburgh, and Royal Danish Symphonies; the Philadelphia



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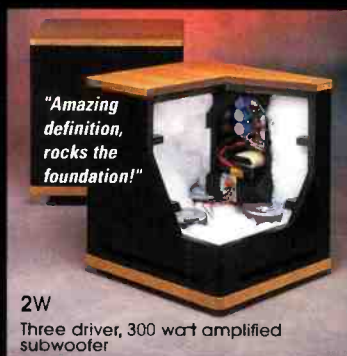


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and Cleveland Orchestras; the New York Philharmonic, and the Met Opera Orchestra.

The first session had eight to 10 players; the total for Ensemble II is not given, but reportedly over 300 percussion instruments are variously banged, stroked, scraped, and otherwise attacked during the nine skillful and witty transcriptions. Haydn's "Surprise" has perhaps never been so surprising! And the Can-Can must be heard to be believed. It all takes me back to the early days of hi-fi demos and an Emory Cook 10-inch LP titled "Speed the Parting Guest." Great fun and great sounds!

John Sunier

Walzer à la Paganini: Musik des Biedermeier, III

Biedermeier Ensemble Wien
DENON CO-75779, CD; 75:15

What a charmer! One of the most deliciously played recordings I ever hope to hear. It is utterly musical and marvelously styled, rhythmed, and pitched, the essence of the Viennese waltz tradition in 15 examples—not one familiar, and every single one delightful. They range from Philipp Fahrbach, *Vater und Sohn*, to Johann Strauss, the same (Sr. and Jr., in our terms), plus Josef, brother of Johann Jr., and the famous but rarely heard Joseph Lanner, who started the whole century-long tradition.

The music is, of course, arranged, by one Helmuth Puffler, first violinist in this Viennese-based string group of two violins, viola, and double bass (for the oom-pah-pah); this only adds to the intimacy and persuasiveness of the music. Such sweet violin sounds! Herr Puffler carries most of the melodies, but when the second fiddle joins him, the sound is indescribably beautiful.

All waltzes? No. There are a few polkas, galops, and Ländler—and the ever-changing tempo, so knowledgeable of the Viennese style, avoids even a trace of monotony. By the way, the double

bass should be a gently perfect workout for your subwoofs.

Edward Tatnall Canby

Shchedrin: Carmen Suite; Concerto for Orchestra ("Naughty Limericks")

Ukrainian State Symphony
Orchestra, Theodore Kuchar

NAXOS 8.553038

CD, DDD, 55:30

This is the same spectacular ballet score, transmuted from bits of Bizet's opera, that Arthur Fiedler and the Boston Pops originally popularized in the U.S. It was



the first ballet the Russian composer wrote specifically for his wife, Marya Plisetskaya of the Bolshoi. The dance connection is emphasized by the wide range of percussion instruments used here—requiring five cooks in the "kitchen" department of the orchestra—plus a large string orchestra.

The suite consists of 13 movements covering most of the popular tunes from the opera. Rodion Shchedrin creates a rich and colorful orchestration out of his seemingly limited resources, stressing the dramatic nature of the original music. An example of his imagination and musical wit is the "Torero" aria, during which the melody totally disappears—yet any listener might swear to its being audible!

The close-up and clean sonics present the *Carmen* suite as more of a sonic blockbuster than any of the previous recorded versions, and the performance is as good as Fiedler's. "Naughty Limericks," another virtuoso work, is based on the tunes of satirical and often scatological limericks familiar to most Russians. The composer recited one about "Uncle Joe" Stalin to this writer, but neither space nor propriety allows its quotation here.

This disc is another example of how the bargain record labels often better the full-price ones, if you're not adamant about musical "names." John Sunier

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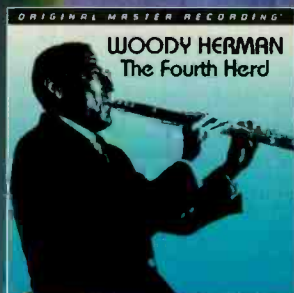
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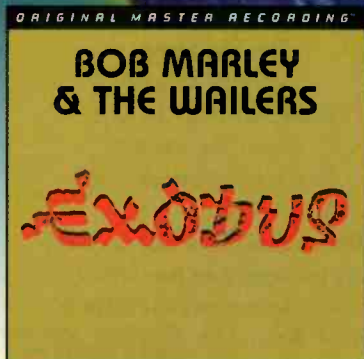
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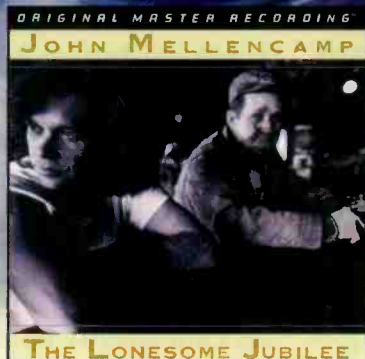
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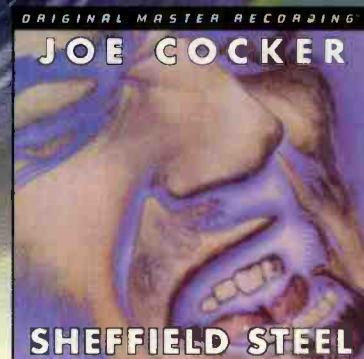
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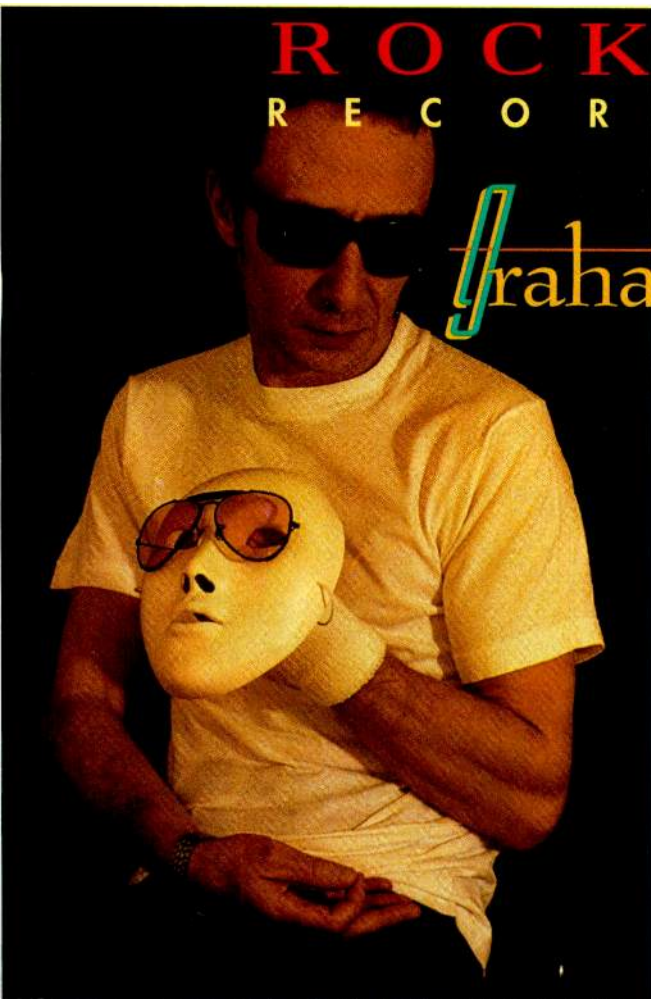
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Graham Parker



12 Haunted Episodes

Graham Parker

RAZOR & TIE RT 2817, 44:31

Sound: B+, Performance: A



In 20 years of recording, Graham Parker has never sounded more confident than on *12 Haunted Episodes*, his debut for the indie label Razor & Tie. Parker appears to have abandoned his previous goal of becoming the “next big thing” in favor of making music he feels good about. Certainly, freedom from the commercial expectations of major labels only helps his cause.

Over the years, Parker has gotten a lot of mileage out of discontent and grouching. *Episodes*, in contrast, kicks off with two of his sunniest songs ever. “Partner for Life” celebrates a strong, happy working relationship, while “Pollinate” reinforces this ro-

manic ideal with lyrics like “Baby I’m not filled with hate/That’s all wrong/That’s out of date.” His exuberance with these glad tidings places the album, from the outset, somewhere near euphoria.

Even when Parker gets grumpy, there’s a joyous subtext at work. “Force of Nature,” which recalls Dylan’s “She Belongs to Me,” gleefully catalogs a partner’s peculiarities. “See Yourself” is a torrent meant to insult a false friend with a maze of wit. “Disney’s America,” about the failed corporate attempt to place a theme park near one of Virginia’s hallowed Civil War battlefields, is tender and eloquent, with one of Parker’s loveliest melodies ever. But it’s songs of hope that really distinguish *12 Haunted Episodes*: “Next Phase” recounts the evolution of Parker’s current relationship, “Fly” is about the end of a difficult chapter in his life, and the fitting closer is the optimistic “First Day of Spring.”

Production is spare and smart, with nothing wasted or gratuitous. Parker plays all the guitar and bass parts (plus harmonica) and gets solid support from drummer Denny McDermott and piano/organ work from Joel Diamond. Kudos to engineer Chris Andersen for excellent soundcrafting.

Clearly, *12 Haunted Episodes* is a high-water mark in Graham Parker’s checkered recording career. It’s especially satisfying to find this eternal misanthrope finally at ease and at peace. It’s even more satisfying to find him able to shape this newfound serenity into these excellent songs.

Michael Tearson

Music for the Jilted Generation

The Prodigy

MUTE 9003-2, 70:10

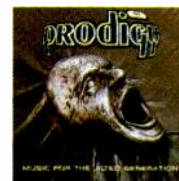
Sound: A-, Performance: B-

The Prodigy are the accessible side of techno. Their beats aren’t as hard, and their melodies are slightly more prominent. They hew more toward the chromium electronics of Orbital rather than the surreal sound fields of The Orb.

On *Music for the Jilted Generation*, The Prodigy create their own high-tech, post-Kraftwerk world. It is a kinetic landscape populated by staccato melodies, soul-diva exhortations, and grinding rhythms. They use liberal samples, everything from heavy-metal shouts to a sample of a sample from The Art of Noise (the aged godfathers of sampling).

This is curiously compelling music: The beats are relentless, but so are the dynamics that keep things from becoming a nonstop techno grind. It’s like a carnival—all lights, sounds, and sensations—and though there’s not too much going on underneath, at least the midway is fun.

John Diliberto



The Big Bang

Various Artists

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Sound: A, Performance: A

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Essentially, *The Big Bang* celebrates the drum and its connection to Mother Earth, traversing cultures like the soundtrack to some wondrous travel on the Discovery Channel. From the Cook Islands to Ghana, Korea, Guinea, Brazil, and Cameroon, we're treated to a patchwork of percussive sounds. We hear the burning Afro-Cuban conga work of Giovanni Hidalgo, the brilliance of Indian tabla master Zakir Hussain, the mesmerizing sound tapestries of Javanese gamelan orchestras, and the churning conga of Santeria priest Carlos "Patato" Valdes. The incredible frame drummer Glen Velez and Brazilian percussion mas-

ter Airoto are each featured in solo performances. We eavesdrop on two Baka Pygmy women bathing in a river and slapping their hands on the water's surface to create a rhythmic accompaniment to their vocals. We hear Islamic ritual jams, military drumming from Armenia, percussion to accompany the Ming-Chung Puppet Troupe of Peking, and one first-rate example of Native American drumming.

But we're also treated to updated examples of ancient traditions. Frank Zappa alum Terry Bozzio offers his version of an African percussion ensemble on the drum kit. The Grateful

Dead's Mickey Hart explores techno-primitive grooves with his Planet Drum orchestra, combining organic drumming and MIDI triggers in a most creative way. Former Santana drummer Michael Shrieve and noted session drummer David Beal use two Octapads (MIDI triggers struck with drumsticks) for a hip-hop update of Cozy Cole's 1950s swing hit "Topsy, Part II." Carl Palmer (of the supergroup Emerson, Lake, & Palmer) gives an awesome display of his rolling pyrotechnical approach to the kit on the drum solo from ELP's "Karn Evil 9," while Jack DeJohnette goes into polyrhythmic overdrive with "Last Chance to Stomp," from his 1975 fusion album, *Cosmic Chicken*.

Excerpts from interviews with noted drummers (Bob Moses, Rush's Neil Peart, Joey Kramer of Aerosmith, T. S. Monk, Stewart Copeland, Ginger Baker) help to illustrate just how much these drumming styles have in common. Curiously, though, jazz is underrepresented. There's no Max Roach, Milford Graves, Elvin Jones, Andrew Cyrille, Baby Dodds, Tony Williams, or Roy Haynes—all players who elevated melodic, conversational drumming to a high art. But maybe that's a whole other three-CD set. *Bill Milkowski*

Whip-smart

Liz Phair

MATADOR 92429-2

Sound: B-, Performance: B+

Whip-smart is Liz Phair's follow-up to her out-of-nowhere 1993 debut, *Exile from Guyville*. It also sounds like it was made the week—not the year—after *Guyville*. This is good news and bad news.

It's good news because Phair remains a candid and clever wordsmith, complementing her lyrics with a trashy sound that adds to her originality. Her influences—which include The Pretenders, The Rolling Stones, and Galaxie 500—are obvious, but they coalesce into a pastiche with its own messy personality. It's this unabashed, raw honesty in both music and message that gives Phair her unique charm, which is maintained here. And songs like the title track, "Go West," and "X Ray Man" prove that her talent is genuine.

The bad news is that Phair appears to be dependent on this formula. It worked amazingly on *Guyville*, causing the media buzz that hailed her as a bold new voice. But on *Whip-smart*, it seems redundant—an indication that for her third album, Phair will have to consider writing a second act. She needs to



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grow as a songwriter, and a sonic upgrade wouldn't be unwelcome.

Until then, *Whip-smart* will do. For now.

Jon & Sally Tiven

The Poet Game

Greg Brown

RED HOUSE RHR CD 68, 51:04

Sound: B+, Performance: A-

Greg Brown's nine-album career has earned him a "folkie" tag and plenty of accolades, including comparisons to Bruce Springsteen, Mark Knopfler, even Tom Verlaine. But Brown carves out his own niche; he's a superb

contemporary singer/songwriter who flirts with the disparate genres of blues, pop, and folk. With a low, quavering voice and a thoughtful persona (his delivery has the cheekiness of a polished Tom Waits), his originality draws in listeners winningly. Whether complaining about the boomtown phenomenon or musing about Elvis and Jesus, he hits his mark about 80% of the time.

Brown's 10th and latest album, *The Poet Game*, is by far his best-produced effort. Consistently well written, songs such as "Brand New '64 Dodge" and "Ballingall Hotel" aren't about a car or a place where you bed down, and the title song isn't about a new competi-

tion—with Brown, songs mean something entirely different from what their titles suggest. He conveys his feelings with a kind of openness rarely encountered in contemporary music. "One Wrong Turn," for example, is a blues piece sung with more maturity than you'd expect from someone so young; it isn't a Beck-like, tongue-in-cheek pastiche, but an affecting leap into a difficult genre. The uncluttered arrangements, performed with a small band (led by guitarist Bo Ramsey), only add to the weight of the lyrics. In a world of Jackie Collinse and Rush Limbaughs, Brown looks Faulknerian by comparison. Grab *The Poet Game* while Greg Brown is still a cult item.



Jon & Sally Tiven

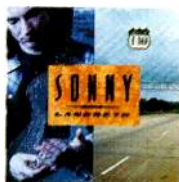
South of I-10

Sonny Landreth

ZOO/PXAXIS 72445-11070-2, 48:03

Sound: A, Performance: A

Sonny Landreth is a serious triple threat—great songwriter, distinctive vocalist, and stunning instrumentalist. After KO'ing audiences with his virtuoso slide guitar while playing in the service of John Hiatt, Zachary Richard, Clifton Chenier, and John Mayall, he scored a triumph with his 1992 debut, *Outward Bound*. Landreth's follow-up, *South of I-10*, is chock-full of more astounding slide guitar, and it oozes with the earthy charm of his native Louisiana.



No other slide guitarist (with the exception of the amazing David Tronzo) has more impressive technique, and few others cut with the powerful, ripping tone that has become a Sonny signature. That alone might be enough to attain cult status from rabid guitar freaks, but Landreth's upbeat, rocking originals ("Shootin' for the Moon," "Turning Wheel," "Creole Angel," and the autobiographical title track) have much wider appeal. And when Landreth turns to his swampy roots—as on the affecting "Cajun Waltz," his oft-recorded "Congo Square," the zydeco romp "C'est Chaud (It's Hot)," or the anthem "Great Gulf Wind"—he weaves a wistful hoodoo on the listener. And don't worry, guitar freaks, there's plenty to drool over on the lone instrumental track, "Native Stepson," which combines a Celtic tinge with a Cajun touch.

Mark Knopfler makes a special guest appearance on guitar and vocals, but the real treat here is Landreth's piano/dobro duet with New Orleans legend Allen Toussaint on J. B. Lenoir's "Mojo Boogie."

Bill Milkowski

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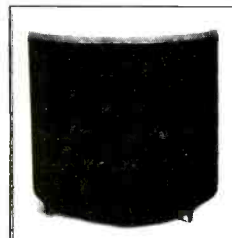
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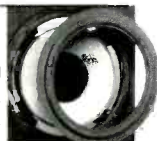
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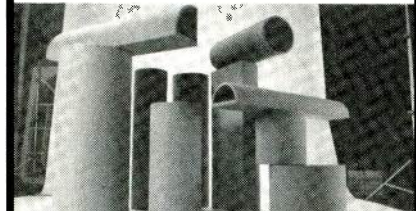
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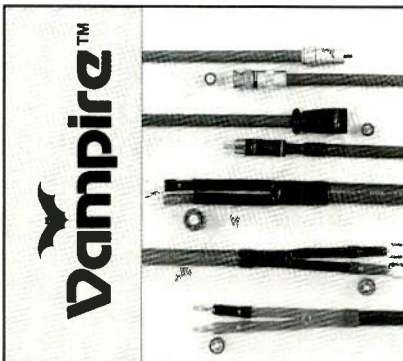
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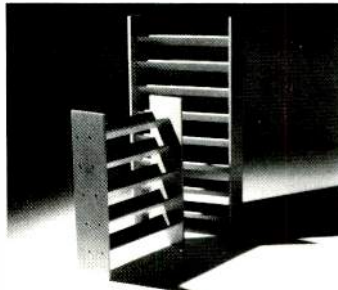
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AD INDEX

Firm (Reader Service No.)	Page
Adcom (1)	9
Advent	59
Audiophile Systems	18
AudioQuest	Cover IV
Audio Research (2)	33
BMG	16 a & b
Bose/Wave Radio	23
Brystonvermont (3)	27
Caig Laboratories (4)	17
Cambridge SoundWorks (5, 6)	10, 11
Canon (7)	28-29
Carver (8)	79
Chase Technologies (9)	23
Crutchfield (10)	69
Dave's	*21
Digital Phase (11)	67
Eclipse (65)	43
Electronics Depot	86
Energy (13)	13
Ford Electronics	47
Home Theatre Systems	80
Infinity (14)	7
J & R Music World (15)	83
Kimber Kable (16)	75
Linn Hi-Fi	18
Martin-Logan	3
Mobile Fidelity (17, 18)	77, 81
Monitor Audio (19)	32
NAD (34)	14 & 15
Nakamichi (66)	43
NBS Cables (21)	55
New West Electronics (22)	84
Panamax (23)	63
Parasound	53
Pioneer (24)	Cover II & 1
Pontiac/Firebird (25)	31
Precision Power (67)	43
Sonic Frontiers (27)	Cover III
Sound City (28)	85
Stillwater Designs (68)	43
Sunfire Corporation (30)	60
Thiel	25
Vandersteen (31)	78
Westlake Audio (32)	73
Yakov Aronov (33)	12
Yamaha	5

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PlayBack

MB Quart Vitalizer Psychoacoustic Processor

The benefits of sound processors seldom outweigh the detriments of adding their extra amplification stages to the signal path. MB Quart's Vitalizer, however, does much more good than harm. Its useful "Bass" control makes the bass tighter or looser, "Tune" sets the lower frequency limit for the midrange effects, "Process" sets effects levels for the bass and midrange, and "Harmonics" plays phase games with the treble. It takes a long time to get a feel for the controls and how they interact, but the Vitalizer worked as advertised, and it added punch and presence to all the LPs and CDs I tried it with. However, I couldn't leave it on all the time; it was never entirely transparent, and it removed too much of the delicacy of well-recorded acoustic music. Once you get the Vitalizer set for a recording, it always seems to improve response and dynamics, but at the expense of detail, imaging, and soundstaging. The "Bass" feature is the best part: It doesn't degrade the bass at all, and it lets you dial in almost any quality of bass you like. The only processor I've tried that's

clean enough to use all the time is the Cello Palette preamp, which costs \$6,500. For the tiny amount of rock/pop listening that I do,

GRADE: B

spending \$1,200 for the Vitalizer just wouldn't be cost-effective—but I'd definitely want one if I had a project studio, and it'd be great for rock/pop listeners who want to tweak a lot. Build quality is excellent—sturdy RCAs in back, microstepped pots, solid chassis.

Brent Butterworth

For literature, circle No. 120

Sony TC-K615S Dolby S Cassette Deck

Sony's TC-K615S three-head cassette deck (\$400) is of the same family as the discontinued, best-buy TC-K690 Dolby C deck and the company's first Dolby S deck, the TC-K611. But Sony apparently has moved some best-buy features up to its ES line, leaving the TC-K615S without a headphone volume control (a big mistake) and a three-motor transport/tape-loading mechanism. However, the deck still has enough goodies to make it a strong performing recorder, including its outstanding Dolby S NR, Dolby HX Pro headroom extension, manual bias control, and easy-to-read peak meters. With Dolby S, the cassette reveals its highest sound quality yet. In comparisons using TDK MA tape, it was difficult to tell the difference between source and recording when listening to pop and jazz. Dolby S is said to be a few dB quieter than Dolby C, but the major differences are a less bright sound and a lack of low-level "pumping" or grunge in quieter passages.

John Gatski

For literature, circle No. 121



GRADE: B

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particularly well with Motorola's cellular phones. (The less expensive Lifestyle Series is limited to hard-wired phone lines.)

GRADE: A

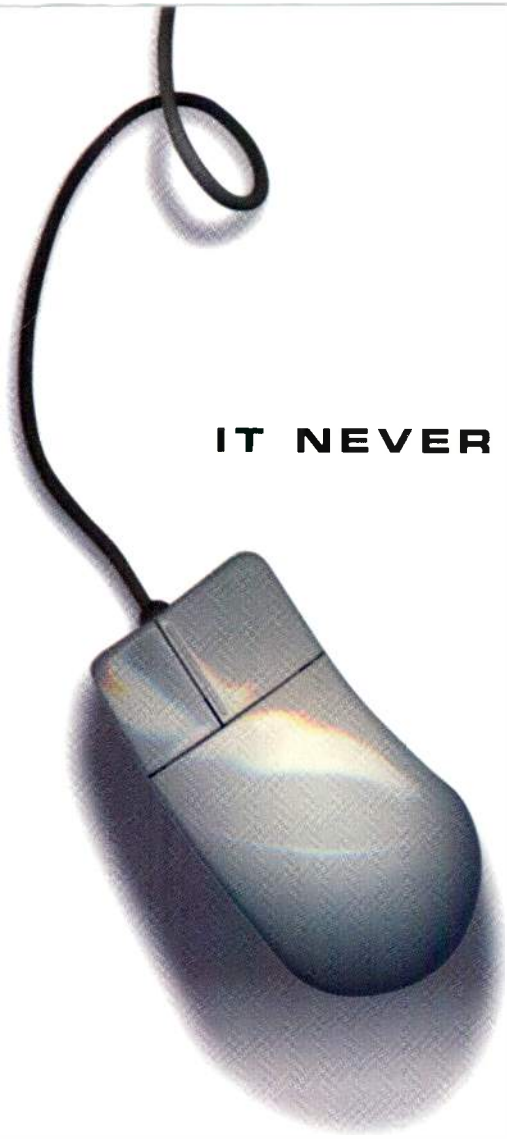
Setup isn't a problem, even though the quickie instruction sheet is written in a version of English perhaps best described as quaint; the big manual is better, so read it! The software includes the usual setup/utility programs (well integrated, by the way) and the increasingly popular WinFax Lite to turn your computer into an on-demand fax machine. Of course, CompuServe and America Online stuff comes too. Supplied cables and adaptors take the worry out of becoming connected. How's it work? Nicely, thanks. Would you believe me if I said the modem "sounds" good? *Nah!* So I won't. But it does what it's supposed to.

Aaron Frederick

For literature, circle No. 122

"PlayBack" mini-reviews are the result of short, sweet, and sometimes deadly testing by our all-too-experienced editors and writers. These hands-and-ears-only write-ups may look like new product announcements, but the grades and text reflect what the reviewer thought after less than an afternoon's "honeymoon."—E.P.

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"The Sonic Frontiers SFD-2 MKII with its HDCD decoder/filter chip establishes a new benchmark in digital-playback sound quality... the MKII is the best-sounding processor I've heard to date..."

ROBERT HARLEY

Stereophile, Vol. 18 No. 3, March 1995

With the constant technological advancements in digital audio, Sonic Frontiers has never been content to just sit back and relax once a design has proven itself. The SFD-2 MKII Digital Processor reflects this attitude and, once again, sets a new benchmark in digital audio. It is the culmination of more than a year's worth of improvements and revisions to the critically acclaimed SFD-2, winner of *Stereophile's* "Digital Source of 1994" award.

To achieve the goal of improved functionality and sonic performance, the SFD-2 MKII incorporates refinements in its industrial design, ergonomics and analog output stage, plus a significant redesign of the entire digital stage. The changes to the digital stage required the development of an all new digital PCB (readily accomplished due to the SFD-2's modular design), which incorporates 2 additional digital inputs (BNC and Toslink); a low-jitter AES21 input receiver and customized D20400A DAC modules from UltraAnalog™; and the Pacific Microsonics PMD-100 HDCD® digital filter/decoder chip.

The HDCD process is a true advancement in digital audio reproduction, providing one of the single greatest improvements in digital audio since the introduction of the CD format more than a decade ago. This sophisticated encoding/decoding system greatly reduces both additive and subtractive distortions in digital recordings, providing a resolution and freedom from distortion equal to that of analog recordings. In addition, the HDCD decoder's internal digital filter provides significant sonic improvements to non-HDCD source material as well.

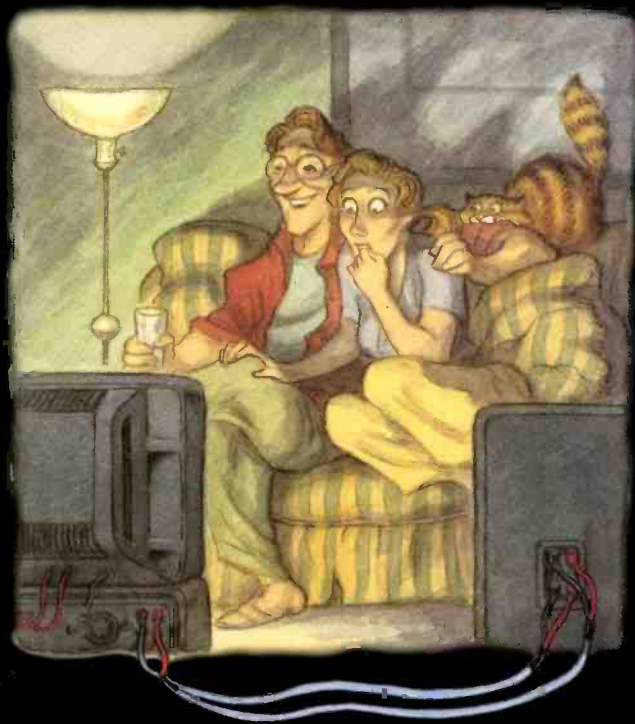
Extensive listening sessions confirm the sonic impact of the HDCD process on the SFD-2 MKII. Non-HDCD recorded material is improved in the areas of bass quality, extension, weight and authority; the sound is less forward, while at the same time more involving and dynamic. However, with HDCD source material, the SFD-2 MKII's sound is transformed into a new realm. Soundstage width, depth and height explode; instrument focus is pinpoint and the musical soundstage is "blacker", allowing you, the listener, to

be pulled deeper into the musical experience. With HDCD recordings, the music just sounds right.

Contact Sonic Frontiers for more information on the latest benchmark in digital audio reproduction - the SFD-2 MKII Digital Processor (or for information on our digital upgrade program for existing SFD-2s). In keeping with today's constantly changing technology in digital audio, it is no longer a matter of "back to the drawing board" - at Sonic Frontiers "it never leaves the drawing board."

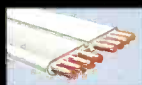
 **SONIC FRONTIERS**
INCORPORATED

BREAKING THE SOUND BARRIER



Which scares you more, a horror film with the sound turned off, or a horror show on the radio? The answer is easy because it is the movie's soundtrack which carries the pathos and emotion. You can enjoy sound without pictures, but who wants pictures without sound?

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It doesn't cost more to do it right! AudioQuest offers a full range of cables, but the biggest improvement you'll hear is going from big

fat stranded cable to the least expensive cables from AudioQuest. For the complete story, please call or write for our *Cable Design* booklet - or better yet, visit an AudioQuest dealer and listen for yourself.

It just so happens that cables are the part of your system which can help or hurt the performance the most... and for the least money. Whether you have two-channel stereo or multi-channel stereo, you have to have cables. You can't completely fix a bad system with good cables, but you can seriously degrade a good system with badly designed cables.

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