Audio®

SUBWOOFER SHOOTOUT

THUNDER IN THE LISTENING ROOM
4 SUBWOOFERS HEAD TO HEAD

A BETTER WAY
VIMAK DS-2000 D/A CONVERTER **AND** PREAMP

TESTED
2 **GREAT GRADO** HEADPHONES

REFERE
CD PLA
FROM **T**

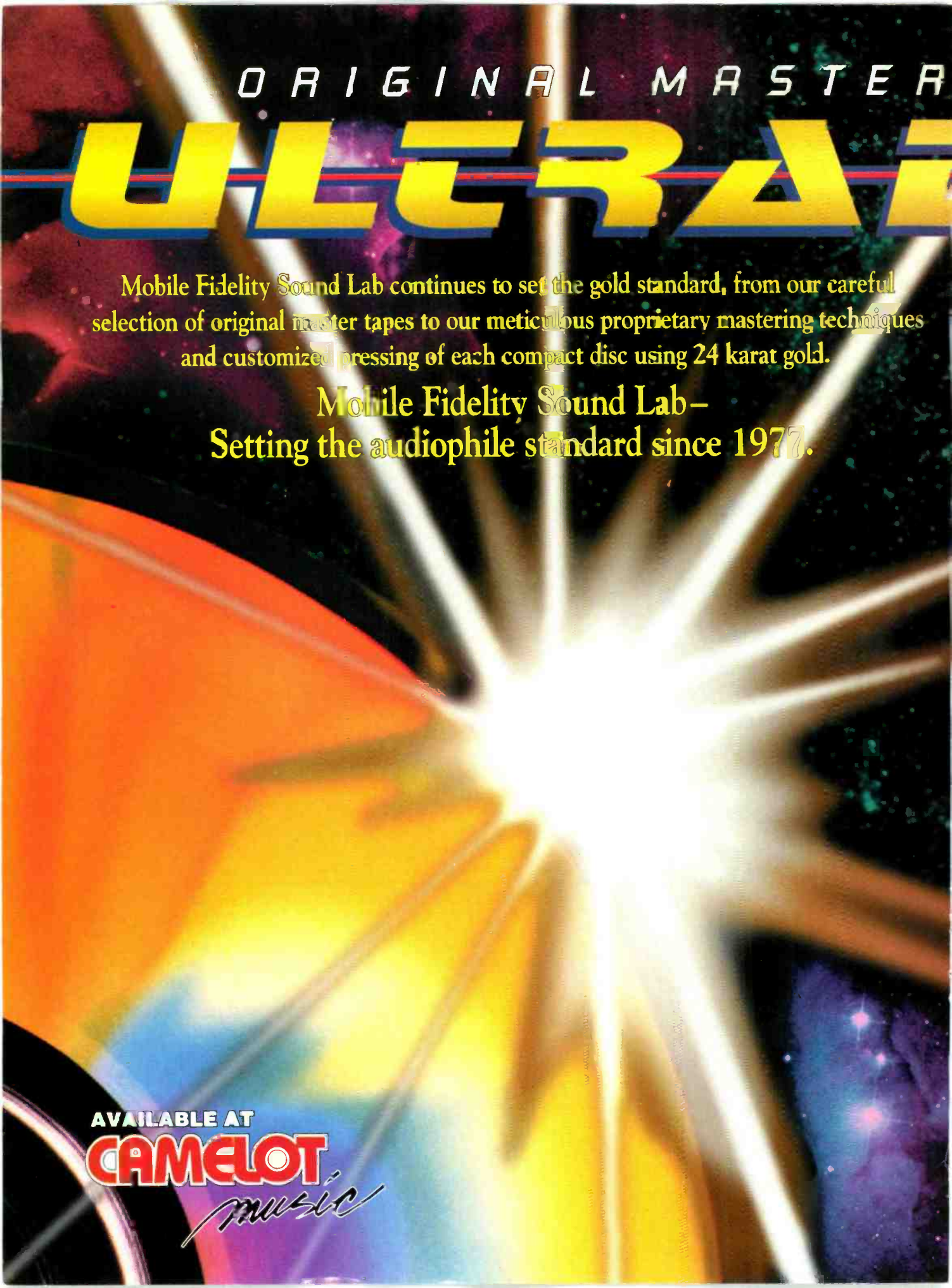
HOT KOSS ESP/950 HEADPHONES

NOV 1992
US $2.95
UK £1.95
CAN $3.50

WE CHANGED THE WAY YOU LISTEN TO MUSIC. NOW CHANGE THE WAY YOU CHANGE IT.

We created Compact Discs to bring you the true power of music. And now Sony CD Changers bring you hours of the music you enjoy. In whatever order you choose to hear it. And with DSP, you can actually change—from a Concert Hall to a Jazz Club—to suit your mood. In music, change is good. In CDs, changers are better. From Sony.

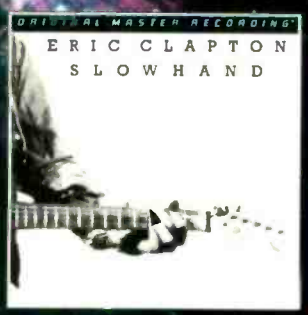

SONY
DISC-5
PROGRAM
HIGH DENSITY LINEAR CONVERTER
DIGITAL SERVO SYSTEM / OPTICAL DIGITAL OUTPUT
DISC SKIP
OPEN/CLOSE
LINE OUT
PHONE LEVEL
PHONES
PULSE
D/A CONVERTER


ORIGINAL MASTER
ULTRA
Mobile Fidelity Sound Lab continues to set the gold standard, from our careful selection of original master tapes to our meticulous proprietary mastering techniques and customized pressing of each compact disc using 24 karat gold.
Mobile Fidelity Sound Lab–
Setting the audiophile standard since 1977.
AVAILABLE AT
CAMELOT
music

RECORDING™

ULTRADISC II™

UDCD 552



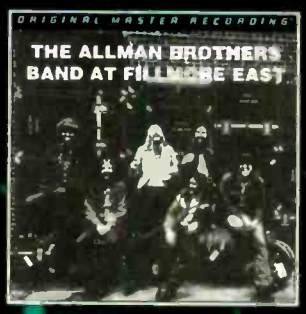
UDCD 553

UDCD 554

UDCD 555

UDCD 556

UDCD 557



UDCD 2-558

UDCD 559

UDCD 560

UDCD 561

UDCD 562

UDCD 567

New Releases

UDCD 565

UDCD 568

mobile fidelity sound lab
a division of MFSL, INC.

The Great American Audio Company™

ULTRADISC II™ is a new, improved ULTRADISC™ formulation.

For a free MFSL catalog, call 800-423-5759

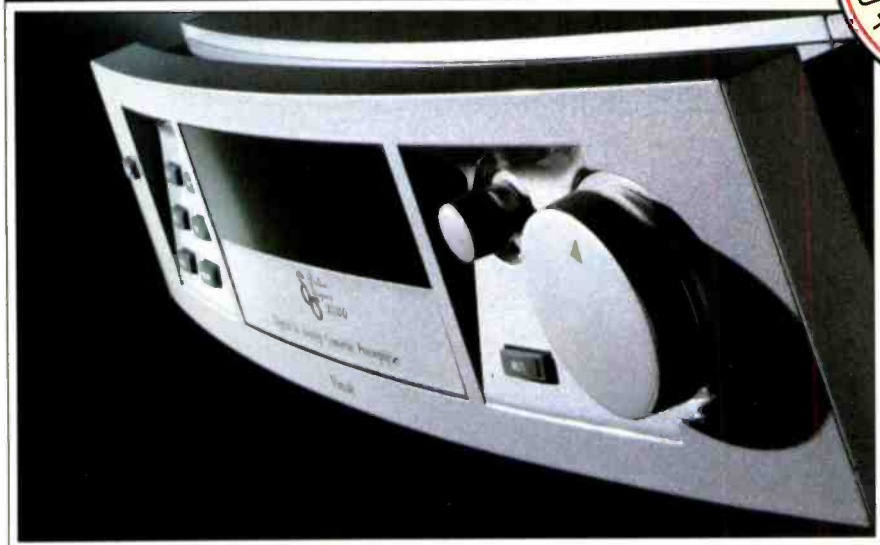
Enter No. 17 on Reader Service Card

Audio

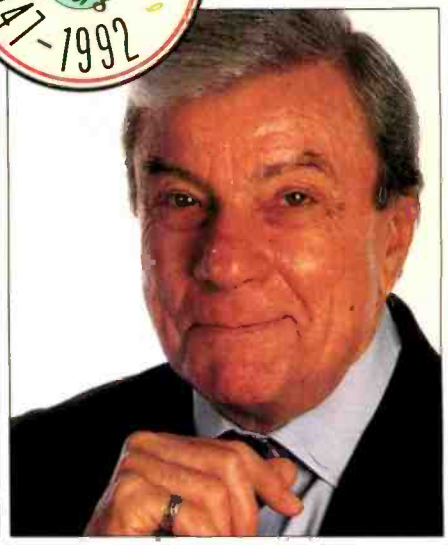
NOVEMBER 1992

AUDIO 45 years 1947-1992

VOL. 76, NO. 11



Vimak DS-2000, page 54



Jack Pfeiffer, page 44

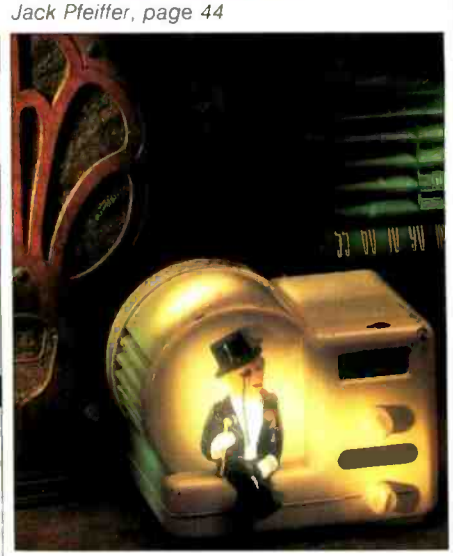
The Cover Equipment: Vimak DS-2000 D/A converter and preamp
The Cover Photographer: ©Carl Zapp.

Audio Publishing, Editorial, and Advertising Offices,
1633 Broadway, New York, N.Y. 10019.

Subscription Inquiries, (800) 274-8808;
in Canada or other foreign countries, (303) 447-9330.

The Audit Bureau

MPA



AM Reception, page 22

Tom Verlaine, page 118

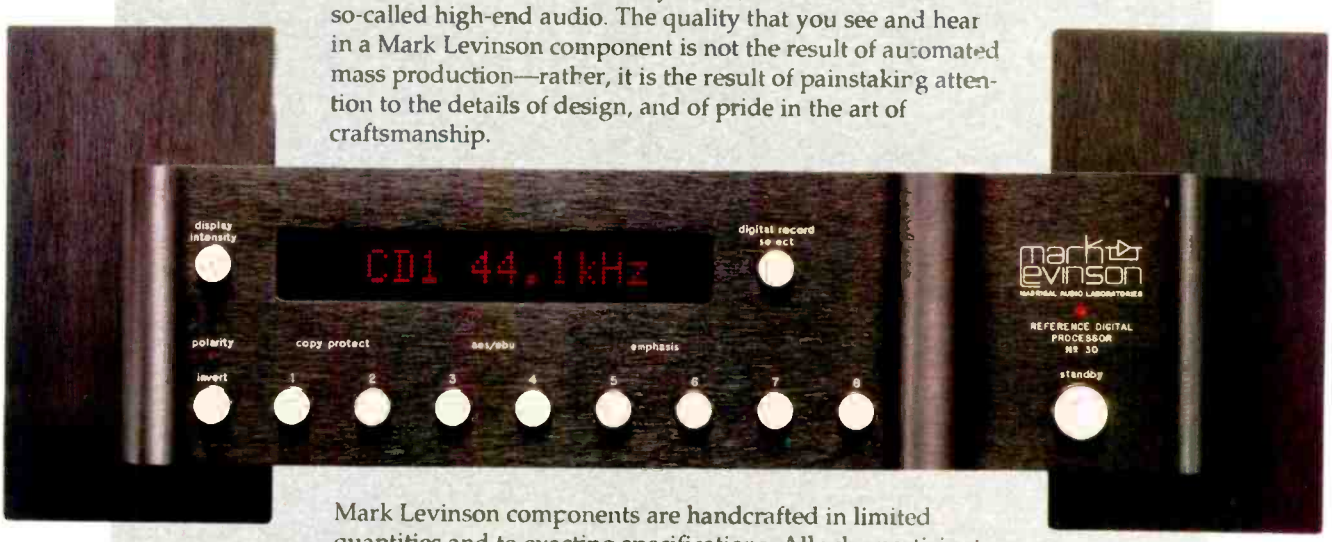
Nº 30

REFERENCE DIGITAL PROCESSOR

PRIDE IN THE DETAILS . . .

Mark Levinson® components have earned a reputation for their rugged reliability, uncompromising fit and finish and, above all, superior sonics. We at Madrigal Audio Laboratories are understandably proud of this reputation.

The presence of "high technology" in our society has, for some, come to mean the absence of craftsmanship. Mass-produced look-alikes are everywhere, even in the realm of so-called high-end audio. The quality that you see and hear in a Mark Levinson component is not the result of automated mass production—rather, it is the result of painstaking attention to the details of design, and of pride in the art of craftsmanship.



Mark Levinson components are handcrafted in limited quantities and to exacting specifications. All who participate in their production share the feeling of pride that comes from knowing that they contribute to a product that defines quality.

It is with great pride, then, that we introduce the Mark Levinson Nº 30 Reference Digital Processor. Five years of exhaustive research into digital audio yielded a processor worth waiting for, deserving of the Levinson marque.

The Nº 30 is a true reference: it neither adds to nor subtracts from the music. It brings to your home the accuracy as well as the essence of the performance. Finally, the promise of digital audio is fulfilled.

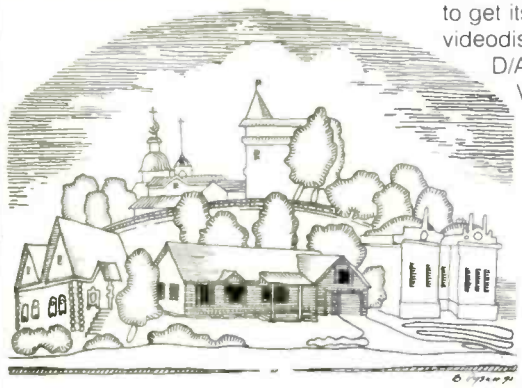
The Nº 30 is proof that state-of-the-art digital *and* analog technology can coexist with craftsmanship. The subject here, however, ultimately is music, and the heart of music is in the listening. To fully appreciate the quality of the Nº 30, we recommend that you visit your Mark Levinson dealer for a full audition.

mark levinson®

Mark Levinson® products are designed and manufactured by
MADRIGAL AUDIO LABORATORIES P.O. Box 781, Middletown, CT 06457 FAX (203) 346-1540

FAST FORE-WORD

Imagine a typical American-style house, a 1,300-square-foot ranch, fitted out with a not-quite-typical, very high-end audio system. Now imagine that house located 190 kilometers (118 miles) or about 3 hours by car from Moscow, in the Russian city of Vladimir, an industrial city of 350,000. Imagine further that most of the building materials and furnishings were donated by companies like Georgia Pacific, Whirlpool, GAF, Marvin Windows, Eureka, et al. Dedicated July 4 of this year, the house was principally built by construction workers from the area of Bloomington-Normal, Ill., sister cities of Vladimir. The project is titled "The First American Home in Russia."



"The First American Home in Russia," being completed in Vladimir

Illustration: V. Ruzin

The electronics in the home were supplied by members of the Academy for the Advancement of High-End Audio, with project coordination by the Academy's director, Joyce Fleming of The Mod Squad. The audio system includes major components in the living room with satellite speakers for the office, master bedroom, and patio, plus a completely independent, full home theater with surround sound. The components include:

Acoustic Research M4 loudspeakers; AudioQuest PT-7 tonearm and MC-5 cartridge; Counterpoint 220 amplifier; Crown PSL-7 preamp and PS-200 amp; Definitive Technology DR7 speakers; Harman Kardon DC5700 cassette deck; Krell Digital CD-1 Compact Disc player; Lexicon CP-2 surround sound processor; Mod Squad McCormack Signature CD player; Monster Cable interconnects and speaker cables; Niles SVC-4L speaker selector; Pinnacle PN8+ speakers; Polk CS100, RTA15, and M3 (both indoor and all-weather versions) speakers; two RCA television sets (still to come), and a VPI HW-19 Jr. turntable. All of the main system in the living room will be housed in a cherry wood cabinet from Custom Woodwork and Design. Theta Digital was not able to get its Theta Data combination CD/videodisc transport and DS Pro Prime D/A converter through customs.

Vladimir and its environs are interesting. Founded in 1108, the city was for two centuries the capital of Russia and is presently home to factories producing textiles, chemicals, tractors, and furniture, among other items. The Golden Ring area, where Vladimir is one of 11 principal cities, has over a thousand years of cultural and political history.

The actual building of the house was a cooperative project. Russian workers from Vladimir operated heavy equipment, while American construction workers poured footings, did framing, etc. Even though the house was formally dedicated on July 4, there remains some work to be done by a plumber, a flooring specialist, and a carpenter, who will go to Vladimir later on when the installation of the audio system is being finished. Ric Mancuso of Monster Cable has been doing the actual setup of the system, as well as much of the project coordination.

Dr. Ronald R. Pope initiated the project. He is associate professor of political science at Illinois State University in Bloomington-Normal and president of Serendipity: Russian Consulting and Development, Ltd., which uses the home as its offices and as a classroom for American English and culture courses. There is a small library of used paperbacks and magazines. The design and overall supervision of the construction were done by Dr. C. E. Francis, ISU professor of industrial technology and specialist in energy conservation.

Audio

V.P./Editor-in-Chief: Eugene Pitts III

Art Director: Cathy Cacchione
Associate Art Director: Linda Zerella

Technical Editor: Ivan Berger
Managing Editor: Kay Blumenthal
Associate Managing Editor: Teresa Carriero
Associate Managing Editor: Douglas Hyde
Directory Editor: Ken Richardson
Assistant Editor: Joe Wiesenfelder
Assistant Editor/Music: Michael Bieber

Associate Editors:
Edward Tatnall Canby, Bert Whyte
Senior Editors:
Leonard Feldman, D. B. Keele, Jr., David Lander

Contributing Editors/Artist:
M. Aldred, H. Burstein, D. L. Clark, A. H. Cordesman, T. Costa, J. Diliberto, F. Driggs, J. Eargle, S. Elliott, E. J. Foster, J. Giovanelli, B. H. King, E. M. Long, R. D. Long, F. Lovece, J. W. Poses, J. R. Sank, M. Tearson, J. & S. Tiven, M. Wright

General Manager: Greg Roperti
Production Director: David Rose
Production Manager: Kerry Tonning
Research Manager: Dru Ann Love
Office Manager: Nadine Goody
Operations Manager: Sylvia Correa
Ad Coordinator: Linda Neuweiler

V.P./Group Publisher: Nicholas Matarazzo
(212) 767-6035
V.P./Assoc. Publisher: Tony Catalano
(212) 767-6061

ADVERTISING
Regional V.P./Ad Director, East Coast:
Charles L. P. Watson (212) 767-6038
Regional Account Mgr.:
Christine B. Forhez (212) 767-6025
Regional V.P./Ad Director, Midwest:
R. Scott Constantine (212) 767-6346
Regional V.P./Ad Director, West Coast:
Bob Meth (213) 954-4831
Western Mgr.: Paula Mayeri (213) 954-4832
National Record Label Sales: MAG Inc.
Mitch Herskowitz (212) 490-1715
Steve Gross (212) 490-1895

Hachette Magazines

Chairman: Daniel Filipacchi
President, CEO, and COO: David J. Pecker
Exec. V.P. and Editorial Director: Jean-Louis Ginibre
Sr. V.P./Dir. Corp. Marketing: Paul DuCharme
Sr. V.P./Dir., Corp. Sales, Mag. Network: Jay Burzon
V.P./Dir. of Strategic Planning, Adv. & Circ.: Patrice Listfield
V.P., Chief Financial Officer: Paul De Benedictis
V.P., Corp. Communications: Jolie Cross Doyle
V.P., General Counsel: Catherine Flickinger
V.P., Mfg. & Distribution: Anthony Romano
V.P., Circulation: Leon Rosenfield

AUDIO, November 1992, Volume 76, Number 11. AUDIO (ISSN 0004-752X, Dewey Decimal Number 621.381 or 778.5) is published monthly by Hachette Magazines, Inc., a wholly owned subsidiary of Hachette Publications, Inc., at 1633 Broadway, New York, N.Y. 10019. Printed in U.S.A. at Dyersburg, Tenn. Distributed by Warner Publisher Services Inc. Second class postage paid at New York, N.Y. 10001 and additional mailing offices. Subscriptions in the U.S., $24.00 for one year, $42.00 for two years, $58.00 for three years; other countries, add $8.00 per year.

Subscription Service: Forms 3579 and all subscription correspondence must be addressed to AUDIO, P.O. Box 52548, Boulder, Colo. 80321-2548. Allow 8 weeks for change of address. Include both old and new address and a recent address label. If you have a subscription problem, please write to the above address or call (800) 274-8808; in Canada or other foreign countries, (303) 447-9330. Canadian GST Number 126018209. **Back Issues:** For information, write to P.O. Box 7085, Brick, N.J. 08723.

"SOFT PACK FEEL IN A BOX"

NEW BENSON & HEDGES SPECIAL KINGS

FULL, RICH FLAVOR IN THE NEW POCKET PACK.™
SHAPED TO FIT SMARTLY IN YOUR HAND AND POCKET. "SOFT PACK FEEL IN A BOX."
IN SHORT, AMERICA'S PREMIUM CIGARETTE

AVAILABLE IN LIMITED AREAS

SURGEON GENERAL'S WARNING: Quitting Smoking Now Greatly Reduces Serious Risks to Your Health.

Lights: 12 mg "tar," 0.8 mg nicotine—Men. 13 mg "tar," 0.9 mg nicotine; Kings: 16 mg "tar," 1.1 mg nicotine av. per cigaretta by FTC method.

Worthwhile Cause

Dear Editor:

Even though I am opposed to institutions and to government, I belong to the American Music Center and I pay my taxes, though Henry David Thoreau, whose work I otherwise follow, didn't. I mean he didn't pay his taxes and was put in jail because of that. "What are you doing in there?" Emerson asked him. His reply: "What are you doing out there?" My reply is that I'm out here because, among other things, I'm writing music and I have less time now than I used to have.

When I was asked by Joan La Barbara to help the American Music Center in their membership drive, I automatically said I would. I love her singing, her music, her way of living and working in the world, the society. Since I am about to be 80, I have many commissions, and the Center sent me a draft of the letter I should sign to save me time, but I couldn't sign it. This letter takes its place.

I am, like your readers, living in a complex time. My life is one inconsistency after another. I do some things to save my skin, others because they give me pleasure. Still others because they seem right or good. I write music when I am not doing any such things. That is why I use chance operations. I am at the point of not thinking and not feeling. All I write is sounds.

But now I am not writing music. I am writing what I told Joan I would write, asking your readers to join the American Music Center for no reason at all. If you need a reason, call up the Center in New York at (212) 366-5260. They'll give you one.

John Cage
Honorary Board Member
American Music Center
30 West 26th St., Suite 1001
New York, N.Y. 10010-2011

Editor's Note: Regrettably, Mr. Cage passed away on August 12, just one month short of his 80th birthday.—*I.B.*

Grand Opening

Dear Editor:

Your great magazine's August article on varying abilities to judge fidelity compelled me to write about something very exciting in the acoustical world.

In Palm Beach, Florida this November, the all-new Kravis Center for the Performing Arts will be opening with a 2,200-seat auditorium. What makes this hall special is that Russell Johnson did the acoustical work. His major works have become renowned worldwide for their high quality, and this new hall goes even further. The Kravis Center promises to be a major breakthrough in the live listening experience, one that will lead the way into the 21st century.

The reason I send this idea to you is that this is *not* an ordinary opening. This is a truly revolutionary hall in many ways and promises to make waves throughout the music world!

Michael Kirkbride
New York, N.Y.

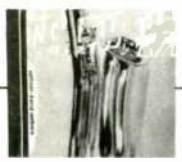
Columbia House. The face of jazz.

This is the place where the biggest names in jazz come together.

From the soaring classics of John Coltrane to the virtuoso stylings of Chick Corea, only Columbia House has the expertise and heritage to bring you face to face with today's greatest artists.

Look to Columbia House–where the jazz is.

With the release of Upfront, legendary saxophonist David Sanborn returns to his improvisatory roots. Upfront is "loose, like a jam," with a vibrant sense of freedom and musical honesty.



David Sanborn—Upfront (Elektra) **438•994**

Take 6—So Much 2 Say (Reprise) **413•310**

Tom Scott—Born Again (GRP) **440•636**

Joey Calderazzo—To Know One (Blue Note) **441•758**

The Modern Jazz Quartet—Pyramid (Atlantic) **441•717**

GRP All-Star Big Band—(GRP) **440•503**

Bobby Watson—Present Tense (Columbia) **439•695**

George Howard—Do I Ever Cross Your Mind (GRP) **438•564**

John McLaughlin—Que Alegria (Verve) **438•473**

Terence Blanchard—Simply Stated (Columbia) **439•661**

John Scofield—Grace Under Pressure (Blue Note) **438•085**

Grant Geissman—Flying Colors (Bluemoon) **436•725**

Dizzy Gillespie—Live At Royal Festival Hall (Enja) **436•691**

Ricardo Silveira—Small World (Verve) **436•030**

Harper Brothers—You Can Hide Inside The Music (Verve) **436•022**

Harry Connick, Jr.—We Are In Love (Columbia) **406•645**

Diane Schuur—In Tribute (GRP) **436•097**

LEGENDARY JAZZ CLASSICS

Thelonious Monk—Solo Monk (CL Jazz Masterpieces) **439•356**

The Divine Sarah Vaughan (Columbia) **374•280/394•288**

Dinah Washington—Dinah Jams (Verve) **441•709**

The Best Of Chet Baker (Capitol/Pacific Jazz) **433•680**

Charlie Parker—Now's The Time (Polydor) **429•605**

Erroll Garner—Body And Soul (CL Jazz Masterpieces) **427•955**

Ella Fitzgerald—The Cole Porter Songbook, Vol. 1 (Polydor) **426•692**

Nat King Cole—Jumpin' At Capitol (Rhino) **421•982**

The Best Of Art Blakey & The Jazz Messengers—The Blue NoteYears (Blue Note) **416•016**

Louis Armstrong—The Hot Fives, Vol. I (CL Jazz Masterpieces) **377•622**

The Best Of Miles Davis (Blue Note) **435•206**

John Coltrane—Giant Step (Atlantic) **371•591**

The Duke Ellington Orch.—Digital Duke (GRP) **357•350**

Billie Holiday—From The Original Decca Masters (MCA) **354•985**

Dave Brubeck Quartet—Time Out (Columbia Jazz Masterpieces) **353•060**

Count Basie & His Orch.—The Best Of Count Basie (Roulette Jazz) **435•990**

Special EFX—Global Village (GRP) **436•055**

Holly Cole Trio—Blame It On My Youth (Blue Note) **435•982**

Al DiMeola—Kiss My Axe (Tomato) **435•453**

Joe Henderson—Lush Life (Verve) **434•696**

Paco Delucia With Chick Corea—Zyryab (Verve) **434•605**

Stan Getz/Kenny Barron—People Time (Verve) **434•597/394•593**

Abbey Lincoln—You Gotta Pay The Band (Verve) **432•708**

Bobby Lyle—Pianomagic (Atlantic) **432•286**

Gerald Albright—Live At Birdland West (Atlantic) **430•777**

Patti Austin—Carry On (GRP) **430•686**

David Benoit—Shadows (GRP) **430•652**

Joe Sample—Collection (GRP) **430•280**

Dave Grusin Collection (GRP) **378•398**

Grover Washington, Jr.—Next Exit (Columbia) **435•396**

Shirley Horn—Here's To Life (Verve) **439•190**

Yellowjackets—Live Wires (GRP) **435•388**

Nancy Wilson—With My Lover Beside Me (Columbia) **429•225**

Basia—Brave New Hope (Epic) **428•722**

Bobby McFerrin & Chick Corea—Play (Blue Note) **434•381**

Blue Interlude, the most recent release of the Wynton Marsalis Septet, blends Marsalis' unique vision with a thoroughly modern approach to jazz, and confirms his place as a virtuoso musician, composer and arranger.

Wynton Marsalis Septet—Blue Interlude (Columbia) **439•463**

Michael Franks—Blue Pacific (Reprise) **408•328**

Joey DeFrancesco—Re-Boppin (Columbia) **433•649**

Branford Marsalis—The Beautyful Ones Are Not Yet Born (Columbia) **428•078**

Rippingtons—Curves Ahead (GRP) **426•874**

Chick Corea Elektric Band—Beneath The Mask (GRP) **426•866**

Various Artists—Night And Day (Verve) **426•684**

Lee Ritenour Collection (GRP) **425•876**

Lionel Hampton—Mostly Ballads (Musicmasters) **424•309**

Harry Connick, Jr.—Blue Light, Red Light (Columbia) **429•191**

Fourplay (James, Ritenour, East & Mason) (Warner Bros.) **428•334**

Alex Bugnon—107 In The Shade (Epic) **423•046**

The Quintet—Jazz At Massey Hall (Debut) **421•719**

Spyro Gyra—Collection (GRP) **420•950**

Jean Luc Ponty—Tchokola (Epic) **420•224**

The Crusaders—Healing The Wounds (GRP) **419•952**

Gerry Mulligan—Best Of Gerry Mulligan Quartet with Chet Baker (Capitol/Pacific Jazz) **419•689**

Best Of Herbie Hancock (Blue Note) **419•408**

Dianne Reeves—I Remember (Blue Note) **418•756**

Earl Klugh—Midnight In San Juan (Warner Bros.) **416•776**

Stanley Jordan—Stolen Moments (Blue Note) **433•417**

The advantages of jazz at Columbia House.

By choosing any 8 CDs for only a penny (plus shipping and handling), you become a member of the Columbia House Jazz Club. Once you're enrolled, you agree to buy just 6 more CDs at regular Club prices (currently $12.98 to $15.98, plus shipping/handling) within the next three years. You may cancel your membership at any time after doing so.

Free Music Magazine: As a member we'll keep you current with the best jazz by sending you the Columbia House Jazz Magazine about every four weeks (up to 13 times a year). Inside, you'll find descriptions of Regular Selections plus hundreds of alternatives to choose from. We'll also send you 6 Special Mailings. In a year, you'll enjoy a total of 19 convenient opportunities to select your favorite music.

Buy Only What You Want: If you choose the Regular or Special Selection, it will automatically be sent. Or, if you prefer an alternate selection–or none at all–simply mail the Response Card always provided by the date specified. You'll always have 10 days to decide. If not, you may return the Selection at our expense.

Bonus Offer: Join right now and get an additional CD at the super-low price of only $6.95. That allows you to take another CD for FREE. That's 10 CDs in all. And if you're not satisfied, just return everything within 10 days–with no further obligation.

Half-Price Plan: Remain a member after fulfilling your obligation and take advantage of our money-saving Bonus Plan. It lets you buy any CD at half price for each one you purchase at the regular Club price. For selection, convenience and price, Columbia House is the best place for jazz. So get in the groove. Sign up now.

COLUMBIA HOUSE Where the jazz is.

1400 North Fruitridge Avenue • Terre Haute, Indiana 47811-1129

8 CDs for 1¢ PLUS A CHANCE TO GET ONE MORE FREE!

See details.

COLUMBIA HOUSE, 1400 N. Fruitridge Ave. **464/F92**
P.O. Box 1129, Terre Haute, Indiana 47811-1129

Please accept my membership application under the terms outlined in this advertisement. Send me the 8 Compact Discs listed here and bill me 1¢ plus shipping and handling for all eight. I agree to buy six more selections at regular Club prices in the coming three years—and may cancel my membership at any time after doing so.

My main musical interest is (check one): *(But I may always choose from any category)*

☐ Jazz	Soft Rock	☐ Classical
Spyro Gyra	*Mariah Carey*	*Vladimir Horowitz*
Grover Washington Jr.	*Michael Bolton*	*Jean Pierre Rampal*

☐ Mr
☐ Mrs _____ Age _____
☐ Miss Print First Name Initial Last Name

Address _____ Apt _____

City _____

State _____ Zip _____

Do you have a VCR? (04) ☐ Yes ☐ No
Do you have a credit card? (03) ☐ Yes ☐ No

☐ **Extra Bonus Offer:** also send me one more CD now, for which I will be billed only $6.95.

...and I'm entitled to this extra CD FREE!

DXH-F6-59

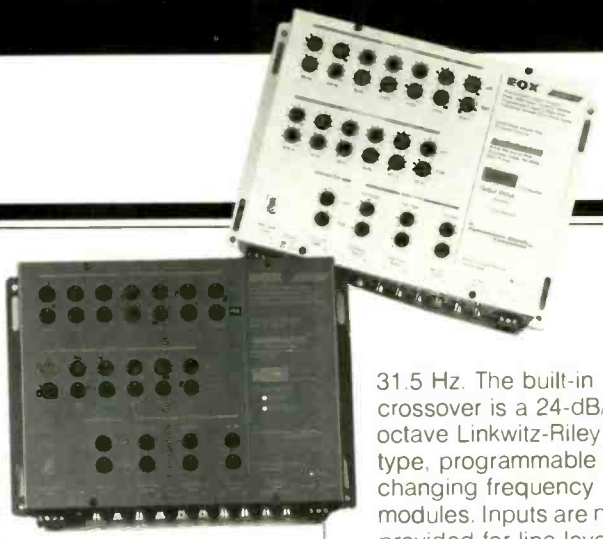
Note: we reserve the right to reject any application or cancel any membership. These offers not available in APO, FPO, Alaska, Hawaii, Puerto Rico; write for details of alternative offer. Canadian residents serviced from Toronto. Applicable sales tax added to all orders.

Selections with two numbers contain 2 CDs and count as 2—so write in both numbers.

WHAT'S NEW

Microscan Speaker Enclosure Damper

Applied to a speaker enclosure's rear panel, the Microscan Anti-Resonant System damps panel vibrations that can affect the sound. The system consists of selectively tuned polymer damping plates that dissipate mechanical energy as heat. Models D-6 and D-8 are designed for use on full-range speakers, while Model SW-1 is for subwoofers. Prices: D-6, $146 per pair; D-8, $169 per pair; SW-1, $79 each.
For literature, circle No. 105



AudioControl Car Equalizer

The EQX Series II from AudioControl has a lower profile than the original EQX, plus several new features. A 13th equalizer band has been added, at 31.5 Hz. The built-in crossover is a 24-dB/octave Linkwitz-Riley type, programmable by changing frequency modules. Inputs are now provided for line-level signals plus amplified inputs from factory-installed head units and the like. Specifications include 120-dB S/N, 0.005% THD, and a maximum output level of 7.5 V. Price: $329.
For literature, circle No. 108

JVC CD Changer

For convenience, the JVC XL-M507TN features a single-CD drawer in addition to its interchangeable six-disc magazines. Up to 120 discs can be given eight-character titles that will automatically display as each named disc plays; the titles can also be used as an index to the contents of up to 20 magazines. Programming facilities include all seven CDs, and a two-way edit function selects track order when dubbing so as to best fill the tape. The D/A converter is a one-bit PEM type. Price: $380.
For literature, circle No. 106

Sennheiser Headphones

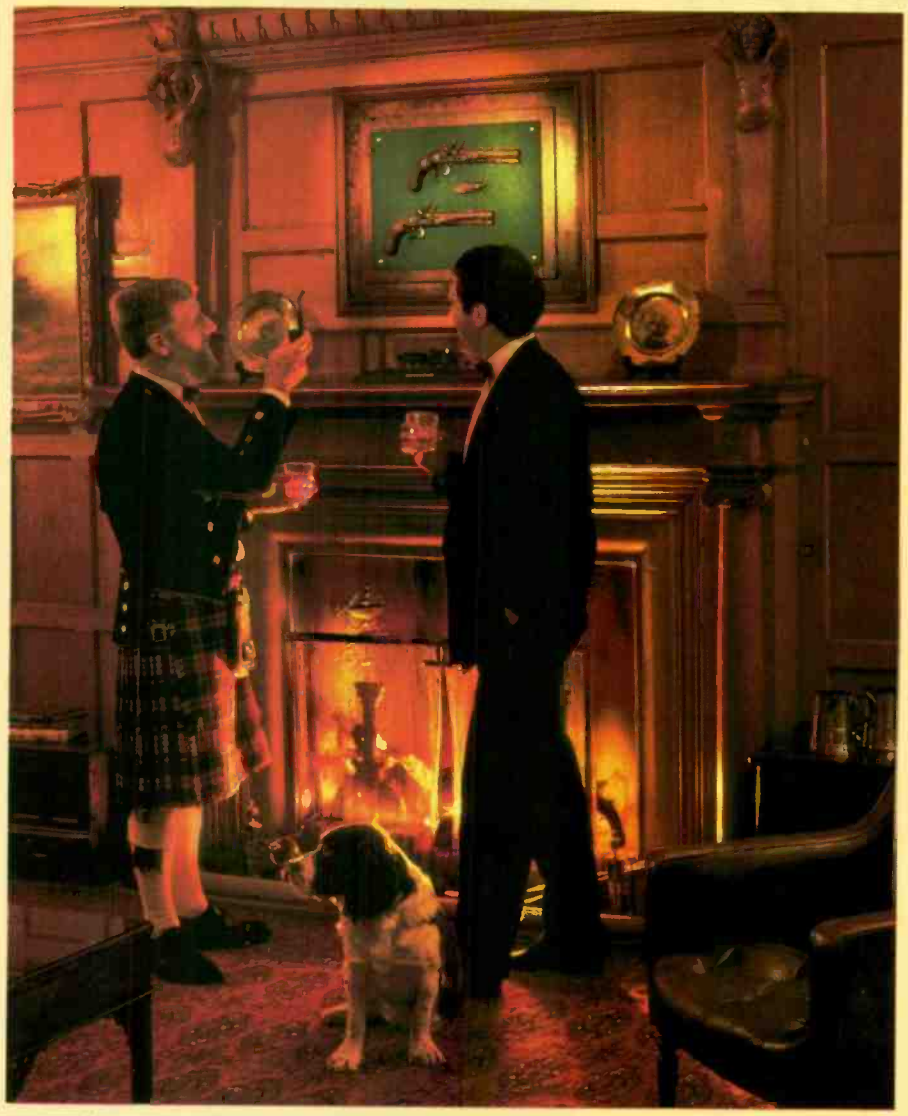
Open-air headphones are not renowned for bass, but Sennheiser's HD 560 Series II has a rated response that starts at 16 Hz and extends to 30 kHz. Tuned bass ports in each earpiece help extend the bass response. The diaphragm's center is silk, to vent air behind the driver and to damp unwanted motion. Price: $279.
For literature, circle No. 107

Tree Dimensions Media Cabinets

Holding CDs, audio cassettes, videocassettes, or a combination, the AV330 and AV220 racks from Tree Dimensions feature solid shelves that can be tilted up or down and solid backs. Construction is oak, with a choice of three finishes: Black, honey oak, or black with honey oak shelves. The AV330 holds up to 330 Compact Discs, 180 cassettes, or 108 VHS tapes; the AV220 holds 220 CDs, 120 cassettes, or 72 VHS tapes. Prices: AV330, $224.95; AV220, $164.95.
For literature, circle No. 109

"These hair-trigger pistols once saved the owner of The Glenlivet® from a band of cutthroats."

– Sandy Milne, our Resident Sage.



Sandy Milne holding forth on the pistols.

The men, a brutish lot, were clearly intent on dirty doings.

The scene was the desolate inn at Cock Bridge, in the Highlands. George Smith, maker of The Glenlivet single malt Scotch, was on his way home from a sale of his much prized whisky, his money belt stuffed with gold sovereigns.

Also at George's belt, fortunately, were a pair of hair-trigger pistols, given him by the laird of Aberlour. Before the men could jump him, he cocked one of the pistols and fired into the peat fire. A cloud of white ash filled the room. By the time it had cleared, George was on his horse and well away.

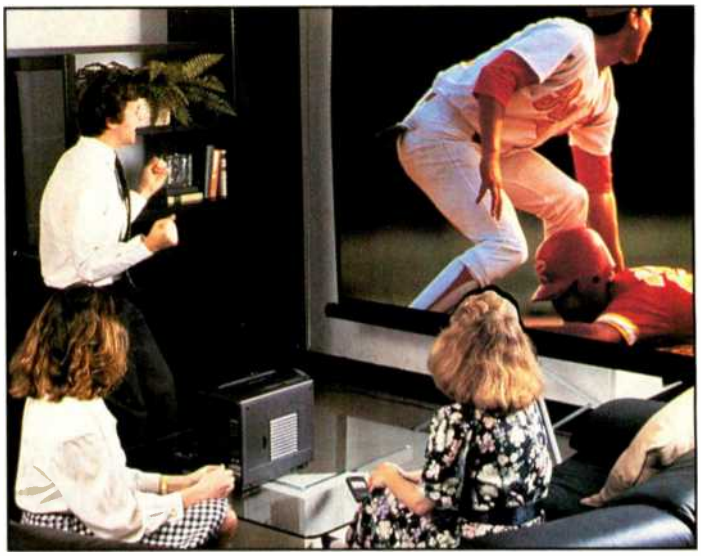
"If that pistol had misfired," says our Sandy Milne, "there might not be such a thing today as The Glenlivet. A thought horrible to contemplate."

What is a single malt Scotch?

A single malt is Scotch the way it was originally: one single whisky, from one single distillery. Not, like most Scotch today, a blend of many whiskies. The Glenlivet single malt Scotch whisky should therefore be compared to a château-bottled wine. Blended Scotch is more like a mixture of wines from different vineyards.

The Glenlivet.
The Father of All Scotch.

SHARPVISION BRINGS THE ACTION HOME



You love going to the movies, but hate the long lines. You would love to go with your family to see your favorite sports team in action, but good tickets are just too expensive. The solution? Home theater.

Home theater, the latest trend in home design, brings the large size action and emotion of your favorite movies or sporting events to the comfort of your living room.

See that perfect football pass up-close and with more clarity than actually being at the game. Dim the lights and settle back on your cozy sofa and enjoy your favorite movie. In today's economy, more and more people are turning towards home entertainment as an alternative to going out.

Setting up a home theater is not as complex as many people think. With new technology, creating a family entertainment center, complete with a large-screen projector for watching sports, movies...and even playing video games, is now easier-than-ever.

Sharp Electronics Corporation offers the latest in home theater video projectors, an integral part to any home theater. By incorporating LCD (Liquid Crystal Display) technology, Sharp has created SharpVision video projectors that not only provide stunning, clear, larger-than-life images, but are also portable in design.

Weighing only 28 lbs., Sharp's new high resolution SharpVision model, the XV-S250ZU, is easy to take to a friend's house, move from room-to-room or store away when not in use. SharpVision adds extra convenience because it can be projected onto either a screen or a white wall.

This kind of versatility is only available with LCD projectors. The "LCD advantage" means no more large, bulky picture tubes, which make the units heavier and more cumbersome. LCDs also last years longer than standard CRT picture tubes, providing years of brilliant images and picture clarity, far superior to any other large-screen video alternatives.

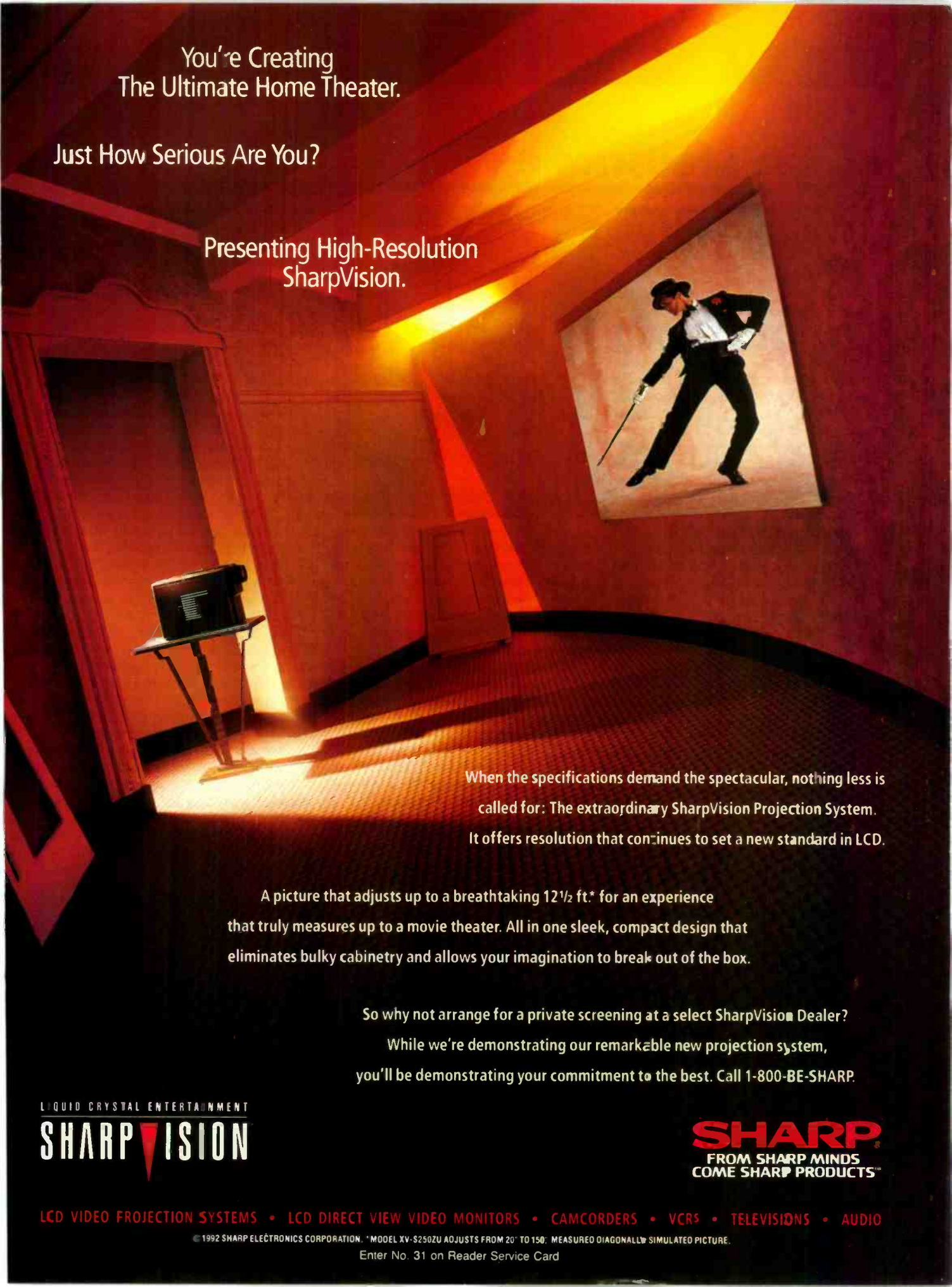
SharpVision is also perfect for those who prefer to watch some programs with a smaller, standard-size television image, because Sharp-Vision's projected image adjusts easily from a giant 150-inches down to a conventional 20-inches (measured diagonally), with a simple turn of the lens. Perfect for any size room, SharpVision needs as little as – 12.5 feet for a 100-inch image and only 18.5 feet for a 150-inch image (measured diagonally).

"Home theater is a perfect way to enhance any home environment," explains Sherman Langer, general manager, Sharp Consumer LCD Division. "Large screen entertainment is also ideal for social get-togethers. The decision for today's family is not where to put the television, but at what picture size to watch the SharpVision."

To transform any room into a home theater, just connect SharpVision to the video output on any standard or S-VHS video source (including cable, satellite TV, VCR, laserdisc player, camcorder or video games) and add an audio source, plus a few speakers for concert-like surround sound. That's home theater...it's that simple.

The top-of-the-line XV-S250ZU SharpVision has a suggested list price of $7,495, with other SharpVision models available for under $2,500. Imagine your favorite football player doing his endzone dance, a spectacular rock concert's laser light show with a musician playing guitar or a passionate movie scene coming to life – all right in your living room!

However, SharpVision home theater does present one problem - once you experience it, you may never want to go out again!


You're Creating
The Ultimate Home Theater.
Just How Serious Are You?
Presenting High-Resolution
SharpVision.
When the specifications demand the spectacular, nothing less is called for: The extraordinary SharpVision Projection System. It offers resolution that continues to set a new standard in LCD.
A picture that adjusts up to a breathtaking 12½ ft.* for an experience that truly measures up to a movie theater. All in one sleek, compact design that eliminates bulky cabinetry and allows your imagination to break out of the box.
So why not arrange for a private screening at a select SharpVision Dealer? While we're demonstrating our remarkable new projection system, you'll be demonstrating your commitment to the best. Call 1-800-BE-SHARP.
LIQUID CRYSTAL ENTERTAINMENT
SHARPVISION
SHARP
FROM SHARP MINDS COME SHARP PRODUCTS™
LCD VIDEO PROJECTION SYSTEMS • LCD DIRECT VIEW VIDEO MONITORS • CAMCORDERS • VCRS • TELEVISIONS • AUDIO
©1992 SHARP ELECTRONICS CORPORATION. *MODEL XV-S250ZU ADJUSTS FROM 20" TO 150", MEASURED DIAGONALLY. SIMULATED PICTURE.
Enter No. 31 on Reader Service Card

A+ FOR ACOUSTICS

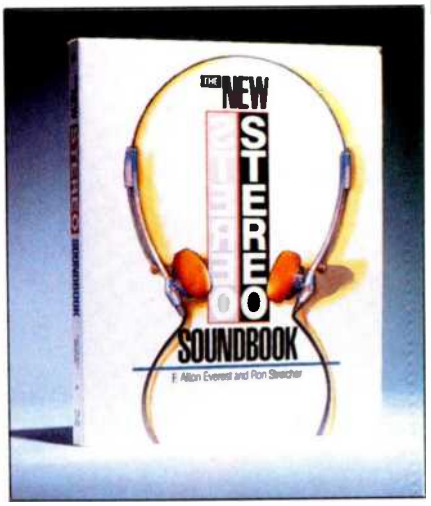
The New Stereo Soundbook by F. Alton Everest and Ron Streicher. TAB Books Division of McGraw-Hill, softcover, 283 pp., $18.95

I strongly recommend this excellent volume. Everest and Streicher provide a most interesting historical overview of stereophony, followed by a thorough examination of how our hearing system enables us to localize sound, both live and stereophonically reproduced. Only after introducing these auditory concepts do the authors examine microphone placement techniques at the recording end of the stereo chain and the implementation of multi-dimensional stereo and surround sound at the playback end.

An acknowledgment at the beginning of *The New Stereo Soundbook* mentions that the manuscript was read by none other than Floyd E. Toole, a longtime researcher of audio phenomena who spent many years at the National Research Council, Division of Physics, in Canada and who recently joined JBL as a research scientist. Anyone familiar with Dr. Toole's work will agree that if he found no scientific errors in the manuscript, it is accurate.

In addition to this volume's 14 chapters, there is a 19-page appendix that relates specific paragraphs of A. D. Blumlein's 1933 British patent to just about every aspect of stereophonic recording and reproduction. Anyone interested in stereo should find the work of this early pioneer fascinating. Blumlein's death in an airplane crash in Britain during World War II cut short a brilliant career during which he was granted some 128 patents. This appendix, and the complete chapter-by-chapter reference and bibliography section, are worth the price of the book alone. The glossary defines many terms that, I venture to say, even the most experienced audio enthusiast may not have encountered before or, if he has, may not have properly or completely understood.

The main chapters explore stereo sound from various aspects. First, the authors explain the directional encoding of sounds falling on the ear and how interaural differences in these cues provide spatial texture to stereo images. Two chapters are devoted to the philosophical and pragmatic implications of stereo production techniques, while five chapters examine modern stereo microphone practices in great detail. Other chapters cover auditory spaciousness, coloration of sound, and perhaps most important to readers of *Audio*, optimization of the listening environment.



All too many audio enthusiasts spend large sums of money and a great deal of time in selecting electronic equipment, but relatively few, it seems, devote enough effort in improving the acoustics of the room where they do their listening. Chapter 14 is one of the best treatises (however abbreviated) on room acoustics that I have ever read and should be required reading for professional audio practitioners and serious audiophiles as well. I chuckled at the second paragraph of this chapter: "Long ago a child defined salt as 'something that makes potatoes taste bad if you don't put any on.' Acoustics makes music sound bad if nothing is done to correct it." From that starting point, Everest and Streicher lead the reader through such subjects as axial-mode resonance, tangential and oblique resonance modes, the mid/high-frequency region and delay effects, reflections in the listening room (and their effects), diffusion of sound, stereo geometry, and room treatment (for bass and the mid/high-frequency region).

One chapter that particularly fascinated me was "Multidimensional and Surround Sound Systems." In tracing the history of multi-channel sound, the authors show why the various matrix and discrete quadraphonic systems of the 1970s failed and how they eventually gave rise to the surround and ambience systems many of us currently enjoy. In dealing with multi-directional sounds from the perspectives of both production and playback, the authors give us greater understanding of just what it is we perceive when we listen to music played back using Ambisonics, Dolby Surround, Shure's HTS Stereosurround, and the like.

The New Stereo Soundbook includes instructions on easy-to-follow experiments and all the diagrams, tables, and photographs you need to enhance, improve, and modify your stereo system. If you read this book from cover to cover, you should be able to use microphones to achieve satisfactory special stereo effects. You will know how to record signals binaurally with the use of a dummy head. You will understand how to create a stereo signal from two or more monophonic signals and how to control sound reflections for optimal stereo listening. I would hasten to add that if you have a phobia about those complex mathematical formulas that have a way of cropping up in many texts on sound and acoustics, put your fears aside. The authors present all their material in nonmathematical terms while at the same time conveying all the concepts that are necessary for a better understanding of their subject matter.

Once you've read this book you will have a more complete understanding of stereophonic sound. And that increased understanding will, in turn, provide you with greater enjoyment of your stereo equipment, be it modest in price and complexity or at the superhigh end. *Leonard Feldman*

Bullock on Boxes by Robert M. Bullock III, assisted by Robert White. Audio Amateur Press, paperback, 74 pp., $10.95.

It has been my observation over the years that almost everyone who is interested in the technical aspects of sound reproduction is especially intrigued by the mysteries of loudspeaker design. I am often asked for good reference materials such as books and magazine or technical journal articles that explain some of these mysteries.

Never miss another O.

If you've got the soul of a photographer, we've got the camera—the revolutionary Olympus IS-I.

Its unique Zoom **O** *Lens Reflex (ZLR) system*

new orleans

can power **mood** *you from 35mm to 135mm in* **soul** *just 1.2 seconds.*

IS-I has auto- **olympus**

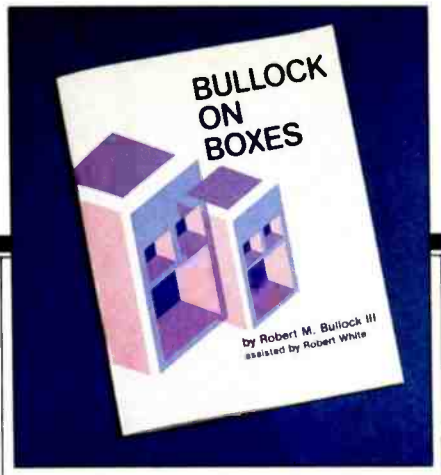
everything: fuzzy logic auto-exposure, macro capability, red-eye reduction flash, plus the ability for full creative control. All this in a compact camera that has one of the most advanced lenses ever with ED glass for sharper, brighter photos. The IS-I. It

could change your mind about changing lenses.

OLYMPUS

Enter No. 21 on Reader Service Card

Bullock on Boxes is a valuable compilation of articles from a professor who applies his math skills to amateur speaker design.



There are a few good books, but the main sources of information are the *Journal of the Audio Engineering Society (JAES)* and *Speaker Builder* magazine. Each monthly issue of the *JAES* usually contains technical reports covering various theoretical aspects of loudspeaker design and measurement written by and directed to professional engineers. The articles in *Speaker Builder* are written by both professionals and amateurs, and they are more concerned with the practical aspects of building and measuring loudspeaker systems.

Robert M. Bullock III has written a large number of articles about loudspeaker design, intended to help amateurs build systems that will compare favorably with commercially offered products. He is a professor of Applied Mathematics and Statistics at Miami University, Oxford, Ohio and has brought some of his mathematical expertise to his hobby, which is designing and building loudspeaker systems. *Bullock on Boxes* is a compilation of articles, dealing with vented or ported loudspeaker design, which appeared in *Speaker Builder* magazine during the 1980s. The material in the book is based on the work published by A. N. Thiele in Australia, which appeared in the *JAES* Vol. 19 (1971), and on refinements by R. H. Small that were published in the *JAES* Vol. 21 (1973). The work by Thiele and Small is an exposition and elaboration of the concept that a loudspeaker system can be modelled as a high-pass filter, at least in the low frequency range where the loudspeaker diaphragm acts as a piston. This idea was also proposed by James F. Novak in *IRE Transactions on Audio*, Vol. AU-7 (1959). The design and implementation of electronic filters has become a very complex field because the theoretical foundation has expanded greatly over the years; Thiele and Small have made good use of high-pass filter theory by applying it to the design of speaker systems. They also expanded the idea of using a high-pass filter model and came up with different filter alignments by adjusting driver and enclosure design parameters; these alignments came to be known as "Thiele-Small Parameters."

The book contains nine chapters, the first four of which are devoted to the design methods, explanations of the theory, and some design examples that use commercially available loudspeaker drivers. Chapter 1 is titled "Thiele, Small, and Vented Loudspeaker Design." Bullock starts by giving the background for the whole idea of using electrical filter design techniques and the use of Butterworth, Chebyshev, and Bessel filters as analogs for different vented box designs. He discusses the five main loudspeaker driver parameters that are used in the design formulas: R_E, the d.c. resistance of the driver's voice-coil; f_S, the driver's resonance in free air without a baffle or enclosure; Q_{ES}, the electrical part of the "Q" or quality factor of the driver at its free air resonance (f_S); Q_{MS}, the mechanical part of the "Q" of the driver at f_S, and the V_{AS}, which is the compliance of the driver's suspension expressed as the compliance of an equivalent volume of air. Q_{TS}, the total system "Q," is then derived from Q_{ES} and Q_{MS}. Figures 1 through 6 show output versus frequency response characteristics for various vented box designs so the reader can get a good idea of what filter alignments such as B4 (fourth-order Butterworth) and QB3 (Quasi-third-order Butterworth) look like. Under a subheading titled "Alignments," Bullock explains the use of the ratio parameters "h" and "α" (alpha): $h = f_B/f_S$ and $\alpha = V_{AS}/V_B$. He then explains the difference between what have come to be known as "Thiele Alignments" and "Small Alignments." The use of the Q_{TS}, "h," and "α" parameters are explained and examples are shown in tables. Chapter 1 also includes sidebars for an appendix and references. Since the material for this book is derived from Bullock's articles in *Speaker Builder* magazine, an interesting twist, for a book, is that comments about the original article from readers and the author's replies are included at the end of this chapter.

Chapter 2 is titled "Determining Design Parameters for Your Loudspeaker." Bullock discusses methods of measuring the parameters of amplifiers that will affect the response of the loudspeaker system, as well as the parameters of the loudspeaker drivers that are necessary to use the Thiele/Small design methods. For the amplifier measurements, he shows both constant-voltage and constant-current techniques for obtaining parameters. I found the section "Finding f_S, Q_{MS}, Q_{ES}" a little vague and perhaps a bit hurried; I think that it could be expanded by explaining the formulas (7c), (7v), (8c), and (8v) in more detail. The practical aspects of the test equipment and details of the measurements and things to be concerned about are well covered. Another minor quibble I have concerns page 14, where the V_{AS} for Example 1 is calculated using equation (11), which doesn't appear until later in the exposition.

Chapter 3, "Fine Points of Vented Speaker Design," contains an exposition of the practical details that are necessary to design a vented loudspeaker system. To this end, the parameters for two commercially available drivers are used, and complete design information for the bass section of two systems is presented. The effects of design parameters on the response of these systems is shown in 14 graphs; there are also six tables showing various data. Numerous anecdotes about personal experiences with practical designs are also included.

Chapter 4, "Alternate Alignments," is aimed at readers who have gained some expertise from designing their own systems and explores the variations in response that can be obtained by using different alignments for vented systems. There are 19 tables and 15 graphs in the chapter. For readers who wish to try values and possibilities not found in the tables, Chapter 5, "T/S Calculator Programs," shows programs (which can be run on the Texas Instruments TI-59 and Hewlett-Packard HP-97 calculators) for determining response curves of particular vented systems, and includes some design examples.

Chapter 6, "BOXRESPONSE: An Apple Program for the Thiele/Small Models," and Chapter 7, "Realizing BOXRESPONSE's Potential," deal with an Apple computer program that can be

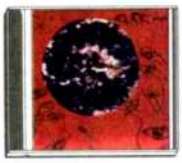
8 FOR 1

GET 8 COMPACT DISCS FOR THE PRICE OF 1

also available on cassettes!

with nothing more to buy...EVER!

Tears For Fears: Tears Roll Down (The Hits 1982-1992) (Fontana) 80162



The Cure: Wish (Elektra) 11116

Prince & The N.P.G.: Diamonds And Pearls (WB/Paisley Park) 63372

Boyz II Men: Cooleyhighharmony (Motown) 10930

Two Rooms-Celebrating The Songs Of Elton John & Bernie Taupin (Polydor) 35407

R.E.M.: Out Of Time (Warner Bros.) 24762

Wynonna Judd: Wynonna (MCA/Curb) 64540

Bon Jovi: New Jersey (Mercury) 00516

TLC: Oooooohhh... On The TLC Tip (LaFace) 50167

Janet Jackson's Rhythm Nation 1814 (A&M) 72386

Billy Idol: Vital Idol (Chrysalis) 54038

Glenn Miller: Chattanooga Choo Choo-The #1 Hits (Bluebird) 11052

Depeche Mode: Violator (Sire) 73408

The Doors/Sdtrk. (Elektra) 54289

Skid Row: Slave To The Grind (Atlantic) 54433

Diana Schuur: In Tribute (GRP) 34566

Natalie Cole: Unforgettable (Elektra) 83452

Slaughter: Stick It Live (Chrysalis) 20666

Eagles: Greatest Hits 1971-1975 (Asylum) 23481

Reba McEntire: For My Broken Heart (MCA) 73624

Bobby Brown: Dance! ...Ya Know It (MCA) 73660

Pet Shop Boys: Discography-The Complete Singles Collection (EMI) 05605

ZZ Top: Recycler (Warner Bros.) 73969

Van Halen (Warner Bros.) 14620

The Steve Miller Band: Greatest Hits 1974-1978 (Capitol) 33199

Maceo Parker: Mo' Roots (Verve) 64645

Kronos Quartet: Pieces Of Africa (Nonesuch) 10472

John Mellencamp: Whenever We Wanted (Mercury) 74582

Oak Ridge Boys: The Long Haul (RCA) 10924

Jesus Jones: Doubt (SBK) 44654

Santana: Milagro (Polydor) 24813

Robert Palmer: Addictions, Vol. 2 (Island) 25277

Arrested Development: 3 Years, 5 Months And 2 Days In The Life Of... (Chrysalis) 25357

Lou Reed: Magic & Loss (Warner Bros./Sire) 15470

P.M. Dawn: Of The Heart, Of The Soul & Of The Cross (Gee Street/Island) 15156

Heart: Rock The House "Live"! (Capitol) 05603

Squeeze: Singles 45's & Under (A&M) 35208

Anthrax: Attack Of The Killer B's (Megaforce/Island) 25154

Mötley Crüe: Decade Of Decadence (Elektra) 40298

Color Me Badd: C.M.B. (Giant) 25479

Meli'sa Morgan: Still In Love With You (Pendulum) 93241

Dr. John: Gettin' Back To New Orleans (Warner Bros.) 53246

Dire Straits: On Every Street (Warner Bros.) 74151

Delfeayo Marsalis: Pontius Pilate's Decision (Novus) 34714

Chaka Khan: The Woman I Am (Warner Bros.) 73288

Peter Cetera: World Falling Down (Warner Bros.) 63423

Bonnie Raitt: Luck Of The Draw (Capitol) 15567

George Strait: Ten Strait Hits (MCA) 25425

The Best Of Jay & The Americans: Come A Little Bit Closer (EMI) 72262

Matthew Sweet: Girlfriend (Zoo) 83384

The Very Best Of The Righteous Brothers: Unchained Melody (Verve) 44658

Holly Cole Trio: Blame It On My Youth (Manhattan/Capitol) 53261

Supertramp: Breakfast In America (A&M) 25246

The Best of Earl Klugh (Blue Note) 52302

Howard Jones: In The Running (Elektra) 53236

Lynch Mob (Elektra) 11101

Kiss: Revenge (Mercury) 25279

Testament: The Ritual (Atlantic) 24426

Neil Young: Ragged Glory (Reprise) 34621

Wayne's World-Music From The Motion Picture (Reprise) 63551

Jimmy Buffett Live!: Feeding Frenzy (MCA) 24853

The Commitments/Sdtrk. (MCA) 74016

Extreme: Pornograffitti (A&M) 43557

Marc Cohn (Atlantic) 82983

New Edition: Greatest Hits, Vol. 1 (MCA) 83623

Peter Murphy: Holy Smoke (RCA) 64612

k.d. lang: Ingenue (Warner Bros./Sire) 44370

Eric Clapton: Rush-Music From The Motion Picture Soundtrack (Reprise) 05632

Fourplay (Warner Bros.) 10723

McBride & The Ride: Sacred Ground (MCA) 44394

The Beach Boys: Pet Sounds (Capitol) 00513

Arry Grant: Heart In Motion (A&M) 25182

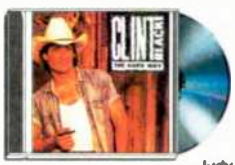
Joe Henderson: Lush Life (Verve) 05611

Paula Abdul: Spellbound (Virgin) 73320

Frank Sinatra: Sinatra Reprise/The Very Good Years (Reprise) 80304

Styx: Paradise Theatre (A&M) 25243

Spinal Tap: Break Like The Wind (MCA) 54301



Clint Black: The Hard Way (RCA) 35458

The Neville Brothers: Family Groove (A&M) 24724

Mr. Big: Lean Into It (Atlantic) 24821

Tracy Chapman: Matters Of The Heart (Elektra) 11050

Carreras, Domingo, Pavarotti: 3 Tenors (London) 35078

Rod Stewart: Downtown Train (Warner Bros.) 10708

MSG (Impact) 05649

Judy Garland: The Best Of The Decca Years, Vol. 1 (MCA) 10497

Vanessa Williams: The Comfort Zone (Wing/Mercury) 25066

INXS: Live Baby Live (Atlantic) 52528

Dave Grusin: The Gershwin Connection (GRP) 10620

The Best Of Stevie Nicks: Timespace (Modern) 10940

Yellowjackets: Live Wires (GRP) 74600

Lindsey Buckingham: Out Of The Cradle (Reprise) 20483

Tom Petty & The Heartbreakers: Into The Great Wide Open (MCA) 35409

John Williams/Boston Pops: By Request... (Philips) 25360

The Best Of The Doobie Brothers (Warner Bros.) 43738

Charlatans U.K.: Between 10th & 11th (RCA) 44622

Horowitz The Poet (DG) 25258

Steely Dan: Gold (MCA) 74339

Traffic: The Low Spark Of High Heeled Boys (Island) 25169

Best Of The Grateful Dead: Skeletons From The Closet (Warner Bros.) 83892

Tanya Tucker: What Do I Do With Me (Liberty) 25536

U2: Rattle And Hum (Island) 00596

Joe Jackson: Look Sharp ! (A&M) 25192

N.Y. Rock & Soul Revue (Giant) 63189

Van Halen: For Unlawful, Carnal Knowledge (Warner Bros.) 10016

Yanni: Dare To Dream (Private) 93703

Carly Simon: This Is My Life-Music From The Motion Picture (Reprise/Qwest) 74178

Lee Greenwood: American Patriot (Liberty) 42219

Bell Biv DeVoe: WBBD-Boot City!-The Remix Album (MCA) 54360

Dee-Lite: Infinity Within (Elektra) 73999

David Byrne: Uh-Oh (Warner Bros.) 73214

The Who: Who's Better, Who's Best (MCA) 00790

The Tangle Mainstean Collection (Polydor) 25460

Primus: Sailing The Seas Of Cheese (Interscope) 64171

Rush: Roll The Bones (Atlantic) 73723

Jimi Hendrix Experience: Live At Winterland (Rykodisc) 63650

CeCe Peniston: Finally (A&M) 53858

Boyz N The Hood/Sdtrk. (Qwest) 24419

D.J. Jazzy Jeff & The Fresh Prince: Homebase (Jive) 21073

EMF: Schubert Dip (EMI) 05604

Little Village (Reprise) 05636

ZZ Top: Greatest Hits (Warner Bros.) 83411

Jodeci: Forever My Lady (MCA) 90177

Sting: The Soul Cages (A&M) 25218

Fleetwood Mac: Greatest Hits (Warner Bros.) 00796

U2: War (Island) 24619

Allman Bros. Band: A Decade Of Hits 1969-1979 (Polydor) 35031

Guy!: Guy!...The Future (MCA) 14875

En Vogue: Funky Divas (East West) 61717

Anita Baker: The Songstress (Elektra) 40154

Eric Clapton: Slowhand (Polydor) 25094

Soundgarden: Badmotorfinger (A&M) 05637

Richie Sambora: Stranger In This Town (Mercury) 64685

Scorpions: Best Of Rockers 'N' Ballads (Mercury) 63492

Neil Diamond: 12 Greatest Hits (MCA) 84050

Tom Petty: Full Moon Fever (MCA) 33911

Paul Simon: The Rhythm Of The Saints (Warner Bros.) 10455

Bette Midler: Beaches/ Sdtrk. (Atlantic) 00793

The Alice Cooper Show (Warner Bros.) 11103

Jane's Addiction: Ritual de lo Habitual (Warner Bros.) 10020

A Tribe Called Quest: The Low End Theory (Jive) 24809

David Bowie: Changesbowie (Rykodisc) 43693

Blind Faith (Polydor) 25073

Fleetwood Mac (Reprise) 04897

BMG COMPACT DISC CLUB

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 5071 INDIANAPOLIS, IN.

POSTAGE WILL BE PAID BY ADDRESSEE

BMG COMPACT DISC CLUB
P.O. Box 91412
INDIANAPOLIS IN 46209-9758

8 FOR 1

GET 8 COMPACT DISCS FOR THE PRICE OF 1

also available on cassettes!

with nothing more to buy...EVER!

Lita Ford: The Best of Lita (RCA) 10784

Lethal Weapon 3/Sdtrk. (Reprise) 73322

Mark Chesnutt: Longnecks & Short Stories (MCA) 20505

Until The End Of The World/Sdtrk. (Warner Bros.) 15420

k.d. lang And The Reclines: Absolute Torch And Twang (Sire) 60257

The B-52's : Wild Planet (Warner Bros.) 10540

Whitney Houston: I'm Your Baby Tonight (Arista) 10663

James Ingram: The Power Of Great Music (Warner Bros.) 11131

Tori Amos: Little Earthquakes (Atlantic) 50382

Fu-Schnickens: F.U.- Don't Take It Personal (Jive) 10484

Michelle Shocked: Arkansas Traveler (Mercury) 10521

Wilson Phillips (SBK) 00726

Digital Underground: Sons Of The P (Tommy Boy) 02152

R.E.M.: Eponymous (I.R.S./MCA) 00701

Metallica: ...And Justice For All (Elektra) 00478

Derek & The Dominos: Layla And Other Assorted Love Songs (Polydor) 25249

DAS EFX : Dead Serious (Atco/EastWest) 25328

David Sanborn: Upfront (Elektra) 11104

Domingo: The Broadway I Love (Atlantic) 30015

U2: Achtung Baby (Island) 25174

Lyle Lovett: Joshua Judges Ruth (MCA/Curb) 10508

The Cure: Staring At The Sea-The Singles (Elektra) 50024

Abbey Lincoln: You Gotta Pay The Band (Verve) 64571

Moody Blues: Greatest Hits (Threshold) 34284

Faith No More: The Real Thing (Reprise) 63719

Guys And Dolls/Original Cast (MCA) 43962

Bob Marley: Legend (Island) 53521

Melissa Etheridge: Never Enough (Island) 25435

Chicago: Greatest Hits 1982-1989 (Reprise) 63363

Linda Ronstadt: Cry Like A Rainstorm, Howl Like The Wind (Elektra) 52221

Lynyrd Skynyrd: Skynyrd's Innyrds (MCA) 01150

The Best Of The Manhattan Transfer (Atlantic) 30125

Tony! Toni! Toné!: The Revival (Polydor) 00565

Christopher Holliday: And I'll Sing Once More (Novus) 25322

Kenny Rogers: 20 Great Years (Reprise) 25449

Aaron Tippin: Read Between The Lines (RCA) 05650

Willie Nelson: Greatest Hits & Rare Tracks (Rhino) 63284

Amy Grant: The Collection (A&M) 44643

Battle: The Bach Album (DG) 73670

Talking Heads: Stop Making Sense (Sire) 24560

Elvis Presley: The Number One Hits (RCA) 72190

Poison: Flesh & Blood (Capitol) 50207

Garth Brooks: Ropin' The Wind (Liberty) 25535

James Taylor: Greatest Hits (Reprise) 23790

Madonna: The Immaculate Collection (Sire) 54164

Chic: Chic-ism (Warner Bros.) 83182

Southside Johnny & The Asbury Jukes: Better Days (Impact) 61604

Paul Simon: Negotiations And Love Songs 1971-86 (Warner Bros.) 20461

Linda Ronstadt: Mas Canciones (Elektra) 50090

Enya: Shepherd Moons (Reprise) 53190

Grand Funk Railroad: Capitol Collector's Series (Capitol) 73258

The Sound Of Music/ Sdtrk. (RCA) 00046

Clint Black: Put Yourself In My Shoes (RCA) 24690

The Isley Brothers: Tracks Of Life (Warner Bros.) 30086

Bobby McFerrin & Chick Corea: Play (Blue Note) 05634

Enya: Watermark (Reprise) 43249

Hammer: Too Legit To Quit (Capitol) 25514

Richard Marx: Rush Street (Capitol) 15574

Lorrie Morgan: Something In Red (RCA) 83848

The Police: Every Breath You Take—The Singles (A&M) 73924

Marky Mark And The Funky Bunch: Music For The People (Interscope) 53860

Bryan Adams: Waking Up The Neighbours (A&M) 35175

Sinéad O'Connor: I Do Not Want What I Haven't Got (Chrysalis) 33512

Beastie Boys: Check Your Head (Capitol) 92473

Elvis Presley: Essential Elvis, Vol. 1 (RCA) 64039

Ringo Starr: Time Takes Time (Private Music) 35088

The Sugarcubes: Stick Around For Joy (Elektra) 05648

Mint Condition: Meant To Be Mint (Perspective/A&M) 05638

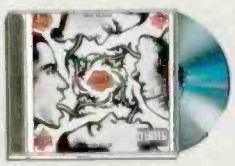
Michael Crawford Performs Andrew Lloyd Webber (Atlantic) 74128

Chieftains: The Bells Of Dublin (RCA) 10943

Best Of Dire Straits: Money For Nothing (Warner Bros.) 00713

The Very Best Of Cream: Strange Brew (Polydor) 00468

Billy Ray Cyrus: Some Gave All (Mercury) 41711



Red Hot Chili Peppers: Blood Sugar Sex Magik (Warner Bros.) 11127

Best Of Miles Davis-The Capitol/ Blue Note Years (Blue Note) 11000

The Best Of Twisted Sister: Big Hits And Nasty Cuts (Atlantic) 42900

Dire Straits: Brothers In Arms (Warner Bros.) 14734

The Best Of The Velvet Underground (Verve) 62303

Bulgarian State Radio & TV Choir: Le Mystère Des Voix Bulgares, 3 (Fontana) 15512

Emerson, Lake & Palmer: Brain Salad Surgery (Atlantic) 54608

Start with **4** FREE COMPACT DISCS NOW — pay only shipping and handling with membership

Buy only **1** at regular Club prices within a year

Then get **3** more CDs of your choice, FREE — shipping and handling charges are added

Enjoy **8** CDs for the price of one!

Nothing more to buy...EVER!

HERE'S HOW THE CLUB WORKS:

Get 8 for the Price of 1! Choose 4 free CDs or cassettes from this ad, buy just 1 more at regular Club prices (currently $14.98 and up for CDs, $8.98 and up for cassettes) within a year, and then get 3 more Free! Shipping and handling charges are added to all shipments. The BMG Compact Disc Club is unlike other clubs which make you buy 6 CDs, or 8 cassettes at full price.

Free 10-Day Trial! Along with your 4 introductory selections, you'll receive a welcome package with complete details of the Club. Enjoy your introductory selections for 10 days. If you are not completely satisfied, you may return them without any further obligation. Send no money now; we'll bill you later.

Club Music Mailings

- About every three weeks (19 times a year), you'll receive our exclusive Club catalog which contains hundreds of selections from which to choose.
- Each issue highlights a Featured Selection from your preferred music category. If you'd like the Featured Selection, do nothing and it will be sent to you automatically. If you prefer an alternate selection, or none at all, simply return the Notification Card, enclosed with each issue of your magazine, by the date specified on the card.
- You have at least 10 days to return the Notification Card. If you do not have 10 days, you may return the Featured Selection at our expense.

Stay a member as long as you like. After purchasing your regular-Club-price selection, you may cancel your membership at any time simply by writing to us. If you remain a member, you'll enjoy additional savings on CDs or cassettes with our special sales and bonus discounts.

Save with Instant Bonus Discounts. With every CD you buy, you're entitled to instant sales or discounts on additional CDs. These Instant Bonus Discounts begin with your very first CD purchase. Also, the longer you remain a member, the better the sales get. Other clubs make you buy 6 or more at full price before you "earn" savings like this.

Cassettes also available. Simply check the "cassettes" box on the postage-paid reply card if you prefer to receive your selections on cassettes.

If the reply card is missing, please write to: **BMG Music Services**, P.O. Box 91001, Indianapolis, IN 46291

COMPLETE THE POSTAGE-PAID REPLY CARD AND START SAVING TODAY!

INSTANT **50% OFF** BONUS DISCOUNTS!

The BMG Music Services Difference

You earn INSTANT 50%-OFF BONUS DISCOUNTS *every time you buy a CD at regular Club prices.* Just buy one, and take another at half price. With other clubs, you must first buy 6 or more at full price and become a "Preferred Member" before you can get savings like this.

☐ **I PREFER CASSETTES**[1]
(You may choose cassettes with the same 10-day, no-obligation privilege. Full membership details will follow.)

BMG Compact Disc Club / P.O. Box 91412 / Indianapolis, IN 46209-9758

Please accept my membership in the BMG Compact Disc Club and send my four FREE CDs as I have indicated here under the terms of this offer. I need buy just *one* more CD at regular Club prices during the next year. After that, I can choose 3 more CDs FREE! Shipping and handling charges are added to all shipments. That's 8 for the price of 1, *with nothing more to buy... ever!*

RUSH ME THESE 4 CDs NOW (indicate by number):

I am most interested in the music category checked here, but I am always free to choose from any (check one only):

1 ☐ **LIGHT SOUNDS** — Bette Midler, Frank Sinatra
2 ☐ **COUNTRY** — Reba McEntire, Hank Williams, Jr.
3 ☐ **HARD ROCK** — U2, Dire Straits
4 ☐ **POP/SOFT ROCK** — Bonnie Raitt, Paula Abdul
5 ☐ **CLASSICAL**[2] — Luciano Pavarotti, Vladimir Horowitz
6 ☐ **JAZZ** — Dave Grusin, Yellowjackets
7 ☐ **HEAVY METAL** — Mötley Crüe, Skid Row

☐ Mr. ☐ Mrs. ☐ Ms. First Name Initial Last Name (PLEASE PRINT)

Address Apt.

City State Zip

Telephone, please ( ) Area Code

BLDLH (AS)

Signature

Have you bought anything else by mail in the last ☐ 6 months ☐ year ☐ never

(1) Members who choose cassettes will be serviced by the BMG Music Service. Current Music Service members are not eligible.
(2) Members who choose CLASSICAL as their listening interest will be serviced by the BMG Classical Music Service.
Photocopies of this coupon are acceptable.
We reserve the right to request any additional information or reject any application. Limited to new members, only one membership per family. Local taxes, if any, will be added. Alternative offer available in Alaska and Hawaii. Offer not available in Puerto Rico, APO or FPO.

BMG COMPACT DISC CLUB

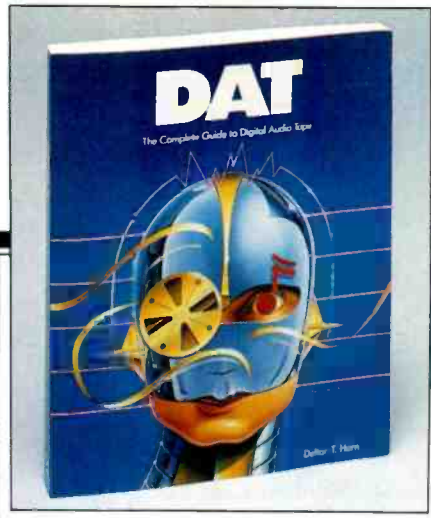
used to design vented loudspeaker systems. The program was written by Bob White, who also wrote Chapter 7. Another program, called "BOX-MODEL," lends its name to the title of Chapter 8; it includes the option of modelling systems that use passive radiators, and examples are shown in this chapter. Chapter 9 consists of letters from readers about the original articles and Bullock's replies. There is an index, a bibliography of related *Speaker Builder* articles, and a glossary.

Because this book is really a compilation of previously published articles, it doesn't follow a plan of exposition that would be found in a book written from scratch, but it is still very valuable because it provides much information about vented box design in one convenient package. I hope that someday Bullock will find the time to write the definitive book about both vented and sealed loudspeaker system design. He has acquired a great amount of knowledge about vented loudspeakers from designing and building real systems. Bullock shares this expertise with readers in a very useful way by presenting both the formulas and the measurement techniques, along with good explanations and practical examples of them; the book is also written in the first person and is very friendly. Anyone interested in designing and building vented loudspeaker systems should have a copy. *Edward M. Long*

DAT: The Complete Guide to Digital Audio Tape by Delton T. Horn. TAB Books Division of McGraw-Hill, softcover, 254 pp., $12.95.

If you want to learn all about the history of sound recording and reproduction by reading the first 48 pages of this book, by all means rush right out and purchase a copy. If you'd like a refresher course on analog sound recording, the basics (and I mean the *very* basics) of digital recording, and the basics of Compact Disc recordings and how CDs are made, read the next 87 pages or so of Horn's book. You will then have read more than half of this book before the subject of DAT is broached in any depth.

Although the copyright year shown at the beginning of this book is 1991,



DAT: The Complete Guide to Digital Audio Tape will bring you up to date, but only as far as early 1990.

Horn says that he did the writing during 1990. Unfortunately, he apparently did no revisions after, at best, early 1990. For example, he discusses the Serial Copy Management System (SCMS) as if it were still waiting to be adopted by manufacturers. This, after several pages of rehashing the story of the infamous "copycode" notch system that was proposed at the very beginning of the DAT controversy and summarily rejected when the National Bureau of Standards confirmed the failings of the system, both sonic and operational. The book also talks about buying DAT recorders on the "gray market," though they've long been fairly widely available in conventional electronics stores.

Normally, in attempting to write a book about such a fast-moving technology as digital audio recording, I would not fault an author for being a bit behind the times. In this case, however, I found the title of the book, as well as its subtitle, "The Complete Guide to Digital Audio Tape," far too misleading. Almost all of Chapter 7 of the book is devoted to a discussion of several automotive playback-only DAT decks. Most of these have been superseded by later generation models. The only two "home" DAT recorders mentioned, for reasons stated earlier, are the Casio DA-2 (which is no longer being sold to consumers) and the Nakamichi 1000 (which, according to my latest pricing information, carries a suggested list price of $11,900).

Chapter 8 of the book is entitled "Maintenance and Troubleshooting." After advising the reader not to try to pull tape out of the DAT cassette housing, the author tells us that DATs cannot be edited using manual cut-and-splice (razor blade) methods. The author then outlines several problems (e.g., "Problem—cassette cannot be inserted into the well. First, double check to make sure you are trying to put the cassette into the recorder right-side up. . . ."). This and other problems of similar complexity are then summarized by impressive-looking flow-charts that end with "Call qualified service technician." In discussing the various options, sampling rates, and recording times of DAT, the author doesn't mention that some DAT recorders can record up to four hours on a single tape at reduced sampling rates with reduced audio bandwidth, an option clearly written into the DAT standards.

In Chapter 9, the author conjectures as to the future of DAT. While Horn claims, earlier, to have understood the SCMS system, it is clear from a couple of sentences that he was not adequately briefed as to the limitations of SCMS when he wrote this chapter. He tells us that, "Electronic 'one-man bands' who play all the parts themselves will be able to pass their tapes through as many generations as they need to create elaborate pseudo-orchestra recordings, without worrying about noise and distortion buildup." That is not true, since SCMS also permits only one digital-to-digital copy generation for recordings made via the analog inputs. Again, because of the rapid advances in technology that are characteristic of the audio industry, Horn could not possibly have known about the Philips Digital Compact Cassette (DCC), whose technology was revealed in early 1991. Neither could he have predicted the introduction of the MiniDisc developed by Sony and scheduled for introduction in late 1992. Both of these new formats will undoubtedly have an important bearing on the future of DAT.

In summary, if you have been on an extended safari or vacationing on a remote South Pacific island for the past three or four years, this volume will bring you partially up-to-date as to the history and almost-current status of audio recording, both analog and digital. If you want to know what's really happening with home digital recording, however, I would suggest that you will learn more about the subject by simply reading the owner's manual that accompanies your DAT recorder or the articles and product reviews on the subject that appear in this magazine. *Leonard Feldman*

As If The Ethe

Eight Pounding Cylin

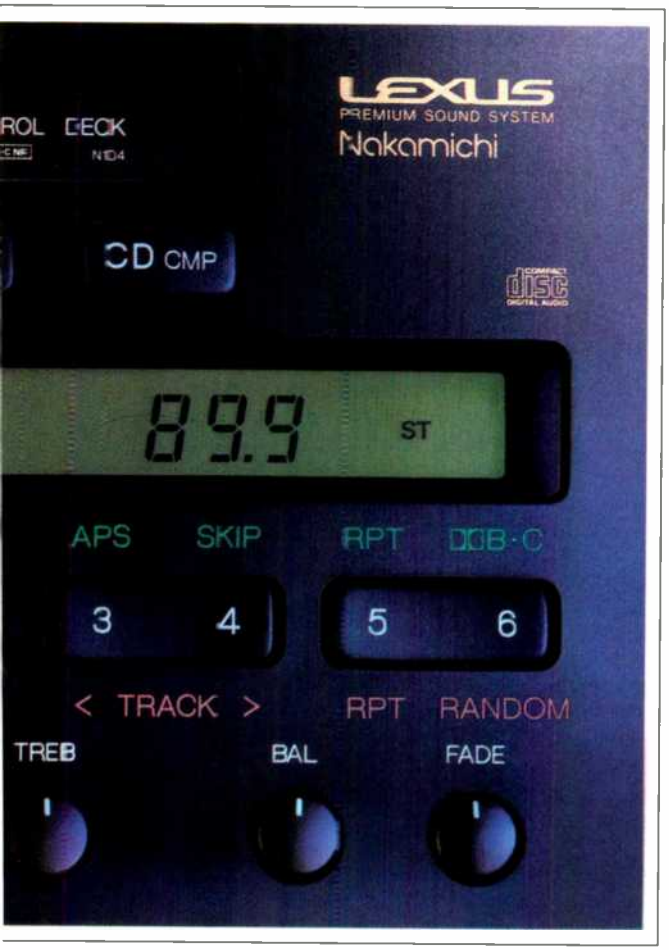
To hear the hum of the Lexus SC400's Four Cam, 32-valve engine is definitely a pleasure. But you have to admit, there will probably be times when you'll want to hum along with something a bit more musical.

Enter the optional Lexus/Nakamichi Premium Sound System with twelve-CD auto-changer, perhaps one of the finest audio units ever to be installed inside an automobile.

Dare we say, even a living room.

A total of seven speakers occupy the cabin: two tweeters, four extended-range speakers, and a ten-inch subwoofer. Each one placed in a distinct location to enhance sound imaging.

Turn up the volume and the first image that comes to mind is front row seats, thanks to 280 watts* that, at your discretion, can send a musical note to a place about four inches beneath the sternum. But power is nothing without finesse. That's why active high- and low-pass crossovers feed



specific frequencies that match the optimized operating range of every speaker. Equalization circuits (we'll spare you the details) are also used to tailor sound reproduction to the interior design of the car.

In English,

this means phenomenal sound quality. "The finest system you can buy in a new car" is how *Car Stereo Review* translated it (*Motor Trend* magazine, on the other hand, took a more direct approach by simply naming the entire car 1992 Import Car of the Year).

Of course, if you ever decide to turn off the stereo, you can always listen to how well the engine carries a tune.

real Sound Of ders Weren't Enough.

LEXUS
The Relentless Pursuit Of Perfection.

TED ALEXANDER

AIM HIGH ON AM

Photograph: ©Jon Holderer

I have been enjoying *Audio* for many years, and for the first time, I feel compelled to write. In the July issue, Leonard Feldman reviewed the Technics SA-GX910 A/V receiver and made a comment on the poor performance of the AM section of the tuner. He went on to comment on how all manufacturers, except for one or two, pay no serious attention to AM performance. I say, finally I see something in print that strikes at the heart of the problems of AM radio.

As all of you who can remember when AM receivers were somewhat more wide-banded know, AM is capable of *exactly* the same frequency response and distortion characteristics that FM is. As chief engineer of several radio stations over the past 25 years, including some of the huge 50,000-watt clear-channel powerhouses, I maintained these stations at specifications that included frequency response from 25 to 15,000 Hz, ±0.5 dB! Distortion figures were always below 1.2%. One of those old 50-kW transmitters really "groaned" during some musical passages, but these stations sounded *exactly* like FM on a *low-distortion, wide-band monitor.*

Several years ago, when broadcasters were being alarmed everyday whenever new radios were introduced, especially car radios, AM stations began to sound so bad that on some car radios even talk stations were hard to understand! Receiver manufacturers put in narrow-band filters in the i.f. that restricted high frequencies to 2,800 Hz or less. Phase response and "ringing" of those cheap narrow filters further eroded received AM quality. Broadcasters and manufacturers agreed on the NRSC pre-emphasis and 10,000-Hz bandwidth limits in hopes of manufacturers "opening up" the i.f. bandwidth.

At this time most major AM stations and many smaller AMs are transmitting very high-quality, NRSC-compliant signals. Before the agreement, AM stations could transmit the full 15,000-Hz audio bandwidth. We gave up the top half-octave to persuade receiver manufacturers to design and market wider bandwidth radios. The biggest limiting factor was AM's higher susceptibility to noise. We hear the roll-off above 10 kHz, but casual listeners pay little attention to that if the signal is noise-free.

Now, new rules soon to be adopted seem to be "sticking it" to AM again. Whenever AM broadcasters seek to upgrade the signal, they must reduce signal strengths toward their "neighbor" stations on or near their spot on the dial by 10% (a 20% power reduction) by either reducing transmitter power or tightening up a directional antenna system. Just what AMs don't need is a reduction in signal level, right when they need all the signal they can get to overcome man-made electrical interference.

I wonder how many readers know just what awful stuff is done to audio these days before it's applied to a transmitter for broadcast. For all but the few FMs who broadcast primarily Fine Arts programming, any resemblance a received audio signal bears to the original is coincidence. Dynamic range, even on the "softer" stations, is usually less than 6 dB. Limiting high frequencies dynamically to fit inside the pre-emphasized modulation limits often means the highs are attenuated nearly 18 dB! Then clipping is applied. Dividing the signal up into some three to seven frequency bands and processing them separately, then recombining them and processing them some more, is what almost every FM station is doing these days. Most AM stations now process their audio somewhat less than FM stations do.

Those listeners fortunate enough to possess a true wide-band AM receiver—the (now discontinued) Sony SRF-A100 and SRF-A1, the Carver TX-11b, and only one or two other models—are the only people who can truly hear great sound via AM. (Unless they listen to a station's monitor or have an old wide-band tuner or radio.) The new stuff is "junk" on AM. Most people think that since FM sounds okay and AM sounds bad, then it's the station and/or the medium that falls short. How can we expect them to think differently?

What AM needs the most is the ability to transmit a strong enough signal to overcome man-made interference, the ability to transmit wide-band audio back out to 15,000 Hz, and most of all, for receiver manufacturers to include (at the least) NRSC wide-band, low-distortion, AM tuner sections. Noise- and interference-cancelling circuitry is highly developed and should be implemented in all future receivers. And the public should be educated that AM sounds bad mostly because of the inferior receivers they must listen to.

If there is any way *Audio* can help encourage the receiver manufacturing industry to include higher quality AM sections, all AM broadcasters, and eventually the public to which they broadcast, will benefit.

Ted Alexander is chief engineer of WDOK-FM and WRMR-AM in Cleveland, Ohio, and he hosts a midday on-air program. He has been a broadcast veteran "from both sides of the mike" for 28 years.

Contrary to popular opinion, you *can* please everyone.

PRODUCT REVIEWS

"Deliciously liquid... breathtaking dynamic range... superb bass handling." – *Steven Baird, – The Sensible Sound, Fall/Winter, 1991.*

"Astonishingly musical...upper bass rich and potent... highs sweet sounding and clear." *– Inner Ear Report, Fall/Winter, 1991.*

"An excellent example of digital audio done right." *– Daniel Kumin, High Performance Review, Summer, 1991.*

"Everything expected from a top-quality CD player... superb low-level linearity... full complement of features." *– Julian Hirsch – Stereo Review, April, 1991.*

A hard bunch, those critics. So pardon our delight at such universal acclaim for our CD players. It's true, Carver's classic tube technology and the latest wonders of single bit D/A conversion make for "astonishingly musical" CD sounds. But please, hear them for yourself. Take your favorite disc to your Carver dealer today. And audition the full line of Carver CD players.

CARVER

Powerful • Musical • Accurate

P.O. Box 1237 Lynnwood, WA 98046
(206) 775-1202

reprints available on request

Distributed in Canada by Evolution Audio, Oakville, Ontario (416) 847-8888

Enter No. 8 on Reader Service Card

BERT WHYTE

TESTING...1, 2, CD

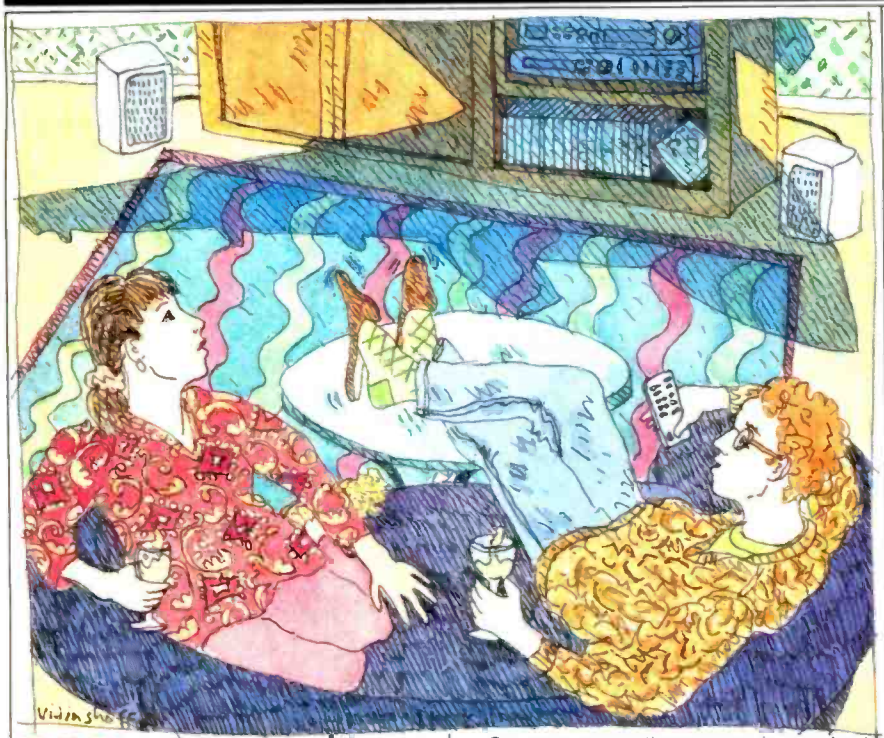


Illustration: Carol Vidinghoff

When the Compact Disc was introduced 10 years ago, most audiophiles were not familiar with the arcane world of digital technology. Even when they eventually understood the fundamentals of digital recording and the complexities of CD players and digital processing, many audiophiles were frustrated by their inability to "tweak" the new devices. Of course, in the analog era, the tweaking of audio equipment was a time-honored tradition, the mark of a true audiophile. In spite of the relatively immutable parameters of CD playback, many audiophiles have embraced a mind-boggling array of devices that purport to improve the sound quality of CD. In my opinion, many of the devices being offered are of dubious scientific or sonic validity, and some clearly cross over into the realm of audio fantasy.

There are, however, some very useful things that, used intelligently, can at the very least provide a solid frame of sonic reference for CD performance values; at best, they can significantly improve the CD sound in your listening room. I am referring here to the CD test recordings that have been issued by a number of companies since the launch of the CD format.

CD test recordings vary in content. Some have musical excerpts, along with test signals, to demonstrate certain technical aspects. Some have test signals that can differentiate performance parameters of the CD player, and still others have signals useful for checking overall system performance. Some recent test CDs place emphasis on signals that can provide information on the interaction of room acoustics and loudspeaker placement. Most of these test CDs are useful even if the only measuring instruments are your ears, but they can provide far greater information with the addition of some fairly basic and inexpensive measuring devices.

The most useful device to accompany test CDs is a sound level meter, which can range from the elaborate and expensive Brüel & Kjaer units, widely used in professional audio, to good-quality meters from GenRad and other companies. At rock bottom and of particular value is a simple sound level meter from Radio Shack. It has an SPL range of 60 to 126 dB, plus A and C weighting scales, and costs only $31.95. To properly plot SPL readings of the sound level meter from CD test signals, you need Keufel and Esser frequency response graph paper.

In surveying various test discs, keep in mind that similar or duplicate test signals appear on these CDs. There is no essential difference between third-octave test tones on one disc as compared to the same tones on another. In choosing a disc, see what special-purpose signals or tests are offered along with the ubiquitous signals to check frequency response, and decide if they fit your needs. Actually, to utilize the full gamut of tests, it is necessary to own several test CDs.

One of the earliest CD test recordings was *The Digital Domain* (Elektra 9-60303-2). This is a sort of showcase for digital technology in the form of elaborate synthesizer works, done at Stanford University's Center for Computer Research in Music and Acoustics. The very first track is very unusual—and potentially dangerous! It opens with 15 seconds of silence (all bits set to zero), which can be used to check the noise floor of a system, followed by faint sounds of insects, light breezes, and a burbling creek. If you happen to turn up the volume to increase the audibility of these sounds, you may blow your speakers with the tremendous roar of a jet plane take-off that suddenly follows the pastoral scene! Then another jet takes off, and one lands with a huge output of low-frequency rumbles. PZM mikes were used to record the nature sounds, and B & K mikes were used to record the jet planes. Track 16 has another dangerous high-level sound—that of a helicopter, recorded with B & K high-intensity mikes. The test signals are for the usual channel identification, followed by pink noise with and without emphasis, and then 1-kHz sine signals down to −60 dB.

Digital Audio Check (Denon 33C39 7441) has the expected complement of balance and phase signals plus a frequency signal swept from 5 Hz to 22.05 kHz. The extended high frequency is exactly half of the 44.1-kHz CD sampling rate, which allows examination of the attenuation characteristics of any low-pass filter in a CD player's circuitry. A level sweep and a phase sweep follow, and then there are short intervals of repeated orchestral music and solo piano at levels of −60 dB, −40 dB, −20 dB, and at (maximum) 0 dB. Playing the highest, 0-dB level first

In case you missed our preamp/tuner reviews, here's a few highlites.

PRODUCT REVIEWS

"High quality... extremely low distortion and noise... FM frecuency response among the best I have ever seen."
– Leonard Feldman, Audio, Dec., 1990.

"Carver demonstrates brilliant technological innovations... ACCD tuning delivers FM signals with stunning effect."
– David Doll, syndicated audio writer, 1991.

"Qualifies as the control center of any music system... impressively compact... a full array of Carver innovations."
– Julian Hirsch, Stereo Review, Nov., 1990.

Why separate components and not a receiver? How about cleaner FM reception, more power, and far superior sound.

Why Carver separates? How about Sonic Holography™, ACCD tuning, and in our flagship CT-17, Dolby Pro Logic and the ability to play two different music sources in two different rooms, *simultaneously*. Whew! That's enough.

You'll have to hear the rest for yourself. Check out our full range of separates at your Carver dealer.

CARVER
Powerful • Musical • Accurate
P.O. Box 1237 Lynnwood, WA 98046
(206) 775-1202

reprints available on request

Distributed in Canada by Evolution Audio, Oakville, Ontario (416) 847-8888

Enter No. 9 on Reader Service Card

A CD test disc can provide a frame of sonic reference for CD performance values and can even improve sound in your listening room.

and then raising your volume control for each lower level will provide a good test of low-level linearity and noise. The test signals are followed by a dozen musical excerpts that demonstrate a variety of recording techniques used in various recording venues.

One of the most comprehensive arrays of tests is on a two-CD set from Pierre Verany (PV. 788031/788032). No less than 106 digital tests and demonstration tracks are provided. The first CD starts with music examples of voice, solo instrument, chamber music, organ, and orchestral music. The test section starts with a maximum-level, 0-dB, 1-kHz calibration tone. This is followed by tests for channel identity, frequency response, harmonic distortion, signal-to-noise ratio, de-emphasis, transient response on square-wave signals, and response to tone bursts. Tracks 43 to 46 are both fascinating and revealing. An excerpt of Dvořák's Ninth Symphony is heard on track 43 with normal 16-bit quantization, on track 44 at 15 bits, on track 45 at 14 bits, and finally on track 46 at eight bits! Even on a high-resolution system, it takes very keen ears to pinpoint differences between the 16- and 15-bit tracks. The 14-bit track adds noise, is not as clean, and has less accurate timbre. The eight-bit track is quite noisy, sounds compressed, is grainy, and has grungy artifacts. Next are tracks for intermodulation distortion, while tracks 52 to 56 are used to demonstrate D/A converter overload on both pure tones and music. When I listened to this, it was obvious that the ear is more sensitive to overload on tones than it is to music.

The second CD from Pierre Verany is mainly concerned with digital, mechanical, and electronic performance parameters of the CD and the CD player. Tracks 1 to 24 provide information on linear cutting velocity and track pitch of a CD. Tracks 25 to 50 are among the most interesting on this disc and may cause consternation among some audiophiles. Deliberately produced "dropouts" (lack of data) were generated by the laser cutter. These range from 0.05 mm on track 25 to a horrendous 4.0 mm on track 38. The CD Red Book standard states that CD players should be able to correct dropouts of 0.20 mm. Beyond the standard,

The Listening Environment Diagnostic Recording test is fascinating—it detects reflecting surfaces in the speaker/room interface.

the Reed-Solomon code's error correction should be able to regenerate a lack of information of 2.47 mm, corresponding to an interruption of 1.9 mS. Most good CD players can do this, and some can correct even larger defects. The remaining test tracks concern dropout correction on minimum track pitch and the ability to correct successive dropouts. It should be understood that today's CD manufacturing plants produce CDs with an amazingly small number of defects. Actually, most dropouts are a result of careless consumer handling, which produces scratches, stains, etc. Of course, if there are gross dropouts beyond the error-correction capabilities of the CD player, it will go into "mute" mode.

The first *Stereophile Test CD* (STPH-002-2) begins with a reference tone of 1 kHz, includes tests for channel identity and phasing, and includes some pink noise. This is followed by a dissertation on hi-fi by *Stereophile* founder J. Gordon Holt, recorded in mono. As Holt speaks, the mike used to record each of his statements is changed (and identified in the CD booklet). Most of the professional mikes used for today's recordings, as well as several more unusual types, are utilized, and it is easy to discern the tonal balances and flatness of response between the various mikes. There is also a music section that permits comparison of A/D converters. Finally, a series of third-octave warble tones, starting with a 1-kHz reference and then descending from 200 to 20 Hz, can be quite useful for checking loudspeaker bass performance and room interaction. (This CD is available from *Stereophile*, P.O. Box 5529, Santa Fe, N.M. 87502, or call 800/358-6274.)

The British publication *Hi-Fi News & Record Review* on its test CD #2 (HFN 015) has perhaps the most comprehensive group of test signals. In addition to signals for checking channel identification, balance, and phasing, it has signals for calibrating level down to −100 dB (dithered), checking spot frequencies from 2 Hz to 20 kHz, making frequency sweeps, ascertaining S/N ratio and IM distortion, checking pre-emphasis, and checking response to impulse noise, pink and white noise, and square waves. The disc contains an Ambisonic walk-around, a number of Ambisonic music excerpts, and music for microphone comparison. (This CD is available from Music & Sound Imports, 2381 Philmont Ave., Suite 117, Huntingdon Valley, Pa. 19006, or call 800/487-7686.)

One of the more recent test CDs is from Chesky Records (JD37). The first part is a jazz sampler of Chesky recordings, followed by the obligatory test for channel identification. Then follows one of the most fascinating tests available on any CD: Listening Environment Diagnostic Recording (LEDR). The test is for stereo imaging and uses a computer-generated signal developed by Doug Jones of Northwestern University. It really is a means of detecting reflecting surfaces in the loudspeaker/listening room interface, which can degrade imaging. In the first test, the left-channel signal should appear to begin at the midpoint of your loudspeaker and then move straight up toward the ceiling! The same should be true for the right channel. After the signal moves straight up toward the ceiling, it should arc across the ceiling and then move down to the opposite channel's speaker. Finally, the signal should move laterally between the speakers. If the signal does not have the motion as described, it indicates the presence of an interfering reflective surface. For example, if the signal does not rise straight up from the speaker, suspect a reflection from the ceiling, which might be alleviated by using some absorption or diffusion. Repositioning the speakers might be in order, and running the LEDR test again will reveal if the results are any better—or any worse! Other useful tests on this CD are for image depth, absolute polarity, low-level linearity, and A/D converter comparison.

For all of the aforementioned test CDs, you can plot the test signals by using a sound level meter and frequency response graph paper, or a third-octave analyzer. This will give you at least some idea of major peaks or notches in frequency response as heard from your listening position.

Whatever test CD you use, it is reassuring to know that its signals, unlike those on the LP test discs of yore, are as accurate as those from the test instruments themselves! A

MEDIA AND OTHER MADNESSES

From the beginning, the Consumer Electronics Show activities, sponsored by the Electronic Industries Association, have been trade events organized to keep dealers abreast of new product developments in an ever-expanding field. For many years there was only one show a year, in the summer in Chicago, and then about 20 years ago a winter show was introduced. Nobody relished going to Chicago in January, so the winter venue was soon changed to Las Vegas.

For more than 15 years the Las Vegas show has prospered. The Chicago summer show, on the other hand, has been so flat in recent years that many manufacturers have talked openly of pulling back, possibly attending only one show per year. One problem with the Chicago show is that it comes too soon after the Las Vegas show (just a little more than four and a half months apart this year), and in many areas of product development, there is little new to exhibit, just production versions of the prototypes shown in January.

A quick check of the program booklets for the two recent shows indicates that the exhibitor base in Chicago was only about two-thirds what it was in Las Vegas, with registration way down to boot. This trend has been under way for some time, and the CES management tried to bolster the flagging attendance by opening the last day and a half of the show to the public for an admission charge.

The MiniDisc's underside Protective shutter at right slides open during play

I don't know how successful this was in the large picture of exhibits at McCormick Place, but judging from public attendance at the high-end exhibits at the Hilton, I'd say it was not very effective. Other exhibitors, primarily suppliers to the industry, had virtually nothing to show to the public and closed their stands at noon on the third day.

Whatever problems CES has cannot be solved by opening the show to the public, and in the long run such an approach will only alienate exhibitors. Joint trade/consumer shows are common in Europe and Japan. This works there mainly because travelling distances are short, allowing people from the relatively few major market areas to converge on one location; a single show can thus adequately serve both the trade and public.

In the United States, distances are far too great for such a plan to be successful. This points up the necessity for something that has long passed from the general scene—the "audio fair" concept. I am thinking of this in the same general context as boat shows, auto shows, camera shows, and the like, which happen yearly in metropolitan centers all over the country. But this is a subject for another time; suffice it to say that we cannot successfully piggyback an audio fair on top of a trade show.

The biggest thing in audio at CES was the unveiling of Sony's MiniDisc (MD) and its market positioning as a direct competitor to Philips' DCC. The positioning is about as direct as you can get; Sony intends for the MD to become the new standard for "audio on the go" in automobile and Walkman applications where the cassette has long been king. Of course Philips has the very same plan for DCC. Overall, both systems are equivalent in sonic terms. Both are recordable, and neither seems to have a clear advantage over the other in the cost department. Beyond these points, their advantages diverge. The DCC provides a line of continuity with the past in that all DCC machines will play older analog cassettes. The MD players will not accommodate older CDs but will offer many of the advantages of CD, such as no wear on the medium and very rapid access time to individual program tracks.

The big question is this: Why, in these economic times, are two titans squaring off for a marketplace battle that neither may win? There certainly isn't room for both, and a pitched battle may kill both. There might be room for one or the other—if the titans worked together. (Remember that the astounding success of the CD happened largely because of cooperative efforts between Philips and Sony—the very two companies whose systems now oppose each other in the audio marketplace.)

Video continues to dominate CES, and activity here will certainly quicken as we head toward an FCC decision

TO CELEBRATE THE ARRIVAL OF PHILIPS DCC, THERE'S A FREE DIGITAL RECORDING ON THE NEXT PAGE

MYSTERIOUS

Introducing DCC, from Philips. What you see here represents only the first 4.7 seconds of the piece. But, it stands for years of enjoyment to come. It's all digital. Zero noise, zero hiss. It's called DCC (for Digital Compact Cassette). And by no coincidence, it comes from Philips. The same company that invented the compact disc. DCC not only plays music with crystal clear CD quality, it lets you *record* with the same digital sound quality. And it has features CD players can't offer. Beyond direct track access and a display for track number and elapsed time, Philips DCC players show you the current song title, album title and artist.

DIGITAL
COMPACT CASSETTE

WAYS BY U2:

Right from the start, there are literally hundreds of DCC titles available, from all the major artists — in every style of music, in new releases and classic titles

So what happens to all those cassettes you've amassed over the years? Play on. They'll sound as good as ever on your DCC player. The Philips DCC home player is available as we speak. And before long DCC will be available as a personal portable player as well. For the location of the Philips dealer near you call **1-800-982-3737.**

Your music will never be the same.

PHILIPS

Another First from Philips

TIPS FOR MAIL ORDER PURCHASERS

It is impossible for us to verify all of the claims of advertisers, including product availability and existence of warranties. Therefore, the following information is provided for your protection.

1. Confirm price and merchandise information with the seller, including brand, model, color or finish, accessories and rebates included in the price.
2. Understand the seller's return and refund-policy, including the allowable return period and who pays the postage for returned merchandise.
3. Understand the product's warranty. Is there a manufacturer's warranty, and if so, is it from a U.S. or foreign manufacturer? Does the seller itself offer a warranty? In either case, what is covered by warranty, how long is the warranty period, where will the product be serviced, what do you have to do, and will the product be repaired or replaced? You may want to receive a copy of the written warranty before placing your order.
4. Keep a copy of all transactions, including cancelled checks, receipts and correspondence. For phone orders, make a note of the order including merchandise ordered, price, order date, expected delivery date and salesperson's name.
5. If the merchandise is not shipped within the promised time or if no time was promised, 30 days of receipt of the order, you generally have the right to cancel the order and get a refund.
6. Merchandise substitution without your express prior consent is not allowed.
7. If you have a problem with your order or the merchandise, write a letter to the seller with all the pertinent information and keep a copy.
8. If you are unable to obtain satisfaction from the seller, contact the consumer protection agency in the seller's state or your local U.S. Postal Service.

If, after following the above guidelines, you experience a problem with a mail order advertiser that you are unable to resolve, please let us know. Write to Nick Matarazzo, Publisher of Audio Magazine. Be sure to include copies of all correspondence.

Whatever problems CES has cannot be solved by opening the show to the public, and in the long run, this will only alienate exhibitors.

on HDTV in 1993. While it should be possible this year to buy wide-screen TV sets with a 16:9 ratio of width to height (about a third wider than our current 4:3 screens), there is little to play on them that takes full advantage of the wide-screen format except for movies recorded on LaserDisc in "letterbox" style. (Letterboxing enables wide-screen movies to be viewed without undue truncation of the picture's sides, but this leaves blank areas at the top and bottom of today's 4:3 screens.) I understand that some cable services will provide screen-filling programs. This may all be viewed as an interim step toward the mid-'90s, when we might expect the first true HDTV products and source material.

DCC, like MiniDisc, has album graphics on its smooth top side.

Elsewhere on the video front, Sharp exhibited their superb LCD HDTV projector, this time using a stacked pair for added brightness when delivering a 200-inch diagonal picture. JBL formally introduced its Synthesis One, which for the first time brings some of their theater loudspeaker technology into an area heretofore dominated by cones and domes. (See September "Currents".) The Snell home theater exhibit was also very well done, with an interesting program of both music and video clips and perhaps the best standard NTSC projection system at the show.

One thing that has puzzled me has been the failure of digital signal processing (DSP) to make an impact in auto stereo. The auto stereo market seems to do very well without it, perhaps because most of the examples I've heard to this point have been so poorly executed. What I am talking about here is the use of DSP to create spatial enhancement in the car, and this can take the form of reverberation programs or image enhancement of various kinds. Conceptually, all of this makes sense because the car's interior is generally perceived acoustically as dry and confining. What better way to open it up than with a modicum of tasteful spatial enhancement? The important thing here is the term *tasteful*. I know from firsthand experience, both at home and in the car, that the difference between a subtle spatial effect and a grossly overdone one is often no more than about 3 dB!

In the exotic loudspeaker department I came across a unusual German design that resembles a high-tech space heater! It goes under the brand name mbl and is unlike anything I have ever seen. It consists of low-, mid-, and high-frequency elements, all of which are shaped like prolate spheroids (footballs) stacked vertically. The upper ends are fixed while the bottoms are driven by voice coils. The spheroids are flexible in construction, and they execute a 360° pulsating motion when driven by the voice coils. While most loudspeaker mechanisms perform best when they are kept as simple as possible, these transducers are, by their very nature, of complex construction. The large bass section is constructed of alternating pieces (a little like barrel staves) of rigid aluminum and flexible, neoprene-like material. The aluminum pieces are further carefully damped to minimize secondary resonances. At a sensitivity of 80 dB, for 1 watt at 1 meter, the system is quite power hungry. The speakers sounded quite good, with the characteristic spaciousness of omnidirectional designs. And what is the price? About $29,000 for the pair!

There *were* highlights to this CES, and I have noted a few here. But I hope that organizers can work on ironing out some of the wrinkles, that they can keep CES a trade show only, and that this summer show can hold its own against its winter counterpart in Las Vegas.

WHAT MAKES A MOMENT

A MEMORY

Clockwise from upper left: Infinity SSW-210 with grille removed, Hsu Research HRSW 10, Altec Lansing PSW10, and Velodyne F-1500 with grille detached.

THUNDER

SUBWOOFER

IN THE

SHOOTOUT

LISTENING ROOM

D. B. Keele, Jr.

Hooked on bass and can't get enough of it? Turning up your bass control doesn't add low bass so much as boost the upper bass, which you already have enough of—and when some really powerful low bass notes come along, all that comes out of your speakers is distorted mush. And if you have high-end equipment, where tone controls are considered to detract from the purist, straight-wire sound, there isn't even a bass control to turn.

If lack of bass is your problem, subwoofers are the solution. Because they're optimized to reproduce bass, subwoofers won't wilt when handling high-level deep-bass signals. This gives you extra freedom in getting the exact bass level you want. And because they handle only bass, it's hard to tell where their sound is coming from, which gives you the freedom to place them where they'll sound best and look least obtrusive. What's more, handing the bottom octave or two over to subwoofers frees your full-range systems and the amplifiers driving them from the demanding requirements of high-level bass. Combining subwoofers with small systems that lack low bass response but offer superior imaging and more even coverage can often give you greater sound for the buck than larger, more expensive full-range systems.

Thanks to the popularity of home theater systems, subwoofers are more plentiful than ever: *Audio*'s 1992 Annual Equipment Directory lists almost 300 of them. To help you choose, this review compares four subwoofer systems covering a fairly wide range of prices (from $750 to $1,495 per system) and design approaches. Two systems, the Altec Lansing PSW10 and Infinity SSW-210, are from well-known speaker manufacturers. The Velodyne F-1500 comes from a well-known subwoofer specialist, and the Hsu Research HRSW 10 comes from a new company that also produces only subwoofers. All but the Hsu Research are powered, closed-box designs, sold individually. The HRSW 10, however, is a passive, vented woofer sold in pairs. All three self-powered speakers include active low-pass filters (plus an active high-pass, in the Velodyne) as well as circuitry to protect the drivers by limiting excursion when the signal includes high-level low-frequency information. They also have left and right line-level and speaker-level inputs, so they can reproduce the bass from both stereo channels.

The Altec Lansing PSW10 includes a single 10-inch long-throw woofer mounted on the bottom of its raised,

Photos: Leonard LaGrua

The Altec provides a solid combination of good looks, ease of installation, and credible performance.

Ser Hsu, the designer, calls his systems "true subwoofers" because they can produce high output down to 20 Hz with low distortion, to differentiate them from subwoofers that go down to just 30 or 40 Hz, as many of them do. Even so, at $750 per pair, the Hsu system is the least expensive of the subwoofers reviewed here, though no amp is supplied. The passive crossover is a separate box, with speaker-level inputs that are driven from the same amp as the satellite speakers but with line-level outputs to feed a separate stereo amplifier that drives the two subwoofers. Hsu recommends 40 to 300 watts per channel and says that, with room gain, a 40-watt amplifier will be enough to deliver levels of 109 dB SPL at 1 meter, even at 20 Hz.

Infinity's SSW-210 houses two 10-inch long-throw drivers, a 250-watt amplifier, and a crossover. Its slant-sided cabinet, essentially a rectangular block with one corner cut off, allows it to be placed in (and loaded by) a room corner or placed on the floor behind a piece of furniture. It can also be used upright, and optional end panels turn it into a low table that angles the drivers downward for floor loading. On its rear panel are a level control, a continuously variable control for the frequency of the low-pass crossover filter, and an on/off switch. In addition to the built-in walnut cabinet, plus a 100-watt amplifier and an active crossover mounted in the box. A panel holds "Equalizer" and "Volume" controls, a knob to select crossover frequencies (of 50, 80, 100, or 150 Hz), and pushbuttons to select crossover slope (18 or 24 dB/octave) and normal or inverted polarity. There's no on/off switch, because the system turns itself on when it receives a signal, but there is a "Power" LED. Another LED, just below, shows the status of the Dynamic Equalization excursion-limiting circuitry.

The Hsu Research HRSW 10 consists of two cylindrical cabinets (to minimize side-wall flexing), each containing a 10-inch long-throw woofer, plus an external passive crossover network. The enclosures are vented by long internal port tubes that run nearly the full height of the cabinets and exhaust at the bottom, next to the drivers. The cabinets are wrapped in black knit cloth, with a wood cap at the top. Poh

ALTEC LANSING PSW10

Manufacturer's Specifications
Enclosure Type: Sealed box.
Driver: 10-in. cone.
Power: Built-in Class-B amplifier, 100 watts out at 0.1% THD.
Frequency Response: 26 to 180 Hz, ±3 dB.
Crossover Frequencies: 50, 80, 100, or 150 Hz, selectable.
Crossover Filter Slopes: Low-pass, 18 or 24 dB/octave, selectable.
Dimensions: 17⅜ in. H × 17⅜ in. W × 17⅜ in. D (44.1 cm × 44.1 cm × 44.1 cm).
Weight: 57 lbs. (25.9 kg).
Price: $850 each.
Company Address: P.O. Box 277, Milford, Pa. 18337.
For literature, circle No. 100

low-pass filter, Infinity offers both line-level active and speaker-level passive high-pass filters as options. Some Infinity literature mentions servo control, but there is no direct motional feedback in the system, although the amplifier does use positive current feedback techniques to reduce driver distortion.

The Velodyne F-1500 does use high-gain motional feedback servo techniques to control its 15-inch driver. Like all Velodyne subwoofers, it uses a piezoelectric accelerometer attached to the driver's voice-coil to sense drive movement, then uses feedback from the accelerometer to linearize the driver's motion and reduce its distortion. The built-in 250-watt servo amplifier also contains a protective limiter (see *Audio*'s November 1987 review of the Velodyne ULD-15 for an in-depth discussion of the servo system). The F-1500 is the only system reviewed here that has a full crossover, including a high-pass filter to limit low-frequency feed to the satellites; both line- and speaker-level high-pass outputs are provided. Controls on the rear allow for level adjustment, continuously varying the crossover frequency, and power switching. At $1,500, the F-1500 is the highest priced of the four systems I evaluated.

Measurements

Figure 1 shows the frequency responses of the four systems, with each curve's maximum plotted at 0 dB. Near-field and ground-plane techniques were used in the gathering of response data. Curves were run at sufficiently low levels that protective limiters or compressors, where present, did not operate.

Each system's crossover controls were set to their highest frequency and fastest roll-off, and any other controls were adjusted for flattest response. For the Altec PSW10, the settings were "Volume" fully clockwise, "Equalizer" at the 1:00 position, normal polarity, and a crossover of 150 Hz and 24 dB/octave. The Hsu HRSW 10 was driven directly from my amp, and the resulting curves were adjusted to reflect the measured response of the low-pass crossover filter. For the Infinity SSW-210, level and frequency controls were set fully clockwise. The Velodyne F-1500's volume control was set to its mid position ("5"), and the crossover low-pass was set at 100 Hz. Input levels for this test were 10 mV rms into the line-level inputs of the three active models and 2.83 V rms (1 watt, at its rated impedance of 8 ohms) for the Hsu Research unit.

The response measurements can be grouped into two different categories: Low-frequency extension to 30 Hz (Altec and Infinity) and to 20 Hz and below (Hsu and Velodyne). These response curves are not the whole story. In an active, or powered, system, the designer can theoretically apply response equalization to make the system flat down to any frequency he chooses—but with the danger that pushing a driver beyond its capabilities can lead to distortion or even damage. What matters is how loud the system will play at each frequency at a reasonable distortion level, not how flat it measures at low signal levels. Getting audible 5-Hz output from a 5-inch driver is an exercise in futility, no matter how big your power amp, even if you could design a 5-inch woofer with an 18-inch excursion. Distortion data at specific levels and frequencies, and maximum acoustic output information—both of which have nothing to do with the flatness or lack thereof of low-level frequency response—are required for assessing the effective performance of a subwoofer. Distortion and maximum output data will be shown later.

The upper frequency limits of the systems cover a broad range, from a low of 40 Hz for the Hsu subwoofer (which can be purchased with higher crossover frequencies) and up to 160 Hz for the Altec. The half-power (−3 dB) frequencies for the subwoofers were: Altec, 31 to 160 Hz; Hsu, 14.3 to 40 Hz; Infinity, 28 to 123 Hz, and Velodyne, 17.5 to 70 Hz. These figures were all reasonably close to the manufacturers' ratings. Measured upper frequency *acoustic* roll-off rates (which include the driver's own roll-off in addition to the crossover's) were sometimes steeper than specified. Measuring at levels of −10 to −30 dB (where the roll-off is most important for proper matching to satellite speakers), I found the slope to be 12 dB/octave, as rated, for the Velodyne, 18 dB/octave for the Altec (when set for 24 dB/octave) and the Hsu, and a very rapid 42 dB/octave for the Infinity. The only significant frequency anomaly was a dip of about 2.5 dB in the Altec's response in the ⅓ octave centered at 65 Hz. Altec's designer revealed that this was because the dip filter intended to tame the system's primary woofer-box resonance was somewhat misaligned in my test sample.

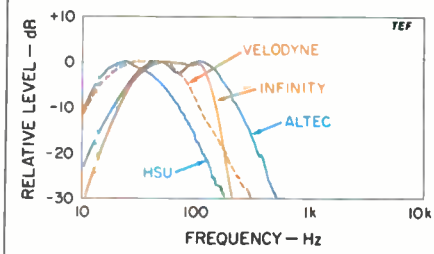


Fig. 1— Frequency response of all four subwoofers.

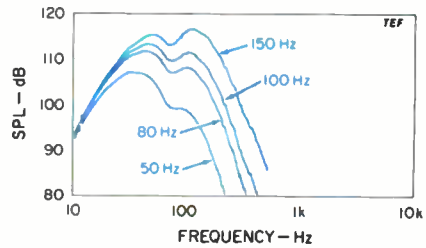


Fig. 2— Effect of crossover-frequency settings on the response of the Altec Lansing PSW10, at 24-dB/octave crossover slope.

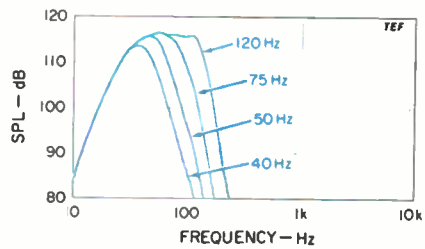
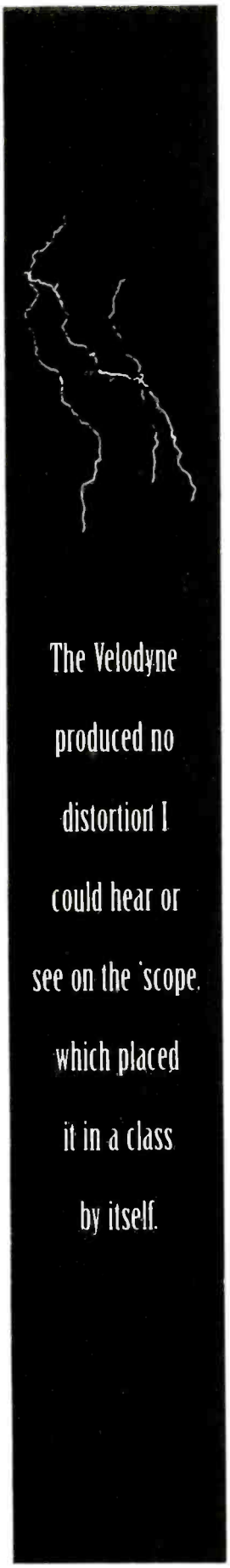


Fig. 3— Effect of selected crossover-frequency settings on the response of the Infinity SSW-210.



family of curves at the 18-dB/octave setting (not shown) was similar to those for the 24-dB/octave family except for greater level above 50 Hz and a measured acoustic roll-off rate closer to 12 dB/octave.

The Altec's EQ control mainly affects the frequency response in the two-octave range from about 15 to 60 Hz, with maximum influence at 30 Hz. The EQ circuit basically just boosts, but because of driver roll-off, overall response is flattest with the control near the zero point of its "−9" to "+9" dB scale. At 30 Hz, the total boost measured about 22 dB with the control fully clockwise (−13 to +9 dB referenced to the control's 0-dB position). The Dynamic Equalization circuits of the PSW10 partially eliminate this boost at high levels. With the usual settings of the EQ control (mid to full rotation), this action serves to provide a subjective high level of bass at low to moderate levels but decreases the amount of boost at high levels so that the system will not be overdriven. My tests revealed that the boost was reduced very suddenly when the threshold level was reached. At threshold, an increase of only about 0.5 dB would turn the boost off completely.

Figure 3 discloses the crossover responses of the Infinity SSW-210 with the crossover-frequency control at the positions indicated and the level control at maximum clockwise. Test condi-

I chose not to present any phase response curves because of the large variety of available responses. Also, because each system was essentially minimum-phase, its phase performance would be directly rated to its frequency response, thus presenting no surprises.

Figure 2 shows the crossover responses of the Altec PSW10 in its 24-dB/octave roll-off mode. The EQ control was set to the 0-dB, straight-up, position, with the volume control at maximum. The curves were run with 10 mV applied, and the resultant near-field sound pressure was noted. The test microphone was placed ¼ inch away from the center of the woofer's dome. The curve family exhibits significant changes in level as the crossover frequency is varied. When the response maximums were normalized to 0 dB (not shown), the upper frequency limits (−3 dB points) were 51, 58, 117, and 151 Hz as compared to the rated values of 50, 80, 100, and 150 Hz. The

VELODYNE F-1500

Manufacturer's Specifications
Enclosure Type: Sealed box.
Driver: 15-in. cone with servo accelerometer attached to voice-coil.
Power: Built-in Class-AB amp, 250 watts continuous.
Frequency Response: 18 to 85 Hz, ±3 dB.
Crossover Frequencies: Low-pass filter, 40 to 100 Hz, variable; high-pass filter, 85 Hz.
Crossover Filter Slopes: Active low-pass, 12 dB/octave; passive high-pass, 16 dB/octave.
Dimensions: 20 in. H × 20 in. W × 20 in. D (50.8 cm × 50.8 cm × 50.8 cm).
Weight: 79 lbs. (35.9 kg).
Price: $1,495 each.
Company Address: 1070 Commercial St., Suite 1012, San Jose, Cal. 95112.
For literature, circle No. 101

tions were the same as for the Altec system, with the microphone in the near field of one of the two woofers. The responses of the two woofers were very closely matched. The roll-off rate was significantly more rapid at the highest crossover-frequency setting than at the lowest (42 dB/octave at 120 Hz versus 24 dB/octave at 40 Hz). If the response maximums were normalized to 0 dB, the upper frequency limits (the points where response was 3 dB down) would be 46, 57, 76, and 125 Hz.

The responses of the Velodyne F-1500 for three settings of its variable crossover-frequency control are shown in Fig. 4. As I did when testing the Altec and Infinity, I set the mike ½ inch from the center of the driver's dome and applied a signal of 10 mV rms to the system's line-level input. Because the Velodyne's gain was substantially higher than that of the Altec and Infinity systems, however, I set its volume control at its mid position. With the volume at maximum, only 1 mV was required for substantial bass levels. As with the Altec system, varying the crossover frequency also significantly changed the gain. Normalizing the response peaks as before showed that the upper low-pass filter's cutoff frequency could be adjusted only for −3 dB points from 52 to 71 Hz, significantly narrower than the 40 to 100 Hz indicated on the control dial. If the Velodyne were to be used with mini-monitor satellite systems having limited low-frequency capability, this relatively low upper crossover point would present blend problems in achieving flat response in the upper bass.

The compressor-limiter circuits of the Velodyne were very effective. With a sine-wave input increasing in level, the system would simply stop getting any louder when the excursion limits of the woofer were reached. This limiting was done very smoothly and without any extraneous audible effects. For very high inputs, the Velodyne protected itself by shutting down its power amplifier until the overload went away. With the volume control at mid position, the system shut down after a couple of seconds when a 20-Hz-signal at a level of 400 mV was applied to the line-level input. Raising the input from 50 to 400 mV, an 18-dB increase in level, resulted in only a 2.4-dB increase in output level.

The Hsu HRSW 10 subwoofer is the only one of the four systems evaluated here that is not self-powered, so somewhat different tests were run. An additional complication I faced was that the Hsu subwoofer is supplied as two separate units containing individual 10-inch woofers with an external low-pass passive crossover filter. Should I compare just one of the Hsu systems or the pair with the other systems? I chose to compare a pair of Hsu systems connected in parallel.

Figure 5 shows the 1-meter axial response of the pair of Hsu systems, connected in parallel, with 2.83 V rms applied (2 watts into 4 ohms, driven without the external low-pass filter). The subwoofers were actually measured on the ground plane at a distance of 2 meters. The HRSW 10s were upright, side by side, and raised 2½ inches above the floor (the height provided by the supplied spikes). A single system measured under the same conditions exhibited a curve 6 dB lower in level (84 dB at 100 Hz instead of 90 dB). Below 100 Hz, the axial response rolls off smoothly and is down about 11.5 dB at 20 Hz. When the system was driven with an amplifier being fed by the supplied passive low-pass filter (whose response is not shown), the system's response appears as in Fig. 1. A high-Q dip in the axial response is evident at about 260 Hz. This is a result of the primary organ-pipe resonance of the long vent tubes that tune the systems to 20 Hz.

Figure 6 shows the impedance magnitude of a single Hsu system. If two systems are operated in parallel, the impedance will be one-half the values seen in the graph. The minimum impedance of a single HRSW 10 just barely drops below 8 ohms at the system's 20-Hz tuning frequency. Rather high maximums of 41 and 115 ohms are reached at the lower and upper vented-box impedance peaks. The high peak impedance values actually indicate a good driver design that derives most of its damping from electromagnetic effects due to current flow through the voice-coil rather than from mechanical losses. This impedance should be an easy load for any amplifier to handle.

Figures 7 to 10 show the results of harmonic distortion tests. A suite of sine-wave distortion tests were run at nine third-octave center frequencies from 16 to 100 Hz at axial levels ranging from 70 to 110 dB SPL. The actual measurements were all near field but referenced to 1-meter free-field levels. No room gain was taken into account. The harmonic distortion readings

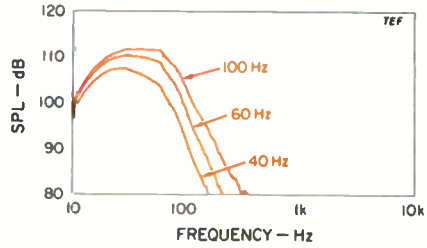


Fig. 4— Effect of selected crossover-frequency settings on the response of the Velodyne F-1500.

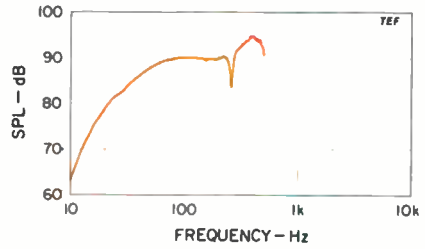


Fig. 5— One-meter, on-axis anechoic frequency response of the pair of Hsu Research HRSW 10 subwoofers, with input of 2.83 V rms.

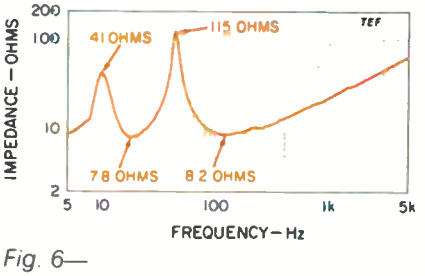


Fig. 6— Impedance of a single Hsu HRSW 10.

Overall, the Hsu HRSW 10 is an extremely good value and a good buy, even if you do need to add an amplifier.

shown were made by summing the power in the first 20 harmonics of the fundamental, referencing this power to the fundamental's power, and then calculating the percentage of distortion. Effectively the method yielded results very close to total harmonic distortion (THD), which includes the power in all the harmonics. In all the tests, the second and third harmonics of the fundamental predominated.

Each frequency was first raised to an equivalent 70-dB SPL fundamental level, and distortion was measured. The level was then increased in 2-dB steps until the distortion became excessive (usually in the range of 40% to 60%), the output stopped increasing, or the power capability of the driver was exceeded—whichever occurred first. (Note that the curves for the lowest frequencies are at the rear of the charts, placed there so that their higher distortion would not obscure the readings at the higher frequencies.)

In Fig. 7, the results for the Altec, the distortion is reasonable down to 50 Hz and at levels up to about 100 dB SPL. At lower frequencies, the distortion rises much more rapidly until level-limiting sets in at the lowest frequencies. Below 32 Hz, the distortion rises very rapidly with level.

The distortion of the Hsu subwoofer is shown in Fig. 8. The distortion reaches maximums of only about 15% for 100 dB at 25 and 32 Hz. At 16 and 20 Hz, the maximum sound levels are limited by the power capability of the woofer. The distortion-reduction capability of the Hsu's vented-box design is clearly evident in the 16- and 20-Hz bands. Between 80 and 90 dB SPL the distortion is actually somewhat less at 16 and 20 Hz than at 25 and 32 Hz. The distortion reaches only about 6% for 90 dB at 16 and 25 Hz. At 40 Hz and above, loud levels of about 104 to 106 dB can be reached with quite reasonable levels of distortion.

Figure 9 shows the distortion data for the Infinity SSW-210. The performance of this system ranks between that of the last two systems. At 50 Hz and above, the distortion is very reasonable. Below 50 Hz, however, distortion increases rapidly as frequency is lowered. At 25 Hz, a usable 88 dB SPL is reached at about 15% distortion.

The distortion data for the Velodyne system is shown in Fig. 10. Incredibly, the distortion reaches a maximum of only 2% in the 20-Hz band! The very beneficial effect of the servo is quite

HSU RESEARCH HRSW 10

Manufacturer's Specifications
Enclosure Type: Dual, vented boxes.
Driver: 10-in. cone in each enclosure.
Recommended Power: 40 to 300 watts per channel.
Frequency Response: 16 to 40 Hz, ±3 dB.
Rated Impedance: 8 ohms.
Crossover Frequencies: 40 Hz; 40 to 100 Hz available on special order.
Crossover Filter Slopes: Low-pass, 12 dB/octave; 18 dB/octave available on special order.
Dimensions: 29 in. H × 14½ in. diameter (73.7 cm × 36.8 cm).
Weight: 23 lbs. (10.4 kg) each.
Price: $750 per pair with walnut top and standard passive crossover; other finishes, $50 additional for light oak top, $100 additional for rosewood; crossover options, $50 extra for passive crossover with 18-dB/octave slope, $30 extra for special frequency, $350 for active crossover.
Company Address: 20013 Rainbow Way, Cerritos, Cal. 90701; 800/554-0150.
For literature, circle No. 102

evident in holding the distortion down at all frequencies and levels. The maximum levels were set by the action of the system's limiter circuits. The Velodyne was always extremely well behaved during most of these tests and generated only the given low-frequency tone, without any audible distortion or noise. It is the cleanest low-frequency reproducer I've ever heard. The only extraneous sounds generated occurred when a very high-level sine-wave signal was suddenly applied to the F-1500: At that point, an overload-related clicking sound was generated briefly before the system's limiters came into operation.

Figure 11 shows the subwoofers' short-term, 1-meter, free-field peak acoustic output capabilities as a function of frequency. The test signal used was a 6.5-cycle shaped tone burst with a third-octave bandwidth. The "room gain" of a typical listening room at low frequencies, which adds about 3 dB to the response at 80 Hz and 9 dB at 20 Hz, *has* been added to all these curves. Tests were run over the range from 16 to 200 Hz. The outputs of the systems were monitored both by ear and with an oscilloscope to check the produced waveforms. The input to the systems was increased until reasonable visible or audible distortion developed, whichever occurred first, and then the peak output sound pressure was noted. Since the Velodyne produced no distortion I could hear or see on the 'scope, its output limit was set by its protection circuits. This placed it in a class by itself. For example, even though the graph shows the maximum output of the Hsu (tested here with both systems operating in parallel) exceeding the Velodyne by a few dB, its output was almost invariably more distorted than the Velodyne's, even when producing the same sound level.

The Altec's output starts at 80 dB SPL at 16 Hz, rises rapidly with frequency, and then levels off at about 110 dB above 50 Hz. Its output was the lowest of all the systems.

The Infinity starts out much higher, 96 dB at 16 Hz, rises with frequency to reach a peak of 119 dB at 100 Hz, and then falls rapidly. Its drop above 125 Hz seemed to be due to some internal electronic limiting action and not power amplifier or woofer limiting. Between 80 and 160 Hz, the Infinity's output was second highest, and exceeded the Velodyne's. At 16 Hz the Infinity's maximum output was within 3 dB of the Velodyne and Hsu systems'

The Hsu exhibited the highest maximum acoustic output of all the systems (with both cabinets operating in close proximity). As mentioned before, although its output exceeded the second-place Velodyne's in the important range from 16 to 50 Hz, its output was significantly more distorted than the Velodyne's. The Hsu essentially exceeded 110 dB SPL at 20 Hz and above, and 120 dB above 80 Hz. Note that these outputs were attained with an effectively unlimited amount of power from a very powerful amplifier. The maximum peak electrical input power of the Hsu (not shown) started at 210 watts at 16 Hz, rose to 700 watts at 20 Hz, fell to 450 watts at 25 and 32 Hz, and then rose to a plateau of about 2,200 watts above 80 Hz.

The Velodyne's maximum peak output was the cleanest, though not the highest, of all the tested systems. At the highest levels, the Velodyne's limiters changed the envelope of the tone-burst test signal from its original shape, peaked in the center, to something closer to a constant-level burst. Although the burst's envelope changed, at no time did the individual cycles of that burst become more distorted.

Effectively, the Velodyne and Hsu subwoofers are fairly close in maximum output, but the Velodyne has a definite edge in generating clean output. The Infinity system was a reasonably close third in level to the Velodyne and Hsu, with the Altec following behind. At 32 Hz and below, the Altec was not in the same league as the other systems, however.

Use and Listening Tests

I did a moderate amount of informal listening to the subwoofers individually by simply adding each of them to whatever main speakers I happened to have set up at the time. The main speakers were not high-passed, and I experimented with various woofer locations. The self-powered subwoofers were more amenable to this experimentation because they didn't require any other added equipment. My initial impressions placed the Velodyne and Hsu units on top, closely followed by the Infinity, with a decent showing by the Altec.

Hooking up the three powered systems (Altec, Infinity, and Velodyne) was simply a matter of connecting their speaker-level inputs in parallel with my main speakers and adjusting the speakers' controls for best blend and balance. Hooking up the Hsu systems

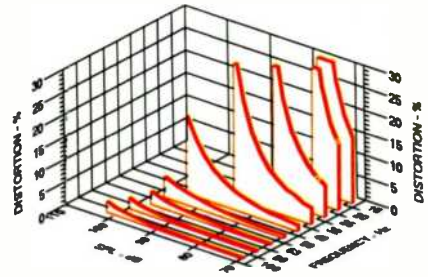


Fig. 7—
THD vs. SPL and frequency for the Altec PSW10.

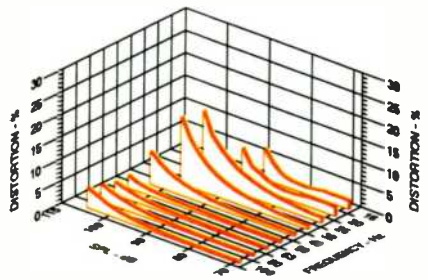


Fig. 8—
THD vs. SPL and frequency for the Hsu HRSW 10.

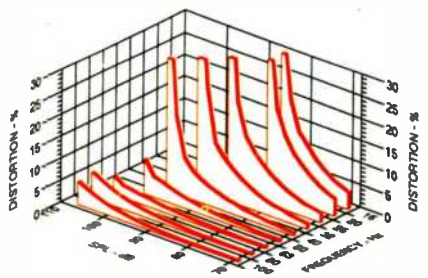


Fig. 9—
THD vs. SPL and frequency for the Infinity SSW-210.

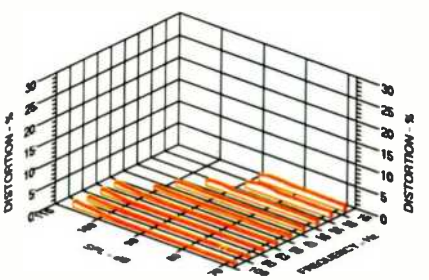


Fig. 10—
THD vs. SPL and frequency for the Velodyne F-1500.

The Infinity is easy to set up and can just about keep up with the Velodyne, and it costs about three-fourths of the latter's price.

was more complicated, involving the passive low-pass filter supplied plus an extra amplifier.

With all this added bass capability in my listening room, I had to get out all my CDs that have deep-bass sound effects, including tracks with thunder, cannons, fighter planes, helicopters, trains, etc. Having lots of good clean bass is exhilarating!

Serious listening and direct comparison was done with a much more complicated setup, designed around a distribution power amplifier and speaker switcher, that allowed instant comparisons between the four subwoofer systems. My main speakers were a pair of PSB Stratus Minis, small, high-performance two-way systems with 5-inch vented woofers. Other equipment consisted of a Bryston .4B preamp and 4B power amplifier driven by Onkyo and Rotel CD players. The main speakers were high-passed at 80 Hz with a line-level resistor-capacitor (RC) 6-dB/octave filter in my system's tape loop. An extra power amplifier (a Crown Macro Reference) was added between the output of the main amplifiers and the inputs of all the subwoofers to act as a speaker-level bass distribution amplifier. (This was admittedly overkill, because the added amp was essentially used only to drive the comparatively high-impedance speaker inputs of the individual powered subwoofers and of the Hsu filter.) To compensate for the bass roll-off from the RC network I'd installed in my tape loop, I added a second complementary network to the input of the distribution amp, ensuring that a flat signal would reach the subwoofers. This amplifier's level control then allowed the levels of all the subwoofers to be raised and lowered together (although only one subwoofer was selected at a time with the speaker switcher).

A relatively low-power (50 watts per channel) Crown D-75 was used to drive the pair of Hsu subwoofers (one per channel), which were placed next to each other for maximum coupling, and was driven by the supplied Hsu low-pass filter. I used this rather small amplifier because Hsu Research states that even the amplifier from an inexpensive receiver can be used to drive their systems. The clipping indicator on the D-75 was invaluable in setting maximum levels. Although this amount of power was quite adequate, more would be beneficial. Hsu suggests that their systems can also be used as stands for small main loudspeakers.

All four systems (five, if you count the Hsu pair separately) were then placed in close proximity to each other, behind the right main system, and positioned halfway between the main system and rear wall. Previous experimentation had determined that this

INFINITY SSW-210

Manufacturer's Specifications
Enclosure Type: Sealed box.
Drivers: Two 10-in. cones.
Power: Built-in amplifier, 250 watts continuous.
Frequency Response: 25 to 120 Hz.
Crossover Frequencies: Variable, 40 to 120 Hz.
Crossover Filter Slopes: Low-pass, 36 dB/octave.
Dimensions: 18⅜ in. H × 26 in. W × 9¾ in. D (46.7 cm × 66 cm × 24.8 cm).
Weight: 58 lbs. (26.3 kg).
Price: $1,098 each; optional end panels, $58 per pair.
Company Address: 9409 Owensmouth Ave., Chatsworth, Cal. 91311.
For literature, circle No. 103

woofer location provided a good balance between smooth response and positive boundary enhancement at my listening location. Between listening sessions, the locations of the subwoofers in the grouping were scrambled a couple of times, decreasing any tendency to identify a particular subwoofer with a sound that was actually a function of its position in the room.

With the use of an AudioControl SA-3050A third-octave real-time analyzer and pink-noise generator, the individual level and crossover controls of each system were adjusted to match the acoustic outputs of the subwoofers to each other, and to best blend with the main systems. This matching was done at a low enough level so that the Altec was operating below its dynamic EQ threshold. After balancing, the controls of the powered systems were set as follows: The Altec's EQ control was set at full, crossover frequency at 80 Hz, crossover slope at 24 dB/octave, and polarity normal. The Infinity's crossover frequency was set at 75 Hz, and the Velodyne's at 70 Hz. The Hsu's lower crossover point left something of a hole in the overall response between these subwoofers and the main speaker systems.

The first CD I listened to was one supplied to me by Hsu that had specific passages containing deep bass. Saint-Saëns' Symphony No. 3, the "Organ Symphony" (Philips 412 619-2), contains an almost pure 17-Hz pedal note at 9:04 into the second movement. Both the Velodyne and Hsu systems generated truly awesome room-shaking bass with an effect that I can best describe as the air pulsating around me. The Infinity's output, although quite clean, was much reduced at the fundamental, while the Altec's output was audibly distorted.

On less demanding material with minimal low bass (32 Hz and below), all four systems did a good job. The Altec performed well as long as it was operated below its dynamic EQ threshold; above this level its low-bass output was greatly reduced, although what was left was clean. When the Altec was operated near its threshold, often the bass could be heard to fluctuate or modulate in level as the bass program material went above and below the threshold. This didn't necessarily sound bad, but it was quite obvious when this subwoofer was compared with the other systems.

The Hsu competed very well with the Velodyne at all frequencies and levels, but I continually had to monitor its amplifier to ensure operation below clipping when reproducing deep bass material. Even when clipping, the effect was not very audible, particularly if it occurred when there was program material at higher frequencies to mask the resulting distortion products. The 50-watt amplifier feeding the Hsu clipped when that subwoofer was delivering about the same acoustic output level as the Velodyne was at its onset of limiting. With a more powerful amp driving the Hsu, clipping would have occurred at higher levels. However, the Velodyne's input could be turned up well past the limiting point without causing any audible distortion, though without causing any increase in output, either. This seamless operation of the Velodyne's limiting action turned out to be one of the speaker's greatest advantages. It makes operation effortless, because you needn't be afraid of inadvertently overdriving the system and generating excessive distortion. The three remaining systems would distort, sometimes badly, if overdriven. Note, however, that the three self-powered systems (even the Infinity and Altec, which distorted at high levels) could not be damaged by high input levels. Though the Hsu could theoretically be damaged, Fig. 11 shows that it would take very high power levels to do so.

When listening to the subwoofers by themselves (mains off), at moderate levels with pink noise, I could hear appreciable bleed-through of higher frequencies on all the systems except for the Infinity. This made the Infinity's sound somewhat cleaner on this admittedly specialized test, presumably due to the more rapid roll-off of the Infinity's low-pass crossover.

The Hsu and Velodyne reproduced band-limited third-octave noise very impressively, especially in the 20- and 25-Hz bands, where these two speakers had all the windows and doors in the room vibrating and shaking! At the same levels, the Infinity was distorted at 20 and 25 Hz but was okay at higher frequencies. The Altec was badly distorted at the 20-, 25-, and 32-Hz bands but kept up with the other systems at 40 Hz and above.

On high-level rock 'n' roll bass, such as the ZZ Top "Gimme All Your Lovin' from *Eliminator* (Warner Bros. 23774-2), the Velodyne, Hsu, and Infinity systems could all be turned up to gut-thumping concert levels. I had no clear preference for one over the other. The Altec could not reproduce the same levels due to the limiting imposed by the threshold of its dynamic equalization. The kick drum on track 5 of the *Sheffield Track/Drum Record* CD (Sheffield CD-14/20) was rendered extremely well by all three of the larger systems, but I had a slight preference for the sound and tightness of the Infinity. The Altec did an adequate but not exceptional job. On average program material containing high-level upper bass but no loud deep bass, the Altec performed as credibly as the other systems did.

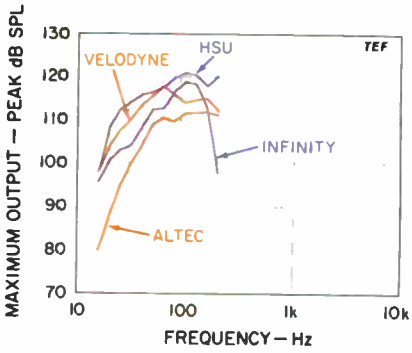


Fig. 11— Maximum peak sound output vs. frequency, including the effects of room gain.

In summary, if you want it all, the Velodyne is the subwoofer of choice. If you are on a low budget and don't mind the added complexity, the Hsu provides extremely good value for the money, even counting the cost of a moderate-sized amp to drive it, and still better value if you already have such an amp. For just somewhat more money, the Altec system provides a solid combination of good looks, easy installation, and performance, but only if your taste runs to program material that doesn't include low bass of the room-shaking variety. The Infinity system has the easy setup of a self-powered unit and can just about keep up with the Velodyne, for only about three-fourths the price.

SUSAN ELLIOTT

Jack Pfeiffer

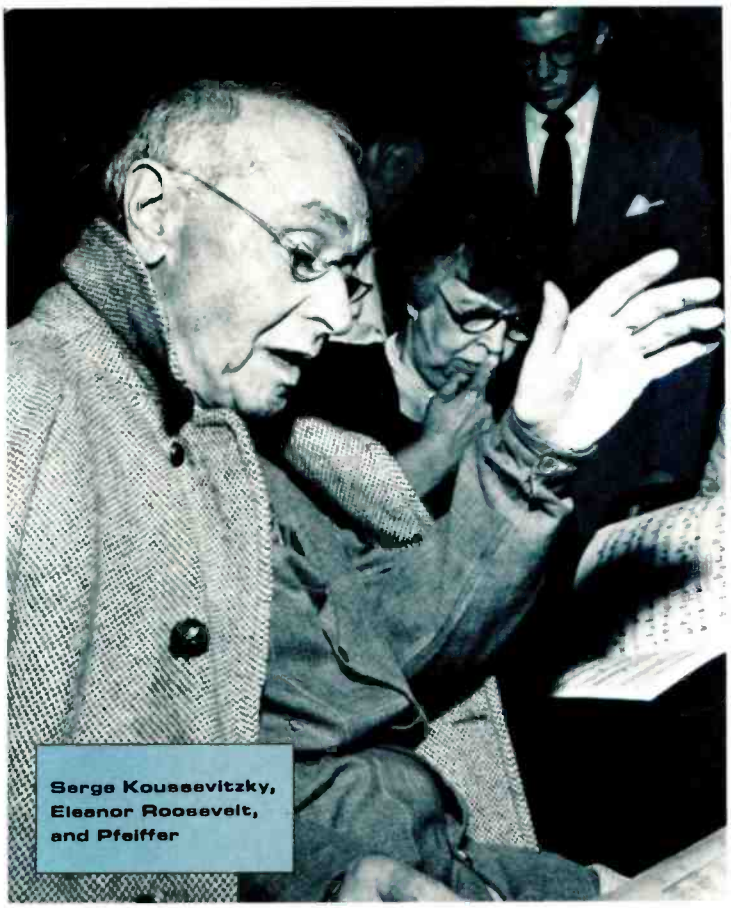
RCA's Prince Charming

Ivan Fisher, Jascha Heifetz, Brooks Smith, and Pfeiffer

He is the prince of the RCA vaults, currently "reawakening all the sleeping beauties . . .," many of which he also created. Jack Pfeiffer (John F., formally), a 43-year veteran of RCA, now BMG, has produced the original recordings of many of classical music's most revered performers, including Artur Rubinstein, Vladimir Horowitz, Jascha Heifetz, Van Cliburn, Leontyne Price, and Arturo Toscanini. He now is overseeing the reissue of these treasures onto CD.

Pfeiffer arrived at RCA in 1949 fresh out of the University of Arizona. From 78s through tape, microgroove, Dynagroove, stereo, quad, and digital, he's seen—and in some cases helped create—it all. *S.E.*

PHOTOGRAPH: DAVE KING



Serge Koussevitzky, Eleanor Roosevelt, and Pfeiffer

All photographs courtesy of Jack Pfeiffer

When you started, was tape the accepted medium?

When I finally got into the record department, tape had just come in; everything was being recorded on it. The RCA engineers had made their own tape machines. We call them now the Tinkertoys. They had small, 7-inch reels and they ran at 30 ips, so you could only get 7½ minutes per reel. Anything that went on for any length of time had to be overlapped. We used to do that on some of the early Toscanini recordings and then had to splice them together.

Generally we ran two machines on everything. If a piece was more than 7½ minutes long, we would stop one machine, change the reel, start that up, then stop the other machine, change the reel, and then start that one up, and so on.

You started as an engineer?

I was hired before I graduated from engineering school to come to RCA as a design and development engineer. They were interested in me because I had a music degree and was on my way to an engineering degree as well. I went through their training program in Camden [New Jersey]. I had done a lot in sound work as an undergraduate, so they had me designing audio amplifiers and IM distortion analyzers.

How long did this go on?

I started in July of '49 and by September there was an opening in the recording department for a quality-control engineer. They needed someone with a musical background, someone who could tell the difference between a technical flaw and a musical flaw. I got the job, which meant I was also in charge of production control of the record division on 24th Street.

That went on for a few months. In the meantime I met Richard Mohr, who was the only producer in the classical department. RCA was beginning to rerecord for LP and 45 a lot of the earlier 78-rpm recordings that were not of good enough quality to transfer to the new microgroove format. They were setting up sessions with the Boston Symphony and all the major orchestras and instrumentalists—Heifetz, Horowitz, and so on—to rerecord the repertoire that had been popular on 78s.

Richard couldn't do it all alone, there was just so much. When he found out

Everyone felt that quad technology had possibilities,

You've worked with all the greats, Jack. How does it feel?

I can't tell you how proud I feel about that. Just to be able to remember sitting in a control room while Jascha Heifetz played the violin into a microphone—and then recalling that he actually asked *me* what I thought! How ridiculous! To have had the feeling that all these great artists—Heifetz, Rubinstein, Stokowski, Reiner, Horowitz, Landowska, Leontyne, Placido—would profit from my opinion is really just unbelievable to me.

How do you see your role as a producer?

I'm an audience, a receptacle. Artists want a reaction. Not that they always consider it valid.

You're too modest. There must be a reason these people kept coming back to you, besides you being a warm person with a lot of patience.

I think that's the whole thing. Somehow I always managed to give the artists the feeling I was on their side, that I was doing everything I could to help them do what they did best. As a result, they gave me friendship. Some developed into very close friends.

Who?

Heifetz, Horowitz. Wanda Landowska was probably first. Certainly Van [Cliburn] has been an enormous friend.

Watching you in the studio, I see your approach as laid-back, low-key—very different from, say, Tom Frost's. He's very hands-on and even functions as a music director.

I always felt the artist knew pretty much what he wanted to do, and it was my job to translate that onto a phonograph record—not to tell them how or what to do. Of course, a lot depends on the level of the artist. To some I've had to say, "Sorry, that doesn't make it," but only when I felt they weren't sure of what they were doing. I always found the better the artist, the easier he or she is to work with.

After 43 years with RCA, what has been the best decade for you?

The first, because of the wide-eyed, just unbelievable excitement and enthusiasm and newness. To be suddenly in close proximity with all these people I had admired from a distance—I can't think of anything I could've done that I would have enjoyed as much.

about my musical background, he asked me to join him in the A&R Department, in the spring of 1950.

How long did you use the Tinkertoys?

By 1950 we had machines with 16-inch reels, so we could record up to 30 minutes of music at 30 ips. These were mostly used for assembling LP masters and Toscanini broadcasts. Then around '52 or '53, Ampex came out with some good 15-ips machines—the heads were better, the electronics, even the mechanical aspects were better. Torque was more consistent, there was little flutter or wow, and you could record a whole LP side, about 23 minutes, with the 2,400-foot reels.

What was your reaction when you first heard the microgroove record after hearing the 78s for all that time?

I was practically hysterical, it was so beautiful. First of all, the music wasn't interrupted every five minutes, and then not to hear all the ticks and pops and bangs and crashes was just a delight.

Tell me about your involvement in the early days of stereo.

We started experimenting with it in 1954 when they had finally gotten two-track machines. I insisted that we take advantage of our recording sessions and set up two systems. We did this with the Chicago and Boston Symphonies recording sessions. There was one mono setup and one stereo setup, each with its own console, microphones, tape machine, engineer, and producer.

Out of those sessions we got some fantastic recordings, especially the Chicago Symphony's *Ein Heldenleben* of Strauss with Reiner. Those were done in March of '54.

How did those first stereo recordings turn out to be "fantastic"?

Out of sheer ignorance, I had only used a couple of microphones—literally, one for each track. I set up two in front of the Chicago Symphony in Orchestra Hall in Chicago. And the clarity and the definition that we got—of course, a lot of it had to do with the acoustics of the hall, the quality of the musicians, Reiner's balances, and so forth—were so dramatic. It was completely different from anything we had ever heard before. I set up listening sessions down on 24th Street and grabbed anyone who was around to come in and hear this fabulous sound. I remember getting some of the RCA executives to listen. They were all enormously impressed.

I think the early stereo experiment proved the point, that the fewer microphones you have, the more likely you are to get a really first-class recording. Microphones are stupid. They pick up everything that comes their way. So the more mikes you have, the more phase differences you get, plus you pick up all the reflections from the acoustical environment. It all adds up to a mess. I've always tried to limit the number of microphones.

Still?

Yes. Of course, there are certain advantages in multi-miking. You have only a limited amount of time in a recording session to get a good performance; in a live situation you only have one chance. You use all the insurance you can get—you put up a lot of microphones so you can try out various combinations later on [in the mix] rather than during the session, when costs are enormous. I've always felt that multi-miking gave a satisfactory result, but not the best result—not as good as just two microphones.

Did the progression of stereo machines from two tracks to three alter your miking philosophy?

Somewhat. In '54, Ampex came out with a machine that recorded three discrete tracks. That seemed practical, because very often you had a soloist, whom you wanted to isolate from the rest of the orchestra—so you could record the orchestra on two tracks and the soloist on the third.

But you were still thinking one mike per track?

Yes, although then we began to think that sometimes the center of the orchestra, which was behind the soloist, sounded a little subdued—that it wasn't being picked up properly. So we thought, let's put a couple of mikes up for the woodwinds, just to have a little more control. And then, well, maybe we don't hear the percussion quite enough. Eventually it just got out of hand.

What other kinds of experiments were you involved in?

Even before stereo, we were playing with tape editing. Actually the LP generated tape editing, because [earlier] you had to edit together the 78-rpm sides to make up an LP. From that,

but the producers didn't know how to work with it.

Pfeiffer, Richard Mohr, Lewis Layton, and Leopold Stokowski

Pfeiffer and Artur Rubinstein

Hollywood. It was basically set up for soundtrack recording.

Because of Heifetz's fascination with editing, we did a great deal of tinkering. There is a point in one of the sonatas where Heifetz felt that Bach would have written a low F, which of course doesn't exist on the violin. So he decided we would stop while he retuned the bottom G string to an F. He'd play the phrase, then we'd stop while he retuned back up. Then we edited in the phrase. That's on the recording, and no one has ever found it.

Who else did you record in the early '50s?

Well, my first solo session with Horowitz was in December 1950 at Hunter College. He did the Liszt "Funérailles" and the "Stars and Stripes," among other things, all in the same day. I recorded [pianist] Willy Kapell, José Iturbi, and the Robert Shaw Chorale that same year. We completed the Bach sonatas and partitas in October of '52. Also in the early '50s were Stokowski, Kirsten Flagstad, and Jussi Bjoerling, between sessions in Lakeville [Connecticut] with Landowska.

In 1954 we did a whole series of recordings with Helen Hayes, Thomas Mitchell, and Raymond Massey called

Digital is basically a high-quality transmission line;

everyone realized that you had more degrees of freedom.

Editing was a real fascination. Some musicians were so overwhelmed by the possibilities, they just went hog wild. Especially Jascha Heifetz. He was a great tinkerer. He loved to work with his hands. He liked automobiles, firearms, all sorts of things. He had every tool in the world there in his workshop in California. Never used any of them, of course.

Because of his feel for tinkering, when he discovered tape editing he became fascinated. Not that he wanted to edit for the sake of editing, but it gave him an ability to put things together in a way he never could before. He was never totally satisfied with his recordings, though he had made many great ones before editing.

I myself practically became an editing fiend. Because of my interest in technical things, I very quickly recognized all the possibilities. I knew what to listen for because I could envision the waveform that was being created by the onset of the sound.

The attack of Landowska's harpsichord, for instance, was a very sharp wavefront. You could hear where the sound actually started. I realized you could edit note by note if you had the patience. And I had infinite patience. With Landowska we did a great deal of editing on the recording of the Well Tempered Clavier. It was a great benefit to her, especially since she was elderly and had difficulty getting her fingers to be reliable all the time. I got my editing feet wet on that recording.

Has your editing philosophy changed over the years?

Not much. I try to maintain as much of a spontaneous feeling as possible. If you overedit, you risk losing that. A musical experience has to have the human element, so it's bound to have flaws. So long as the flaws don't distract from the music, then I think they should be left in.

Tell me when you first began to record Heifetz.

I first went to California with Richard [Mohr] in the summer of 1950 to record the trios with [Gregor] Piatigorsky and [Artur] Rubinstein. The following year I went out alone to work on the Bach solo sonatas and partitas. We worked in RCA's studio on Sycamore Street in

"Poet's Gold." I got [Hayes] to record my favorite poem, "The Owl and the Pussycat." She was such a delight.

Wasn't that the same year that Toscanini stepped down from the NBC Symphony?

Yes. I recorded his last two concerts in 1954 in stereo, independent of the mono setup they had for recording. They were never released on CD because the family won't give approval—they were not that good. But they are his only true stereo recordings.

You've supervised BMG's entire Toscanini reissue program—all 82 CDs' worth. From what sources did you work?

The original recorded masters, that is, the composite original tapes that were played for Maestro for his approval. In some cases, those original source tapes had been lost or destroyed. So we went to Walter Toscanini's vaults, which were given to the Lincoln Center Library. He would get 15-ips copies of the approved master tapes, so he would have a source that sounded almost as good.

What shape were the originals in?

They were in bad condition. They haven't been handled properly over the years—they were improperly

wound, some of the oxide was peeling off. Sometimes they were completely unusable. There has been a multitude of difficulties finding acceptable sources.

What was the trickiest recording to piece together?

The Verdi Requiem. I figured up the cost of that one day. The remastering cost more than the original recording. Engineering time costs $145 an hour, and we spent hundreds of hours on it. It was a bad recording to begin with. It was a broadcast and the pickup wasn't particularly good. Plus it had all those performance forces and the broad dynamics of the Dies Irae, with somebody standing back there beating the hell out of a thunder drum. That recording went through numerous incarnations, just to arrive at something for Maestro to approve. They took parts from rehearsal and parts from broadcasts. The original was just full of distortion. The production master was really terrible.

So we had to go back and re-edit. We re-created the composite that Maestro had approved, using notes from Walter's letters and from our own records here.

with me and John Volkman and Don Richter, the head of our engineering department. He told us to come up with sound that was superior to anything on the market.

So Don developed an equalization system designed to bring out the characteristics of sound, of musical instruments, irrespective of the level at which they were played. He contended that a lot of people listened to things at a much lower level than they were actually performed. It's probably true. A full orchestra can get up to 110 dB, but you can't play things at that level at home. Your system wouldn't tolerate it, nor would your neighbors.

So Don designed this equalizer that operated dynamically, that is, responding to the dynamics of the music. It gave you at a lower [overall] level a frequency response that was similar to the one you would hear if the music was performed at a higher [overall] level. It was a big mistake. Immediately all the critics saw "dynamic equalizer" and just assumed that we were equalizing the dynamics.

Olson came up with a distortion eliminator so the groove was cut in a way that would be more compatible with a spherical playback stylus, which at that time was the only shape there was.

So we had a contribution from the research department and one from the recording department.

Where did you fit into all this?

I was supposed to come up with a new method of recording that improved the overall quality. I had just come back from a two-year sabbatical studying the problems of music and engineering and psychoacoustics.

Mr. Marek said, "You go in there and tell the producers and the engineers how to record. It's no longer their job to determine the sonic quality of the records, it's yours. Follow through in the transfer, the mixdown, etc. Make sure all the recordings have all the characteristics you want. Then we'll put them on record with these other two improvements and we'll have a better product and we'll call it Dynagroove."

What was your new, improved method?

I started throwing out mikes and simplifying setups and trying to get everything much more basic than it had been. This was in about '62. I started going to all the sessions. I hated the name Dynagroove, however.

it doesn't guarantee a good-sounding record.

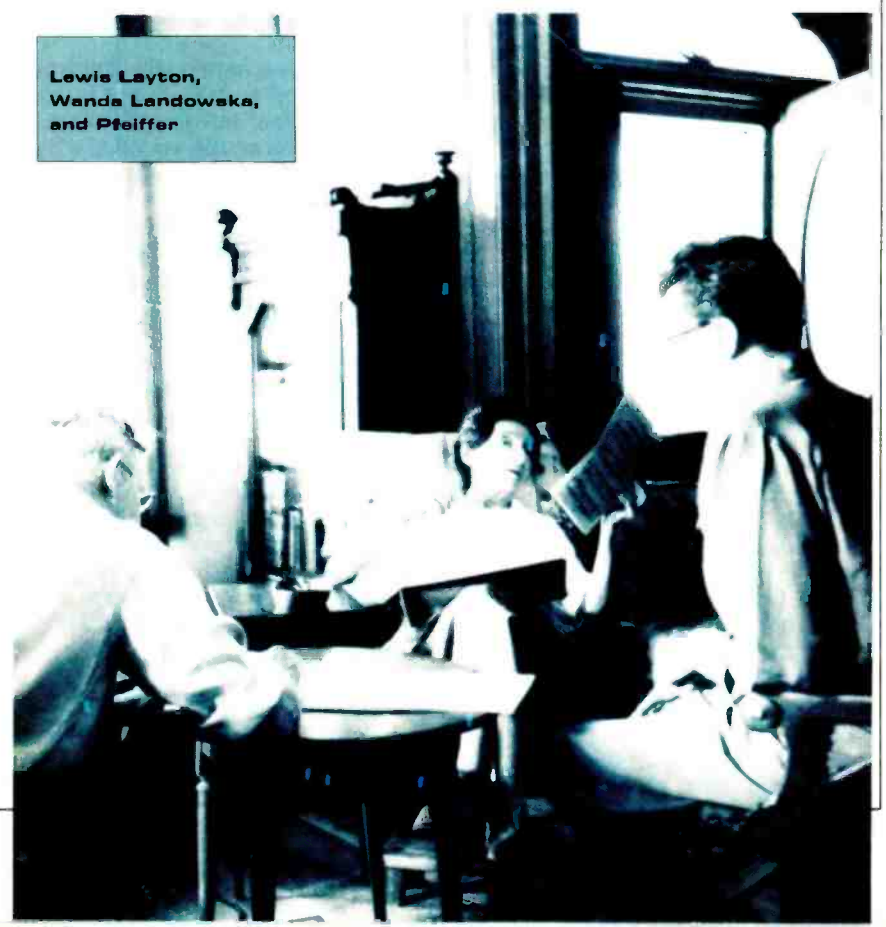
The results are amazing. Maestro starts screaming during the Tuba Mirum, when all the brass come in. It sounds like damnation. That part of the Verdi Requiem never sounds right to me unless I hear Maestro screaming. It sets your blood on fire.

Was he as amazing a force as everyone claims?

Yes. You couldn't go to one of his concerts without being overwhelmed by the power of his personality. He was so concentrated on what he wanted. Basically he was an opera conductor, he was best in music in which there was a dramatic message. There's a lot of that in Beethoven, of course; the really strong and powerful program music was what he did the best. His Respighi and his Verdi were mind-boggling.

Tell me your thoughts on the development of Dynagroove.

Late in the '50s, some companies started recording on 35-mm film—Bob Fine did that, at Mercury. Technically it was a very good system. George Marek, RCA's president, decided that we should have *some* big technological breakthrough too. He got Dr. Harry Olson, the acoustical wizard, together



Lewis Layton, Wanda Landowska, and Pfeiffer

Richard Mohr, Pfeiffer, and Pierre Monteux

country at least, to demonstrate digital recording. He demonstrated it to us back in '75 or '76 with the Virgil Thomson opera *The Mother of Us All*.

Once digital looked like it would be a commercial possibility—Denon had gotten into it, with their own system, and then Sony—Tom Stockham started in this country. He designed a different system, which I thought was better because it used a higher sampling frequency—50,000 per second instead of Sony's 44.1k. I also thought the Soundstream editing system was much more flexible and lent many more degrees of freedom than Sony's.

What was RCA's first digital recording?

It was in 1979, the Bartók Concerto for Orchestra with Eugene Ormandy conducting the Philadelphia Orchestra. Jay Saks produced it.

In the early years of the digital era, what was RCA's ratio of analog to digital recordings?

Maybe 40% digital. I promoted digital recording from the time when Stockham first demonstrated it as being a very efficient system of storage. There wasn't any generation degradation either. But it didn't make the sound any better than analog did with good mi-

If digital has nothing to do with sound, how do you explain the early digital recordings with hard-edged string sound or oboes that sound like kazoos?

If you heard it on everything, on all the sources, it would have something to do with the digital sound. But you don't, so it must have something to do with something other than digital.

Do you think digital sound is changing? Improving?

No, but people are learning a little more about how to record with it.

When RCA started to reissue its back catalog on CD in earnest, you commented that you were having a ball.

Oh, it's been a lot of fun. Many of those recordings were things I originally produced. So it's been wonderful to go back and make friends with some of those sleeping beauties.

What is your primary function these days?

Producing the reissues. I supervise three crews in digital remastering. My job takes in the entire reissue program of BMG Classics, which is Red Seal, Victrola, Gold Seal, Silver Seal, Victor. Even the Broadway shows. And of course the Toscanini Collection. And the Victor Vocal Series, which is very close to my heart—recordings by Geraldine Farrar, Ezio Pinza, Marcella Sembrich. I've gotten quite a few out. I keep pushing our merchandising people to put them on the schedule.

Then there's the Victor Opera Series, which we're almost through with. I'm constantly making lists of recordings that should be reissued—for example, the new Victor instrumental series for people like Paderewski and Kapell and Rachmaninoff and Kreisler and Casals. We just don't have the facilities to do much more than we're doing.

You do everything in-house?

Some 78-rpm transfers I have done outside because we no longer have good 78-rpm transfer facilities. It's a lost art. Most engineers don't know how to make a 78-rpm transfer to tape. It's a totally different kind of discipline.

How has your philosophy as a producer evolved through the years, relative to all the technological changes you've seen?

I simply try to get the best musical performance possible, or as good a representation of the artist as I can. The technical aspects have, of course, played a role. But they've never represented anything more than a means to the end.

I simply want the best musical performance possible.

And the end result?

The first records were received with a lot of enthusiasm. But when the critics started reading about the dynamic equalizer, they started questioning whether the records had a limited dynamic range. They assumed we were equalizing the dynamics to make records for inferior machines.

How long did Dynagroove last?

About four or five years. Then we went through a very bad period, when the whole record company was depressed.

And the next technological milestone?

Quad. I wasn't involved in creating the technology, just in demonstrating the aesthetic qualities of the four-channel system. Everyone felt, as I did, that it had possibilities. But then the producers didn't know how to work with it.

And after quad?

Digital. I started working on it in '76, '77. I had been working with Tom Stockham at Soundstream on the Caruso project, starting in about '73. Basically Stockham had to convert the old Caruso recordings into digital form in order to process them on the computer. Stockham was the first one, in this crophone placement and good head-end equipment.

It's basically a high-quality transmission line. They're now using it in consoles, of course, but you still have to convert from an analog sound to a digital form, and that conversion has its drawbacks. Just having a digital recording does not guarantee it's going to sound good. Microphone placement, the acoustical environment, and the judgments you make in your original recording are still the determining factors, as they have been ever since Mr. Edison recorded "Mary Had a Little Lamb."

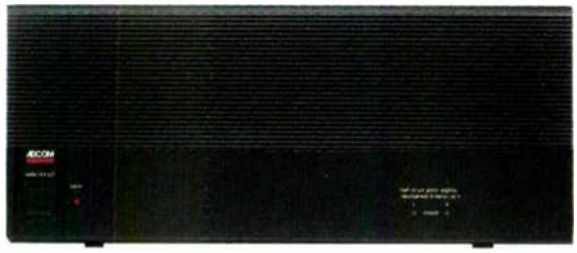
What about tape hiss?

True, that's not a problem anymore, but it never was, really. I listen to music, I don't listen to noise. The mind has the ability to concentrate on what it wants to hear. It's not like a microphone, which can't discriminate as to what it will listen to and what it won't.

Are there disadvantages to digital?

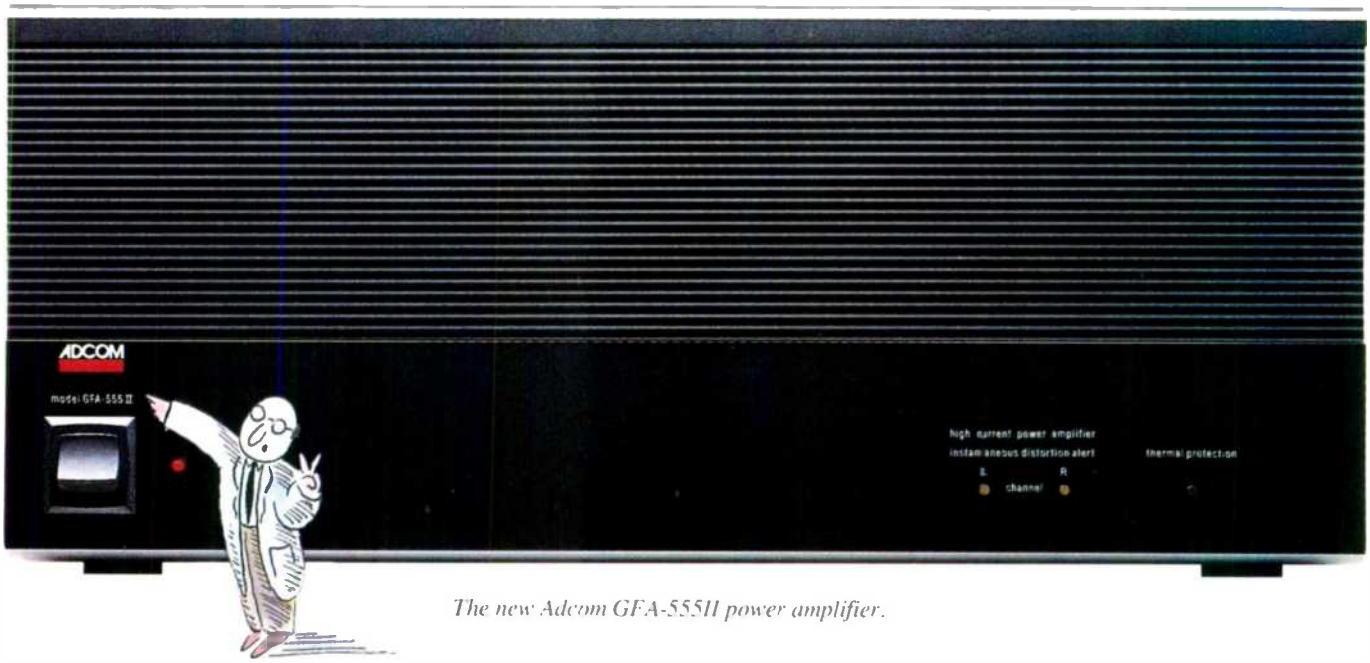
In our experience digital tape deteriorates more rapidly than analog. Some of the manufacturers have specified that the shelf life of their U-matic tapes is 10 years.

The Breakthrough.



The original Adcom GFA-555 power amplifier.

The New Breakthrough.



The new Adcom GFA-555II power amplifier.

Upon its introduction, the Adcom GFA-555 power amplifier was considered a breakthrough in audio technology. Rated superior to amplifiers costing two and three times as much, some critics had difficulty in naming a better component at any price.

Now, after years of using the GFA-555 as their model of superior performance and value, Adcom engineers announce another breakthrough. The new, upgraded GFA-555II, rated at 200 watts per channel*, offers greater stability, superior heat dissipation and less distortion. It is everything which made the GFA-555 "...one of the best selling amplifiers of all time,"** and more.

With the GFA-555II, Adcom begins a new generation of amplifiers, designed to set a new standard for performance at a reasonable price... giving more and more music lovers the opportunity of experiencing the thrill of sonic perfection without the shock of exorbitant costs.

Visit your Adcom dealer and listen to the new GFA-555II. Then ask its price. You'll hear how good this new breakthrough sounds.

**Power output watts/channel, continuous both channels driven into 8 ohms, 20 Hz - 20 kHz at less than 0.04% THD.*

***Stereophile*, October 1990.

ADCOM®

details you can hear

11 Elkins Road, East Brunswick, NJ 08816 U.S.A. (908) 390-1130
Distributed in Canada by PRO ACOUSTICS INC. Pointe Claire, Quebec H9R 4X5

DIGITAL
ccc
COMPACT CASSETTE
Made in the USA

ANALOG
COMPACT CASSETTE
1965

EVOLUT

REVOLUT

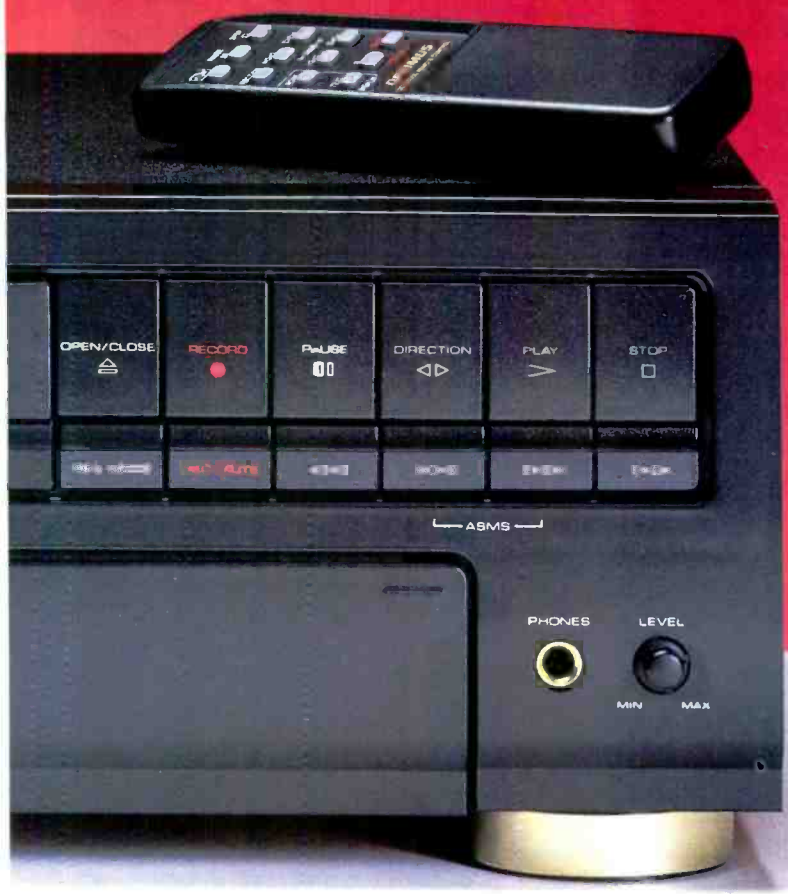
INTRODUCING THE WORLD'S FIRST DIGITAL

IONARY.

DIGITAL
COMPACT DISC
1982

TIONARY.

COMPACT CASSETTE RECORDER



Now enjoy the best of both worlds.

With the new Optimus® DCT-2000 you can record and play true digital audio on convenient Digital Compact Cassettes . . . *and* play your existing library of analog cassettes, too. Make perfect copies of your CDs—indistinguishable from originals—plus superb recordings from sources such as LPs and analog tapes.

The DCT-2000 incorporates the best in audio technology. 64-times oversampling. Fiber-optic, coaxial and analog inputs. Even a unique display that shows titles and performers' names on prerecorded DCC tapes. All the result of American—yes, American—craftsmanship.

Join the Revolution.

Radio Shack®
AMERICA'S TECHNOLOGY STORE℠

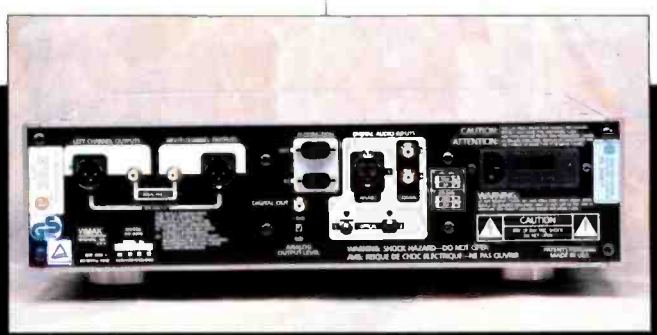
Enter No. 27 on Reader Service Card

1

VIMAK DS-2000 D/A CONVERTER AND PREAMP

Manufacturer's Specifications

Input Resolution: 18 bits, 128-times oversampling.
Amplitude Response: 5 Hz to 20 kHz, +0.1, −0.5 dB.
PLL Re-Clocking Jitter: Less than 50 picoseconds.
THD + N: Less than 0.004% at 1 kHz.
EIAJ Dynamic Range: Greater than 100 dB.
Channel Separation: Greater than 96 dB, 5 Hz to 20 kHz.
Internal Precision: 56 bits (338 dB).
Dither Type: Triangular probability-density function or narrow-band weighted; user-selectable.
Maximum Output Level With 600-Ohm Loads: Balanced, +22 dBV; unbalanced, +16 dBV; headphone, +18 dBV.
Minimum Load Impedance: Balanced, 150 ohms; unbalanced, 300 ohms; headphone, 8 ohms.
Input Sampling Rates: 32, 44.1, and 48 kHz.
Dimensions: 17½ in. W × 4⅜ in. H × 18¼ in. D (44.5 cm × 11.1 cm × 46.3 cm).
Net Weight: 42 lbs. (19.1 kg).
Price: $5,000.
Company Address: 12 Alfred St., Baldwin Park I, Woburn, Mass. 01801.
For literature, circle No. 90



As a trained electronics engineer, I have always been a bit skeptical when reading some claims made for so-called high-end equipment, particularly when the claims lack scientific basis. My skepticism turned into unbridled enthusiasm when I encountered the Vimak DS-2000. Its designers were obviously schooled in the scientific approach to handling digital audio signals, yet at the same time they still know the value of simplicity, physical beauty of product, and ergonomics. Much more than a digital-to-analog converter, the DS-2000 incorporates control functions (such as volume and balance and selection of up to seven digital inputs) that allow it to serve as the only interface between your power amplifier and digital program sources.

Thick, solid aluminum surrounds the DS-2000's steel frame, isolating the internal circuitry from electromagnetic interference and providing a high thermal mass. Digital, analog, front-panel, and power-supply board assemblies are all shielded in separate sections, and the entire inner framework is copper plated to reduce electrical and magnetic interference. Separate digital and analog power supplies are used, and optical couplers are provided, to eliminate electrical connections that could carry noise between the analog and digital circuit boards.

Once you've selected a digital input signal, it's read by a digital audio interface receiver that extracts the sampling-rate clock and up to 24 bits of audio data (if the source provides them) using a low-jitter phase-locked loop (PLL). From there, it goes through a digital signal processing (DSP) section that performs volume, balance, polarity inversion, and dither computations with 56-bit internal precision, according to Vimak. The volume control is a hybrid digital type: in the upper part of its range, it varies the reference voltage to the D/A converters, while at lower settings it multiplies the digital signal by a gain coefficient of less than 1. Dither is automatically switched on when the input source has 18-bit or greater precision or when the volume control is in its lower range. The user can choose either broadband triangular dither (which minimizes the audibility of quantization but raises the noise floor about 9 dB) or dither weighted towards the inaudible part of the spectrum, which is filtered out in conversion but uses ultrasonic frequencies some listeners may believe are audible.

The next circuit section, a delta-sigma modulator, upsamples the audio data by a factor of 128 and generates separate one-bit outputs for left and right channels. At this point, the signals are fed through opto-couplers to the analog board, where the signals are reclocked by another PLL, to limit jitter. The reclocked signals for each channel are then fed through four balanced, single-bit D/A converters of the pulse-density-modulation type, whose outputs are summed in the analog domain. The summing accomplishes some of the needed low-pass filtering, minimizes the effects of any nonlinearities in individual D/A converters, and cancels switching glitches. After additional analog low-pass filtering, the left and right signals are fed to separate output driver stages for the balanced, unbalanced, and headphone outputs. These details are covered more fully in a brochure, "DS-2000: Insights into Theory and Design," available on request from Vimak.

While the front-panel layout seems simple and uncluttered, the versatility of the Vimak's few controls and switches is awesome. The power switch is at the far left. To its right are five input selectors and a "Program" button, about which more in a moment. The display at the center of the panel shows the digital sampling rate, the input in use, and all current control settings. An "Error" light in the display indicates defects in the source data or that the selected source isn't playing.

Computer serial ports allow performance checking now, plus the ability to interface with home automation and control systems later.

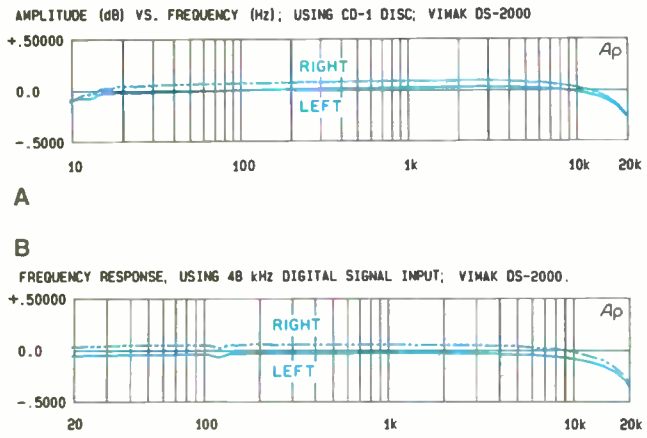


Fig. 1—Frequency response for digital output from test CD (A) and 48-kHz signal from test generator (B), both measured at analog output of DS-2000.

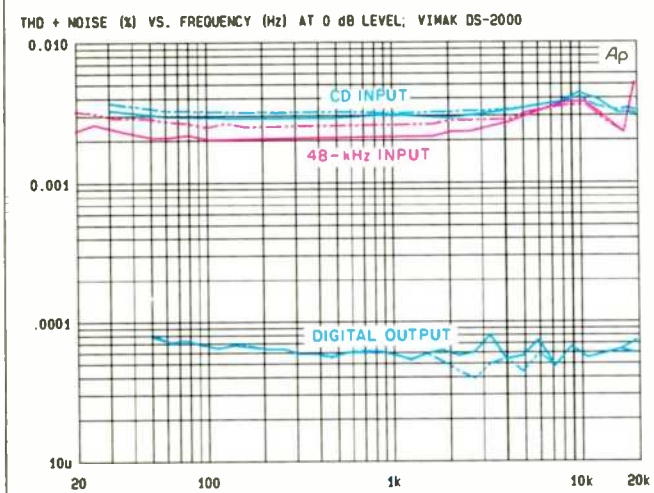


Fig. 2—THD + N vs. frequency for, top to bottom, signals from CD, signals from test generator at 48-kHz sampling rate (both measured at analog output), and test-generator signal measured at digital output. Note that bottom of scale is 0.00001%. Solid curves are for left channel, dashed curves for right channel.

Opening the hinged panel below the display discloses the stereo headphone output jack, the auxiliary optical and coaxial inputs and the pushbuttons to select them, a polarity-inversion key, and a "Fixed/Variable" switch. This switch disables the volume and balance controls, allowing the unit to be used with an outboard preamplifier.

The right-hand section of the front panel contains a −20 dB muting switch, the balance control, and the volume control. When used in conjunction with the "Program" button, the balance control takes on additional functions: Varying display brightness, selecting the type of dither you want, setting the "Automation ID Number" (to give the unit a unique digital address for use in automation systems, and for factory diagnostic use), and changing the displayed source indications to the names of your actual sources. (Names can be up to 20 characters long and use any of 70 alphanumeric characters, including both capital and lowercase letters.)

The DS-2000 accepts up to seven digital inputs: Toslink and glass optical, two coaxial, and one AES/EBU input on the back panel plus the optical and coaxial inputs behind the hinged section of the front panel. The rear-panel outputs include balanced XLR and unbalanced phono jacks plus computer-style DB-9 "Automation" input and output jacks for connection to RS-232 or RS-485 computer serial ports. At the moment, these ports are only used by Vimak in factory testing, but built-in software routines will eventually allow the DS-2000 to be linked to the factory via modem for diagnostic tests, and the software is being changed to allow displayed source names to be typed in from a computer keyboard. The company also plans to offer interface units to link the DS-2000 to some home-automation systems.

The supplied infrared remote duplicates all of the front-panel input selectors, the volume and balance functions, the polarity-inversion and muting functions, and the "Program" key. Combined use of the remote's "Program" and "Balance" buttons enables you to access the previously described programming functions just as easily as from the front panel itself. There is also a "Mode" button reserved for future applications.

Measurements

I approached bench testing of the DS-2000 in two ways. From a practical point of view, I wanted to see how the unit would perform when fed with a digital input source, such as my reference CD player's digital output terminal. Then, from a purely theoretical point of view, I wanted to compare that performance with what the DS-2000 would do when fed with a digital signal generated by my Audio Precision test equipment. It should be noted that the AP equipment generates 24-bit data words. The AP then sets the dither level and assumes that the receiving device will simply truncate at the set level. However, the DS-2000 extracts the full 24 bits, as mentioned earlier, and feeds the data to its internal DSP circuits. Since data is present below the 18-bit level, the DSP will automatically add dither of its own, effectively adding dither on top of dither. This will result in misleadingly high noise and THD readings. The problem was avoided by "tricking" the Audio Precision unit, setting its output word length to 25 bits. This prevented dither from being added to

Measured deviation (or, in this case, lack of deviation) from linearity was clearly superior to that of any digital device I can recall.

the output data and allowed the DS-2000 to properly dither the data internally.

The frequency response when decoding the digital output from my reference CD player, using the CBS CD-1 test disc (Fig. 1A), is down 0.25 dB at 20 kHz, well within Vimak's published specifications. Response to the digital output of a test signal with a 48-kHz sampling rate (Fig. 1B) is virtually the same. The DS-2000 provides a digital output as well as digital inputs, so it can serve as a control center for digital signals. I therefore measured response at the digital output, using my Audio Precision equipment to convert the signal back to the analog domain. This response (not shown) was ruler flat to 20 kHz, suggesting that the slight high-frequency attenuation seen in Figs. 1A and 1B was caused by the analog low-pass output filters or by the analog amplifier stages.

I used the same three setups to measure THD + N (Fig. 2). With input from the CD-1 test disc and my CD player, THD + N remains at around 0.003% over most of the audio spectrum, reaching the rated 0.004% only at 10 kHz. With a 48-kHz test signal from my generator, THD + N is even lower, remaining at around 0.002% for the left channel and 0.0026% for the right channel over most of the frequency range. With the same 48-kHz input signal, mid-frequency distortion at the digital output measures between 0.00005% and 0.00006%, nearly 125 dB below reference leve'!

Next, I checked THD + N versus signal amplitude, using track 18 of the CD-1 test disc as a signal source. This track provides signals of decreasing amplitude from 0 dB (maximum) to −90 dB. The THD + N, expressed in dB below maximum recorded level, generally hovered around the −95 dB mark, regardless of signal amplitude. This corresponds to a THD + N percentage of 0.0018%. To isolate THD proper from quantization noise, I used the Audio Precision's FFT facilities to conduct a spectrum analysis of residual harmonic distortion components of a 1-kHz signal at full amplitude. The only significant harmonic (at 3 kHz) had an amplitude of −108 dB, corresponding to a true THD percentage of 0.0004%.

A spectrum analysis of a −60 dB, 1-kHz signal (Fig. 3) revealed no outstanding harmonic components and showed a noise percentage of around 0.04% relative to the −60 dB signal. This is nearly 68 dB below the −60 dB signal level!

Channel separation, plotted versus frequency in Fig. 4, reveals a separation of approximately 115 dB at mid-frequencies. At 16 kHz, channel isolation was still 105 dB. The curve slopes suggest that if my test disc had a 20-kHz signal on one channel, the separation I'd measure at that frequency would still be greater than the 96 dB Vimak claims.

The A-weighted signal-to-noise ratio, obtained using the "silent" track of the CD-1 test disc and with the signal applied to the DS-2000 via its coaxial digital input, was −103.4 dB on the left channel and −101.2 dB on the right channel. A spectrum analysis of the residual noise as a function of frequency (using a third-octave bandpass filter to track the plot) is shown in Fig. 5. The left-channel hum component at 60 Hz reaches a peak of only −104 dB, while the right channel seems better isolated from the power-line frequency.

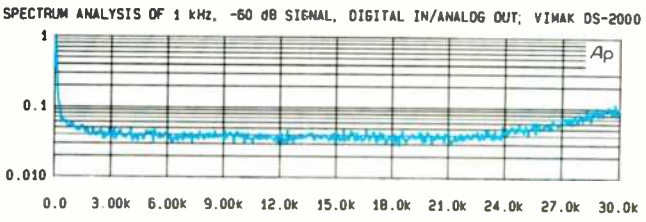


Fig. 3—Spectrum analysis of 1-kHz signal at −60 dB recorded level, measurec at analog output.

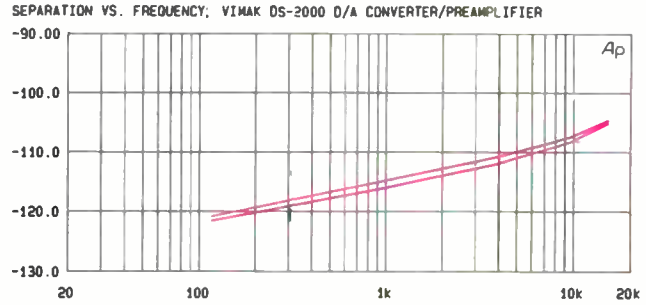


Fig. 4—Separation vs. frequency.

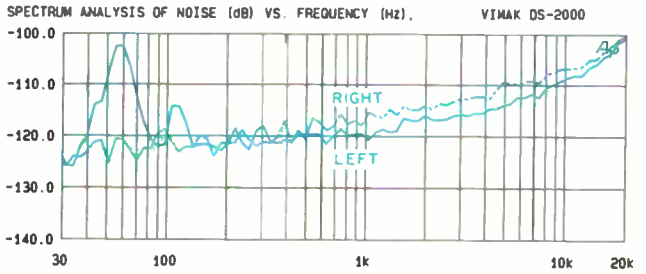


Fig. 5—Spectrum analysis of residual noise when decoding "no signal" CD track.

The improvement I heard convinced me Vimak has come up with a better way to decode digital signals.

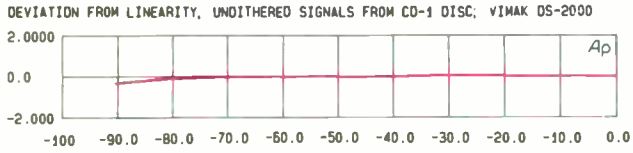


Fig. 6—Deviation from perfect linearity, using undithered signals from CD.

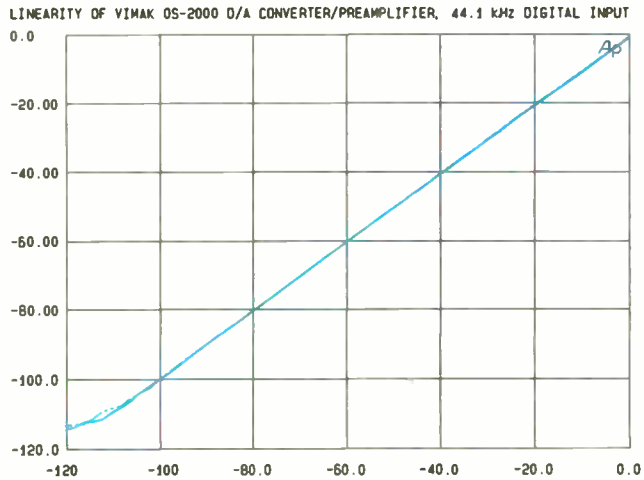


Fig. 7—Linearity, output vs. input, for dithered 500-Hz test signal.

Figure 6 shows deviation (or, in this case, lack of deviation) from linearity over the amplitude range from 0 to −90 dB, using undithered signals from the CD-1 test disc. These results are clearly superior to those from any other digital device I recall having tested over the years. At −90 dB, deviation amounts to less than −0.3 dB, providing ample proof of the superiority of one-bit D/A conversion, at least as it is implemented in this superb Vimak D/A converter circuitry. To further confirm the DS-2000's superb linearity, I used the Audio Precision system to generate a dithered digital signal of gradually decreasing amplitude and then compared input and output levels for this signal (Fig. 7). Linearity is virtually perfect from 0 down to −110 dB. Note, too, that linearity is virtually identical for the left and right channels.

The only other bench test I made was to assess master clock accuracy, which turned out to be within −0.0002% of absolute accuracy. Translated to musical terms, this means that a middle-A tone (440 Hz) would be reproduced as 439.99912 Hz. The difference would be indistinguishable even to musicians possessed of perfect pitch.

Use and Listening Tests

I found the DS-2000 to be simple to use, once I familiarized myself with its somewhat obscure programming functions. My problem in conducting listening tests was: What source material would I use to fully demonstrate the excellent qualities of the DS-2000? Listening to CDs was all well and good, but I knew that the limiting factor would be the inherent quality of the CD itself. The same would hold true for the small collection of DAT cassettes that I have amassed over the last couple of years. Still, listening to pure tones generated by my test equipment would hardly make sense. I finally arrived at a compromise solution: I would listen to CDs and DATs, using the DS-2000 for D/A conversion, and compare the sound quality with that obtained from the analog outputs of my reference CD player (which, at its introduction a couple of years ago, had a suggested retail priced of around $1,200).

The CD I chose was *Engineer's Choice* (Delos DE 3506). This disc's wide variety of classical selections was engineered by my good friend John Eargle, one of the most skilled recording engineers I know. Selections chosen included the "Gun Battle" from Copland's *Billy The Kid*, the Scherzo from Shostakovich's 10th Symphony, and for evaluating the sound of a piano, Rachmaninoff's Prelude in G Minor. Could I hear a difference between the two modes of sound reproduction? *You bet I could!* In the "Gun Battle" sequence, the percussive sounds seemed to have a better attack or transient response when reproduced using the DS-2000. The Shostakovich selection, though highly dynamic when heard from either setup, seemed to exhibit greater clarity and definition of individual instruments when played through the DS-2000. And as for the piano selection, all I can say is that it sounded more like a piano when heard through the DS-2000. I repeated the tests using the headphone outputs of the Vimak as well as the CD player, and my observations and conclusions were consistent with the tests using loudspeakers.

My chosen prerecorded DAT was one issued early on by GRP, *Digital Duke* (GRT-9548), featuring the music of the great Duke Ellington played by the Duke Ellington Orchestra. After the experience with the CD, I was not surprised that "Mood Indigo," my favorite tune on this tape, sounded mellower and less strident through the recorder's optical digital outputs and the DS-2000 than via the recorder's analog outputs.

In short, the improvements in sound quality that I heard convinced me that the folks at Vimak have not only come up with a better way to decode digital audio signals but that devotees of the purest form of sound reproduction would do well to audition the DS-2000 (and, when available, the somewhat lower cost DS-1800). Such auditioning may well lead to the conclusion that, if anything, the DS-2000 is *underpriced* compared with some other high-end D/A converters that offer neither the versatility and features of the DS-2000 nor its superb sound quality. *Leonard Feldman*

"Definitive Technology Has Hit the Bull's Eye."

— Julian Hirsch, *Stereo Review*

Experience the Miracle of Bipolar Technology with Definitive's Revolutionary BP10 & 20!

"Truly Outstanding"
— Stereo Review

Experts agree that Definitive's revolutionary bipolar BP10 and BP20 are two of the world's finest speakers and are sonically superior to speakers selling for many times their remarkably affordable cost.

These advanced technology bipolar (front and rear radiating) systems combine lush spacious soundstaging, lifelike depth-of-field, razor-sharp resolution and pinpoint 3-D imaging with powerful subwoofer-like bass (to below 20 Hz), high efficiency, wide dynamic range and easy-to-position convenience for superb musical reproduction so real that it has been called, "a sonic miracle!"

The Ultimate Home Theatre
Combine the BP10s, BP20s or DR7s with our C1 ultra center channel and BP2 bipolar satellite/surround speakers for the ultimate in home theatre sound.

Visit your nearest Definitive dealer and experience the dramatic sonic superiority of these truly extraordinary loudspeakers. **For More Information**

Call 1-800-451-2248

Definitive Technology®

11105 Valley Heights Drive • Baltimore, MD 21117
(410) 363-7148

Enter No. 11 on Reader Service Card

2

TEAC ESOTERIC X-1 CD PLAYER

Manufacturer's Specifications
Frequency Response: Unbalanced output, 0 Hz to 20 kHz, ±0.3 dB; balanced output, 20 Hz to 20 kHz, ±0.5 dB.
S/N: Greater than 110 dB.
Dynamic Range: Greater than 102 dB.
Harmonic Distortion: 0.0013% or less at 1 kHz.
Channel Separation: Greater than 110 dB at 1 kHz.
Analog Output Level: Unbalanced, 2.0 V rms; balanced, 19.5 dBm (7.3 V rms).
Digital Output Level: Coaxial, 0.5 V peak to peak; optical, −15 to −21 dBm.
Number of Programmable Tracks: 20.
Power Requirements: 120 V a.c. 60 Hz, 24 watts.
Dimensions: 17¾ in. W × 5⅜ in. H × 15¾ in. D (45.1 cm × 13.7 cm × 40 cm).
Weight: 40 lbs. (18.1 kg).
Price: $5,000.
Company Address: 7733 Telegraph Rd., Montebello, Cal. 90640.
For literature, circle No. 91

When an audio company asks potential customers to spend $5,000 on a CD player, it had better offer superior performance and superior sound quality. This is particularly true now that such refinements as one-bit D/A conversion and multi-stage noise shaping have found their way into low-cost CD players. Happily, the Esoteric X-1 CD player manufactured by TEAC does offer a wide enough assortment of technological and sonic improvements over lesser players to call for extensive auditioning.

One of the important features found in the X-1 is a high-precision, vibration-free disc-clamping system that uses a large-diameter, concave turntable to hold the disc rigidly during play. By accurately clamping the disc by its entire surface area, surface vibrations are minimized, making it possible for the player to read signals with greater precision.

The X-1 also adds dither to the signal to reduce quantization noise. Apparently (TEAC's brochure is not clear about this subject), a digital noise-shaping filter shifts the dithering noise into the ultrasonic range, where it is rendered inaudible.

The 20-bit D/A converter uses a "1/16-shift" digital offset system. This combats errors in the most significant bit, said to occur near 0 V and cause zero-crossing distortion in multi-bit converters. By adding 1/16 of full-scale voltage to the entire digital signal, the offset system shifts the signal's actual zero reference up to a level where crossing distortion is no problem. According to TEAC, this improves linearity in the range below −18 dB, where the music's sound is mostly concentrated. The converter section also includes a 25-bit filter with eight-times oversampling, a third-order Butterworth output filter, and separate negative and positive power supplies. Construction features include a vibration-resistant structure using a central transport mechanism and a front panel made from a high-density compound of stainless steel and ceramic material. The signal circuits are built up from monocrystalline oxygen-free copper transmission wires, and the p.c. board has extra-thick, 70-micron traces for increased reliability and lower resistance.

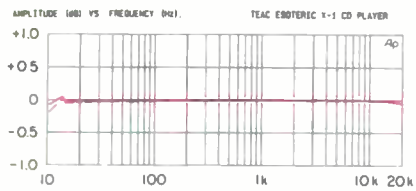


Fig. 1—Frequency response, from 10 Hz to 20 kHz. Dashed curve is right channel.

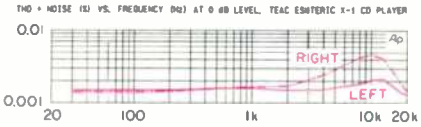


Fig. 2—THD + N vs. frequency, in percent relative to maximum output level.

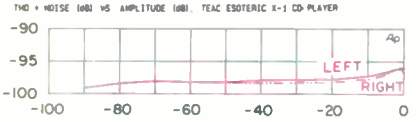


Fig. 3—THD + N vs. signal amplitude.

Control Layout

Front-panel controls are minimal, consisting of the usual "Power" switch plus softly illuminated buttons for "Open/Close," "Play," and "Pause" and non-illuminated buttons for forward and reverse track skip and to turn on a light inside the CD compartment so you can observe the disc's rotation. A display at the center of the panel shows the state of play including "Track" and "Index" numbers, time remaining on the track or disc, and the status of such operating modes as "Repeat," "Auto Space" (which inserts an automatic 4-S pause between tracks), and programming.

As you'd suspect from the multi-function display and the minimal front panel, most of the X-1's features are operated from its supplied remote control. Its numeric keys are used for programming and for direct selection of track numbers and index points during play. Other buttons control all programming and repeat-play functions, select index points, and turn "Auto Space" on and off.

The rear panel carries coaxial and optical digital outputs, a switch to turn off the digital outputs, phono and XLR jacks for, respectively, unbalanced and balanced analog outputs, and a socket for the a.c. power cord.

Measurements

Using the unbalanced analog outputs, I measured frequency response (Fig. 1) as flat from 10 Hz to 20 kHz, well within ±0.1 dB. That even exceeds TEAC's claim for this unit. Over most of the frequency range, THD + N for a signal at maximum recorded level (0 dB) was well below 0.002%, rising only slightly at higher audio frequencies, as shown in Fig. 2.

How much of that THD + N is actual THD? I checked the harmonic components in an FFT spectrum analysis (not shown) of a 1-kHz signal at full recorded level and found that the harmonics at 3, 5, and 9 kHz reached amplitudes of about −110 dB. From this, I calculated that the actual harmonic distortion was only about 0.00055%, or about as low as I have ever measured for any CD player or any separate D/A converter.

Figure 3 shows how THD + N varies with recorded signal levels, over the range from −90 to 0 dB. At maximum recorded level, THD + N measures −96 dB, which corresponds to 0.0016%, correlating well with the earlier results shown in Fig. 2. At lower signal levels, THD + N (relative to maximum recorded level) is even lower, better than −98 dB from levels of −30 dB downward.

As an additional check, I looked at a spectrum analysis of dithered and undithered 2-kHz tones at −90 dB re-

The Esoteric X-1 is superb, and even if you can't afford this gem, please do yourself a favor and go hear it.

corded level. For undithered signals, harmonic components arising from quantization distortion were apparent over much of the audio range, with the noise floor hovering at around −135 dB. When dithering was added, those distortion components disappeared, but noise level increased to a floor of about −120 to −125 dB. This excellent, low noise level is attributable to TEAC's noise-shaped dithered signals, described earlier.

Separation, shown in Fig. 4, measures 118 dB for the left channel and 116 dB for the right channel at 1 kHz. Even at 16 kHz, channel separation remains greater than 100 dB for both channels.

Overall signal-to-noise ratio, measured while playing a "no signal" track of my CBS CD-1 test disc, was 110.6 dB for the left channel and an almost identical 110.1 dB for the right channel. The EIAJ dynamic range measured 99.7 dB for either channel. A spectrum analysis plot of the residual noise produced by the Esoteric X-1 is shown in Fig. 5. Note that even at 60 Hz, where I normally expect to see a noise peak caused by the power supply's fundamental frequency, the worst peak (for the right channel) is still 123 dB below maximum recorded level—obviously inaudible.

Figure 6 shows deviation from perfect linearity. With undithered signals, linearity is almost perfect from 0 dB (maximum recorded level) down to −90 dB, and deviation is less than 1.0 dB at the extremely low level of −90 dB; this attests to the X-1's excellent D/A conversion system. Using dithered signals at even lower levels (−70 to −100 dB) produces even better results, as shown. I could detect *absolutely no measurable deviation from linearity*, even at −100 dB.

My final graphic plot is of a fade-to-noise test using dithered signals from −60 to −120 dB (Fig. 7). This test, in addition to providing further evidence of excellent linearity, also allows me to derive the system's EIA dynamic range, which is approximately 115 dB.

Additional spot measurements were made for SMPTE-IM distortion, which turned out to be 0.0049% for the left channel and 0.0054% for the right channel. Clock accuracy was within 0.0108% of perfection.

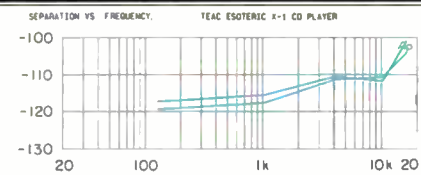


Fig. 4—Separation vs. frequency.

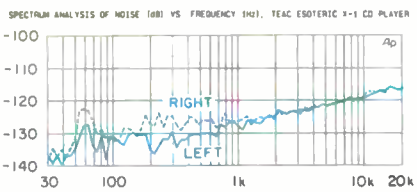


Fig. 5—Spectrum analysis of residual noise when playing "no signal" test track.

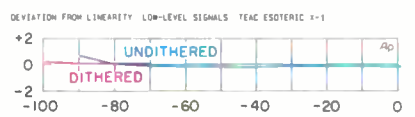


Fig. 6—Deviation from perfect linearity.

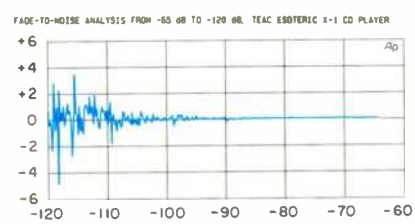


Fig. 7—Fade-to-noise test.

Use and Listening Tests

Using the special Pierre Verany "defects" disc, I determined that this player could handle missing data extending for 1.0 mm. That's not the best I have measured for a CD player, but it is well above the minimum standards found in the Philips/Sony Red Book of basic specifications for CD players and recordings. On the other hand, the chassis and mechanism of the Esoteric X-1 are so stable and impervious to external vibration that I literally had to pound on the sides of the unit for the system to mistrack.

For my listening tests, I chose a couple of new CDs that I recently acquired. Telarc's release of Offenbach's *Gaité Parisienne* (CD-80294), played by the Cincinnati Pops Orchestra under the direction of Erich Kunzel, sounded crisp and clear, typical of Telarc's approach to classical recording. On a lesser CD player, however, this same recording seemed overly strident (an effect that some CD players have been known to produce on many Telarc releases). No such stridency was evident when the recording was played on the X-1.

A second CD that did particularly well on the X-1 was a Cedille Records release (CDR 9000 008) of a pair of cello sonatas by two modern composers, Easley Blackwood and Frank Bridge. Expecting to hear an assortment of dissonances, I was pleased and surprised, particularly by the Blackwood Cello Sonata, Op. 31. As Blackwood himself put it, "I have tried to approach, as nearly as possible, the style that I think Schubert would have discovered if he had lived until 1845." Be that as it may, the rich sonority of the solo cello in this piece came through with not the slightest evidence of roughness that sometimes accompanies cello compositions heard on lesser CD players.

In short, the TEAC Esoteric X-1 is a superb instrument in which great emphasis has obviously been placed on sound quality as well as performance reliability. Even if you can't afford to own this gem of a CD player, do yourself a favor and give the Esoteric a listen. If nothing else, you will then have a reference against which to compare CD players that you *can* afford!

Leonard Feldman

THE POWER AND THE GLORY!

WHAT DOES IT TAKE TO BUILD a high-end speaker in the digital age?

It's not easy. Today's finest speakers must be able to reproduce not just the subtle detail of music but also its size - be it a grand symphony, intimate jazz or progressive rock. Even few expensive speakers are up to the task.

But, with the STUDIO MONITOR, PARADIGM has done the impossible... captured high-end speaker performance for an almost impossible $1,899/pair.*

Designing this fine an audiophile speaker takes a lot of determination and extensive resources - better design execution with better materials.

And premium materials are used throughout. From diecast aluminum chassis, used in all drive units, to the astonishing tweeter with its pure-aluminum-dome, to the midrange with a mineral-filled polypropylene cone and ferrofluid cooling, to bass drivers with mineral-filled polypropylene cones, 1½" voice coils and massive 40 oz. magnets, to advanced enclosure design and seamless dividing networks.

The results are staggering! The STUDIO MONITOR is articulate and transparent, yet also very dynamic!

YOU WON'T FIND PARADIGM everywhere. Speakers this good require the expertise of a qualified audio specialist. So, before you buy any high-end speaker, visit your AUTHORIZED PARADIGM DEALER... *and listen to the power and the glory of the STUDIO MONITOR.*

FOR MORE INFORMATION CALL 1-800-553-4355 Ext. 41274 or write: AUDIOSTREAM, MPO Box 2410, Niagara Falls, NY 14302. In Canada write: PARADIGM, 569 Fenmar Dr., Weston, ON M9L 2R6.

Sound & Vision *Critic's Choice Award*

HI-FI GRAND PRIX AWARD FROM AudioVideo

For More Information

Call 1-800-451-2248

Paradigm®

Enter No. 23 on Reader Service Card

3

DYNACO STEREO 70 SERIES II TUBE AMP

Manufacturer's Specifications

Rated Power: 35 watts per channel into 4, 8, or 16 ohms, from 20 Hz to 20 kHz.

THD: 0.25% at full rated power, less at lower output levels.

IM Distortion: Less than 1% at up to 30 watts continuous per channel into 4, 8, or 16 ohms, with any combination of test frequencies.

Frequency Response: ±0.5 dB, from 20 Hz to 20 kHz, at rated power level.

Hum and Noise: At least 90 dB below 30 watts, at all frequencies.

Damping Factor: Greater than 15.

Dimensions: 13 in. W × 9½ in. D × 7 in. H (33 cm × 24.1 cm × 17.8 cm).

Weight: 35 lbs. (15.9 kg).

Price: $995 in black, $1,095 in chrome.

Company Address: 125 Cabot Ct., Hauppauge, N.Y. 11788.

For literature, circle No. 92

The original Dynaco Stereo 70, produced when tubes were still the norm, probably outsold every other tube amp by a very considerable margin. The emergence of this new version is evidence of the present-day renaissance of high-fidelity tube electronics. The Dynaco Stereo 70 Series II came about through the efforts of John Peterson of Sound Values (formerly Stereo Cost Cutters), the company that has been selling Dyna replacement parts and kits of some Dynaco products, and Bob Rapoport, a 22-year veteran of the audio industry. Rapoport had long dreamt of resurrecting the Dynaco product line. A deal was struck with the Panor Corporation, a maker of automotive and marine audio systems, and with Leo David, a chain of stereo shops that had ended up owning the Dynaco name. Several consultants were brought in to modernize the design of the old Stereo 70, and the end result is the product under review.

The new version, while retaining the original overall dimensions and what's stated to be the same output transformer design as in the original, differs from the earlier design in several ways that can impact the way the unit measures and sounds. Physically the amp at first glance looks like the old Stereo 70, but a closer look reveals some of the changes. First, the speaker-output screw terminals have been replaced by four five-way binding posts for each channel. These are intelligently arranged; the 4- and 8-ohm terminals flank the ground connection, allowing dual-banana plugs to be used for connecting most speakers. (The 16-ohm terminals, placed out beyond the 8-ohm ones, are too far from the ground terminal for dual-banana plugs, but 16-ohm speakers are fairly rare these days.) The old octal sockets that provided filament and plate power to Dynaco (and some other) preamplifiers have been eliminated, the input phono jacks are of better quality and gold plated, and the cheap slide switch for power on/off has been replaced with a more modern rocker. Best of all, the old "Biaset" method of setting bias with a voltmeter has been updated. Each channel's bias pot is now accessible through the front panel and is flanked by a pair of LEDs that illuminate equally when the control is properly adjusted. Internally, the biggest change in construction is from a small p.c. board and a lot of point-to-point wiring to a single, large p.c. board that carries all the major components except the transformers.

The overall circuit is about like the original except that the input tube has been replaced with a similar but more easily attainable tube. One major philosophical difference in the new design is a change in the internal open-loop compensation scheme and the addition of passive input filtering to limit the signal bandwidth to about the audio range. This should improve distortion at the frequency extremes and possibly reduce transient intermodulation distortion. However, with bandwidth limited at the input, Dynaco has also apparently removed the original design's high-frequency stabilization network, a capacitor and resistor in series from the plate of the first tube to ground. This network's purpose was to reduce open-loop gain at high frequencies so as to produce stable high-frequency behavior with negative feedback applied. The schematic of the new version states that this network is "not used in some assemblies." In an attempt to reduce what probably was negligible transient intermodulation distortion in the original design, the designers of

the Stereo 70 II may have caused some problems that we shall look at in the "Measurements" section. Another consequence of the input band-limiting network is that the amp should be driven from a source impedance of less than 2 kilohms so as not to further reduce the high-frequency bandwidth. (This won't be a problem for most users, who drive their amplifiers from preamps, but may be a problem for a few nuts like me who prefer to use a passive attenuator to drive their power amps.) Another change in the Series II is that the overall negative feedback loop is derived from the more often used 8-ohm tap on the secondary of the output transformer rather than the 16-ohm tap used in the original.

In the power supply, the transformer has been beefed up and made with a dual primary (permitting easy change for overseas a.c. mains), solid-state rectifiers have replaced the 5AR4 tube rectifier, the trouble-prone selenium rectifier in the bias supply has been replaced with a more reliable modern silicon unit, and the main high-voltage filter capacitance has been increased to about three times its original value. These changes would tend to increase both transient and steady-state power output compared to the original.

Measurements

Voltage gain into 8-ohm loads on the 8-ohm taps was found to be 22.3 dB for both channels, with a corresponding IHF sensitivity of 217 mV. This is impressive gain matching for a tube power amplifier.

Frequency response at the 1-watt level was measured for open-circuit, 8-ohm loads, and 4-ohm loads on the 8-ohm tap. This is shown in Fig. 1 for the right channel; the slight peaking seen between 150 and 200 kHz is an aberration not present in the left channel. Easy to see here is the bandwidth limiting caused by the input filter; the relatively close spacing of the curves indicates a relatively low output impedance. Data taken from these curves yield an approximate output impedance of 0.6 ohm.

Square-wave response for the Stereo 70 II's left channel is shown in Fig. 2. The top trace is for a 10-kHz signal into 8 ohms on the 8-ohm tap. Rise- and fall-times aren't too swift. They are on the order of 16 μS, predominantly a consequence of the input filtering. A 2-μF capacitance was added to the 8-ohm load in the middle trace. Here the waveform is

The emergence of a new version of the Stereo 70 is evidence of a renaissance in tube electronics.

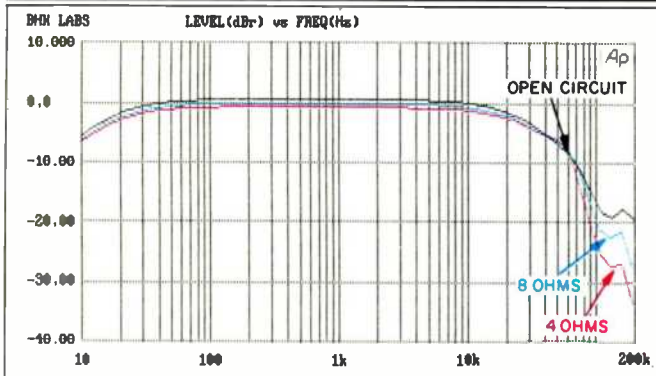


Fig. 1—Frequency response as a function of loading, at 8-ohm tap.

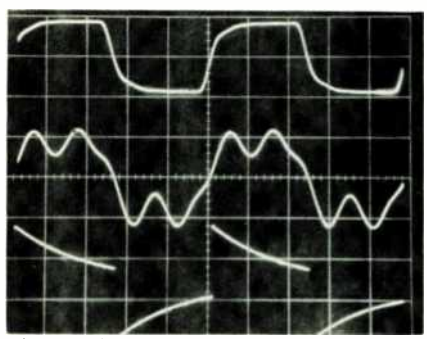


Fig. 2—Square-wave response, measured at 8-ohm tap, for 10 kHz with 8-ohm load (top), 10 kHz with 2-μF capacitance across 8 ohms (middle), and 40 Hz with 8-ohm load (bottom). Scales: Vertical, 5 V/div.; horizontal, 20 μS/div. for 10-kHz traces, 5 mS/div. for 40 Hz.

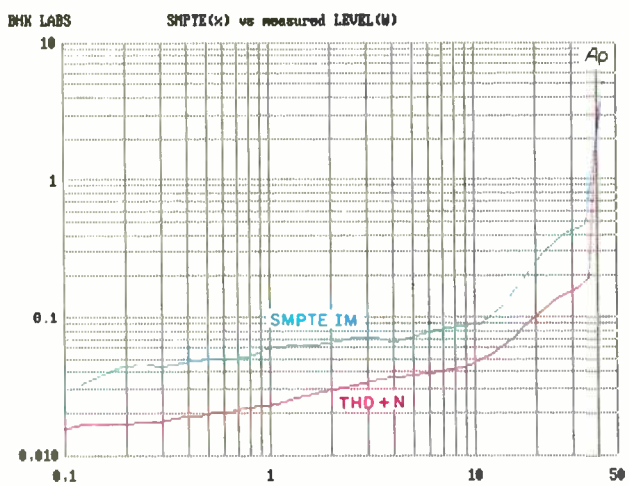


Fig. 3—THD + N, and SMPTE-IM distortion, vs. output power for 8-ohm load on 8-ohm tap.

quite altered, more so than on other power amplifiers. With the same 2 μF and 8-ohm load, the ringing on a 1-kHz square wave (not shown) only decayed by about 50% within the half-cycle time of the 1-kHz signal (500 μS). This is marginally stable performance. In fact, under the same circumstances, the right channel outright oscillated. The aforementioned high-frequency stability network components are provided for on the p.c. board, and in fact, the capacitor is present but the resistor is left out. Adding an 18-kilohm resistor, and hence activating the stability network, caused the amplifier to behave properly. The 1-kHz square-wave signal then damped out after perhaps one cycle of ringing, and the 10-kHz waveform looked much more like that from other amplifiers. I think taking this network out was a mistake that may have adverse sonic consequences in some users' systems.

The bottom trace of Fig. 2 is for a 40-Hz signal. The severe tilt shown is caused by the input high-pass filter (approximately 19 Hz, first order).

Total harmonic distortion plus noise for a 1-kHz signal, and SMPTE-IM distortion, are shown in Fig. 3 for 8-ohm loading on the 8-ohm tap for the left channel. Distortion is impressively low in both channels.

Load tolerance is pretty good: The amp delivers full power (though with higher distortion) when loaded with half the rated output-tap impedance. With a load of twice the tap impedance, distortion is lower, but attainable output power is about half that available with loads of half to full rated impedance. Total harmonic distortion as a function of frequency and power is plotted in Fig. 4, while Fig. 5 shows the spectrum of distortion residue at 1 kHz for an output of 10 watts into an 8-ohm load on the 8-ohm tap. Although the dominant harmonics are low-order, as can be seen, plenty of higher order components are present though at much lower levels.

For comparison, I borrowed an old Stereo 70 that was in pretty good shape. I changed the output tubes and generally cleaned and tuned it up to assure proper operation. The measured distortion was about 10 times higher in the original unit than in this new design. I think that this is mainly due to the different front-end tube used in the Series II and, possibly, to worn-out 7199 front-end tubes in the old Stereo 70. Not having any more 7199s to try in the old unit, I wasn't able to verify this. Bandwidth, stability, and output impedance of the old Stereo 70 were similar to the new design's when its input network was removed and the high-frequency stability network was connected. Power output of the new version was about 4 to 6 watts higher at the onset of clipping.

Getting back to the new Series II, I tested damping factor with the stability network out, as delivered, and found it quite uniform over the audio range. It was about 13.5 for the left channel and 14.0 for the right channel, as measured on the 8-ohm tap.

Output noise as a function of measurement bandwidth, along with the IHF S/N ratio, is presented in Table I. Hum and line harmonics account for the difference between the readings for a bandwidth of 400 Hz to 22 kHz (made with a 400-Hz high-pass filter that screens out hum frequencies) and the readings made wideband or from 22 Hz to 22 kHz.

SONY

Putting a Whole New Spin on Personal Music Enjoyment.

MiniDisc™

MiniDisc: Digital Audio Gets Personal.

It all started with the Compact Disc. When Sony launched the CD just 10 years ago, we introduced the concept of an optical-based digital audio disc. And we gave music lovers their first taste of digital high fidelity with quick random access. Music was finally free of analog noise, wow & flutter and distortion. The CD brought the home listener a giant step closer to the original musical source.

Over the past decade, Sony has taken these high standards, and raised them even higher, with wave after wave of CD player innovations. We've also improved CD software by developing a new generation of professional 20-bit studio recorders. And now Sony's critically-acclaimed Super Bit Mapping™ technology achieves near-20-bit performance on standard 16-bit Compact Discs.

These refinements have helped keep Compact Disc at the cutting edge. But as advanced as Compact Disc undoubtedly is, it has never provided many benefits that until now have been the exclusive domain of cassette tape, like recordability, shock resistance and ease of portability. That's why Sony is about to introduce the next step in the digital audio revolution: MiniDisc.

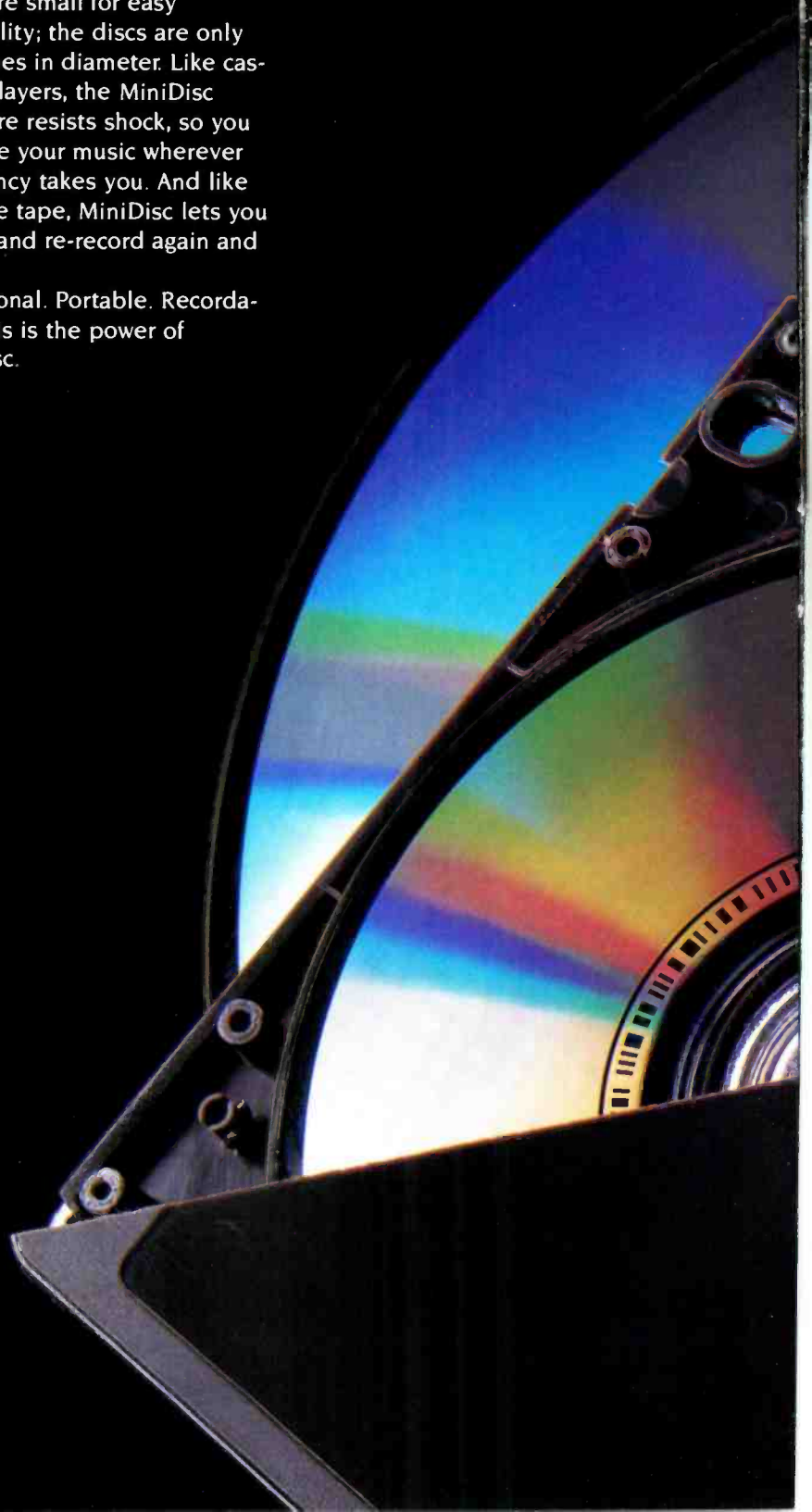
MiniDisc: The New State of the Art in Personal Audio.

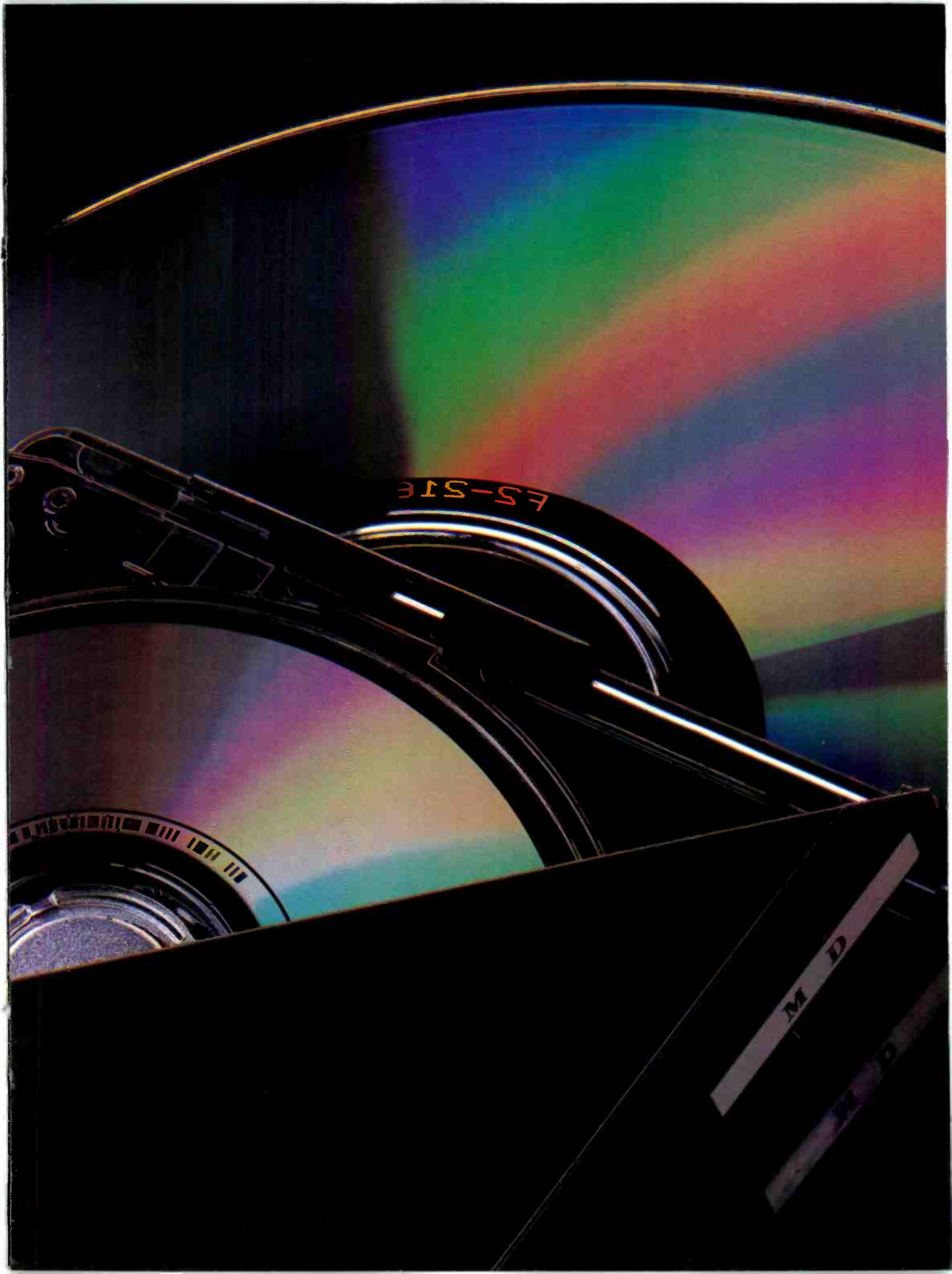
Sony's MiniDisc is an all-new format with an unmatched range of possibilities. Like the Compact Disc, MiniDisc boasts up to 74 minutes of spectacular digital sound—nearly the same sound quality as CD itself. Like CD, you can access any song in less than one second. And the MD is just as durable as a CD, so you can play an MD millions of times without any degradation or wear.

MiniDisc also offers the key advantages of cassettes. MiniDiscs are small for easy portability; the discs are only 2.5 inches in diameter. Like cassette players, the MiniDisc hardware resists shock, so you can take your music wherever your fancy takes you. And like cassette tape, MiniDisc lets you record and re-record again and again.

Personal. Portable. Recordable. This is the power of MiniDisc.

COMPACT DISC 10 10TH ANNIVERSARY




M D

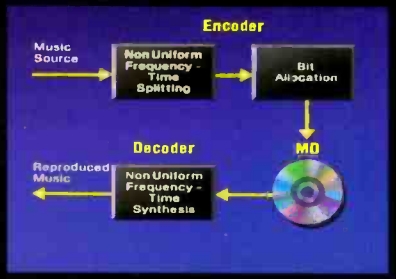
MiniDisc: Great Sound Wherever You Go.

Imagine a disc player you can take anywhere you go, any way you travel. Imagine discs so small that several can fit in a shirt pocket. Yet imagine each of these discs containing up to 74 minutes of stereo sound reproduced with the superb clarity of digital technology. How could Sony put so much music on a disc so small? The answer is a technological tour de force called ATRAC.

ATRAC: Minimum Size, Maximum Music.

ATRAC stands for Adaptive TRansform Acoustic Coding, the proprietary bit reduction technology that makes MiniDisc possible. The system uses psychoacoustic threshold of hearing and masking principles to analyze the music and record only those tones to which the human ear is most sensitive. ATRAC captures music that approaches CD performance in areas like frequency response, dynamic range and distortion on a disc only one third the size of a Compact Disc.

ATRAC is unique among bit reduction systems because it performs a comprehensive, non-uniform frequency and time analysis of the music. It divides the audio signal into three separate bands and 512 frequency spectra, with unequal widths that mirror the ear's sensitivity to different frequencies. Finally, ATRAC constantly varies the allocation of bits according to this analysis.



UNLIKE OTHER BIT REDUCTION SYSTEMS, ATRAC PERFORMS NON-UNIFORM FREQUENCY AND TIME SPLITTING.

While ATRAC technology is complex, the benefits are simple. Extended record/playback time. Miniature disc size. And outstanding digital sound. It's no wonder that award winning producers and engineers like George Massenburg have acclaimed ATRAC technology as "A significant technological breakthrough—not a rework of arcane hardware. It just sounds great!"

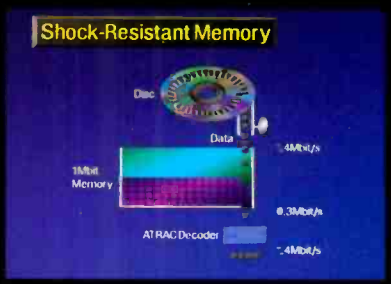
Rugged Cartridge.

MiniDisc may be small, but to make it truly portable, Sony placed it in a protective cartridge. So MiniDiscs are ready to travel. You can toss them in a glove compartment, briefcase or even your pocket.

Phenomenal Shock Resistance.

Most CD players try to resist skipping by means of an oil-damped or mechanical suspension. MiniDisc hardware takes an altogether different approach: a revolutionary method called Electronic Shock Protection (ESP).

The heart of ESP is a buffer memory chip that stores digital data from the disc. Thanks to ATRAC bit reduction, a four Megabit chip corresponds to ten seconds of real-time music. So if shock and vibration should make the laser mistrack, music will continue to flow for up to ten seconds. This gives the laser ample time to resume proper tracking, so your music never misses a beat. In this way, MiniDisc matches today's active lifestyles, letting you bring high-quality digital sound where it's never been before.



As a prerecorded medium, MiniDisc offers still other advantages, like Text Mode. It's an eye-catching display of the disc's title, track title and even the artist's name. Text Mode is just one more example of how MiniDisc puts a new spin on personal music enjoyment.

SONY
DBB
MICHAEL JACKSON
DANGEROUS
STOP/CHARGE

At Long Last, You Can Record on a Disc.

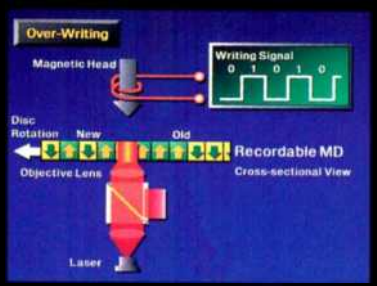
For over forty years, audio recording has meant tape recording. And while tape recording is better than no recording at all, it's always been plagued by tape shedding. Tape stretching. And occasionally even tape jamming.

All of this is about to change, thanks to MiniDisc. For in addition to playback-only prerecorded MiniDiscs, there's also another type of MiniDisc you can record yourself. In fact, with MiniDisc you can record and re-record again and again, up to a million times on the same disc! And MiniDisc recordings provide far faster random access than any tape can, as well as new features that tape formats simply can't touch.

Magneto-Optical Recording.

While prerecorded MiniDiscs use the same laser-read "pits" as Compact Discs, recordable MiniDiscs are different. They represent the first consumer product with magneto-optical technology. Unlike the "write-once" recordable CD's that professionals use, magneto-optical discs are erasable. So you can erase and re-record your MiniDiscs just as you can with cassettes.

Magneto-optical recording has long been used for computer storage. However, MiniDisc incorporates a "direct overwrite" capability that's entirely new. First, a high-power laser beam heats the disc's magnetic layer past the Curie point, the temperature above which the magnetic orientation is easy to change. Then, a semiconductor magnetic head applies the signal from the opposite side of the disc. As the heated spot of the disc rotates away from the laser, it cools and the imprint from the magnetic signal remains embedded on the disc. Because erasing the disc requires at least 400 degrees, the discs are unaffected by stray magnetic fields that might ruin a tape recording.



IN THE MD RECORDER, A LASER HEATS THE DISC'S MAGNETIC LAYER WHILE THE SEMICONDUCTOR MAGNETIC HEAD RECORDS THE SIGNAL BY A MODULATED MAGNETIC FIELD.

As a result of this approach, you get a simpler mechanism. A more accurate spot pattern. Lower error rates. Reduced jitter. And lower power consumption, making battery-powered portable recording a reality.

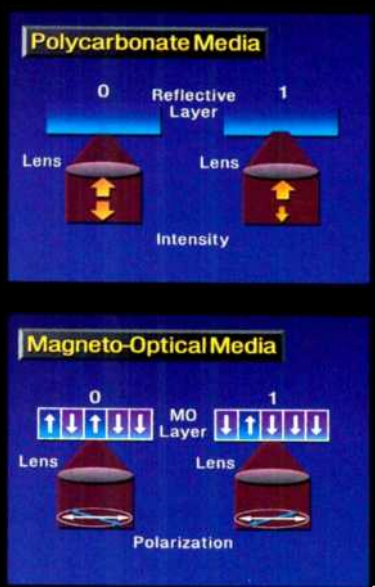
Take Control of Your Recordings.

With MiniDisc, you can alter or adjust your recordings as never before. For example, you can easily re-sequence songs after you've recorded them by writing your new sequence into a section of the disc called the User Table of Contents. You can also edit out a track and all subsequent tracks will be automatically renumbered.

Finally, the MiniDisc format lets you re-record individual tracks, even substituting longer songs for shorter ones. When the recorder comes to the end of the original space, the buffer memory gives the machine up to three seconds to find available disc space and resume recording. So even if your music is recorded on two different sections of the disc, during playback it's never interupted.To a generation raised on analog recording, these capabilities are nothing short of amazing.

Playback without Pits.

Once recorded, a magneto-optical MiniDisc contains a spiral of magnetic patterns. During playback, these patterns reflect laser light at two different angles of polarization. (This is called the Kerr effect.) Remarkably, this same laser pickup is used for playing back prerecorded MiniDiscs. Both types of playback are performed without contact, so you get an unlimited number of plays without disc deterioration or wear.



PRERECORDED MINIDISCS USE CONVENTIONAL PITS (TOP). RECORDABLE MINIDISCS HAVE MAGNETIC PATTERNS (BOTTOM), WHICH THE PLAYER DETECTS BY THE POLARIZATION OF REFLECTED LASER LIGHT.


60 min
Digital Audio MiniDisc
MDW-60
SONY
For Recording and Playback
Quick Random Access
MiniDisc
REC

Once a Dream.
Now a Reality.

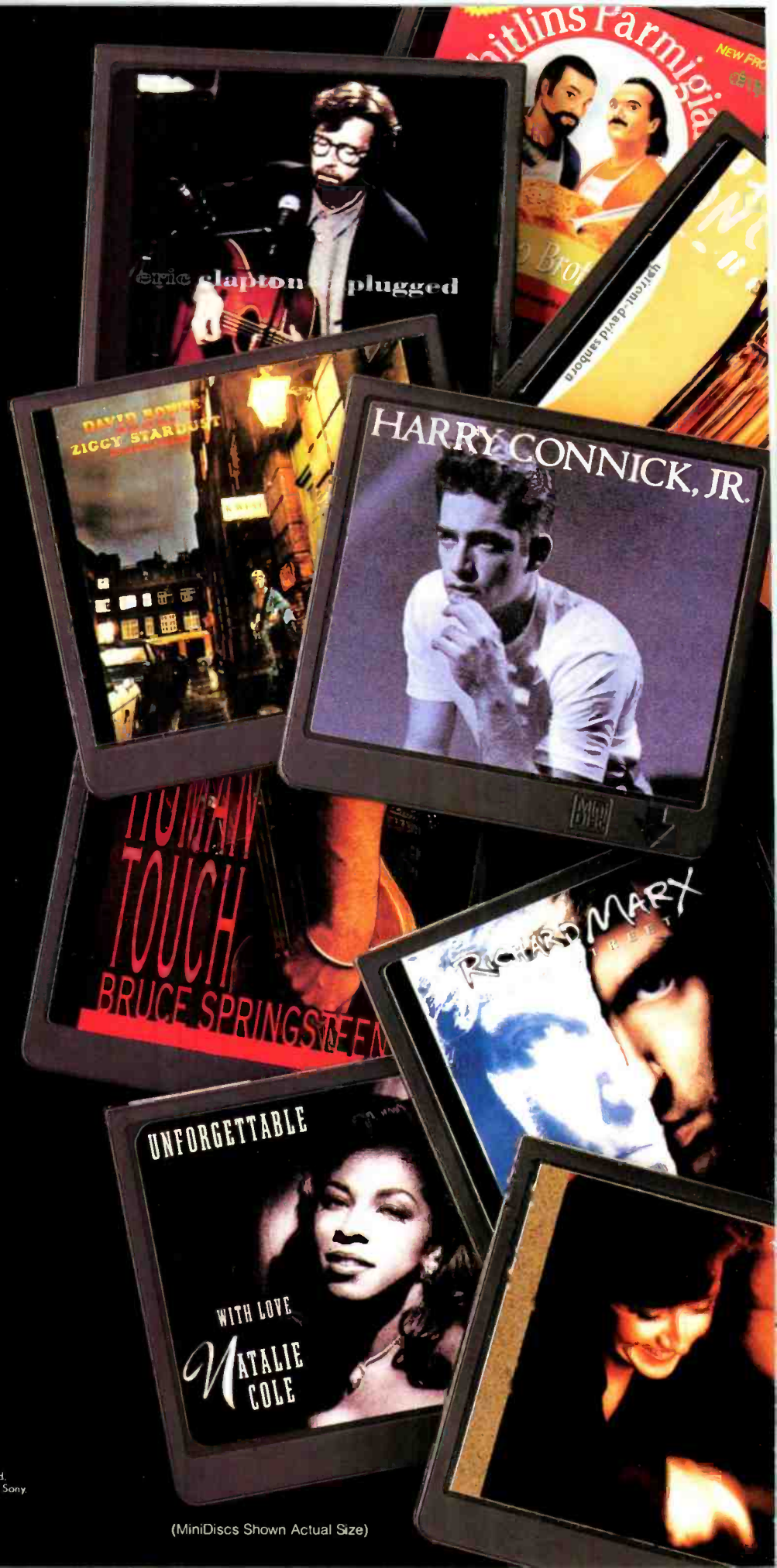
MiniDisc technology sounds futuristic. But the future is now. And soon you'll be able to experience it for yourself.

Which means soon you'll be able to buy a Sony portable MiniDisc recorder; a portable MiniDisc player and a car MiniDisc player complete with AM, FM and CD changer control. And this is only the beginning because MiniDisc is supported by more than 30 consumer electronics companies.

For making your own disc recordings, you'll also be able to buy recordable MiniDiscs from Sony and others. And you'll be able to choose from hundreds of prerecorded MiniDisc music titles from such labels as Atlantic, Capitol, Columbia, DMP, Elektra, EMI, Epic, Ryko, Sony Classical, Virgin, Warner and others.

Once you experience MiniDisc for yourself, we're confident you'll share our enthusiasm for two digital audio disc formats. Compact Disc, which represents the ultimate in high fidelity performance. And MiniDisc, which represents something equally exciting—the new state of the art in personal music entertainment.

MiniDisc™



(MiniDiscs Shown Actual Size)

SONY

Sony Corporation of America
National Operations Headquarters
1 Sony Drive Park Ridge, NJ 07656

Distortion is impressively low, and interchannel gain matching is admirable for a tube amplifier.

In practice, hum was inaudible with my setup. Interchannel crosstalk was more than 80 dB down over most of the audio range, decreasing to about −70 dB at 20 kHz.

Measuring dynamic headroom with 8-ohm loading on the 8-ohm taps yielded a momentary reading of 39 watts, for a headroom figure of 0.47 dB. Steady-state power output at visual onset of clipping was about 37 watts, for a clipping headroom of 0.24 dB. The above measurements were made with a line input of 120 V a.c.

Table I—Output noise. The IHF S/N ratios were 88.3 dB for the left channel and 93.7 dB for the right channel.

	Output Noise, μV	
Bandwidth	LEFT	RIGHT
Wideband	668	625
22 Hz to 22 kHz	661	625
400 Hz to 22 kHz	105	48
A-Weighted	108	58

Use and Listening Tests

Ancillary equipment I used when evaluating the sonic properties of the Dynaco Stereo 70 Series II included the following signal sources: An Oracle turntable fitted with a Well Tempered arm and Spectral Audio MCR-1 Select MC cartridge feeding a Vendetta Research SCP-2B preamp; a Krell Digital MD-1 CD transport feeding either a VTL Reference, VTL Straight-Line, or PS Audio UltraLink D/A converter; a Nakamichi 250 cassette deck and ST-7 tuner, and a Technics 1500 open-reel recorder. Preamplifiers used included a Coda Technologies FET 01, a Quicksilver Audio unit, and a First Sound Reference II. Other power amplifiers included a pair of prototype Quicksilver Audio M-135 mono tube units, a prototype digital switching amp, and the old Stereo 70.

For my formal listening, I started with the Coda Technologies preamp, because the 5-kilohm output impedance of my usual First Sound passive preamp is higher than the 2 kilohms Dynaco recommends as a maximum source impedance for the Stereo 70, and because the capacitance of my long interconnect cables might cause ultrasonic high-frequency loss when used with a 5-kilohm source. I found the overall sound okay, but not too musically involving. The presentation was spatially somewhat flat, and musical detail, life, and definition were lacking. When I switched to the Quicksilver and then the First Sound, each change incrementally improved the sound in its own way. With the substitution of the Quicksilver, a very noticeable and refreshing life came to the music. And with the First Sound, my normal reference setup, I got back to the superior reproduction I have been accustomed to. Incidentally, I don't think these results are due to the lower power rating of the reviewed piece, as the playback levels used were well within its linear capability.

I then set up a last test, using the Quicksilver Audio tube preamp to drive the amp via the long interconnect cables, which it does very competently. I paired the old Stereo 70 against the new design. After switching back between them a number of times, I found myself preferring the overall sound when using the old design. The Stereo 70 II yielded its best sound yet, in this arrangement, but still I felt that it wasn't communicating the music as effectively as the original design.

These observations are according to my own tastes and perceptions, which may be markedly different from your own. The Stereo 70 Series II might well be just your sonic cup of tea. If so, I would advise asking Dynaco or your dealer about the possibility of stability problems with your loudspeaker load, especially if that loudspeaker is an electrostatic.

Bascom H. King

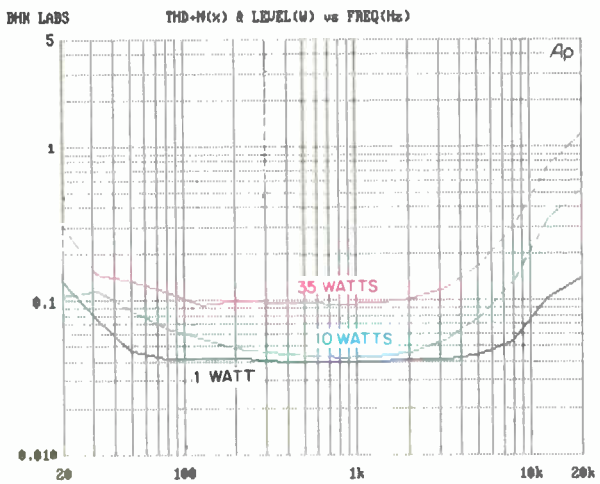


Fig. 4—THD + N vs. power and frequency for 8-ohm load on 8-ohm tap.

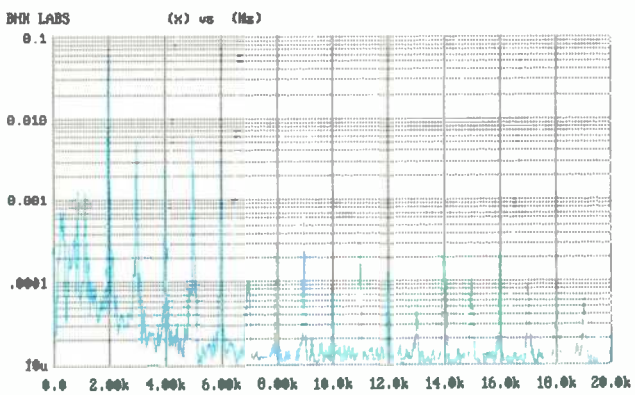


Fig. 5—Distortion spectrum for 1-kHz signal at 10 watts out into 8-ohm load on 8-ohm tap.

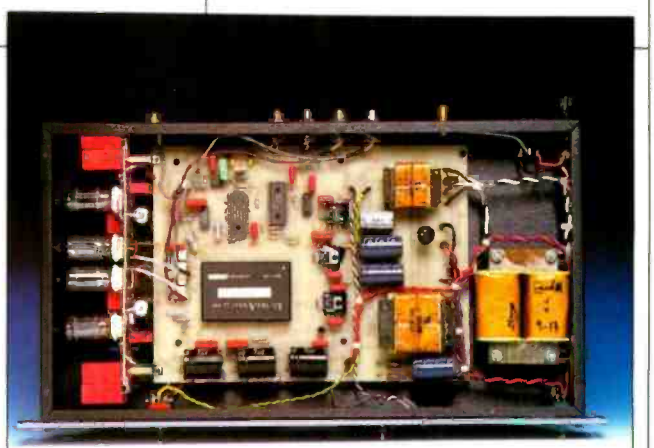
4

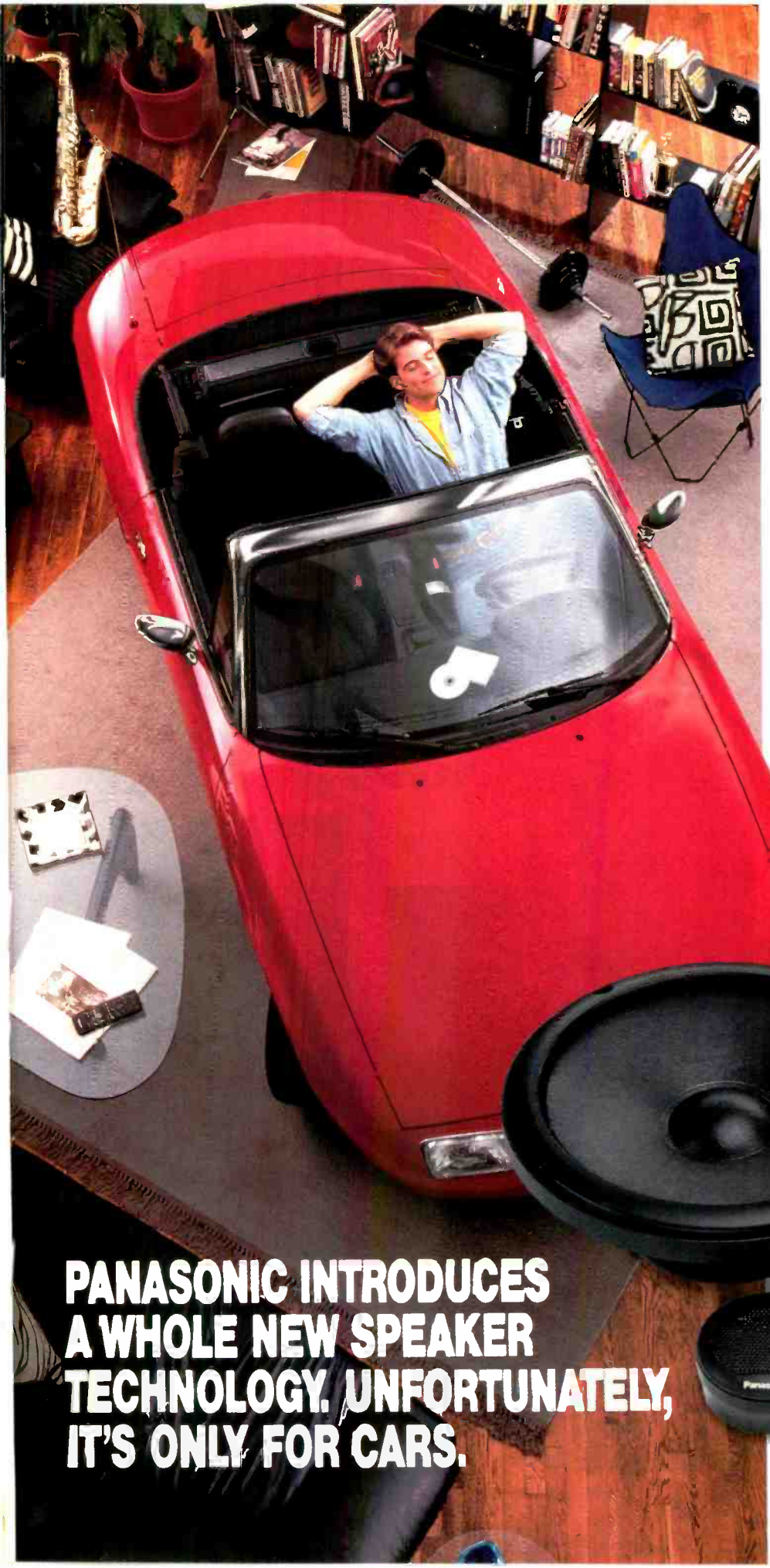
VACUUM TUBE LOGIC STRAIGHT-LINE D/A CONVERTER

Manufacturer's Specifications
Frequency Response: 10 Hz to 20 kHz, ±0 dB.
Converter Type: 20-bit, with eight-times oversampling.
Analog Stage: Four 12AT7A tubes.
Inputs: One coaxial digital, SPDIF type; three 100-kilohm analog bridging inputs optional.
Output Impedance: 100 ohms.
Dimensions: 19 in. W × 2 in. H × 11 in. D (48.3 cm × 5.1 cm × 27.9 cm).
Weight: 12 lbs. (5.4 kg).
Price: $3,000; preamp version with three analog line inputs, $3,500.
Company Address: 4774 Murietta St., Suite 9, Chino, Cal. 91710.
For literature, circle No. 93

My first experience with Vacuum Tube Logic's D/A converters was with their Reference model, a musically superior device using separate 20-bit D/A converter modules for each channel, which costs exactly twice as much as the Straight-Line model I tested. In the Straight-Line, both channels share one 20-bit module, but it's the same type as is used in the Reference. The Straight-Line comes in two flavors, the straight D/A converter I tested and a preamp version having three selectable inputs plus balance and volume controls.

On the converter's front panel are a "Programme/Mute" toggle switch, a red "Muted" LED, a polarity-reversal toggle switch, a green power-on LED, and a toggle power switch. On the rear panel are an IEC power connector, a line fuse, pairs of phono jacks for analog tape and main output, a binding post for a ground wire, and a phono jack for digital





PANASONIC INTRODUCES A WHOLE NEW SPEAKER TECHNOLOGY. UNFORTUNATELY, IT'S ONLY FOR CARS.

Panasonic introduces car speakers so advanced, special materials had to be used to build them.

After it blows the doors off your car, you'll wish it could do the same for your room. It's the new E-Series from Panasonic. They're not just new car speakers, they're a totally new speaker technology.

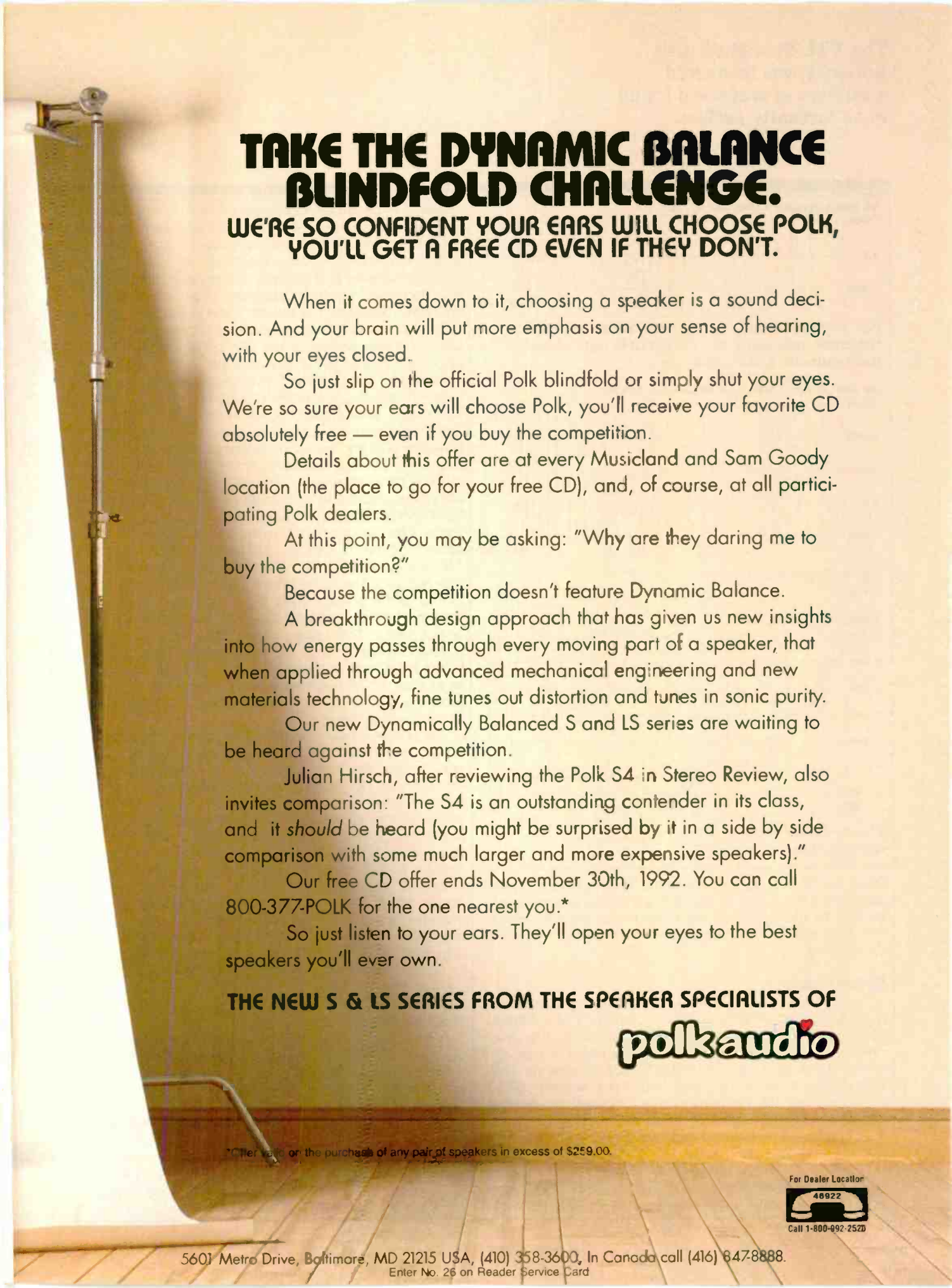
For instance, its woofer system represents a radical departure in speaker design. Usually the outermost portion of a woofer's diameter is unable to create sound. Our new discrete-edge design uses the full diameter of the E-Series woofer to create music. And its acoustically dampened resins reduce harmonic vibrations for stunning sound clarity. And if those specs don't tickle your tweeters, wait 'til you hear its dash-mounted tweeters. They can reproduce up to 25 KHz.

The new Panasonic E-Series. Available in 5¼" (EAB-E55) and 6½" (EAB-E66) component systems, as well as a 6" × 9" 3-way rear deck system (EAB-E99). They're the speakers you would do anything to have in your home. Unfortunately, they're only for your car.

Panasonic®
just slightly ahead of our time.®

Enter No. 22 on Reader Service Card


matthew S Polk



TAKE THE DYNAMIC BALANCE BLINDFOLD CHALLENGE.

WE'RE SO CONFIDENT YOUR EARS WILL CHOOSE POLK, YOU'LL GET A FREE CD EVEN IF THEY DON'T.

When it comes down to it, choosing a speaker is a sound decision. And your brain will put more emphasis on your sense of hearing, with your eyes closed.

So just slip on the official Polk blindfold or simply shut your eyes. We're so sure your ears will choose Polk, you'll receive your favorite CD absolutely free — even if you buy the competition.

Details about this offer are at every Musicland and Sam Goody location (the place to go for your free CD), and, of course, at all participating Polk dealers.

At this point, you may be asking: "Why are they daring me to buy the competition?"

Because the competition doesn't feature Dynamic Balance.

A breakthrough design approach that has given us new insights into how energy passes through every moving part of a speaker, that when applied through advanced mechanical engineering and new materials technology, fine tunes out distortion and tunes in sonic purity.

Our new Dynamically Balanced S and LS series are waiting to be heard against the competition.

Julian Hirsch, after reviewing the Polk S4 in Stereo Review, also invites comparison: "The S4 is an outstanding contender in its class, and it *should* be heard (you might be surprised by it in a side by side comparison with some much larger and more expensive speakers)."

Our free CD offer ends November 30th, 1992. You can call 800-377-POLK for the one nearest you.*

So just listen to your ears. They'll open your eyes to the best speakers you'll ever own.

THE NEW S & LS SERIES FROM THE SPEAKER SPECIALISTS OF

polk audio

*Offer valid on the purchase of any pair of speakers in excess of $259.00.

For Dealer Location
46922
Call 1-800-992-2520

5601 Metro Drive, Baltimore, MD 21215 USA, (410) 358-3600, In Canada call (416) 847-8888.
Enter No. 26 on Reader Service Card

The VTL Straight-Line's linearity was measured a number of ways and found to be virtually perfect.

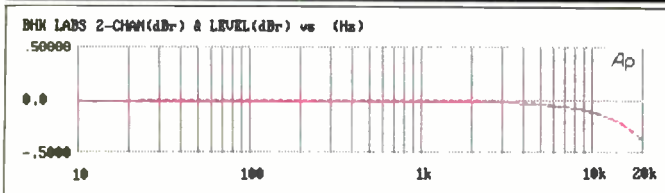


Fig. 1—Frequency response, measured at main outputs. Solid curve is left channel, dash curve is right chann

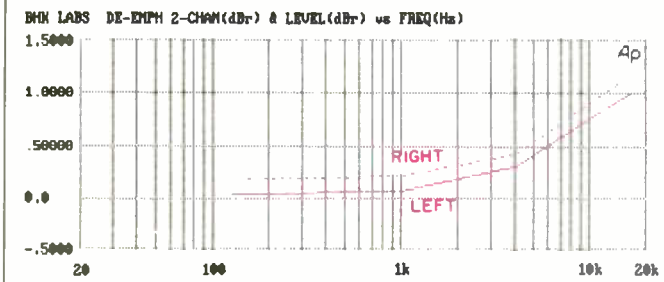


Fig. 2—De-emphasis error.

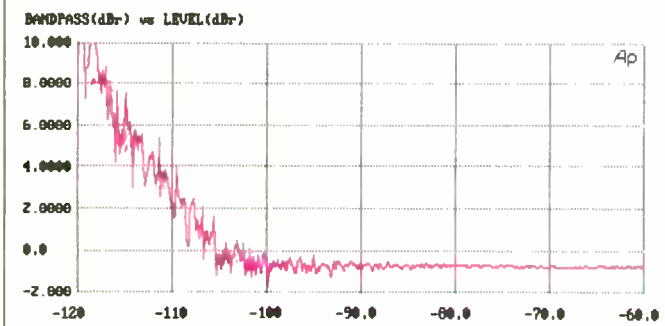


Fig. 3—Fade-to-noise linearity test.

input. All of the signal connectors are high-quality jacks made by VTL. A p.c. board occupies most of the interior, flanked by the largest of the three power transformers on one side and the four horizontally mounted vacuum tubes on the other.

Circuit Highlights

The Straight-Line provides for one digital input, a coaxial type. A signal-conditioning circuit, consisting of a differential line receiver IC, amplifies and squares up the Sony-Philips Digital Interface (SPDIF) input signal and passes it along to the ubiquitous Yamaha YM3623B receiver chip. This device extracts the clock from the composite SPDIF signal and outputs the serial interface signals necessary to drive the following digital filter. The receiver circuitry used here employs a trick or two I've seen before to help reduce jitter in the recovered signals.

Using eight-times oversampling, an NPC SM5813A chip generates a digital Finite Impulse Response (FIR) linear-phase low-pass filter with a sharp cutoff at about 21 kHz to implement the data-reconstruction filter function. The up-sampled serial outputs of this filter are applied to the input of an Ultra Analog multi-bit D/A converter module. These converters are hybrid circuits made up of various surface-mount integrated and discrete components and are generally acclaimed for their accurate measured performance and sonic qualities. The version used in the Straight-Line is custom-made to VTL specifications. These converters are found in other well-regarded D/A converters, usually with prices above that of the Straight-Line.

The audio output of the D/A is passed along to a passive de-emphasis circuit and then into the tube output amplifier. This circuit, although not original in concept, is interesting in that it uses a series-connected, push-pull output stage that provides both low output impedance and the ability to drive a load more or less equally for either signal polarity. The first stage is connected as a common-cathode amplifier with an unbypassed cathode resistor and with both elements of the 12AT7A/6201 dual triode paralleled. Plate output of this first stage is capacitor-coupled to the grid of the second stage's upper tube, half of another 12AT7A/6201. Both halves of this 12AT7A are self-biased, with their own cathode and grid-leak resistors. The upper tube's grid-leak and cathode resistors tie to the bottom tube's plate, with signal output taken from this circuit node and capacitor-coupled to the analog output jacks. The upper tube's plate is also capacitor-coupled to the grid of the lower output tube; the upper tube's plate resistor has a relatively small value, chosen so as to allow just enough signal to be tapped off for the lower tube to work in complement to the upper one, allowing loads to be driven symmetrically.

The power-supply circuitry starts out with three separate power transformers. One is used for the tube output amplifiers. The circuitry here consists of two unregulated capacitor-input and RC-filtered supplies, one for the tube heaters and the other for the high-voltage B+. Both channels are powered from the same high-voltage supply. Another power transformer provides unregulated ±20 V and is regulated down to ±15 V for the analog circuitry in the Ultra Analog module. Main filter capacitors for these supplies are close to 10,000 µF per supply—an amount often used in transistor power amplifiers! The third and final power transformer provides about +9 V to a main digital 5-V regulator. This regulator provides +5 V for the input buffer, the receiver chip, and the digital low-pass filter. Two other +5 V regulators fed from the analog +15 V supply develop +5 V for the Ultra Analog module.

Measurements

Output level from the main outputs at digital full scale was about 1 V per channel. Frequency response is shown in Fig. 1. The frequency response with an IHF load was as shown in the figure except for a level drop of less than 0.1 dB. Output impedance, although not measured, was quite low. Impulse and square waves (not shown) were typical of the NPC SM5813A FIR low-pass filter used in this and other converters; this filter exhibits linear phase characteristics and clips the ringing on full-scale square waves at the full-scale point to leave only those portions of the ringing that point toward the "0" line.

As real as you can get.

If you're tired of flavor-of-the-month preamp pretenders,
maybe it's time to get real about an honest peamp in your music system.
One that doesn t colorize the classics in your music collection,
but lets them speak truthfully and neutraly.
A line preamp that has enough functions to give you practical,
use-it-everyday control over your music system, yet enough inputs and outputs
to be right at home in an audio-video set up.
And – let's not kid around – a high-end preamp that won't vaporize your bank account

Meet the new LS3 line-level preamplifier from Audio Research.
An all-new circuit design with optional balanced outputs. Honest, faithful reproduction.
Sparkling dynamics. And the reputation and lasting value that has been the
hallmark of this American manufacturer for over twenty years.

So, listen to the new LS3. It's about as real as you can get.

audio research
HIGH DEFINITION

5740 Green Circle Drive / Minnetonka, Minnesota 55343-4424 / Phone: 612-939-0600 FAX: 612-939-0604

Enter No. 4 on Reader Service Card

I've heard D/A converters with a bit more space or resolution, but not with the overall musical satisfaction I get from this VTL.

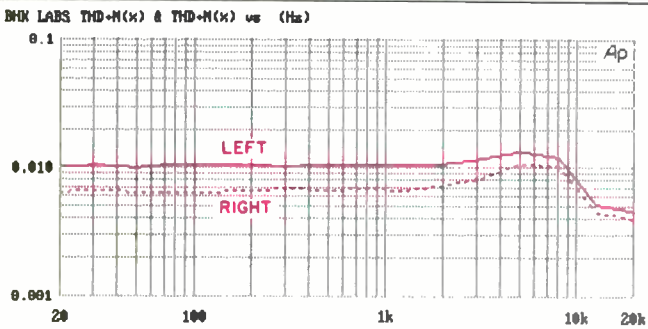


Fig. 4—THD + N vs. frequency at 0-dB (maximum) recorded level. Readings above 10 kHz are attenuated by the 22-kHz low-pass filter used in this test.

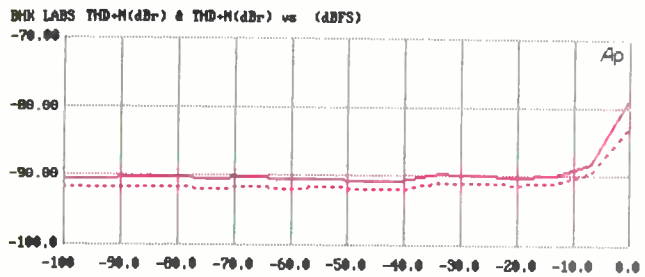


Fig. 5—THD + N vs. recorded level at 1 kHz (−90 dB = 0.003%).

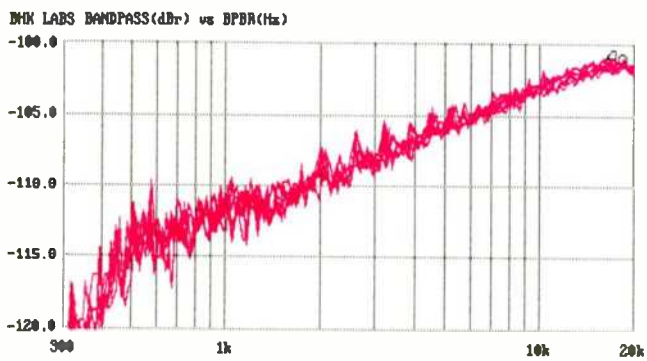


Fig. 6—Quantization spectrum vs. recorded level; see text.

Output from the tape jacks was somewhat lower, about 700 mV, with a quite high output impedance of nearly 20 kilohms. Surprisingly, frequency response into the IHF load was about the same as shown in Fig. 1, though it should have shown more roll-off due to the low-pass filter formed by the IHF load's 1,000 pF of capacitance against the equivalent resistance of the output impedance and the load. I suspect that the tape output jacks in this sample may have been wired to the wrong part of the circuit. Frequency response at the main outputs with de-emphasis correction switched in is plotted in Fig. 2.

Linearity was measured a number of ways and found to be virtually perfect. Deviation from linearity, using the CBS test disc, is shown in Fig. 3 for the left channel. The plot for the right channel looked just the same except for a little less noise below −100 dB. Distortion as a function of frequency at digital full scale is shown for both channels in Fig. 4. A 22-kHz low-pass filter is used in this test to get the maximum resolution in the audio range. In this unit, the dominant distortion was second harmonic, due to the tube output amplifiers; this causes the curves to show reduced distortion above 10 kHz, because the low-pass measuring filter starts to attenuate the second harmonics of frequencies above this point. Distortion at 1 kHz as a function of digital level is depicted in Fig. 5. Actual distortion decreases quite rapidly into the noise.

Moving along into the area of noise levels, S/N in various bandwidths relative to digital full scale, along with measurements for dynamic range and quantization noise, are listed in Table I. The signal-to-noise ratios are done with the Audio Precision digital generator's signal switched off. The results substantially agree with those derived from the quiet track on the CBS test disc. The dynamic range test measures the A-weighted THD + N of a 1-kHz signal at −60 dB. This low signal level is used so that, presumably, distortion in the output amplifier of a CD player or D/A converter won't contribute to the reading. The quantization noise test attempts to measure extra noise generated by the workings of the D/A converter. This test uses a full-scale low-frequency signal, such as 20 Hz, the output from which is passed through a 400-Hz high-pass filter (to eliminate the 20-Hz signal and its harmonics) and a 22-kHz low-pass filter (to eliminate noise above the audio passband), leaving only system noise above 400 Hz. As can be seen from the Table, this is higher than the noise between 400 Hz and 22 kHz with no signal present—as is always the case.

Figure 6 shows a new test for checking the spectral content of quantization noise as a function of signal level, devised by Richard Cabot of Audio Precision. This test, like the simpler quantization noise test, uses a 400-Hz high-pass filter and a low modulating frequency of 41 Hz, but with much lower signal level. Low-frequency levels of −60 to −100 dB relative to digital full scale were used in 10-dB steps. The analyzer sweeps its third-octave filter over a range from 300 Hz to 20 kHz and thus displays the spectral content of the quantization noise at the instantaneous modulation level of the 41-Hz signal. Results for each signal level are overlaid on a common graph, as shown. If the spectral content of the noise is constant with signal level, which is desired, the curves will be coincident. This is more or less the case for the VTL Straight-Line. The rise of approximately 3 dB per octave with increasing frequency is caused by the fact that this is white noise, with constant energy in a given bandwidth, whereas the third-octave measuring filter's constant-percentage bandwidth, more appropriate for use with pink noise, makes it see more energy in the third-octave from, say, 3,150 to 4,000 Hz than in the third-octave from 315 to 400 Hz. When this is the case, the measured energy rises at 3 dB per octave.

Form Function Flexibility

MICRO II from Infinity. It's the soul of a home theater surround sound system—a high-tech, high performance, compact replacement for your old speakers *and* the ideal speaker system for your balcony, bedroom or patio.

The MICRO II 2-way satellites mate to the subwoofer to reproduce the musical spectrum with lifelike musicality. Broadly dispersed, clean musical patterns are produced by the satellites for superb sound imaging. Harmonically true bass dynamics are developed by a pair of subwoofer drivers in a specially tuned enclosure with curved exit port.

Magnetic shielding lets you place the satellites near your TV without causing color distortion. Or, using the versatile installation brackets, you can mount the satellites to walls, ceiling or entertainment cabinetry—angling or pivoting them for both optimum placement and sonic performance.

Experience the *only* 3-piece system that can satisfy your musical and lifestyle requirements for form, function and flexibility.

Call **(800) 765-5556** for the Infinity dealer nearest you. In Canada, call (416) 294-4833, H. Roy Gray, Ltd.

Infinity

We get back to what it's all about. Music.

Space and dimension were astonishing, tonal balance was realistic, and there was often a palpable presence of musicians in the room.

Table I—S/N ratios, referenced to 0-dB recorded level. Quantization noise was −94.2 dB in the left channel, −95 dB in the right channel. Dynamic range was 98.3 dB in the left channel and 102 dB in the right.

	S/N, dB	
Bandwidth	LEFT	RIGHT
Wideband	78.5	69.3
22 Hz to 22 kHz	93.0	96.0
400 Hz to 22 kHz	97.6	99.3
A-Weighted	99.2	100.5

My final test (not shown) was a third-octave sweep over a wide frequency range, with a 1-kHz signal at −80 dB. Some a.c. line harmonics were visible, and more significant, there was low out-of-band noise above 20 kHz.

Use and Listening Tests

Ancilliary equipment used to evaluate the sound of the Straight-Line converter included First Sound Reference II and Quicksilver preamps to drive several amps, including Quicksilver M-135 prototype mono tube units, a Crown Macro Reference, a prototype digital switching design, and a pair of Carver Silver Sevens. Krell Digital MD-1 and Wadia Digital WS-3200 CD transports fed the SPDIF signal into the D/A converter. Win Research SM-10 monitors and Spica Angelus speakers were used.

I had been using the VTL Reference D/A converter before receiving the Straight-Line unit. I was amazed at how much the Straight-Line sounded like the more expensive converter. I have listened to a number of D/A converters while I have had the VTL units, and while some of them might have had a bit more space or resolution, this was usually accompanied by more irritation. For overall musical satisfaction, I would quickly return to the VTL units. The overall level of sound quality and realism I got using CDs on my system was very, very good. With the Wadia transport feeding the Straight-Line D/A, and using the First Sound Reference II passive preamp feeding the tube amplifiers, I was continually amazed at the level of reproduction attained. Space and dimension were astonishing, and more importantly, tonal balance was realistic. With many pieces of music, the presence of the musicians in the room was palpable.

In conclusion, I think the VTL Straight-Line is a very musical and listenable D/A converter and I really appreciate what it does for digital reproduction in my music system. The only nit I have to pick is that I wish the output level was more like 2 or 3 V instead of 1 V. I strongly recommend that those looking for an external D/A converter in the Straight-Line's price range and who have similar listening priorities to mine go give this VTL a listen. *Bascom H. King*

Fourth in a series

THE COMPONENTS OF EXCELLENCE: PERSONALIZED SERVICE.

The right time to think about service is before the sale.

Made in the USA

For more than 40 years, McIntosh has designed every piece of its superb high fidelity equipment as though it would be used indefinitely. In fact, tales of McIntosh components that still meet their original specifications after 20 or 30 years of faithful service are legion.

With equipment built to McIntosh standards, service means far more than just fixing something that is broken. To McIntosh and to its dealers, service means professional-grade audio system design and installation, founded on years of hands-on experience and extensive product knowledge.

To McIntosh, service is highly personal—real people answering real questions and offering forthright assistance when help is needed. In a time when most things are intended to be used-up and thrown away, McIntosh offers its customers the comfort of knowing that McIntosh intends for its equipment to provide outstanding performance for as long as it is owned

McIntosh®
Components of Excellence

McIntosh Laboratory Inc., 2 Chambers St., Binghamton, NY, USA 13903-2699 (607) 723-3512

THE DIFFERENCE

In any endeavor there are individuals and companies that come to exemplify the spirit of an idea and a time. These are the people and organizations that have made a difference in history, science, and music.

In high-fidelity, Acoustic Research is one of these companies. The seminal work of this company has actually formed the cornerstone of an industry, as much from a business standpoint as a technological one.

AR's approach to developing products has brought the world the acoustic suspension loudspeaker, dome high frequency and midrange drivers, the three-point suspended subchassis turntable and liquid cooled drivers. Each of these has become an industry standard because each bettered musical reproduction in a tangible, practical way. These successes come directly from two principles: First, the products must set a standard not previously achieved, or they must perform far beyond similarly priced competitors. And, second, no matter how advanced the technology may be, music is always the essential purpose and ultimate measure.

CLASSIC

The AR Classic loudspeakers are the first products to come from a new AR engineering team. Their research encompassed acoustics, physics and pure mathematics. They listened and measured – in labs, in sound rooms and in their own homes. The remarkable loudspeakers that they designed are classic AR products in every sense of musical performance and honest value.

For middle and high frequencies, the AR Classics employ a Symmetrical Radiation Array (SRA) that acts as a virtual point source. The SRA is made

AR CLASSIC LOUDSPEAKERS

up of an all-new soft cloth dome tweeter, flanked above and below by die-cast mid-bass drivers. A sophisticated third-order crossover network, derived by extensive computer modeling, seamlessly integrates the SRA module with acoustic suspension woofers optimized for bass reach and dynamic definition.

With the AR Classic Series you will find a difference. They don't cast their own shadow over the music. Timbre, musical texture and air are intact. The image has height, width and depth. Dynamics appear to be limitless.

Listening will tell you far more than reading can. When you are considering and evaluating loudspeakers, bring along music you care about. Ask your dealer to play the AR Classics and hear the difference between the ordinary and the classic.

THE AR CLASSIC 26

Tapered cabinets minimize frontal area and diffraction

SRA, Symmetrical Radiation Array, provides a virtual point source

Acoustic suspension woofers are placed to control room interaction

All the Classics have bi-wiring capability

AR

Acoustic Research
330 Turnpike Street
Canton MA 02021
1 800 969 AR4U (2748)

GRADO LABS SR200 & JOSEPH GRADO SIGNATURE HP-2 EARPHONES AND HP-1ADC EARPHONE AMP

Company Addresses: SR200: Grado Laboratories, 4614 Seventh Ave., Brooklyn, N.Y. 11220; HP-1ADC and HP-2: Joseph Grado Signature Products, 921 Tice Pl., Westfield, N.J. 07090.

For literature, circle No. 94

A good pair of earphones can provide as much pleasure as a good pair of speakers. Earphones cannot ordinarily reproduce the deepest bass notes, and they cannot reproduce as natural a soundstage from ordinary stereo recordings as speakers do; however, they are free of room effects and placement problems, and they minimize any interference from external noise. They also offer portability and the ability to listen without worrying about sound levels and the neighbors.

Unfortunately, many audiophiles never really enjoy earphones or explore their potential. They treat them as Walkman extensions, paying little attention to the fact that poor or mediocre earphones are a recipe for quick listening fatigue. Worse, they use second-rate earphones to monitor recordings or do serious listening, then compound the problem by using equally second-rate amplifying circuits.

The recent renaissance in earphone design and technology may change this situation. Companies like Stax and Sennheiser have refined their products; Koss has brought back its electrostatic in an improved version; Krell has its first earphone amplifier, and Joe Grado—a long-established leader in the cartridge business—has introduced not one but two new *lines* of high-end earphones.

Grado has created not only two lines of earphones but an earphone amplifier and cables designed to do them justice. Under his Grado Laboratories brand, he offers three Prestige Series earphones, from $150 to $275, with the SR200, reviewed here, making up the middle at $200. The three models of his Grado Signature line range in price from $395 to $595; the $495 HP-2, also reviewed here, is again the middle model but differs from the top-of-the-line HP-1 only in its lack of a switch for polarity reversal. (All three models in the Signature line carry the designation "HP 1000" on their cases.)

The Grado Signature system also includes special interconnect cables ($195 for a 1-meter pair and $275 for a 2-meter pair) and an earphone amplifier, the HP-1ADC. The hand-built amplifier was designed by Sid Smith of Marantz fame and sells for $795. It can run on batteries, or an a.c. power supply is available for an additional $125.

All of the Grado earphones are dynamic designs that represent years of experimentation with new magnets and materials. All are the result of a long series of experiments with different cable and wire designs. All are "open" phones that allow some outside sound to be heard, and all rest lightly on the head and ears, rather than clamp on. Somewhat surprisingly given the price differences between them, all have a hand-machined look that gives them a definite "high-end" appearance. This kind of styling and manufacturing quality may not affect the sound, but it gives the Grado line an added touch of distinction.

These similarities go beyond design and appearance. The Grado Laboratories $200 model and the Grado Signature $495 model have the same general sound character. The SR200, though just $50 above Grado's least expensive unit, still gives you exceptional bass, a rich and detailed midrange, and upper octaves that are smooth but have just a touch of punch.

This combination of bass power and midrange gives the Grado SR200 a much more musical sound than many competing earphones. No earphone can deliver the kind of deep bass and bass power that comes with the best full-range speakers, but the SR200 delivers a far more solid rhythm line than most earphones. It also has enough bass power to be fully convincing with organ music and bass strings—something far too many high-priced designs can't deliver. If you have rejected other earphones because of missing lower octave power and detail, you will definitely be impressed by the Grados.

aragon amplifiers

the beast within the beauty

Each 4004 MKII contains two separate monoblock amplifiers enclosed in a single chassis. This beast produces 200 watts into 8 ohms, 400 watts into 4 ohms from each monoblock, and continues increasing power into lower impedances. The new 4004 MKII has advanced discrete high bias class A gain stages with auto bias control. From the epoxy sealed military grade resistors to the beta matched output transistors, the quality of the components in an Aragon are found only in the world's costliest electronics.

All this is then housed in a timeless sculpture of steel and aluminum, whose beauty has been exhibited in some of the nation's most prestigious museums. But the beauty is not just skin deep, the Aragons are there to exhibit the subtle musical differences between Stradavari, Guarneri and Amati violins.

Experience the beast within the beauty. Made in America and internationally acclaimed as the finest quality and value attainable.

MONDIAL DESIGNS LIMITED

2 Elm Street, Ardsley, New York 10502 • 914-693-8003

Enter No. 18 on Reader Service Card

Exceptional bass power, plus rich and detailed midrange, give the SR200s a very musical sound.

The greatest strength of the SR200, however, is the midrange. Far too many earphones have a dry middle that lacks lower midrange power. As a result, they accentuate the upper midrange and treble. This sometimes seems to add detail, but only by exaggerating one part of the frequency spectrum. The resulting lack of lower midrange energy not only is fatiguing but deprives music of a great deal of its romance or emotional impact.

The SR200s do not, however, lose midrange detail. They provide excellent reproduction of musical harmonics and low-level information. Compared to most earphones in their price range, the SR200s do an excellent job of reproducing difficult piano passages, complex drum sets, massed strings and woodwinds, organ voices, and choral music. Many earphones seem to omit midrange detail; the Grados almost enhance it.

The top octaves of the SR200 are very good, but electrostatic fans are probably going to prefer the flatter and more extended response of the best electrostatics. The SR200 also slightly exaggerates transients in the upper midrange. Rock fans may well prefer this kind of punch, but it reduces the sweetness and air of classical music, particularly violin, as well as instrumental solos—and especially with acoustic guitar.

As for soundstage detail, the SR200s do a very good job of reproducing the ambient sound that helps make performances more realistic. Like all earphones, however, the SR200s create a left/right split in the stereo image unless they are reproducing a binaural recording. Similarly, the SR200s do not reproduce the illusion of depth or place instruments accurately in the center of the soundstage.

Dynamic contrasts are a different story. Many earphones seem to limit dynamic contrasts sharply. All music seems to occur at one volume, and the earphone seems to be most comfortable with a single signal level. The SR200s are much more like good loudspeakers. They have an excellent dynamic range, treat low passages realistically, and have no trouble handling sudden loud passages or transients. Equally important, they are as good in dealing with a full symphony or rock group in full flight as with solo instruments and small groups.

Given this praise for the SR200, what do you get for another $295 with the Grado HP-2, aside from the personal attention of Joe Grado? The answer will depend almost solely on how demanding you are. The HP-2 provides more detail and musical information in every octave and does not have the upper midrange punch of the SR200. You do, however, get the kind of limited refinement that is of interest largely to professionals or ultra high-end audiophiles. Unless you are really seeking

"There is an inherent quality of ruggedness, reliability, and sonic integrity that has always impressed me favorably when I have had the opportunity to test and listen to Soundcraftsmen products."

Leonard Feldman, **Audio**

SOUNDCRAFTSMEN UTILIZES ITS LEGENDARY CRAFTSMANSHIP AND RELIABILITY TO PRODUCE THE FINEST LINE OF AUDIO ELECTRONICS AVAILABLE.

MADE IN THE USA AND CRAFTED TO EXACTING TOLERANCES, SOUNDCRAFTSMEN ELECTRONICS ARE AMERICAN INGENUITY AT ITS HIGHEST LEVEL.

MODELS SHOWN ARE THE A400, P100, AND T100

MTX SOUNDCRAFTSMEN
Technical Assistance: 2200 S Ritchey, Santa Ana, Ca 92705,
Phone 714-556-6191
Sales Support: 555 W Lamm Rd, Freeport, IL 61032,
Phone 815-232-2000

Quote reprinted with permission from Hachette Magazine, 1989

Enter No. 19 on Reader Service Card

The HP-1ADC earphone amp frees the music, opening up every aspect of musical performance.

the best and are an extremely demanding listener using equally demanding signal sources, you will quickly find you have passed the point of diminishing returns.

Your associated electronics and cables also become extremely important in judging the merits of the HP-2 versus the SR200. Quite frankly, I was a bit stunned at just how much difference the HP-1ADC earphone amplifier made in improving the sound. I had long been aware that most earphone amps in mid-fi audio equipment were little more than afterthoughts, but the HP-2 made it clear that they veil and harden the sound, and compress musical dynamics and contrasts to an amazing degree. In contrast, the HP-1ADC amplifier literally frees the music. It opens up every aspect of musical performance and has convinced me that no one who is monitoring recordings or seeking true high fidelity from earphones should use a standard earphone amp if they can possibly avoid it.

In short, earphones really do need to be thought of as a system where the electronics are as important as the 'phones. This is why you may well find the differences between the SR200 and HP-2 important only if you are using a top-grade earphone amplifier like the HP-1ADC or exceptional earphone circuitry. It is also why I believe you will find the HP-1ADC to be worth its high cost if you are seeking anything approaching high-end sound and cannot use loudspeakers. Certainly, no portable CD player or DAT unit I could find came close to being able to drive high-quality dynamic earphones with anything like the sound quality of the HP-1ADC amp.

The benefits of the Grado Signature interconnects are more problematic. The Grado interconnects are excellent, but at their price they are strictly for perfectionists. I would listen very carefully, and on a comparative basis, before I gilded the lily with interconnects at this price. I would rather, for example, use the money to buy the HP-2 than buy the SR200 with the top-of-the-line interconnects.

Finally, this advice about careful auditioning is of equal importance when it comes to the question of how the Grado system compares to alternative high-end systems like those sold by such companies as Koss, Sennheisser, Sony, and Stax. High-end earphone systems need to be auditioned just as carefully as speakers, and the bass and midrange balance of the Grados are different from those of virtually all the competition. I would certainly want to hear a pair of high-quality electrostatics shortly before I made up my mind, but I believe you will find the sheer musicality of the Grados to be extremely seductive—particularly if they are played through electronics of the quality of the HP-1ADC.

Anthony H. Cordesman

Existing Speaker Technology Wasn't Good Enough.

Redefining speaker design was the job at hand for Camber.

That's the concept behind the Ti Series, the Laser Series, and the SC Series by Camber. Long respected for many industry firsts, Camber set out to create a line of loudspeakers that would offer unprecedented performance at affordable prices. To achieve this goal, Camber relied heavily on technology acquired through years of research at Canada's famous National Research Council and upon experience gained designing and building Studio Monitors for the Canadian Broadcasting Corporation.

CONSUMER ELECTRONICS SHOWS INNOVATIONS '92 DESIGN & ENGINEERING AWARD

1991 CRITIC'S CHOICE

- **One of the most innovative consumer electronics products of 1992, the Camber 3.5 ti was selected for The 1992 International Summer Consumer Electronics Show's *Innovations '92 Award.***
- **Critic's Choice Award from *Sound & Vision Magazine* in recognition of the Camber 1.0 ti, Camber Laser 7 as well as the Camber 3.5 ti for Technical Excellence and Exceptional Value.**
- **The Canadian Broadcasting Corporation selected the Camber 3.5 ti as its official Studio Monitor for use in its studios around the world.**
- ***Canadian Consumers Magazine* rated Camber 1.0 ti Best Buy in the under $500 per pair category.**

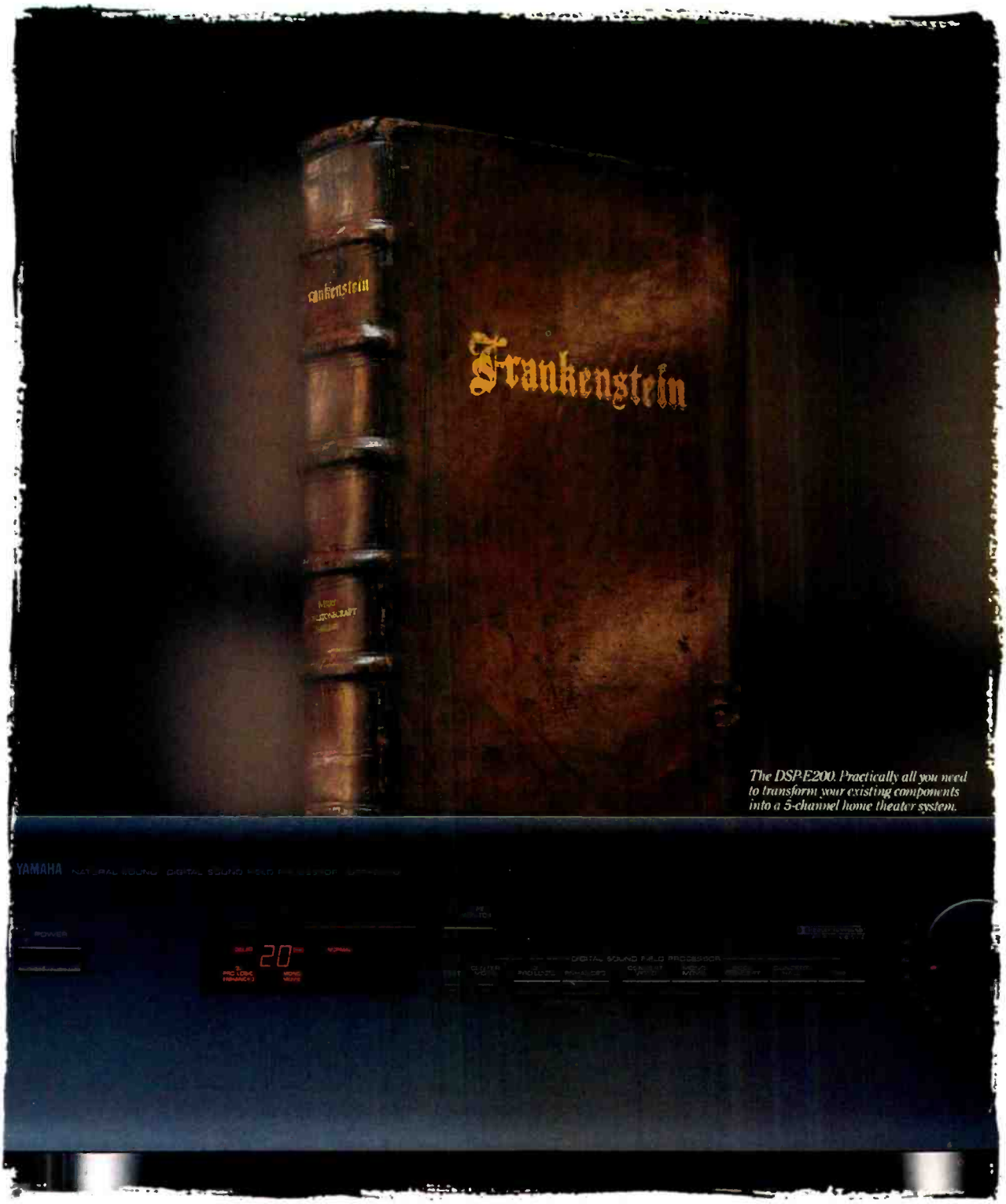
For more information please wrirte to Camber at :

CAMBER Canada 5700 Griffith Street, #306, Montreal, P.Q. H4T 1A7 (514) 738-3225 • (514) 738-5797 FAX
CAMBER USA, 244-20 88th Avenue, Bellrose, NY 11426 (718) 343-3231 • (718) 343-3231 FAX

CAMBER

Enter No. 25 on Reader Service Card

Once again, science has old parts and bring



The DSP-E200. Practically all you need to transform your existing components into a 5-channel home theater system.

created a way to take them back to life.

INTRODUCING HOME THEATER COMPONENTS DESIGNED TO BREATHE NEW LIFE INTO THE EQUIPMENT YOU ALREADY HAVE.

A good story has always been a great form of entertainment. It still is. Only now the best stories of our time come in a slightly different format.

Namely video tapes and laser-discs. Movies that come to life right before your very eyes. With soundtracks every bit as riveting as the pictures themselves.

Assuming, of course, you have the equipment that can play them.

Which is precisely where Yamaha enters the picture.

Thanks to a team of dedicated Yamaha engineers, you won't have to wait for some kind of manna from heaven to save your old components from an early grave.

Almost any TV in the house is fine, although you'll get maximum effect out of a 25" screen or larger.

If you're starting from scratch, you owe it to yourself to consider the RX-V660. It's the newest member in Yamaha's renowned line of 5-channel audio/video receivers.

The DPS-E1000. A 5-channel audio/video amplifier that can literally bring down the house. Add it to your existing system to create a 7-channel home theater that can push DSP, Dolby Pro Logic and Cinema DSP to the limit.

Our engineers started with parts a lot of people already have—a good color TV, a Hi-Fi VCR, maybe even a receiver and speakers—and created a fairly miraculous way of bringing them back to life.

Which leads us to one of our more exciting new products. A specifically designed three-channel amplifier. The DSP-E200. A remarkable new amplifier that plugs into your existing amplifier/receiver and can give you the same sound placement, depth and intensity, that until recently, one could only find in the finest movie theaters.

CINEMA DSP

What makes this overwhelming experience possible is something Yamaha calls Cinema DSP. A unique Yamaha development that actually combines Digital Sound Field Processing (a technology Yamaha invented) with Dolby Pro Logic†

What's so great about that?

Digital Sound Field Processing (DSP) recreates the acoustic properties of an actual movie theater in the relatively cramped quarters of your living room. While Dolby Pro Logic places sound effects and dialogue around the room just how the director originally intended.

Cinema DSP combines the best of both technologies. Simply stated it's the part of the system that creates a spacious movie theater experience in the confines of your living room.

Yamaha's NS-A102 rear effects speakers and a Yamaha center channel speaker. All you need to add to your existing main speakers.

There you have it. An exceptionally simple approach to home theater.

Which when you think about it, proves a couple things.

You don't have to spend a fortune to experience the latest trend in home entertainment.

You just need to breathe a little life into the equipment you already have.

YAMAHA®

Yamaha Electronics Corporation, USA
P.O. Box 6660, Buena Park, CA 90622

KOSS ESP/950 EARPHONES

Transducer Design: Electrostatic.
Coupling to the Ear: Circumaural.
Equalization: Diffuse field.
Sensitivity: 104 dB SPL at 100 mV (see text).
Maximum Output: 123 dB SPL.
Impedance: 100 kilohms.
Absolute Polarity: Positive.
Cord: 4 feet long from both earcups, with 5¾-foot extension cord.
Weight: 'Phones, 10 oz. (0.283 kg); energizer box, 17½ oz. (0.496 kg); battery box, 12 oz. (0.340 kg) with six C cells.
Price: $2,000.
Company Address: 4129 North Port Washington Ave., Milwaukee, Wisc. 53212.
For literature, circle No. 95

Koss has specialized in producing earphones for a long time. They introduced the SP/3 dynamic earphones to the consumer market in 1958. There were other earphones available at the time, but they were never considered competition to loudspeakers for serious music listening. Koss developed the SP/3 to be sold with a portable record player. That combination product might have been ahead of its time and didn't take off, but when marketed separately, the SP/3 earphones were an immediate success. It could thus be said that Koss created the consumer market for earphones in America. Koss was also the first American company to make an electrostatic earphone as a consumer product back in the 1960s; I still have a pair of ESP/9s. Although I didn't weigh them, they are much heavier than the 10-ounce ESP/950 earphones. I hear that Koss has used the ESP/950s in setting balance and level for classical recordings that the company has produced with the Milwaukee Symphony and other groups.

The ESP/950 might be considered an earphone system rather than just a pair of earphones. They come in an 11½ × 7 × 8 inch leatherette carry case with compartment dividers. These dividers are held in place against the plush lining by hook-and-loop fasteners so that the compartments can be rearranged. I did take advantage of this to make a portable listening system by adjusting the dividers to accommodate a portable CD player. The lid of the case has a double zipper, and there are additional zippered compartments on each end that I used to store CDs. The earcup yokes snap onto the headband, and they are easy to remove for storage in the case. The front and rear of each black earcup has a gray "L" or "R" for the left and right channels; it is somewhat difficult to see the markings in dim light. For the portable system, I used the battery box, which weighs 12 ounces with the six C batteries. It supplies about 320 mA at 9 V d.c. for normal listening levels.

The 17½-ounce energizer box that supplies the audio signal to the Koss ESP/950s is 4¼ inches wide × 2⅝

EARPHONE EVALUATION

PARAMETER	RATING	COMMENTS
Overall Sound	Excellent	"Great sound" and "Natural"
Bass	Excellent	"Realistic" and "Clean and tight"
Midrange	Excellent	"Very articulate" and "Natural"
Treble	Excellent	"Smooth and extended"
Overall Isolation	Poor	"Outside sounds easily heard"
Bass	Poor	"No bass isolation"
Midrange	Poor	"Easy to carry on conversations"
Treble	Fair	"Highs are reduced"
Comfort	Excellent	"Surrounds outer ear completely"
Value	Good	"Expensive but worth it"

GENERAL COMMENTS: Very clear and natural sound; transparent mid and treble; realistic bass; very comfortable for long-term listening; very similar to reference earphones.

Command Performance.

Introducing the new Adcom GTP-500 II Tuner/Preamplifier.

Only a few years ago, Adcom announced the dawn of a new era by introducing its GTP-500 tuner/preamplifier. Together with any of Adcom's critically acclaimed power amplifiers, this unique audio product has given thousands of cost-minded, serious music lovers a quality alternative far superior to the common receiver. The new, evolutionary GTP-500 II offers a meaningful expansion of convenient features and sonic performance.

Full Command Of Your Music System

Control your system's power on/off, select pre-programmed FM and AM stations, scan the FM dial, adjust volume level and select different sources... all with Adcom's wireless remote controller. With optional Adcom remote sensors and additional loudspeakers, you can also enjoy your Adcom music system in other rooms throughout your home.

For total music system integration, the GTP-500 II remote sensors will also receive and retransmit commands to a majority of remotely controlled components, regardless of brand. This remarkable design gives you full command of your entire music system throughout your home and offers the ultimate flexibility of integrating the remote features of components manufactured by others.

Value Measured By Performance

The overall performance of the new GTP-500 II is demonstrably superior through its evolutionary design and the use of state-of-the-art component parts.

Adcom's unique, low-impedance RIAA compensation provides lower noise and distortion in the phono input stage. To further reduce noise and distortion in all stages, all switching devices are buffered.

Long term adherence to circuit design objectives is accomplished by utilizing 1% Roederstein resistors in all critical applications as well as a new low-loss, printed circuit board.

Through a careful balance of sensitivity and selectivity, the GTP-500 II optimizes FM performance whether you're in an urban or rural area. Design parameters, including an improved IF stage, have been optimized to translate into lower distortion. In fact, the quality of FM stereo reproduction through the GTP-500 II is as good as the broadcast itself.

More Sound, Less Money

Adcom stereo components have established a reputation for sounding superior to components costing two and three times as much. The new GTP-500 II promises to keep faith with this tradition of more sound for less money.

Its ability to command your entire music system by remote control, and its exceptional sonic performance are why so many experts consider the GTP-500 II to be Adcom's command performance.

ADCOM®
details you can hear

11 Elkins Road, East Brunswick, NJ 08816 U.S.A. (201) 390-1130 Distributed in Canada by PRO ACOUSTICS INC. Pointe Claire, Quebec H9R 4X5

The listening panel gave the Koss ESP/950 'phones excellent ratings for both sound quality and physical attributes.

inches high × 6¼ inches deep. With the battery box plugged into the back, and the audio input and the earphone cord plugged into the front, I was still able to place the energizer box in the case and close the soft top lid. I placed the energizer box vertically so that its volume control was easy to reach. This control has two concentric knobs allowing the left- and right-channel levels to be adjusted independently; a slight friction between the controls causes them to rotate together. The front panel also has a stereo mini 'phone jack for the audio input, a special five-pin socket for the earphone plug, a power switch, and an LED indicator that changes from green to red when the batteries are low. The rear of the box has the power input jack and left and right input phono jacks.

The Koss ESP/950 earphones have a 4-foot cord attached, but the system includes a 5-foot, 9-inch extension cord. Also included are three stereo patch cords with gold plugs for phono to phono, phono to mini, and mini to mini connections.

The ESP/950s have a spring steel headband, covered by a foam-filled leatherette cushion, terminated at each end by plastic retainers. The yokes can be unlocked from the headband, allowing the earcups to be installed or removed with ease. Plastic pins molded into yokes allow the earcups to swing about 30°, while some play in the steel clips allows the earcups to swivel slightly so they will fit properly against the head.

The foam-filled leatherette ear cushions are removable for cleaning or replacement. They encircle the entire outer ear; this, combined with the relatively low headband tension, make the ESP/950s very comfortable to wear for long listening sessions.

The Koss ESP/950 earphones are the "open" type, i.e., without a seal behind the transducer diaphragm. The seal between the head and the front of the diaphragm is reasonably good, so there is very good output down to the lowest bass. When I pulled the ESP/950s away from my ears, while listening to pink noise, the sound changed dramatically. The pitch of the noise in the bass range seemed to sweep upward as I moved the 'phones away from my ears. If you try this with the ESP/950s, be careful to keep your hands away from the rear of the earcups because this will also affect the sound quality. Placing the flat of your hands even as much as 6 inches from the earcups dramatically changes the sound of pink noise. Also, if you listen while in bed or on a deep-backed chair, expect some change in the sound. The lack of a seal behind the earphones allows outside sounds to be heard quite easily, especially in the low-frequency range.

The subjective sound qualities of the Koss ESP/950 earphones were rated by members of a listening panel. I asked them to compare the sound of the Koss ESP/950 earphones with the sound of the Stax SR-Lambda Pro earspeakers. They rated the ESP/950s while listening to a variety of program material and also wrote comments about the sound. I compared their ratings and comments with measurements I made.

My measurements showed that the bass level and extension were definitely affected by the quality of the seal between the earphones and the head. With a good seal, the bass was very extended, with good output even at 20 Hz. The panel members rated the bass sound of the ESP/950s as excellent and made comments such as "realistic," "clean and tight," and "excellent deep bass." Comments about the midrange included "very articulate," "natural," and "good presence." These comments correlate well with the smooth midrange response I measured. The comments about the treble range, such as "smooth and extended" and "open and clear," also confirmed my measurements. The ESP/950's high-frequency response was just as extended as the Stax's.

The Koss ESP/950 earphones are designed to have a diffuse-field response, although there is still no agreement between manufacturers as to the exact shape of a diffuse-field equalization curve. The shape of the 500-Hz square wave was excellent, with only a slight amount of "ringing," and was very similar to that of the Stax earphones.

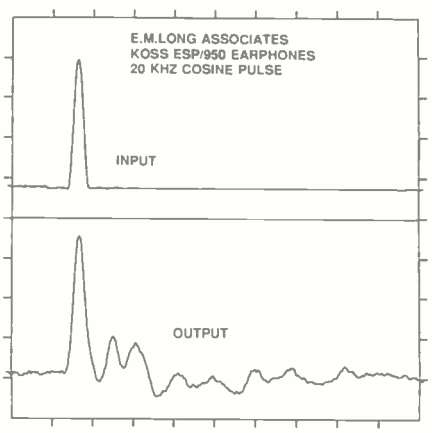
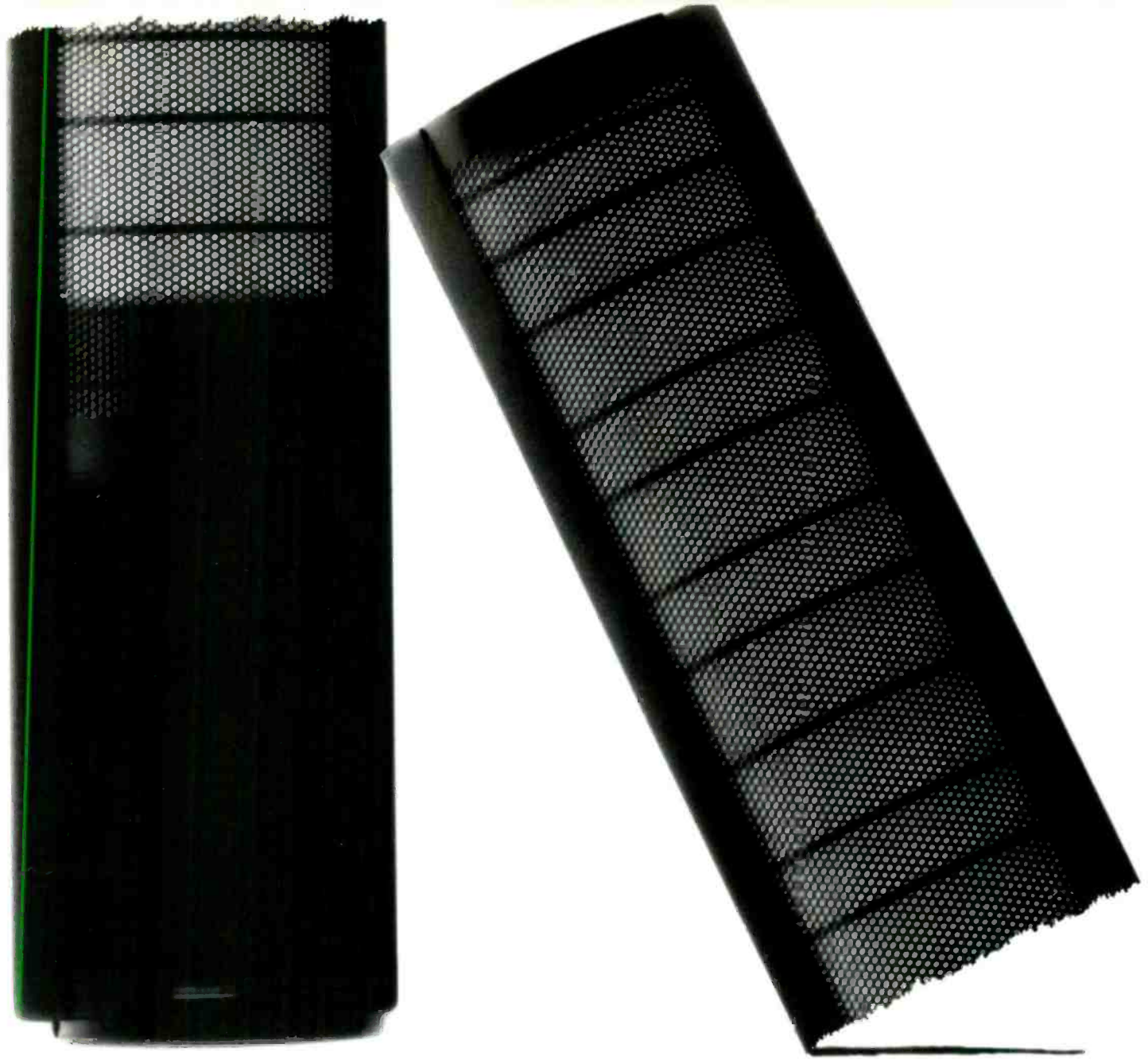


Fig. 1—20-kHz cosine-pulse test.

Figure 1 shows the output of the Koss ESP/950 earphones for a 20-kHz cosine input. The initial output is almost a duplicate of the input pulse and shows that the ESP/950s have a very fast rise-time. The output isn't perfect, but it indicates that the time-domain response is relatively well behaved. This correlates with panel-member comments such as "precise transients" and "excellent details." The output pulse also shows that the ESP/950s produce a positive acoustical output for a positive electrical input.

Because they have their own electronics, the ESP/950 earphones can produce very high sound levels of 104 dB with an input of only 100 mV. The listening panel members gave the ESP/950 earphones an overall sound quality rating of "excellent" and an "excellent" rating for physical attributes. Their sound makes them a close match to the Stax SR-Lambda Pros. Who would have thought that you could have electrostatic sound quality in a portable system? *Edward M. Long*



THE NEW AERIUS SPEAKER FROM MARTIN LOGAN LTD. SO MUCH TECHNOLOGY WE HAD TO CUT IT IN HALF TO FIT IT ON THIS PAGE

Sometimes it's not what you see, but what you don't see. That's true of the new Aerius Speaker from Martin Logan. What you do see is a speaker. Sleek. Elegant.

What you don't see are the components of a traditional speaker. After all, it looks like we put nothing behind the grill. What you're not seeing is our Electrostatic Driver that incorporates an incredibly advanced Vapor Deposited Membrane. You can see right through it. A design that allows for the soft subtleties of Brahms to come through crystalline and flawlessly. But just crank up some of your favorite rock & roll and get busy.

Martin Logan invented the Curvilinear Electrostatic Speaker. And we packed all this technology into a very intelligently sized package.

We may have had a difficult time putting all this on one page, but you'll have no problem sticking all of the music in your ear.

New Aerius
$1,995.00 pr.

MARTIN·LOGAN, LTD.
THE ELECTROSTATIC TECHNOLOGY

913-749-0133
P.O. Box 707 Lawrence, Kansas 66044

OUR AUDIO COMPONENTS HAVE THE UNCANNY ABILITY TO PRODUCE INCREDIBLE FEEDBACK.

"I am not aware of an amplifier, anywhere, that delivers this much usable power at such a modest cost."

HCA-800II AMPLIFIER, BOUND FOR SOUND, DECEMBER 1990, U.S.A.

"... internal appearance definitely suggests that of some far costlier high-end components. ... first rate sound at a truly affordable price."

P/FET-900II PREAMP, STEREO REVIEW, JANUARY 1992, U.S.A.

"Parasound comes out on top in the areas of fine detail, clarity and timbral accuracy."

HCA-800II AMPLIFIER, FALL 1992, THE SENSIBLE SOUND, U.S.A.

"From the very first sounds—even forgetting this price—we noticed unsurpassed spaciousness and detail enveloping us."

P/FET-900 PREAMP AND HCA-800II AMPLIFIER, HOMESTUDIO, DECEMBER 1989, HOLLAND

"... a product that's basically untouchable by the competition."

HCA-2200 AMPLIFIER, BOUND FOR SOUND, DECEMBER 1991, U.S.A.

"It offers more than just a touch of high-end sound at a very affordable price."

HCA-800II AMPLIFIER, STEREOPHILE, OCTOBER 1990, U.S.A.

One thing is coming through loud and clear. A consensus that our audio components are a resounding success.

And it's no accident. Because we take a uniquely pure approach to music reproduction. You see, we put our money into elegant audio engineering and acoustic design. Not into fancy decorations that don't add any sonic value.

On the surface, this may not seem like such a big deal. But, as you can see, we've built quite a reputation by making high-end audio components at affordable prices.

To learn more about our complete family of audio products, give us a call. And discover for yourself why we're generating so much positive feedback.

PARASOUND

Affordable audio for the critical listener.

Parasound Products, Inc. 950 Battery Street, San Francisco, CA 94111 • 1-800-822-8802; 415-397-7100; Fax: 415-397-0144
In Canada, distributed by: Absolute Sound Imports, 7651 Granville Street, Vancouver, BC; 604-264-0414

OUR POWERFUL, HIGH-END AMPLIFIERS ARE ALSO DESIGNED TO INSULATE YOU FROM STICKER SHOCK.

Shopping for high-end audio can be a real jolt to your system.

But it doesn't have to be. Because Parasound offers a complete family of affordable power amplifiers to faithfully reproduce the music you love.

From the HCA-500 at under $400, to the John Curl-designed HCA-2200 at under $2,000. Each one is designed to master difficult loads with true power and grace.

What you'll receive is quality sound that surpasses amplifiers costing two to three times more.

Your authorized Parasound dealer will help you choose the one that's right for you. For further information and reviews, give us a call. And discover amplifiers and other components which are nothing short of electrifying.

PARASOUND

Affordable audio for the critical listener.

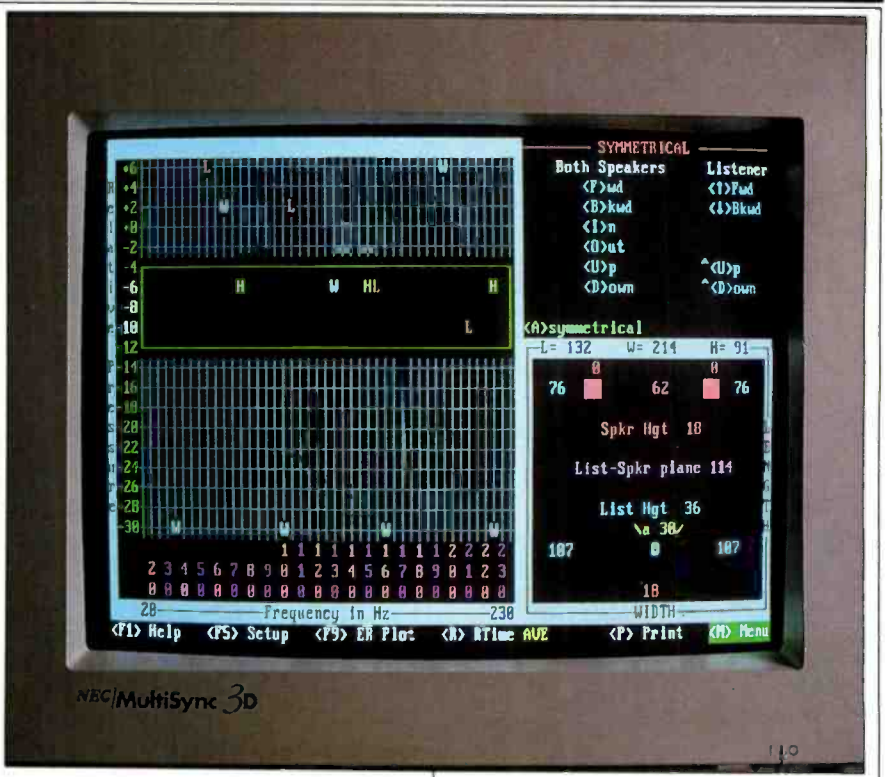
Parasound Products, Inc. 950 Battery Street, San Francisco, CA 94111 • 1-800-822-8802; 415-397-7100; Fax: 415-397-0144
In Canada, distributed by: Absolute Sound Imports, 7651 Granville Street, Vancouver, BC; 604-264-0414

SITTING DUCK LISTENING ROOM SPEAKER-PLACEMENT PROGRAM

Company Address: P.O. Box 130, Veneta, Ore. 97487.
For literature, circle No. 96

The last four years have brought a renaissance in computer software for loudspeakers. As editor of *Voice Coil*, an industrial-strength newsletter for loudspeaker manufacturers, I have reviewed 18 different loudspeaker-design programs since 1988. More than a dozen room-design programs have also been written for use by commercial contractors who install sound systems in churches, coliseums, and auditoriums. Fortunately, all this effort to model loudspeaker performance on desktop computers has finally produced a consumer-oriented, MS-DOS software package, The Listening Room ($47.50), which answers the simple yet essential question ultimately faced by all audio enthusiasts: "Where do I put my speakers?"

The Listening Room program is a room-mode analyzer that can simulate standing waves for nearly any given room with parallel walls. Unlike the room design programs used by professional sound contractors (such as Bose's Modeler, Renkus-Heinz's Ease, and Altec's AcoustiCADD), which require details like loudspeaker coverage angles and sound absorption coefficients, The Listening Room software takes an effective but basic approach to solving the speaker location problem. By ignoring furniture and other acoustic details, the program concentrates on locating the peaks and dips caused by major room modes occurring below 200 to 300 Hz. (Actually, much of the math required to reliably calculate this information was outlined in the late 1870s by Lord Rayleigh and in the early 1900s by W. C. Sabine, although you probably wouldn't want to try it with a hand calculator.) The Listening Room provides a user-friendly interface that quickly maps a room's standing-wave patterns, allowing you to experiment with different speaker and listener locations and simulate what the response of a flat speaker would be for each possible combination of positions.



For even a novice computer user, The Listening Room software should be relatively easy to operate. You're asked for the height, length, and width of your room. As soon as you enter this data, the program calculates the primary mode frequencies for each dimension. Hitting any key takes you to the main work screen.

This screen is divided into three windows: One shows a small floor plan with the location coordinates of the speakers and the anticipated listening position. Using simple keystrokes, you can "move" the speakers or listeners in any direction, including up and down. The window just above the floor plan shows what each key does.

The largest window of the work screen consists of a mode plot that shows relative sound pressure (+6 to −30 dB) on its vertical scale, and frequency (20 Hz to cutoff) on the horizontal scale. The letters W, L, and H are displayed on the mode plot to indicate the frequencies and intensities of standing waves along the room's width, length, and height. Imposed on the plot is a target window, which is 8 dB high, extending across the bandwidth, and includes settings for live,

average, and dead room-reverberation characteristics.

As you vary the speaker locations and listening positions, the room modes shown by the W, L, and H markers move up and down the dB scale, showing how different positioning affects the peaks and dips in the speaker's room response; response is flattest when the most letters fall within the target window. Once the best fit is obtained, the influence of nearby boundaries on the frequency response can be viewed by simply pressing a function key.

A number of features and options add to the program's flexibility. To help find the sources of particular dips and peaks, the effects of the front and adjacent walls and the ceiling can be switched in and out of the calculations, and one can select setups with or without carpets, changing the effect of floor reflections. The upper frequency cutoff for the boundary plot can be varied from 200 to 1,000 Hz in 100-Hz steps, and a time cutoff window for reflections can be adjusted from 2 to 100 mS in 2-mS steps. The recommended window setting is 20 mS.

The test for any computer simulation is to compare one of its predictions to measured reality. For this test I employed a pair of PSB Mini Stratus speakers, whose anechoic response I measured at ±1.5 dB from 45 Hz to 21 kHz. After placing the speakers in a typical arrangement along the only available wall, I entered the room's dimensions and the speaker and listener positions and used the program to plot the response from 20 to 1,000 Hz at the listening position.

The PSB speakers were then measured using a DRA Labs MLSSA FFT analyzer and an ACO Pacific 7012 measurement microphone. With the mike and speakers carefully placed in the exact positions entered into the program, an MLS (maximum length sequence) measurement was performed over the same bandwidth, with the impulse response windowed, as in the software, to 20 mS.

Comparing the two plots, I immediately noted that the measured and calculated responses below 50 Hz were different. This was partially because the speaker rolls off below 45 Hz while the program assumes a 20-Hz roll-off

The computer simulation shows where to place speakers and where to sit for the flattest possible sound in your room.

and partially due to measurement inaccuracy caused by using a 20-mS window for the FFT impulse, resulting in time aliasing below 50 Hz. However, comparison of the plotted outputs at frequencies between 50 and 250 Hz showed considerable agreement between the computer simulation and the measurement.

For the right speaker, the two dips between 100 and 200 Hz occurred at very nearly the same frequency and magnitude, while the dip at 250 Hz occurred at the same frequency, although lower in magnitude. The left speaker prediction was nearly as good, except in the area from 100 to 200 Hz. Both plots showed peaks at about 100 and 200 Hz and a dip at about 175 Hz, but MLSSA showed an additional dip at 150 Hz. Removing the left wall from the simulation eliminated its 175-Hz dip, so I concluded that this dip was due to reflections from that wall and that the measured depression at 150 Hz was likely due to the bulky furniture on the left wall near the loudspeaker.

At frequencies above 250 Hz, it is not realistic to expect simulation software such as The Listening Room to offer accurate predictions. As wavelengths get shorter, the effects of objects and room materials become more significant, and even slight changes in microphone position can make drastic differences in the measured response.

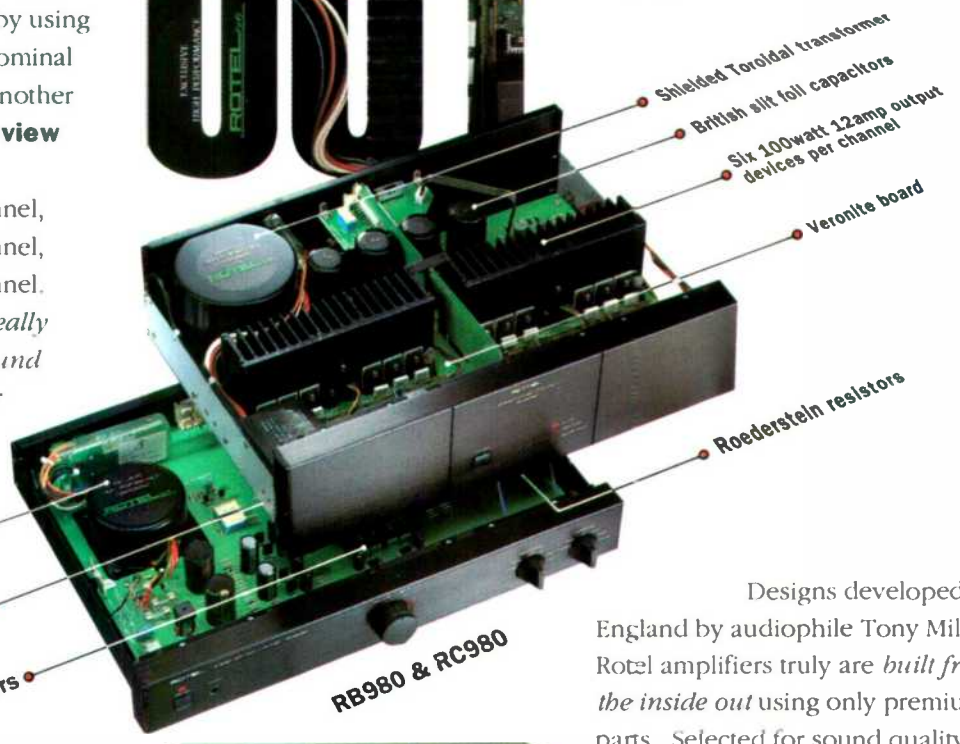
The Listening Room is an amazingly accurate piece of software, especially considering its modest price. It also makes only modest demands of your computer, requiring only DOS 3.x or higher, 256K of RAM, and almost any graphics card, from CGA up, including Hercules. (A Macintosh version is coming soon, at $67.50.) Moreover, The Listening Room can be used with dot-matrix or LaserJet-compatible (PCL) printers. As a low-cost alternative to expensive measurement equipment, this program can provide valuable assistance in arranging your sound room, such as helping you find a null in which to locate your turntable (though the best location is usually in another room). If you can't justify $6,000 worth of FFT analyzer and measurement mike, The Listening Room is a worthwhile adjunct to your other acoustic analyzer, your ears. *Vance Dickason*

BUILT FROM THE INSIDE OUT

For most, the benefits of a pre/power amplifier set-up is rarely considered as many combinations cost thousands of dollars–most are discouraged well before a demonstration. Rotel, winners of **What Hi-fi?** *"Best product of the year 1991 and Best System"* has an affordable solution. Rotel introduces the 360watt 8ohms (Bridged Mono) amplifier that can be bought in stages.

Aclaimed by **Audiophile** (11/91), the RB980 can form the heart of your audio system, it can grow as your system grows. Begin by using one RB980 with 120watts nominal per channel and then add another when you need. **Audio Review** (2/92) measured the RB980; 137watts @ 8ohms per channel, 267watts @ 4ohms per channel, 388watts @ 2ohms per channel. **Audio Review** noted, *"a really great performance. The sound quality is extraordinary for products in this price range."*

Rotel CD players. They have received worldwide aclaim. **Hi-fi Choice** (11/91) Rotel CD player RCD965 'Best Buy' *"produces the sort of sound that many highend products wouldn't have a hope of achieving."* **Hi-fi World** (11/91) RCD965 *"effortless sound quality..."* **CD & Hi-fi Buyer** (12/91) again reviewing the RCD965 *"bass is tight, deep and where appropriate, thunderous, always well under control. High frequencies are sweet and clear..."*



Designs developed in England by audiophile Tony Mills, Rotel amplifiers truly are *built from the inside out* using only premium parts. Selected for sound quality, resisitors and capacitors come from Germany and the UK, while special semiconductors orginate in USA. If you're on a budget then consider the Rotel RB960 power amplifier, its of dual mono design and capable of 60watts per channel in stereo. By bridging a pair of amplifiers you can feed your speakers with a stunning 180watts. **What Hi-fi?** (3/92) says, *"a thoroughly commendable performance. Great sound quality for price."*

Drive your amplifier with **Remote Control** AM/FM tuner/preamp RTC950 motor-driven volume control and 20 presets or RC980 preamp with its non magnetic chassis which cancels hysteresis distortion. Whichever you select, the sound quality is going to be incredible. Also, check out the

ROTEL®

Designed in Britain Enjoyed Worldwide

ROTEL OF AMERICA · PO BOX 653 · BUFFALO · NY 14240 · USA · TEL 1·800·724·3903

Enter No. 29 on Reader Service Card

AKG K340 EARPHONES

Transducer Design: Electrostatic tweeter, dynamic woofer.
Coupling to the Ear: Circumaural.
Equalization: Direct field.
Sensitivity: 117 dB SPL for 200 mW.
Impedance: 400 ohms.
D.c. Resistance: Left, 318 ohms; right, 319 ohms.
Cord: Coiled, 7¾ feet long from left earcup, with ¼-inch stereo phone plug.
Adjustment: Headband slides in detented bails.
Weight: 14 oz. (0.387 kg).
Price: $249.
Company Address: 1525 Alvarado St., San Leandro, Cal. 94577.
For literature, circle No. 97

The K340 earphones from AKG Acoustics are a tour de force of acoustical design. From the use of both electrostatic and dynamic transducers to the elaborate design of the acoustical earcup chambers, there is a level of engineering here that is seldom found in such a product. The K340 earphones are designed not only for smooth response but also for the exclusion of outside sounds. AKG makes both open and closed earphones; the open-air K280 earphones that I reported on in the January 1992 issue allowed outside sounds to be easily heard, while the closed design of the K340 blocks these sounds. Since the K340s do a reasonably good job of attenuating outside sounds, you can use them to monitor a recording in progress even when you are in the midst of the sounds being recorded.

Both the K340 and the K280 use two transducers in each earcup. In the K280, each transducer is a small dynamic unit. The K340 uses an electrostatic transducer for the treble and a dynamic unit for the bass; they are mounted on the same axis, with the electrostatic element in front of the dynamic transducer. Each earpiece contains separate sound chambers, with five acoustical resistances and five passive diaphragms mounted on a special baffle. There is also a tiny step-up transformer for the permanently charged electrostatic transducer. The K340 earphones are definitely an elaborate design that takes many interrelated factors into account.

The K340 headband is imitation leather. Foam-filled pockets on its underside rest against the top of the head, allowing air to flow between the headband and the wearer's head. The headband is attached to a sliding plastic piece on the bails; detents on the bails keep the headband in the selected position. You can adjust the earcups easily without having to remove the earphones from your head. The left and right earcups are marked by an "L" and "R" embossed on the outside of the sliding bail adjustment, but it is hard to see these letters in low-light situations. The bails have a slight swivelling action that helps to make the earcups fit snugly against your head. The foam-filled vinyl ear cushions are very comfortable. The tension that holds the earcups against the head is very moderate, and this, coupled with the comfortable ear cushions, makes long-term listening through these earphones possible. Overall, the comfort provided by the foam-filled headband, the light tension, and the vinyl-covered

EARPHONE EVALUATION

PARAMETER	RATING	COMMENTS
Overall Sound	Good	
Bass	Very good	"Tight bass" and "Lowest bass subdued"
Midrange	Good	"Recessed" and "No harshness"
Treble	Good	"Subdued"
Overall Isolation	Good	
Bass	Moderate	"Some bass can be heard"
Midrange	Good	"Voices are subdued"
Treble	Very good	"Highs are well suppressed"
Comfort	Very good	"Ear cushions are very good"
Value	Good	

GENERAL COMMENTS: Good fit to different heads; very comfortable; very low fatigue factor over long listening periods.

The Advent Sounds of the '60s Audio and Electronics Quiz.

Advent® is celebrating its 25th birthday by giving you a chance to win a commemorative pair of one of the most popular speakers ever made—The Large Advent. To win a pair, or one of our other prizes, correctly identify the electronics in the Advent Sounds of the '60s Audio and Electronics Quiz. Winners will be drawn from those with correct answers. See details below.

5 FIRST PRIZES:
Pair of The Large Advents

15 SECOND PRIZES:
Advent Sampler CD*

25 THIRD PRIZES:
Advent T-Shirt

1. The receiver in this picture is a:
   a. Scott b. Marantz c. KLH d. Pioneer
2. This turntable is a:
   a. Garrard b. Dual c. Radio Shack
   d. Acoustic Research
3. The speakers are:
   a. KLH b. JBL c. Advent d. Pioneer

///ADVENT

Mail this completed page to: Advent 25th Birthday Contest; P.O. Box 8555; Prospect Heights, IL 60070

Name_____

Address_____

City_____ State_____ Zip_____

NO PURCHASE NECESSARY. Entries must be received by 12/31/92. Drawing will be held on or about 1/15/93. Only one entry per household. No photocopies or other facsimiles accepted. To obtain an entry form, the complete rules and answers to quiz questions, send a self-addressed stamped envelope (WA and VT residents need not affix return postage) to: Advent Entry Forms, 15 E. Palatine Rd. #101, Prospect Heights, IL 60070. Requests must be received by 12/1/92. Limit one request per envelope; one entry form per request. Open to U.S. residents 18 years or older. For a winners list, send a self-addressed stamped envelope to: Advent Winners, 15 E. Palatine Rd. #101, Prospect Heights, IL 60070 by 2/1/93. Void where prohibited.

The AKG K340 earphones are eminently suitable for extended listening to all sorts and qualities of program material.

earcups make the K340 easy to live with even though it weighs a relatively heavy 14 ounces.

The bass output from the K340 is very good. This might be expected from a closed or sealed design, but air leaks can reduce the bass response of some earphones. While a major leak can cause a problem for the K340 earphones, they still produce good bass when a moderate leak occurs. This is a boon for those who wear glasses, which usually cause an imperfect seal between the earcups and the head.

The subjective sound qualities of the AKG K340 earphones were rated by members of a listening panel, all of whom are experienced in judging the sound produced by high-quality audio components. They were given a rating form and asked to listen to various types of program material and write down their comments.

My measurements showed that the bass output was very extended, with only a gradual roll-off of about 2 dB per octave from 600 Hz down to 80 Hz; from 80 Hz down to 40 Hz the roll-off was about 10 dB. This characteristic can be easily corrected by an ordinary bass tone control, but this much correction may not be needed, as some of the roll-off may have been caused by the lack of a completely tight seal around the ears of the B & K Head and Torso Simulator (HATS) manikin that I used for the measurements. In any case, if you don't have a tight seal or if you wear glasses, it is nice to know that you can obtain a very uniform output from the K340s with an ordinary bass control, found on most preamps, integrated amps, and receivers. Comments by listening panel members, such as "good bass," "tight bass," and "lowest bass notes slightly less than reference," indicate that they didn't feel a need for an increase in bass output. Comments about the sense of presence being "very dry," "subdued," and "less forward than reference" correlate well with the measurements that I made with the B & K HATS. (See "As Close As You Can Get," *Audio*, April 1991.)

The AKG K340 earphones showed a depression in the response from about 3 to 5 kHz when equalized with the diffuse-field correction curve of the B & K measuring system. The AKG literature indicates that the K340 earphones were designed with a direct sound-field equalization in mind, but I was not aware of this at the time of the measurements. The depression would have been even deeper had I used the direct-field equalization provided by the B & K system. The Stax SR-Lambda Pro Earspeakers, which I use as reference, also showed a broad dip around 2.8 kHz when measured with the B & K system's diffuse-field equalization (see *Audio*, April 1991), but it was less severe than the dip from the AKG K340; the listening panel all commented that the AKG K340s earphones sounded more subdued in the middle register than the reference earphones. My own impression of the K340s is that they have a sound characteristic similar to many highly regarded and successful two-way bookshelf loudspeakers that are purposely designed with a depressed upper middle register. This type of response makes loudspeakers, or in this case earphones, very nonfatiguing and easy to listen to over long periods, even with bright, forward, or harsh program material.

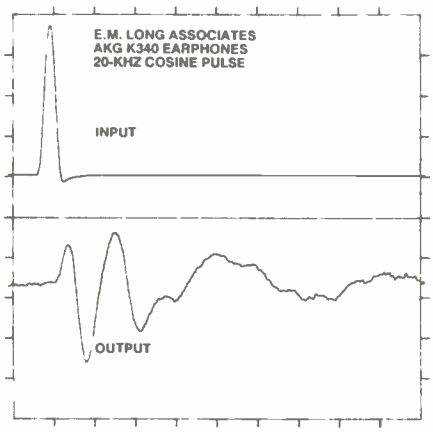


Fig. 1—Output vs. time for 20-kHz cosine pulse.

The AKG K340 earphones had difficulty reproducing the 500-Hz square wave that I use as one of my standard tests. The output waveform showed that the higher frequencies from the electrostatic transducer element arrived ahead of the lower frequencies from the dynamic transducer element. To reproduce square waves accurately, the phase and amplitude of each harmonic must be exactly right; such was not the case with the K340 earphones. This result correlates well with the "subdued" sound of the K340s as compared to the sound of the reference earphones. The spectrum of the square wave also showed depressed upper midrange harmonics at 3.5 and 4.5 kHz, as expected.

Figure 1 shows the output of the AKG K340 earphones for a 20-kHz raised cosine pulse input. The input pulse is shown at the top and the output from the K340 below. I had a difficult time determining the absolute polarity of voice and music with the K340, and this certainly correlates well with the output shown here.

I also measured the output versus frequency response with a Fast Fourier Transform (FFT) analyzer, using the same 20-kHz cosine pulse; I placed a B & K 4133 condenser microphone directly in front of the coaxially mounted earphone elements. The response showed a rise at 2,400 Hz, a dip centered at 3,500 Hz, and good output up to 10 kHz, where it began to roll off. The response showed no irregularities from reflections between the transducer diaphragm and the protective screen—or from the ear cushions, which are well padded. The relationship between the amplitude and phase of the output indicated some nonminimum-phase characteristics that are probably due to the offset between the two separate transducers. The AKG K340 earphones had almost no coloration when reproducing wide-band pink noise, which translates into low listener fatigue. The impedance, slightly more than 300 ohms, was lower than that of some earphones I have tested, but still high enough to ensure that the source's impedance had very little effect on frequency response.

The AKG K340 earphones are very comfortable, and they make even less than ideal program material, with slight distortion and noise, quite listenable. The listening panel members rated the K340 earphones as "good" for overall sound quality and "very good" for comfort. I think these earphones are very suitable for extended listening to a wide variety of program material. With this in mind, I think that they are a very good value and suggest that you give them serious consideration.

Edward M. Long

First in a series

THE COMPONENTS OF EXCELLENCE: BUILD QUALITY

You can tell how good a McIntosh is even before you turn it on.

The MC1000 is a 1000 Watt, Mono Block Power Amplifier

Made in the USA

For a high fidelity component to earn a position at the pinnacle of high-end audio, many criteria, not simply superb sound quality, must come into play. A McIntosh audio component is built to such high standards that it speaks volumes about itself and the company that built it...even before it is turned on.

The look and the design, the feel and 'sound' of the controls, the way the parts mesh together, the strength and heft of its construction; all these McIntosh qualities are not mere adjuncts to superb sonic performance, they are essential to the definition of the highest quality. In fact, for more than 40 years, the design and construction of McIntosh products have set a standard of quality not only for audio components, but for the finest products of any kind.

McIntosh®
Components of Excellence

McIntosh Laboratory Inc., 2 Chambers St., Binghamton, NY, USA 13903-2699 (607) 723-3512

CARRYING ON

Illustration: Rick Aklut

Chris Norman: Man with the Wooden Flute. Chris Norman, flute; Robin Bullock, guitar, cittern, fiddle; Ann Marie Morgan, viola da gamba; Pete Sutherland, fiddle.
Dorian DOR 90166, CD; 73:29.

All flutes were once wooden, classical or no, and this perhaps signalizes the music on this marvelously musical and polished folk recording, out of the now familiar Anglo-American-Irish-Scottish tradition, with a touch of (American) French. The performers here are young folkists, typically with varied classical and early-music backgrounds as well as folk. It is a fine consolidation, combining scholarship and wide knowledge of folkways with an acute understanding of what "tradition" *really* means, both now and in the past.

I found out back in the 1950s when this sort of music first began to hit the boards, or at least the tape recorders and the LPs. There were "traditional" songs and dances, as well as old and "pure" songs, dug up from ancient ladies and elderly gents in the untouched back country; the "traditional" to my astonishment sounded more or less modern. Guitars, pianos, and whatnot. Not at all pure! Why? Because tradition means *constant change*, as old usage adapts itself to newer conditions. Forget the British beefeaters and the like—a special case. True *traditional* songs and dances are not revived but carried on, still functional.

Chris Norman, known as a member of the Baltimore Consort, is joined by other young people who are aware of the wonderful "pure" music of the hinterlands, first known and collected in the early part of this century (notably by Cecil Sharp, who came to America in 1916, and later by Alan Lomax and Jean Ritchie), but also the easier music of Irish pubs and festivals (strictly popular and alive on its own). On this ideal digital recording, made in the Troy Savings Bank Music Hall, Norman et al. blend the two in a wonderfully graceful and musical fashion. The pacing is excellent, with good pauses and nice changes of accompaniment.

Edward Tatnall Canby

Gerard Schwarz

Hanson: Symphony No. 4; Serenade; Lament for Beowulf; Pastorale; Merry Mount: Suite. Seattle Symphony Orchestra and the New York Chamber Symphony of the 92nd Street Y, Gerard Schwarz, conductor; Seattle Symphony Chorale, Rich Sparks, director.
Delos DE 3105, CD; DDD, 75:07.

If you like Howard Hanson's music, you'll find this CD a veritable feast of some of his most accessible and popular works.

Hanson wrote his Fourth Symphony in memory of his father. While cast in four movements, it is brief—usually performed within 25 minutes. Hanson conducted the Boston Symphony Orchestra in the premiere performance in December of 1943. It gained immediate popularity and was awarded the first Pulitzer Prize for music in 1944. The Hanson Fourth is by turns austere, songful, and powerfully dramatic, with a noble, elegiac quality as well. The scherzo is a tumultuous brassy presto that contrasts sharply with the impassioned scoring of the Fourth Movement, "Lux aeterna." This is a deeply emotional, inspirational paean of beautiful music, which ultimately soars to a hugely sonorous climax for full orchestra, followed by a brief hushed epilog.

Serenade for Flute, Harp and Strings was a wedding gift to Hanson's wife. On a Hanson recording session that included this piece, I remarked to Howard that I thought the music was exceptionally beautiful. He grinned at me mischievously and said, "I call it Afternoon with Peggy." In its lush scoring, it is indeed Howard Hanson at his romantic best. Pastorale for Oboe, Harp, and Strings is another lovely chamber piece also dedicated to the composer's wife.

THE IDEAL AMPLIFIER FOR SUPERIOR SOUND SYSTEMS

Bryston's

3B NRB

Amplifier

Bryston's new 3B NRB amplifier is a companion piece to the 4B NRB and 7B NRB, with a similarly optimized interface between power supply and signal circuitry, and the same ultra-linear amplification as its larger counterparts. Its 120 watts per channel is a popular size for a wide range of music systems requiring the highest quality source of power. The 3B NRB uses Bryston's proprietary Quad-Complementary output section, which improves linearity to a new standard of accuracy, while virtually eliminating aggressive higher harmonic distortion products. From input to output, all the circuitry in the NRB series of amps has been optimized for the most musical amplification possible, with dual power supplies to provide precise and focused imaging. New, three-colour LEDs glow green for power-on, yellow for transient clipping, and red to indicate longer-term overload or any other departure from linearity, including shorted outputs, or strong out-of-band information, like RF or DC. Gold plated RCA and XLR input connectors allow unbalanced or balanced operation at the flick of a rear mounted switch. A ground lift switch separates system ground from audio ground to reduce annoying ground loops and system hum. Finally, switchable monaural operation is available if higher power requirements become necessary. Although the description of circuit innovations can indicate the research and commitment we bring to the design of the finest audio products, only in the listening does the result of that dedication become clear. Bryston's 3B NRB is capable of doing justice to the most refined sound system, with the subtlest details of the musical fabric revealed in their original form. We invite you to experience the musical accuracy, long term reliability and excellent value the Bryston 3B NRB represents.

BRYSTON

57 Westmore Dr., Rexdale, Ontario, Canada M9V 3Y6

Tel: (416) 746-1800 Fax: (416) 746-0308

Brystonvermont, RFD#4 Berlin, Montpelier, Vermont 05602

Tel: (802) 223-6159 Fax: (802) 229-2210

Enter No. 34 on Reader Service Card

20 YEAR WARRANTY - A GENERATION OF MUSIC

As these inspired readings show, the Rachmaninoff tradition in Philadelphia remains brilliantly alive.

"Lament for Beowulf" for chorus and orchestra is one of Hanson's most evocative and dramatic works. Derived from the ancient English epic poem of the larger-than-life hero Beowulf, it tells of his derring-do in slaying monsters, the ultimate sacrificing of his life, and the pagan rituals of his burial. "Lament" opens with some mezzo-forte repetitive string figures with ostinato tympani, then suddenly ascends the dynamic scale with a massive bass drum, with declamatory bass trombone and tuba chords. A brazen trumpet fanfare enters on the right of the orchestra, answered by heavy French horns on the left. There are repeats of this, plus more developmental sections, leading to the entrance of the chorus. The whole piece is cast in a heroic mold, with great choral and orchestral outbursts.

The disc concludes with a suite from Hanson's opera, *Merry Mount*. Wonderful, ingratiating music here, with the sections entitled "Children's Dance" and "Maypole Dances" especially spritely and effervescent.

Gerard Schwarz understands the essential romanticism of Hanson's music and gives insightful interpretations here. Tempos are well chosen and lyricism is not sacrificed for momentum. The Seattle musicians perform really expressively, with especially lush string tone. Schwarz's preference for strings divisi works particularly well with Hanson's music.

John Eargle's recordings of a variety of ensembles are simply brilliant. The Fourth Symphony, "Lament," and *Merry Mount* are presented in just the right acoustic perspective with all orchestral choirs beautifully balanced and every element clearly delineated. The choral/orchestral balances are wonderfully judged—neither ever overwhelms the other—with fine vocal articulation. The sheer sonority of the Fourth and "Lament" is simply stunning. Musically and sonically, a major achievement. *Bert Whyte*

Rachmaninoff: Symphony No. 3, in A Minor, Op. 44; Symphonic Dances, Op. 45. Philadelphia Orchestra, Charles Dutoit, conductor. **London 433-1812,** DDD; 74:54.

Next year will mark half a century since Sergei Rachmaninoff's death. During his lifetime, his electrifying gifts as a pianist eclipsed his remarkable abilities as a composer, but the more time passes, the more his greatness as a pianist recedes into history and his own powerful musical creations establish themselves more and more firmly as an important part of the world's concert repertoire.

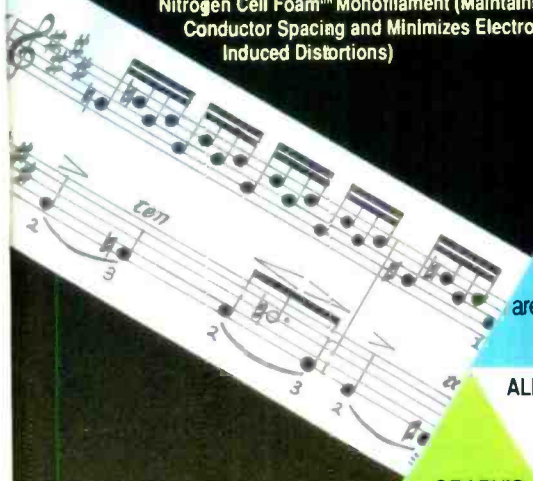
The Third Symphony has never attained the popularity of the Second—for one thing, its fundamental melodiousness suffers by comparison—but this vibrant, vital, vigorous performance makes one wonder why. The Philadelphia Orchestra, of course, especially during its Stokowski and Ormandy eras, had a unique personal relationship to Rachmaninoff (he even conducted it in a recording of his tone poem "The Isle of the Dead"). Conductors since then have come and gone, but these inspired readings indicate that the Rachmaninoff tradition in Philadelphia has remained brilliantly alive. One would hardly expect such music to bring out the best in such an emphatically French conductor as Charles Dutoit, but especially in the irresistible Symphonic Dances he reveals strata of the overall texture that emerge radiantly to sound fresh. The combination of Philadelphia sheen and opulent London sonics makes this disc a particular aural delight. *Paul Moor*

Dmitri Shostakovich: 24 Preludes and Fugues, Op. 87. Keith Jarrett, piano. **ECM New Series 437 189-2,** two CDs.

Keith Jarrett as classical keyboardist is quite a different performer from his spontaneous jazz-improvising persona. There is no "singing" here, and the conservative tonal studies penned by the Russian master as a tribute to Bach are lovingly and accurately brought to life in this fascinating set. It provides a natural flow from Jarrett's previous classical keyboard survey of the com-

Photograph: Gene Martin

Experience
FULL SPECTRUM SOUND!!!



ARTUS

FEATURES:
Tubular Geometry™ Inner Conductors (Individually Insulated), Tri-Barrier Geometry™ Dielectric Construction and Spira-Shield™ Outer Conductors. All Conductors are Silver Plated, Vacuum Drawn, Oxygen Free, High Conductivity Copper.

ALL ESOTERIC AUDIO INTERCONNECTCABLES FEATURE

the Highest Quality Plugs Available They are Machined From Solid Rod Stock and Electroplated with 24 Karat Gold. All Connections are Precision Soldered With Our Proprietary, 5% Silver, Super High Conductivity Solder.

GRAPHIS

FEATURES:
Tubular Geometry™ Inner Conductors, Nitrogen Cell Foam™ Dielectric Construction, and Reticulated-Shield™ Outer Conductors. All Conductors are Vacuum Drawn, Oxygen Free, High Conductivity Copper.

PRIMUS

FEATURES:
Tubular Geometry™ Inner Conductors (Individually Insulated), Tri-Barrier Geometry™ Dielectric Construction, and Spira-Shield™ Outer Conductors. All Conductors are Vacuum Drawn, Oxygen Free High Conductivity Copper.

Since 1977, Esoteric Audio has pioneered truly innovative cable designs. Our comprehensive research has culminated in our Tubular Geometry™ design. This unique construction eliminates strand interaction, minimizes skin effect, and dampers distributed resonances within the cable.

What does this mean in terms of musical sound quality? Simply put, the music will come through pure, clean, and totally palpable. Instruments and voices come to life with a precise and coherent 3-dimensional soundstage. In short, you will finally hear the music without cable induced distortions getting in the way.

But why take our word for it? Visit your local Esoteric Audio dealer and experience FULL SPECTRUM SOUND for yourself. The difference is incredible!

Mylar® and Teflon® are registered trademarks of E.I. Dupont Nemours & Co., Inc.

"When listening through my new Esoteric Audio interconnects, it was like hearing my recordings for the first time, again!"

the Art and Science of Connectology

ESOTERIC AUDIO USA

RR3 Box 262 Winder, Georgia 30680
Telephone: (404) 867-6300 Fax: (404) 867-2713

Enter No. 12 on Reader Service Card

Wendy Carlos has given her original *Switched-On Bach* an intelligent, original, state-of-the-art updating for its 25th anniversary.

Photograph: Annemarie Franklin

plete Well-Tempered Clavier of Bach. Shostakovich's masterpiece is agreed by many to be the only "remake" of the WTC that can be taken seriously. Jarrett limns out the counterpoint of this absolute music, and ECM's piano reproduction is a standard toward which others ought to strive. *John Sunier*

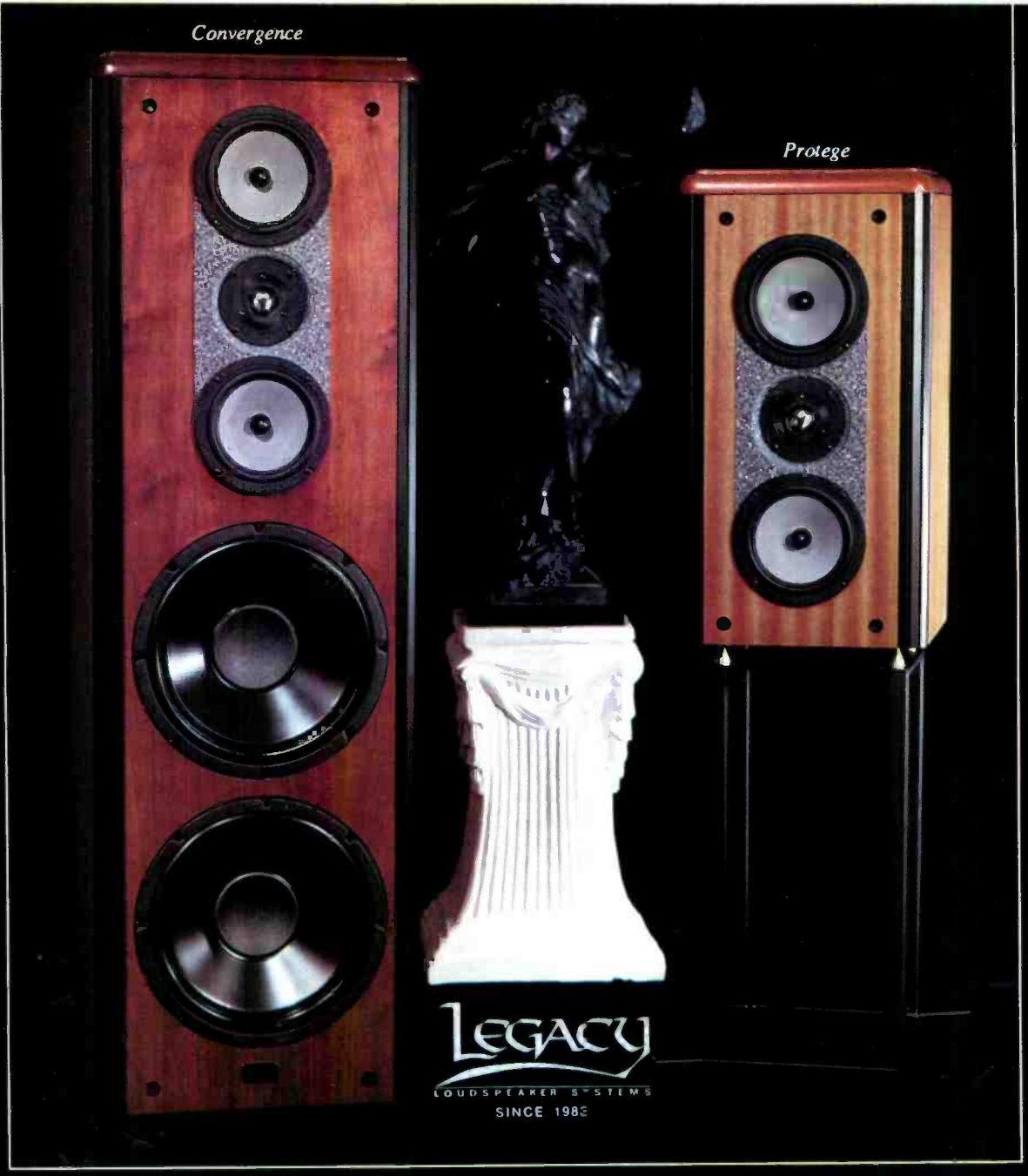
Switched-On Bach 2000. Wendy Carlos. **Telarc CD-80323.**

Wendy Carlos updates those unforgettable exotic, cowbell-like Moog synthesizer timbres for their 25th anniversary in four discrete Dolby Surround channels (plenty of hocket) recorded direct to digital—no mikes—using a plethora of state-of-the-art digital gear. Joining the original program are the Toccata and Fugue in D Minor and a slightly more conservative improvisation in the Brandenburg No. 3. A sweeter—and more conventional—harmonic sound is achieved by reproducing the circular and mean-tone tunings preferred by Bach. One sound patch from the original was used, but you have to guess where. Intelligent and intriguing, but not enough to replace the nostalgic thrill of the vintage '68 recording. *Michael Wright*

Telemann: Domestic Music, Vol. 3. Collegium Musicum 90; Simon Standage, director. **Chandos 0525.**

Georg Philipp Telemann was a friend of Handel and was considered in his time a more important composer than Bach. He was a tireless promoter of public concerts—not just in halls but also in the homes of patrician families. The seven works in this collection are of this type, including lovely duos for violins; a quartet for flute, two violins, and continuo; a trio sonata, and songs for tenor with continuo.

Telemann's chamber works are in rather conventional baroque style, but Simon Standage's clever programming provides variety and balance that would be absent in a program of, say, seven trio sonatas. Early instruments are featured, but their thinner and wiry timbre shouldn't annoy musical conservatives in Chandos' intimate and mellow sonics. *John Sunier*



To receive a free 52 page color brochure on innovations like our dual 20 bit control center, 200 watt powered subwoofer and nearly 100 other high end products call 1-800-Audio-Hi.

distributed by Reel to Real Designs 3021 Sangamon Ave. Springfield, IL 62702
dealer and export inquiries invited 1-800-233-4644 Fax: 1-217-744-7269

Enter No. 28 on Reader Service Card

FACTORY AUTHORIZED

Philips VR6615 — CALL
Four head hi-fi stereo VCR with remote conrol

Hitachi VTF551A — LOW
Four head hi-fi VCR with remote control

JVC HRD910U — $339
Four head hi-fi stereo VCR with remote control

Paanasonic PV4260 — $369
S-VHS playback hi-fi VCR with remote control

JVC HRS4700U — $499
Super VHS hi-fi stereo VCR with remote control

JVC HRS6800U — CALL
Super VHS hi-fi stereo VCR with jog/remote

PVM2021/PVM 1321 — CALL
20"/13" color TV w/ VCR built-in with remote control

Sony VCRs — CALL
Authorized dealer All models on display

PHILIPS *DFA980*
Reference digital integrated amplifier features 100W/ch RMS into 4 ohms, grade "A" version dual D/A converter chip w/4X OS. Two stage remote volume control
ORIG $750 NOW ONLY **$399**

Hitachi VME-23A — LOW
8mm, 64X zoom, 3-lux, built-in titler, wireless remote

Hitachi VMS-P1A — PRICE
8mm water resistant sports camcorder

Panasonic PV42 — $289
VHS-C, 20X digital zoom, image stabilizer, 1-lux

JVC GR-AX2 — $579
VHS-C, 1-lux 6X power zoom

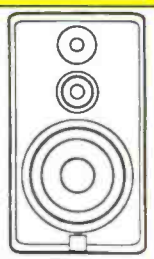
JVC GRM3U GRM5U — NEW
VHS-C Camcorders

Minolta 8-808
Hi-8 camcorder 8X zoom, Hi-Fi — $899

Minolta 8-918
New 8mm Pro-Twin CCD chip — CALL

Sony Camcorders
Authorized Dealers Everything on display

CANTON
Karat 980
As reviewed in Stereo Review "The MB390's sound had a distinct forwardness and a clean crisp top end that was always a pleasure to listen to. There was no accentuation of hiss and not a hint of shrillness."



ORIG $2000 NOW ONLY **$1179pr**

MINI-SYSTEMS

JVC UX1 *Micro-Component System*

Features active hyper-bass circuit • CD player w/20 track programmability • AM/FM digital synthesizer tuner • 30 station preset capability • U-turn auto reverse full-logic cassette deck • Dolby* NR • 34-key remote control • 2-way speaker system
SALE $369

Denon G05 *AM/FM dual cassette CD player with EQ*	CALL
Hitachi FX7 *AM/FM dual cassette CD player*	US
Denon NS1 *AM/FM dual cassette CD player*	LAST
JVC MX44 *AM/FM dual cassette CD player*	WE
JVC MX55M *AM/FM dual cassette multi-CD player*	BEAT
JVC MX77M *AM/FM dual cassette multi-CD player*	ANY
Panasonic SCCH55 *25W/ch mini system with remote*	PRICE
Sony MHC300 *NEW 18W/ch mini system*	
Sony MHC1200 *Mini-system*	
Sony MHC2750 *Mini-system*	

AUTHORIZED SONY DEALER 1992

ALL IN STOCK FACTORY AUTHORIZED CALL FOR BRANDS & SYSTEMS NOT LISTED

JVC JX-SV55

The Ultimate S-VHS Production Center
• Special Effects Video Enhancer
• Image Enhancer
• Color Processing Joystick
ORIG $750 NOW ONLY **$479**
Also available: JS-X100 • JX-S300 • JX-S900 • A/V Switchers

HOME SPEAKERS

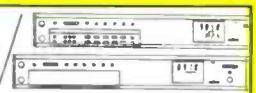
ADVENT Graduate

The Graduate offers the same outstanding cosmetics as its "little brother" the Baby II, but features an 8" long throw woofer and a 1/2" ferrofluid-filled polycarbonate dome tweeter in a larger cabinet. The result is outstanding imaging and soundstage reproduction.
FREE Sony WM-FX33 AM/FM Cass Walkman w/purch **$249**

Advent A2000 *Model 350 New Vision Series*	$499
Advent A2004 *Model 250 New Vision Series*	$349
Rock Solids *Indoor/outdoor speakers w/brackets*	CALL
Audo Source VS One *Center channel video shielded speaker*	FOR
AR Partner 570 *2-way powered bookshelf speaker*	LOW
Advent Heritage *Top-of-the-Line floor standing speakers*	PRICE
Advent A2002 *Model 500 New Vision Series*	LOW PRICE
Celestion *SL700, SL600Si, SL12Si, Models 3, 5, 7, 9, 11*	CALL
MB Quart 350W *2-Way tower speakers white only*	CALL
MB Quart 650 *3-way floor standing tower speaker*	PRICE

ALL IN STOCK FACTORY AUTHORIZED CALL FOR BRANDS & SPEAKERS NOT LISTED

a/d/s/



R4 *Receiver* ORIG $1400
75W per ch. receiver w/0.03% THD **$499**
Clock/timer • Flexible inputs/outputs

T2 *Tuner* ORIG $650
AM/FM digital tuner with presets **$269**
Act fast limited quantities!

750iL *Speakers* ORIG $1200
3-way in-wall speaker • Bi-wiring **$599**
capabe • 4th order X-over • Oak only

SOUND CITY SUPER SPECIALS

ADS AX2 *2-way electronic crtossover*	$97	Mission 762 *Ported bookshelf speakers*	$269	Terk AF9925 *Powered AM/FM indoor antenna*	IN
Jensen JFX125 *5-1/4" dual cone car speaker*	$39.95	Niles SPS1 *4-pair speaker selector*	$79	Technics SL1200 *DJ #1 Turntable*	STOCK
JVC RX705VTN *100W/ch Pro Logic receiver*	$289	Target BT1 *Tilt & swivel speaker brackets*	$27	Thorens TD180 *3-speed w/78 RPM turntable*	CALL
JVC TDV541TN *3-head cassette deck*	CALL	Brand Name DAT *Digital Audio Tape recorder*	$469	Audio Source EQ10 *10 band EQ/analyzer w/remote*	US
BBE 4012 *New Sonic Maximizer for the car*	LOW	Brand Name *150W/ch car amplifier*	$169	Technics SLXPS900 *MASH 1-bit portable CD player*	FOR
JVC HRD910U *4-head Hi-Fi MTS VCR*	$349	Sherwood RV6010RS *Rated #1 receiver with remote*	CALL	Panasonic KXT9000 *NEW 900mHz cordless phone*	THE
JVC XLM405 *Home 5-disc changer*	$189	Stereo Headphones *AKG • JVC • Singet • Sony • Sennheizer*	LOW	Sony D802 *Portable car CD player w/adapt.*	BEST
Minolta 8-418 *8mm camcorder 8:1 zoom*	$699	Panasonic RXDT 680 *3-piece portable stereo system*	PRICE	Sony D303 *Full featured portable CD player*	PRICE

Come Audition The New Technics SC-TH200 System

LUCASFILM THX

SoundCITY

Meadtown Shopping Center
Route 23 South
Kinnelon, NJ 07405

Fax Your Order
201•838•9599

FOR INFORMATION & CUSTOMER SERVICE PLEASE CALL: **201•838•1180**

HOURS: Mon-Fri 9-8 Sat 9-6 Sun 11-4

VISA MasterCard DISCOVER AMERICAN EXPRESS

Factory Authorized for all brands we sell • Not responsible for typographical errors • Some pictures for illustration only • NO refunds on video equipment or installed/opened car stereo products • 10 day defective exchange from date or receipt (Must call for authorization before return) • All returns must be made within 10 days of receipt of merchandise & are subject to a 10% restocking fee • Products returned must be in original conditioning and packaging.

1•800•542•SAVE

JBL Authorized Dealer Home Audio & Car Audio

TRIAD System 6 • System 7 Satellite Subwoofer Systems
NEW THUNDER Subwoofer
NOW ON SALE
CALL FOR PRICES

NHT Authorized Dealer Full Line Available

LUXMAN Digital Surround/EQ
Orig. $499
$269
G007 Digital Surround Processor/EQ
Digital delay surround sound processor with Dolby® Surround with 7-band EQ/spectrum analyzer & more

LASER DISC PLAYERS
BRAND NAME with over 400 lines of resolution. Plays both audio and video laser discs. W/remote control As Low As $399
Philips CDV600 LOW PRICE

JVC AL-A151BK Turntable
FREE PSX10 CARTRIDGE
• Precision DC servo motor
• Automatic arm return
• Arm cueing control up front
• Low mass straigh tonearm
$89
Call For Other Brands

BBE Sound Inc. Reveals all the Sound You've Never Heard!
BBE1002 Sonic Maximizer
A REAL IMPROVEMENT!
FREE dbx SX-20 Video Sound Impact Restorer w/ Purchase
$189

AudioSource®
Home Theater System 4001 Dolby® Pro Logic System Features:
• SS4 Dolby® Pro Logic Surround Sound Processor
• VS-One video shielded center channel full range speaker • LS-Ten/A surround Sound Speakers (1 pr)
ADD TO YOUR EXISTING SYSTEM
Make Your Receiver Into A Home Theater System
NOW ON SALE
$399

LUXMAN Compact Disc Player
DZ-92 REMOTE CD PLAYER
Features dual D/A converters • 4X oversampling digital filter • 3-beam laser • 20 selection programmed play • All metal chassis and housing • Multi-function remote control • STAR circuitry & more
ORIG $280
NOW ONLY $129
5 YEARS
5 YEAR LUXMAN PARTS & LABOR WARRANTY

Panasonic OFFICE EQUIPMENT
Telephones • Answering Machines
Fax Machines • Cordless Phones
ALL MODELS AVAILABLE

ALTEC LANSING **JBL** ads **CANTON** SONANCE niles audio
INWALL SPEAKERS
INFARED REPEATERS
VOLUME CONTROLS
SPEAKER SELECTORS
SPEAKER SWITCHERS

ROCK PARTNER
Bookshelf/floorstanding acoustic suspension 2-way loudspeaker system. Features 8" long-throw woofer and 1-3/4" liquid-cooled dome tweeter. The Rock Partner is equalized to boost bass output. Perfect for floor corner or shelf placement.
Originally $300
$129
LIMITED QUANTITIES
CALL FOR PARTNER 570
AR ACOUSTIC RESEARCH

PINNACLE
Patented Compact Loudspeakers
Pinnacle PN2+
• Patanted Diaduct port design
• 10-40W RMS 120W peak power
• Frequency response 60-21kHz
• 7 year transferrable parts & labor warranty
NEW FOR '92
PN50 • PN60 • PN70
ALSO AVAILABLE
PN5+ • PN8+ • PN Sub
$59ea

PHILIPS Cassette Decks
LAST CALL
FCR50XBK
Auto reverse cassette deck with Dolby® B/C noise reduction; Dolby® HX Pro and fine bias control, quick music search, tape counter, auto music search & more
ORIG $400 NOW ONLY $179
FC315XBK
Dual stereo cassete deck features dual Azimuth adjustments, Dolby® B/C noise reduction, Dolby® HX Pro headroom extension, mic mixing function and more.
ORIG $300 NOW ONLY $139

HUGHES MODEL AK-100
AUDIO PRODUCTS Sound Retrieval System
"Perhaps the most effective stereo enhancement system, one that even simulates full surround sound."
Len Feldman Video Review March 1991
"The sound spread was so startling that I was certain additional speakers had been turned on-but they hadn't"
Len Feldman Audio April 1992
CALL FOR PRICE

WE'RE YOUR CAR AUDIO HEADQUARTERS
CD PLAYERS/CHANGERS • AMPLIFIERS • EQUALIZERS • SPEAKERS • WOOFERS • SIGNAL PROCESSORS • ALARMS • HEAD UNITS

HUGHES RETRIEVER™ NEW
AUDIO PRODUCTS 3-D Audio Excitement
Restores dynamics, depth and incredible width to all of your sound • Adds spacious ambiance to mono, stereo, or surround type encoded material • No annoying "Sweet Spot"
Introductory Price CALL

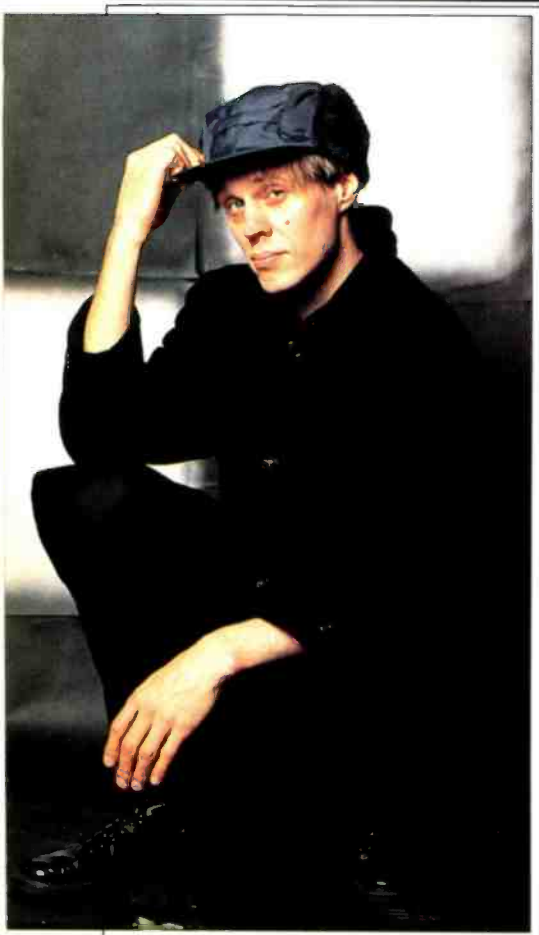
AUTHORIZED **SONY** DEALER 1992
HOME AUDIO COMPONENTS
BOOKSHELF SYSTEMS
CAR AUDIO
COMCORDERS
VHS/8MM VCRs
TELEVISIONS

UPTOWN BRAND NAMES...DOWNTOWN PRICES

• ADS • ADVENT • AR • AIWA • AKG • ATLANTIC TECHNOLOGY • AUDIO SOURCE • BAZOOKA • BBE • BELTRONICS • CANON • CARVER • CANTON • CLIFFORD • CWD • DENON • EPI • HAFLER • HITACHI • HUGHES • JVC • KENWOOD • LUXMAN • MINOLTA • MITSUBISHI • MONSTER CABLE • NAD • NHT • NILES • ONKYO • OPTONICA • ORION • PANASONIC • PHASE LINEAR • PHILIPS • PINNACLE • PROTON • PS AUDIO • ROCK SOLID • SENNHEISER • SHERWOOD • SOUNDCRAFTSMAN • SONANCE • SONY • SOUNDSTREAM • SSI • TECHNICS • TERK • THORENS • TOSHIBA • TRIAD • VELODYNE

Enter No. 32 on Reader Service Card

TUBE HEAD



Photograph: Fabio Nosotti/LGI, ©1987

Warm and Cool: Tom Verlaine **Rykodisc RCD 10216,** CD; AAD; 51:51.

Sound: A Performance: B

Television
Capitol 98396-2, CD; 49:17.

Sound: A Performance: B+

The seminal punk-era band Television was principally a medium for its songwriter/vocalist/guitarist Tom Verlaine. The veracity of this assertion can be tested by comparing Verlaine's first all-instrumental solo album and Television's eponymous 14-year follow-up to *Adventure*, the band's last release.

Warm and Cool recalls the instrumental cocktail-lounge pop that made a niche for itself in the late '50s and early '60s. Deftly accompanied by Television drummer Billy Ficca, Verlaine begins this excursion into sound noir with "Those Harbor Lights," a paraphrase of a classic slow-dance number. With his guitar drenched in vibrato and old-fashioned spring reverb (or darned good digital imitations), Verlaine ambles through a set that covers extremes from the "Bonanza" Revisited of "Sleepwalkin' " to the almost anachronistic, slightly saccharine hippie-good-lovin' of "Harley Quinn." Even Verlaine's song titles are vintage material: Three renditions of the tune "Depot" are parenthesized "1951," "1957" (with bongos), and "1958."

Occasionally, Verlaine's characteristically angular guitar (a focal point in Television) makes an appearance, but here his playing is reminiscent of soundtracks to gritty-teethed black-and-white art films of the beat generation. The net effect is to create an illusion of nostalgia without the substance of it, a nifty artistic trick that ultimately leaves you more with a sense of vaguely familiar unease than with a warm and cool glow.

Television reflects a similar inwardly focused spirit. Hearing the first effort since 1978 by this group is like meeting an old friend. Although the band doesn't exactly pick up where it left off, *Television* is still clearly Television.

Verlaine and Richard Lloyd still swap guitar textures like those of an ink-and-watercolor sketch, with brief melodic outlines surrounding chordal washes. Verlaine's singing retains its rough-hewn quality but is tempered a bit. His lyrics, meanwhile, have become more personal and obtuse with time. It's not that the wit or perception is gone, just that the irony that prevailed in the '70s has been replaced by observations on modern vanity ("No Glamour for Willi") or rap-inspired love songs ("Rhyme").

Warm and Cool and *Television* long for an older vision while at the same time update it. But though Verlaine's observations feel unsettlingly uncertain—much like America in 1992—these albums clearly bear his mark, an excellent reason to give them a listen.

Michael Wright

Levelling the Land: The Levellers. **Elektra 61325-2.**

Rocking yet folky, The Levellers dish up a rousing fiddle-driven brand of song. The young Brits sing not only of love, but of cherished hopes and lost dreams. They are not despairing or sour, as a fierce faith pervades their work. "The Boatman" is a song about choices made unavailable by circumstance. "One Way" is a credo for truth to oneself in tough times. These are my favorites, but "Liberty Song," "Far from Home," and "Another Man's Cause" are all quite impressive as well. The Levellers are a band whose conscience is an integral part of their work, making their music truly uplifting. But best of all, they still have a lot of fun making it.

Michael Tearson

Mondo Bizarro: The Ramones. **Radioactive/MCA RARC-10615.**

With four chords, breakneck tempos, and humorous hard-luck stories of adolescence, The Ramones helped define 1970s trash culture (a.k.a. punk rock) while creating quasi-cartoon-like characters out of themselves.

The Levellers

So Who Are We To Argue? Introducing The NEW Hafler Trans • *nova*

There is something "very right" about tube sound. Audiophiles know it, musicians know it, so who are we to argue? We don't. Jim Strickland, Hafler's chief engineer, has created "tubey" sounding solid state circuitry for Hafler's new Models 9300 and 9500 power amplifiers. A unique drive stage allows the lateral MOSFET output devices to be connected just like tubes! In fact, this new **trans•*nova*** circuitry is so unique, it's patented.

As with the rest of the new Series 9000 line, the **trans•*nova*** amplifiers share the same elegant sonic quality, simplicity in design, modesty in price, reliability, and an unprecedented 7-year warranty!* We know you'll hear the distinction immediately. *Audition the new Models 9300 and 9500* **trans•*nova*** *amplifiers at your local Hafler dealer and hear incredible tube sound...* ***without the tubes.***

Model 9500

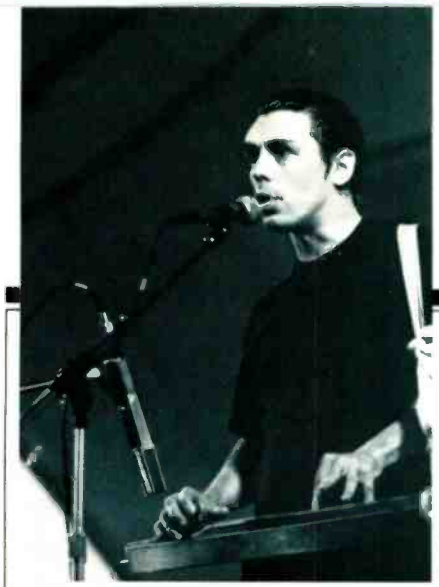
Hafler®

"THE AFFORDABLE HIGH END"

Hafler, A Division Of Rockford Corporation
Tempe, Arizona 85281 U.S.A. 1-800-366-1619
In USA, Fax (602) 894-1528
In Canada, Call Korbon Trading (416) 567-1920
In Europe, Fax (49) 421-487-877
In Pacific Asia, Fax (65) 339-0363

*7-Year warranty valid only in the USA

Enter No. 13 on Reader Service Card



Photograph: ©Carla Gahr

David Massengill has a gentility to his melodies that comes largely from writing them on dulcimer.

Mondo Bizarro, their 11th and newest studio album, spins like sworn testimony of how artists become more eclectic (bizarro?) as they get older. Witness singer Joey Ramone's recently adopted crooning shtick that places him somewhere between Perry Como and Billy Idol. Conversely, thank god, are the songs that truly make *Mondo Bizarro* a Ramones album—the uptempo stuff like "Anxiety" or "Tomorrow She Goes Away," the latter addressing an obsessed fan of the opposite sex in typically comedic Ramones style, and evidence that Joey's sense of humor hasn't fallen by the wayside.

Worth mentioning are a fine cover of The Doors' "Take It As It Comes," backing vox from Flo and Eddie, and guitar work from Vernon Reid. In the producer's chair is Ed Stasium, a true master of the art of recording hard rock/metal bands.

Although *Mondo Bizarro* isn't a quintessential Ramones album, it is a milestone for the band—the first for a new label and with a new bass player (C. J. Ramone) after many years. More important, it's an offering of some wickedly good new Ramones songs worth turning your amp up to 11 for.

Michael Bieber

Coming Up for Air: David Massengill. **Flying Fish FF 70590.**

David Massengill, a most gracious and charming songwriter, has a gentility to his melodies that comes in large part from writing them on a dulcimer. Sentiment for the underdog is a key theme in his songs, and Massengill uses it effectively in a story about an illegal alien's escape ("My Name Joe"), the title song, an Abbie Hoffman tribute called "Don Quixote's Lullaby," and the outlaw ballad "On the Road to Fairfax County." With the help of Steve Addabbo's subtle yet classy production, this is an album of exquisite craft.

Michael Tearson

The Extremist: Joe Satriani. **Relativity 88561-1053-2.**

With *The Extremist*, Joe Satriani shifts from painstaking solo studio creation to "playing with a band," one that includes Matt and Gregg Bissonette and Paulinho Da Costa, among others. Co-production by Andy Johns results in sweet, stinging instrumental melodies that range from ballistic blues-rock to flowing minor-key exotica and soaring poetic nirvana in the harmonic mode of Eric Johnson. Performing with real people adds a welcome human dimension to Satch's metaphysical presence, although it also gives some of the material a less cosmic aura similar to others working the neoclassical mine of inspiration. *Michael Wright*

The Criminal Under My Own Hat: T Bone Burnett. **Columbia CK 45213.**

T Bone Burnett returns to form here with a spare, stripped-down album, the focus squarely on the songs, which is where it should be. He alternates between a Nashville backup band of Mark O'Connor, Jerry Douglas, and Edgar Meyer and an L.A. crew of Mark Ribot, Jerry Scheff, and Jim Keltner. Burnett's songs do moralize a bit, but his skewed imagery and lyricism are ever-fascinating as he gazes into apocalypse. *The Criminal Under My Own Hat* is like an album of some great Bob Dylan songs that Dylan never wrote. *Michael Tearson*

Joe Satriani

T Bone Burnett

Photograph: Steve Nilsson

Gravity: Alejandro Escovedo. **Watermelon CD 1007.** (Available from Watermelon Records, P.O. Box 402088, Austin, Tex. 78704.)

Alejandro Escovedo's solo debut skips deftly from genre to genre: Folk-rock ("Paradise"), gentle waltz ("Broken Bottle"), Rolling Stones territory ("One More Time"), country, jazz, and on around the musical map. Best of all, he does all of this with confidence and authority, backed by an army of Austin's best. A very strong album in both conception and execution, *Gravity* has made a firm believer out of me.

Michael Tearson

Outward Bound: Sonny Landreth. **Zoo/Praxis 72445-11032-2.**

Sonny Landreth is a thrilling slide guitarist whose playing has lit up a whole lot of records. He's one of those rare players whose very presence on the lis: of sidemen makes me rush to hear a record. He's also spent time leading John Hiatt's backup band, The Gone Gators. His own album owes a lot to Hiatt's sharp brand of song making, especially in "New Landlord" (an ode to gambling addiction) and "Common-Law Love," both of which feature Hiatt singing along. *Outward Bound* features a steady dose of Landreth's spirited playing and a healthy variety of styles. *Michael Tearson*

Photograph: Neil Zlozower

THE IMPRESSIONISTS

A Windham Hill Sampler

Windham Hill reaches back through time to present a sampler of enchanting classical music from 19th century France; both modern and traditional interpretations of Ravel, Debussy, Fauré, and Satie as performed by a variety of label artists. Some things are timeless.

The licks Jimmy Page tossed off 30 years ago are more entertaining than most of his stuff after Led Zeppelin.

Jimmy's Back Pages . . . The Early Years: Jimmy Page with various artists. **Sony Music Special Products AK 52428.**

Imagine the horror on Jimmy Page's face when he sees 22 songs from his years as a session man (the early to mid-'60s) compiled on one disc with his face on the front! Actually, it's not as bad as all that—the licks Page tossed off without half-thinking almost 30 years ago provide more musical entertainment than most of the stuff he's cut since Led Zeppelin went belly-up. Most of the artists here fall into the categories of Yardbirds sound-alikes (The Authentics, The First Gear), typical mid-'60s Brit pop bands (Les Fleurs De Lys, The Lancastrians), or solo artists (Nico, Donovan), and with the exception of the last category, hardly any of these entities have seen their recordings rereleased—the only thing they have going for them is young Jimmy Page's searing guitar work. Few, except for the diehard Page-maniacs, will find much here that bears up to repeated listenings, but this is a fair companion disc to the bootleg *Session Man*, which is not readily available. The liner notes provide almost as much amusement as the music. *Jon & Sally Tiven*

Ferment: Catherine Wheel. **Fontana/Mercury 314 512 510 2.**

Catherine Wheel's debut spins their dense guitar web around a core of solid melodies and airy vocals. Though chomping guitars grind, vocals stand out in careful mix. Enjoying huge popularity overseas as a live band, Catherine Wheel makes the transition to disc with the help of producer Tim Friese-Green (Talk Talk). His contribution to Wheel's studio persona explains a hint of similarity to Talk Talk's slow deliberate songs coupled with a detached singing style, most evident in the eight-minute "Black Metallic." Heavy cymbal-ism gets tedious (in ballads?) but it works with the reedy vocals and this distinctive material.
Toby Haber

0898: The Beautiful South. **Elektra 61308-2.**

The Beautiful South effortlessly renders their sophisticated pop melodies and signature lyricism with silken production, courtesy of producer Jon Kelly (Kate Bush, Peter Gabriel), whose work can almost retitle this band The Beautiful *Sound*.

Slyly perched on their smooth melodies are bittersweet stories about what people do to each other and themselves. A drunk ("Old Red Eyes Is Back") and a prostitute ("36D") are part of *0898*'s pathetic cast of characters. While the signature black humor that appeared on the band's 1990 debut is still here, it takes a back seat to empathy. But the lack of contempt has not stopped them from being wickedly clever. *Toby Haber*

Hearing is Believing.

"Rooms with good sound included Clearfield...The impressive and reasonably priced Metropolitans were driven by Counterpoint's gorgeous new monoblocks." -Robert Harley, **Stereophile**, April '92, Vol. 15, No. 4.

"The pride of this new line is an imposing, beautifully crafted tower dubbed the Metropolitan ($6000/pair) in Walnut, Light Oak, Black Oak, or Cherry. After listening a few minutes, I asked designer Albert Von Schweikert if he was a musician. He beamed and said, "Yes, a pianist" Indeed, his speakers are finely tuned instruments." —Lawrence B. Johnson, **CD Review**, March '92.

"...The sound had an airy, detached-from-the-speakers quality that's rare in speakers of their size, bass response, and dynamic capability..." --Robert Deutsch, **Stereophile**, Vol. 15, No. 4.

The Clearfield Metropolitans were selected for the CES Design and Engineering Exhibition as **most innovative new product, 1992.**

On the Clearfield Continentals ($3000/pair); "The Continental has a way of sonically disappearing into the room - of disassociating its physical self from the recorded event to where, if the eyes are closed, only the music remains. Its presentation and the vividness of its imagery is tactile to a degree that I am tempted to say that "seeing is believing." —Martin G. DeVuli, **Bound for Sound**, No. 6a/92

Model shown: Metropolitan

The introduction of the new Clearfield line caused quite a stir at CES. To hear why, may we suggest you call the number below to receive literature and information on the nearest Clearfield dealer to you.

CLEARFIELD BY COUNTERPOINT

1 (800) 275-2743

Enter No. 10 on Reader Service Card

MINGLING WITH MINGUS

Photograph: © David Gahr

Weird Nightmare: Meditations on Mingus: Various artists
Columbia CK 52739, CD; 74:15.

Sound: B+ Performances: B+

Producer Hal Willner is at it again, setting a horde of motley improvisors and rock renegades on the compositions of a musical icon. He's already done it to Nino Rota, Thelonious Monk, and the music of Disney movies, and now to Charles Mingus. After several of these albums, the results are becoming almost predictable, as Willner pulls from the same coterie of players—Bill Frisell, Vernon Reid, Henry Threadgill, Marc Ribot, et al.

The big twist on this particular project is the inclusion of instruments or devices invented and constructed by composer Harry Partch from Pyrex bottles, reed pump organs, and wooden resonators played by strings, and bearing names like cloud chamber bowls, harmonic canon, bass marimba, and chromolodeon. In Partch's music, the sound was like a primitive orchestra from an alien world. Here, Willner deploys the instruments to provide atmospherics and colors.

With Charles Mingus, Willner has chosen a composer whose work not only invited improvisation and interpretation but depended on it. Willner and crew do a wild take on "Work Song," beginning in the foreign landscape of a full Partch ensemble before embarking on bluesy jazz tangents, followed by a Reid/Frisell guitar duet that scrapes and screams until finally reaching a siren crescendo.

Author Hubert Selby, Jr., and vocalists like Robbie Robertson, Henry Rollins, and Dr. John intone the words to Mingus' schizophrenic, pseudo-autobiography, *Beneath the Underdog*. Robertson's grizzled reading is effective, as is Elvis Costello's plaintive vocal on "Weird Nightmare." Keith Richards croaks his way through a gospel arrangement of "Oh Lord, Don't Let Them Drop That Atomic Bomb on Me," and Public Enemy's Chuck D finds his spiritual mentor on "Gunslinging Bird," with help from drummer Michael Blair's stomp-blues arrangement.

Brilliant solos abound, including some slip-sliding clarinet from Don Byron, snarling trombone by Art Baron, and lots of guitars courtesy of Frisell, Reid, Gary Lucas, and Robert Quine.

Weird Nightmare is more cohesive than Willner's past projects—which, with constantly changing ensembles and personnel, sent your head spinning like Linda Blair's in *The Exorcist*. This time, Willner generally uses a core band, playing "conventional" and Partch instruments, to support featured artists like Robertson or Richards, allowing their interpretations of Mingus to spin *you* around.

It is a weird nightmare, and weirdly wonderful music. *John Diliberto*

Photograph: Dave King

Next Exit: Jay Anderson. **dmp CD-490.**

Acoustic bassist Jay Anderson's debut recording contains some truly exquisite moments, with the remainder of the album sparkling pretty nicely too. Most exquisite, perhaps, are the title cut's opening seconds, pairing Anderson with the pastoral synthesizer pads of keyboardist David Witham. Similar lush panoramas appear throughout the album in different contexts, with Anderson's performing and composing skills receiving an excellent showcase. Included in his session band are trumpeter Randy Brecker and up-and-coming guitarist Wayne Krantz, who both contribute fine performances that help this album transcend the stifling categorization of "contemporary jazz." *Michael Bieber*

Help Yourself: Eddy Clearwater. **Blind Pig BP 74792.**

From "Tequila"-inspired Tex-Mex surf riffs to reelin' rockabilly covers of Jimmy Reed, Eddy Clearwater re-creates the smoke-and-stale-beer atmosphere of the Chicago West Side clubs he's worked since the late '50s. As a guitarist, Clearwater whips out thin, whiney leads that slip and slide when you least expect it, creating a distinctive voice that complements his glid-

Effortless

"Theta's Generation III DS Pro does not merely sound better than other digital processors. It literally redefines what digital music can sound like.

With the Theta Generation III, we hear into the music as we have never heard from digital, its stunning and effortless transparency is reminiscent of the clarity we have heretofore encountered only from the world's very finest turntables..."

"The superiority of the Theta Generation III covers all sonic aspects, from transparency to clean purity to stereo imaging."

"...the Theta DS Pro Generation III can give you a total musical experience that you can't get anywhere else from digital."

—Peter Moncrieff
International Audio Review #64

Digital Done Right

Theta Digital Corporation

5330 Derry Ave., Suite R, Agoura Hills, CA 91301
(818) 597-9195 FAX (818) 597-1079

Enter No. 33 on Reader Service Card

Eddy Clearwater re-creates the smoke and stale beer atmosphere of Chicago's West Side clubs on his *Help Yourself.*

ing, throaty vocals and often humorous metaphors like on "Chicago Weather Woman," where his girl is "changing all the time. . . ." Harpists Little Mike and Carey Bell contribute lonesome wail textures to otherwise sparse, clean arrangements. Good work from a blues original. *Michael Wright*

Thru the Years: Anson Funderburgh and The Rockets. **Black Top BT-1077.**

Anson Funderburgh is the ultimate team player. This young Texas blues guitarist embodies the spirit of all the Muddy Waters guitarists who calmly sat on chairs behind their boss, their names barely known, yet played their tails off night after night. Like them, he knows that his job is to contribute to the band, not hog the spotlight.

That spirit explains why Anson Funderburgh and The Rockets featuring vocalist Sam Myers is one of today's finest blues bands. The proof is in *Thru the Years*, a highly recommended 11-year retrospective. Anson's got great chops and a stranglehold on a variety of styles, but he's never forgotten the virtues of economy. His work is required listening for guitarists who confuse eloquence with length, and technique with passion. *Roy Greenberg*

Lost Tribes: The Zawinul Syndicate. **Columbia CK 46057.**

An immense part of Josef Zawinul's genius lies in his ability to make synthesizers sound as genuine as a Steinway or a Stradivarius. Then, of course, there's the music he plays on 'em. *Lost Tribes*, the third effort from his post-Weather Report band, is hardly a "world beat" project, but Zawinul still wears his Marshall McLuhan hat. On *Tribes*, Zawinul's trademark use of African-influenced melodies in his vocals and synth lines continues. He goes further by including South African musicians on one cut while deploying sampled sound bites depicting a typical Soweto day on another. Drawing from a different region, bassist Gerald Veasley contributes the neo-flamenco "San Sebastian." *Michael Bieber*

Fats and His Buddies: Fats Waller. **RCA/Bluebird 61005-2.**

This is a standout among the many Fats Waller reissues for its variety, energy, excellent restoration sonics, and several tunes most fans haven't heard previously. There are eight tracks featuring Fats and His Buddies (who included Red Allen, Eddie Condon, Jack Teagarden, Gene Krupa, and Jabbo Smith), seven are with Morris' Hot Babies, and six are with the Louisiana Sugar Babes, incorporating the great Estey pipe organ in Victor Records' converted church-studio in Camden, N.J. Due largely to the intelligent and subtle use of the CEDAR noise-reduction system (as well as the excellent quality of the original 1928 recordings), I could discern the ambience of the church—something I'd never heard on any 78s. *John Sunier*

SONY

SONY AND BILLBOARD UNLEASH THE POWER OF MUSIC™

UP TO 3 FREE DECADE OF MUSIC CDS WITH PURCHASE OF ANY SONY CD PLAYER.

A decade ago Sony unleashed the power of music by introducing the world's first Compact Disc player. To commemorate this anniversary, Sony is offering, with the purchase of any Sony CD player, an exclusive collection of CD hits compiled directly from the Billboard charts. Visit your Authorized Sony Dealer or call 1-800-451-2248 (Access Code #41281) for a coupon with all the details on this offer, and let Sony CD Unleash the Power of Music for you.

For great music entertainment, watch for the Billboard Music Awards on Fox Television, December 9, 1992.

COMPACT DISC 10 10TH ANNIVERSARY

DEALER SHOWCASE

Visit these specialty retailers for professional consultation

CALIFORNIA

The DAT Store

NOW IN STOCK: CD RECORDERS

DIRECTLY RECORDS AUDIO FROM ANY SOURCE • FINAL RECORDED DISCS COMPATIBLE W/CD PERFORMANCE

NEW IN STOCK: "SCOOPMAN" RECORDER

ULTRA SMALL STAMP SIZE CASSETTE • LONG BATTERY LIFE W/ A SINGLE "AA" BATTERY • DIGITAL STEREO RECORDING

COMING IN OCTOBER: DCC

DIGITAL RECORD/PLAYBACK W/OUTSTANDING SOUND QUALITY • PLAYBACK COMPATIBILITY • QUICK TRACK ACCESS W/ADDRESS DATA • TEXT INFORMATION DISPLAY

COMING IN NOVEMBER: MINIDISC

QUICK RANDOM ACCESS • TOTAL DURABILITY • SHOCK & VIBRATION RESISTANT PORTABILITY • RECORDABLE DISCS • SUPERB COMPACTNESS • CD QUALITY SOUND

IN STOCK SINCE 1988: DAT RECORDERS

OVER 25 MAKES & MODELS • SALES • RENTALS • REPAIRS DUPLICATIONS DAT TO DAT & DAT TO CD • 4MM DATA CARTRIDGE & BLANK DAT TAPE (S HOUR AVAILABLE) ACCESSORIES & BLANK MEDIA FOR ALL RECORDERS

THE DAT STORE • 2624 WILSHIRE BOULEVARD
SANTA MONICA • CALIFORNIA • 90403
WEEKDAYS 9-6/SATURDAYS 11-4/CLOSED SUNDAYS
FAX: 310-828-8757 • 310-828-6487

CALIFORNIA

More than 50000 CDs ON-LINE

WORLD'S LARGEST ON-LINE AUDIO COMPACT DISC STORE

Discount prices • Fast delivery
Free shipping for orders of $100 or more

Modem: 408-730-9015
Up to 9600 bps 8-N-1
or call to order 408-733-0801

COMPACT DISC CONNECTION

VISA MasterCard

1016 E. El Camino Real • Sunnyvale, California 94087

CALIFORNIA

SYNERGY

Def: That phenomenon whereby the end result is greater than the sum of the parts: i.e. a home entertainment system created by The Systems Design Group, which is celebrating the grand opening of a new Beverly Hills location.

Purveyors of:
Alon • Adcom • Audioquest • Audiostatic • B&W • B&O • Carver • Celestion • Counterpoint • Definitive Technology • Denon • Fosgate • Grado • Klipsch • Lexicon • Linaeum • Marantz • McCormack • Mod Squad • M&K • NAD • Paradigm • Proton • Rock Solid • Rotel • Sci-Fi Tesla • Terk • Theta

Systems Design Group

(310) 370-8575
1310 Kingsdale Ave
Redondo Beach, CA 90278
261 N. Robertson Blvd.
Beverly Hills, CA 90211
(310) 205-0166
Mon-Fri 11am-7pm
Sat 11am-6pm

CALIFORNIA

Before you invest your money, spend some time with us.

Call us for expert advice on custom home and theater sound systems at affordable prices. We offer fast, convenient shipping and provide unparalleled service after the sale.

REFERENCE
AUDIO • VIDEO

310 517-1700 • FAX 310 517-1732
18214 DALTON AVENUE, DEPT A, GARDENA, CA 90248

AUTHORIZED DEALER FOR: AKG • ALON • ATLANTIC TECH
AUDIBLE ILLUSIONS • AUDIOQUEST • AUDIO ALCHEMY
AUDIO CONTROL • BEYER DYNAMIC • BOSE • CAL AUDIO LABS
CARVER • CELESTION • CLEARFIELD • COUNTERPOINT • CWD
DAHLQUIST • DCM • FOSGATE • GENESIS • GRADO SIGNATURE
HAFLER • HARMAN KARDON • HUGHES • INFINITY • JAMO • JBL
LEXICON • MAGNUM/DYNALAB • McCORMACK • MUSE • NAD
NESTOROVIC • NHT • NILES • OHM • ONKYO • PARASOUND
PHILIPS • PIONEER • POWER WEDGE • PROTON • PROAC
PS AUDIO • ROOMTUNE • REVOX • SONANCE • SONY • STAX
TARGET • TDK • THORENS • TICE • VELODYNE • VPI • AND MORE!

CALIFORNIA

"For The Magic Of Music."

Optimal Enchantment

Our customers are the discerning audiophiles of L.A. These are the DIE HARD MUSIC LOVERS who search everywhere before they buy. These are the most critical listeners, the least easily fooled, and the hardest to please. They seek UNEQUALLED MUSICALITY, which is why they buy here. Allow us to demonstrate our award winning sound & custom installations.

AUDIO RESEARCH - AUDIOQUEST - AUDIBLE ILLUSIONS - ACOUSTIC ENERGY - CAL - DYNACO - ORACLE - PSE - ROTEL - ROWLAND - SME - SOTA - SPICA - THETA - VPI - VERSA - VANDERSTEEN - & more

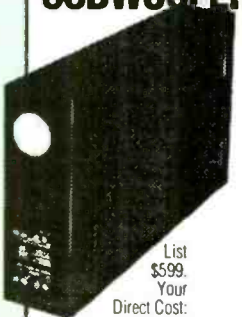
also : AUDIOPHILE RECORDINGS

For personal appointment call:

(310) 393-HIFI

FLORIDA

FACTORY DIRECT HIGH END SUBWOOFER SYSTEM



- Slim 17-1/4Hx30Wx6D
- Hand Crafted Enclosure. 65 lbs!
- 90Db Efficiency
- Response 34hz - 120hz
- 50 -200w per Channel
- High Gloss Laminate Finish
- 7 Year Warranty
- Dual Channel Passive Crossover

List $599.
Your Direct Cost:

$329 EA

SPEAKER WORLD

VISA AMERICAN EXPRESS

Call 10-6 EST. Mon-Sat

1-800-359-0366

ILLINOIS

Reel to Real Designs

New FOCUS Speaker

Authorized Dealer:

- CODA
- Counterpoint
- Cary
- Sumo
- Soundcraftsmen
- Thorens
- Parasound
- Fosgate
- Simply Physics
- Sumiko
- Quicksilver
- Room Tunes

800-283-4644
call for literature

Visit our SPEAKER FACTORY SHOWROOM at 302 Sangamon Ave., Springfield, IL 62702

INDIANA

FREE Catalog For Home & Auto

- J.V.C.
- JENSEN
- CRAIG

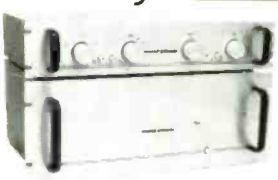
CALL OR WRITE

PIVCO

1801 N. GREEN RIVER RD
EVANSVILLE, IN 47715
1-812-479-3525 • C.S.T. 10-6

IOWA

hawkeyeaudio



- Apature
- Audioquest
- B&K
- Carver
- Conrad-Johnson
- Definitive Technology
- Infinity
- M&K
- Marantz
- Onkyo
- Ortofon
- Paradigm
- Polk Audio
- Sharpvision
- Sonographe
- Sony
- Spica
- Stax
- Thorens
- Yamaha

319-337-4878
401 S. Gilbert, Iowa City, IA 52240

DEALER SHOWCASE

MAINE

Acurus . . . Aragon . . . Audible Illusions . . . Audioquest . . . Audio Research . . . Bryston . . . Compact Discs . . . Creek . . . CWD . . . Denon . . . Grado . . . Jamo . . . Lexicon . . . Livewire . . . Magneplaner . . . Magnum Dynalab . . . Mark Levinson . . . Mission . . . NAD . . . Near . . . Prometheans . . . PSB . . . Pulsar . . . Revolver . . . Rotel . . . SME . . . Sota . . . Stax . . . Stewart . . . Sumiko . . . Sumo . . . Symdex . . . Thoren . . . VPI . . . And Much More!

Hi Fi Exchange

FORESIDE MALL • ROUTE ONE
FALMOUTH, ME 04105
(207) 781-2326

MASSACHUSETTS

The Best Values In Hi End Hi-Fi.

audio studio

Authorized sales and service for:
Adcom, Advent, AR, Audible Illusions, Audioquest, B&K, Bedini, Beyerdynamic, Cardas, Celsestion, Counterpoint, Dual, Hafler, Harman/Kardon, KEF, KLH, Klyne, Maplenoll, Marantz, Mirage, Monster Cable, Morel, NAD, Nakamichi, Ortofon, Proton, QUAD, Revox, Sennheiser, SME, Shure, Sony ES, Stax, Straight Wire, Teac, Technics, Thorens, Velodyne, VPI, and many more.

303 Newbury St., Boston, MA 02115
(617) 267-1001
414 Harvard St., Brookline, MA 02146
(617) 277-0111
INTERNATIONAL BUSINESS ACCEPTED

MINNESOTA

1 (800) 229-0644

RECORD PLAYER NEEDLES AND CARTRIDGES. World's Largest Selection and Lowest Price!!

The needle doctor sells all major lines of **needles and cartridges**. Great variety! He stocks audio, video, phone accessories, record care, & headphones too.
M-Sat 10-7 Sun 12-5
419 14th Avenue SE
Minneapolis, MN 55414
(612) 378-0543 FAX: (612) 378-9024

Jerry Raskin's
Needle Doctor

MISSISSIPPI

IDEAL ACOUSTICS

Full line of speakers by:
DUNTECH - KLIPSCH - B&W PARADIGM
Electronics by:
AUDIO RESEARCH - CROWN - NAD NAKAMICHI - WADIA - DENON OPTONICA VIDEO
Accessories:
AUDIO QUEST - SIGNET - TELARC
Used:
DUNTECH MARQUIS - THIEL CS3.5 CELESTION SL600 - ACOUSTAT 3 KEITH MONKS - RECORD CLEANER HP 339A DISTORTION ANALYZER

100 Russell Street
Starkville, MS 39759
601-324-1020
After hours call 601-323-4001

NEW JERSEY

Audio Connection

- Acoustic Energy
- Audible Illusions
- B & K
- Counterpoint
- Creek
- Dynaco
- EAD
- Fried
- Kimber Kable
- Lectron
- Magnum Dynalab
- Melos
- Micro Mega
- Morch Arms
- Musical Fidelity
- Music Reference
- N.E.A.R.
- Parrasound
- Powerwedge
- Pro Ac
- PSB
- PSE
- Quicksilver
- Rega
- Rotel
- Spendor
- Spica
- Unity
- VAC
- VANDERSTEEN
- VPI

615 Bloomfield Avenue,
Verona, N.J. 07044

(201) 239-1799
TUBES & CABLES

NEW JERSEY

SAVANT AUDIO

Providing the Ultimate In Products & Services

Consultancy • Custom Systems
Acoustic Treatment • Installation
Home Theater • Retail • Worldwide

Air Tangent • Allegro • Apex
Arcici • Athena • Air Tight
Audio Prism • AudioQuest
Audiostatic • Basis • Benz
Bitwise • Cardas • Chario • Chesky
Clarity Audio • Creek • CWD
Delos • Dorian • EAD
EKSC • Electron Kinetics
Eminent Technology • Ensemble
Epos • Essence • First Sound

Fosgate • Geman Acoustics
Harman Video • Harmonia Mundi
Kinergetics • Klyne • Last
Lectron • Magnan • Merrill
Mod Squad • Mogami • Morch
Nestorovic • Neutrik • Nimbus
Opus3 • Power Wedge
Presence Audio • Pro Ac
Proprius • QED • Rega
Reference Recordings • Roksan
RoomTune • Rotel • Sequerra
Sheffield Labs • Sims • Sumiko
Symphonic Line • Tara Labs
Target • Tice Audio • Wadia
Water Lily • WBT
and More

In New York & New Jersey
800-628-0627 609-799-9664

NEW YORK

60 Years in Business... We Must be Doing Something Right!

Apogee • Audio Quest • C.A.L. • Classe • Magnum • Monster Cable • B&W • NAD • Nakamichi • Straightwire • Sumo • Velodyne • Carver • Rotel • Signet • Genesis • Kinergetics • Target • B&O • Arcici • Fosgate • Lexicon • Listen Up • Sonographe • Sony ES • Tice • B&K • Thorens • Dahlquist

Consult a Quiet Expert

Square Deal

456 Waverly Ave., Patchogue, NY 11772

Local: ***(516) 475-1857***
Others: ***1 800 DEAL-441***

NEW YORK

ALPHA STEREO

Quality Components, Professional Installation & Service

NAD

"We are known for the companies we keep"

Adcom, NAD, Rotel, Onkyo, Denon, Mission, B&W, Soundstream, Audioquest, Paradigm, Monster Cable, M&K, Ortofon, AKG, Stax, Polk Audio, Sharp Vision, Sony ES, Target, Atlantic Technologies, Audio Alchemy, Beyerdyamic

Northern NY's oldest & most renowned dealer.

345 Cornelia St., Plattsburgh, NY 12901
518-561-2822
Fax: 518-561-2961

Monday-Friday 10am-8pm, Saturday 10am-6pm
Mastercard, Visa, Discover, Amex

DEALER SHOWCASE

NEW YORK

- Acoustat
- Audio Alchemy
- B & K
- Canton
- Celestion
- Conrad Johnson
- Counterpoint
- Duntech
- Enlightened Audio
- Harmon Video
- Jadis
- KEF
- Lexicon
- Monitor Audio
- Motif
- NEAR
- NHT
- Pioneer Elite
- Runco
- Snell
- Sonographe
- Straightwire
- Synthesis
- Tice
- VPI
- Wadia
- XLO

& Much More

973 Northern Blvd., Great Neck, NY 11021
PHONE & FAX (516) 627-4456
THE DISCRIMINATING EAR

NEW YORK

GRADO audio-technica TWEEK

TIPTOES LASC MONSTER CABLE

Dynavector Bang&Olufsen PICKERING

YOUR SEARCH IS OVER!

We specialize in hard to find phono cartridges and original replacement styli only!!

(800) 221-0906

CALL TOLL-FREE FOR FREE PRICE QUOTES AND VISA/MC ORDERS
N.Y. STATE (516) 599-1112

SEND SELF ADDRESSED STAMPED ENVELOPE FOR OUR FREE CATALOG.

VISA

LYLE CARTRIDGES
115 South Corona Avenue
Valley Stream, N.Y. 11582

Phones Open Mon-Sat 9 am-8 pm

ortofon SHURE STANTON

PENNSYLVANIA

PHILADELPHIA AUDIOPHILES

Acoustic Energy	Jadis	PSB
Altis Audio	J.A. Michell	Rega Planar
Audible Illusions	Kimber Kable	Roksan
Audio Alchemy	Kinergetics	Rotel
Audiolab	Klyne	Sci-Fi
Audioquest	Koetsu	Snell
Avalon	Maplenoll	SOTA
Bitwise	Meridian	Soundcraftsmen
B&K Components	Micromega	Sound Lab
Cary	Mission/Cyrus	Stax
Celestion	MIT	Sumiko/SME
Classé	M&K Sound	Target
Counterpoint	Monitor Audio	Unity Audio
Duntech	Muse	VAC
Dynavector	NAD	VPI
Eminent Tech.	Oracle	Well Tempered
Ensemble	Parasound	Wheaton
Genesis	PS Audio	XLO Electric

DAVID LEWIS AUDIO
At Sound Service Company
8010 Bustleton Ave. (215) 725-1177
Philadelphia, PA 19152
Bank Cards Accepted

TENNESSEE

cag **CUMBERLAND AUDIO GROUP**

REPRESENTING:
AUDIO QUEST · AUDIO RESEARCH · B&K AUDIO · B & W · BASIS · CALIFORNIA AUDIO LABS · CELESTION · CLASSE · CONRAD-JOHNSON · DAY SEQUERRA · GRAHAM · LINN · LYRA · MIT CABLE · MOD SQUAD · ORACLE · REGA · ROTEL · JEFF ROWLAND DESIGN GROUP · STAX · STRAIGHTWIRE · SUMIKO · TARGET · THETA DIGITAL · VANDERSTEEN · V A C · WELL TEMPERED · WILSON & MORE · CD's & LP's ·

CREDIT CARDS · DELIVERY · SET UP · MON-SAT 11-6

4119 HILLSBORO RD · NASHVILLE, TN 37215
(615) 297-4700

VERMONT

Vermont's Audio Leader!

SUMIKO
PARADIGM
A&R CAMBRIDGE
DENON · SUPERPHON · KLIPSCH
B&K · ADVENT · ADS · ROTEL
REGA · STRAIGHTWIRE · AUDIO CONTROL · AKG · SENNHEISER
CREEK · GRADO TARGET · GOLDRING
AUDIOLAB · SPICA · KIMBER · AIWA
MAGNUM · SHARP VISION · ACURUS
PINNACLE · DEFINITIVE TECHNOLOGY
ACOUSTIC RESEARCH · ARCICI
CHICAGO · HUGHES

INTELLIGENT AUDIO AT REASONABLE PRICES"
802-863-4372

city stereo

207 College St • Burlington, VT 05401

VERMONT

HERE IN VERMONT, PEOPLE DEMAND VALUE. WE DON'T WASTE CUSTOMERS' MONEY, AND NEITHER DO THESE FOLKS:

ADCOM AUDIOQUEST B&W DUAL
GRADO HAFLER LUXMAN MIT
MODSQUAD MONSTERCABLE ONKYO
ORACLE ROTEL SIGNET SUMIKO
SME TANNOY THORENS WHARFEDALE

FIVE-YEAR WARRANTIES ON ALL NEW EQUIPMENT
100% FINANCING AVAILABLE
90 Days Same as Cash
FREE INSTALLATION IN CONNECTICUT RIVER VALLEY & NYC

SCIENTIFIC STEREO
800-456-4434
802-257-5855
128 MAIN ST BRATTLEBORO VT 05301

WEST VIRGINIA

THE BEST IN HOME GROWN AUDIO.

Hi-Fi Farm

FEATURING:

Philips, Quad, Alon, Scientific Fidelity, McCormack, OCM, Magnum, Lexicon, Snell, Woodside, Roksan, Spendor, B&K, Kimber, VMPS, Modsquad, Cardas, Harman Video, and many more.
Also featuring high end used equipment, fully guaranteed!

735 S. Kanawha, Beckley, WV, 25801
International Business Accepted on:
1-304-253-5450
Nationwide Toll Free:
1-800-752-4018
All major credit cards accepted.

WISCONSIN

The Sound Seller

For the Musical Difference

Authorized Dealer For:

Acoustat	NAD
Audio Control	Onkyo
M&K	Harmon Kardon
Nitty Gritty	Lexicon
Celestion	PROAC
Carver	Dahlquist
Kinergetics	Target
Monster Cable	Velodyne
Nakamichi	Grado
Niles	Atlantic Technology
Fried	Apature
Thorens	CWD
Proton	STAX
Component Guard	Sony

2808 Cahill Road
P.O. Box 224
Marinette, WI 54143
1-800-826-0520 (715) 735-9002

Dealers...

Just as you're reading this ad, so are thousands of potential customers.

For complete information on placing your ad,

Call 800-445-6066

CLASSIFIED ADVERTISING

For advertising rates—please call 800-445-6066 (9am-5pm e.s.t.).

ANNOUNCEMENTS

ACT AUDIO gives good sound!
A professionally designed listening room costs less than some CD's. Send SASE for details. ACT AUDIO, 619 Moon Clinton Rd., Coraopolis, PA 15108.

UNIVERSITY AUDIO SHOP, MADISON, WI... Best sound for dollars? We have many solutions! Dealer: B&K, KEF, Paradigm, Vandersteen, Parasound, Micromega, AudioAlchemy, Rega, Roksan, AudioQuest, Symphonic Line, Modsquad & others. (608) 284-0001.

AUDIO CLASSICS

Buys-Sells-Trades-Repairs-Modifies.

Amplifiers: Accurus A250 $750, 2004II $1099, 4004 $975; Audio Research D40 $795; Audire DM700 $699; B&K M200/Bal $1799; Berning EA2100 $2099; Carver M1.5t $399; Cary Audio SLA70DLH $1069; Counterpoint SA100 $899, SA12 $825, SA220 $1995; Electrocompaniet Amp II $799; Jadis Defy 7 4575; Janis Interphase 1A $375; Krell KSA150 $3550, KSA250 $4900, KST100 $1999, Lazarus H1A $899; McIntosh MC2120 $799, MC240 $1400, MC250 $499, MC2500 $2900, MC275 $2899, MC50 $599, MC75 $2495, MC754 $699, Motif MS100 $1825; Precision Fidelity M7A $399; PS Audio 200C $1199; Quad 306 $599, SAE A205 $399; Soloist OCM200 $1289, OCM500 $2099; Sonograph SA120 $599. **CD Players:** Adcom GCD575 $359; B&O CDX $300; CAL Aria $595, Icon $399; Discrete Technology FD2040 $199; Kinergetics KCD40 $1899; Krell CDDSP Custom $2533, MD2 $1999; McIntosh MCD7000 $749, MCD7007 $1499; NAD 5240 $249, 5300 $700; Yamaha CDX111OU $499; **CD Processors:** Arcam Delta Black Box $299; Krell SBP32X $1999; Philips LHH1002 $799. **Crossovers:** Crown VFX2 $299. **Equalizers:** Audio Control C101 $325. **Headphones:** Stax ED1 $475, Lambda $399, Lambda Signature $1499, Sigma $379, SR80MX $299. **Integrated Amps:** MA5100 $350, MA6100 $449, MA6200 $1199. **Line Conditioners:** Tripp-Lite BC325 $399, LC1800 $249. **Preamps:** Amber FF17 $199; Apt Holman $200; Audiolab 8000C $349; B&K CS115 $269; Bedini BC800 $999; Carver C1 $299; Hafler SE100 $287; Jadis JPL $4995; Kinergetics KPA2 $999; Krell KBL $3200, KSL $1499, PAM5 $1125; Levinson 26 $3499; Marantz 7T $495; McIntosh C20 $349-799, C22 $1699, C26 $299, C27 $499, C28 $449, C29 $999, C31V $1200, C32 $899, C35 $1295, C504 $550; Mod Squad Line Drive Deluxe $699; Motif MC9 $799; MTI 500 $399; Precision Fidelity C7AII $380, C8 $399; Reference Line 1000 $299; Soloist OCM55 $1129; VSP Straightwire II $499. **Processors:** Benchmark Acoustics ARU $299; Fosgate 101A $249; Lexicon CP1 $799, CP2 $799; Yamaha DSP1 $449. **Receivers:** Carver 2000 $999; Kyocera R461 $399; McIntosh MAC1700 $249, MAC4100 $999; MAC4280 $1558; Nakamichi SR3A $449, TA3A $599; Scott 340 $299; **Record Cleaners:** VPI HW16.5 $375. **Speaker Switches:** Audio Control 15 $199. **Speakers:** Acoustic Energy AE1 $1589; Apogee Diva $6666, Major $2999, Minor $799; B&W 801 Matrix II $2999, 802 Matrix III $3483, 804 Matrix $1775; Dahlquist DQ20i $1145; Infinite Slope .6A $399; Infinity Kappa 5 $399, Kappa 6 $559; Janis W1 $399; JBL 4408 $549; KEF 103/3 $999, 105/3 $2399, 107/2 $4195, C35B $299, C35W $285, C55 $399, C85 $599, Q60 $499, Q80 $499; Kinergetics SW800 $3369; Klipsch Quartet $649; Martin-Logan CLSIIa $2200; McIntosh ML1C $550; XR1052 $999; Phase Tech PC80 $375; Polk SDA1A $699; ProAc Mini Tower $1299; Quad ESL63 $1995; Ryan MCL3 $899; Snell KII $299; Tannoy K3838 $799; TDL Studio 1 $965, Studio 3 $995; Velodyne F1200 $995, ULD 15II $1195. **Tape Decks:** Nakamichi CR7A $995; Sony PCMF1 $920. **Tonearms:** Dennesen ABLT1 $400; SME V $999; Syrinx PU4 $499. **Tuner Preamps:** McIntosh MX110 $399, MX112 $399, MX113 $449, MX17 $1199. **Tuners:** Carver TX11 $288; Creek T40 $399; Hafler DH330 $175, SE130 $289; Kenwood KT7001 $99; Magnum Dynalab Etude $1179, F205B17 $257, FT101AS19 $725, FT11S17 $399; McIntosh MR500 $699, MR510 $839, MR65B $299, MR7082 $1195, MR7083 $1299, MR71 $899, MR80 $1350; Sansui TUX701 329; Tandberg TPT3001A $1295. **Turntables:** B&O 3300 $249; VPI HW16.5 $375, HW19IV $1499. **Video Disc Players:** Denon LA2000 $299; NAD 5900 $599. **FREE Catalogue.** 8AM-5PM EST Mon-Fri., **AUDIO CLASSICS** POB 176 AAA, Walton, NY 13856.

607- 865-7200

ANNOUNCEMENTS

THE LNPA 150 MONOBLOCK POWER AMPLIFIER; clarity, immediacy, and accurate harmonic content never before heard in high end audio. Designed to please a musician's ears and built for longevity. "Some of the best solid state I have ever heard." Brian Cheney; VMPS Audio Products. R.E. DESIGNS, 510 Western Avenue, Lynn, MA 01904. (617) 592-7862. Available to audition at The Listening Studio, Boston, MA.

EUROPEAN TUBE ELECTRONICS: KLIMO, LECTRON, VERDIER and others; the MORCH tonearms from Denmark, the VERDIER turntables from France. Also outstanding classical/jazz CDs and LPs from six European countries (catalog $3.00). All items imported/distributed exclusively by **AUDIO ADVANCEMENTS,** PO Box 100, Lincoln Park, NJ 07035. For info and dealer near you call: 201.633.1151!

CALL US
FOR QUALITY AUDIO
AT THE LOWEST PRICES
WITH FAST SERVICE,
EVEN ON ESOTERIC ITEMS

SOUND ADVICE . . . without the price

AUDIO OUTLET (914) 666-0550
P.O. Box 673
Bedford Hills, New York 10507-0673

CD IMPORTS

KYU SAKAMOTO	Best • Features 'Sukiyaki' (JPN)	$34.99
CHIFFONS	Greatest Recordings (UK)	$21.99
THE RASCALS	Best (All Stereo!) (JPN)	$26.99
OLIVIA NEWTON JOHN	Best (JPN)	$29.99
PETULA CLARK	Greatest Hits (SWDN)	$19.99
CASCADES	Rhythm of the Rain (JPN)	$24.99
ASSOCIATION	Greatest Hits (JPN)	$24.99
KOOL & THE GANG	Best Of (JPN)	$23.99
TONY ORLANDO & DAWN	Greatest Hits (JPN)	$29.99
SONNY & CHER	Collection (JPN)	$23.99
JAMES TAYLOR	Live in Rio (BRZL)	$21.99
LAURA BRANIGAN	Best (JPN)	$24.99
PETER, PAUL & MARY	Best (JPN)	$26.99

We Specialize in Oldies, Greatest Hits & Classic Rock & Roll ONLY! (No metal. No weird stuff!) Call for FREE List
WE SHIP TODAY! ... ALL MAJOR CREDIT CARDS
Add $4.50 S/H per total order - NY Res. add Tax
CDMO, INC., Dept. AUC, 900 Rt. 110, Melville, NY 11747
Info: 516-385-2366 Orders Only: 1-800-FOR-CDMO

RCS Audio International

US and Canadian Distributors for:

Spendor Loudspeakers
Onix Electronics
Chord Power Amplifiers
British Fidelity

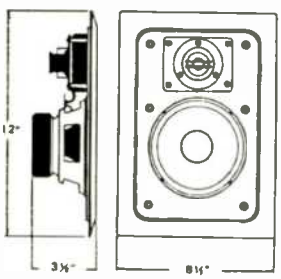
For Further Information Contact:
Peter Ewenko - Sales Mgr.
3881 Timber Ln., Verona, WI 53593
(608)-833-6383 FAX (608)-829-2686

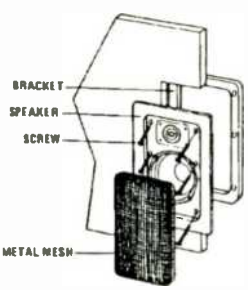
In-Wall Speakers

We are proud to introduce the **WS006** speaker system for in wall mounting. The **WS006** is a complete system: consisting of a Polypropylene 17 cm (6.5") woofer, a soft dome 25mm tweeter, a 12dB crossover filter, housed in a sturdy baffle with an attractive metal mesh grill and beveled frame. Outside measurement is 8.5" x 12" with a depth of 3.5" for easy installation in between 16" stud walls. Cut out size is 7⅛" by 10½". A template and thorough instructions are supplied. The **WS006** comes in white, but can be painted to suit your color requirements.

Specifications:

Impedance	8 ohms
Frequency Response	45 to 20K Hz
Power Handling	40 Watts Nominal
Sound Pressure Level	90db
Resonant Frequency	50Hz
Woofer	6.5" Polypropylene. 10oz magnet
Tweeter	1" soft dome, 6oz magnet
Crossover Frequency	3000Hz
Speaker Weight	69.68oz





Whether you are an experienced installer who is trying to find a way to give your clients a better system, or you are a hobbyist who is building or remodeling and wants access to quality audio installation products, the **WS006** is what you are looking for.

Price: $140 per pair
New construction installation kit: $15/pr

Ordering Information: All speaker orders will be shipped promptly, if possible by UPS. COD requires a 25% prepayment, and personal checks must clear before shipment. Add 10% for shipping, residents of Alaska, Canada and Hawaii, and those who require Blue Label air service, please add 25%. There is no fee for packaging or handling, and we will refund to the exact shipping charge. We accept Mastercard or Visa on mail and phone orders.

Madisound Speaker Components
(8608 University Green)
Box 44283
Madison, WI 53744-4283 U.S.A
Voice: 608-831-3433
Fax: 608-831-3771

ANNOUNCEMENTS

CASH for USED AUDIO & VIDEO EQUIP. BUYING and SELLING by PHONE. CALL for HIGHEST QUOTE. **(215) 886-1650.** The Stereo Trading Outlet, 320 Old York Road, Jenkintown, PA 19046.

CD MAGIC makes CD Music come to life. Clean highs, fabulous detail, marvelous vocals, new musicality. **CD MAGIC stops CD skipping.** CD Magic sprays an invisible film onto CDs for major sound improvement. Will not harm or alter CDs. **CD MAGIC will improve 200 Cds** for audiophile playback. Send $14.95 for new CD MAGIC, postage paid. **Compact Dynamics Co.**, P.O. Box 32014-A Euclid, Ohio 44132.

WESCOTT AUDIO - **Acoustat** Spectra mods, **XLO**, Discovery, **VAC**, Sumiko, Room Tune, Bitwise, **Ensemble**, Sonus Faber, **Muse**, Dynavector, **Power Wedge**, Benz-Micro, **Prodigy**, Edison Price, Eminent Technology, Vampire, Kontak, & the superlative **EAD T-7000 & DSP-7000** transport & D/A converter. Call 800-669-7574 For Info. & Expert Consultation.

SPEAKER
CATALOG

Parts Express is a full-line distributor of electronic parts and accessories, geared toward the consumer electronics industry, and the technical hobbyist. Stocking an extensive line of speaker drivers and accessories for home and car. Send for your **FREE** 148 page catalog today.

Parts Express
340 East First Street
Dayton, Ohio 45402
1-800-338-0531

WHY RENT?
$AVE! $AVE!
CABLE TV DESCRAMBLERS
JERROLD • OAK • HAMLIN • ZENITH
PIONEER • SCIENTIFIC ATLANTA
READY-TO-SHIP!
6 MONTH WARRANTY!
ABSOLUTELY LOWEST WHOLESALE /RETAIL PRICES!
MASTER CARD • VISA
AMEX • C.O.D.
FREE COLOR CATALOG!
1 (800) 950-9145
JP VIDEO
1470 OLD COUNTRY ROAD, SUITE 315-AR
PLAINVIEW, NY 11803 NO NY SALES

ANNOUNCEMENTS

AUDIO UNLIMITED in Colorado offers Acoustic Energy, Acrotec, AirTight, Audio Note, Benz-Micro, Bitwise, Chario, CODA, Dynavector, Ensemble, Ikeda, JM Labs, Lazarus, Magnum Dynalab, Musical Design, ORACLE, Muse, Roksan, Roomtunes, SOTA, Tice, Unity Audio, Wheaton Triplanar, & more... Call John Barnes at (303) 698-0138 or Fax (303) 922-0522. 2341 West Yale Ave., Englewood, CO 80110.

HOSANNA AUDIO: NAKAMICHI PA5II-$875. BELLES 400A-$750. EAGLE 2A-$595. KENWOOD MONO-BLOCKS-$600. REVOX B286 TUNER PREAMP-$595. ACCUPHASE T101-$250. MUST MAN BE BORN AGAIN? JOHN 3:1-18. (313)471-1223.

LOW PRICES! We have a wide selection of audiophile products! FULL WARRANTY, plus extended warranties. PRICES TOO LOW TO PRINT! Sound Shop (206)692-8201.

BIG DISCOUNTS! CALL US!!
BARGAIN PRICES ON CD PLAYERS, SPEAKERS, AND MANY MORE COMPONENTS! FAST SERVICE, FULL WARRANTY. SOUND SHOP (206)692-8201.

VOICE CONTROL & AUTOMATION for your audio/visual system and your home. Amazing DIY products to do your own whole house music/video system. Free catalog. Home Automation Systems. 1(800)SMART-HM; (714) 642-6610.

AUDIOSCAPES GUIDE TO HOME THEATRE. In plain English. The handbook for realizing your new home entertainment system. $12.95. Guaranteed satisfaction. Visa MC. 1-800-888-1711. AudioScapes, Box 17293, Boulder, CO 80308.

CA$H PAID FOR AUDIO & VIDEO EQUIPMENT. AUTHORIZED: **DENON**, HARMAN KARDON, ROTEL, SUMO, ACURUS, ROGERS, CELESTION, ENERGY, SIGNET, ETC. **STEREO CLASSICS**, 75 CHURCH ST., NEW BRUNSWICK, NJ 08901. (908) 220-1144, FAX: (908) 220-1284.

ATTN: QUAD OWNERS! FACTORY AUTHORIZED REPAIRS AND MODIFICATIONS ARE PERFORMED BY QS&D. WE HAVE ORIGINAL REPLACEMENT PARTS AVAILABLE ALONG WITH RECONDITIONED QUAD EQUIPMENT. IF YOU NEED ASSISTANCE PLEASE CONTACT QS&D AT 33 MCWHIRT LOOP #108, FREDERICKSBURG, VIRGINIA 22406. PHONE: 703-372-3711, FAX: 703-372-3713. MC VISA.

AUDIO BY VAN ALSTINE HAS ALL NEW MODELS! Announcing our stunning new FET-VALVE, OMEGA TWO, and TRANSCENDENCE THREE DESIGNS. Our brand new big amplifier chassis features ultra-efficient extruded heatsinks and up to 50% more output mos-fets. We engineered brand new preamplifiers for all budgets (hybrid, tube, and solid state). Big preamps complete with tone controls and 9 sets of inputs for the most complex systems. Fabulous performing straight line preamps at true budget prices. Complete line-only preamps, headphone amps, stereo phase inverters, and more at prices under $300. Many available as complete kits for even greater savings and fun. All hand crafted in the USA. No cheap parts, no "made by machine" layouts. We design to be faithful to the spirit of the music. It's a listening revelation! Write or call for our illustrated catalog. Audio by Van Alstine, 2202 River Hills Drive, Burnsville, MN 55337. (612) 890-3517.

FOR SALE

REPLICA WATCHES & ORIGINALS PREOWNED: Lowest Prices Nationwide! Exact Weight & Color! 18K Goldplated! Moneyback Guaranteed! (404) 963-3872.

UPGRADE FOR LESS! ROGERS' AUDIO IS OFFERING BEST PRICES ON USED AUDIO COMPONENTS. BUY—SELL—TRADE. CALL (509) 966-4431.

AUDIO CABLES & MORE
DON'T PAY EXORBITANT PRICES FOR TOP QUALITY. WE HAVE YEARS OF EXPERIENCE IN WIRE MANUFACTURING AND HAVE SIMULATED THE HIGH PRICED BRANDS. HIGH PRICED EQUIVALENTS AS LOW AS .35/FT. WE DEMYSTIFY WIRE TECHNOLOGY. SEND FOR EXPLANATION LITERATURE WHICH ALSO INCLUDES ALL OUR AUDIO PRODUCTS PRICE LIST OR CALL OUR LITERATURE REQUEST # (800) 321-2108, 24 HRS/DAY. FAX (609) 428-1832. **L A T INTERNATIONAL**, DEP'T A, 317 PROVINCETOWN RD., CHERRY HILL, NJ 08034.

RACK AND CHASSIS BOXES for construction of electronic projects. Low cost; stocked for quick delivery. Call for free catalog. SESCOM, INC. 1-800-634-3457.

FOR SALE

SAVE 40% ON HIGH-END home speakers, subwoofers, amplifiers. FREE CATALOG, 3021 Sangamon Avenue, Springfield, IL 62702.1-800-283-4644.

AA/STEREO TECH.

LOW PRICES/FAST DELIVERY! DENON, NAD, KEF, B&W, ADCOM, CARVER, NAKAMICHI, BOSTON, HAFLER, VPI, ADS, M&K, ROCK SOLID, ONKYO, B&K, DCM, SNELL, FRIED, VELODYNE, POLK, SPICA, COUNTERPOINT, AND MORE!
FULL WARRANTY!!
MOST ITEMS IN STOCK!!
414-836-2942

CALL US!!

PHILIPS DAC960 D/A CONVERTER PREAMPS AT HALF PRICE! Coax & optical digital inputs, fixed & variable preamplified outputs drive power amps, balanced outputs, headphone amp. New with orig!nal Philips warranty. $475 + s/h. Phone (410) 828-9225 or write attention: HAMPTON CHILDRESS, BOX 36141, TOWSON, MD 21286-6141.

AAA—LOW PRICES—HIGH END EQUIPMENT!!!
A/D/S/ • B&K • CARVER • CHICAGO STANDS • DCM • DENON • FRIED • GRADO • M&K • NAKAMICHI • ONKYO • PS AUDIO • SNELL • SUMIKO • THORENS • VELODYNE • VPI, and others. AUDIO ELITE, Menasha, WI.
414-725-4431 • SAVE $$$

Cable TV Descramblers, Converters, Accessories. Name Brands. Lowest prices. Best service. Call CABLE READY COMPANY, (800) 234-1006 for FREE 16-page color catalog.

ABARGAIN: STAX SIGN/LAMBDA $1,395; SIGN/SRM1-II $859, PRO/LAMBDA(#1) $459, SIGN/LAMBDA SRD/7 $599; GRACE F9ERUBY $199; F9E $125; FR1MK3F $169; ALL UNUSED (212) 966-1355.

SAN FRANCISCO AREA - IRRESISTABLY priced audiophile components/accessories. Shipped/delivered. World's best! By appointment only. 444 Eastwood, Petaluma, CA 94954. (707) 765-1992.

AUDIO NEXUS = QUALITY

Featuring legendary **VANDERSTEEN** loudspeakers & **ROTEL** CD Players.

• Apogee • Audio Alchemy • Audioquest • B&K • Cary • Counterpoint • Dynaco • EAD • Esoteric • Forte • Fried • Kimber Silver • Magnum Dynalab • McCormack • Melos • PSB • Rotel • Jeff Rowland • Scientific Fidelity • SME • Sony ES • Sota • Stax • Vandersteen • VPI • Wadia.
SUMMIT, NJ (908) 277-0333.

AUDIO BEST: LA, ORANGE, SAN BERNADINO, CALIFORNIA. HOT COMPONENTS: NEAR 50ML, COUNTERPOINT, HAFLER, PS ULTRALINK; AUDIBLE ILLUSIONS; POWERWEDGE, ACOUSTAT; SPICA; VPMS; MAGNUM; FOSGATE; B&K, TARALAB, MUSIC REFERENCE, SOUNDLAB, MAPLENOLL, SYSTEMDEK, CELESTION, MONSTER, STRAIGHTWIRE, MUSICAL CONCEPTS, (714) 861-5413, APPOINTMENT.

HI FI CLASSICS — USED HI END — HUGE SELECTION of components, cables, etc. Competent & helpful salespeople & the best prices around. WE BUY SELL & TRADE, INVENTORY LIST AVAILABLE. TEL: (718) 318-9618, FAX: (718) 318-9623.

FOR TWENTY YEARS WE HAVE BEEN THE SOURCE FOR ALL OF YOUR BLANK AUDIO/VIDEO TAPES AND ACCESSORIES, EVEN REEL-TO-REEL TAPES FOR STUDIOS, AT DISCOUNTED PRICES. CATALOG AVAILABLE. SOUNDD INVESTMENT CORPORATION, 3586 PIERCE DRIVE, CHAMBLEE, GA 30341. (800) 659-TAPE (8273), IN GA (404) 458-1679. FAX: (404) 458-0276.

MCINTOSH MCD7007 CD PLAYER. PERFECT CONDITION, ONE OWNER, FACTORY PACKING & MANUALS. $1400.00 WITH CASE. (206) 322-6846 OR (206) 325-6539 PACIFIC TIME.

AUDIO SOLUTIONS is Atlanta's Hi-End source for Audio Research, McCormack, Theta, Vandersteen, CODA, Wire World, Acurus, Snell, Music Metre, Classe, Musical Design, Kimber Kable, B&K, Magnum Dynalab, Rotel, & VPI. 4880 Lawrenceville Highway. (404) 381-0778.

FOR SALE

NY, NJ & CT: QUICKSILVER PRO AC & VANDERSTEEN AUDIO CONNECTION 201-239-1799

AUDIBLE ILLUSIONS, VAC, PSE, SPICA, B&K, ROTEL, MUSIC REFERENCE, UNITY, CREEK, MAGNUM DYNALAB, EAD, REGA, LECTRON, PSB, MORCH, SPENDOR, CARDAS, COUNTERPOINT & MORE!!

WANTED MCINTOSH/DYNACO

WANTED: MCINTOSH, MARANTZ, DYNACO, ALTEC, JENSEN, FISHER, CITATION, JBL, ELECTROVOICE, CELLO, LEVINSON, AUDIO RESEARCH, CONRAD JOHNSON, WESTERN ELECTRIC, TUBE/SOLID STATE. (713)728-4343. FAX: (713)723-1301. MAURY CORB, 12325 ASHCROFT, HOUSTON, TEXAS 77035.

HOME THEATER SOUND

Finally, a simple cost effective way to convert your 2 channel stereo system into a 5 channel home theater. Introducing the **QD-1** Series II featuring Dynaco's exclusive **PASSIVE MATRIX**™ technology. $79.95 + $4.95 (s/h).

SHOWTRONICS
Rt 1 Box 46A, Louisa, Virginia 23093
1-(800) 628-1626, Fax: (703) 967-1663
Visa/MC/Disc/Amex

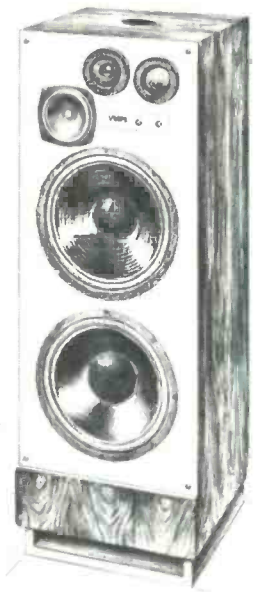
Patent pending

STORADISC™

Fine-furniture quality CD storage systems with angled shelves & non-slip surface that holds a single CD upright. Solid hardwoods & textured finishes. 360 & 576 capacity shown. Smaller sizes available. Write or call ***1-800-848-9811.***

Davidson-Whitehall Company
555 Whitehall Street Atlanta, Georgia 30303

LOWER LOUDSPEAKER DISTORTION



The VMPS Tower II, 43 x 15 x 16", 95#, $479/ea kit, $649/ea assem in gen. lt or dark oak

The VMPS Tower II is a low distortion, high output floor-standing speaker system offering unparalleled performance for price.

With its three 12" woofers (two active, one passive), butyl surround polycone mid, softdome tweeter and dual supertweeters (piezo or ribbon), the Tower II generates no more than 0.7% THD/1W drive down to 22Hz. High sensitivity (94dB/1W/1m) and high undistorted output levels (120+dB SPL/1m) ensure dynamic range and impact previously unavailable in its price range. **Audio Magazine** critic Anthony Cordesman comments: "... the Tower II is the only speaker even close to its cost that is capable of true deep and powerful bass response . . . It is an unquestionable Best Buy." (Jun 89)

Hear VMPS at the dealers below, or write for brochures and test reports on our full line including the **MiniTower IIa** ($369ea kit, $479ea assem), **Super Tower/R** ($749ea kit, $998ea assem), the all-out **Super Tower III** ($4700/pr kit, $5600/pr assem), our four highly acclaimed **Subwoofers (Smaller,** $259ea kit, $329ea assem; **Original,** $349ea kit, $429ea assem; **Larger,** $479ea kit, $599ea assem; **Dedicated,** $349ea kit, $429ea assem), the **QSD626 A/V Monitor** (269ea kit, $329ea assem), and the **QSO Series** bookshelf speakers starting at $159ea. Kits are supplied with assembled cabinets and prices include free shipping in 48 states.

VMPS AUDIO PRODUCTS

div. Itone Audio
3429 Morningside Dr. El Sobrante, CA 94803
(510) 222-4276 Fax: (510) 232-3837

Hear VMPS at: The Listening Studio, Boston; Sounds Incredible, Brookfield Ct; Hamisch Norton NYC NY; Dynamic Sound, Washington DC; Hifi Farm, Beckley WV; Pace Audio, Decatur, Ga; American Audio, Greenville SC; Tech Electronics, Gainesville FL; Arthur Morgan, Lake Mary, FL; Sound Solutions, Carlisle PA; Sounds Deluxe, Clarendon Hills Il; Audio Specialists, South Bend In; Audio Connection, Terre Haute In; Ruth Industries, St. Louis Mo; Shadow Creek Ltd, Minneapolis Mn; Audio by Gil Morrison, Detroit Mi; Concert Sound, San Antonio Tx; Stereoworks, Houston Tx; Lookout Electronics, Longview Wa; Affordable Audio, Fresno, Ca; Exclusively Entertainment, Oceanside, Ca; Hal Broda, Escondido Ca; Christopher Hansen Ltd, Bevesly Hills Ca; Audio Haven, Upland Ca; Sounds Unique, San Jose Ca; Private Line Home Entertainment, Stockton Ca; Golden Ear, Chico Ca; Itone Audio, El Sobrante Ca. The Sound Room, Vancouver BC Can.

FOR SALE

FOR SALE

FOR SALE

AUDIO DEN Authorized Sales and Service. ADCOM, ARAGON, ARCAM, B&K, CAL, CELESTION, CODA, CONRAD-JOHNSON, KLIPSCH, MAGNEPAN, MIRAGE, MIT, MONSTER CABLE, NAD, NAKAMICHI, NEAR, PARADIGM, ROGERS, SONOGRAPHE, SONUS FABER, SOTA, STAX, THETA DIGITAL, VELODYNE, YAMAHA. **AUDIO DEN**, 2021 Smith Haven Plaza, Lake Grove, NY 11755. **(516)360-1990.**

BANG & OLUFSEN, B&W, CARVER, REVOX, NAKAMICHI, ADCOM, DENON, H/K, YAMAHA, CELESTION, KEF, ADS, POLK, INFINITY, JBL, KLIPSCH, ETC. MANUFACTURER'S WARRANTIES. AUTOMATED PRICING 24 HRS, LIVE ASSISTANCE 10-6 ET. AMERISOUND SALES, INC. (904) 262-4000.

MCINTOSH Bought-Sold-Traded-Repaired. FREE Catalogue. See our ad at the beginning of the classifieds. **AUDIO CLASSICS**, POB 176MB, Walton, NY 13856. 607-865-7200. 8AM-5PM EST Mon.-Fri.

ATTENTION AUDIOPHILES! See October '92 Audio, Pages 343 & 347. Unbiased, Expert Advice. Best Trades! Used/Demo List. **AUDIO CLASSICS ENTERPRISES.** Visa/MC/Disc. (405) 842-3033.

BEST $1,500 LOUDSPEAKERS!!! B&W • BANG & OLUFSEN • CROWN • NAKAMICHI • VMPS • DENON • TRIAD • ADCOM • CARVER • HARMAN/KARDON • POLK • MIRAGE • KEF + MORE + HONESTY. MANUFACTURERS WARRANTIES! TECH ELECTRONICS. (904) 376-8080.

WANTED TO BUY

TOP PAYING FOR MCINTOSH, MARANTZ TUBE AMP McIntosh Solid state, Western, JBL, Altec, Tannoy, EV, Jensen, Speakers & Horn, EMT Turntable, Ortofon Arm, Temma--(516) 942-1212, (516) 496-2973.

HI-FI SUPPLIES--PAYS CASH FOR LEVINSON, ARC, C.J., KRELL, SPECTRAL, ROWLAND, THRESHOLD & OLD MARANTZ, MCINTOSH TUBE EQUIP. **(212) 219-3352**, 7 DAYS 10AM-6PM (NY).

AAAALWAYS PAYING TOP $$ FOR CLEAN, COLLECTABLE McINTOSH TUBE AND SOLID STATE, MARANTZ TUBE, WESTERN ELECTRIC, JBL-PARAGON, HARTSFIELDS, ETC. & ALNICO PARTS. EV PATRICIANS, GEORGIANS & MISC. PARTS. M. LEVINSON, KRELL, ARC, SPECTRAL ETC. CALL ME LAST ONLY WHEN YOU'RE READY TO SELL! JOHN: 1-800-628-0266.

MARANTZ, MCINTOSH, HARTSFIELDS, W.E., PATRICIANS, TANNOY, KRELL, LEVINSON, ARC, ETC. Call LAST for absolutely highest collector prices on mint equipment. Act before market weakens. N.Y.S.I. (718) 377-7282, 2-6P.M., WEEKDAYS.

Wanted: Car Stereo- Used, Refurbished, New: Alpine, ADS, Blaupunkt, Blade Technologies, Clarion, Denon, Kenwood, Linear Power, Nakamichi, Orion, Pioneer, Phoenix Gold, Rockford Fosgate, Sony, Soundstream. Stereo Exchange, 445 N. Pennsylvania St., Suite 712, Indianapolis, IN 46204. 317-631-6937.

Audio City Always Paying top for: Studer, Levinson, Mcintosh, Marantz, CJ, ARC, Quad, Leak, Western Electric, Telefunken, Siemens, Neuman. Vintage speaker systems, raw units by Tannoy, W.E., EV, JBL, Altec, Jensen. Audio tubes by Telefunken, Genalax, etc. P.O. Box 802, Northridge, CA 91328-0802. Tel: 818-701-5633. David Yo.

COLLECTOR WILL TRAVEL, even long distance if necessary, to **pick-up:** tube MARANTZ, McIntosh, **TANNOY** Speakers, etc. **MONO**/Stereo. (718) 387-7316. NEW YORK.

WANT — JBL Hartsfield, EV Patrician, Singles OK, McIntosh, Marantz & other tube equipment. Larry Dupon, 2638 W. Albion, Chicago, IL 60645. (312) 338-1042, evenings.

WANTED: WESTERN ELECTRIC, JBL, MARANTZ OLD EQUIPMENT. SUNLIGHT ENGINEERING COMPANY: 310-320-7020, 22130 SOUTH VERMONT AVENUE, #A, TORRANCE, CA 90502.

I BUY USED MID TO HIGH END EQUIPMENT. (303) 777-6064. LEAVE MESSAGE IF NOT IN.

CAR STEREO

"STEREO WORLD" is your discount sound source with great deals on car and home stereo: Panasonic, JVC, Sony, PrecisionAudio Pioneer, Sherwood, Hi-Fonics, Blaupunkt, MTX, Pyle, Orion. Kenwood, Scosche EFX, Autotek, JBL-Car, Clarion and many others. We Carry alarms and a full line of installation kits. Please call or write for FREE catalog. FREE UPS in 48 states. Visa/MC; COD accepted. P.O. Box 596, Monroe, NY 10950 (914) 782-6044.

SERVICES

Specialist, Tube Equipment Customization, Repair Services. Vintage military tubes & parts available. Service estimates for audio equipment, old or new. BWS Consulting, 5609 N. 23rd Street, Arlington, VA 22205. (703) 536-3910.

DON'T DEGRADE, UPGRADE! Make Your Old Equipment Sound Better Than New. Call For Pricing After 6PM CDT. MUSICAL INTEGRITY DESIGN. (204) 339-9889.

Audio Repairs and Restorations by Clif Ramsey, former Senior Service Technician at McIntosh. **Tuner Modifications** by Richard Modafferi, independent consultant to Audio Classics, inventor, and former Senior Engineer at McIntosh. Over 70 years combined experience. **AUDIO CLASSICS.** 8AM-5PM EST Mon.-Fri., POB 176SAR, Walton, NY 13856. 607-865-7200.

THE $ENSIBLE SOUND

After 12 years of publishing still the only audiophile magazine to help you spend less and get more. Our current issue (#46) discusses the issues of tube amplification design which are never spoken of by those who report fashion instead of reality.

Subscriptions: $20.00/yr. – $36.00/2 yrs.
All available back issues (over 30) – $49.00

1-800-292-5843

BOB

BUY DIRECT
from the owner
Save $ money and time.

Use my 22 years of experience to provide you with the best equipment at the lowest cost possible.

When in boston, please visit the world's smallest HiFi shop, featuring products by:

ALCHEMY	NAD
AUDIOQUEST	PARADIGM
BOSE	PHILIPS
HAFLER	PS AUDIO
HARMAN KARDON	SONY
LEXICON	STAX
MARANTZ	THORENS

SONY ES Used, too.

Q Audio

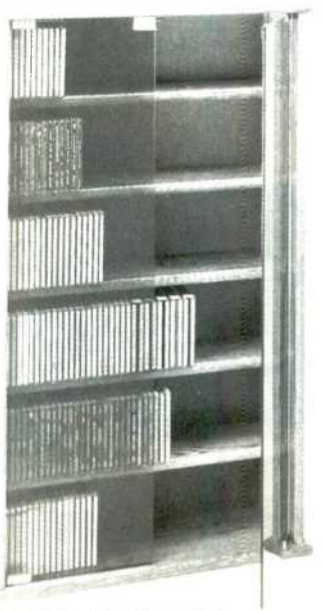
95 Vassar Street
Cambridge, MA
02139

(617) 547 2727

STORE HOURS:
M-F 10-7
SAT 10-6

MC/VISA/DISC/AMEX

CD STORAGE+™



No. A 300 (Shown in Solid Brown Oak)

Soricé Systems — Setting the Standards in Audio/Video Storage Systems

- Store 300 CD's in this Premium Solid Hardwood Cabinet.
- Impeccably crafted in your choice of Solid Oak, Walnut, Teak or Cherry.
- Fully adjustable Shelves store any combination of CD's, Videos and Cassettes — all in ONE cabinet.
- No-Slot design maximizes storage space, simplifies organizing & re-arranging your collection, accommodates single & multiple CD sets, allows for possible changes in the size of CD packaging.
- Adjustable Solid Brass Bookends keep Discs & Tapes upright and in place.
- Cabinets can be stacked, wall mounted or left free standing.
- Optional Clear or Smoked Glass Doors are available.
- Completely enclosed back provides dust protection.
- Compact size: 39½"H x 23½"W x 7½"D
- Shipped to you fully assembled.

SORICÉ
P.O. Box 747-G Nutley, NJ 07110

We accept Visa, MasterCard, American Express, Checks and Money Orders. All Models come with a 30 Day Money Back Guarantee and a Full One Year Warranty.

For Prices and Free Full Color Literature on our Complete Line of Audio/Video Storage Systems: Call Toll Free **1-800-432-8005** or FAX your name and address to **1-201-748-2592**

LOUDSPEAKERS

LOUDSPEAKER COMPONENTS-KITS. Dynaudio, Morel, Eclipse, Focal, Peerless, Eton, Vifa, more! Crossover parts--design books also. Catalog $2. Meniscus, 2575 28th St., SW, UNIT 2, Wyoming, MI 49509. (616) 534-9121.

CUSTOM ELECTRONIC CROSSOVERS, 6 to 36 dB/Oct. Also Snell, Magnepan versions. DB SYSTEMS, POB 460, RINDGE, NH 03461. (603) 899-5121.

WE REPAIR SPEAKERS!
SPEAKER CLINIC. FREE Estimates. (404) 933-0101.

Simply better technology from North Creek Music Systems - loudspeaker components and kits for the descriminating audiophile. Please call or write for a complimentary catalog. 500A Route 8, Speculator, NY 12164. (518) 548-3623.

BANG & OLUFSEN, B&W, CARVER, REVOX, NAKAMICHI, ADCOM, DENON, H/K, YAMAHA, CELESTION, KEF, ADS, POLK, INFINITY, JBL, KLIPSCH, ETC. MANUFACTURER'S WARRANTIES. AUTOMATED PRICING 24 HRS, LIVE ASSISTANCE 10-6 ET. AMERISOUND SALES, INC. (904) 262-4000.

CD PLAYERS

MUSICAL CONCEPTS = CD MUSICALITY
"Musical Concepts players are not about fancy faceplates, nor unsupportable hype, they're about completely satisfying musicality and transparency!" **ENIGMA V**, "The best CD value, outperforming $4000 transport/DACs", for only $649, **EPOCH V**, "More natural than any transport/DAC combination—**breakthrough** openness and transparency!", $995. All players use 384X oversampling! Try our **CDT**—hear the difference a transport can make ($595)! We modify most **Rotel, Philips, Magnavox, Pioneer.** MUSICAL CONCEPTS, 1832 Borman Ct., Suite One, St. Louis, MO 63146. (314) 275-4925.

COMPACT DISCS

CASH PAID FOR AUDIOPHILE LP'S. MOBILE FIDELITY, NAUTILUS, CBS MASTERSOUND, SUPER DISC, SWEET THUNDER, JAPANESE PRESSINGS, RCA LIVING STEREO, MERCURY LIVING PRESENCE, ENGLISH DECCA'S AND EMI. MUST BE SEALED OR IN MINT CONDITION. CALL BOBBY AT (913) 823-7211.

LATIN MUSIC LOVERS. Your 1 stop source. CD's & videos from Latin Countries. JPR LATIN RECORDS, P.O. Box 4155-B, Winter Park, FL 32793.

RECORDS

LV/CD/RECORD COLLECTOR'S SUPPLIES. Jewel boxes, record jackets, sleeves, storage boxes, 78 sleeves, dividers, much more! Free brochure: CABCO PRODUCTS, ROOM 663, POB 8212, COLUMBUS, OH 43201. (614) 267-8468.

STYLUS SWEEP™ Soft! Gently Removes Fuzzballs. Handheld. $3PPD. • **NITTY-GRITTY** LP Brush. $11PPD., Vac-Sweep Replacement Kit. $11PPD. • **STANTON** 500E MKII. Great New Cartridge! $26PPD. • **CAIG** Contact Renewal Kit. $22PPD., • Free Catalog! • Order Today! CSH/CHK/MO: KAB Electro-Acoustics, Box 2922A-11, Plainfield, N.J. 07062-0922 (908) 754-1479.

HALF MILE VINYL. Affordable used LP's. Selected w/care. Cleaned & graded. All categories. Call f/information. SASE lists/wants: Box 98, East Wareham, MA 02538. (508) 295-2508.

SoundSearch - Providing record research services of all kinds including appraisal, acquisition, sale/auction, documentary research & discographical information. **SoundSearch**, P.O. Box 5010, Hacienda Heights, CA 91745. **Phone: (818) 855-7909 Fax: (818) 855-7913.**

USED LPs. AUDIOPHILE COLLECTIONS. MOSTLY CLASSICAL. $3.00 FOR LIST. 2,000+ TITLES. BOX 1766, VISTA, CA 92085.

AUDIOPHILE RECORDS

AUDIOPHILE RECORD WAREHOUSE! Out-Of-Print Direct-To-Disc, Halfspeed, Quiex II & Import Pressings. Great selection of In-Print Records & CD's. Quantity Discounts! Call for Free Catalog. Elusive Disc, 5346 N. Guilford Ave., Indianapolis, IN 46220. (317) 255-3446.

AUDIOPHILE RECORDS

WORLD'S LARGEST SELECTION OF AUDIOPHILE LP'S AND CD'S! Mobile Fidelity, Sheffield, Reference, Chesky, Analogue Productions, Wilson, Klavier, Audioquest, Nautilus OPUS 3, TBM, Proprius, Harmonia Mundi...many more current, rare and out of print. Catalogue $3 in U.S./$5 elsewhere. INFORMATION: (913) 825-8609. FAX: (913) 825-0156. ORDERS: 1-800-525-1630. ACOUSTIC SOUNDS, BOX 2043, SALINA, KANSAS 67402.

BUSINESS OPPORTUNITIES

LET THE GOVERNMENT FINANCE your small business. Grants/loans to $500,000.00. Free recorded message: (707) 448-0270. (KF1).

MAIL ORDER

THE BEST DISC AND TAPE STORAGE SYSTEM IN AMERICA. Stackable, portable oak units hold all recording formats. FREE Mailorder Brochure (please mention Audio). Per Madsen Design: (415) 928-4509. P.O. Box 330101, San Francisco, CA 94133.

Copies of articles from this publication are now available from UMI Article Clearinghouse.

UMI A Bell & Howell Company
300 North Zeeb Road, Ann Arbor, MI 48106

AUDIOPHILE LPs&CDs

Analogue Productions
Mobile Fidelity - Wilson
Reference Recording - Chesky
Sheffield Lab - Harmonia Mundi
Proprius - RCA Living Stereo - Klavier
Mercury Living Presence - plus many more
in and out of print recordings!

Catalog $3 in USA, $5 elsewhere - refundable

ACOUSTIC SOUNDS 1-800-525-1630
P.O. BOX 2043 • SALINA, KS 67402-2043
1-913-825-8609 • FAX: 1-913-825-0156
Visa
MasterCard

ACTIVE ELECTRONIC CROSSOVERS
MODEL 120 CABINET & NEW 120-R "RACK AND PANEL" DESIGNS

Made to order in Butterworth bi-amp, tri-amp, or quad-amp configurations with optional level controls, subsonic filters, or summers. Filters, regulated power supplies, equalizers, are also available.

New catalog and price sheet. Free!

DeCoursey **Eng. Lab.**
11828 Jefferson Bl., Culver City, CA 90230
PHONE (310) 397-9668

AUDIOLAB *Integrates High End.*

8000A MK II Integrated Amplifier

- *High current 60W per channel.*
- *Defeatable tone controls.*
- *Moving coil phono section.*

ARTECH ELECTRONICS LTD.
P.O. Box 1980 Champlain, NY 12919 Tel (514) 631-6448 Fax (514) 631-1212

Esoteric Sound and

CLEARFIELD by COUNTERPOINT

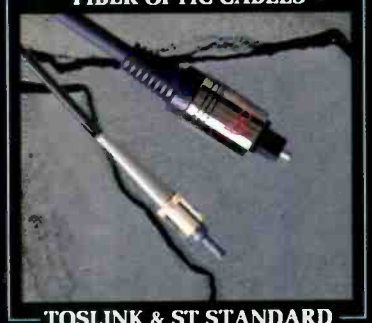
when music matters!

Esoteric **Sound Sytems, Ltd.**
Coventry Commons, Rte 347
Stonybrook, NY 11790
(516) 689-74444 FAX: (516) 689-7457

AD INDEX

Push the envelope!

FIBER OPTIC CABLES

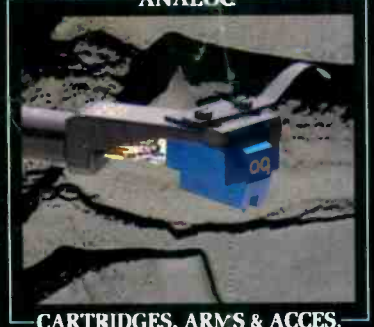


TOSLINK & ST STANDARD

In the world of high technology the term "envelope" is used to describe the performance limitations of the equipment. In the world of music and wonder, a diverse group of technically competent products from AudioQuest lets you expand the performance envelope of your audio or video system.

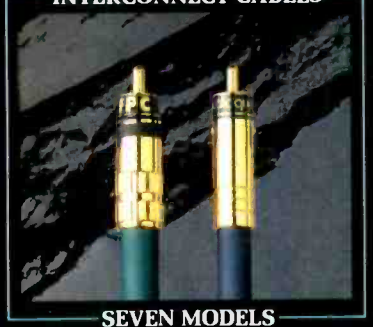
The common thread running through all the AQ products is that they offer the most improvement for the least money. No system is so poor or so perfect that using AudioQuest products won't make a wonderful improvement. The only proof is in the products themselves – please put us to the ultimate test – listen and look for yourself.

ANALOG



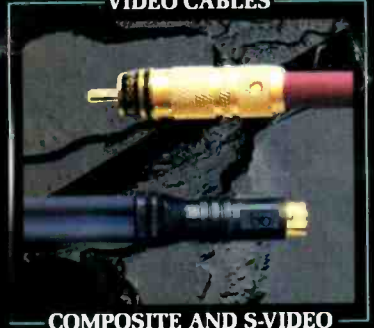
CARTRIDGES, ARMS & ACCES.

INTERCONNECT CABLES



SEVEN MODELS

VIDEO CABLES



COMPOSITE AND S-VIDEO

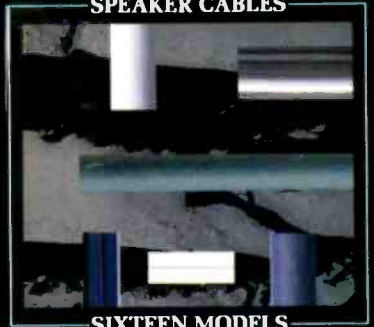
ULTRACONNECT

SORBOTHANE FEET

LP'S AND CD'S

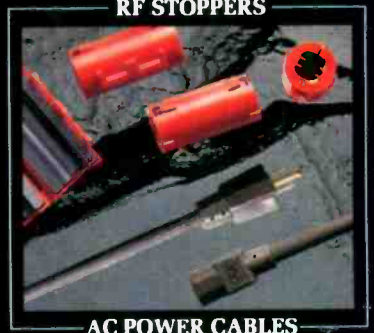
GREAT MUSIC-GREAT SOUND

SPEAKER CABLES



SIXTEEN MODELS

RF STOPPERS



AC POWER CABLES

audioquest

P.O. Box 3060 San Clemente, CA 92674 USA TEL (714) 498-2770 FAX (714) 498-5112
Distributed in Canada by Audio Products International, 3641 McNicoll Ave., Scarborough, Ontario M1X 1G5 Tel: 416-321-1800

Professional type, balanced output jacks are grounded, and shield the signal against noise.

In airline pilots, brain surgeons, and CD players, steadiness is a pretty fundamental requirement.

In the case of the Elite® line of CD players and the uncompromising Elite transport, their rock-solid stability has rocked the world of music lovers and audio critics. It's apparent from the reviews and the awards that Elite has advanced CD standards dramatically.

At the very apex of CD technology today is our PD-S95 transport. To insure optimum sound quality, it mobilizes an unprecedented array of mechanical and electrical isolation techniques, including rigid acoustic shell construction and discrete power supplies.

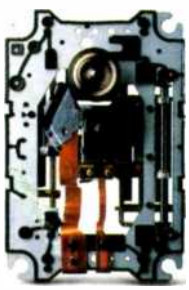
But its most significant innovation – incorporated throughout the Elite line – is the stable platter.

The Elite PD-75 Compact Disc Player. Its elegant urushi finish reflects technical elegance within.

Two basics of physics – mass and inertia – combine to make the stable platter an obviously superior platform to support a disc spinning at high velocity. Next, the stable platter, by supporting the entire area of the CD disc, minimizes wobble and chatter. A wobbling disc presents a difficult target for the laser, while a chattering disc creates resonance, distorting the signal, which distorts the sound.

The stable platter, with its great mass and driven with precision by a new transport mechanism, spins solidly in

[How A Concept Called The Stable Platter Turned The CD Upside Down.]



An advanced linear drive motor moves the laser pickup with smooth speed and precision.

place generating no vibration. The result is sound that is perceptibly superior.

Another problem for conventional CDs is gravity. Spinning above the laser pickup and supported only in the center, the disc sags microscopically. Which to a laser beam is significant. But on the Elite CD platter, the disc is turned upside down and lies firmly clamped to a solid surface. Meanwhile, the laser pickup reads the disc's digital code from above, where it is immune to dust settling on the laser optics.

We invite you to visit an Elite dealer and audition the entire line of Elite CD players.

And usher in a new era of stability.

ELITE
BY PIONEER

For the name of a select Elite dealer in your area, please call 1-800-PIONEER. © 1992 Pioneer Electronics (USA) Inc., Long Beach, CA.