SPEAKERS FROM THE OUTSIDE IN

AUDIO®

THE EQUIPMENT AUTHORITY

AUGUST 1997

50th Anniversary
1947-1997

TESTED

NAD's INNOVATIVE DIGITAL PREAMP

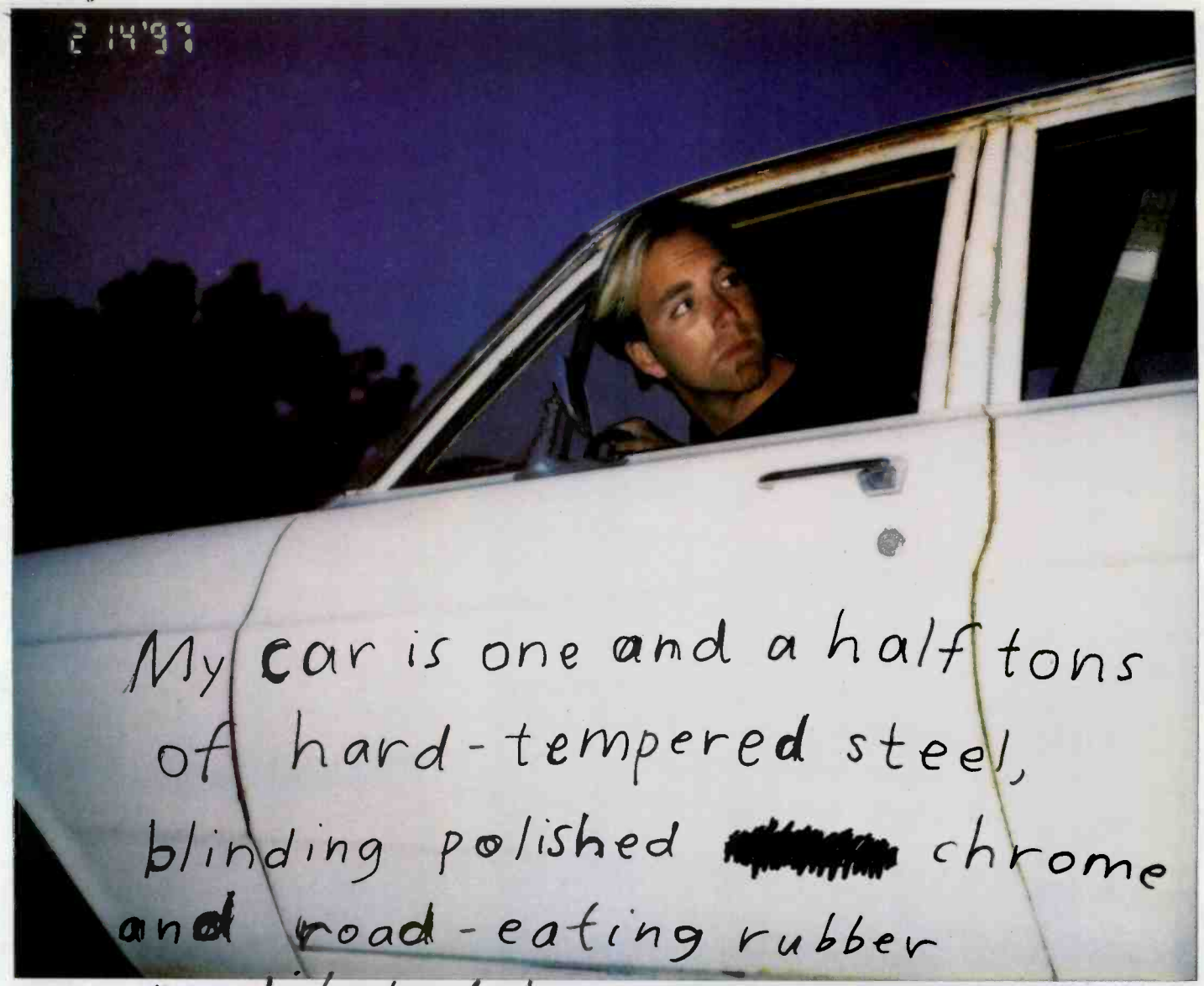
SURROUND SOUND DUO FROM ROTEL

ALSO TESTED

Celestion *and* Thiel Speakers, Houston Amplifier, *and* MORE

US
UK £2.20
CAN $4.95

Apparently, someone just bought Sony's 200-CD changer. Smart move. You took your ever-growing collection out of those awkward towers and loaded it into our MegaStorage™ disc changer. Thanks to its Custom File System, you can finally hear what you want, when you want it, in the pure sound quality only a Sony can deliver. Yeah, life is good. The sun is shining. Nice day for a drive.



My car is one and a half tons of hard-tempered steel, blinding polished [redacted] chrome and road-eating rubber undiluted by crappy paper speakers.

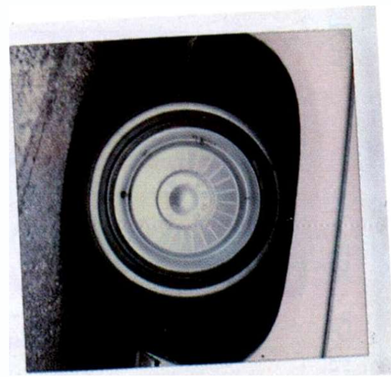
Most speaker cones are made from paper. Paper is the material used for speeding tickets. Paper does not rock.

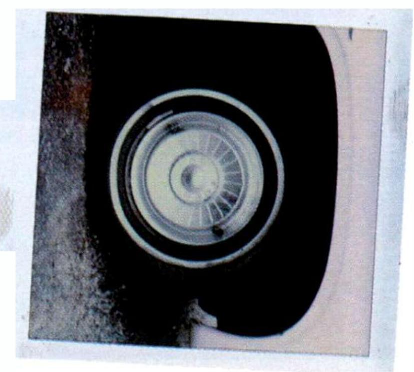
Pioneer Foam IMPP (injection-molded polypropylene) technology produces speaker cones from perfectly blended, advanced materials to create just the right cone for each frequency or music type.

Plus, they're more durable, remain unaffected by temperature or moisture, and can reproduce bass for long periods of time without wear. Bass, we might add, you can feel in your spleen.

They've got better linearity, less distortion and higher internal loss (a good thing - look it up).

Paper is also used for kitty litter coupons. Just thought you'd like to know.





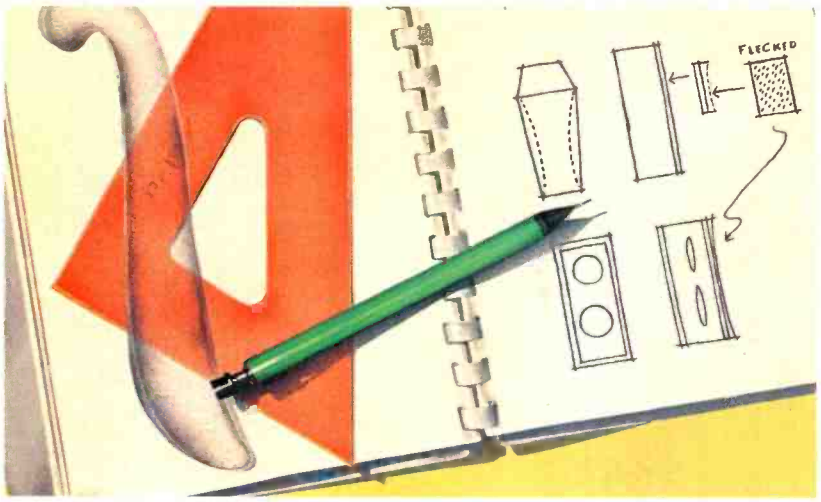
PIONEER®
The Art of Entertainment

www.pioneerelectronics.com

AUGUST 1997 VOL. 81, NO. 8

AUDIO

THE EQUIPMENT AUTHORITY



Speaker Design, *page 32*

FEATURE

EQUIPMENT PROFILES

AURICLES

Onkyo Integrated Amp, *page 96*

PLAYBACK

DEPARTMENTS

RECORDINGS

Cover Photographer: Bill Kouirinis Studio
Cover Equipment: NAD 118 digital preamp and Rotel RDA-980 Dolby Digital decoder and RSP-980 A/V preamp/processor

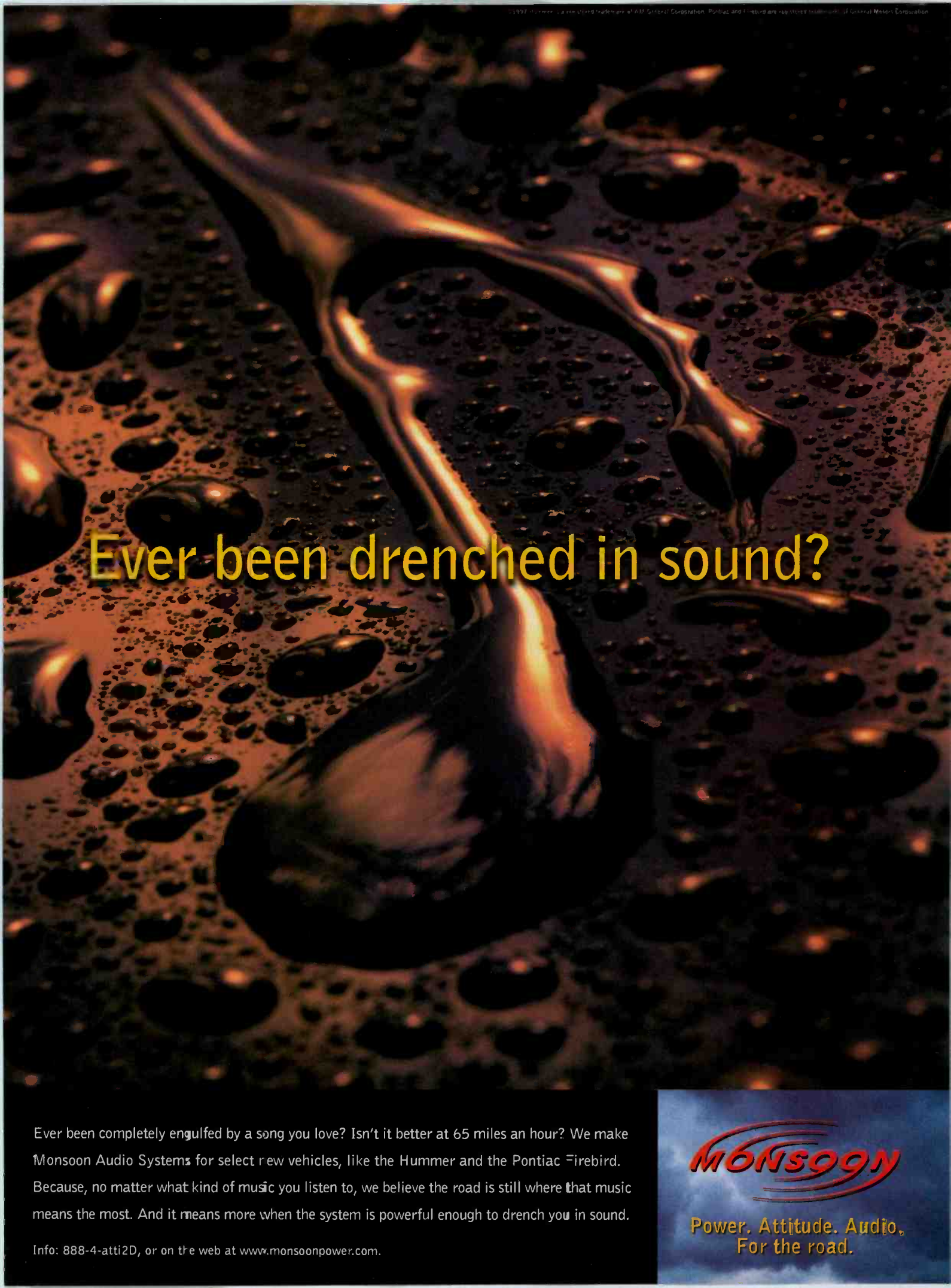
Audio Publishing, Editorial, and Advertising Offices,
1633 Broadway, New York, N.Y. 10019
Editorial E-Mail: audiomag@aol.com

Subscription Inquiries:
Phone, 303/604-1464; fax, 303/604-7455

The Audit Bureau

Revving up Revel, *page 36*

Houston Amp, *page 56*



Ever been completely engulfed by a song you love? Isn't it better at 65 miles an hour? We make Monsoon Audio Systems for select new vehicles, like the Hummer and the Pontiac Firebird. Because, no matter what kind of music you listen to, we believe the road is still where that music means the most. And it means more when the system is powerful enough to drench you in sound.

Info: 888-4-atti2D, or on the web at www.monsoonpower.com.

MONSOON

Power. Attitude. Audio.
For the road.

FAST FORE-WORD

Recently I had my first look at a DVD authoring facility in action. The location was an historic one—the Sony Pictures studios in Hollywood, today, but MGM's headquarters in that studio's heyday. An enormous number of classic movies were filmed entirely on that lot. (When it's not busy, for example, you can visit the soundstage where *The Wizard of Oz* was made.)

Sony still makes movies there, but it also does something unheard of in Busby Berkeley's day, which is preparing finished films for video release. In the case of DVD, this process divides into two basic parts: film-to-video transfer (telecine), which is the first step for any video release format, and actual DVD mastering, which encompasses audio and video compression, preparation of subsidiary data streams (such as subtitles), and putting all the resulting digital parts together into a final, integrated bitstream that will go onto the discs.

The most interesting aspect of Sony's methodology is the first part. For DVD releases, Sony makes a 1,035-line high-definition transfer, which is then filtered down to 525 scanning lines. The reason is to eliminate the aliasing artifacts sometimes visible in conventional video images of scenes containing fine vertical detail (Venetian blinds, for example). Aliasing occurs because television image-scanning is basically a sampling process, but unlike sampling for digital audio, there typically is no input filtering to remove signals above half the sampling frequency. By going first to hi-def, Sony gives itself the opportunity to do such filtering in the downconversion to standard (NTSC) definition and thus to present a cleaner final picture.

The most intriguing part of the actual DVD authoring (at least to me) was how little manual diddling seems to be required to get artifact-free video compression. The MPEG encoder, which is a proprietary Sony design, seems able to do pretty well on its own with a couple of passes through the program. Operators still have to watch carefully and occasionally adjust data rate and other parameters to clean up stuff the encoder doesn't catch, but surprisingly little such intervention seems necessary.

Audio is digital all the way, starting from Sony's own DASH multitrack tape machines. Sony is, by the way, the only studio I know of that currently supplements any 5.1-channel soundtrack with a separate two-channel Dolby Surround mix. In most cases this isn't strictly necessary, since the Dolby Digital decoders in DVD players can downmix 5.1-channel Dolby Digital soundtracks to conventional Dolby Surround on the fly. But since it is possible to do things in a discrete-channel system that can't be done in a matrix system, automatic downmixing may not always give optimal results. Rather than pick and choose which soundtracks need special treatment and risk missing something, Sony does it for all.

Speaking of new technology, we recently received communication from a German inventor who claims to have developed a new type of loudspeaker driver with radically better performance characteristics than conventional ones. Hans-Joachim Raida calls his waveguide-based driver the Directed Stick Radiator, or DSR, because of its shape. Claimed benefits include high efficiency and output together with wide bandwidth from a small, unobtrusive radiating element; extremely flat frequency and phase response; and easily controllable directivity. Needless to say, if it works as described, the DSR would be truly revolutionary.

In the past year, I think I've encountered more genuinely interesting loudspeaker innovations than I can remember over the preceding decade. (There's always a healthy crop of obviously crackpot ideas, but I'm excluding those.) We hope to survey the field in a future issue. Meanwhile, you can find more detailed information about DSR on Raida's Internet home page, http://home.t-online.de/home/raida.

AUDIO

EDITOR-IN-CHIEF
Michael Riggs

ART DIRECTOR
Cathy Cacchione
ASSOCIATE ART DIRECTOR
Linda Zerella

TECHNICAL EDITOR *Ivan Berger*
SENIOR EDITOR *Alan Lofft*
MANAGING EDITOR
Kay Blumenthal

ASSOCIATE MANAGING EDITORS
Douglas Hyde, Scott Van Camp

ASSISTANT EDITOR/MUSIC
Michael Bieber
ASSISTANT EDITOR/DIRECTORY
Gerald F. McCarthy

EDITOR-AT-LARGE
Corey Greenberg

SENIOR CONTRIBUTING EDITORS
Edward J. Foster, D. B. Keele, Jr., Edward M. Long

CONTRIBUTING EDITORS/ARTISTS
Edward Tatnall Canby, David L. Clark, Anthony H. Cordesman, Ted Costa, John Diliberto, Frank Driggs, John Eargle, D. W. Fostle, John Gatski, Joseph Giovanelli, Dawn Joniec, Ken Kessler, Bascom H. King, Daniel Kumin, Robert Long, Paul Moor, Jon W. Poses, Jon R. Sank, John Sunier, Michael Tearson, Jon & Sally Tiven, Michael Wright

V.P./GROUP PUBLISHER
Tony Catalano 212/767-6061

V.P./ASSOCIATE PUBLISHER
Scott Constantine 212/767-6346

GENERAL MANAGER *Greg Roperti*
BUSINESS MANAGER *Jonathan J. Bigham*
PRODUCTION DIRECTOR *Patti Burns*
PRODUCTION MANAGER *Dana L. Rubin*
PROMOTIONS MANAGER *Adele Ferraioli-Kalter*
RESEARCH MANAGER *Dru Ann Love*
OFFICE MANAGER *Aline J. Pulley*
OPERATIONS MANAGER/AD COORDINATOR
Linda Neuweiler

ADVERTISING
REGIONAL V.P./AD DIRECTOR, EAST COAST
Charles L. P. Watson 212/767-6038
REGIONAL ACCOUNT MANAGER
Christine B. Forhez 212/767-6025
ACCOUNT EXECUTIVE *Paul C. Smith* 212/767-6077
MIDWEST ADVERTISING MANAGER
Jerry Stoeckigt 312/923-4804
REGIONAL V.P./AD DIRECTOR, WEST COAST
Bob Meth 213/954-4831
WESTERN MANAGER *Paula Mayeri* 213/954-4830
NATIONAL RECORD LABEL SALES
MAG Inc. Mitch Herskowitz 212/490-1715
CLASSIFIED ADVERTISING 800/445-6066

Hachette Filipacchi Magazines

CHAIRMAN *Daniel Filipacchi*
PRESIDENT AND CEO *David J. Pecker*
EXEC. V.P. AND EDITORIAL DIRECTOR
Jean-Louis Ginibre
SENIOR VICE PRESIDENT, COO *John Fennell*
PRESIDENT, NEW MEDIA *James P. Docherty*
SR. V.P./DIR., CORP. SALES *Nicholas J. Matarazzo*
SR. V.P./CFO & TREASURER *John T. O'Connor*
SR. V.P./MFG. & DISTRIBUTION
Anthony R. Romano
SR. V.P./GENERAL COUNSEL AND SECRETARY
Catherine Flickinger
V.P., CIRCULATION *David W. Leckey*
V.P., RESEARCH & MKTG. SERVICES *Susan Smollens*
V.P., COMMUNICATIONS & SPECIAL PROJECTS
Keith Estabrook
V.P., DIR., MARKETING AND SALES DEVELOPMENT
Lynn Chaiken
V.P., FINANCIAL OPERATIONS *Margaret Carroll*

EUROPEAN IMAGING AND SOUND ASSOCIATION
EISA
AWARDS
EUROPEAN HIGH-END AUDIO '96-'97
Krell KAV-300i

The Price of Admission has Just Changed!

With the introduction of the Krell Audio+Video line, entry into the world of high performance audio has just become more accessible. The new Krell KAV-300i integrated amplifier delivers sonic quality never attainable before at this price level.

Integrated is the key word here. The KAV-300i integrates a discrete, Class A, remote controlled preamplifier with a potent 150 watt/channel power amplifier that just happen to share the same chassis. The KAV-300i also shares the same engineering, production and parts quality as every other Krell product manufactured at our Connecticut factory. In fact, the proprietary output devices used in the KAV-300i are identical to the ones used in our reference amplifiers. Innovative engineering, unmatched capabilities, flawless build quality—funddmental elements of the KAV-300i and standard in all components bearing the name Krell.

The KAV-300i—Out of this world performance at a real world price.

Under $2,400. From Krell—The Leader in Audio Engineering.

Krell Audio+Video

The Krell KAV-300i

THE KAV-300i INTEGRATED AMPLIFIER

KRELL ▪ 45 Connair Road ▪ Orange, CT 06477 ▪ Phone: 203-799-9954 ▪ FAX: 203-799-9796

LETTERS

Fabulous 50th

Dear Editor:

I've enjoyed *Audio* for many years, with the balanced coverage of technology, equipment, music, and personalities that it has provided. However, the May 50th-anniversary issue is your best yet. The insight into the heritage of hi-fi that it provides is both fascinating and concise.

Although 50 years ago I was too young to appreciate the transition that was occurring in audio, the May issue made me feel part of that time. The coverage of (and by) some of the greats such as Fisher, Grado, Cook, Bozak, Klipsch, and others provided a link to an era that, in many cases, is just a dim memory. It was a time when I built my first kit (an Eico HFT-90 tuner), bought my first amp (a Bogen DB130A), listened to a Wharfedale 60 while lusting for a Bozak Symphony loudspeaker (I later bought a pair and still have some of the B 199A woofers), and owned many of the other products you mentioned. Thinking about the passion and work that these pioneers lavished on audio makes me realize how lucky we are today. They provided not only an audio legacy, but also the basis for the fantastic quality of music reproduction available today at ridiculously low prices. It's great to read about the past, but it's even better to live in such exciting times.

Thomas Perazella
Sleepy Hollow, Ill.

Those Were the Days

Dear Editor:

The 50th anniversary issue was a great nostalgia trip—a wonderful evocation of those heady days of the late '40s, '50s, '60s, and '70s when the high-fidelity hobby was new and growing rapidly. Those were the days when many of the most exciting product developments came from small companies run by music lovers. Their objective was to accurately reproduce the sound of real music (usually classical or good jazz). For them, in the beginning at least, making money was secondary. Your five feature writers brought back the aura of those early days most effectively (although I thought Ken Kantor was just a little too cutesy). The May issue is a treasure to be preserved. You and your staff deserve congratulations and hearty thank-you's!

Tom Shedd
Evanston, Ill

As Time Goes By

Dear Editor:

Congratulations! Fifty is a very respectable age for any publication in these times. As a lifelong hobbyist in the field for more than your 50 years, this issue was a great nostalgia bath.

My Dad and I put together our first system in the early 1940s using a modified Regal P.A. amplifier, a 12-inch Jensen speaker in a bass-reflex cabinet (home built), and a manual turntable. When Pilot Radio produced its first FM tuner right after the war, we added that to the system.

The old Regal was replaced in 1946 or '47 with an Altec 15-watt amplifier, which was traded in 1949 for a Leak Point 1 brought from England. By then, the turntable had been replaced by a Rek-o-Kut T-12 two-speed with the extra idler for 45 rpm. The arm was a Gray with first a GE cartridge, and then a Pickering 120 and 140. The old Jensen had been replaced by an RCA LC1A mounted in a cabinet designed by Victor Brociner. Since then, there have been many upgrades as I continue to seek the best sound within budget constraints. I most recently purchased KEF Fours, which I truly enjoy, even with the limits placed on me in an apartment.

While I know that you have space limits in magazines and it would be impossible to mention everything that has gone on in the last 50 years, you may wish to amend these articles with one dealing with retail stores that made a real difference in the growth and development of the audio industry. Here in New York, Harvey Sound is one such pioneer; it's still going strong. There were two national chains that had great influence: Lafayette Radio in New York, with its 125 company stores and more than 700 franchises, Korvettes, with its chain, and Allied Radio in Chicago. I am sure there were others. These dealers provided places where old and young alike could hang out, see, listen, and talk hi-fi. Sadly, in this era of mass-market retailers, this no longer occurs. While there are individual retailers that sell mass-market equipment and a few that specialize in high-end products, there are no shops that encourage what once was.

I should point out one error that I noted in your text dealing with the introduction of the long-play record. Columbia introduced Dr. Goldmark's "LP" on June 30, 1948, along with a very inexpensive player built for them by Philco. It retailed for $29.95 at the time and made it possible for almost everyone interested to get into this new way of playing music. Again, congratulations and let us see what the next 50 bring us.

Richard L. Gaynor
New York, N.Y.

Short-Circuited

Dear Editor:

Congratulations on your 50th anniversary and on a very good issue to commemorate it.

I started buying *Audio* when it was still called *Audio Engineering*, probably in 1950. While I still enjoy *Audio* and believe that it does a good job of helping the reader to obtain high-quality sound, I do miss the technical or hobbyist side of the publication that has disappeared over time. When Dr. Norman E. Thagard's detailed and informative articles on the construction of a power amplifier in early 1995 did not engender a single reader response (that I recall), I realized that *Audio*'s audience for "circuitry" is just not there. Old-timers tend to wax a little too nostalgic, and though I would be tempted, the fact is that your contributors to the anniversary issue handled the early days very nicely.

Currently, I especially value Joseph Giovanelli's "Audioclinic" column. It is a model of how an expert can write for puzzled and sometimes uninformed readers without writing down to them, while at the same time providing plenty of useful information for those of us who fancy we know a lot. Among your equipment reviewers, I appreciate Bascom H. King, who is the last of your regular contributors to assume that readers are interested in circuitry, even

though it seems to be impossible to reproduce actual schematics these days.

All in all, I envy those who will be around for the next 50 years of your publication.

Lawrence Wallcave
Santa Rosa, Cal.

A Transport Is a Transport Is a. . .

Dear Editor:

Upon receiving your 50th anniversary issue (May), I devoured it, cover to cover. It is excellent and a perfect example of why *Audio* will go on for many more years. In particular, I enjoyed Floyd E. Toole's "The Future of Stereo, Part I."

I do, however, take issue with Anthony H. Cordesman's "Auricle" review of the Mark Levinson No. 31.5 CD transport. In most cases, one can argue about whether a reviewer's "golden ear" can detect audible differences between components. In the case of the Mark Levinson, it is different: This is a transport. It reads data off the disc, performs error detection and correction, and then spits the digital data to a D/A converter. This does nothing to affect the audio content of the CD's data.

A little tidbit I picked up in an audio class a few years ago was that a "typical" CD player reads data off a nondefective CD with an error rate of five to 20 errors per second. After the errors are corrected, there is an error rate of one per hour. If Cordesman had stated that the Levinson transport was superb at correcting or masking errors from a defective disc, or that it continued to read data through an earthquake, I would not take issue. But there is no mention of these factors, just this statement: "The most you can expect from the best CD transports is a relatively subtle improvement in bass definition and dynamics, transient definition, and low-level detail." Please explain to me how this can be true. Either the data is decoded properly and perfectly from the disc, or it is not. If decoding data from a CD without errors were a problem, we would not see $50 CD-ROM drives.

Gary Hunsberger
Schaumburg, Ill.

Author's Reply: Computers care only about correctly reading the "1s" and "0s" in the data stream, but the numbers in a digital audio stream represent the amplitude of the original analog waveform at particular points in time. To accurately reproduce the waveform, the conversion from digital back to analog must precisely match the timing of the conversion from analog to digital.

The current digital standards applied to CD transports and players ensure that this timing is very close to the original, but not necessarily close enough that the human ear cannot hear subtle changes due to time differences measured in billionths of a second. Retrieving the data from a CD and trying to synchronize the data from the internal clock of a CD transport with the clock in the D/A converter can create a complex mix of timing errors. The technical term for these differences is "data jitter," or jitter.

The most common type is correlated jitter, which increases or decreases in direct proportion to a specific musical note or group of notes (frequencies), and thus may be audible because it follows the music and is frequency-selective. The ear is very sensitive to this kind of jitter, and a number of listening tests have found that it does affect perception of the sweetness or natural harmonic character of music, low-level detail, and spatial characteristics.

There is much controversy over how audible jitter is and how well specific transports, jitter-reduction devices, and D/A converters deal with it. Many listeners are tolerant of jitter in ordinary CD players and do not find it a barrier to enjoying their sound. Others seem so hypersensitive to it that they insist they can listen only to analog.

The point I hope I made clear in my review was that I found the Mark Levinson 31.5 transport to be the best I had encountered and that a special synergy between the technology in the 31.5 transport and the 30.5 D/A converter produced a superb soundstage. At the same time, I stressed that these components are so expensive that any decision to buy them should be made after very careful auditioning and an equally careful decision about where to invest the money you have available in upgrading your stereo system.

This brings me to my final point. No reviewer can be anything other than a rough guide to the sound of a component, and words are only a crude tool for describing musical nuance. At the same time, technology and test specifications present the same problem. I strongly suggest that you go to a top dealer and listen for yourself.—*A.H.C.*

WHAT'S NEW

KLIPSCH SPEAKERS

Each of the Synergy Monitor speakers—the KSB 1.1, KSB 2.1, and KSB 3.1—has a K-94 Tractrix horn, which Klipsch says results in high efficiency, low distortion, controlled directivity, and flat frequency response. Moreover, the KSC-C1 center channel, with its identical K-94 Tractrix horn, is sonically matched to the three KSB models for home theater use. Rated sensitivity ranges from 92 dB in the KSB 1.1 to 94 dB in the KSB 3.1. Heights of the three Synergy Monitors are 11, 15, and 17 inches. Prices: KSB 1.1, $230 per pair; KSB 2.1, $330 per pair; KSB 3.1, $430 per pair; KSC-C1, $279 each.
For literature, circle No. 100

Gallo Acoustics SPEAKER

Constructed of aluminum, the Nucleus Minor's spherical bass enclosure is said to eliminate internal standing waves, minimize baffle diffraction, and overcome the effects of energy storage. And though the sphere's volume is just 0.5 cubic foot, Gallo Acoustics says its proprietary technology enables the speaker to have a frequency response of 42 Hz to 20 kHz, ±3 dB, and a sensitivity of 88 dB/1 watt/1 meter. Prices: $995 per pair, in black, champagne, or pewter; Barcelona stand, $275 per pair in satin black (other colors optional).
For literature, circle No. 104

PMC SPEAKER

Transmission-line loading of the enclosure is said to enable the AB1 to produce low bass to 25 Hz and to generate high sound pressure levels (SPL) without compression. Peak SPL is specified at greater than 116 dB/1 meter, with sensitivity at 89 dB/1 watt/1 meter. The two-way AB1 has a 10-inch woofer, a silk-dome tweeter, and a 17-element fourth-order crossover. The Professional Monitor Company, the British builder, says the magnetically shielded AB1 is intended for home theater and music as well as broadcast and studio duties. Price: $3,420 per pair in black ash or walnut, $4,050 in rosewood.
For literature, circle No. 101

ACOUSTIC RESEARCH
DOLBY DIGITAL HOME THEATER SYSTEM

AR says The Leading Edge is the world's first Dolby Digital (AC-3) home theater system in a box. It comprises five Edge two-way shielded satellite speakers (each with a 4¼-inch woofer and ¾-inch tweeter) and a 12-inch powered subwoofer. The system has a Dolby Digital processor incorporating a proprietary 18-bit design, six channels of amplification with a total of 400 watts of output power, two digital inputs, two analog inputs, an on-screen display, a seven-button remote control, and a secondary soft-touch function control. All one need add is a TV. Price: $1,999.
For literature, circle No. 102

MB QUART
Powered Subwoofer

Intended for large rooms of 1,700 to 3,000 cubic feet, the Domain D1200Si has a 12-inch copolymer-cone driver powered by a built-in 185-watt high-current amplifier. Usable bass response is said to extend below 30 Hz. Its vented enclosure has a flared port to reduce "chuffing" noise. The internal crossover accepts speaker- and line-level inputs, and the crossover frequencies are adjustable. Slopes are 6 and 18 dB per octave for the high- and low-pass filters, respectively. The sub's top panel is available in ten different finishes. Price: $799.
For literature, circle No. 103

DISH NETWORK DOES IT AGAIN!

MORE TV LESS MONEY

NO UPFRONT ANNUAL SUBSCRIPTION!

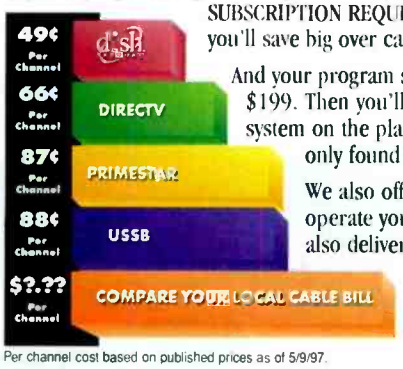
$19.99 PER MONTH

AMERICA'S TOP 40 PROGRAMMING PACKAGE℠

*Not Available On DIRECTV.

ASK ABOUT OUR OTHER 75 GREAT CHANNELS

Once again, the DISH Network has broken the price barrier! Join the DISH Network now and enjoy America's Top 40℠ programming, including The Disney Channel, for a rock bottom $19.99 a month! That's right, NO ANNUAL SUBSCRIPTION REQUIRED! With 40 of your favorite channels for less than $20 a month, you'll save big over cable and other satellite TV providers.



Per channel cost based on published prices as of 5/9/97.

And your program savings over cable will quickly pay for your complete system at only $199. Then you'll continue to save and relish the most advanced TV entertainment system on the planet with crystal-clear, digital video and crisp, rich audio normally only found on CDs.

We also offer system upgrades with a UHF remote where you can even operate your system through walls and other obstructions. These systems also deliver a host of incredible features and capabilities cable and other satellite TV systems can't begin to match. And these advanced systems allow you to add a second, inexpensive receiver so you can watch different satellite TV channels on separate TVs for a small monthly access fee.

$199 COMPLETE SYSTEM

ONE GREAT PRICE —
* NO HASSLES
* NO REBATES
* NO GIMMICKS

Premium movie services are also available in a multichannel format including HBO/HBO Family (6 channels), Cinemax (3 channels), Showtime (3 channels), The Movie Channel (2 channels), FLIX and Sundance Channel — all at incredibly low prices! So if you're tired of cable constantly raising your rates and want more versatility, more choices, more service and definitely more value, call DISH Network today!

Your Only Single Source For Satellite TV!

One Call Does It All:

YOUR PRIORITY SERVICE CODE 6118

1-800-333-DISH

30-Day Moneyback Guarantee

http://www.dishnetwork.com

dish NETWORK

Nothing Else Compares.℠

All prices, packages and programming subject to change without notice. Local and state sales taxes may apply. Programming is available for single-family dwellings located in the continental United States. All DISH Network programming, and any other services that we provide, are subject to the terms and conditions of the Residential Customer Agreement, which is available upon request. Broadcast Networks are only available to customers in those areas not served by local network affiliates. Prices do not include installation or shipping and handling. 30-day moneyback guarantee does not include shipping costs to or from the customer and applies to direct sales only. All receivers must be connected to a phone line. Offer by DISH Factory Direct Corporation. DISH Network is a trademark of EchoStar Communications Corporation. DIRECTV® is a registered trademark of DIRECTV, Inc., a unit of Hughes Electronics Corp. USSB is a registered trademark of U.S. Satellite Broadcasting Company, Inc. PRIMESTAR is a registered service mark of PRIMESTAR Partners, L.P. ESPN and ESPN2 programming subject to change and blackout restrictions, and is licensed separately for residential and commercial use. ESPN, ESPN2 and ESPNEWS are registered trademarks of ESPN, Inc. ©Disney. HBO and Cinemax are registered service marks of Time Warner Entertainment Company, L.P. Showtime, The Movie Channel and FLIX are service marks of Showtime Networks Inc., a Viacom Company. Sundance Channel is a registered trademark of Sundance Television Ltd. Sundance Channel L.L.C. authorized user. MTV: Music Television, VH1 Music First, Nickelodeon/Nick at Nite and Nick at Nite's TV Land are trademarks of MTV Networks, a division of Viacom International Inc. Cartoon Network, CNN, Headline News, TBS Superstation and TNT are registered trademarks of Turner Broadcasting System, Inc. The Family Channel and The Family Channel logo design are registered service marks of International Family Entertainment, Inc. Home Shopping Network is a registered trademark of Home Shopping Network, Inc. All other service marks and trademarks belong to their respective owners. Per channel costs based on the following packages. DISH Network America's Top 40, DIRECTV Total Choice™, PRIMESTAR PRIME Value℠ package, USSB Basics, as of 5/9/97. Channels per package may vary.

CIRCLE NO. 3 ON READER SERVICE CARD

WHAT'S NEW

Wright Preamp and Phono Stage

A separate choke-filtered power supply isolates AC fields and transformer vibration from the LT-3 line-level tube preamp's main chassis, which has two buffered tape outputs and seven line-level inputs (a separate tube phono stage, Model PH-2, is optional). Harmonic distortion is specified at less than 0.05%, S/N at 92 dB, and bandwidth at 10 Hz to 60 kHz, –1 dB. Wright Audio says the LT-3 uses 1% metal-film resistors and point-to-point wiring throughout. Tube life is said to be 4,000 hours. Prices: line-level preamp, $1,250; phono stage, $650.
For literature, circle No. 107

Marantz A/V Receiver

Separate chips for Dolby Digital (AC-3) and Dolby Pro Logic decoding are used in Marantz's new SR-880 A/V receiver. Moreover, there are three Dolby Digital inputs: RF for laserdisc, as well as optical and coaxial for DVD and other sources. Five discrete, integral amps deliver 110 watts each to the three front channels and 60 watts to each surround channel. The SR-880 will switch A/V sources from four audio and five video inputs, the latter S-jack equipped. Other niceties are defeatable tone controls, an on-screen display, and the elaborate RC2000 learning remote, which can transmit 20 commands at the touch of one button. Price: $1,499.99.
For literature, circle No. 105

ULTECH DOLBY DIGITAL A/V PREAMP

The Theater Center AC3 has HDCD decoding for music playback and built-in Dolby Digital decoding. Its Zoran ZR38500 DSP chip and six Burr-Brown 20-bit D/A converters are said to ensure accurate and dynamic Dolby Digital and Pro Logic playback, with all decoding performed in the digital domain. The Theater Center has a built-in RF AC-3 demodulator for Dolby Digital outputs from laserdisc players and standard digital inputs for AC-3 and PCM data streams from DVD players, CD transports, and other digital sources. A remote is included. Price: $3,995.
For literature, circle No. 108

Z-Systems DIGITAL PREAMP

Said to be capable of 24-bit resolution from input to output, the rdp-1 has six digital inputs (two XLR, three coaxial, and one optical) and three digital outputs (XLR, coaxial, and optical). Besides enabling digital format conversion (from coaxial to optical, for example), the rdp-1 has a Transparent Tone Control (TTC) algorithm, which facilitates speaker, room, and tone correction in the digital domain (there are 100 presets to store these settings). Other features include numerous dither options, an A/B facility to instantly compare TTC settings, and a digital volume control. Price: $5,000.
For literature, circle No. 106

PHILIPS MAGNAVOX DVD PLAYER

The DVD400AT has digitally enhanced playback functions that allow it to deliver solid freeze frames, clear slow-motion images, and two-speed forward and reverse scan. Multiple camera angles, subtitles, aspect ratios, and other DVD software modes are supported, and there are outputs to feed a Dolby Digital or Pro Logic surround decoder. Besides selling the player at retail, Philips has set up a network of video store kiosks and a program for customers to rent a DVD400AT player plus two PolyGram DVDs (*Fargo, Dead Man Walking, Three Tenors*, etc.) for $19.95 for two nights. Price: $549.
For literature, circle No. 109

The LS15 Stereo Line Preamplifier
6 inputs, (2 balanced) XLR & RCA outputs. Full remote control. 12 dB all-tube gain (18 dB optional).

The VT100 Stereo Power Amplifier
100 WPC continuous all-tube push-pull design with 270 joules energy storage. XLR & RCA inputs.

New anodized gray panel finish available at no extra charge.

For once, the critics agree.

"This very special amplifier does so much right and so little wrong that it's almost impossible to describe... the music the VT100 makes is bettered only by two things within my compass—the Reference 600 and life itself... The LS15 recalls the sound of the VT100 in every particular—unruffled, coherent as well as continuous, and highly transparent... it lets music glow from within rather than adding any light of its own."
*Paul Bolin, **The Absolute Sound**, Issue 111, July 1997.*

"Audio Research has once again taken a clear lead over the competition, giving you sonic performance that others can only envy. With the LS15, Audio Research gives you this world beating performance at a price that is so affordable... it will be a runaway success... After the REF1, the LS15 is the best line section we've ever heard, and the most exciting bang-for-the-buck tube preamp you can buy...

The VT100's sonic strengths are so outstanding, and so important to recreating the sound of live music, that they alone make the VT100 objectively competitive with any power amp you can buy, at any price."
*J. Peter Moncrieff, **International Audio Review**, No. 74.*

"The Audio Research VT100 amplifier has touched me in a way no other audio component has, and in a way I didn't think any audio component could... I felt a sense of magic I'd never heard in an amplifier before... Audio Research has raised the bar."
*Robert Reina, **Stereophile**, March 1997, Vol. 2 No. 3.*

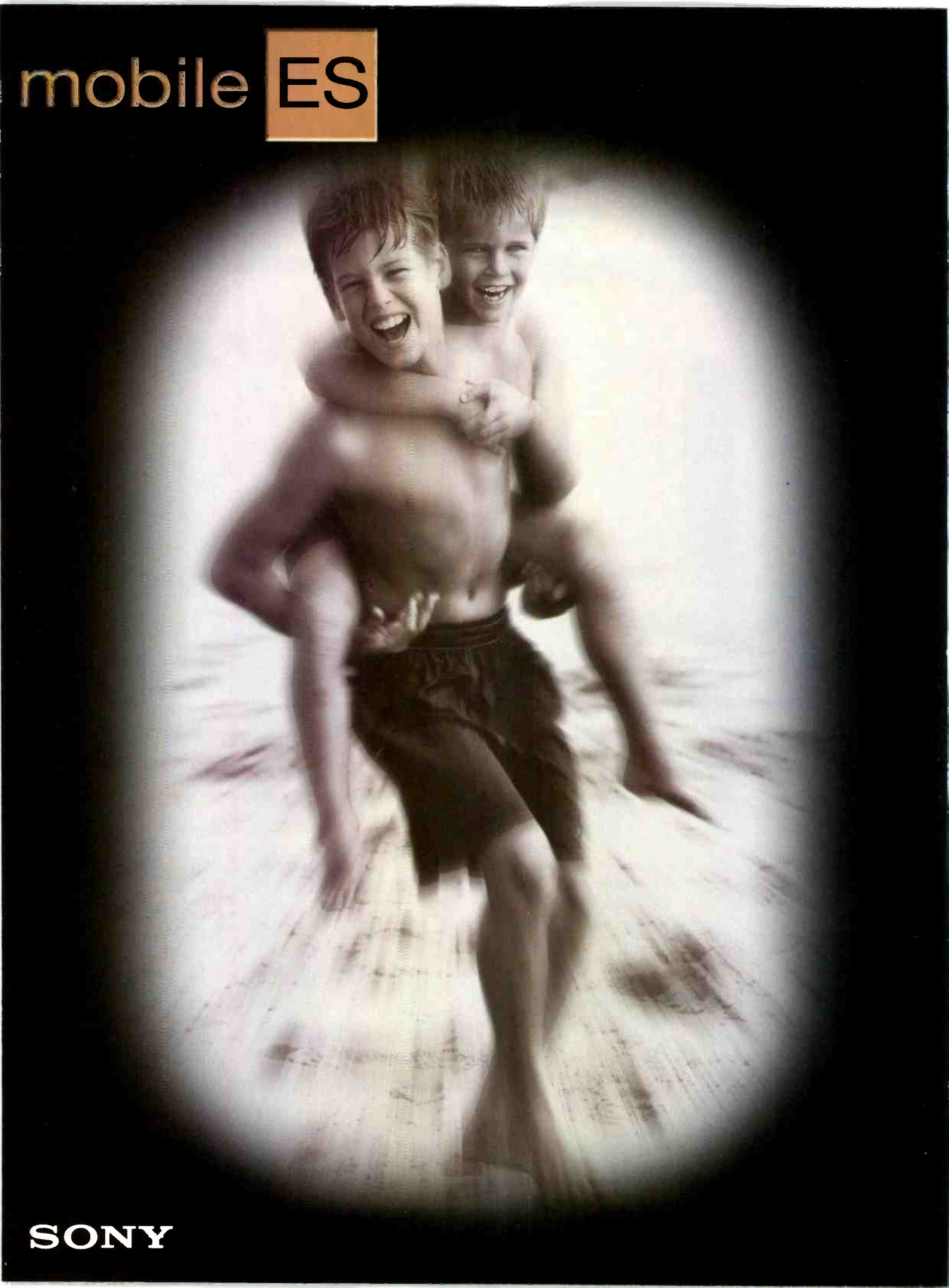
"Over the years I've owned any number of medium-powered, medium-priced tube and transistor amps. The VT100 is, overall, the best I've heard. So, I'm going to buy it."
*Jonathon Valin, **FI Magazine**, July 1997, Vol. 2, Issue 6.*

audio research
HIGH DEFINITION®

5740 Green Circle Drive / Minnetonka, MN 55343-4424 / Phone: 612-939-0600 FAX: 612-939-0604 www.audioresearch.com

CIRCLE NO. 1 ON READER SERVICE CARD

mobile ES



SONY

EVERYONE NEEDS A

ROLE

MODEL

MOBILE ES REFERENCE SERIES BY SONY

DON'T COMPROMISE

AUDIO CLINIC

JOSEPH GIOVANELLI

Active or Passive Preamp

Q *My preamp can operate in active or passive mode (the latter bypasses any stage of gain). My power amplifier operates in Class-A mode when driven up to 10 watts output. Am I more likely to keep the amplifier operating within its Class-A mode by using the active or the passive mode of preamp operation?*—Alan Fassinger, Rochester Hills, Mich.

A Assuming that you are able to achieve whatever volume levels you want in either preamp mode, it won't make any difference. Only if you can't get as much output as you want in the passive mode would you be more likely to stay in the power amp's Class-A range, but in that case you undoubtedly would switch to active mode to get the volume you want. Whether that will happen depends on two factors: the sensitivity of the input stage of your power amplifier and the signal level provided by the various program sources connected to your preamp.

Also, unless you are using highly efficient horn-loaded speakers or are content with very modest sound levels, 10 watts of output power may not be sufficient and your amplifier will inevitably move into a Class-AB mode to produce enough power to drive the speakers to adequate volume.

Cable Quandary

Q *My hi-fi components are located along the wall adjacent to my speakers. Should the wire from the right speaker be the same length as the one from the left, even though the run to the right speaker is much shorter than that to the left speaker? And do I need to attach connectors such as pins or spade lugs?*—Gregory Walls, Logan, W. Va.

A I don't think it is necessary to have speaker cables of equal length. Any slight power loss caused by the increased resistance of a longer cable can be offset by using a heavier-gauge wire. If you use 12-gauge wire for the speaker cable runs found in most home audio installations—about 15 to 50 feet—any differences in resistance between unequal left- and right-channel cables will be reduced to a few tenths of an ohm or less, trivial in terms of the amplifier power supplied to each speaker. Of course, use the same wire gauge for both cable runs.

The use of pin connectors or spade lugs is to facilitate connection to the amplifier and to the speakers. Plenty of speaker and amplifier terminals will accept bare wire, but 12-gauge cable often is too large to fit into the hole in many binding posts, and it's awkward to wrap heavy-gauge wire around a post. Hence the use of pin or spade connectors or banana plugs.

Automatic Recording Level in Hi-Fi VCRs

Q *I have seen many Hi-Fi VCRs that don't have recording level meters. How do I know if I am recording a CD, an LP, or a cassette at the proper level?*—Steven Matthews, Louisville, Ky.

A Unfortunately, the gradual disappearance of Hi-Fi VCRs that have level meters or recording level controls is a product of the price competitiveness prevalent in the video business and consumer preference. Apart from a minority of audio buffs and video enthusiasts, Hi-Fi VCR owners never use their machines for audio-only recording purposes. (Indeed, some surveys have revealed that fewer than half of VCR owners ever use their machines to *record* video! The VCRs are used simply to play back rental videos.)

In order for Hi-Fi VCRs to sell for $200 or less, an unthinkably low price a decade ago, manufacturers eliminate features such as recording level controls and replace them with inexpensive IC-chip-based automatic level control (ALC) circuits. For some years, record level controls and meters were retained on the most expensive, feature-laden machines or S-VHS models, but now they're becoming scarce in that realm.

An ALC circuit may act as a limiter, automatically keeping the loudest sounds below a level that would otherwise produce audible distortion, or as a compressor, reducing the level of loud sounds to prevent distortion as well as *increasing* the level of soft sounds to prevent them from being lost in the noise floor. It's as though an engineer were adjusting the volume control in accordance with the dynamics of the program. If the overall signal level goes beyond some preset point, the circuit holds all signals at that level, regardless of how much louder they become.

Thus, ALC makes it almost impossible to overrecord from most program sources. On the one hand, this sounds wonderful; it simplifies the recording process tremendously. On the other hand, it does so at the expense of the dynamics of the original program being copied. (In well-designed ALC systems, the level-adjusting circuitry does not come into play except for the loudest signals. This means that most of the dynamics of the original program are preserved.)

Old ALC designs often produced audible "pumping" or "breathing" of the noise floor as the circuit increased the level of soft sounds too aggressively. However, in recent years these circuits have been dramatically improved. Some of them are quite subtle in their operation and produce few, if any, audible artifacts.

FM Antenna Placement

Q *I want to put an FM antenna in my attic. I understand that antennas should be kept 10 feet apart. Because my TV antenna is outside, mounted to the chimney, it will affect where I place my FM antenna. Is it really necessary to follow the 10-foot separation rule?*—Kevin Cottrill, via e-mail

A Generally speaking, it's best to keep the two antennas at least 10 feet apart to avoid proximity effects that may compromise the reception of both TV *and* FM signals. Indoor FM antennas have a hard enough time pulling in a decent signal without compounding the problem. But before you invest in a second antenna, you might check to see whether your TV anten-

---

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

na can also feed your FM tuner. If the FM stations you want are coming from the same direction as the TV stations, and your antenna does not block out FM signals (as some do), it should work fine for both purposes. First try feeding the TV antenna directly to your tuner; if that's successful, connect your antenna, your TV, and your tuner to an FM splitter, preferably one designed to separate TV and FM bands.

Whither the Back Wave?

Q *Some reviews of electrostatic speakers suggest they convey the feeling of live music because they are bipolar, emitting sound waves from the front and back. But if dipolarity is so great, then why are acoustic-suspension speakers sealed? What happens to the back wave?*—Joaquin Serrano, Condado, Puerto Rico

A You are mixing up what have come to be two distinct terms, dipole and bipole. The manner in which a speaker projects sound waves into a room determines its radiation or *polar* pattern. Imagine looking down at a speaker from overhead: Large flat-panel speakers, which include electrostatics and other planar radiators whose diaphragms are exposed at the front and rear, are *dipoles*. They radiate sound to the front and rear in a figure-eight pattern, but the back wave from the dipole is out of phase (in opposite polarity) with the the front-directed wave. Bass frequencies, which are omnidirectional and have wavelengths longer than the dimensions of the panel, therefore travel around the baffle and cancel out. This causes poor bass response (and is why many electrostatic speakers use a conventional dynamic woofer in a ported or sealed enclosure for low bass). Nevertheless, the dipole's mid- and high-frequency back waves bounce off the rear wall and adjacent room surfaces and tend to impart a greater sense of spaciousness and depth to the soundstage.

In contrast to the dipole, a *bipole* does not depend on an exposed diaphragm at the rear to generate its back wave; instead, it typically uses pairs of conventional cone woofers and dome tweeters mounted on the front and rear baffles. A bipole's rear-directed sound wave is *in phase* with the waves radiated to the front, so cancellation of low bass does not occur. Thus, a bipolar speaker's bass response may be excellent, and the speaker retains the added spaciousness and depth produced by the rear-radiated sounds bouncing off adjacent surfaces. (Some interference of the front and rear wavefronts may still occur with bipolar systems, which may cause some tonal coloration of sound compared to a forward-firing speaker.)

As to whether dipole or bipole speakers sound "better" than conventional speakers because of their radiation patterns is largely subjective: "different," perhaps, but not necessarily better.

In an acoustic-suspension speaker, if the back-wave radiation were not suppressed, bass output from the speaker would be greatly reduced. Like the dipole, low frequencies emanating out of phase from the rear would travel to the front (and vice versa), converge with the signals there, and cancel. High- and mid-frequency wavelengths are relatively small, so the size of the enclosure prevents them from migrating around it.

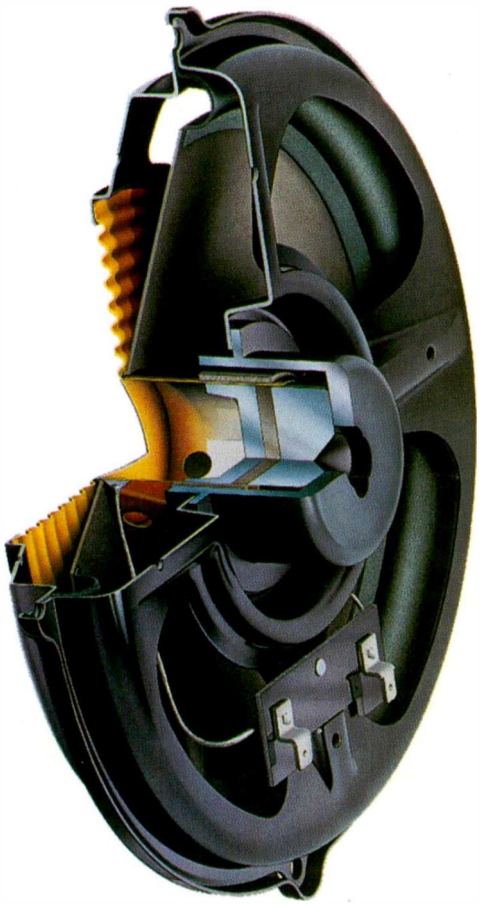
Designers of acoustic-suspension speakers get rid of the back wave by sealing the enclosure and filling it with sound-absorbing material to soak up signals before they strike the internal surfaces of the box and cause them to resonate or be reflected back through the woofer cone. There is an added benefit, too: The density of this material makes the enclosure appear (acoustically) to have a somewhat greater internal volume than it really has. This enhances bass reproduction.

A Cure For RFI

In response to the reader who described his interference troubles with ham radio broadcasts ("Laserdisc Interference," February), I had a similar problem a couple of years ago with my preamp. It was picking up a CB radio transmission loud and clear. After soliciting solutions on the Internet and trying various things (such as upgraded patch cords and ferrite chokes), I discovered that the preamp's bottom plate was made not of metal but from some plastic or phenolic material, which extended a welcome mat for those pesky RF waves. I placed a piece of aluminum foil as a shield, with a thin sheet of plastic over it for insulation, inside the bottom of the chassis (making sure the foil was in contact with the metal sides of the chassis). The interference went away.—John Senko, via e-mail A

IVAN BERGER

THIN IS IN



Bose slimmed its Nd woofer (above) by putting the magnet out front; Infinity's Kappa UniPlanes (middle right) were slimmed by turning their cones inside out.

All but the smallest speakers were crowded out of most dashboards years ago, a major reason why speakers so often wind up in car doors. Now, what with electric windows, side-impact beams, side airbags, powered mirrors, and seat controls, the doors are getting crowded, too.

Infinity and Bose have come up with similar answers to this problem: thinner drivers. These are not exotic designs such as electrostatic or planar drivers, but cone drivers with magnets tucked inside their cones; aside from that, however, the two companies' speakers differ markedly.

Bose's Nd woofer, so far used only in Gulfstream V jet aircraft and in the 1997 Corvette, has its magnet in front of its cone. The neodymium in this neodymium/iron/boron magnet, which claims 10 times the energy density of conventional ferrite, gave the speaker its name. The magnet is shielded, not for use near video screens but to concentrate the magnet's energy. The voice coil is helically wound of flat wire for dense packing, which increases speaker efficiency. Instead of a conventional basket, the Nd woofer has a wraparound frame only 2.35 inches deep. Despite its thinness, the Nd woofer is said to allow up to an inch of cone excursion and to handle more power than other 8-inch woofers, performing more like a conventional 12-incher.

Its compact magnet and aluminum voice coil help make the Nd woofer much lighter than traditional drivers its size. That's important to the vehicle manufacturers that buy Bose's drivers. In airplanes, weight savings increase fuel economy, cruising range, and payload. Weight savings also improve cars' fuel economy, and car makers are mandated by law to deliver reasonably high average gas mileage.

Weight is less of a concern when you're upgrading your own car stereo system. So Infinity didn't mention it when it introduced its thin Kappa UniPlane speakers. That still left plenty to say about them.

Each of the four Kappa UniPlane models (a 4-inch and a 6-inch two-way, a 6-inch mid-bass driver, and an 8-inch woofer) has an inside-out cone, its apex towards the listener. The magnet and voice coil are still behind the cone but no longer project out of the frame. As a result, mounting depths range from as little as ¾ inch for the 4-inch two-way to less than 2 inches for the 8-inch woofer. This enables you to put coaxial speakers in locations where only tweeters would normally fit and to bring all but the lowest bass octave up to the front of the car by putting 8-inch woofers in your doors.

Because the UniPlanes' cones are inverted, Infinity engineers mounted the tweeter of each UniPlane two-way speaker right at the cone's apex. This improves the time coherence of the two drivers, and because the inverted mid/woofer cone extends behind the dome tweeter rather than to each side of it, keeps the cone from reflecting high frequencies or horn-loading the tweeter. Consequently, the Kappa UniPlane coaxials are said

It's no coincidence that so many two-way speakers, such as this Fultron Aria, have coincident tweeters.

Paradigm® Reference Wins The Best of 1997 Awards!

Video Magazine's Home Theater System of the Year

AudioVideo International Grand Prix Product of the Year

Sound&Vision Critics' Choice Award

"Phenomenal...Highly Recommended!"
- Don Keele, Audio Magazine

"Skin Tingling...Truly Topnotch."
- Julian Hirsch, Stereo Review

"Outstanding...I Surrender..."
- Greg Petan, Audio Adventure

"Extraordinary...Bravo Paradigm!"
- Andrew Marshall, Audio Ideas Guide

With years of design expertise and a state-of-the-art in-house R&D facility, Paradigm engineers and acousticians set out to build the world's finest speakers, regardless of cost! The result is Paradigm Reference...electrifying and eminently satisfying high-end speaker systems that bring you closer than ever to the live event!

And, while this stunning performance heightens the sheer enjoyment of music, it is equally important for the best in home theater sound, especially now with the arrival of digital AC-3 and DTS.

We invite you to visit your nearest Authorized Paradigm Reference Dealer and experience this astonishing new reference standard in music and home theater sound for yourself!

Studio/20 *Studio/60* *Studio/80* *Studio/100* *Esprit/BP Bipolar* *Eclipse/BP Bipolar* *LCR-450 Left/Center/Right* *CC-450 Center Channel* *ADP-450 Surround* *Servo-15 Subwoofer*

AC-3 is a trademark of Dolby Labs. DTS is a trademark of Digital Theater Systems.

PARADIGM® REFERENCE

THE ULTIMATE IN HIGH-END PERFORMANCE FOR MUSIC AND HOME THEATER™

For more information visit your nearest Authorized Paradigm Reference Dealer or write: AudioStream, MPO Box 2410, Niagara Falls, NY 14302 (905) 632-0180 In Canada: Paradigm, 101 Hanlan Rd., Woodbridge, ON L4L 3P5 (905) 850-2889

website: www.paradigm.ca

CIRCLE NO. 18 ON READER SERVICE CARD

Pioneer says the nickel coating on its cone improves the response of this Premier speaker.

to have excellent dispersion, with response 45° off axis that nearly matches their on-axis response. (That's very important in a car, where you're more likely to be sitting way off a speaker's axis than you are to be right on it.) Infinity demonstrated this with a pair of 6-inch, Model 62f coaxes in floor-standing enclosures, rotating the enclosures to let us compare the on- and off-axis sound. At 45° off axis, frequency response and imaging were good, although some listeners felt that the center image had widened.

MOUNTING DEPTH, TREBLE DISPERSION, AND WEIGHT ARE ALL IMPORTANT IN CAR SPEAKERS.

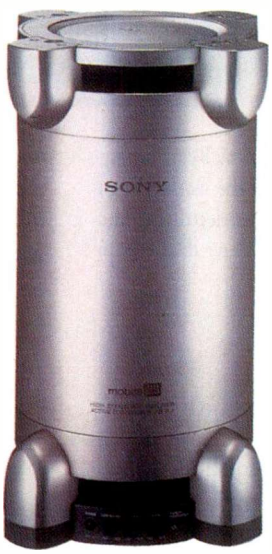
The cones of the UniPlane speakers are made of Acrylic Polymer Gel (APG), a fibrous plastic whose stiffness enabled Infinity to reduce distortion by doing without the stiff fabric or plastic "spiders" most drivers use to keep cones centered. Infinity says the UniPlanes have as much excursion as conventional drivers except for the 8-inch woofer; its 4-millimeter excursion is a bit less than usual.

I was also intrigued by the Infinity's Reference Separate Components tweeter—or rather, by its mounting system. The I-Mount system is designed for quick attachment: Gaps in the threads of its mounting tube and plastic retaining nut let you quickly slide the nut up toward the top of the tube, then tighten it with just a fraction of a turn. I've seen this interrupted-thread idea before, but not in car stereo.

That Infinity tweeter is pivoted so you can aim the treble. The idea is fairly common, nowadays, but I applaud Aura, Clarion, CD Technologies and Kenwood for applying it to some of their coaxial speakers. It's not too hard to find good places to put tweeters, but it's harder to find good locations for coaxials, which require larger holes. If your coaxials wind up near the floor, being able to aim your tweeters toward your ear instead of toward your socks could be a godsend. Mounting a coaxial's tweeter at a fixed angle to the mid/woofer cone can also accomplish this; you just orient the speaker so the tweeter points where you want it. Several makers, including Aura, MB Quart, and JBL, take this approach.

More and more two-way car speakers now use coincident tweeters, at the apex of the mid/woofer cone instead of on a post or bridge in front of it. As in the Infinity Kappa UniPlanes, this gives the speaker broader, more even coverage. Besides the UniPlanes, coincident models are now available from Advent, Aria, JBL, KEF, Macrom, Orion, and Ultimate Sound (and probably from other brands I've missed). Advent's version is the Inductively Coupled Tweeter (ICT), which shares the mid/woofer's magnet instead of having its own ("Roadsigns," August 1992).

Another trend is toward using hard-coated midrange and woofer cones, to increase rigidity without greatly increasing mass and to improve response at the upper end of the driver's frequency range. Alpine's VR subwoofers have ceramic coatings, several Clarion models have purple metallic coatings, and some Pioneer and Premier speakers are coated with nickel. Sony has opted for a hyperbolic cone shape that's said to achieve the same effect.



Sony's XS-TL1 subwoofer has a built-in, Class-D amp.

Sony's biggest speaker news is its XS-TL1 subwoofer, "digitally powered" by virtue of an internal, Class-D switching amp. Such amps have very high efficiency, which means low power draw (less than 6 amperes to reach its rated 100 watts, says Sony) and almost no waste heat to worry about. The amp delivers 100 watts only into 1-ohm loads, but it's mated with a 1-ohm driver. Rated response goes down to 20 Hz. The futuristic-looking tube enclosure measures 16 inches long and 8 inches in diameter and is designed for horizontal or vertical mounting; no matter what gets crowded out of your dashboard, Sony wants to be sure the XS-TL1 doesn't get crowded out of your trunk.

PAGING THE DYNAMIC RANGER

History suggests that new recording media will continue to appear and that they'll all be digital. So maybe, when the next one arrives, we can use it to solve the problem of dynamic range.

Digital technology has already turned the problem on its head. In analog days, the challenge was to record enough dynamic range to reasonably simulate reality. Today, with CD's wide dynamic range, the challenge is to hear it all when late-night listening limits the maximum loudness we can play or when road noise limits the minimum sound levels we can hear.

For late-night listening, Dolby Digital decoders have switchable compression that reduces dynamic range to listenable limits. For listening on the road, some car stereos have also offered compression, so you can hear quiet passages without blasting loud passages into the next block. (Car audio compression doesn't sell well, however. Many people don't understand it. And today's compressors affect all frequencies equally, whereas road noise does not.)

What compressors don't do yet is vary their effect to match the recording and the situation. But they could. Future digital recordings could carry subcodes for each disc's or track's dynamic range. Controls on the player would let you set the maximum dynamic range you want, and compressor

"THE FINEST IN-WALL SPEAKERS IN THE WORLD!"

Audio/Video International Grand Prix Product of the Year

Sound&Vision Critics' Choice Award

Consumers Digest Best Buy Award

All in-wall speakers are not created equal! Although they may look similar, most often beauty is only skin deep. Paradigm's extraordinary AMS in-walls, on the other hand, are designed from the inside out to provide stunning state-of-the-art performance that sets *the* standard for high-end in-wall sound!

What does it take to build the world's finest in-wall speakers? Nothing short of better design execution and better materials. So, rather than the all-to-common flimsy plastic parts, Paradigm's AMS in-walls use an aluminum diecasting that combines the main chassis, mid/bass driver chassis and tweeter faceplate into a single ultra-rigid unit. Instead of mounting hardware made of plastic parts, metal clips etc., we use an ultra-rigid diecast aluminum mounting bracket.

Add Paradigm's world renowned driver technology, seamless dividing networks, and the result is dramatically superior in-wall sound for both music and home theater.

We invite you to visit your nearest AUTHORIZED PARADIGM DEALER and experience these sensational in-wall marvels today. The difference is... simply better sound!

Paradigm®

THE ULTIMATE IN HIGH-PERFORMANCE SOUND™

For more information on other fine Paradigm speakers visit your nearest AUTHORIZED PARADIGM DEALER or write. AUDIOSTREAM, MPO Box 2410 Niagara Falls, NY 14302 (905) 632-0180 In Canada: PARADIGM, 101 Hanlan Rd. Woodbridge, ON L4L 3P5 (905) 850-2889

website: www.paradigm.ca

CIRCLE NO. 8 ON READER SERVICE CARD

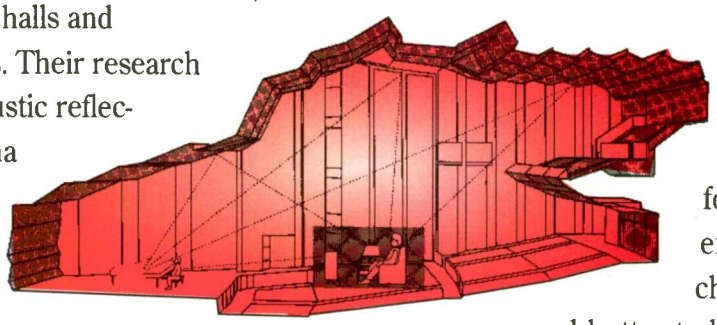
Been there.

When most people go out to the movies, they grab a bucket of popcorn and a soda to keep them company.

Yamaha sound field engineers, on the other hand, bring something a bit more sophisticated along.

Equipped with an array of advanced measuring systems, they record the way sound waves behave inside an actual theater—in the same way they've measured concert halls and other performance venues. Their research captures the complex acoustic reflections that make the cinema experience seem so much larger than life.

Measured that.



Finally, our engineers translate this understanding of sound field behavior into unique, sophisticated new signal-processing devices. Using Yamaha's extensive semiconductor design and manufacturing capabilities.

Yamaha custom-designed ASIC chips give you cleaner sound than general-purpose chips that are stressed by running faster and hotter in the same job.

Built this.

Just how much they've accomplished you'll hear in the new Yamaha RX-V2092. The first A/V receiver ever offered with on-board Dolby Digital AC-3 decoding as well as proprietary Yamaha 7-channel Tri-Field Cinema DSP.

Dolby Digital gives you 5.1 discrete channels of surround sound, positioned precisely as the director intended.

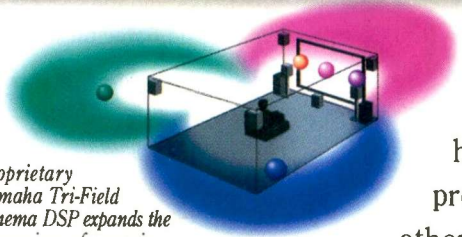
While our 7-channel Tri-Field Cinema DSP gives you the keys to the theater by adding a whole new dimension of realism.

SEVEN CHANNEL

Tri-Field processing recreates the sonic environment typical of grand movie houses our sound field specialists have measured. By employing Yamaha-manufactured chips expressly designed for the job. Rather than less-efficient general-purpose chips that have to run faster and hotter to handle the same tasks—less cleanly. And the results?

Imagine the birds in a primeval forest twittering in the treetops a hundred feet above your ceiling. Or the distant song of a steam locomotive beginning miles beyond your walls, then hurtling closer until it highballs through your living room.

Better yet, give your imagination a rest. Call 1-800-YAMAHA for the dealer nearest you and audition our series of new A/V receivers. You'll hear where we've already been. And precisely how far other home theater technology still has to go.



Proprietary Yamaha Tri-Field Cinema DSP expands the dimensions of a movie soundtrack far beyond the limits of your room.

CINEMA DSP™ Tri-Field

YAMAHA®

WHERE HOME THEATER LIVES.

www.yamaha.com

circuits would then reduce the recording's range just enough to suit you. Car stereos could incorporate noise sensors that set compression to match the range limits imposed by ambient noise.

Coming to a home theater (and car) near you? Maybe. You'll have to wait for the next revolution in recording systems.

POCKET COLLECTIBLES

If you can't afford to collect original Marantz components, you may want to follow the example of Darryl Rehr, a Los Angeles-based journalist, and collect classic transistor radios.

Next year marks the golden anniversary of the transistor, which won its inventors at Bell Labs the Nobel prize; transistors first

The historic Regency TR-1 and Sony TR-63.

appeared in a radio in 1954. Like vintage Marantz gear, the American-made Regency TR-1 was relatively expensive; though it measured a mere 4¾ x 2⅞ x 1¼ inches and weighed just 11 ounces without its battery, it cost $49.95, equivalent to about $300 today.

Japanese transistor radios began arriving on our shores in 1957, exactly 40 years ago. The first was the Sony TR-63. Sony promoted it as a shirt-pocket portable and, because it was a tad large, outfitted salesmen with shirts that had pockets cut especially for it, says Rehr.

He notes that the most coveted transistor radios were made between 1954 and 1963. (Check dials for the triangular Conelrad symbol at 640 and 1240 kHz, the Civil Defense frequencies reserved for emergency broadcasts, found on most radios of the period.) Enthusiasts prefer the more stylish

Transistor radios from Magnavox, Emerson, Bulova, Toshiba, and Hitachi.

models, whose cases may have clear plastic panels that are painted on the inside and which often feature exuberant decorative motifs—diagonals, boomerangs, or stars and atoms, for example. Before buying any transistor radio, be sure to check its case for chips or cracks, flaws that substantially decrease value.

Factories here and abroad churned out countless transistor radios under a myriad of brand names ranging from Arvin and Bulova to Westinghouse, Zenith, and Zephyr. Important early sets sell for $100 to $500, while the choicest rarities, such as Sony's TR-55, can command $500 to $1,000. Most other collectible models are likely to be worth between $20 and $100.

If you have a transistor radio you're interested in selling or swapping, you might want to make a photocopy of the radio

Three more early Sonys, the TR-510, TR-72, and TR-610.

itself and send that copy, with a note and self-addressed stamped envelope, to Darryl Rehr (P.O. Box 641824, Los Angeles, Cal. 90064).

David Lander

Photographs: Darryl Rehr

MONDO AUDIO

KEN KESSLER

WE'VE GOT EUROPE SURROUNDED

As an American living overseas—or, in British parlance, a "****ing Yank"—I'm more aware of U.S. sensitivities than I would be if I had stayed at home. In the context of hi-fi, it comes up mainly when American manufacturers ask me why European prices are so high, why there's a shortage of decent distributors in Europe, or why sales tax (or "value-added tax," that all-time killer euphemism) is 15% to 30% or more. But that's another saga. More worrisome is the late-20th-century American inferiority complex that has replaced the irritating John Wayne-style jingoism of the 1950s.

Philo-Americanism took a beating in the post-Vietnam years, for reasons as trivial as McDonald's/MTV/The Gap spreading faster than the Black Death, usurping local culture, and as serious as Watergate. But that whole Ugly American thing gets a bit wearing, especially after you have encountered German or French tourists in full cry. They make the most overweight, Kmart-clothed, charter-flight-full of Middle American Kodak clickers seem like a bunch of solemn monks. No, it's not the cartoon image of American tourists per se that's caused a loss of self-esteem, because Europeans will always think of us as "overpaid, oversexed, overweight, and over here," an ungrateful hangover from World War II. Rather, it's American worries that we're losing our grip as *the* cutting-edge nation, which we have been for the better part of the century.

ONE HOME ENTERTAINMENT SUB-GENRE WHERE AMERICA RULES ABSOLUTELY IS CUSTOM INSTALL.

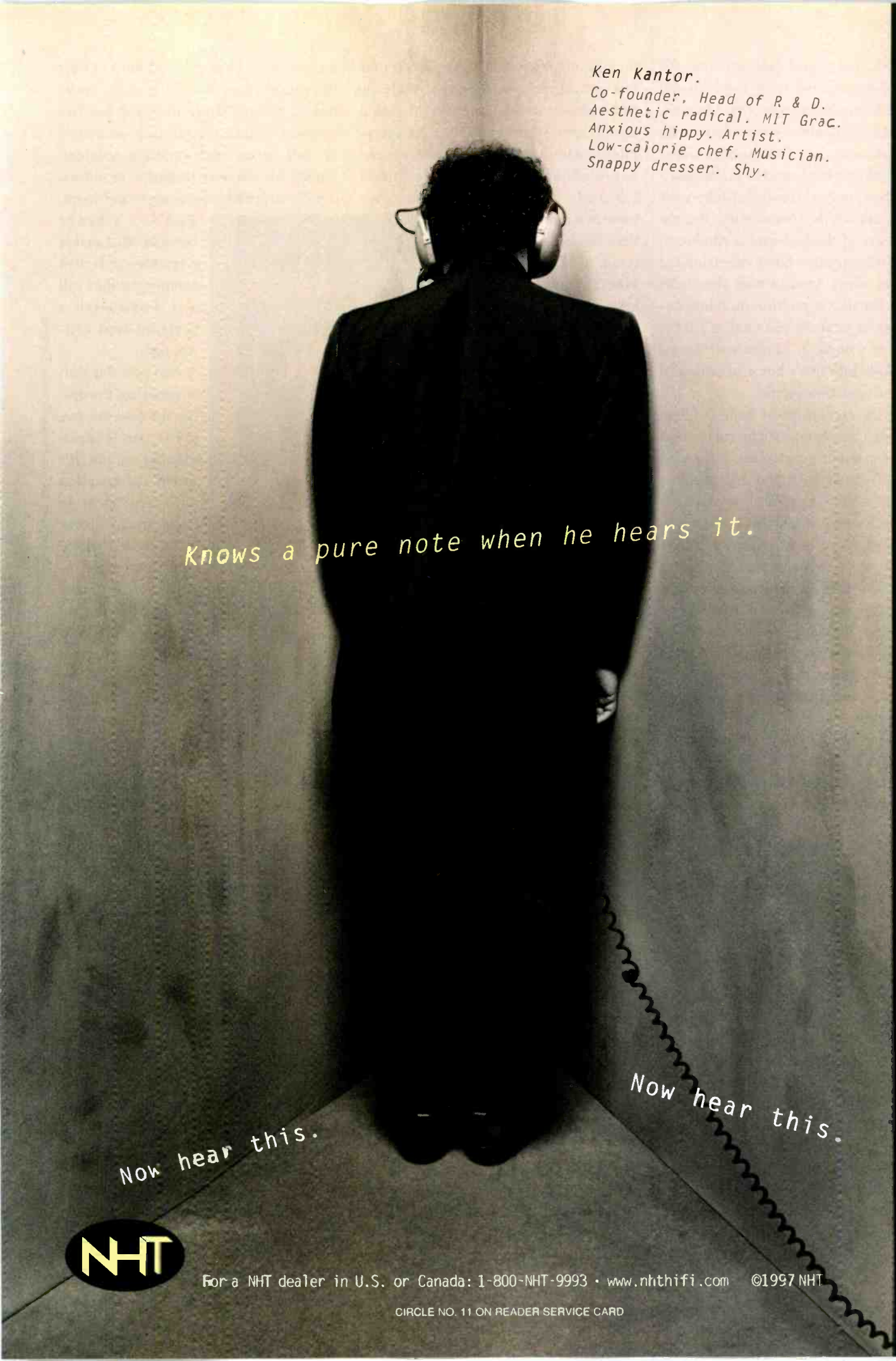
Without wishing to sound like I've gone all P. J. O'Rourke on you, I will gladly state that this rumored slip down the technological Top 10 is pure fantasy. And America is still the country everyone wants to visit, if not necessarily inhabit. You'd be amazed at the jealousy that underlines conversations with non-Americans. The U.S.A.'s higher standard of living, 24-hour shopping, state-of-the-art medical technology, cheap cars 'n' gas, *The National Enquirer* in every supermarket—man, do Italians get pissed off when you tell them how much a pair of Levi 501s cost in the U.S. But American egos have been bruised, perhaps too much.

Okay, so the Japanese and the Dutch can lay full claim to inventing CD and all of its derivatives, right up to DVD. So the Japanese hijacked video, even if Americans did invent it. But, hey, *absolutely everything* that matters in the world of computing is American. True, most monitors, printers, sound cards, scanners, and other peripherals are made offshore, but let's not be greedy. When it comes to software and operating systems—indeed, the entire concept of computing—it's red, white, and blue. For that very reason, Americans can stand up to all other nationalities and (to hell with political correctness) gloat.

And we can do it for high-end audio and home theater, too.

Again, others have joined in, so we find upscale video projectors from

Inset photograph: Archive Photos/Republic Pictures



Italy, surround sound decoders from the United Kingdom, and really fine high-end goodies from Greece, Australia, Malaysia, Portugal, and just about every country with an "audio community." All can offer home-grown high-end hardware like single-ended triode amps, and we'd be stuffed, tube-wise, if it weren't for the Communists. But the lion's share of the high end is American. And there's one other home entertainment sub-genre where America rules absolutely: custom install. Or multiroom, home automation, or whatever you want to call the concept of a music 'n' movies system integrated fully into one's home in both aesthetic and operational terms.

With the exceptions of Bang & Olufsen—which has always marched to the beat of its own remote-controlled, integrated drummer—and a few brands like Meridian and Linn, custom install really is American turf. And it's easy to see why: Just travel to any land outside of North America. It's the difference between America and the rest of the world, what Hitler so disarmingly called *Lebensraum* and what Californians call "space, dude." America rules in custom install because the average American home tends to be larger than anyone else's. In essence, Yankees invented/perfected custom install because we *needed* to do so.

Before we get carried away with a Detroitian view of America (longer, lower, wider), let's also recognize that there are gigantic, mind-blowing homes outside of the U.S. Just because something lies west of Oahu or east of Marblehead, it's not necessarily Third World. The White House ain't got nothing on Versailles or Buckingham Palace, and there are enough gazillionaires in Monaco, London, Hong Kong, Milan, Rio de Janeiro, and Singapore to ensure that there are homes outside of the U.S. that can be measured in acres, too. What's odd is that it took so long for these high-flyers to indulge in what well-heeled Americans have enjoyed for a decade-plus.

Perhaps it was inevitable, given that custom install grew alongside home theater, which exploits the global love of movies. If anything, the two markets are now inseparable, and rare are the custom installations that *don't* include an A/V chamber as part of the spec. Indeed, the swing has been toward more and better home cinemas, however much slicker and superior today's multiroom automation equipment is over that available only five years ago. Where the first custom installations started with a client's desire for remote-control-everything and total camouflage of said toys, the unprecedented growth of home cinema has made the mini-Rialto-in-your-den more of a motivation than environmental (read: hidden) hi-fi. Where once the home cinema was an add-on to a multiroom installation, now it seems as if the home cinema comes first, and the multiroom element is the add-on.

Photograph: Archive Photos/Republic Pictures

UNAPOLOGETICALLY HIGH-END BRANDS ARE NOW OFFERING PRODUCTS FOR A/V, MULTIROOM, OR BOTH.

But who really cares about this particular chicken and egg? With a market as moribund as pure audio has been since CD made it so completely populist (and this is not necessarily a good thing if it means a lowering of the status quo), both home cinema and custom install have been regarded as life savers by starving retailers and manufacturers. With the exception of some really weird cultist brands and stores—those masochistic and arrogant purists so divorced from reality that they think chapter 11 has something to do with books—nearly every company with an ounce of commercial sense has joined the movement. Again, it's led by America.

Now able to offer you products for A/V, multiroom, or both are such unapologetically high-end companies as Audio Research, Krell, Theta Digital, Madrigal, Apogee Acoustics, Lexicon, EAD, Martin-Logan, Snell, and dozens more. We're not talking about the mere re-badging of conventional hi-fi products so they wear more suitably A/V logos. The conversion has led to the production of audiophile-grade surround sound decoders superior to those found in cheap receivers, multichannel amplification on a single chassis, the necessary socketry for multiroom linkups, and more. As for the speaker manufacturers, which really had to do little more than sell you five speakers instead of two, they developed in-wall or on-wall variants, shielded models for use near television monitors, dipole surround loudspeakers and more. And it's a brave company that makes a remote-controlled component that will not work with a Crestron-type control pad.

And now this stuff is invading Europe. (By the time this sees print, we'll know whether or not it's worth redecorating one's apartment in Hong Kong.) A couple of loosely related events marked the official arrival of custom install in the European market, even though there have been high-end installers on the right-hand side of the Atlantic ever since the first flush-mount speakers appeared.

Although lip service had been paid to custom install in the past, the organizers of the 1997 Le Salon Hi-Fi & Home Cinema in Paris nailed their colors to the mast with a gorgeous Home of the Future display. Smack in the middle of the first floor at the Palais de Congres were fully functioning prefabricated rooms that could have been air-lifted from Los Angeles. There were motorized screens, hidden speakers, powered blinds, cool furniture, and as convincing a modernist vibe as any consumer could hope for prior to allowing the carpenters to invade his home. And these fully automated rooms attracted the biggest crowds at the show. Then again, the Salon was awash with home cinema, too, the French being the most cinefanatical people in the universe. (Their Jerry Lewis deification is for real.) They could rename the show Projectors and Other Stuff, and few would argue with its aptness.

A month later, CEDIA U.K.—the British wing of America's Custom Electronic Design & Installation Association—held its first trade-only conference, and it was an absolute smash hit with 300 trade attendees. CEDIA (now called CEDIA International) started in the U.S. in 1989 and today boasts 400 member companies; the U.K. division started only in January 1996 and already has more than 100 members. And they include every manufacturer and installer prepared to meet CEDIA International's standards, with the American organization quite clearly setting the pace.

Blessedly, the American brands fully supported the CEDIA conference by sending over guest speakers for the various training courses, including American-based CEDIA International personnel and employees of Lexicon, Ampro, Solus, PRC Marketing, Audio Access, and Sonance. The British were amazed by the support they received, and it reinforced the respect held for the American install pioneers. And these Yanks behaved as diplomatically as ambassadors should, so it was a two-way exchange, heavy on the encouragement.

Doug Wood of Sound Ideas produced the star design of the show. His breathtaking installation cost $20,000 just for the decorating materials, a substantial outlay for a mock-up room with a life of only a week. This was used to adorn a $160,000 system that was entirely American except for the laserdisc player and rear-projection monitor: Snell and Solus loudspeakers, Carver amplification, Audio Access and Crestron remote controllers, Inca lifters, and more. To repay the compliment, the American visitors concurred that this British installation firm had not just met but exceeded the standards established in the U.S.

No, that's not to suggest that the British will do to custom install what the Japanese did to video. They cannot commandeer it as their own because it's now a mature genre, with the U.S. forever showing the way. That's because everyone *knows* it's as American as Coca-Cola, and U.S. firms have a long head start. What's so pleasing to observe, though, is that this latest American invasion has been welcomed as an enhancement, not an intrusion. Maybe that's because the only vestiges of John Wayne are up there on screen. A

COREY GREENBERG

THE RETURN OF MR. MICROPHONE

One of the nice things about being an *Audio* columnist is that I can not only strongly encourage but also grant full diplomatic immunity to any reader of this magazine who suddenly lunges forward and violently karate-kicks the next audiocreep who repeats that age-old hi-fi lie about how only people who regularly attend live music events can accurately judge the sound of audio gear.

Sonic Studios' DSM-6S mikes look ugly but sound great and let you record with binaural or stereo perspective.

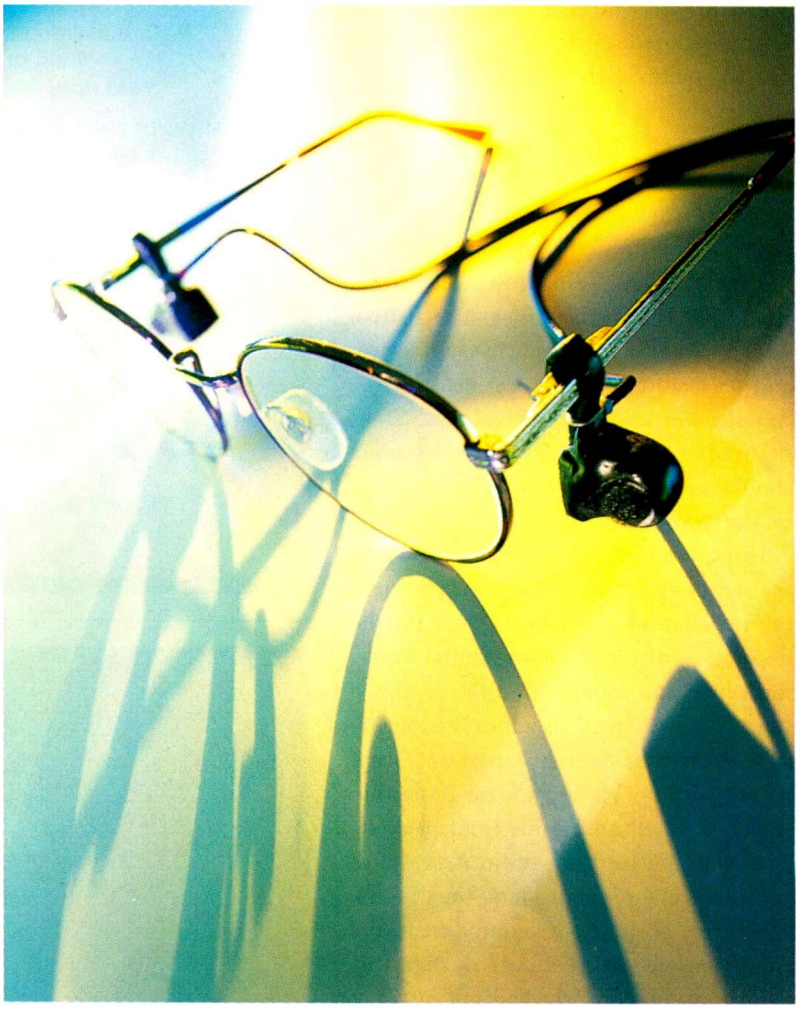
I've been hearing this elitist line ever since I got into this hobby, and it's time to put it to rest once and for all. Because it's just plain wrong. If it weren't, then all the reviewers in the high end who get up on their hind legs about how they regularly "condition" their ears with live music would be at the top of their game, and the fact of the matter is most of these guys are clowns. Earnest, yes, but a clown can be earnest, too. He's just got to paint a frown on his mouth instead of a smile and carry a wilted, oversize prop daisy in a cracked pot (at least according to some carnies I run with).

The fact is, simply exposing yourself to live music on a regular basis does not enhance your listening ability one iota. You can attend all the live music you want and never get any closer to being able to tell if a piece of hi-fi gear is accurate or not. I've been going to hear live music of all types since I was the proudest owner of the fakest ID you ever saw, but while that love of music fueled my entry into the hi-fi hobby, it never "conditioned" my ears to be able to tell whether or not a component is accurately reproducing the audio signal that's being fed to it. All my years of steady live music attendance didn't save me from making the same errors in judgment that I see so many self-professed Super Audiophiles make time and time again, labeling less accurate components superior because they color the sound in ways that remind them of what they *think* live music should sound like.

IT'S UNCANNY HOW GREAT THIS SIMPLE, AFFORDABLE RECORDING SYSTEM SOUNDS.

What did educate my ears and brain in a big hurry was recording live music and then comparing the sound of the recording to my memory of the original event. I cannot overemphasize this point enough: Making recordings of live music and then hearing these recordings played back was the turning point when I started making much more accurate judgments when listening to audio gear.

There's just something about being present at the original acoustic event and then hearing a good recording of that same event later that dramatically schools your ears for good. It's like you cross a thresh-



Photograph: John Wilkes

From Hollywood to Main Street, it's being heralded as the beginning of a home entertainment revolution. It's called DVD Video. With a digital picture that's better than laser disc, and state-of-the-art digital audio, DVD is destined to change your home into a, well, you get the picture. Now movies meet the digital age. And Philips Magnavox is there to help make the introductions.

Let's make things better.

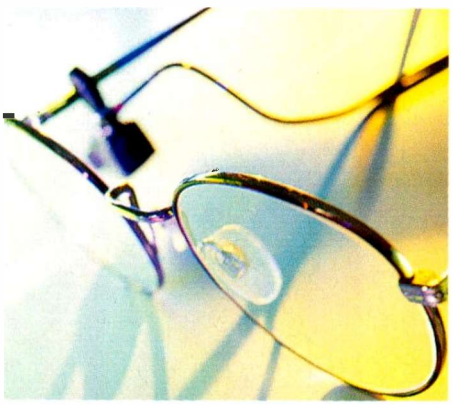
PHILIPS MAGNAVOX

DVD VIDEO

DVD Video from Philips Magnavox.
Technology for the heart, the spirit and the imagination.

old, and henceforth you're a much better listener. And this isn't just my experience: The reviewers over the years whose listening and judgment I've respected the most, Gordon Holt and the late Peter Mitchell, were lifelong amateur recordists who've pointed to that experience as being not merely beneficial but essential to any audiophile's development as a reliable arbiter of sonic accuracy.

Now, making your own recordings of live music was a pretty common thing back in the olden days of '50s and '60s hi-fi, when that good ol' do-it-yourself spirit was in full swing. It wasn't unusual at all for an audiophile back then to own a good open-reel tape deck and a pair of decent, semi-professional microphones. And later on, many upmarket cassette decks even came packed with a nice pair of mikes so you could plug 'em in and start making your own recordings right away.



EXPOSING YOURSELF TO LIVE MUSIC DOESN'T ENHANCE YOUR LISTENING ABILITY ONE IOTA.

It's too bad that kind of thing went away, because making your own recordings is some of the best fun you can have with hi-fi. And you don't have to rent a hall and an orchestra, either. If you've got a friend who plays acoustic guitar, or sings, or even belches the alphabet, for that matter, you've got live sound to record. Once you take that step of making a recording and then hearing it over your system, your perception of what is and isn't accurate when it comes to hi-fi gear will never be the same. Not to mention the thrill of hearing your own recording efforts on the hi-fi rig you've spent so much time and money on in order to make other guys' recordings sound so good.

The reason I've got home recording on the brain lately is because I've been playing around with a set of DSM-6S stereo microphones from Sonic Studios (of Sutherlin, Oregon, 888/875-4976). DSM stands for Dimensional Stereo Microphones, and Sonic Studios' Leonard Lombardo says these little omnidirectional microphones, placed on either side of your head, "fully utilize the natural psychoacoustical cues involved in normal spatial hearing of sound." Lombardo must be doing something right, because the DSM mikes are currently being used by the BBC, National Public Radio, *60 Minutes*, and Skywalker Sound, among others.

The $400 DSMs look kind of like those little in-the-ear "earbud" headphones, except instead of a speaker inside, there's a high-quality Panasonic condenser microphone element and some really teensy circuitry to make it go. Lombardo hand-builds the professional-grade DSM-6S, matching each stereo pair for gain accuracy to ±0.25 dB. For 100 clams less you can buy the standard-grade DSM-6 stereo mikes, which are identical to the DSM-6S but matched to only ±1 dB. And either way, since these mikes are condenser types, you'll also need Sonic Studios' $75 PA-6 phantom power supply. (A $225 version with adjustable low-bass cut is also available.)

Each mike nubbie is about the size of a Milk Dud, with a little rubber loop for you to slip onto the stem of your sunglasses. And *voilà*—Mr. Microphone rides again! My sister-in-law Ann-Marie took one look at me with the DSMs on my Revos and shouted, "You freak! Get out of my house!!" But you should hear the DAT I made of her screaming this at me—it sounds like she's right there in the room!

The beauty of the Sonic Studios mikes is that all you have to do is stand where you think the music sounds good, hit record on a good-quality portable DAT or cassette deck, and as soon as the music's over you'll have a finished, ready-to-listen-to stereo recording that sounds much, much cleaner and more natural than most anything you've got on record or CD. And, no, I'm not simplifying things. It really is that easy. The recording quality of these Sonic Studios mikes is so good that the normal beginner's learning curve of coping with typical mediocre budget mikes just isn't there at all. As long as you set the recording levels correctly so the recorder doesn't overload on peaks (very important with DAT, less so in good cassette recording), you will come away with an amazing-sounding tape that will stun and spoil you for most of what you consider to be excellent commercial recordings, just by standing there looking like a freak with little black Milk Duds hanging off your shades.

The excellent, comprehensive set of instructions Sonic Studios includes with the DSM-6S mikes makes it a breeze to start making great recordings right away. Lombardo does tend to cram a ton of real-world recording tips and tricks onto a page, in the manner of Dr. Bronner's Magic Peppermint Soap labels. ("Use the –20 dB attenuator for all Essene scroll recordings. All-One-God-Faith! And remember to hit the record button twice to start recording. Dilute! Dilute! OK!") But believe me, this guy really knows all the ins 'n' outs on how to get fabulous sound from these little mikes, and you should read every word he says before getting started. I, of course, dove straight into things without reading the poop sheet and found out the hard way that the Sony TCD-D8 portable DAT doesn't dig input levels that force you to turn its level control below 4, because its preamp overloads and distorts like crazy even though your meter isn't anywhere near 0 dB. Had I read Lombardo's tips, I could've learned this the easy way. So read them! Moral ABC! Exceptions eternally? None!!

The coolest thing about these DSM mikes is that you can radically alter their stereo pickup pattern from a quasi-binaural setup (for "3-D" virtual imaging over headphones) to a stereo sound field that translates extremely well over a pair of loudspeakers. How do you go about making this adjustment, you ask? Well, here's where things get tricky: For binaural recording, you slide the Milk Duds all the way back on the stems of your sunglasses so they're right in front of your ears, and for normal stereo recording you slide them all the way forward. Ouch, that hurt my brain. How about you?

It's only a matter of moving the mikes a few inches, but, man, does it make a huge difference in the sound field they lay down onto the recording. Set up for binaural pickup, my recordings sounded amazing on my Grado RS-1 headphones but with a very dull treble balance and nearly no stereo spread over the pair of NHT 3.3s I've got in my living room. I liked the sound of the recordings I did much better with the mikes pushed all the way forward on my shades—huge, wide, brilliant purist stereo with a crystal-clear high end on the NHTs. And while headphone listening didn't have the same reach-out-and-touch-it "3-D" effect as the binaural setup, it sounded at least as good as any conventional stereo recording heard over headphones. Unless you're one of those binaural cultists with the buzz cut and the black Nikes and the beatific smile as you listen to the Indy 500 on your Sony earbuds, I recommend sticking with the regular stereo setup when using the Milk Dud mikes.

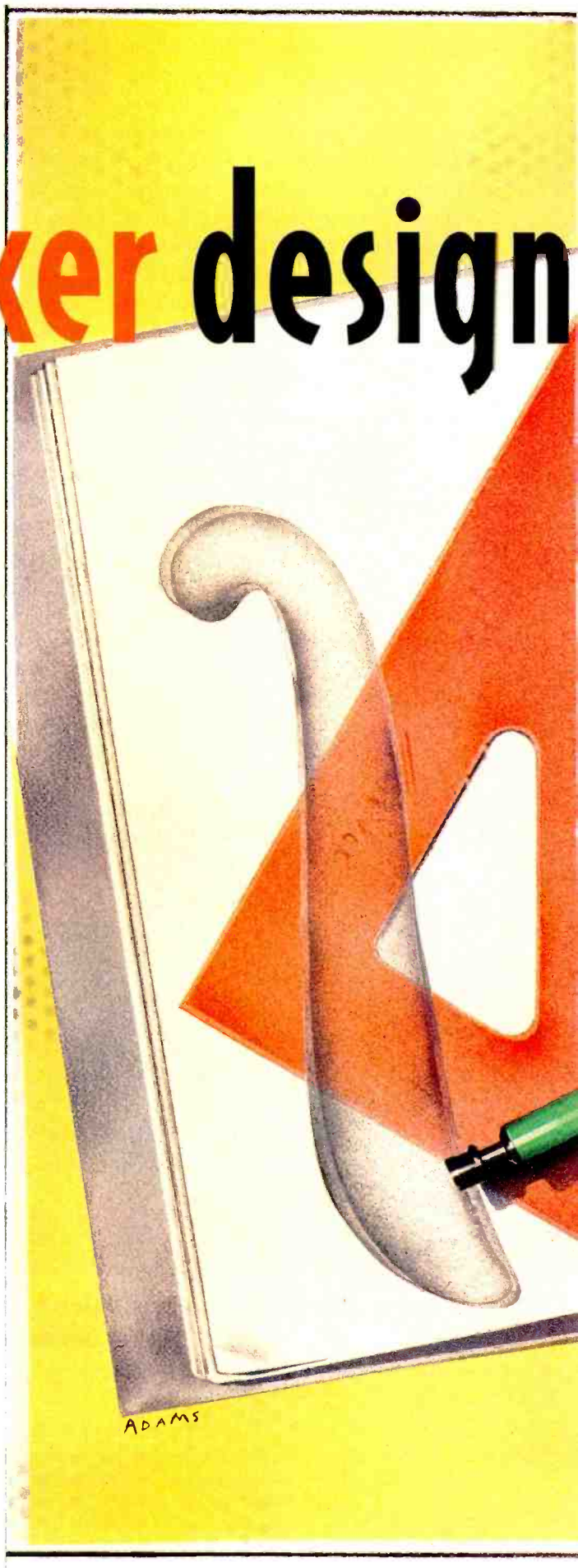
I ended up making a ton of recordings with the Sonic Studios mikes and the Sony portable DAT. Everything from my sister-in-law shouting "You freak!" to local musicians to street corner traffic to myself strumming a Stratocaster plugged into a little Fender tube amp on the other side of the room. And when I hooked the Sony DAT up to my hi-fi rig and listened to these recordings, they sounded so much like the original events I couldn't believe it, even after years of making my own recordings both at home and in pro studios. It's just uncanny how great this simple, affordable recording system sounds and how ridiculously easy it is to make reference-quality recordings that kill most of what you hear on the audiophile labels. I sure wish I'd had the Sonic Studios mikes back when I was first learning my way through a recording studio—they would've saved me years of learning how to get good-sounding recordings from a pair of microphones.

The $700 Sony TCD-D8 portable DAT is a natural partner to the Sonic Studios mikes, but if you don't feel like ponying up that kind of dough, I can tell you that I also made some truly excellent recordings with the Milk Dud mikes plugged into my Sony Walkman Pro D-6 portable cassette recorder, which you can buy new for around $350 or used for under $250. The sound quality wasn't quite as transparent or jaw-dropping as with the portable DAT, but I was pleasantly surprised at how good the Walkman Pro sounded when fed a purist stereo mike signal from the DSMs.

As for you, Dear Reader, for just $475 you can own some of the best-sounding microphones I've had the pleasure of using. I can't recommend these Sonic Studios stereo mikes enough. Whether you opt to mate them with a portable DAT or something more down to earth like the Walkman Pro cassette recorder, you'll be making your own audiophile recordings that push the sound of your hi-fi rig to heights you never dreamed it could go. And even more important, the moment you listen to the first good recording you've made of an event you heard right in front of you, your ears and hearing ability will never be the same again. Trust me, the money you'll save on dumb gear purchases by being a much better listener will pay for these mikes and whatever recorder you mate them with several times over. That's a promise. A

by Karen Winner

speaker design



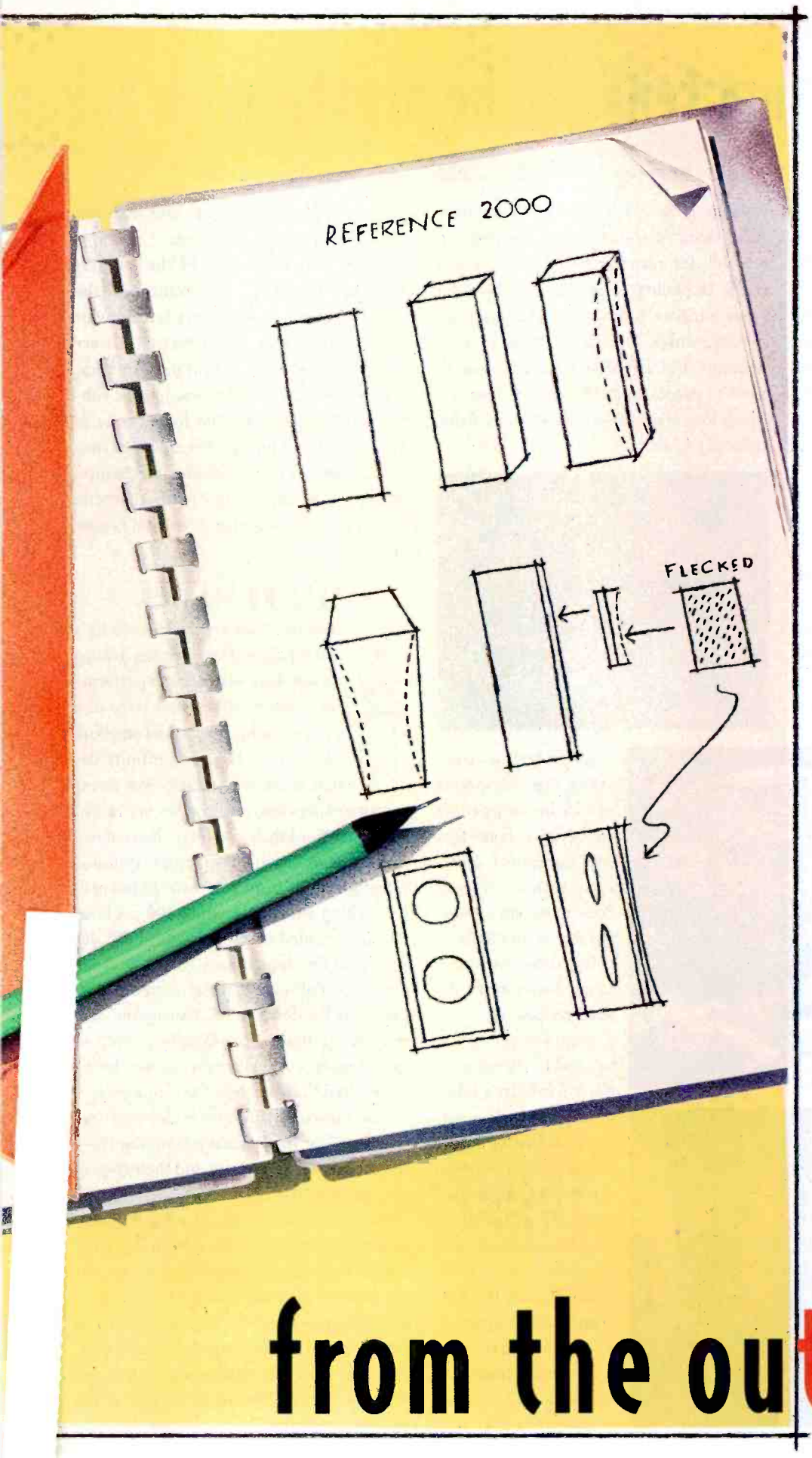
Editor's Note: *The last few years have seen an unmistakable trend to more sophisticated designs not merely for speakers, but for their cabinets. The simple wooden boxes of yesteryear are gradually giving way to more complex enclosures, some still of wood, others molded plastic or formed metal, and still others combinations of the two approaches. Although much of this shift has been primarily for appearance's sake, it often also reflects a deeper, more subtle understanding of the cabinet's influence on performance.*

What follows is an article we probably wouldn't have considered publishing not so long ago, as it's primarily about the industrial design process for a new line of speakers. But when we were approached with the idea, we thought it could be an opportunity to explore the increasingly important interplay between acoustical, visual, and marketing considerations in loudspeaker engineering. In this case, the players are the venerable California loudspeaker manufacturer Infinity Systems and one of the country's leading design firms, Edge Industrial Design.—Michael Riggs

Appreciation for outstanding audio technology does not typically include knowledge of the equipment design process. "In fact," admits Edge Industrial Design President Jonathan Oswaks, "industrial design in general is pretty much taken for granted if it's done right. If the consumer finds a product—any kind of product—attractive, convenient, and easy to use, then the designer has done his job well."

But numerous factors are involved in arriving at a good design. Oswaks' partner Bob Hess notes, "First and foremost, there's the process, which should be a tight

Karen Winner is a freelance writer based outside Minneapolis, Minnesota.



from the outside in

partnership between design firm and client. The dynamics of the relationship are crucial in establishing trust and baring souls. Both parties must be willing to share all information. Research is another important component that tips the scales in favor of a particular product. It is key to creating a product design that meets the intended market's needs."

BEFORE THE BEGINNING

Before starting work on the Reference 2000 series, Infinity's marketing and engineering teams researched the market systematically, surveying their own and competitors' products to learn who was doing what acoustically and aesthetically in specific price ranges. "We literally dissected all these speakers," says Mitch Witten, Infinity vice president of market development, "measuring each individual part of each speaker, and, of course, we listened to each of them." The goal, says Annette DiSano, Infinity's senior vice president of marketing and sales, was "to produce a line of speakers that would blend more attractively into home theaters and sound better than competing products at the same prices."

Laurie Fincham, Infinity's senior vice president of engineering, knew it would be an acoustical challenge to balance box size with bandwidth and

illustration: Lisa Adams

Industrial design tends to be pretty much taken

efficiency, given the dimensional constraints for the speakers. This juggling act was complicated by the desire to control the load presented to the amplifier. "Our goal," says Fincham, "was to make a more efficient speaker without lowering its impedance, which would place unnecessary additional strain on the amplifier. We chose the route of genuinely improving efficiency without lowering impedance in order to assure load compatibility with any manufacturer's electronic equipment and thus to give the speakers the broadest appeal possible."

Since a top priority was to create speakers that would blend gracefully into a home theater, the floor models were to feature a slim front profile that would minimize the required floor space. Consequently, a relatively small woofer was needed, requiring more linearity as compensation. Fincham explains, "We used CAD/CAE [computer-aided design/computer-aided engineering] methods for adapting Infinity's own linear motor technology, originally developed for a much higher-end speaker. The motor assembly, which includes a static magnet structure and a mobile voice coil, was altered to produce greater linear movement, which lowers distortion without sacrificing efficiency or cost."

Below, J.P.Durand pepares initial concept drawings. Bottom, Robert Hess and Jonathan Oswaks review sketches and foam models.

Engineering could assure that the speaker would be compatible with existing home theater equipment. However, Infinity wanted Edge to design a package that would look far better than traditional square boxes in the desired price range.

Edge's response can be seen in the integration of Infinity's Elliptical Wave Guide tweeter into the speaker baffle, nestled between the two stacked midrange drivers for a balanced look. Edge also specified a curved grille to distinguish the Reference 2000 appearance. Metal is as acoustically transparent as cloth, but when it is curved it has greater mechanical integrity and does not require a supporting structure.

To preserve the beauty of the speakers when their grilles are removed, the polypropylene driver cones (chosen for their performance characteristics) were made slate gray with a slight metallic fleck. A polypropylene-based thermoplastic rubber is molecularly bonded to the cone to form a surround that further enhances consistency and provides superior mechanical strength. The durability of this synthetic rubber is superior to that of natural rubber or foam.

GETTING STARTED

Based on their research, Infinity's marketing and engineering groups turned their wish list into performance specifications that were discussed during the initial meeting between the Edge and Infinity design teams. Edge's task was to incorporate them into an attractive six-model line (three bookshelf and three floor-standing models) for home theater systems, ranging in price from $199 to $749 per pair.

Working from more than 100 requirements presented by Infinity, the Edge design team developed more than 150 visual concepts. Following initial reviews, they pared the list down to six. During the next stage, Edge fleshed out details of each of these concepts. A further review with Infinity reduced the slate to just two concepts.

The surviving concepts underwent "refinement," or mechanical adaptation (how the designs would be built and their respective associated costs). Oswaks notes that "this is a critical element of the design process, because it helps determine what design technology to use. We have to add the cost of manufacturing to the cost of technology to assess the product's ability to return profit at the targeted retail price. This was especially challenging in the case of the Reference 2000 series because of the budget constraints."

for granted if it's done right.

REFERENCE 2000

In this stage, Edge uses Silicon Graphics' Alias software to develop three-dimensional images that detail all of the design elements. The surfaces can be "molded" on the computer, much like clay, until the design is satisfactory. Then the surfaces are defined with the help of a data library containing finish, color, and texture details. The Infinity marketing team's furniture sleuthing prompted selections of black and deep cherrywood (almost a rosewood) finishes in lieu of oak, a departure from the usual Infinity look.

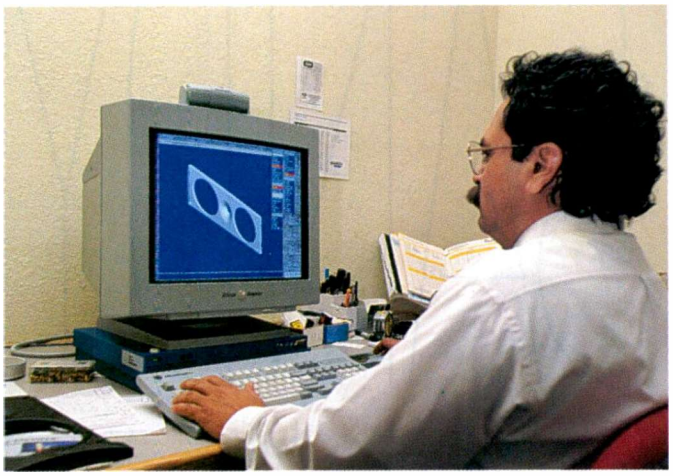
After details were defined, the images were set on a computer-generated background and lit like models in a photography studio to produce lifelike printed likenesses. In addition, Edge constructed mock-ups of each model from high-density foam core. And preliminary engineering drawings of each speaker were sent out for materials and manufacturing costing.

PREPRODUCTION

To aid in final concept and detail selection, Edge created additional images and linked them together to form a six-minute multimedia presentation consisting of animated sequences featuring six models in each concept. An integral part of this presentation is depiction of consumer trends in the target market. "It was a fabulous tool for introducing Reference 2000 to dealers and the sales force, to get their feedback in selecting a final concept," adds DiSano.

Once the final concept was selected, data generated by Alias was transferred to a 3-D CAD system called ProEngineer. From this data, Edge developed details to translate the images into actual parts, wall thickness, and interior details, such as bosses (where screws are used to attach parts) and ribs (for reinforcement). Once each part is designed, it is configured with others to form assemblies that can be modified, as needed, to correct potential manufacturing problems before fabricating prototypes.

In finite-element analysis, the final step before prototyping, a computer simulation analyzed each speaker's ability to withstand stresses endured by each of its parts. Oswaks explains, "By simulating the load a part is likely to be subjected to, we can identify where it needs to be reinforced. For example, because the speakers would be subjected to vibration generated by high- and low-frequency music in addition to the stresses encountered during shipment and assembly, we were looking for an ample ratio of strength to wall thickness to protect the integrity of the product."



Computerized 3-D drawings (top) are used to create approval models (above right) and eventually molded production parts (left).

With design and engineering complete, Edge transmitted the finished databases over the Internet to a StereoLithography vendor. StereoLithography is a computer-based process that uses a laser to cure photosensitive plastic, layer upon layer, and thereby create an exact production-like model of a part from the data. The Infinity design team then conducted numerous listening tests and competitive comparisons, tweaking the prototype as they went along. Once the prototype was accepted, the STL file was transmitted to a toolmaker who used the same database to drive its computer-controlled mills to make the machine tools necessary for actual manufacturing.

OUT THE DOOR

Looking back on the Reference 2000 project, Edge and Infinity agree that exceptional cooperation kept the process exceptionally brief. "Six to eight months from concept to shipment is an extremely aggressive schedule," says DiSano. "We began in late summer '95, our prototype premiered at the January '96 Consumer Electronics Show, and we were shipping last spring. Some of the efficiency is also attributable to our in-house manufacturing and internally produced drivers." The result was the first Infinity speaker line to be sold through a national retailer (Circuit City) in addition to the company's traditional base of regional audio specialty dealers. A

high-end SANDY BERLIN visionary

by David Lander

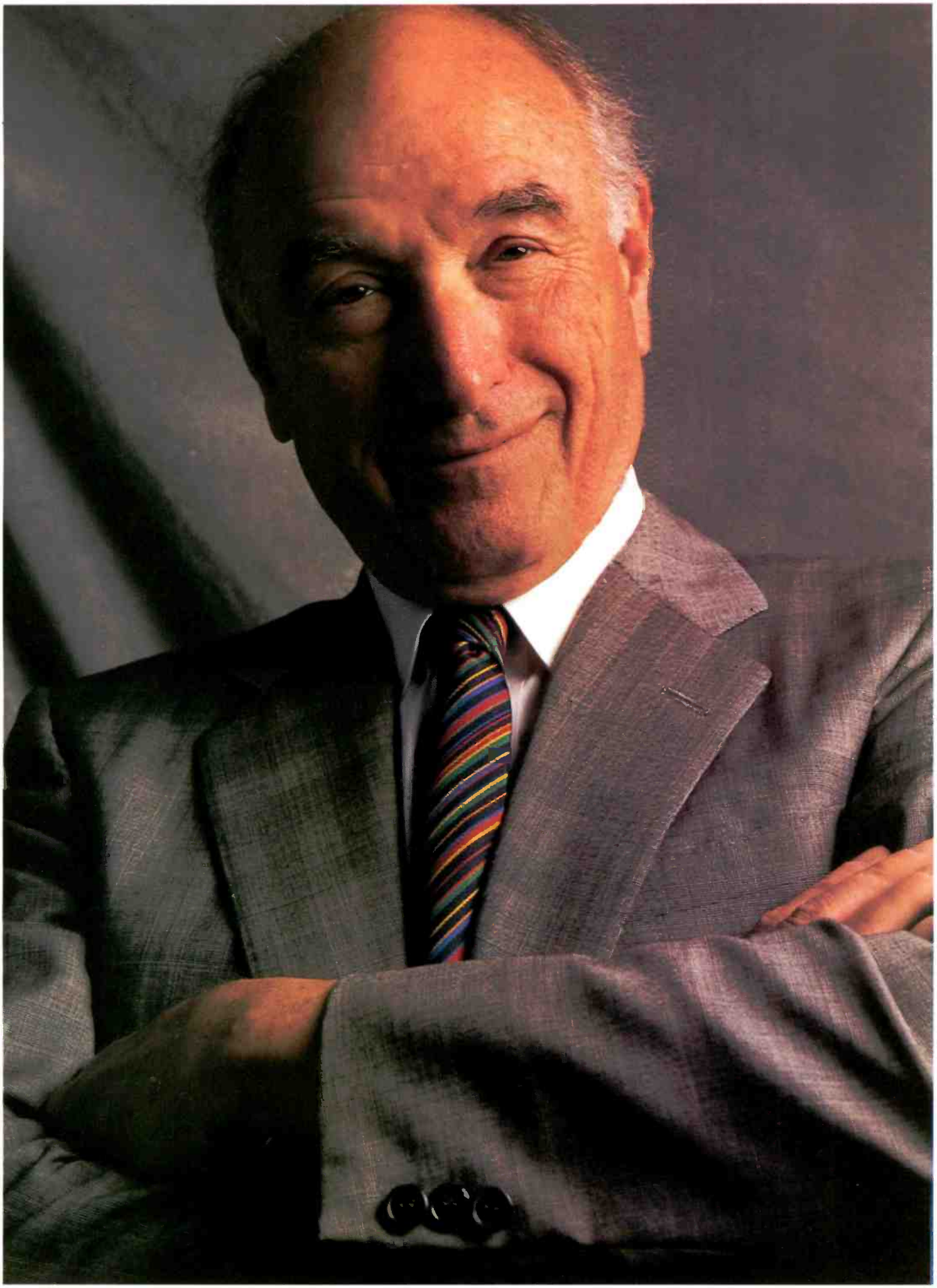
AUDIO AFICIONADOS, NOT SURPRISINGLY, TEND TO FOCUS ON TECHNOLOGY AND WORSHIP THE EQUIPMENT DESIGNERS WHO ARE IN THE VANGUARD OF AUDIO'S THRUST INTO THE 21ST CENTURY. LIKE ANY OTHER INDUSTRY, THOUGH, AUDIO NEEDS VISIONARY BUSINESSPEOPLE—THOSE WHO CAN ORGANIZE COMPANIES AND GET THEM FINANCED, START UP FACTORIES AND KEEP THEM RUNNING. IN THE HI-FI ARENA, SUCH PEOPLE TEND TO REMAIN OUTSIDE THE SPOTLIGHT, BUT WITHOUT THEM, HI-FI COULD NEVER HAVE ADVANCED FROM A HOBBYIST PURSUIT TO A MASS-MARKET PHENOMENON, AND THE DAZZLING PRODUCT DEVELOPMENT THAT ACCOMPANIED THAT GROWTH WOULD NEVER HAVE OCCURRED.

THE AUDIO INTERVIEW

SANFORD BERLIN, WHO TURNED 70 IN APRIL, IS ONE OF HIGH FIDELITY'S MOST ACCOMPLISHED AND MOST SUCCESSFUL MANAGERS. HE BEGAN HIS CAREER IN AUDIO 30 YEARS AGO, AFTER ORCHESTRATING THE SALE OF HARMAN KARDON BACK TO SIDNEY HARMAN, WHO PREVIOUSLY HAD SOLD THE COMPANY TO JERROLD ELECTRONICS (WHICH GENERAL INSTRUMENTS SUBSEQUENTLY BOUGHT FOR ITS CABLE TV OPERATIONS). BERLIN TOOK A JOB WITH HARMAN'S COMPANY (THEN CALLED JERVIS CORPORATION) AND WAS PUT IN CHARGE OF HARMAN KARDON. WHEN JERVIS ACQUIRED JBL IN 1969, BERLIN MOVED TO LOS ANGELES TO RESHAPE THAT FIRM, AND HE LATER SET UP GERMAN AND FRENCH DISTRIBUTION OPERATIONS FOR PRODUCTS BUILT BY THE HARMAN GROUP OF COMPANIES. HE ALSO NEGOTIATED THE PURCHASE OF TANNOY FOR HARMAN AND THEN MOVED TO ENGLAND TO SERVE AS ITS CHAIRMAN FOR A TIME.

WHEN HE MOVED TO CONNECTICUT IN 1976 TO PARTICIPATE IN A FELLOWSHIP PROGRAM AT YALE UNIVERSITY'S INSTITUTION FOR SOCIAL AND POLICY STUDIES, BERLIN CONSIDERED HIMSELF RETIRED FROM THE WORLD OF BUSINESS, BUT IT WASN'T LONG BEFORE HE WAS BACK IN HI-FI, THIS TIME AS AN INVESTOR IN MARK LEVINSON AUDIO SYSTEMS. WHEN THAT COMPANY WAS LIQUIDATED IN 1984, HE BOUGHT ITS ASSETS, ALONG WITH THE LEVINSON NAME, AND FORMED MADRIGAL AUDIO LABORATORIES, WHICH HE PILOTED TO A LEADING POSITION IN HIGH-END HI-FI BEFORE SELLING IT TO HARMAN INTERNATIONAL.

BERLIN THEN TEAMED UP WITH SIDNEY HARMAN ONCE AGAIN AND FORMED REVEL CORPORATION (OWNED BY HARMAN) TO PRODUCE A LINE OF SPEAKERS OF THE SAME CALIBER AS MARK LEVINSON ELECTRONICS. D.L.



PHOTOGRAPH: © 1997 ALLAN ROSENBERG

I TOOK THE CITATION AND THE JBLs HOME, NOT REALIZING THAT 11 YEARS LATER I'D BE RUNNING HARMAN KARDON AND, LATER, JBL.

When did you first become interested in high-fidelity audio?

I used to listen to classical music on the radio, but I never really developed an interest in it until after we got a good system. In 1956, I went to a company called Barnett Brothers, in Philadelphia, and I said, "My wife wants a fine high-fidelity system. What do you recommend?" The salesman asked, "How much money have you got?" I said, "Well, I've got enough to buy a good system, I suppose. What's your best?" And he recommended the Harman Kardon Citation and the JBL Baron. In those days, JBL was a very high-end line. And I took them home, not realizing that 11 years later I'd be running Harman Kardon, and 13 years later I'd be running JBL.

As an executive, what was your first assignment in the hi-fi industry?

My first assignment was Harman Kardon. The head of General Instruments wanted to get rid of Harman Kardon, because it was not a cable TV enterprise and was an oddball company insofar as all the other properties of Jerrold were concerned. He said, "Get rid of it."

I talked to a hell of a lot of people about buying Harman Kardon, but I didn't manage to sell the company. I was about to give up, and I said to myself, "You know, I'm going to go talk to Sidney Harman," who by that time had left Jerrold and was involved in a business enterprise in New York, a company called Jervis. I told him why I was there, and he said, "Why do you think I want to buy it? I sold it." I said, "Well, that's true, but it's a very good name. It would be a shame to have it go out of business." He replied, "What do you mean go out of business? Who's going to put it out of business?"

I said, "General Instruments told me that if I don't sell it by a certain date, they're just going to put the key in the door." And when I saw the look on Sidney's face, I knew that he was the buyer [*laughs*].

After leaving Harman Kardon in 1976, you received a fellowship from Yale and moved to New Haven. What got you back into the hi-fi industry?

I met a guy named Biaggio DiLieto, the mayor. I didn't know him very well; I was a contributor to one of his campaigns. He asked me if I would meet Mark Levinson, a fellow that the city had some interest in. His company was in poor economic shape, and the city wanted to save the jobs of the 70 employees. The city had been negotiating with him to take over an unused factory.

At the time, he was headquartered in Hamden, an adjoining town, wasn't he?

That's right. He had been in New Haven, had moved to Hamden, and now was willing to move back with those jobs. So I said, sure, I'd talk to him.

Revel's Ultima Sub-15 subwoofer uses a 15-inch driver with a cast aluminum frame, a 32-pound magnet, and a 4-inch edge-wound voice coil.

You invested in the company, but a series of events ultimately led to bankruptcy.

In October 1984, the company was shut down by the bankruptcy court. After about 60 or 90 days, nobody had stepped forward to buy the assets, so the judge said, "Auction them off." I was ready to retire at that point, but I went to the auction and said, "I'd like to bid for the assets." And the auctioneer told me, "Go ahead. You can bid on each lot, or you can bid one figure for everything. If the sum of the high bids on the lots is not greater than your single bid, then you're the owner." So I gave him a bid and a check, and I left the auction. He called me up at home that night and notified me that I was the proud owner.

So much for retirement. When did you start up again as Madrigal Laboratories?

January 30, 1985.

What did you think the company needed most at its inception?

Good designers. We hired a guy named Kevin Burke, who had a master's degree from Georgia Tech. Georgia Tech, as you may know, has a big audio program.

Were there watershed products introduced at that time, products that pointed you and Madrigal in any specific direction?

The Mark Levinson No. 20, which was a highly refined power amplifier. And, not long after that, the first digital processor that Levinson ever made, the No. 30. It became obvious to me that audio electronics were changing in the most amazing ways, and I started to hire more and more people who were educated in both analog and digital. By 1987, I got very interested in digital electronics, and it may seem odd, but no other high-end company really was. I had it all to myself. And the more I learned, the more I was able to hire people who had good educations in this area. I sometimes used to think that I must be doing something wrong, because nobody else was doing it. The big companies were doing it—Sony was doing it, Philips was doing it—but if you looked at the direct competitors to Madrigal, they were not.

Had anything analogous been going on when you stepped in at JBL? Was there something that seemed a very obvious part of audio's future that your competitors had overlooked—or, as was the case with digital when you started Madrigal, had shunned?

When Harman bought JBL, the management became very active. They did lots of exporting, and they began to design products with a much broader market base. The company's sales went from 6 million to 10 million to 20 million to 70 million.

Was broadening your base a goal when you formed Madrigal?

No. Madrigal and JBL were very different. My feeling was it would be nice to have a company that never made any compromises, that sold to a base of dealers who really wanted to sell the best, highest-priced products. Then, if we could continue to introduce products the way we started to in the mid-1980s, we'd probably begin to dominate that field. A number of years ago, in the late '80s, I believe, I started a Rolodex of high-end dealers. There are about 600, maybe 550, real high-end dealers in the world, and they're spread out all over the place. My view was to stick with these dealers and try to get as many of them as I could.

That strategy seems to have worked very effectively for Madrigal.

If you look back at Madrigal on the day it was sold to Harman, its volume was greater than that of its four largest competitors in the United States and Europe. And it's larger now. When I left Madrigal, it had about 21 people in the engineering department alone.

In the past, you've expressed concern that many high-end hi-fi products sound a lot better than they look.

At JBL, I hired, as president, Arnold Wolf. He was an industrial designer, and he got me interested in industrial design. He gave me books on the subject and would direct me toward museum exhibits on design.

And that interest resurfaced when you were at Madrigal?

Back around 1989, I began to worry about the appearance of the Levinson products. Their look didn't seem to be keeping pace with their technology. I started to search for an industrial designer, and I really couldn't find one I liked. Then one day I met a student two weeks away from getting his degree in architecture from the University of Illinois who was very interested in industrial design; he had worked in a store selling audio equipment all through his college career and was going to

Kevin Voecks, vice president of engineering for Revel, looks deservedly happy with his latest speaker design, Revel's Ultima Gem.

MY FEELING WAS THAT IT WOULD BE NICE TO HAVE A COMPANY THAT NEVER MADE ANY COMPROMISES, THAT SOLD THE BEST, HIGHEST-PRICED PRODUCTS.

look for a job in this field. That was David Barson, and David has worked on the design of every Madrigal product since about 1990. I decided to build a department that did that kind of thing. Later we hired Debbie Jaffe, who was from the Rhode Island School of Design, an honor student there. She came to Madrigal right out of college, and she's still there. Subsequently I hired Anthony Aviles, a graphic designer. By the way, that department got so good that a 50-billion-dollar-a-year company looked me up one day and asked, "Would you like to do some work for us?" And I took that company on as a client. It was Samsung. Our design department created a line for them that was sold in Korea. And the fee was appropriate to our skills and their size. We became known for industrial design. In fact, when I began forming Revel, I immediately engaged the people at Madrigal.

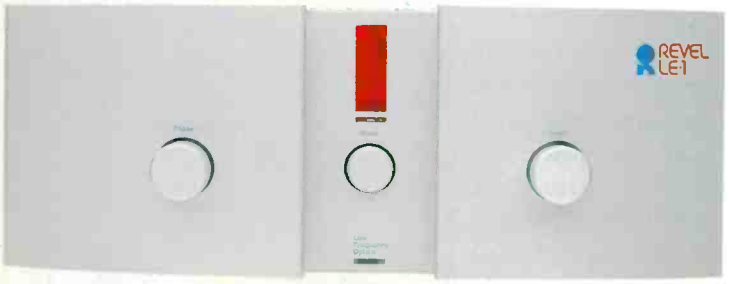
What other talents did the Madrigal engineering department come to include under your administration?

We also had two excellent mechanical engineers at Madrigal. If you put it together, you've got a considerable design team for one little high-end company. I'm not sure if I know of another high-end company in the United States that employs mechanical engineers, and I know that none has industrial designers in house.

What were your goals with the Proceed line? I believe that goes back to about 1990.

Because of the way Levinson equipment is built, there is a price floor below which you can't go, somewhere between $4,000 and $5,000. It's almost impossible to build a Levinson product below that because of the specifications. Also, this whole business of home theater was appearing on the horizon. It seemed that Proceed would be a very good line that high-end dealers could use to pursue nontraditional interests, and home theater in those days had to be considered a nontraditional interest. I wanted Madrigal to participate in the development of home theater, and I wanted to have a lower-priced line that would contribute to the profitability of the company.

Revel's Ultima Gem, which has a very unusual grille, uses dual 5-inch titanium-cone woofers with 2-inch voice coils to achieve high power handling and avoid compression.



To drive the Sub-15, Revel's Ultima LE-1 subwoofer amplifier is rated at a minimum of 680 watts into one sub or 1,000 watts into two subs.

Banks all over Connecticut went broke between 1988 and 1991. Other banks moved in, and it was impossible for a small company to borrow any money. I once even borrowed money from my mother, and my mother couldn't afford it [*laughs*]. The point of Proceed was to try to expand the company, and expand it in a particular direction. I told the people at Madrigal that I expected Proceed, someday, to be a larger line than Levinson. It now accounts for about 25% of the volume, but I continue to believe that it's going to grow at a more rapid pace because it does a lot of interesting things at a very good price. Its first product was a blockbuster, an audio/video preamplifier called the PAV. Thousands of them were sold.

When did Harman buy Madrigal?

September 1995.

Why didn't you retire at that point?

I was going to retire.

You've been saying that for more than 20 years now.

Well, I was already planning to move out to California. I wanted to be closer to my family; they live out here. And at one point, Sidney Harman asked me what I saw as a good mate for Madrigal, meaning another company that built loudspeakers. I told him that I didn't know of a speaker company that was available for sale and that he'd probably have to create one. That subject arose again, and then I began to get the idea that it would be much better to start that company far away from Madrigal.

Then I met Kevin Voecks [pronounced Vakes], who lives in California, and he was interested in talking. I felt—and feel now—that he has considerable ability as a speaker designer and that I had something to contribute because I know how to run a business. I know a lot about industrial design, and no matter how good a product is acoustically, if it doesn't look like an attractive addition to your home, sooner or later it will fade away. If you want to expand the frontiers of a business beyond audiophiles, then you have to design the product as if it were a fine piece of furniture. You also have to deal with the problem of creating systems for home theater that are suitable for music; if someone spends a huge amount of money and can't even listen to Mozart, the system is not well designed. I thought we could work on problems like that and on other problems that are much more difficult, like room correction. Kevin was already interested in a lot of those things before I met him.

With an output stage fully biased in Class A to produce 100 watts into 8 ohms, the massive Mark Levinson No. 20 mono power amp was a watershed product for Madrigal.

The Mark Levinson No. 30 Digital Processor and its power supply, unveiled by Madrigal in 1991, reflected Sandy Berlin's passion for striking industrial design.

To be absolutely candid, there's another reason: I felt that if I was moving to Los Angeles, it was much better to move here as a working person than as an unemployed old fogey. So I talked to Sidney Harman, and he was tremendously interested in the idea. In fact, he's the real head of Revel. He's the person I report to. And the reason for that is he wanted to be sure Revel got a good start. He knew that I had a couple of motives for joining him again, and it's worked to my benefit. You know, I started a new address book since I came out here, and I have 120 names that were never in any address book of mine before.

Are these people you got to know through business?

I would say two-thirds of them are. I might have known other people, but I doubt that I would have known these people, because if you're moving around as the head of a company, you get to meet all kinds of people, and here and there you find a friend. Revel began rolling out product in the spring with the aim of completing its first multichannel system by the end of the year.

What are the company's long-range plans?

Revel is a company that is not meant to be large. Harman has large speaker companies that sell to big chains; it doesn't need another one. Harman wants a real high-end speaker company. Therefore, we've been given a separate factory that's not connected to any other Harman enterprise. The company has a different logo, a different staff, and when I leave, whenever that is, it will have a different president. In my career, I have been an officer or a board member of quite a number of audio manufacturing companies—Harman Kardon, JBL, Tannoy, Ortofon, Mark Levinson, Madrigal, and now Revel. I also ran companies that distributed quite a number of other lines—Maxell, Accuphase, Jadis, and Meridian among them—but I have the feeling that Revel is going to be my last and best hurrah. Our first products are off the line, and they sound beautiful. They're perfect mates to my Levinson system. It would please me to hear the same thing said many times by audiophiles in the future.

And after Revel?

I'm a member of a large and loving family, and I find it takes a great deal of time to love them all properly. I also feel I owe the world something for having led a very interesting and adventurous life. After Revel, I intend to address ways to repay that debt. A

EQUIPMENT PROFILE

DANIEL KUMIN

ROTEL RSP-980 A/V PREAMP/PROCESSOR AND RDA-980 DOLBY DIGITAL DECODER

Digital technology's inexorable progress is making home audio and video gear more complex and elaborate every year. Nowhere is this more evident—or more troublesome—than in A/V surround preamps and receivers. These components are fast becoming so overloaded with technologies, functions, and features as to overwhelm us—reviewers as well as consumers. Fortunately, a number of manufacturers are beginning to do something about it. For example, the latest surround sound setup from Rotel is a pair of components that manage to combine the latest surround technologies with uncommonly simple layouts and straightforward operation.

The Rotel RSP-980 A/V preamplifier/surround processor has most of the functions and features a serious home theater devotee might seek, including Dolby Pro Logic decoding, Lucasfilm Home THX processing, a handful of music surround modes, and flexible audio/video control and switching. The one thing the RSP-980 lacks is discrete "5.1-channel" digital surround—and that's supplied by its companion unit, the RDA-980 Dolby Digital decoder.

The RSP-980 is unusually simple for an A/V preamp/processor. To the right of its large volume knob are 15 logically arranged pushbuttons and two small bass and treble knobs; these controls are effective in all modes except "5.1 CH Input," which overrides everything. A row of six buttons handles source selection; an identically labeled row of six smaller buttons, just below, selects the signal to be fed to the recording output. Eight small LEDs under that row indicate the current surround mode. These modes, selectable only from the remote, are four music surround choices, Dolby Pro Logic, and THX Cinema, as well as stereo (bypass) and mono. The THX logo, near the power switch, attests that the RSP-980 meets Lucasfilm's Home THX standards, including requirements for main-channel re-equalization and surround-channel decorrelation and timbre-matching.

In addition to the filtering involved in Home THX processing, the RSP-980 has Rotel's own high-cut "Movie Filter," which is selected by a front-panel switch. This filter imposes a gentle rolloff on the top-octave response of the three front channels. The filter is inactive for signals coming via the 5.1-channel input but is otherwise active in all surround modes and stereo; in THX mode, its effects are added to those of THX re-equalization, which has a similar response.

The RSP-980's remote is simple, with a sparse, easily learned layout and just 17 keys—which nonetheless activate several functions that aren't on the front panel. In addition to surround mode selection and muting, there are buttons marked "ON SCRN" and "CTR FCS." The first of these invokes on-screen display of the volume setting, active input, currently selected surround mode, and (for some reason) the surround-channel delay setting. The on-

PREAMP/SURROUND PROCESSOR
Dimensions: 17⅜ in. W x 4¾ in. H x 13 in. D (44 cm x 12.1 cm x 32.9 cm).
Weight: 16.5 lbs. (7.5 kg).
Price: $1,299.

DOLBY DIGITAL DECODER
Dimensions: 17⅜ in. W x 2⅞ in. H x 10⅝ in. D (44 cm x 7.3 cm x 27 cm).
Weight: 10.1 lbs. (4.5 kg).
Price: $999.

Company Address: 54 Concord St., North Reading, Mass. 01864; 508/664-3820.
For literature, circle No. 90

Photos: Michael Groen

screen data also aids setup. The "CTR ECS" button apparently boosts center-channel output by about 2 dB, but only in the music surround modes; oddly, all the owner's manual says is that the button exists.

The RSP-980's inputs and outputs are on the rear panel. Most connections are audio/video (the laserdisc and tuner inputs and the three video monitor loops), but there are also an audio-only tape monitor loop and a "Line/CD" input. Phono jacks are provided for 5.1 channels of audio output (three front, two surround, and subwoofer), a stereo "Zone 2" audio output, and a video output for a TV.

The "Zone 2" output enables you to feed line-level stereo signals to amps driving speakers in other rooms. Source selection and volume adjustment for this output can be controlled from the remote via infrared sensors in that zone but not from the RSP-980's front panel. A control input on the processor's rear panel accepts commands from the sensors. (An additional remote for use in the second zone is available for $30.

THE ONLY THING THE RSP-980 LACKS IS DOLBY DIGITAL, WHICH THE RDA-980 PROVIDES.

Rotel also makes two more expensive remotes, one of which can control other Rotel components, too, while the other can learn commands for components of all makes.) A control output jack on the rear panel can relay zone 2 commands to Rotel components that have matching jacks; to operate other components from the second zone you'll need infrared repeaters (made by, among others, Niles and Xantech) to retransmit commands from the sensors.

The RSP-980 has composite and S-video connections for all video inputs and outputs. Most of them just loop each signal format through, without conversion—S-video input signals fed only to the S-video outputs, composite inputs only to the composite outputs (including the "TV Monitor" output, which has a rear-panel switch to activate either the composite or S-video output). Another rear-panel switch selects composite or S-video output mode for "Video 3," the sole output that has circuitry to convert S-video inputs to composite (though not the reverse).

The most prominent of the RSP-980's rear-panel features are two large, computer-style (DB-25) 25-pin connectors. The cables you plug into these connectors bundle together six channels of line-level audio, simplifying surround system setup and minimizing cable clutter. (The DB-25 connectors are permissible under Dolby Labs and Lucasfilm surround standards, though few manufacturers I know of use this option.) The RSP-980 provides DB-25 and phono-jack outputs but only a DB-25 connector for "5.1 CH Input." Some Dolby Digital decoders (such as Rotel's companion RDA-980) have DB-25 outputs; if you want to use a decoder that doesn't have them, you'll need an adaptor cable (available from Monster Cable).

The RDA-980 Dolby Digital decoder, on the other hand, has both DB-25 and RCA outputs, so it can feed surround components from other makers. It also has RCA inputs for an AC-3 RF signal (for use with the AC-3 outputs of some laserdisc players) and two demodulated Dolby Digital bitstreams. (Currently, the only sources for straight Dolby Digital bitstreams are DVD players and outboard AC-3 RF demodulators. In the future, HDTV sets and, probably, next-generation DSS receivers will deliver these bitstreams as well.)

Also on the RDA-980's rear panel are small slide switches to configure its two-way crossovers to match your speaker complement and speaker sizes; the switch for the center channel has positions for "Large," "Small," or "None" rather than the past nomenclature of "Wide," "Normal," and "Phantom." These switches select 12-dB/octave crossover filters and implement Dolby Digital bass redirection. For example, setting the "Center" switch to "Small" rolls off the center channel at 120 Hz and diverts low-frequency center-channel sig-

MEASURED DATA

All tests were made with measurement bandwidth of 20 Hz to 80 kHz and 500-mV input and output reference levels, unless otherwise specified.

PREAMP/PROCESSOR, GENERAL

Input Impedance: 49 kilohms.

Output Impedance: 375 ohms.

PREAMP/PROCESSOR, STEREO MODE

Frequency Response: 20 Hz to 20 kHz, +0.2, –0.1 dB.

THD + N: Less than 0.34%, 20 Hz to 20 kHz.

A-Weighted S/N: Left, 88.5 dB; right, 89 dB.

Channel Separation: Greater than 62 dB, 20 Hz to 20 kHz.

Input Overload: 5.6 V.

PREAMP/PROCESSOR DOLBY PRO LOGIC MODE

Frequency Response: Main and center channels, 20 Hz to 20 kHz, +0.35, –0.25 dB; surround channel, 30 Hz to 6.65 kHz, +0, –3 dB.

THD + N, Main and Center Channels: Less than 0.08%, 100 Hz to 20 kHz; 0.7% at 20 Hz.

A-Weighted S/N: Left front, 85.3 dB; center, 87.5 dB; right front, 85.1 dB; surround, 85 dB.

Channel Separation at 1 kHz: 30 dB or greater.

Input Overload Margin: Left front, +3 dB re 2 V in; right front, +3.4 dB re 2 V; center, +3 dB re 1.41 V; surround, +0.3 dB re 1.41 V.

DOLBY DIGITAL DECODER, AC-3 MODE

Reference Output Level: 125.2 mV for –20 dBFS input.

Frequency Response: 20 Hz to 20 kHz, +0.1, –0.35 dB.

THD + N: Less than 0.08%, 20 Hz to 20 kHz.

A-Weighted S/N: Greater than 86.5 dB re 0 dBFS.

Channel Separation: From 20 Hz to 20 kHz, greater than 52 dB; at 1 kHz, greater than 63 dB.

Channel Balance: Main and surround, within ±0.1 dB of center channel.

Maximum Output Level: 4.3 V for 1-kHz signal at 0 dBFS.

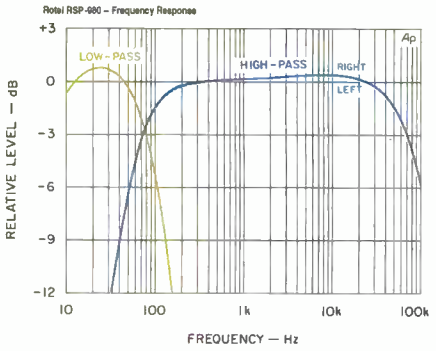


Fig. 1-Frequency and crossover response of RSP-980 in stereo mode.

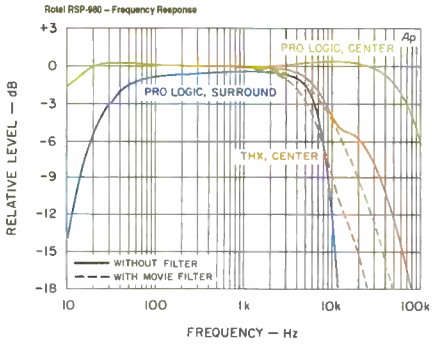


Fig. 2—Center- and surround-channel responses, RSP-980. For clarity, surround-channel curve has been lowered by 0.5 dB.

nals to the subwoofer output (if a subwoofer is present).

However, the decoder's DB-25 link to the preamp goes through the preamp's own high-pass filters in the main and surround channels (though not, surprisingly, the center). Thus, if the RDA-980 and the RSP-980 are set for "Small" main and surround speakers, the bass in these channels will be attenuated more in Dolby Digital mode than in stereo or Dolby Pro Logic. This is very odd; unless you use full-range main and surround speakers, it is essentially impossible for you to maintain a consistent level match between them and your subwoofer when you switch between Pro Logic and Dolby Digital playback. Unfortunately, neither product's instructions make this clear.

The RDA-980's front panel has buttons to choose among its three inputs, to turn on the Dolby Digital "Dynamic Range" circuitry and select its compression level, and to start a circulating pink-noise test for speaker balancing. Two rotary switches enable you to control delay for the center and surround channels, in order to compensate for differences in speaker position from the listening position.

Both Rotel components provide satisfying levels of chassis solidity and overall fit and finish—nothing Nagra need worry about but still a clear step above the mass-market norm. Both units appeared tidily, carefully, and expertly constructed.

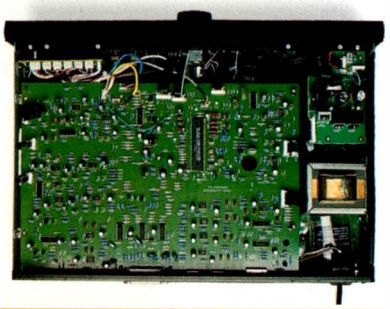
The RSP-980 preamp/processor, for example, is densely packed with components, mounted on a triple-decker stack of circuit boards. Rotel's design philosophy here was to give the RSP-980 simple signal paths, top-quality analog and digital processing, and independent sources of clean, high-current, regulated power for each important circuit section. As a result, much of this circuitry is for the power supply. The three boards all seem fairly peppered with power-supply transistors, regulators, and filter capacitors. The Dolby Pro Logic decoder is Analog Devices' top-performing chip, the SSM-2126A, which is widely used in high-end surround components. I also noted both discrete-transistor and IC op-amp circuitry and a healthy allotment of high-quality, close-tolerance passive components.

The RDA-980 Dolby Digital decoder is also populated with high-quality components, though less densely. A Zoran ZR38500 DSP engine, which performs the Dolby Digital decoding, takes center stage; three Philips Bitstream stereo DACs apparently handle the digital-to-analog chores; the DACs feed discrete-transistor output and filter stages. Like the RSP-980, the RDA-980 has a large power supply, with rather more filter capacitance (almost 14,000 microfarads) and regulators than you might expect.

Measurements

My bench tests of the Rotel surround pair yielded mostly straightforward data, but there were a few mildly unexpected results. Figure 1 shows the RSP-980 preamp/processor's frequency response in plain-vanilla stereo mode with the crossover set for "Small" main speakers. It is very accurate, having only 0.3 dB total variation. The crossover is 3 dB down at 80 Hz, and the curves for left and right channels virtually overlie each other. High-pass and subwoofer output responses in the various surround modes were essentially identical to the curves shown.

Figure 2 shows the frequency response of the RSP-980's center channel in Dolby Pro Logic and THX modes, with and without the "Movie Filter"; it also shows Pro Logic surround-channel response (this curve has been lowered for clarity). The center and surround channels were set for "Large" speakers, i.e., no bass rolloff. As you can see, Rotel's "Movie Filter" high-cut mimics the Home THX re-equalization filter except for the latter's 10-kHz shelving action. Because it doesn't shelve, the "Movie Filter" cuts 3 dB more at 20 kHz than THX re-equalization. So you have four choices of top-octave response: flat (with neither filter active), –6 dB at 20 kHz in straight Home THX mode,



AS A PRO LOGIC DECODER, THE RSP-980 WAS VERY CLEAN, QUIET, AND DYNAMIC.

–9 dB in Pro Logic mode with "Movie Filter," or down a whopping 15 dB at 20 kHz in Home THX mode with the "Movie Filter" engaged. (Alas, neither filter operates on the 5.1-Channel input for Dolby Digital.) Note that the RSP-980's surround

channel, whose –3 dB point is 30 Hz, does not have the low-end rolloff sometimes seen on Dolby Surround processors.

Signal-to-noise ratios for all channels of the RSP-980 were in the range of 85 to 90 dB, A-weighted, in stereo and Dolby Pro Logic modes. That is very good, but not record-setting, and is a tick or two short of Rotel's specs; I attribute this mostly to variation between sample units and to differing measurement environments. (There was a residual 300-Hz buzz I could not eliminate, possibly from a ground loop.) In any event, neither the RSP-980 nor the RDA-980 ever sounded anything but quiet to me.

FREQUENCY RESPONSE WAS HIGHLY ACCURATE FOR ONE COMPONENT AND ABSOLUTELY FLAT FOR THE OTHER.

In Dolby Pro Logic mode, the RSP-980's input overload margin at 1 kHz was +3 dB or a bit better in the three front channels, based on the expected maximum signal levels of 2 volts in the main channels and 1.41 volts in the center. In the surround channel, however, it was only 0.3 dB above the expected 1.41-volt signal maximum; that's cutting things pretty close, even though full peak-level surround signals in Dolby Surround recordings are events of Hale-Bopp-like rarity.

The RSP-980's total harmonic distortion plus noise (THD + N) is plotted in Fig. 3 for 500-millivolt inputs. The stereo traces are almost completely superimposed, but the distortion in this mode is unexpectedly high—almost an order of magnitude higher than in Pro Logic mode (it's usually the other way around)—and well above Rotel's 0.03% spec. The curves for Dolby Pro Logic mode, on the other hand, reflect very good analog decoder performance, on a par with that of similar high-end designs. (For the main channels, the left front is plotted; the right front performed almost identically.)

The RSP-980's channel separation in Pro Logic mode was generally very good, mostly right around 50 dB (fairly typical for the top-grade Analog Devices decoder chip). The exception was the right front channel, which was about 15 dB more susceptible to crosstalk than the other channels. What is of more significance is that when I plotted separation across the band, I saw at least 25 dB of separation in all directions between about 200 Hz and 20 kHz—excellent.

The curves for the RSP-980's THD + N versus input level at 1 kHz (Fig. 4) are all pretty much what you'd expect except for the stereo curve, which reaches about 0.5% THD for a 1-volt input and keeps climbing. (Again, the right front channel's response was identical to the left's in stereo and Pro Logic modes.)

I am not presenting frequency response of the RDA-980 Dolby Digital decoder, because it was essentially a straight line. The decoder's crossovers were 3 dB down at exactly 120 Hz and had textbook 12-dB/octave slopes. Its THD + N was 0.08%; that's a bit higher than I expected, and the signal-to-noise ratio was a bit lower than expected, about 87 dB all around. Channel separation ranged between about 75 and 62 dB (re 0 dBFS) at various frequencies. Although that is about 10 dB worse than I've seen for some Dolby Digital units, it's still far more than you need to keep crosstalk inaudible.

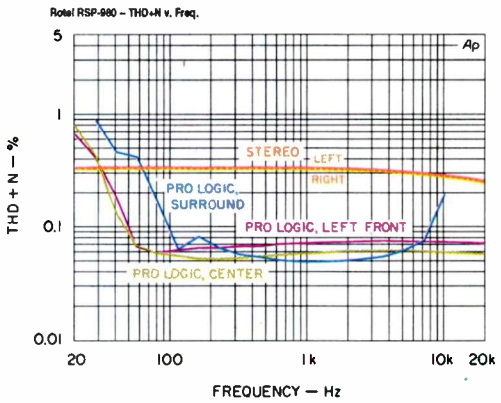


Fig. 3—THD + N vs. frequency, RSP-980.

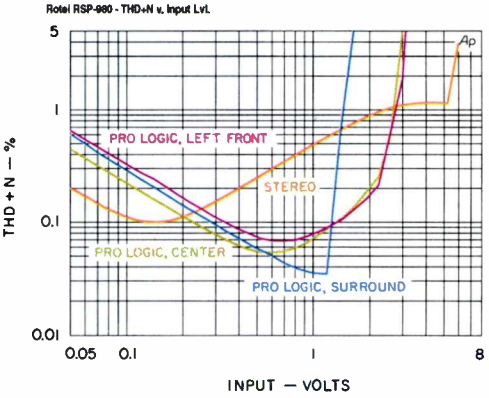


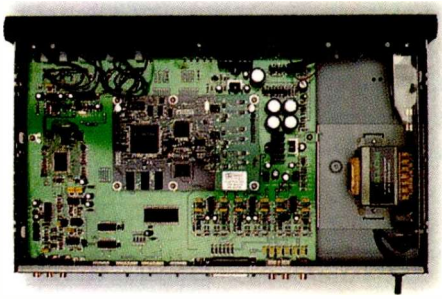
Fig. 4—THD + N vs. input voltage, RSP-980.

Use and Listening Tests

I installed the RSP-980/RDA-980 duo in my home theater. The amplifier is a Cinepro 3k6, a massive model having six 350-watt channels. (Because my subwoofer, a B&W 800ASW, is powered, one amp channel isn't used.) Across the front, B&W 801 Matrix Series 2 speakers flank a B&W HTM center-channel model. The surround speakers are Citation 7.2s, operating in their dipole configuration and placed high on the side walls of my 2,250-cubic-foot studio. I have experimented with bipole, monopole, and dipole surround speakers in various positions. Yet much of my listening (like most folks', I expect) still involves Dolby Surround, and I feel that the virtues of dipolar surround speakers apply to discrete 5.1-channel playback as well. I'm therefore keeping the Citations, which are switchable to bipolar mode, set as dipoles.

The RSP-980's channel balance did not change when I varied its volume setting from around 60 to 95 dB SPL, which is good. Getting the proper balance in the first place was, however, tricky. I first calibrated the preamp/processor by using signals from its internal test-noise sequencer, checking balance with an SPL meter at my listening position. I then recalibrated with matrixed Dolby Surround noise from the *Dolby Laboratories Digital Demonstration and Test LaserDisc, Version 2.0.* Unfortunately, the two noise sources did not agree. Using the Rotel's noise generator for calibration gave me 1 dB greater level in the center channel, and 1 dB less in the surround channel, than I got when using the test disc—not too bad but hardly ideal. Using Dolby Digital calibration noise from the same laserdisc, via the RDA-980 decoder, I found the surround channels down by yet another 1.5 dB rela-

tive to the Dolby Surround laserdisc result. These level differences are not huge in absolute terms, but a cumulative center-to-surround error of more than 3 dB (using the Dolby Digital disc) is sufficient to throw a surround mix out of whack. For short-term testing, I used the laserdisc to rebalance the system each time I switched between Dolby Pro Logic and Dolby Digital. A more practical solution for everyday life would be to set the surround channels midway between the proper Pro Logic and Dolby Digital levels, compromising each by an acceptable 0.75 dB. (If you didn't know this, you could spend years wondering why Dolby Digital playback seemed to have less ambience than Dolby Surround rather than the expected opposite.)



BOTH ROTEL UNITS ARE SOLID AND WELL MADE AND ARE PACKED WITH HIGH-QUALITY PARTS.

With this hurdle cleared, I listened extensively, in Dolby Pro Logic and Home THX modes, to a number of laserdiscs. The RSP-980 proved itself a highly capable Pro Logic decoder. It was very clean and dynamic, with quick, well-defined transients and an open feel from bottom to top. It was very quiet, too: Even 3 dB above THX reference level (which yielded uncomfortably high peak levels in my room), the RSP-980's background noise was never audible above the whir of the paused laserdisc player unless I was within 3 feet of a speaker—that's impressive. Tonal control was also notable: The big crash scene from *The Fugitive* can sound harsh and somewhat artificial, but it was presented believably by the RSP-980 and contained less ear-fatiguing hash than I've sometimes heard.

Dialog definition and intelligibility were truly first-class, and the RSP-980 exhibited relatively little "leakage" from the center to the main or surround channels. More important, what little leakage I did hear was almost completely free of dynamic spitting on "p," "t," and sibilant sounds.

As mentioned earlier, switching in the RSP-980's "Movie Filter" when in Home THX mode adds its rolloff to that of the THX re-equalization filter. The combination smoothed the sound excessively in most cases. I did find a few films where I actually preferred using both filters at once (*Speed*, for example); in these instances I simply tried not to contemplate how many dB down the treble was; a wise man once said that if you think about the beating a piston takes, you'll never drive again.

I judged the RSP-980's surround-channel decoding and reproduction to be particularly good. The tunnel-chase scene in *The Fugitive* gave this channel an excellent workout, providing wide dynamics from its tons of ambience, a dense array of subtle Foley sound effects, and lots of high-level transients. After muting the other speakers, I listened repeatedly to the same scene through the surround channel alone: The Rotel presented clean, highly defined elements and transparent, rich, cohesive ambience. Repeating the scene one last time, with all speakers activated, made me realize again how strongly a well-executed soundtrack, well reproduced, can help pull you into a film.

Dolby Digital Surround, via the RDA-980 decoder, yielded even better vocal clarity and naturalness as well as an immediately noticeable sense of more natural and organic ambience. I admit that these differences, as usual in comparisons between Pro Logic and Dolby Digital, are hard to judge reliably: The Dolby Surround and Dolby Digital versions of any soundtrack are essentially entirely different mixes, even though they're on the same disc. Nevertheless, Dolby Digital's overall impact and razor-sharp transient definition were impressive, as they usually are. The Rotel combo's quietness was excellent. True, Dolby Digital background hiss was perceptibly higher than I've heard from some other setups, but this was evident only in the sort of ear-to-the-tweeter, full-gain tests that have no real bearing on everyday use.

The RDA-980's "Dynamic Range" button controls Dolby Digital's compression and dialog-normalization system, cycling through three settings. According to the manual, the "MIN" setting (minimum dynamic range) invokes high-level compression, low-level boost, and dialog normalization; "Normal" invokes only dialog normalization; and "MAX" (maximum dynamic range) leaves the signal unaffected. This system worked transparently and, in the case of "MIN," quite dramatically. By ear, I judged that it provided about 10 dB of peak limiting and low-level compression. Clearly, this setting can be very useful in family life, and some people (my wife, for one) would probably leave it on all the time, even though that rather defeats a considerable measure of Dolby Digital's reason for being. My only quibble is that I don't like Rotel's nomenclature: In my book, "MAX" is actually normal, "Normal" is more accurately "normalized," and "MIN" is, in fact, the maximum effect.

As a stereo preamp the Rotel RSP-980's sound was warm, defined, and musical, though I felt it lacked the ultimate clarity and "hear-through" transparency I've found in a handful of other stereo preamps. Despite this, the Rotel's overall musicality and imaging were excellent in stereo, and it delivered a sumptuous, quick-sounding bottom octave and powerful deep-bass impact.

In addition to Dolby Pro Logic and Home THX, the RSP-980 has four music surround modes. They appear to combine various elements of Pro Logic decoding and THX processing—including left-to-right signal steering and surround-channel decorrelation—with some tonal shaping and (in three of the modes) greatly reduced center-to-left and center-to-right separation. I found the music surround modes to be generally inoffensive but a touch too prone to "boinginess," particularly modes 1 and 4 (which the manual subtitles "Music" and "Stadium"). Mode 2 ("Jazz") was the best sounding, particularly on chamber music and when set for a short delay and 2 dB lower surround-channel output than the Pro Logic/THX calibrated level. Unfortunately, the RSP-980 does not memorize relative channel levels for different modes, nor does it let you adjust surround- and

Continued on page 61

EXECUTIVE PRIVILEGE

Introducing one of the more enjoyable rewards for a job well done.

JVC's new FS Music Systems represent a quantum leap in the design of compact components that are perfect for the home or office.

Underneath its classic exterior lies tomorrow's benchmark engineering. An amplifier with electrolytic capacitors, CD Player with state-of-the-art 1 Bit D/A conversion, AM/FM tuner with clock timer, Compu Play for instant playback, full function remote, and a speaker system that uses JVC's edge-wound 4-layer voice coils and Hyper Neo Olefin drivers.

If you don't understand what all this technology means, it doesn't matter. Your ears will.

The JVC FS Music System.

Everything and more from an original in both sound & style.

JVC

FS SERIES

For your nearest authorized JVC dealer call 1-800-252-5722 or visit our web site at:
www.jvc-america.com

CIRCLE NO. 10 ON READER SERVICE CARD

EQUIPMENT **PROFILE**

D.B. KEELE, JR.

CELESTION A3 SPEAKER

When Celestion was founded, it was as the Electrical Manufacturing and Plating Company, making speakers for Britain's then-new wireless receivers. That was in the 1920s, when "Puccini was alive . . . Strauss was still composing, Satchmo was just out of his teens and Chuck Berry wasn't even born," according to a company brochure. Currently, Celestion is owned by Kinergetics Holdings, which also owns the British speaker company KEF. (If you want to know more, I recommend *The History of Celestion*, a fascinating 19-page booklet by J. R. Wright, available from Celestion.)

It's been four years since I reviewed the Celestion 300 (*Audio*, March 1993), a transmission-line floor-standing system that did very well in my evaluation. The A3 is the top system in Celestion's three-speaker high-end line, the A Series. Among Celestion's many goals for this series were high accuracy and the ability to play loud and clean. The A Series speakers' high sensitivity and high power handling contribute directly to these goals. The series also includes the A1, a two-way stand-mounted system at $1,499 per pair, and the A2, a floor-standing 2½-way speaker at $2,299 per pair. A center-channel speaker, a dipole surround model, and a powered subwoofer will soon join them.

The A3 is a tall, heavy column speaker that uses three 8-inch cone woofers, a 7-inch cone midrange, and a 1-inch titanium-dome tweeter. Its drivers and cabinet are new designs, incorporating the results of Celestion's sophisticated design and analysis techniques, which include laser interferometry and finite-element analysis. The latter is a mathematical technique that breaks down a structure into small elements for which a computer can easily predict mechanical parameters such as displacement, velocity, acceleration, and force. Laser interferometry uses interference between laser beams to accurately detect small mechanical movements of objects, such as loudspeaker diaphragms, over a wide frequency range. (Celestion has traditionally been a pioneer in the use of this and other

CELESTION'S GOAL WAS A SERIES OF SPEAKERS THAT COULD DELIVER LOUD, CLEAN, ACCURATE SOUND.

Rated Frequency Response: 36 Hz to 20 kHz, ±2 dB.
Rated Sensitivity: 90 dB at 1 meter, 2.83 V rms applied.
Rated Impedance: 4 ohms.
Recommended Amplifier Power: 30 to 300 watts.
Rated Power Handling: 200 watts (per IEC 286/DIN 45573: 1979).
Dimensions: 44½ in. H x 11 in. W x 16½ in. D (113 cm x 27.9 cm x 41.9 cm).
Weight: 101 lbs. (45.9 kg) each.
Price: $3,499 per pair in black ash or cherry, $3,999 per pair in Santos rosewood.
Company Address: 89 Doug Brown Way, Holliston, Mass. 01746; 508/429-3600.
For literature, circle No. 91

Photos: Michael Groen

measurement technologies; when I worked for JBL in the early '80s, we consulted with Celestion about laser measurement techniques, which they were way ahead of us in applying.)

Perhaps as a result of this research, the A3's cabinet has been designed to minimize all forms of extraneous panel vibration. Ideally, a speaker cabinet should be completely inert and vibration-free, so that the only sounds you hear are the air vibrations set up by the drivers and ports. The A3's cabinet therefore has an extensive network of inch-thick braces, carefully placed in a honeycomb-like structure. This bracing is designed to raise the frequency of cabinet resonances to the point where the cabinet walls' inherent damping will reduce resulting vibrations to below audibility. White cellulose batting and foam inserts are placed inside the cabinet to damp internal standing waves and reflections. The A3

AS YOU MIGHT EXPECT FROM ITS BRACING, THE A3 HAS FAR LESS CABINET VIBRATION THAN OTHER SPEAKERS.

comes with threaded spikes and spike covers (which act as feet if spikes are not desired), to level the enclosure and ensure firm contact with the floor. To reduce diffraction, the cabinet's front has heavily rounded edges and drivers mounted flush with the cabinet's face.

The A3's midrange and tweeter are housed in a sealed sub-enclosure at the top of the cabinet. The tweeter is just above the midrange driver, with the latter's mounting flange cut out to minimize the distance between them. This is said to improve the system's frequency and polar response. The midrange handles frequencies from 300 Hz to 3 kHz, and the tweeter takes over above that. Bass is delivered by three 8-inch woofers, in a vertical row below the midrange. The woofers' enclosure takes up the bottom two-thirds of the cabinet and is vented to the rear by two large port tubes, 2¾ inches in diameter and 9 inches long, with flared ends. The A3 has two grilles, one that covers the midrange and tweeter section and a larger one for the three woofers.

All of the A3's drivers are magnetically shielded so that the speaker can be used near TV screens. The tweeter and the three woofers have Faraday rings (low-impedance copper shorting rings around their magnetic pole pieces) to reduce distortion by lessening magnetic-flux modulation and variations in voice-coil inductance, both of which are caused by driver displacement. The 1-inch, titanium-dome tweeter is elliptical, which Celestion says smooths its response and improves its off-axis behavior. The cones of the midrange and woofers are injection-molded of polypropylene that's been loaded with flaked mica for added strength and stiffness. To increase power handling, the midrange driver's frame is die-cast aluminum to dissipate heat from the voice coil, and the woofers have long-excursion, four-layer voice coils.

The Celestion A3's crossover is on a printed-circuit board behind the bottom woofer. It consists of a second-order (12-dB/octave) low-pass filter feeding the three woofers, a second-order bandpass filter feeding the midrange, and a third-order (18-dB/octave) high-pass filter driving the tweeter. Input connections are via large, gold-plated bi-wirable binding posts that can accept heavy-gauge cables. The posts, although spaced the same ¾ inch apart as double banana plugs, have solid ends that won't accept such plugs. European safety regulations require this, in part to ensure against confusion between double bananas and some European power plugs.

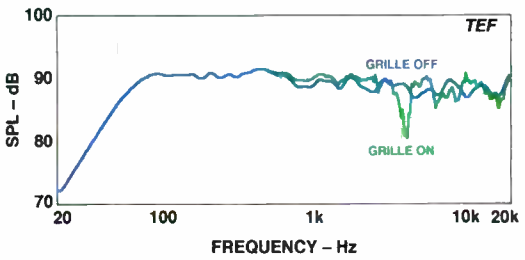


Fig. 1—On-axis frequency response.

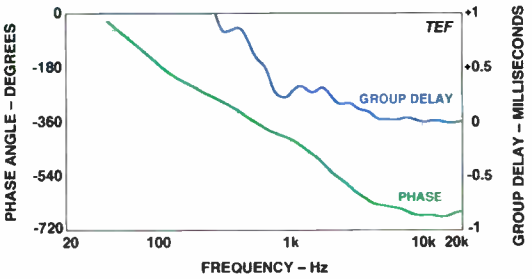


Fig. 2—On-axis phase response and group delay.

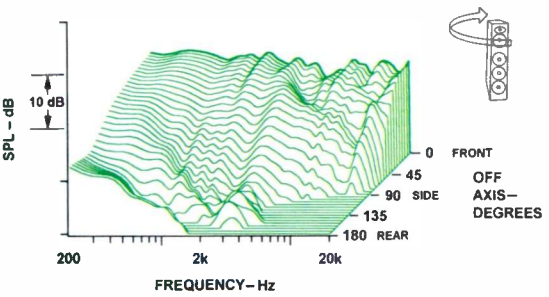


Fig. 3—Horizontal off-axis frequency responses.

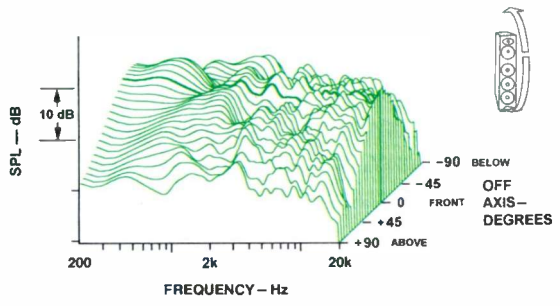
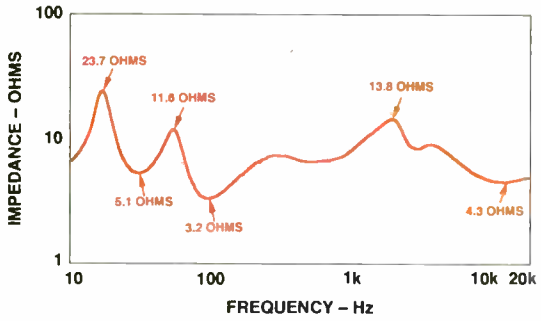


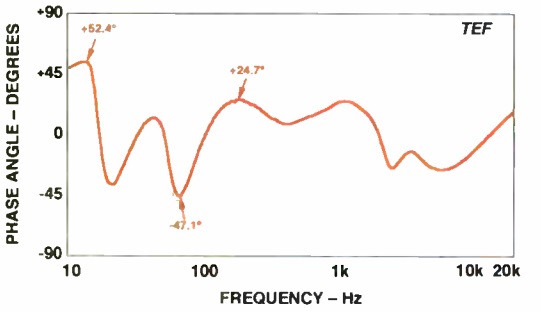
Fig. 4—Vertical off-axis frequency responses.

Measurements

Figure 1 shows the Celestion A3's frequency response, with and without its upper grille. (These curves combine anechoic measurements taken in a large chamber and ground-plane measurements made outdoors; in each case, the microphone was on the tweeter's axis, at the height recommended by Celestion.) Overall, the curve fits within a tight window of 4.6 dB (±2.3 dB referenced to 1 kHz) from 52 Hz to 20 kHz, a wide frequency range. In the bass, output is 3 dB less at 56 Hz than at 100 Hz,



A



B

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

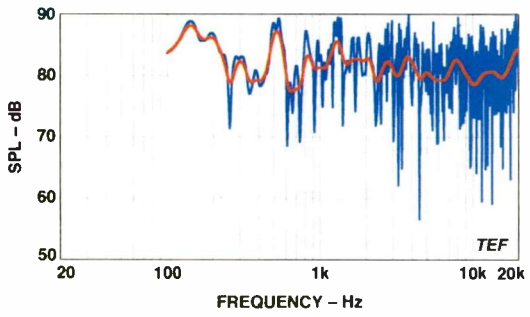


Fig. 6—Three-meter room response.

6 dB down at 45 Hz, and 10 dB down at a low 35 Hz. Without the upper grille, which covers the midrange and tweeter, major irregularities are notably absent, but there is a slight but gentle roughness above 1 kHz and the response above that frequency shelves down about 2 dB compared to the average level from 80 to 800 Hz. The upper grille causes significant response deviations of about ±2.5 dB above 2 kHz, not counting an 8-dB dip, one-third octave wide, at 4 kHz. The right and left speakers were closely matched, within ±1.25 dB.

Averaged from 250 Hz to 4 kHz, the A3's sensitivity measured 89.8 dB, essentially equal to Celestion's 90-dB rating. I used the bi-wiring connections to reverse the woofers' polarity, which caused a rejection dip of about 10 dB between 230 and 310 Hz. That moderate dip indicates that the midrange and woofers are not completely in phase when connected in correct polarity. This should not be a problem, though, because the crossover frequency is low and the spacing between these drivers is much smaller than the wavelength at that frequency.

Figure 2 shows the A3's phase and group-delay responses, referenced to the tweeter's arrival time. The phase curve falls continually with frequency before attaining its final value, about –675°, above 8 kHz. The falling phase between 50 Hz and 5 kHz indicates that the woofers' and midrange's acoustic output lags behind the tweeter's; the group-delay curve, when averaged between 700 Hz and 2 kHz (handled by the midrange driver), indicates that the midrange is about 0.25 millisecond behind the tweeter.

The curve-to-curve uniformity of the A3's horizontal on- and off-axis responses demonstrates that the horizontal coverage is quite even. In the A3's vertical on- and off-axis response (Fig. 4), the curves in the main vertical listening window (±15°) are quite uniform except between 2 and 4 kHz, the region around the 3-kHz crossover. The responses in this region are quite uniform on axis and below, but above axis there's a significant dip at 2.8 kHz (not clearly seen). Some manufacturers have solved this problem by mounting the tweeter below the midrange rather than above it.

The Celestion A3's impedance magnitude (Fig. 5A) has the double bass peak that characterizes vented enclosures; the dip between the peaks is at 30 Hz, the approximate location of the enclosure's tuning frequency. Between 20 Hz and 20 kHz, the impedance reaches a maximum of 13.8 ohms (at 2.1 kHz) and drops as low as 3.2 ohms (at 100 Hz); below the audio range, however, there's a higher peak, 23.7 ohms at 17 Hz. The impedance at the enclosure's tuning frequency is 5.1 ohms, nearly 60% higher than the A3's minimum impedance; this implies that lowering the impedance in the bass range (by using woofers with lower-impedance voice coils, for example) could increase the speaker's bass output. Between 20 Hz and 20 kHz, the A3's overall impedance variation is a moderate 4.3 to 1 (13.8 divided by 3.2). Cable series resistance would have to be no more than about 0.05 ohm to keep cable-drop effects from causing response peaks and dips greater than 0.1 dB. For a typical run of about 10 feet, that would imply 14-gauge (or larger), low-inductance cable.

The A3's impedance phase (Fig. 5B) also reaches its highest value at about 17 Hz. But between 20 Hz and 20 kHz, its maximum angle is +24.7° (at 190 Hz) and its minimum is –47.1° (at 67 Hz). One A3 per channel should not be a difficult load for any competent amplifier. However, the A3's lowest impedance occurs in the upper bass, at 100 Hz, where many recordings demand significant power; this could cause some amplifiers to struggle trying to supply high currents at high volume.

The A3 is bi-wirable via large, gold-plated binding posts.

THE ROOM RESPONSE OF THE A3 IS AS FLAT AND SMOOTH AS ANY I HAVE MEASURED LATELY.

The A3's woofers overloaded quite gracefully when overdriven and exhibited a very long maximum excursion of about 0.8 inch, peak to peak. No dynamic offset was noted. As you might expect from the bracing I mentioned earlier, the cabinet is very solid: The A3 vibrates far less than other speakers

Like a few others in this business, we've successfully avoided becoming a household word.

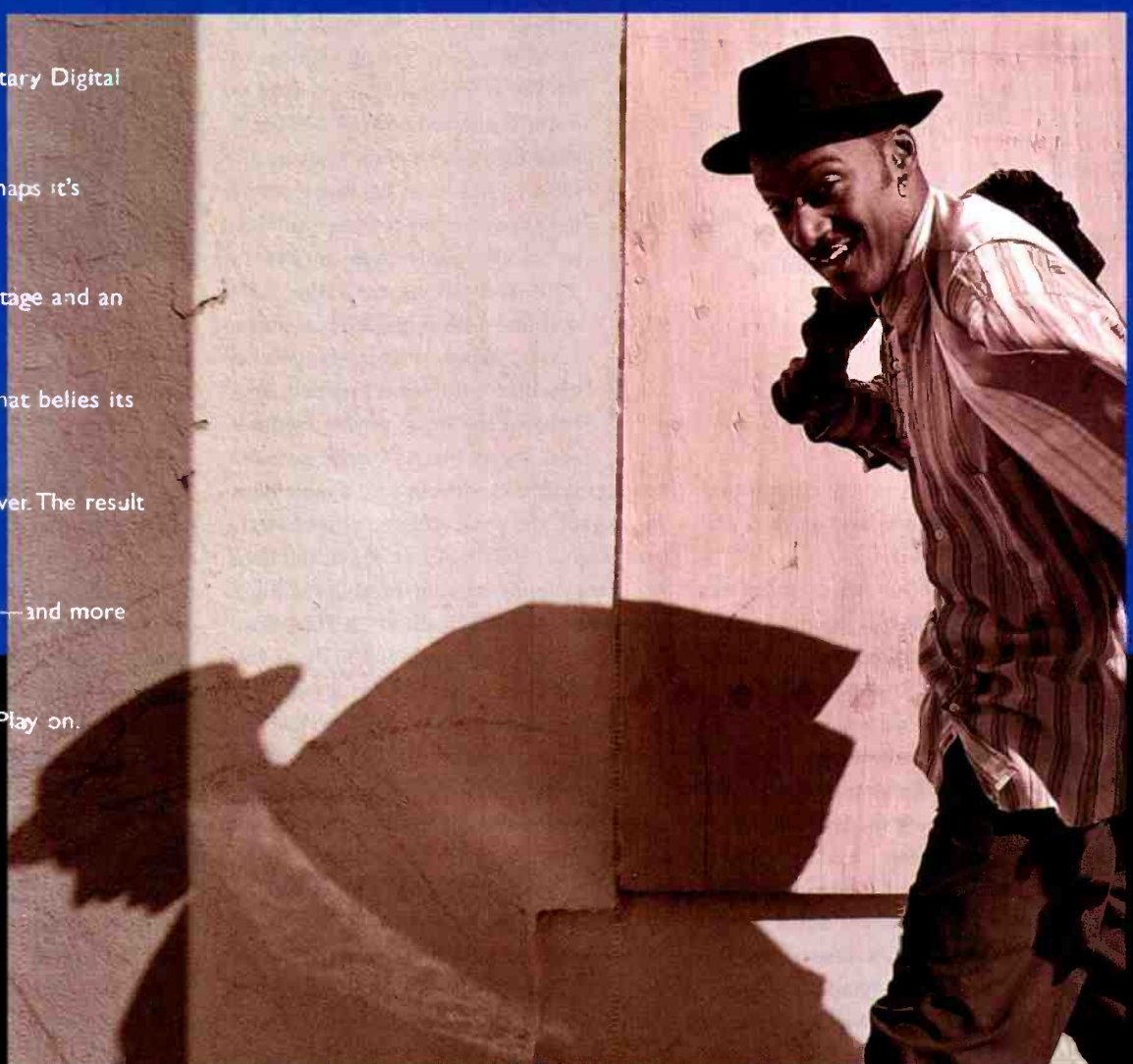
For more than a decade, we've played to relatively small, yet highly appreciative audiences. But now, thanks to the Cal Audio Labs CL-5 Multi-Disc Server, our following is expanding.

Maybe it's the CL-5's sophisticated 5-disc carousel design, its Delta Sigma D/A Converter or proprietary Digital Servo Mechanism. Perhaps it's the design's CL-10 heritage and an astounding accuracy that belies its accessible price. Whatever. The result is quality you can hear—and more than a few can afford. Play on.

California Audio Labs

Quality You Can Hear

714-833-3040 Email: info@calaudio.com Website: http://www.calaudio.com



CIRCLE NO. 14 ON READER SERVICE CARD

Marcus Miller, Santa Monica
photo by William Claxton

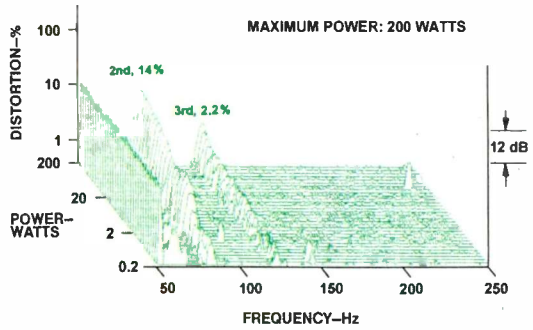


Fig. 7—Harmonic distortion for E_1 (41.2 Hz).

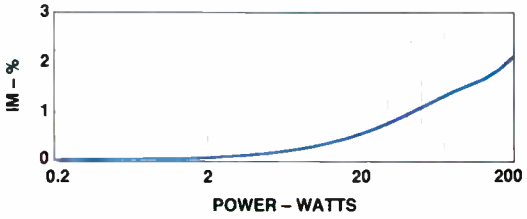


Fig. 8—IM distortion for A_4 (440 Hz) and E_1 (41.2 Hz).

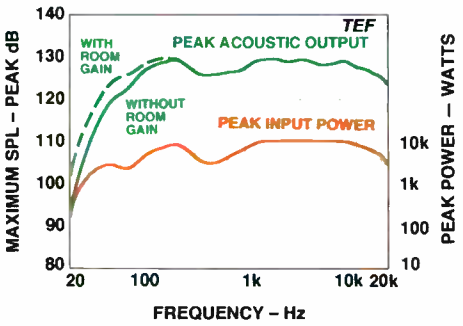


Fig. 9—Maximum peak input power and sound output.

I've tested, and I found only one significant resonance, from the top and sides of the cabinet, at about 345 Hz.

The A3's averaged 3-meter room response (Fig. 6) is as flat and smooth as any I have measured lately. The averaged curve fits a fairly tight window of 10 dB overall and a commendably tight window of 6.5 dB above 750 Hz. No floor-bounce dips are evident in the region between 200 and 400 Hz; this may be because the midrange driver and woofers operate together in this range (they cross over at 300 Hz) and because the multiple drivers form a line source, which limits vertical dispersion. The speaker was in the right-hand stereo position; the test microphone was at ear height (36 inches), at the listener's position on the sofa.

When fed a 41.2-Hz (E_1) tone at power levels from 0.2 watt to a high 200 watts, the A3's second-harmonic distortion rises only to a moderate 14%, while the third harmonic rises to a low 2.2% (Fig. 7). Over the same power range, intermodulation (IM) distortion rises gradually, reaching just 2.1% at 200 watts (Fig. 8). The A3 passed the IM test very well, generating only slightly audible IM at the full test power. The test signal consisted of 440-Hz (A_4) and 41.2-Hz (E_1) tones of equal power; the A3's IM distortion is low because these frequencies are handled by different drivers, with the woofer-to-midrange crossover between them.

The A3's short-term peak power input and output are shown in Fig. 9. The peak input power starts high, 150 watts at 20 Hz, and then rises quickly to a very high 2.7 kW at 45 Hz. After falling slightly, to 1.8 kW at 65 Hz, the power rises to a stratospheric 8.5 kW at 200 Hz. It then drops back somewhat to 2.8 kW at 450 Hz, in the range where the midrange takes over, and rises to an extremely high 10 kW (a ±200-volt swing into the A3's nominal 4-ohm impedance) above 1 kHz. Above 10 kHz, the tweeter sounded somewhat stressed, so I reduced the input power. Figure 9 also shows the A3's peak acoustic output, with and without room gain. With room gain, the peak acoustic output starts quite high, at 102 dB SPL at 20 Hz, and then rises very rapidly, passing through 110 dB at a low 24 Hz and 120 dB at 36 Hz before reaching a very high peak of 130 dB at 160 Hz! After falling somewhat, to a still very high 126 dB in the range from 350 to 600 Hz, the peak SPL rises to nearly 130 dB above 1 kHz! Above 10 kHz, the maximum output drops down to about 123 dB at 20 kHz, still *very* high.

Will the A3 play loud and clean? In spades! With its ability to deliver 120 dB SPL at 36 Hz, the A3's bass output is among the strongest I've measured, even better than three subwoofers! And a pair of A3s in a typical listening room can easily outperform any single subwoofer I have tested. The A3 sounded clean and effortless during all of my peak power tests.

Use and Listening Tests

My first impression of the Celestion A3s was formed before I'd even unpacked them: "Whew, these babies are heavy!" A single A3 tips the scales at just over 100 pounds. Heavy loudspeakers typically get that way from steps taken to minimize cabinet resonances, which usually translate directly into smoother and more accurate response. That's certainly the case with the A3.

Although quite heavy, the A3s can be walked around the room by one person; if you can dead-lift 100 pounds, the ports provide a convenient handhold. Because of the speakers' weight, I did not use the supplied floor spikes, but the A3s were quite resistant to tipping without them, even on my thick carpet.

WILL THE A3 PLAY LOUD AND CLEAN? IN SPADES! ITS BASS OUTPUT SURPASSES EVEN THAT OF SOME SUBWOOFERS!

The owner's manual for Celestion's A-Series speakers is 20 pages long, but because it's printed in seven languages and has a page of specs for each, there are only three pages left in the English section to cover speaker placement, phasing, biamping and bi-wiring, cabinet feet and spikes, power rating, and operation. The placement section is very brief but suggests that the speakers should form an equilateral triangle with you and be canted in so that their axes cross at a spot just in front of you. They should also be placed about 18 to 47 inches from the room's walls and not equidistant from the room's side wall and the wall behind them. The manual's instructions devoted to connections, biamping, and bi-wiring are somewhat more detailed.

I listened to the A3s with their grilles off and used single-wire connections to my amp. Associated gear included an Onkyo Integra DX-7711 CD player connected via a Krell KRC preamp to a Crown Macro Ref-


SMIRNOFF® VODKA 40, 45.2° & 50% Alc. by Vol. distilled from premium grain
©1995 Ste. Pierre Smirnoff FLS (Division of Heublein, Inc.) Hartford, CT Made in U.S.A.
SM RNOFF
PURE MISCHIEF.
SMIRNOFF

erence power amplifier. For speaker comparisons, I used B&W 801 Matrix Series 3s. All speaker and interconnect cables were by Straight Wire.

The A3s were placed and toed in according to Celestion's directions. This meant spacing them 7 feet apart, while I sat about 8 feet away. The Celestions were about 5 to 6 dB more sensitive than the B&Ws, so I put a line-level passive attenuator in my preamp's tape loop and switched it in when playing the A3s in order to make their output equal to the 801s'.

The A3s proved to be excellent all-around reproducers of whatever I sent their way. Their dynamic range and effortlessness border on the best I have heard. I started my listening with an excellent piano recording, *Mozartiana* (Sony Classical SK 52551), on which Cyprien Katsaris plays Carl Czerny's Fantaisie Brillante (on themes from Mozart's opera *Le Nozze di Figaro*), among other pieces. Here the A3s rendered the piano (especially its lower registers) with full authority and impact; the sound was very open and effortless. The A3s proved just as capable on other symphonic material, delivering excellent imaging, a wide soundstage, and highly accurate sound.

The Celestions did equal justice to less dynamic recordings, such as string quartets, rendering them expressively and smoothly and giving an accurate sense of room reverberance on recordings that captured it. Their imaging and localization could not be faulted; centered mono images were always accurate and stable within the soundstage and did not shift with frequency.

Male and female vocals were always accurately and naturally reproduced, with absolutely no harshness. Male voices were free of chestiness, and there was no undue sibilance. The A3s were a touch brighter than the 801s, but this usually translated to a more open and transparent sound, which is hardly undesirable.

As the A3s are magnetically shielded, they'd make excellent main-channel speakers in a home theater setup, and they really shine on material that has wide dynamic range or sharp, impulsive sounds, such as sound effects and movie soundtracks. The A3s performed stupendously (or, as my online dictionary defines that word, "of astounding force, volume, degree, or excellence; marvelous") on one of my favorite sound-effect CDs, *Sonic Booms 3* (Bainbridge BCD 6289). The machine guns and propeller-warplane sounds on track 12 were incredible, and the fire-engine air horn on track 13 will startle even the most jaded sound-effects freak.

On low-frequency band-limited third-octave pink noise, the A3 proved to be one of the most powerful systems I have tested, with clean output that often exceeded the 801's. The A3s provided significant usable output at 20 Hz, and although the 801s delivered more fundamental output there, it was accompanied by significant chuffing sounds from the vents. At 25 Hz, the A3's fundamental output equalled the 801's but, again, with much less vent noise. From 32 to 80 Hz, the Celestion's clean output significantly exceeded the B&W's. And the A3 drew significantly less amplifier power throughout! Speakers that can play louder and cleaner than the 801s are rare in my testing (that's one of the reasons why I use them for comparison!), but the A3s managed that in the bass. At 100 Hz and above, they competed on an equal basis with the B&Ws. The Celestions sounded quite effortless at all power levels and overloaded very gracefully, and their vent noise was always quite low.

THE CELESTIONS' IMAGING AND LOCALIZATION COULD NOT BE FAULTED.

When reproducing broadband pink noise, the A3s matched the B&Ws' smoothness and accuracy when I listened from my couch. When I stood up, however, the Celestions' upper midrange sound changed, becoming much different from the B&Ws'. That change in sonic character probably relates to the 2.8-kHz dip in the A3's off-axis vertical response (Fig. 4).

With about 6 dB higher sensitivity than the B&Ws, the A3s can deliver higher output levels from the same power amplifier or deliver the same levels from an amp that provides only one-fourth as much power. The Celestion A3s' high output capabilities make these speakers excellent choices for large rooms or for listeners who occasionally listen to loud party or rock music having heavy bass lines. The Celestions' bass response is smooth, extended, and powerful. Whether playing my most demanding pipe organ music or rock kick drum, they delivered everything the recordings had to offer.

With its three 8-inch woofers and 7-inch midrange, the A3 can produce very high acoustic output.

The Celestion A3's appearance, construction, and fit are irreproachable, exemplifying solid craftsmanship and simple good looks. Its sound is highly accurate and quite transparent, even at exceptionally high levels, and its bass is smooth and extended. This speaker is a real bargain, costing less than half as much as the B&W while equalling the latter's performance in many areas, and it actually exceeded the 801's dynamic range and bass output. The A3's only fault is its somewhat rough vertical coverage, an area where the 801 is nearly faultless.

To summarize, the A3 offers superb looks, fine craftsmanship, accurate sound, wide dynamic range, smooth and powerful bass, an extended and accurate high end, and excellent imaging and localization, all at a reasonable price. I'd give it an "A," if Celestion hadn't beaten me to it. A

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

B-60 Integrated Amplifier

The remarkably compact, Bryston B-60 Integrated Amplifier provides 60 watts per channel at 8 ohms and 100 watts per channel at 4 ohms. There are provisions for four high level inputs, (CD, Tuner, Video and Aux) in addition to one tape loop and a pre-out/main-in feature. A headphone jack is also provided.

If your requirements are for sonic excellence in a versatile, convenient package, without compromises in performance, value and reliability, look no further than the Bryston B-60 Integrated Amplifier. Call us today, or visit our web site to receive a free product brochure, **705-742-5325**, **www.bryston.ca**

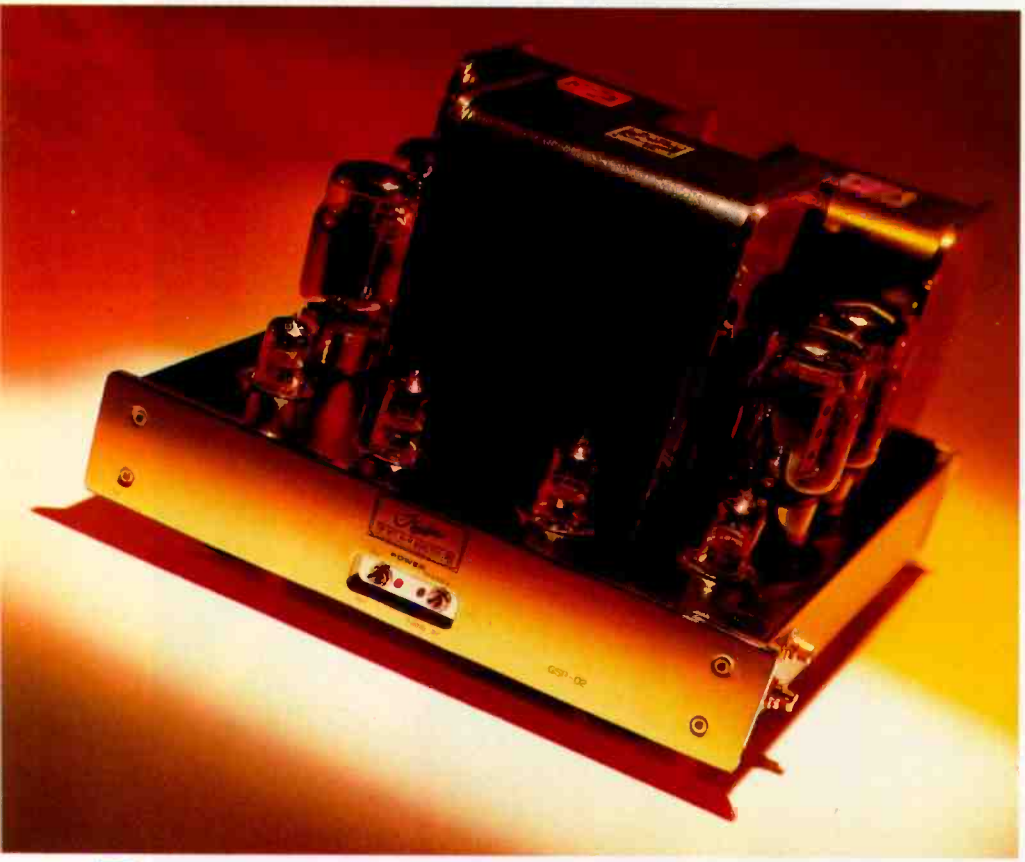
BRYSTON

CIRCLE NO. 21 ON READER SERVICE CARD

EQUIPMENT PROFILE

BASCOM H. KING

HOUSTON GSP-02 AMPLIFIER



Rated at 60 watts per channel, the Houston GSP-02 is one of three tube power amplifiers imported into this country by Centasound International. A smaller unit, the GSI-01 integrated amplifier, is rated at 40 watts per channel; Houston's top model is the GSM-260, a mono amp rated at 65 watts. Houston plans to introduce two line-level preamplifiers, a single-ended integrated amplifier, and a single-ended power amplifier in the coming months. Currently, the Houston products are sold direct, with a no-obligation 14-day home trial.

THE HOUSTON GSP-02 IS QUITE ATTRACTIVE AND IS RELATIVELY INEXPENSIVE FOR A TUBE AMP.

The GSP-02 is quite attractive, with titanium-plated brass on the front and back panels and the sides of the exposed power and output transformers. Each amp is handmade, using point-to-point wiring. The power and output transformers are hand-wound with high-purity copper wire and are potted. Metallized polypropylene capacitors are used in the signal paths. Input and output connectors are gold-plated. (The input jacks are on one side of the amp; the rear panel is taken up by widely spaced output binding posts, the power-cord socket, and a fuse.) Each channel has a pair of 12AU7 tubes in its front end and a pair of KT-100s, in push-pull, as outputs. (I'm not sure, but I suspect the KT-100 is a more rugged version of the more common KT-88 output tube.) Parts and build quality are reasonably good. The bias adjustment pots could use more support, as they are held in place only by their connecting wires.

Measurements

When I first started to measure the Houston amplifier, I found the onset of visual clipping in the output to be at about 45 watts. Whoa, I sez—this is a 60-watt amp? A call to the importer revealed that the 60-watt rating is at 10% distortion! This is not that unusual for today's single-ended, Class-A tube amplifiers (for example, the Cary CAD-805 mono amp I reviewed in the July 1995 issue attained its rated 50 watts at about 10% distortion), but an amplifier is usually expected to put out its rated power (or more) at the onset of clipping. As will be seen, the GSP-02 does make 60 watts per channel at 10% distortion, which is pretty far into clipping. However, if a company is going to rate its amplifiers' power at high distortion levels, it should say so or else publish more realistic ratings.

My discussions with Centasound about the Houston amp's power rating also led the company to send me a second set of output tubes. Substituting these tubes did not raise the maximum power but did improve some other characteristics of the GSP-02's performance, as noted below. For the rest of my tests, I used the same bias current of 31 milliamperes for the replacement tubes as for the originals. Raising the

Rated Output: 60 watts per channel into 4 or 8 ohms.
Rated Distortion: 10% at 60 watts or 0.15% at 8 watts, 20 Hz to 20 kHz, into 8 ohms.
Dimensions: 12½ in. W x 8¼ in. H x 14¾ in. D (31.8 cm x 21 cm x 37.5 cm).
Weight: 52 lbs. (23.6 kg).
Price: $960.
Company Address: c/o Centasound International, P.O. Box 210337, San Francisco, Cal. 94121; 415/668-9003; fax, 415/668-9638; http://www.centasound.com
For literature, circle No. 92

Photos: Michael Groen

Evolution: *A gradual process in which something changes...*

...into a different and more complex form.

Optimus Audio–The evolution of design, technology and sound.

The Optimus family of speakers with Linaeum-designed tweeters produces "wide-angle" sound that envelops your listening area like never before, with remarkable presence you'd expect only from much higher priced speakers. The critics love them, find out why at RadioShack. For our store near you, call 1-800-THE-SHACK.

Built to ROCK!

OPTIMUS® AUDIO

RadioShack®

You've got questions.
We've got answers.®

TECHNICAL HIGHLIGHTS

The GSP-02's circuitry is straightforward, with a slight twist. That is, the input stage is a simplified mu follower, but with the plate of the input tube coupled directly to the grid of the stage's second tube and the cathode of that tube going through a single self-biasing resistor to the junction of the first tube's plate and second tube's grid. The stage's output is taken from the cathode of the second tube. This arrangement yields high gain and a low output impedance.

This first stage is directly coupled to the second stage, a long-tailed phase inverter. The phase inverter's plate outputs are capacitor-coupled to the output tube grids, with unequal plate-load resistors to compensate for the inherent imbalance in its push-pull outputs. No AC balance control is provided.

The output stage is an Ultra-Linear design, with the output tubes' screen grids connected to taps on the output transformer's primary. This stage has a negative voltage on each tube's grid and a bias-adjustment pot for each tube under the chassis. The output transformer's secondary has 4- and 8-ohm taps; negative feedback is taken from the 8-ohm tap back to the input stage.

In the power supply, the high-voltage secondary is rectified by a full-wave bridge. It is then filtered by two 1,000-microfarad, 400-volt capacitors in series and fed to the center taps of the output transformers' primary windings. From this point, a 1-kilohm series resistor feeds another pair of 1,000-microfarad, 400-volt capacitors, which in turn feed the plate circuits of the phase inverter tubes. A 22-kilohm decoupling resistor and a 33-microfarad, 450-volt shunt capacitor supply the first stage. All of the GSP-02's tube heaters are AC powered.

The bias supply consists of a full-wave bridge rectifier feeding through a 10-microfarad, 250-volt filter capacitor into the four 100-kilohm bias pots, which are connected in parallel. Each pot's wiper is bypassed to ground via another 10-microfarad, 250-volt capacitor. The schematic shows that these pots, which have no range-limiting resistors, can vary the bias all the way from 0 volts to a voltage negative enough to cut the output tubes off entirely; an unknowing tweaker could inadvertently bias the tubes to destruction.

The schematic doesn't show it, but the main power switch is supplemented by a "Stand By/Operate" switch. The latter connects and disconnects the AC to the power supply's high-voltage rectifier bridge, thus turning the high-voltage DC on and off. *B.H.K.*

plate current to the levels traditionally used for such tubes would decrease the distortion and increase the damping factor but would also shorten tube life.

Except where noted, all measurements were made via the GSP-02's 8-ohm output taps. Voltage gains with 8-ohm loads measured 27.7 dB for the left channel and 26.9 dB for the right channel with the original tubes but matched each other more closely with the replacements. Corresponding IHF sensitivity (millivolts of input for 1 watt output into 8 ohms) was 117.1 millivolts in the left channel and 128.3 millivolts in the right. My other measurements are for the left channel unless otherwise noted.

Note the differences between Fig. 1's frequency response curves for open-circuit, 8-ohm, and 4-ohm loading and for the NHT dummy speaker load, with and without its high-frequency impedance-compensation circuit. The frequency response the Houston GSP-02 delivers to your speakers will depend a lot on their impedance curves. (The 8-ohm tap, used in Fig. 1, has an output impedance of about 10 ohms.) Frequency response should be flatter if your speaker is connected to the GSP-02's 4-ohm taps, whose impedance is about 3.7 ohms. However, if your speaker's impedance is 8 ohms or higher, connecting it to the amp's 4-ohm tap will reduce the amount of power you get. If you buy a GSP-02, experiment to see which output tap yields the best sound with your speakers.

Damping factor, a function of output impedance, measured about 0.85 and 0.75 for the left and right channels, respectively, and was quite uniform over the audio frequency range. Output impedance dropped a bit with the replacement tubes, yielding a damping factor closer to 1. To assess damping factor, I normally feed 1 ampere into the measured channel's output terminals and measure the voltage across that output; the number of volts equals the output's impedance in ohms. But for the GSP-02, I had to reduce my test current to 0.1 ampere in order to prevent output-transformer nonlinearity from causing excessive waveform distortion below 30 Hz.

On square waves, the rise and fall times with 8-ohm loading were 4 microseconds. In the 'scope photo (Fig. 2), square-wave response for an 8-ohm load is quite good, with only minimal overshoot and ringing. Adding a 2-microfarad capacitor in parallel across the 8-ohm resistance increases the rise and fall times, which will definitely dull the high-frequency response, but the waveform is well shaped and behaved. There is considerable tilt in the 40-Hz square wave.

Distortion is plotted against power output in Figs. 3 and 4. The curves in Fig. 3, for

THE HOUSTON AMP CAN SOUND VERY MUSICAL AND SATISFYING WHEN USED WITH THE RIGHT SPEAKERS.

SMPTE IM distortion and total harmonic distortion plus noise (THD + N) at 1 kHz, are for 8-ohm loading. Distortion with the replacement tubes was significantly lower below about 10 watts, but above that, it was pretty much as shown. In Fig. 4, THD + N at 1 kHz is plotted for 4-, 8-, and 16-ohm loads. Like most tube amps, the GSP-02's power and distortion are both lower with 16-ohm loads, while loading a tap with less

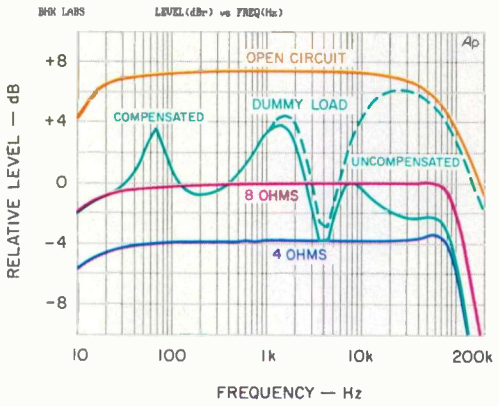


Fig. 1—Frequency response as a function of loading.

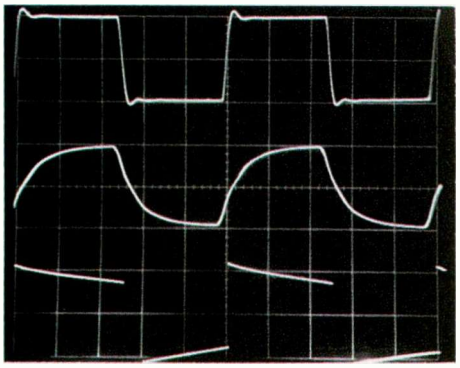


Fig. 2—Square-wave response for 10 kHz into 8-ohm load (top), 10 kHz into 8 ohms paralleled by 2 µF (middle), and 40 Hz into 8 ohms (bottom).

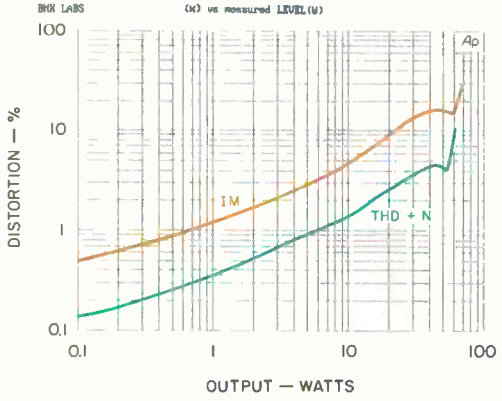


Fig. 3—THD + N at 1 kHz and SMPTE IM distortion vs. power output, for 8-ohm loads on the 8-ohm tap.

than its nominal impedance (here, 4 ohms on the 8-ohm tap) raises distortion a bit without affecting power output. In the curves of THD + N versus frequency at various power levels (Fig. 5), there's only a moderate rise in distortion at high frequencies, which is desirable, but distortion rises more steeply below 50 Hz. Houston may have sacrificed some low-frequency power capability in the output transformers to keep distortion low at high frequencies. The harmonic-distortion residue of a 10-watt, 1-kHz signal, with 8-ohm loading, is analyzed in Fig. 6.

Channel separation was 75 dB or greater above 300 Hz and was greater than 82 dB from 1 to 20 kHz. Crosstalk was greatest at low frequencies, which is unusual; this was probably because of common coupling between the channels in the power supply.

Output noise levels for the Houston amplifier's right (worse) channel were 2,287 microvolts wideband, 2,280 microvolts from 22 Hz to 22 kHz, 273 microvolts from 400 Hz to 22 kHz, and 444 microvolts, A-weighted. However, the left channel's noise was only about 36% of the right channel's in the first two measurements; the higher noise in the right channel was due to power-supply hum. In the last two measurements, which de-emphasize the low bass, both channels' noise levels were lower and the difference between them was smaller.

Dynamic power attainable was 58 watts into 8-ohm loads, which corresponds to dynamic headroom of –0.15 dB relative to rated power. As previously mentioned, the power at visual onset of clipping was about 45 watts, for a clipping headroom of –1.2 dB relative to the rated 60 watts. The GSP-02 drew 0.52 ampere in standby mode and 1.3 amperes in operating mode when idling.

Not surprisingly, in view of its low damping factor, this amplifier doesn't have much overall negative feedback. I checked this by opening the feedback loop. At 1 kHz, with 8-ohm loading, the resulting change in gain was only about 2.5 dB.

Use and Listening tests

When I received the Houston GSP-02, I had a pair of Audiostatic ES-500 speakers set up in my listening room. I was dissatisfied with their response; the midbass was a bit weak and the upper midrange a bit too prominent. When I replaced my original amp with the GSP-02, the frequency balance seemed to improve. I learned why when I measured the Houston amp's performance and discovered its rather high output impedance. The impedance of the ES-500 speakers has a broad maximum at about 100 Hz and is lower in the upper midrange and at high frequencies. Since the voltage delivered by the GSP-02 varies with the load

Associated Equipment Used

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

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

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

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

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

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

Power Amplifiers: Sonic Frontiers Power-3 mono tube amplifiers, Sumo Gold Class-A amplifier (updated by its designer, Jim Bongiorno), Quicksilver M135 mono tube amps, and Arnoux 7B digital switching amp

Loudspeakers: Audiostatic ES-500s and Genesis Technologies Genesis Vs

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

impedance, the interaction between the Audiostatics and the Houston amp had fortuitously equalized the speakers in a way that improved their sound in my room. The overall sound was quite good indeed, with great resolution and detail. On some material, I thought I might have heard some distortion that I could attribute to low idling current in the amp's output stages. With the replacement output tubes, the sound improved and was absolutely first-rate on much of the music I played.

I frequently use B&W 801 Matrix Series 3 speakers in my tests, but I did not feel that using them with the GSP-02 would be entirely appropriate. The B&Ws' impedance curve varies like that of the dummy test load, whose effect on frequency response can be seen in Fig. 1; the response aberrations I could expect if I used them with this amp would obscure other aspects of the amplifier's sound. Instead, I set up the Genesis Technologies Genesis Vs, whose impedance curve is more uniform than the B&Ws' over most of the range that the amplifier has to drive. Since this impedance is 3 ohms or less, I used the 4-ohm output taps on the GSP-02. Using the Houston amp to drive the Genesis Vs, I got very good sound, with excellent space, dimension, and detail.

Tonal balance was more or less what I usually get from the Genesis speakers except for slightly increased output in the upper bass and lower midrange. This was caused by the speaker's rising impedance below about 150 Hz, which enabled the amplifier to deliver a higher output voltage; when an amp's damping factor is as low as the GSP-02's, its output at any frequency will vary with the speaker's impedance at that frequency. When the amp has a more normal damping factor—i.e., moderate to high—its electrical frequency response is more invariant with impedance.

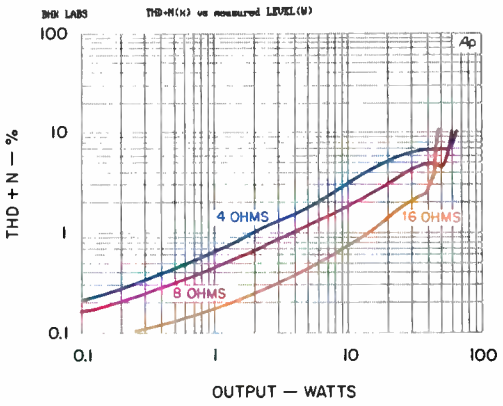


Fig. 4—THD + N at 1 kHz vs. power output and load impedance.

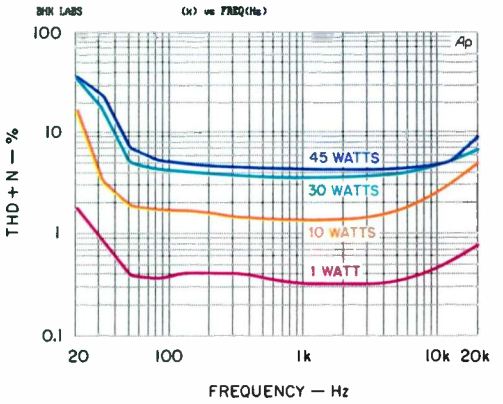


Fig. 5—THD + N vs. frequency.

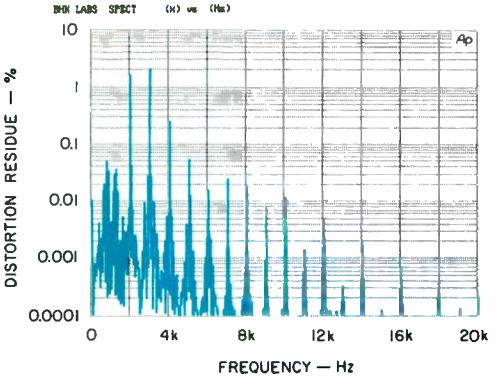


Fig. 6—Spectrum of harmonic-distortion residue for a 1-kHz signal at 10 watts out into 8 ohms.

Although the Houston GSP-02 did not sound quite as good or realistic as some of the amplifiers that I use for reference, it gave a good and musically enjoyable account of itself on the Genesis Vs—especially for a stereo tube power amp priced at less than $1,000. While somewhat sensitive to its speaker load, it can deliver very musical and satisfying sound when paired with the right speakers. A

ROTEL, *continued from page 46*

center-channel levels except through the setup routine, so reestablishing these settings each time would be a chore. Further, because the channel levels have no memory backup, they require resetting if the unit is unplugged or your electricity fails.

Operationally, the Rotel pair's simplicity makes for a direct and intuitive interface. But simplicity can be a double-edged sword, and these components do present a few inconveniences. Foremost is that you must manually select the 5.1-channel input at the RSP-980's front panel; you can't do it from the remote, nor does this preamp/processor automatically select that input when a signal is presented to it. (You can't use the remote to select the RDA-980's dynamic range modes, either.) Similarly, you can select mono, stereo, or a surround mode only by sequencing up or down through the eight possible modes via two keys on the remote. More seriously, there is no way at all to select or change surround modes or to adjust center/surround balance from the front panel. If you misplace the remote or accidentally step on it or run it through the Maytag (don't laugh, someone I know *real* well has done this), you're flat out of luck until you get another. (Unplugging and replugging the RSP-980 at least resets it to THX mode, but it erases all channel-level settings.) The RSP-980 lacks a headphone jack and front-panel A/V inputs for a camcorder. And, finally, both units deserve far better owner's manuals.

DOLBY PRO LOGIC PERFORMANCE WAS TRULY FIRST-CLASS, AND DOLBY DIGITAL SOUNDED EVEN BETTER.

For ascetics bred to the rigors of true audiophilia, these are, of course, mere quibbles. And in all fairness, I found the Rotel duo to be smooth, straightforward, and pleasant to use—pleasanter, in several ways, than some more elaborate and technologically burdened competitors. Rotel has done a very nice job of striking a balance between value, sonics-centered engineering, and extensive home theater features. A

EQUIPMENT PROFILE

EDWARD J. FOSTER

NAD 118 DIGITAL PREAMP

I've been looking forward to the NAD 118 digital preamplifier since I first saw its working prototype nearly two years ago. Over the years, NAD has demonstrated an unusual ability to create products with innovative features and deliver them at very affordable prices. I could hardly wait to see how NAD would apply that ability to a digital preamp.

No one who's been around audio for any length of time could fail to recognize the 118 as an NAD product. Its flat gray finish, clean white lettering, and round black pushbuttons (except for an unmarked green on/off button) imbue the 118 with a beguiling simplicity that's typical of NAD designs. Equally typical is the 118's emphasis on practical features rather than gewgaws. There are, however, more features than you might think from a glance at the 118's uncluttered front panel, and it handles many familiar functions in new ways.

The NAD 118 accepts eight audio program sources, four analog ("analogue" in NAD's British English) and four digital. This being a digital preamp, analog signals are immediately digitized by an 18-bit A/D converter and thereafter manipulated mathematically. Virtually all preamp functions are performed by a digital signal processor (DSP). They include volume, balance, and tone control; infrasonic filtering; mono blending; and polarity reversal. The DSP also provides several interesting digital enhancements: compression/expansion, control of image width and spread, and FM noise suppression.

THE NAD 118'S BEGUILING SIMPLICITY BELIES ITS WEALTH OF FEATURES.

The only exception to the 118's all-digital design is its tape-monitoring system, which is strictly analog. Tape recording, however, can be digital or analog. The 118 has both analog and digital tape and preamp outputs (the digital preamp output can be shut off if desired). And while the A/D converter normally samples analog input signals at 48 kHz, its rate can be changed to 44.1 kHz if desired; this enables a direct digital feed to a CD recorder (which would function only at 44.1 kHz) without sampling-rate conversion. Digital program sources are handled at their incoming rate.

Whether you're using the 118's front panel or its remote, you select a program source from two rows of four buttons, one each for analog and digital, separated by the source-designation labels ("Disc," "Tuner," "Video," or "Tape"). With the exception of "Tape," the inputs are arbitrarily named and can be used with any line-level analog or standard S/P DIF digital signal source. In fact, I doubt whether many users would connect the audio from a video program source to the "Video" inputs, since the 118 doesn't provide surround decoding or simulation and does not route video signals.

Like most of the front-panel buttons, each program-selector button has an embedded LED indicator. (The LEDs are green for the program selectors, yellow for all others.) If a digital source has been selected but no signal is reaching it, its LED will blink to show that the input has not locked to a sig-

Dimensions: 17⅛ in. W x 3¾ in. H x 11 in. D (43.5 cm x 9.5 cm x 28 cm).
Weight: 17.6 lbs. (8 kg).
Price: $1,599.
Company Address: 89 Doug Brown Way, Holliston, Mass. 01746; 508/429-3600.
For literature, circle No. 93

Photos: Michael Groen

nal. Tape monitoring is handled by two "Tape Check" buttons, a bit to the right of the selectors; these buttons' yellow LEDS make it easy to notice when you're monitoring a recording rather than listening to the source.

Directly above the monitor buttons is a button labeled "Process to Tape," with two "DSP" buttons ("In" and "Function") just to its right. The "DSP" buttons select and activate the DSP functions; "Process to Tape" determines whether the currently selected DSP processing is applied to the signals at the analog and digital record outputs. The only remaining buttons, far to the right, are used for polarity inversion and to blend the channels into mono.

MOST TONE CONTROLS MUCK THE SOUND UP, BUT THE 118'S ARE FUNCTIONAL, SUBTLE, AND SENSIBLE.

To choose a DSP mode, you can either cycle through the available modes by pressing "DSP Function" on the front panel or select them directly via six keys on the remote. Not all of these functions can be applied simultaneously, however. The levels of the DSP effects are controlled by three knobs under the NAD 118's display panel and by three pairs of keys on the remote; LEDs on the display show which effects are active. As you adjust each function, a bar graph appears in the display to indicate the setting, then disappears a few seconds later. The panel knobs are marked with a white dot (but no center detent) to show their relative positions within each range.

The "Tone" mode uses the DSP circuits as digital bass, treble, and midrange controls, with LEDs appearing by the words "Bass," "Mid," and "Treble" on the display. Switching to the "Infra & Tone" mode replaces the bass-control function with an infrasonic filter, simultaneously extinguishing the "Bass" LED and illuminating the "Infrasonic" LED just to the right.

The "Width" mode enables you to broaden or narrow a stereo source's image; for mono sources, you'd use "Width & Spread" to simulate a stereo image from a mono source. That stereo simulation is also applied in "FM" mode, which is meant for reducing background hiss on weak stereo broadcasts (but can be used with any input). Like the blend circuits on most tuners or receivers, "FM" is used to reduce channel separation when the signal is weak; unlike those circuits, it then adds some stereo simulation to keep the soundstage from narrowing to mono. "Width" and "FM" are both controlled by the left-most DSP effect knob; "Spread" is controlled by the middle one.

The last DSP function, "COMP," is used to compress or expand a program's dynamic range. Compression is useful for late-night or background listening, letting you hear all the notes when the volume is turned down low; it's also useful for compressing the dynamics of a CD before recording it on a cassette that will be played in a car or other noisy environments. The expansion function can help make overly compressed broadcasts more natural and make recordings punchier.

To the right of the DSP control knobs is a detentless "Balance" control and, at the far right, "Volume." The five front-panel knobs and their counterparts on the remote work independently. I suspect this was done to provide the "analog feel" of knobs without the expense of motorizing them. As a result, you can enter a group of settings via the remote and enter a second set via the panel controls, with the controls you used last remaining in effect until you use the other ones. The remote also has a "Front Panel" pad that relinquishes control to the front-panel knobs. Any DSP settings (including balance) made from the remote can be cleared with the remote's "Clear" pad; from the panel, you'd return the knobs to their respective center positions.

You can store balance and DSP settings in the 118's nonvolatile memory by using the "Store," "Memory," and input-select buttons on the remote. Separate memory banks are available for each input; you also can store your preferred settings for each DSP mode, which are then accessible on all inputs.

Between the balance and volume knobs is a button marked "High Gain," which in-

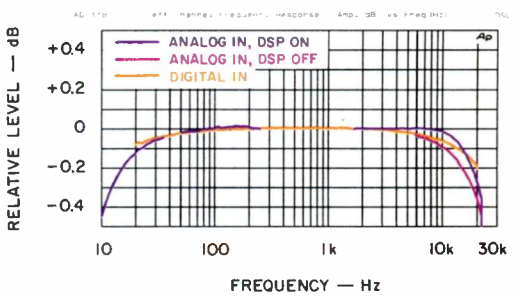


Fig. 1—Frequency response; see text.

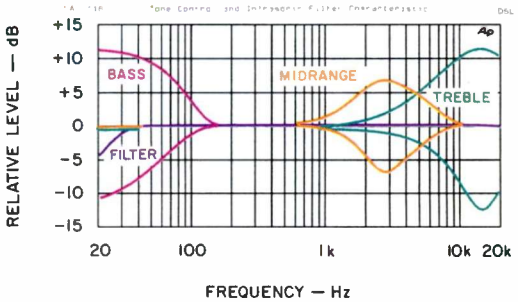


Fig. 2—Tone control and infrasonic filter characteristics.

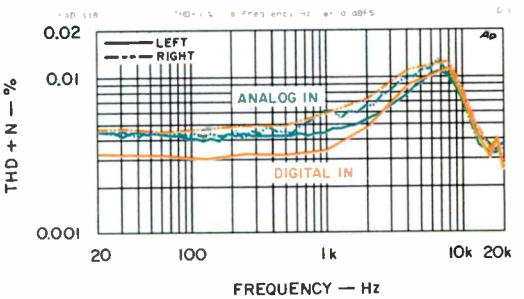


Fig. 3—THD + N vs. frequency at 0 dBFS.

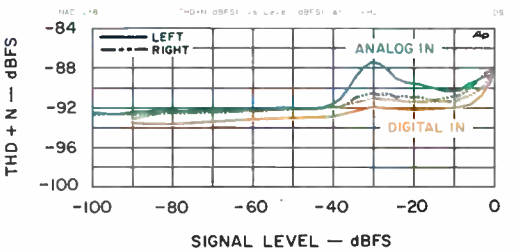


Fig. 4—THD + N vs. level at 1 kHz.

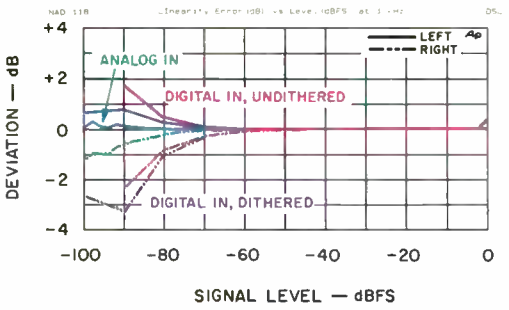


Fig. 5—Linearity error vs. level at 1 kHz.

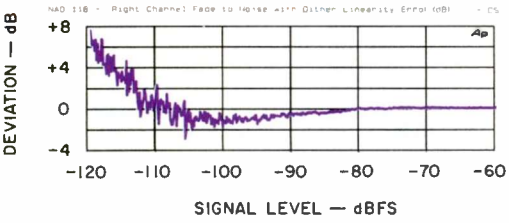


Fig. 6—Fade-to-noise test.

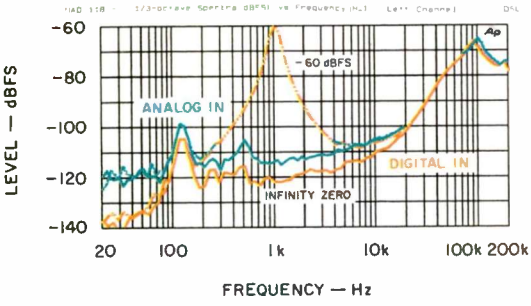


Fig. 7—Spectrum analyses for "infinity zero" signals and 1-kHz tones at -60 dBFS.

creases the analog output level by approximately 10 dB. It's used to tailor the volume control's range to match the program material so that you won't overload the 118's D/A converter. If you do overload the converter, an LED "Peak" indicator, just above the volume control, will flash. A button on the rear panel, marked "System Sensitivity," also shifts the analog output level by about 10 dB, but it does so to account for differences in the sensitivity of your stereo system's power amp and loudspeakers. Neither of these switches affects the 118's digital output.

Additional sensitivity adjustments are provided for the analog inputs. While digital program sources have a well-defined maximum level (0 dBFS), analog program levels can vary widely from source to source. Adjusting the gain of each analog input individually to match its source helps ensure optimum dynamic range from the 118's analog-to-digital converter. To adjust these gains, you hold down an input's program-selector button while feeding in a loud signal, simultaneously adjusting the volume knob until the "Peak" LED flashes to warn of converter overload. Two amber "Gain" LEDs, at the left of the front panel, show the gain setting you've selected. Both LEDs light for –15 dB, the default choice to which all inputs are set at the factory; the "–5 dB" and "–10 dB" LEDs light for those two settings, and neither illuminates for the 0-dB (maximum) gain setting. Only a small nudge of the volume knob is needed to raise or lower the gain by 5 dB. Once adjusted, the input gain is retained in memory for each source, so this is a one-time setup procedure.

The NAD 118's inputs and outputs, on the rear panel, consist of nickel-plated RCA jacks. Only coaxial digital inputs and outputs are provided, so you can't use digital sources or recorders that require other connections (such as Toslink). The tape connections are rather unconventional. There are two sets of analog recording outputs, "Direct" and "Process," and one digital recording output; all of them can be used simultaneously. When an analog tape deck is connected to the "Direct" outputs, signals from analog inputs are transferred directly from the selector, without digital conversion or alteration by the DSP functions. If the source is digital, however, the signal will be affected by the settings of the front panel's "Polarity" and "Mono" switches and, if "Process to Tape" is engaged, by whatever DSP function is active. Analog decks connected to the "Process" output, and digital recorders connected to the digital outputs, do receive DSP-enhanced signals. This unconventional arrangement gives you the choice of recording analog signals on an analog deck without ever leaving the analog domain or of recording the same signals through the 118's digital circuitry, with or without DSP enhancement.

There are two pairs of "Tape" input jacks, one pair marked "Analogue" and the other "Analogue from DAC." The "Analogue" pair serves as the normal analog tape input. You can choose it as the active program source (which means you can also record from it onto analog or digital tape decks) by pressing the "Tape" button in the program selector's "Analogue" row. A bit to the right of that selector is a button labeled "Tape Check 1," which functions as a conventional tape monitor. When you're recording on a digital deck, you connect its analog monitoring output to the "Analogue from DAC" input. The monitor button for this input, "Tape Check 2," is aligned with the "Digital" program selector bank, which makes its operation more intuitive. To use your digital recorder as the active source, you feed its digital output to the "Digital Tape" jack and select "Tape" on the lower row of program selectors.

Interestingly, the NAD 118 automatically dithers both the "Digital REC" and "Digital Preamp" outputs to the same 18-bit level produced by the 118's analog-to-digital converter. When "Process to Tape" is not engaged, whatever digital input is selected is passed straight through to the digital record output without redithering. However, by engaging "Process to Tape" but not engaging "DSP," digital input signals can be redithered to the 16-bit level. This is usually desirable when you're recording on a DAT or CD-R, which has only 16-bit resolution. It's also possible to set the 118's defaults so that the signal at the digital recording output will always be dithered to 16 bits regardless of the source resolution or "Process to Tape" setting.

WHAT THE BLENDING IN THE "FM" MODE TAKES AWAY, THE DSP CIRCUITS PARTIALLY RESTORE.

Measurements

Since the NAD 118 handles both analog and digital input signals, I tested it with

Making Travel Fun and Affordable!

Save up to 50% on a world of travel with The National Travel Club

Enjoy Smart Savings...

- **One-year subscription to Travel Holiday Magazine**
- **Save up to 50% on Hotel Accommodations**
- **20% Dining Savings at over 7,000 Transmedia Restaurants**
- **Big discounts on Select Cruises and Vacation Packages**
- **Up to $50,000 of Club Accident Insurance**
- **Lowest Available Airfares and More**
- **Personalized Trip Routing**
- **Reduced Rates on Rental Cars**
- **25% Savings on Travel Guidebooks**
- **25% off Car/Puter Auto Pricing Service**
- **Up to $100 off Motorhome Rentals**

Whether your idea of a good time is culture in Europe or camping in the Rockies, museums or mountains, bars or beaches, friends or family, membership in **The National Travel Club** can save you up to 50% on hotels, transportation, vacation packages and much, much more.

Enjoy magnificent sunsets...clear blue skies...sandy white beaches and save enough money on your very first trip to pay for your membership fee many times over!

Joining The National Travel Club is simple...*AND VERY INEXPENSIVE!*
TO JOIN, JUST CALL *1-800-627-6761*

A National Travel Club representative will be there to help you. You can pay the low, $24.97 annual membership fee either by check, American Express, Visa or MasterCard.

THE NATIONAL TRAVEL CLUB

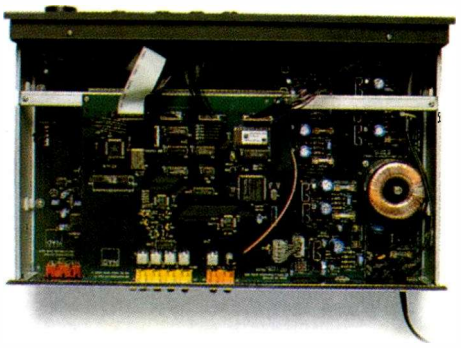
both. The first step when using an analog source is to set the input gain as I described earlier. Let me say for the record that I disagree with the manual's statement that the level is set correctly "if the Peak LED lights up for a fraction of a second every few seconds." I found that if this LED illuminates at all, you're either already into clipping or perilously close (within a fraction of a decibel). I'd rather sacrifice a few dB of dynamic range to ensure that the system doesn't clip. My suggestion when using analog sources is to raise the input gain until the LED flashes and then back off the gain one step (5 dB).

That said, I'm happy to report that the "Peak" LED seems to monitor overload of the digital-to-analog as well as the analog-to-digital converter. That's useful: Even with a digital input, you can overload the D/A converter because the volume control works in the digital domain, i.e., by adjusting digital word values. Presumably, the reason for the "High Gain" and "System Sensitivity" switches (which function in the analog domain, after D/A conversion, and adjust the output level to be compatible with your power amp and loudspeakers) is to ensure sufficient output without D/A overload.

The A/D converter began to clip at analog input levels ranging from 1.57 volts (at a gain setting of 0 dB) to 8.59 volts (gain set at –15 dB); with an appropriate choice of input gain, any analog program source that I can envision should fit into the A/D conversion window. I verified that the input gain did, in fact, shift by 5 dB per level and that the "High Gain" and "System Sensitivity" controls each changed analog output gain by 10 dB, all give or take a tenth of a decibel.

For my main "analog input" tests, I set input gain at –5 dB to provide an input overload point of 2.8 volts (safely above the quasi-standard 2-volt level), used normal system sensitivity, and engaged the "High Gain" button to maximize post-conversion gain. This combination produced unity gain through the preamp with the volume knob set just below its midpoint (about 11:45 o'clock), comparable to the settings I'd use to test an analog preamp. With volume fully advanced, these gain and sensitivity settings yielded a voltage gain of 11.1 dB from input to output. By altering the three gain settings through all possible choices, the maximum throughput gain (volume at maximum) could be varied from –18.6 to +16.2 dB. At the minimum gain settings, you can't get much drive out of the 118 without clipping its D/A converters, but you're hardly likely to use the combination of settings that would cause this.

With my unity-gain settings, I defined my "0-dBFS" input reference as 2.55 volts, about 0.8 dB below the A/D converter's clipping point. The "Peak" LED was off at that point, and the total harmonic distortion plus noise (THD + N) at 1 kHz was less than 0.005%, which seemed pretty safe.



ONE MEASUREMENT AFTER ANOTHER TESTIFIED TO THE EXCELLENCE OF THE NAD 118'S A/D CONVERTERS.

Since I had set the volume for unity gain, the 0-dBFS output level was the same as the input level, i.e., 2.55 volts. (Using instruments, I set the balance control for equal output from both channels, at which point the dot on the balance control was pretty much centered; there's no detent on this knob, so without instruments you have to set it by ear.) Input impedance for analog sources was a high 89 kilohms, leaving little chance of loading the program source; output impedance was a nice, low 200 ohms, so you should be able to drive long cables to the power amp.

When I used the same "High Gain," "System Sensitivity," and volume settings with a digital source, the NAD 118's output level was 2.63 volts, about 0.26 dB higher than my analog reference. Perhaps I could have pushed the analog reference a few tenths of a decibel higher to make the two references exactly equal, but this would have entailed running the A/D converter only 0.5 dB below clipping, which I thought would be rather reckless; as it was, I operated closer to the A/D converter's clipping point than usual (–0.8 versus –1 dB). In any event, the analog and digital references were within a quarter of a decibel of each other, making them identical for all practical purposes.

With a digital 0-dBFS input (using the aforementioned "High Gain" and "System Sensitivity" settings), I could get 3.11 volts out of the 118 by advancing the volume; the preamp clipped at higher volume settings. Since the alternative "High Gain" and "System Sensitivity" settings each reduce the gain of the output amplifier by 10 dB, the output clipping point can be as little as 0.31 volt! That makes me wonder what conditions these settings would be used under. Tape recording output level from a 0-dBFS digital source was a reasonably adequate 1 volt, and the tape output's impedance was 200 ohms.

Figure 1 shows frequency response with analog and digital inputs. With the 118's digital signal processing switched out, response via either input is very good. However, there's a bit more high-end droop in the signal from the analog input, no doubt reflecting the response of the A/D converter's anti-aliasing filter. I therefore engaged the DSP in its "Tone" function and used the "Treble" function to tweak up the high end. (I did this only for the analog input, since it would be hard for anyone to tweak this carefully without test equipment.) I extended the frequency scale past 30 kHz to show the curves over their maximum extent, and I used an expanded vertical scale so you can see just how flat the response really is! Only left-channel curves are presented, as the response of both channels was the same. As you can see from "Measured Data," diddling with the treble control didn't affect the –3 dB point of the analog response (23.34 kHz, using 48-kHz sampling), but I did manage to trim 0.1 dB off the high-end droop and make the overall response very close to that using the digital input: 20 Hz to 20 kHz, +0, –0.21 dB.

For Fig. 2, I exercised the tone controls and infrasonic filter using an analog source; there's no reason to expect different results with a digital input. The curves (left channel shown) are rather different from those

MEASURED DATA

Measurements are for the left channel, worst case, with "System Sensitivity" at "Normal," the "High Gain" button depressed, input gain set at –5 dB, and the volume set for unity gain (approximately 11:45 o'clock).

Frequency Response, 20 Hz to 20 kHz: Analog input with DSP off, +0, –0.35 dB (–3 dB below 10 Hz and at 23.3 kHz); analog input with DSP on and set for best response, +0, –0.26 dB (–3 dB below 10 Hz and at 23.34 kHz); digital input, +0, –0.21 dB.

THD + N at 0 dBFS, 20 Hz to 20 kHz: Analog input, less than 0.013%; digital input, less than 0.012%.

THD + N at 1 kHz: Analog input, below –87.4 dBFS, 0 to –90 dBFS; digital input, below –88.1 dBFS from 0 to –90 dBFS and below –91.2 dBFS from –30 to –90 dBFS.

S/N: A-weighted, 96.7 dB for analog input and 100.8 dB for digital input; CCIR-weighted, 87.8 dB for analog input and 94 dB for digital input.

Quantization Noise: Analog input, –91.5 dBFS; digital input, –91.8 dBFS.

Maximum Linearity Error: Analog input, 0.57 dB to –90 dBFS and 1.18 dB to –100 dBFS; digital input, 2.4 dB to –90 dBFS with undithered signal and 3.2 dB to –100 dBFS with dithered signal.

Dynamic Range: Unweighted, 93.5 dB for analog input and 94.4 dB for digital input; A-weighted, 98.3 dB for analog input and 99.7 dB for digital input; CCIR-weighted, 89.4 dB for analog input and 90.6 dB for digital input.

Output at 0 dBFS: Analog input, 2.55 V (see text); digital input, 0.31 to 3.11 V maximum at 1% THD and 2.63 V with test settings used (see text) at analog preamp output; 1 V at record output.

Analog Input Sensitivity for 0 dBFS Output: 2.55 V (see text).

Analog Input Overload: 1.57 V for gain setting of 0, 2.8 V for gain setting of –5, 5.03 V for gain setting of –10, and 8.59 V for gain setting of –15.

Impedance: Analog input, 89 kilohms; analog preamp and recording outputs, 200 ohms.

Tone-Control Range: Bass, +11.4, –10.6 dB at 20 Hz; midrange, +6.6, –7.1 dB at 2.9 kHz; treble, +11.7, –12.2 dB at 15.2 kHz; infrasonic filter, –3 dB at 23.5 Hz and –14.8 dB at 10 Hz.

Gain: Volume at maximum, –18.6 to +16.2 dB (+11.1 dB as tested).

Channel Separation: Analog input, greater than 73.7 dB, 100 Hz to 15 kHz; digital input, greater than 77.8 dB, 125 Hz to 16 kHz.

of a conventional preamp with analog tone-control circuitry. First off, the shapes of the boost and cut curves are asymmetric in an unusual way; I expect this is related to the "linear-phase" DSP algorithm NAD uses to create response alterations without the phase shifts of analog tone controls. NAD also has chosen to center the midrange action at the frequency of maximum hearing sensitivity and to use a bandpass-filter treble control centered near 15 kHz. Both choices make eminently good sense from a psychoacoustic standpoint.

Figure 3 shows THD + N versus frequency at 0 dBFS for both channels, since they differ slightly. I'm particularly impressed with how closely the curves for the analog and digital inputs match, implying that the A/D converter adds negligible noise and distortion. Sure, the left-channel analog curve lies above the digital curve at frequencies below about 2.5 kHz, but the THD + N on both is under 0.005%, which isn't bad. Distortion peaks around 7 kHz; this suggests the predominance of third-order products, which are suppressed at higher frequencies by my test analyzer's 22-kHz low-pass filter.

The curves for THD + N versus level at 1 kHz (Fig. 4) also match well, within 2 dB except for the peak around –30 dBFS in the analog input's left channel. This suggests a modest amount of distortion in the A/D converter at that level; since that distortion does not appear in the right channel, it may be an anomaly in my review sample.

Interestingly, the curves for linearity error versus level with an analog source are excellent, while those taken with a digital input aren't quite as good as I would have hoped (Fig. 5). I'm not sure why this is so, but I must report that I had some difficulty obtaining consistent data (especially on the right channel) when using a digital source. (Unplugging and replugging the output cable changed the low-level measurements, so the problem could have been caused by poor contact with the 118's nickel-plated RCA jacks. I'd be more confident of that, however, if the same output jacks weren't also used for the analog source data. On the other hand, the analog and digital tests were made on different days, so something could have changed.) If I'm to believe the results, I'd rate the linearity error from the analog inputs as excellent and that from the digital source decent but not exceptional. Figure 6 shows the fade-to-noise test via the digital input; in this test, the NAD 118's linearity proved first-rate.

The third-octave spectrum analyses in Fig. 7 show –60 dBFS, 1-kHz signals and no-signal (infinity-zero) conditions for the analog and digital inputs. The two –60 dBFS curves overlie so perfectly over most of the range that it's hard to distinguish one from the other; indeed, these inputs' dynamic range figures in "Measured Data" are also quite similar. The two zero-signal curves differ because of residual noise in the analog input electronics and A/D converter. The signal-to-noise ratios in "Measured Data" differ more substantially because both weighting curves ("A" and CCIR) emphasize midband noise more than bass noise. Power-supply hum at 120 Hz is apparent in all four curves, but it's at a pretty low level (approximately –100 dB using the analog input and –116 dB for a digital source). The rapid rise in noise above 20 kHz in all curves indicates that the 118 uses a noise-shaping DAC, which is quite common these days.

Quantization noise tests converters' "granularity" and is arguably a more meaningful test than S/N ratio. The 118's results were almost as good using the analog input as the digital, which again testifies to the excellence of NAD's A/D converter. Overall, I'd give the NAD 118 high marks for low noise, however it's measured!

Use and Listening Tests

I compared the NAD 118 with my reference preamp (a Bryston BP-20) feeding a Parasound HCA-2200II power amp. (NAD supplied its Model 218 power amp with the

preamp, but I didn't want to make two changes in my listening system at once.) For program sources, I used a Sony CDP-XA7ES CD player, several DAT decks, a tuner, and a Nakamichi CR-7A cassette deck. Most of the recordings I made (for checking the tape outputs, compression, and other features) were made on the CR-7A. The input and output gain settings I'd used in the lab seemed appropriate for the listening room, so I used them again.

In a way, comparing the NAD 118 to the Bryston BP-20 is like comparing apples and oranges; they're both preamps, but the similarity ends there. The BP-20 is a minimalist wideband analog preamp offering no more than source selection, volume and balance control, mono blend, muting, and polarity reversal. The NAD offers possibilities not dreamed of in the "purist" lexicon. As for comparing NAD's DACs with those in the Sony CDP-XA7ES, few stand-alone converters can match the sound of the XA7ES's DACs, so it's unfair to expect a relatively low-cost digital preamp to do what more expensive converters can't.

Although I can't say that the NAD 118, digitally linked to the CDP-XA7ES, sounded as transparent as the BP-20 fed from the analog output of the same player, I was surprised at how little was lost. Furthermore, when I substituted less exalted digital sources for the CDP-XA7ES, the sound through the NAD 118 was, as often as not, better than those players' analog outputs heard through the BP-20. So the NAD 118's DACs are a match for, or better than, most D/A converters, even if they're not quite so good as the very finest. But this misses the point. I should be talking about what the NAD 118 can do because of digital signal processing. Which is a lot.

Take the tone controls. Regular readers know that, to my ears, tone controls usually worsen the sound more than they fix it. But I could really get to like the 118's controls; they're functional, subtle, psychoacoustically sensible, and don't muck things up unless used to excess. Perhaps it's because they maintain phase linearity, perhaps not. Either way, they sounded good to me.

Even something that seems as simple as adjusting volume is better done in the digital domain. When volume adjustment is done as a digital computation, channel balance remains perfect over the full range of control settings. That's seldom true of an analog volume control because the two sections of the control can rarely be made to track together over their full range.

I live in the boonies, where FM reception ranges from fair to horrible, so I rarely listen to radio. Perhaps I would more often with the 118's "FM" processing. It took a bit of diddling, but I was able to make the sound cleaner and quieter yet still get a reasonable degree of stereo imaging. Overall, radio listening was far more enjoyable with NAD's "FM" algorithm than with any of the "dumb" auto-blends I've used.

"Width" came in handy to broaden the apparent image of DAT recordings I had made with one-point stereo microphones that I had placed, through stupidity or necessity, too close to the source. "Width" won't cure a disaster, but it can help if used tastefully. (Well-recorded CDs won't need it, but, as we all know, not all CDs are well recorded.) "Spread" does something similar for mono recordings, but synthetic stereo has never sounded convincing to me; I expect it's there because a similar function was needed as part of "FM."

NAD OBVIOUSLY GAVE A LOT OF THOUGHT TO USING DIGITAL AND ANALOG RECORDERS WITH THE 118.

The compression/expansion algorithm was most useful when dubbing cassettes for the car (yes, I still have a cassette player in the car) or for a portable player. I would have liked to have tried using this DSP function to expand the dynamic range of FM broadcasts that were compressed in the studio to benefit the road-listening public. Unfortunately, the NAD won't let you use "COMP" and "FM" simultaneously, and I needed the latter's quieting more than I needed the former's dynamic range expansion. Oh, well, there's inevitably a limit to any DSP's horsepower.

Shortcomings? Yes, there are some. The owner's manual could stand improving. It's extensive and fairly readable, despite typographical errors and some convoluted writing, but a signal-flow chart or block diagram would help many people to better understand what's going on. The multiple gain controls (switches for analog output gain on front and back plus four-step input gain control and normal volume) are potentially confusing, but this is more of a problem in setup than normal use. I see no technically sound way of doing without input gain control, but I think the output gain switches could be dispensed with. Just keep an eye on the "Peak" LED until the preamp has settled into your system and you've played enough material to be certain that the settings don't provoke clipping.

I think gold-plated RCA jacks are warranted on a product of this caliber. Had they been used, I might not have experienced the anomaly I did during the linearity tests. And I sure would like to see detents on the front-panel DSP and balance knobs. Even a white line on the skirt would aid when trying to set the balance control to its center point. (Why maintain perfect balance over the full volume range if you can't set balance precisely to start with?) Finally, the 118's wired digital connectors could limit one's choice of companion products. I prefer wired digital interconnects to Toslinks because of their wider bandwidth, but digital sources and recorders outfitted only with optical sockets can't be digitally linked to the 118.

I began by saying that the 118 digital preamplifier was unmistakably "NAD"; I'll conclude the same way. Think about it: Virtually every high-end A/V receiver on the market today uses a DSP-based Dolby Pro Logic decoder. When the DSP isn't used for Pro Logic, it's available for straight audio use. What's done with it? Acoustical surround simulations—pin drops that echo for hours in ersatz "listening environments" that are surrealistic beyond belief! Contrast this with NAD's use of DSP to produce novel or better control functions that enhance the natural sound of the source rather than replace it with a synthetic sound field. It's a different approach—the NAD approach. Some may like it, some not. Personally, I'm for any product that enhances my music rather than replacing it. A

The Equipment Authority sold at these specialty dealers

AUDIO

The following are just some of the fine audio/video dealers that sell Audio Magazine:

Esoteric Audio
4120 N. Marshall Way
Scottsdale, AZ 85251

Pacific Audio & Alarm
2370 E. Orange Thorpe Ave.
Anaheim, CA 92806

Sound Tech/Los Gatos
15330 Los Gatos Blvd.
Los Gatos, CA 95032

Stereo Plus
2201 Market Street
San Francisco, CA 94114

Jack Hanna Audio/Video
6130 Pacific Ave.
Stockton, CA 95207

Sound Eye
1317 Sartori Ave.
Torrance, CA 90501

Westside Int'l News Inc.
11949 Wilshire Blvd.
W. Los Angeles, CA 90025

Durango Music Co.
902 Main Ave.
Durango, CO 81301

Video 7 West
22 Kneen Street
Shelton, CT 06494

Sounds Exclusive/Hanks
757 N. Montrose Street
Clermont, FL 34712

Bob's News & Books
1515 Andrews Ave.
Fort Lauderdale, FL 33316

Audiomasters
102 Lafayette Street
Anma, IL 62906

Sounds Designs
808 Coldwater Road
Murray, KY 42071

Goodwins Audio
870 Commonwelth Ave.
Boston, MA 02210

New Horizon Books
20757 13 Mile Road
Roseville, MI 48066

Audio-Video Alternatives
4526 N. Woodward Avenue
Royal Oak, MI 48073

Sound Advice Inc.
3348 Niles Road
St. Joseph, MI 49085

Matlack Communications
2866 Foxwood Drive
Marylane Hts, MO 63043

Harvey's Stereo
2646 South Glenstone Ave.
Springfield, MO 65804

Pro Audio
1630 Country Club Plaza
St. Charles, MO 63303

Audio Visions
136 Main Street
Kalispell, MT 59901

Sound System
3201 State Route 27
Franklin Park, NJ 08823

Mario's Sound Room
176 Franklin Ave.
Franklin Square, NY 11010

Sound Concept Inc.
264 East Route 59
Nanuet, NY 10954

Dalbec Audio Lab
51 King Street
Troy, NY 12180

Audio Encounters
4271 W. Dublin Granvill
Dublin. OH 43017

Sound Station
601 SE Frank Phillips Blvd.
Bartlesville, OK 74003

Sound Service
621 North Main Street
Guymon, OK 73942

David Lewis Audio
9010 Bustleton Ave
Philadelphia, PA 19152

Stereo Shoppe
900 Washington Blvd.
Williamsport, PA 17701

Sound Decision
3727 Franklin Road
Roanoke, VA 24014

Sound Stage
5900 N. Point Washington Rd.
Milwaukee, WI 53217

Dealers, call: 1-800-221-3148 if you are interested in selling Audio...The Equipment Authority

AURICLE

ANTHONY H. CORDESMAN

THIEL CS6 SPEAKER

Speakers may still be the chief source of colorations in an audio system, but today's best dynamic, ribbon, planar, and electrostatic speakers are notably more accurate than those of even half a decade ago and far more musical than those I grew up with. Jim Thiel has been responsible for some of this progress; he is clearly the kind of speaker designer who just never stops improving his products. Each new generation of Thiel speakers has sounded more detailed, more coherent, and more transparent and has offered flatter response, better dynamics, and a more realistic midbass and upper bass. Each added refinement has been another step toward making the musical experience more real.

Priced at $7,900 per pair, the CS6 is a three-way speaker that weighs 175 pounds and stands 50 inches tall—hardly petite, though its narrow (13-inch), sloping front and 18½-inch depth minimize its visual impact. Although it's not Thiel's largest or most expensive speaker, the CS6 shares those speakers' basic design features. For example, it uses first-order crossovers to minimize phase distortion, but while first-order crossovers can be very simple, the CS6's has 32 elements, 12 of which are used to correct minor frequency response irregularities. Like other Thiel speakers, the CS6 has an extremely heavy enclosure for its size; it's made from inch-thick fiberboard and has extensive internal bracing; built-in "stabilizer pins" (spikes) anchor it to the floor. Another common element is a baffle that's sloped to maintain time coherence among the drivers and rounded to reduce diffraction; as on the CS7, it is cast from concrete in order to subjugate resonances.

The major difference between the Thiel CS6 and some of its predecessors is that it uses a new version of the coaxial tweeter and midrange array that Thiel introduced in the CS7. Although the CS6's precisely calculated baffle slope already gives the speaker an unusual degree of time coherence, Thiel says the coaxial mounting of the tweeter and midrange assures perfect alignment of both drivers and reduces any arrival-time error above 2 kHz caused by differences in listener height.

The tweeter's short aluminum voice coil, long magnetic gap, and long-excursion surround enable it to deliver very high output. The midrange cone is shaped to act as a waveguide for the tweeter so that it won't reflect treble frequencies or horn-load the tweeter, thus reducing the diffraction common in coaxial designs. The midrange cone is an aluminum-polystyrene-aluminum sandwich, for maximum rigidity and minimum resonance; resonance is further reduced by the driver assembly's heavy, cast-aluminum frame. Copper pole sleeves on the midrange and tweeter magnets reduce the voice-coil's inductance and stabilize the strength of the magnetic field; the magnets themselves weigh a total of 10 pounds.

Bass is provided by a 10-inch woofer and a passive radiator. Like

Company Address: 1026 Nandino Blvd., Lexington, Ky. 40511; 606/254-9427.
For literature, circle No. 94

Photos: Len LaGrua

When you've got questions about Audio and Video,

see a specialist

Presented by AUDIO

Q What are high end factory update programs?

A When new units are introduced, high end audio manufacturers frequently invite owners of predecessor models to return them for updating. At the factory, technicians replace appropriate circuitry—and sometimes cosmetic parts as well—so that the old unit comes back performing and perhaps looking exactly like the new model. A manufacturer may base the cost of an update on the price differential between the old model and the new one, and sometimes a bit is added for labor. In either case, update programs protect the investments that discriminating listeners have made in high end gear. And they keep component performance at the cutting edge as the state-of-the-art-advances.

—Dan Mondoro
Lyric Hi-Fi & Video
White Plains, NY

Lyric Hi Fi & Video

Q What are active speakers and what are their advantages?

A Generally, active speakers incorporate built-in amplifiers that directly power each specific drive unit of a speaker. As well, the amplifiers are optimally designed for each driver to ensure proper matching. Active speakers also incorporate electronic crossovers that divide frequencies before the amplifier. Since each amplifier is now only reproducing a portion of the frequency range, it can now work more efficiently and more accurately. In passive speaker systems, the amplifier works much harder because it powers all the drivers full range and must deal with a passive crossover between itself and the drive units. The advantages are simply a guaranteed level of performance that has increased definition, power and dynamic range.

—Carlo D'Ascanio
Audio One
Toronto, Canada

AUDIO One

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

If you would like to submit questions to dealers in your area please write to :
See a Specialist, c/o Audio Magazine, 1633 Broadway, NY, NY 10019

most other Thiel drivers, the CS6's woofer has a voice coil much shorter than the magnetic gap. Combined with the use of a copper sleeve around the center pole, this keeps the magnetic field surrounding the coil stable during very long excursions. The woofer also has a rigid aluminum diaphragm to reduce resonance and a massive, 20-pound magnet. Thiel claims that this technology enables the woofer in the CS6 to move considerably more air than many other 10-inch woofers and that it extends the bass response of the CS6 down to 23 Hz while keeping distortion low.

The balance of the CS6's specifications are more modest about its bass capability. Thiel rates the speaker's bandwidth as 28 Hz to 28 kHz and its frequency response as 35 Hz to 18 kHz, ±1.5 dB. The response at 30° off axis is also said to be extremely flat, even in the upper octaves. This outstanding off-axis response may help explain why the CS6 provides an extremely stable soundstage and excellent imaging over a relatively wide listening area, and it definitely explains why its upper-octave timbre does not change as you rise from your listening chair.

TRANSITIONS BETWEEN THE CS6'S DRIVERS WERE ABSOLUTELY SEAMLESS.

Specifications for time and stepped-pulse response are also very good (true of all Thiel speakers, including the much smaller and less expensive CS2.2 and CS3.6). The CS6's impulse-reproduction specs indicate outstanding transient response, and the company's stepped-pulse curves reveal an unusual ability to reproduce complex signals. These are key measures of speaker performance, and it is a pity more manufacturers don't publish them.

The CS6 has the same moderate to low efficiency as other Thiels, with a rated sensitivity of 86 dB SPL for an input of 2.83 volts. Recommended amplifier power is 100 to 400 watts; I found that you can get away with really good tube amps that deliver as little as 60 to 80 watts, but this is not a speaker for 8-watt, single-ended triode amps or the kind of transistor amplifier that lacks "legs." Opt for 100 watts or more to make the CS6 really come alive.

The CS6 is, however, an easier load than Thiel's CS7 or CS5. It has a relatively smooth impedance curve that mostly stays close to its nominal 4 ohms and reaches its minimum of 2.5 ohms only at frequencies where that's unlikely to matter. This impedance curve makes the CS6 relatively amplifier-tolerant, so it should work well with any modern high-current design.

Overall, timbre is remarkably flat and lifelike. Thiel has long done an outstanding job of removing minor frequency imbalances and colorations.

The bass and deep bass are outstanding. The CS6 has flat, smooth low-frequency response, with little overhang. This may be something of a novelty if you're used to speakers that camouflage limited low-frequency response with a rise in the midbass. But if the recording really does have bass, the CS6 provides audible power down into the bottom octave and does so with unusual definition and control. It can provide deep bass at room-vibrating levels, without doubling. This is not a speaker that can provide the bass power of a subwoofer, but its performance should meet the expectation of any audiophile who's into music rather than bombs and train crashes.

At lower than natural volume levels, however, the CS6's lack of a bass rise will keep it from sounding as good as some more colored speakers whose humped bass helps compensate for the human ear's reduced bass sensitivity at low levels. Like all flat-response speakers, the CS6s come alive only at reasonably high listening levels.

I mentioned earlier that the CS6 has more expensive siblings, the CS7 ($8,900/pair) and the now-discontinued CS5i ($12,300/pair). Although the CS6 does not go down quite as low as these other Thiels, its upper bass and midrange performance rivals theirs, and the CS6 seems to have a smoother and more coherent transition from the upper bass to the midrange than the CS5i did. The CS6 does a lovely job of reproducing solo instruments in this transition region, where many speakers slightly color the sound, making it too warm or lean. It does a great job with solo piano, guitar, violins, brass, and woodwinds. Both male and female voice are very natural, too.

All Thiel floor-standing speakers share this same distinctive profile because they have similar, equally distinctive, baffles.

The upper midrange and treble are similarly impressive. There is a virtually seamless transition, in terms of soundstaging information and of tone, between the upper midrange and treble in the CS6. Dynamic and transient performance are excellent. The CS6's treble is highly detailed but adds no harshness. Normal head movements won't affect the treble you hear, and the "air" provided by the top octave is matched by sweetness and natural life throughout the upper octaves. As with virtually all speakers, however, you need to sit a reasonable distance away to get the best tonal balance; the apex of an equilateral triangle at least 4 to 6 feet on a side is the minimum.

The CS6's dynamics are not as exceptional as those of some select ribbon designs, but no speaker I know that uses cone and dome drivers has better dynamics, and I know of only a few whose dynamics might rival the Thiel's. The CS6 can handle full orchestral peaks without difficulty yet still convey all the low-level dynamics that make good recordings seem almost live; except at the very low levels mentioned earlier, detail and timbre do not change as volume increases or decreases. The CS6's transient detail rivals that from most electrostatic, planar, and push-pull ribbon speakers. Only a few speakers, such as Apogee Acoustics' Grand series, offer livelier and better-defined transients. (And I'm unsure whether that makes the Apogees more accurate or merely euphonic.) Further, the CS6 is one of the relatively few speakers whose bass transients are as accurate as its midrange and treble transients; the Thiel reproduces bass-drum and

double-bass transients just as well as those from snare drum and guitar.

The CS6's spatial reproduction and imaging are as good as you'd expect from the rest of its performance. It does not, like many dipole and bipole speakers, correct for the frequent lack of natural space in recordings by making the soundstage larger than life. But if you spread a pair of CS6s as far apart as you can without sacrificing center fill or coherence and then bring them 6 to 12 inches closer together for safety, you can get a superb three-dimensional soundstage and stable, natural imaging from recordings that do contain such information.

On naturally miked live recordings, the Thiels' ability to place instruments and voices in space was a real pleasure. In playing chamber music LPs made in halls and rooms where I had actually heard live performances, I was impressed by how lifelike they sounded through the CS6s. These speakers can make chamber, small jazz group, solo instruments, duets, and solo voices come as alive, in terms of space and definition, as the source material permits.

Obviously, no speaker is perfect, and as usual, I have a few practical caveats. First, although virtually all modern high-end speakers need time to break in, I would give the CS6 a couple of weeks. The bass is a bit light when the speaker comes out of the box, and the midrange improves steadily with time. If you audition a CS6, make sure it has been broken in adequately.

Second, speaker designers disagree about what kind of response should be considered "flat" and how it should be measured. Jim Thiel's techniques lead to response that has more upper-octave energy than you'll get from such competing speaker manufacturers as Apogee Acoustics, B&W, Genesis, and Vandersteen. Some listeners will feel Thiel speakers sound a little bright, while other listeners will simply consider the Thiel sound more detailed. Your opinion will probably depend on where you prefer to sit in a concert hall; the Thiels will sound more natural if you normally sit up front, less natural if you sit more toward the rear of the hall. This response, combined with some of the most extended highs of any Thiel speaker and the CS6's exceptional off-axis high-frequency response, can produce outstanding results with good to great recordings. But for these same reasons, the CS6 is not a forgiving or euphonic speaker. The effects of close miking, bad digital sound, edgy microphones, and recording electronics that mess up the top octaves are reproduced all too accurately. Truth is not always a blessing.

Placing the CS6s carefully, to get the best bass response, is no more trouble than usual. But if you locate them where standing waves can suck out part of the bass, their frequency balance may seem to tilt more toward the treble than would be the case with other speakers. Luckily, a properly broken-in Thiel CS6 has excellent bass response, and you usually don't have to move it around much to lock in a proper balance between bass and treble. When I finished positioning the CS6s, they produced the flattest overall frequency response that I've ever achieved in my listening room, as measured by a third-octave spectrum analyzer.

My final caveat is that, while the CS6 is one of the most amplifier- and cable-tolerant Thiel speakers in recent memory, it should not be used with amplifiers that emphasize or harden the highs (more likely with older amps than modern ones); it will accurately reproduce any edginess in your audio system. That said, I had no problems using transistor amplifiers ranging from the Adcom GFA-5800 to Classé, Pass Labs, and Krell amps. The timbre and dynamics of the CS6 also worked particularly well with tube amps, as I found when I tried friends' conrad-johnson and VAC amplifiers.

The CS6 comes in a wide range of finishes (including custom finishes) and grille cloths, and its surfaces make me think more of sculpture than of technology. The Thiels' appearance is more than a passing asset in an era when there is less and less tolerance for obtrusive high-tech—especially in home theater, where five speakers are required instead of two. Further, the speaker cables connect to the CS6's bottom rather than its back, making this one of the few speakers that lets you hide your cables under the rug.

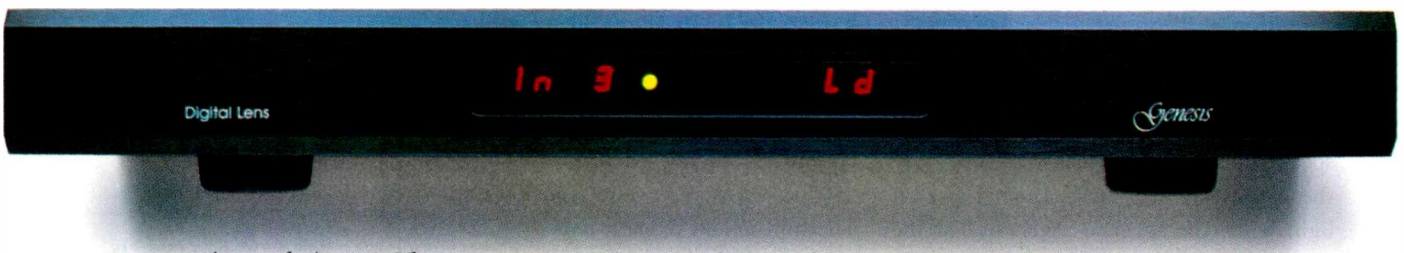
In summary, the CS6 is a reference-quality speaker at what approaches a reasonable price. It has no euphonic colorations or eccentricities to mask defects in your recordings or your audio system, but no audiophile in his right mind invests in coloration over accuracy. The CS6 has all the qualities a true, top-quality, high-end speaker should have. It sounds and looks beautiful. A

AURICLE

ANTHONY H. CORDESMAN

GENESIS TECHNOLOGIES DIGITAL LENS ANTI-JITTER DEVICE

The Genesis Technologies Digital Lens is a highly innovative component designed to improve the sound of digital audio sources such as CD, laserdisc, and DAT. There is no doubt that it succeeds in improving the sound of even the best available digital equipment. The issue, however, is whether the improvement is worth $1,800. The answer, for most high-end audiophiles, will be yes—but much will depend on your system and your sensitivity to the problems in digital sound.



The Digital Lens is a black box that you connect between the outputs of your digital sources and your digital-to-analog converter. It has five inputs (RCA and BNC coaxials, Toslink and ST optical, and AES/EBU balanced), so it will accept an input from any consumer CD transport, laserdisc player, or DAT deck. It also has RCA, AES/EBU, and ST outputs. The front panel carries only a display; all operating functions are handled by the remote.

Company Address: P.O. Box 3789, Eagle, Colo. 81631; 970/328-9515.
For literature circle No. 95

Unlike other anti-jitter devices I know of, the Genesis Digital Lens aims to virtually eliminate jitter rather than merely reduce it, bringing it to a level below audibility over the entire audio band. In the process of accomplishing this, the Lens also corrects for speed errors in your transport and enhances the signal's apparent resolution.

At its input, the Digital Lens strips out not only the jitter-laden clock signal but also the track numbers, track timing information, copy-protection flags, and the bits that distinguish left- from right-channel data. Genesis Technologies says these eliminated bits will cause sonic degradation if they reach your D/A converter. The musical information is then passed on to the Digital Lens's memory. The stripped-off timing information is used to generate a display of your transport's timing error, in parts per million, but is otherwise ignored; the left/right channel identifications are regenerated later.

The music data stored in the memory circuit feeds a computer-driven digital signal processor (DSP). The DSP circuit feeds an S/P DIF encoder and a circuit that restores the left/right channel information. This data is fed to the output-clock circuit, which adds new clock data generated by a precisely controlled, temperature-compensated oscillator. The oscillator has its own power supply and is isolated from the other circuitry through optical coupling.

The Digital Lens uses a half megabyte of computer memory to compensate for transport-speed and source-clock errors, much as a reservoir is used to even out the flow of water. If the signal source's clock is slow, the Digital Lens's DSP computers won't start until its memory has accumulated enough data for output at the proper clock rate to be maintained. If the source's clock is too fast, output begins immediately while the memory holds the overflow until it can be synchronized with the Digital Lens's master clock. Genesis claims that this process virtually eliminates the jitter inherent in the input bitstream, reducing it to the lowest level yet possible. The company also claims that the memory buffering helps the Lens correct for all likely anomalies in transport speed.

I have no way to measure the validity of such claims, but the potential benefits are clear. Jitter can affect perception of the sweetness or natural harmonic character of music, low-level detail, and spatial information such as depth and width. Unlike the mechanical timing problems in such analog devices as turntables, jitter varies only the timing of the input to the D/A converter, not the pitch of its output.

Jitter reduction is not the Digital Lens's only benefit. It can also add triangular-density dither in two ways, selectable from the remote control. The first mode adds dither to extend the signal's word length

from 16 bits to 18 or 20 bits. This digital signal processing does not add or re-create musical information (which is impossible) but is intended to make the signal sound more like that from an 18- or 20-bit source. (Most of today's high-end DAC chips and software-driven DACs can process data words that long.) Genesis has found that increasing the word length beyond 16 bits ensures that your D/A converter's digital filter and DAC circuits do not shut off when the musical signal falls below their signal threshold. The second mode dithers the signal's 15th bit, to add audible noise that Genesis says approximates the background noise in live music. This mode can be used on its own or in conjunction with the extended-dither mode, but to my ears it reduces resolution; even Genesis says this mode will probably be used least. The extended dither complements virtually all digital recordings; the 15th-bit dithering complements almost none.

THE DIGITAL LENS USES COMPUTER MEMORY TO SMOOTH THE SIGNAL, MUCH AS A RESERVOIR SMOOTHS WATER FLOW.

All of this technology would be of only theoretical interest if the Digital Lens did not actually improve the sound of digital source material—but it does. I won't pretend I can assess Genesis's technical claims, but the subjective impact of the Lens is easy to assess. It almost always seemed to improve the overall resolution and the musicality and realism of recordings, with every digital source and D/A converter I tried. For CD playback, I used equipment ranging from the Mark Levinson No. 30.5 D/A converter and No. 31.5 CD transport (which, I believe, make up the best CD playback system available) to an early-generation transport and converter that I keep around solely for comparisons. I also used the Digital Lens with two different DAT decks (one a Sony with Super Bit Mapping) and with Theta Digital and Pioneer laserdisc players. In each case, the Genesis Digital Lens seemed to add harmonic integrity to the music and provided some improvement in soundstage detail, imaging, depth, and width. Invariably, it improved the low-level transient information, giving the sound more sweetness, openness, and air.

The Digital Lens worked well with a wide range of recordings. It significantly improved my ability to hear the differences between the different 24-bit digital conversion systems used in *Virtuosa Valentina* (Audiofon CD 72070), the best available demonstration of the impact of modern analog-to-digital conversion I've heard.

I found that HDCD-encoded recordings sounded significantly better with the Digital Lens than without it. It also improved the sound of Sony recordings with Super Bit Mapping, Chesky "20-bit" and "24-bit" recordings, AudioQuest recordings using the new JVC XRCD process, and such recent Telarc "20-bit" CDs as the Atlanta Symphony's recording of the Barber Concertos (Telarc 80441).

Equally important, the Digital Lens improved the sound quality of older and nonaudiophile CDs. This improvement was often slight, but it sometimes made a recording really come alive in new ways. For example, Zamfir's *Flute de Pan et Orgue* (Disque Celier CD 015) is a great warhorse for demonstrating bass, but the recording and production date back to 1984 and normally show it; the Digital Lens added a nice bit of depth and concert hall detail. The same was true with many old classical and jazz CDs.

I was surprised to find that the Digital Lens made similar improvements with several DAT cassettes and CD-ROMs. I had somehow assumed these sources were less jitter-prone than commercial CDs; judging by the effect of the Genesis Digital Lens, many are not.

The Digital Lens improved the sound of many laserdiscs, particularly musical passages and Dolby Surround soundtracks that had a lot of well-distributed, low-level surround information. For all I know, it also may have improved the sound of gunshots, spaceships, and car crashes, but how can you gauge an improvement in a totally unreal sound? (And do you care? To paraphrase an old Zen paradox, what is the sound of one car crashing?)

I demonstrated the Digital Lens to a number of nonaudiophiles. Although I used blind switching and made no effort to explain which signal had the Digital Lens in the circuit, most of these listeners preferred the sound with the Digital Lens. Most of those who did not were young enough to have spent their lives listening to studio mixes of digital sound rather than attending concerts of live music.

Despite the virtues of the Genesis Digital Lens, you should give serious consideration to what it cannot do, especially since we're talking about an investment of $1,800. First, it cannot change the basic sound character of your D/A converter; it can only improve the quality of the signal that feeds it. I find that the colorations in converters usually affect the sound more than any jitter-reducing device I've heard, including the Digital Lens. So I would invest in a good converter before I invested in a Digital Lens.

Second, the Digital Lens does not miraculously eliminate the effects of transports and interconnect cables. For instance, if one transport sounded better than another when the Digital Lens was not used, it would still sound better when each was heard through the Lens. The Digital Lens reduces the audible differences between transports, but it does not eliminate them.

Third, the level of improvement the Digital Lens makes varies significantly with the transport and D/A converter you're using. It made the least audible difference with the Levinson 30.5 and 31.5 combination, the only combination I could find where the Digital Lens sometimes made little or no improvement. It often did improve the sound of the 30.5 and 31.5 and never seemed to degrade it, but the improvement was usually the kind that only purists could care about. With other components, however, the Digital Lens made a more significant and consistent improvement. For example, the Theta Digital Data III transport and DS Pro Generation V-a Balanced D/A converter are both reference-quality units, but I found that the Digital Lens consistently improved this combination's soundstaging and dimensionality in musically important ways. With the Lens, the musical harmonics of solo instruments, chamber music, blues, and acoustic jazz sounded more natural, and it seemed to bring out more low-level detail on many recordings. More broadly, the Lens helped to correct the slight touch of excess upper-midrange

energy and lack of depth in the Thetas' soundstage without depriving them of their superior life and dynamics.

The Digital Lens made similar improvements with all of the other high-end CD transport and D/A converter combinations I tried it with, although the improvement varied with the equipment involved. For example, the Lens seemed to improve bass dynamics and detail in a some instances but not in others; the improvement in depth and in the "sweetness" of the upper midrange also varied with the associated equipment. If possible, you should audition the Lens with the CD transport and D/A converter you'll be using.

The Lens outperformed the Audio Alchemy DTI•Pro 32 jitter-reduction device, even when I connected it between that company's DDS Pro CD transport and DDE v3.0 D/A converter—and even though the Lens does not allow the use of I^2S bus connections, which I normally find essential to get the best out of Audio Alchemy equipment. I found this striking, because the Audio Alchemy DTI•Pro 32 had previously been the best jitter-reduction and processing device I had used.

Finally, the Lens significantly improved soundstaging and imaging when I used such relatively low-priced equipment as a Marantz CD player feeding an Adcom D/A converter or a friend's PS Audio CD transport and D/A converter.

This brings us back to the questions of cost and priorities. Even in the high end, an additional $1,800 can make a very important difference to the overall quality of a transport and D/A converter, and I'd rather invest that money in a good D/A converter than in the Digital Lens. First things first, and you can get very good converters for that much or less from Adcom, Meridian, Parasound, Proceed, PS Audio, and Wadia Digital, among others. I've heard audiophiles claim they can listen to CDs only though the Digital Lens and that the only possible substitute is an LP, but I flatly disagree. I don't like bad CD sound, but most CD sound is not bad, just imperfect. Further, I hate bad analog sound even more. I can't listen through tape hiss, record scratch, or compressed dynamics and restricted frequency range.

More important, you have to be one hell of a snob to claim that you need a separate CD transport and D/A converter, much less the addition of the Digital Lens. I don't spend my life listening to low-priced CD players and D/A converters, but I hear enough of them to know that some are very musical indeed. I have already mentioned the Adcom D/A converter, a unit I use fairly often in the field, and I've also heard a number of under-$1,000 Marantz, Parasound, Rotel, Pioneer, and Sony CD players that perform very well.

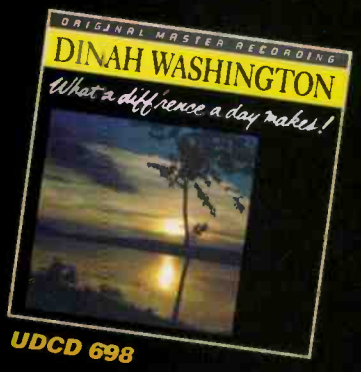
I have some minor practical reservations about the Digital Lens. First, the remote control is designed and made by the same demented sadist who seems to design virtually all high-end remote controls. Its lettering is difficult to read, and there are no cushions on the bottom to ensure its metal case won't mar your furniture. It is hard to tell when it is set for controlling the Lens rather than Genesis speakers. And the display tells you when you initiate some processing modes but not when you turn them off, nor does it indicate whether the dither you've selected is 18- or 20-bit.

That said, let me make one point very clear. I am going to buy the Digital Lens for my own stereo system. My reservations about the unit are either petty or related to cost versus value. I have no reservations about its desirability in almost all expensive high-end systems. Although I may not have a life-or-death love affair with the Genesis Digital Lens, it does bring me closer to the sound of live music.

The Digital Lens also brings the sound of my CDs and DATs closer to the sound of digital masters using longer words and higher sampling frequencies. Digital recording has advanced far beyond the limits of conventional CDs and DATs, and I want as much of this improvement as I can get. Unfortunately, I suspect that the Digital Lens is about as close to the sound of 18- and 20-bit tapes as we're likely to get for quite a while. There is no point in waiting for Godot; it could be half a decade or more before we get consumer hardware and recordings with higher data rates. In today's rock/pop/country-oriented world, it may well be an eternity before enough great classical, jazz, and folk recordings are remastered to make a major library of CDs obsolete. In the interim, I'll take the Digital Lens and any other source of major and consistent improvement in CD sound that I can afford. A

ORIGINAL MASTER RECORDING™

UDCD 696

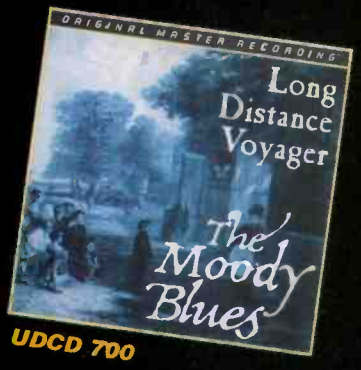


UDCD 698

20th ANNIVERSARY

1977 - 1997

UDCD 699



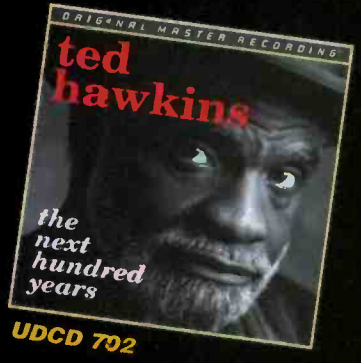
UDCD 700

... still the leader

UDCD 701

UDCD 703 NEW RELEASE

UDCD 704 NEW RELEASE



UDCD 702

IF IT'S MUSIC WORTH LISTENING TO, IT'S WORTH MOBILE FIDELITY.

For 20 years, Mobile Fidelity has been providing audiophiles and music enthusiasts with the ultimate listening experience. Our Ultradisc II™ 24-karat gold CD brings you the warmth and sweetness of analog with the realism of live music. By starting with the original master tapes and our proprietary mastering technology, The GAIN System™, we have become the leader in creating the most sonically accurate audio software in the world. You'll hear our difference; and, every beautiful nuance of the original recording. If it's worth listening to, it's worth listening to *Mobile Fidelity!*

ULTRADISC II™ The GAIN System — **The *Original* 24-kt Gold Audiophile Compact Disc.**

To receive a color catalog or The GAIN System™ *technical paper, call 800-423-5759.*

105 Morris Street • Sebastopol, CA 95472
WWW URL address: http://www.mofi.com/

mobile fidelity sound lab
a division of MFSL, INC.

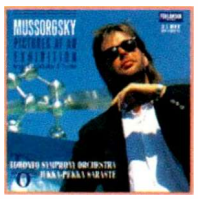
In Canada call 800-267-1216 (Music Retailers)
or 800 465-4434 (Hi-Fi Retailers)

CIRCLE NO. 5 ON READER SERVICE CARD

CLASSICAL RECORDINGS

mussorgsky

Illustration: Nishan Akgulian



Mussorgsky:
Pictures at an Exhibition,
Night on Bald Mountain,
Prelude to Khovanchina,
"Solemn March" from
The Capture of Kars,
Scherzo in B-Flat Major
Toronto Symphony Orchestra, Jukka-Pekka Saraste
FINLANDIA RECORDS
0630-14911; 57:26
Sound: A, Performance: A+

Modest Mussorgsky was one of music's greatest enigmas. Virtually self-taught and staunchly unorthodox, he composed music that left contemporaries trying to decide whether he was a genius or a fool. Mussorgsky divided much of his adult life between his day job as a civil servant, evening debates on the future of Russian music with his friends in shabby taverns, and long nights of composing. Despite a few advocates—such as the critic Vladimir Stasov, who was a champion of Mussorgsky, César Cui, Alexander Borodin, Mily Blakirev, and Nikolai Rimsky-Korsakov and coined the name "Maguchaya Kucha" (the "Mighty Group," or the "Russian Five") for these composers—most of Mussorgsky's music was rejected during his lifetime.

Musicians of the 20th century have vindicated Mussorgsky for his originality and expression of the Russian spirit. Yet his works often needed other composers to prepare them for performance. When Mussorgsky died in 1881, his compositions were a chaotic mess of garbled and unfinished manuscripts. Rimsky-Korsakov orchestrated or re-orchestrated many of these works, sometimes "correcting" Mussorgsky's music so severely that the original intent was lost. In the last century, other musicians have revised Mussorgsky's *oeuvre*, the most notable being Maurice Ravel, whose famous orchestration of the piano work *Pictures at an Exhibition* is the accepted standard.

Conductor Jukka-Pekka Saraste boldly abandons Ravel's celebrated version of *Pictures* for this CD. Instead, he forms a pastiche in which the movements alternate between orchestrations made in the 1920s by the Slovenian conductor Leo Funtek and those made in the 1950s by a Moscow Conservatory professor named Sergei Gortschakov. For those who are faithful enthusiasts of the Ravel version, as I am, this idea may seem rather strange. Perhaps it would be, without Saraste's genius. In spite of my initial misgivings (and once I distanced myself from Ravel's *Pictures*), I must admit that the product Saraste has crafted is a remarkable "must-hear" for all orchestral devotees. It reminds the listener that *Pictures*, like most of Mussorgsky's output, was, after all, a work for solo piano.

Indeed, only one of the orchestral pieces on this recording—the "Solemn March" from *The Capture of Kars*—is pure Mussorgsky. The exquisite prelude from the opera *Khovanchina* was orchestrated by Rimsky-Korsakov, who also re-orchestrated the other works: "Night on Bald Mountain" and the Scherzo in B-Flat Major. Fortunately, these Rimsky-Korsakov efforts were his most successful and enhance Mussorgsky's rugged individualism rather than hide it.

Ottorino Respighi

Ancient Airs and Dances, Suites 1 to 3
NATIONAL SYMPHONY ORCHESTRA OF IRELAND, RICO SACCANI
NAXOS 8.553546; DDD; 53:53
Sound: A, Performance: A

Ottorino Respighi was a superb orchestrator, and these transcriptions contain some of his most beguiling sonorities. This CD includes all of his suites, aside from "Gli Uccelli" ("The Birds"), lovingly recorded in a Dublin hall. The nicely detailed stereo offers a broad but cohesive soundstage. *Robert Long*

LOOK FOR US AT THE
1997 HI-FI SHOW
IN SAN FRANCISCO!
WESTIN ST. FRANCIS HOTEL • RM 705/706

ORIGINAL MASTER RECORDING™

UDCD 682

20th ANNIVERSARY
1977 - 1997

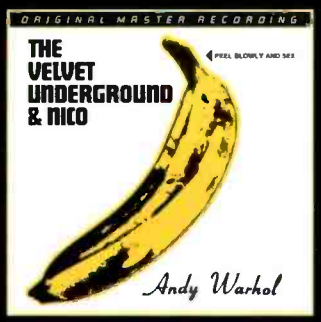
UDCD 687

UDCD 690

UDCD 691

. . . still the leader

UDCD 693



UDCD 695 NEW RELEASE

UDCD 698 NEW RELEASE

UDCD 694

IF IT'S MUSIC WORTH LISTENING TO, IT'S WORTH MOBILE FIDELITY.

For 20 years, Mobile Fidelity has been providing audiophiles and music enthusiasts with the ultimate listening experience. Our Ultradisc II™ 24-karat gold CD brings you the warmth and sweetness of analog with the realism of live music. By starting with the original master tapes and our proprietary mastering technology, The GAIN System™, we have become the leader in creating the most sonically accurate audio software in the world. You'll hear our difference: and, every beautiful nuance of the original recording. If it's worth listening to, it's worth listening to *Mobile Fidelity!*

ULTRADISC II™ The GAIN System **The *Original* 24-kt Gold Audiophile Compact Disc.**

To receive a color catalog or The GAIN System™ *technical paper, call 800-423-5759.*

105 Morris Street • Sebastapol, CA 95472
WWW URL address: http://www.mofi.com/
In Canada call 800-267-1216 (Music Retailers)
or 800 465-4434 (Hi-Fi Retailers)

mobile fidelity sound lab

These great titles and more available at:

BORDERS®
BOOKS • MUSIC • CAFE

CIRCLE NO. 6 ON READER SERVICE CARD

Many of these subtleties might not have been conspicuous but for the sensitive playing of the Toronto Symphony Orchestra. The brass in "Night on Bald Mountain" play with such consistent articulation as to sound like one person performing on many instruments. The strings furnish a particularly rich blend, and the woodwind choir plays flawlessly in tune—notably in the octave passages of *Pictures*. Toronto's Roy Thompson Hall, where this CD was recorded, is happily not so live as to obscure the many dense low harmonies of these Russian masterpieces.

There will always be people who cling to Ravel's *Pictures*, almost as if it somehow had the composer's posthumous blessing. But this recording gives us a new, credible, and animated portrait of Russia's most unconventional composer. Conductor Saraste maintained that he wanted "to arrive at something closer to what Mussorgsky might have intended." He may have accomplished that and much more. *Patrick Kavanaugh*

Tangos Among Friends

Daniel Barenboim, piano; Rodolfo Mederos, bandoneón; Hector Console, bass

TELDEC 0630-13474; 51:46

Sound: A–, Performance: B+

Hommage à Piazzolla

Gidon Kremer, violin; Per Arne Glorvigen, bandoneón; Vadin Sakharov, piano; Alois Posch, double bass; other instrumentalists

NONESUCH 79407; 71:56

Sound: A+, Performance: A+

It's only natural that classical musicians with an eye on the lucrative crossover market might turn to the mini-rage for the tango if they feel comfortable expressing themselves in that genre. Both Daniel Barenboim and Gidon Kremer do, although it is unlikely either would were it not for the inspired music of the late Astor Piazzolla. On Kremer's album, 10 of the 11 tracks were written by the Argentinean who revolutionized the tango. And of the 14 tracks in pianist and conductor Barenboim's tango effort, half are by Piazzolla.

Barenboim was born in Buenos Aires and spent his first nine years there, so this album was truly a return to his roots. He looks to the the much-revered singer Carlos Gardel, one of the first major international stars of tango, for inspiration. Three tangos by Horacio Salgán show some unexpected turns of rhythm and harmonic flow, but nothing like Piazzolla's.

Perhaps because it was difficult to escape his more serious keyboard and conducting life, Barenboim sounds too genteel for the tango. The bittersweet part comes across, but this is chamber or cocktail tango. One pictures a quiet lounge in a classy Buenos Aires international hotel, not a tango bar on the wrong side of the tracks.

Kremer hails from Latvia and is one of the world's best-known and most-recorded violin soloists. But unlike Barenboim, he seems right at home in his foray into the tango world of Buenos Aires. His album is haunting, emotional, and passionate. The larger ensemble and the variety of instrumentation are also advantages over Barenboim's simple trio. Some of the instruments used on various tracks are clarinet, piano, bajan, cello, percussion, and even a harpsichord. Kremer and his players elevate these tango interpretations to high art while maintaining an intense level of melancholy, sensuality, and rhythmic flair.

What a contrast Kremer's CD makes to both Barenboim's and to a previous series on Nonesuch by the Tango Project! The Nonesuch disc's crystalline sonics and precise soundstaging help communicate the sharp edges of Piazzolla's music, and composer John Adams contributes a fascinating essay on the tango master. *John Sunier*

Claude Debussy

Images pour Orchestre, Prélude à L'Après-midi d'un Faune, La Mer

Los Angeles Philharmonic Orchestra, Esa-Pekka Salonen

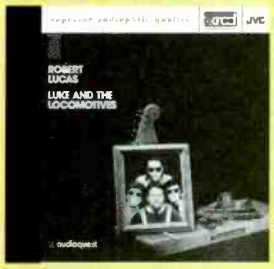
SONY CLASSICAL SK 62599; DDD; 72:23

Sound: A–, Performance: A

Esa-Pekka Salonen's readings of these familiar tone poems are full of wonder, mystery, and nuance. Those favoring a razzle-dazzle approach might wish to stick with Charles Munch or Vladimir Ashkenazy. But listeners who appreciate refinement will welcome this Compact Disc, in which the young Finnish conductor forces his crack ensemble to pull out all the stops only when the score demands it. The recording partners these interpretations ideally, presenting a wide and deep soundstage heard from mid-hall, with woodwind and brass passages that are detailed, rather than spotlighted. *Rad Bennett*

JVC's XRCD...listen and compare.

xrcd extended resolution cd



Robert Lucas
Luke and the Locomotives
JVCXR-0024-2

This is a Chicago blues classic from the man called "the blues discovery of the '90's."

Nancy Bryan
Lay Me Down
JVCXR-0029-2

Likened to artists like Joni Mitchell and Sarah McLachlan, Bryan's bell-like tone expresses a range of emotions from elation to anguish on this stunning release.

Joe Beard
(featuring Ronnie Earl & The Broadcasters)
Blues Union
JVCXR-0025-2

"1996 Blues Album of the Year" -Offbeat

Tiger Okoshi
Echoes of a Note
JVCXR-0030-2

Gil Goldstein, Bela Fleck and Mike Stern join trumpet player Tiger Okoshi on this tribute to Louis Armstrong.

Mighty Sam McClain
Keep On Movin'
JVCXR-0026-2

"The Mighty One has done it again! The singer has gone and made another album as outlandishly good as his 1993 blockbuster Give It Up To Love." -Blues Wire

Ella Fitzgerald & Joe Pass
Take Love Easy
JVCXR-0031-2

"Ella, in absolutely first class form, duetting with Joe Pass." - Jazz - The Rough Guide

Doug MacLeod
You Can't Take My Blues
JVCXR-0027-2

"MacLeod is one of the vibrant voices that will keep this sound alive into the next century." -Blues Review

Thelonious Monk & Gerry Mulligan
Mulligan Meets Monk
JVCXR-0032-2

★★★★1/2 -Downbeat

The Bill Holman Band
Brilliant Corners
JVCXR-0028-2

No one is better suited to revisit the compositions of Thelonious Monk than master arranger/conductor Bill Holman.

ALSO AVAILABLE ON XRCD:

Gene Ammons **Boss Tenor** JVCXR-0033-2
Art Tatum & Ben Webster **The Tatum Group Masterpieces** JVCXR-0034-2
Coleman Hawkins **Good Old Broadway** JVCXR-0034-2
Bill Evans Trio **At Shelly's Manne-Hole** JVCXR-0036-2
Carmen Lundy **Old Devil Moon** JVCXR-0037-2

JVC

To find out more about XRCD access our web site at: xrcd@jvcmusic.com

To order by phone with a major credit card, call toll free: 1-800-jvc-1386

JVC Music, 3800 Barham Blvd., Suite 305, Los Angeles, CA 90068

CIRCLE NO. 16 ON READER SERVICE CARD

ROCK-POP RECORDINGS

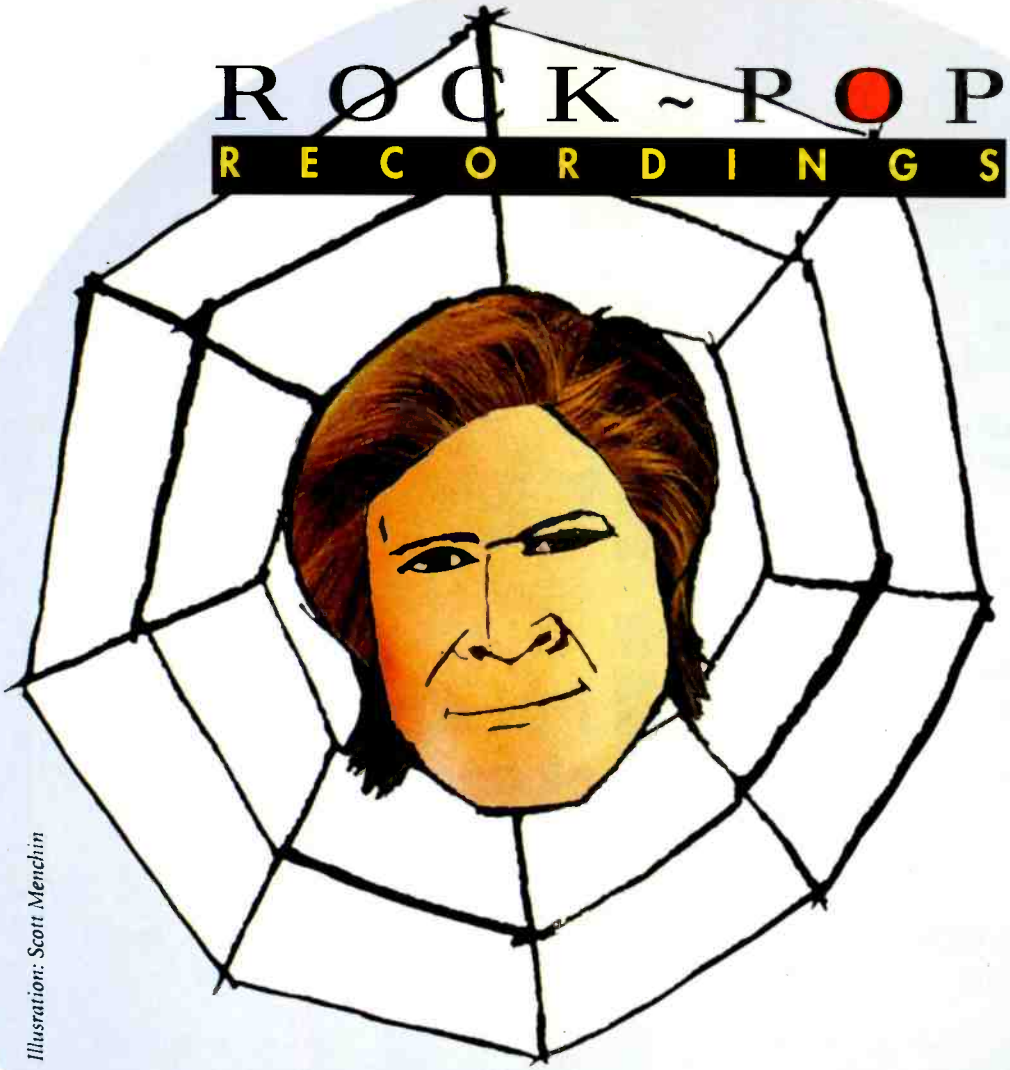


Illustration: Scott Menchin

Blue Moon Swamp

John Fogerty

WARNER BROS. 9 45426, 44:44

Sound: A+, Performance: A

John Fogerty knows what it means to bide his time. The ex-Creedence Clearwater Revivalist took off a full 10 years, from 1975 to 1985, fighting a lawsuit that prohibited him from making records. He spent this time writing the songs that comprised his '85 comeback record, *Centerfield*, which went double-platinum, fueled by hits like "The Old Man Down the Road" and "Rock and Roll Girls." More than a decade later (after threatening to release a record every year since *Centerfield*'s 1986 followup, *Eye of the Zombie*) Fogerty has, at last, made a record.

And *Blue Moon Swamp* is a brilliant collection of roots-rock songs—the result of Fogerty's quest for inspiration and musical honesty that took him on research trips deep into Mississippi.

Front and center on *Blue Moon Swamp* is Fogerty's dazzling guitar. Working in a tremendous array of tones and techniques (from the crafty slide on "Rambunctious Boy" and the stinging solo runs on "Bad Bad Boy" to the slashing blues rock of "Walking In a Hurricane"), Fogerty's playing has become more precise and intuitive over the years, while his arrangements beautifully complement his musicianship. He even attempts a veiled autobiography of himself as a guitar slinger on "Blueboy."

Throughout the record, Fogerty handles all the acoustic (including Dobro) and electric guitars, along with an impressive collection of other string instruments such as sitar, mandolin, lap steel, and bouzouki.

The 12 songs on *Blue Moon Swamp* benefit from a decade of aging and the prolonged gestation period in which Fogerty undoubtedly worked and reworked these tracks until they were glistening gems of Americana purity. The country-esque "Joy of My Life," is Fogerty's first-ever love song; "Blue Moon Nights" has the neatened rockabilly polish of Roy Orbison; and "A Hundred and Ten in the Shade" is helped immensely by guest vocalists The Fairfield Four, giving the song a vintage Delta blues vibe.

Across three decades now, Fogerty has kept alight the flame of real American roots music, and *Blue Moon Swamp*, though long in the making, is a gorgeous addition to the genre's canon—a modern-day roots-rock landmark. *Bob Gulla*

THE JAYHAWKS

Sound of Lies

AMERICAN 9 43114, 55:50

Sound: B, Performance: A

What's a band to do when one of its principal singer/songwriters leaves the fold? Such was the dilemma facing The Jayhawks in the wake of Mark Olson's departure. The solution? Take a break, contemplate disbanding, and then—against all odds—re-emerge with a brilliant new album.

On *Sound of Lies*, the Minneapolis combo turns Olson's vacancy into a reinvention. Without completely abandoning its country/rock roots (apparent on "It's Up to You"), the band ventures into outlying territories—places where the town crier isn't Gram Parsons, but rather *Rumours*-era Fleetwood Mac. Thanks in large part to the expanded role of keyboardist Karen Grotberg (whose backing vocals are prevalent on "The Man Who Loved Life," "Stick in the Mud," and "Haywire"), remaining principal Gary Louris's sharply edged vignettes of despair and redemption practically tremble with absolute truth.

Judging from the inspired music on *Sound of Lies*, The Jayhawks decision to keep flying was the best one of their career. *Greg Siegel*

Flaming Pie

Paul McCartney
CAPITOL CDP 8 56500, 53:46
Sound: A, Performance: B+

Refreshed and doubtless reminded of The Beatles' quality standards after working extensively on the recent *Anthology* series, Paul McCartney is at last back showing the songwriting flair we so want from the man. *Flaming Pie* serves up enough memories of McCartney's erstwhile greatness to make it his most enjoyable release since 1980's *McCartney II*.

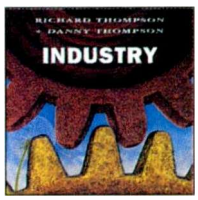
The improvement is best heard where McCartney has traditionally been strongest—on love songs and ballads. "Calico Skies," a lightly strummed acoustic ballad, is lovely and uncomplicated, as is the album closer "Great Day." "Little Willow," an elegy to a deceased friend, offers a simple, keyboard-based melody and a nod to Brian Wilson on its soaring background vocal melody.

Things get stickier when the arrangements get complicated. The *Sgt. Pepper*-like "Beautiful Night," with orchestrations by George Martin, struggles to stay on the good side of taste as strings and horns rush to an overwrought finish. And co-producer Jeff Lynne brings his own heavy hand to the dated pop of "The World Tonight." Conversely, sinewy rockers like "Really Love You," with Ringo Starr on drums, and "Used To Be Bad," with guest vocalist Steve Miller, ride spare blues grooves tastefully. Along with the ballads, these tracks prove that McCartney still has something to strut. *Bob Gulla*

Industry

Richard Thompson & Danny Thompson
HANNIBAL HNCD 1414, 44:03
Sound: A–, Performance: A–

Guitarist, singer, and songwriter Richard Thompson and bassist Danny Thompson aren't related, but as veterans of seminal '60s English folk acts Fairport Convention (Richard) and Pentangle (Danny), they're both pinnacles of musical imagination. To wit, *Industry* is a brilliant collaboration, and its odd subject—a history, of sorts, of British industry—provides both Thompsons an excellent springboard for their talents.



Richard has one of pop music's keenest eyes for the latent cruelty in human relationships, so the plight of the U.K. working man is fertile fuel for his cranky muse. And in collaboration with Danny and support from his jazz-inflected folk combo, the result is a progressive folk

statement that echoes the glories of Richard's best work.

And while *Industry*'s theme suits Richard's often dour muse, it's also a dynamic platform for the disc's jazzier, instrumental explorations. Succeeding on both a musical and conceptual level, *Industry* is a fascinating little benchmark in the musical history of mankind. *Rob Patterson*

First Rays of the New Rising Sun
Jimi Hendrix
EXPERIENCE HENDRIX/MCA
MCAD-11599, 69:37
Sound: B+, Performance: B

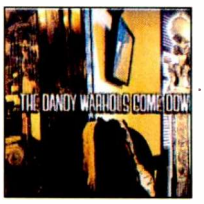
"Is the microphone on?" Jimi Hendrix asks at the beginning of "Hey Baby (New Rising Sun)," on *First Rays of the New Rising Sun*. Fortunately, it was; for this song, along with many others included here, are incomplete works-in-progress that Hendrix had planned for his fourth studio album. Mr. Microphone could've very possibly been *off*.

The songs that comprise *First Rays* were released posthumously in the early '70s on three albums (*Cry of Love*, *War Heroes*, and *Rainbow Bridge*). But the ones that were left unfinished by Hendrix were released with unauthorized overdubs (an attempt to finish them, obviously without Jimi's permission). However, Eddie Kramer, Hendrix's legendary engineer/co-producer, has admirably cobbled together a rough semblance (with finished and unfinished tracks) of Hendrix's last album as he may have wanted it, and at the very least, how he last heard it.

With everything remastered (an improvement that's more apparent on the finished tracks), and with the unfinished tracks stripped of overdubs and restored to their raw, demo-like, original versions, *First Rays* is something of a hodgepodge (though with excellent fidelity throughout). Still, it's a fascinating document that raises more questions than it answers. Would Jimi have recorded a rhythm guitar track on "Room Full of Mirrors"? How about the paucity of solos? Too bad the only man who knows has left to be with his "Astro Man." *Tom Gogola*

. . .The Dandy Warhols Come Down
The Dandy Warhols
CAPITOL CDP 8 36505, 66:20
Sound: B, Performance: B

The Dandy Warhols will probably never be accused of overexerting themselves. The Portland, Oregon-based band's second album, *...The Dandy Warhols Come Down*, is a droning collection of two and three-chord riffs and patterns that never wind up far from where they began. But regardless of how little ground is covered in the course of a song, The Dandy Warhols always take the listener somewhere far away.



Often, bands that rely on repetition to propel their material become tiresome quickly. But The Dandy Warhols keep their kaleidoscopic music intriguing by injecting it with liberal doses of vocal harmony and a mind-spinning array of sonic effects. "Minnesoter" features an otherworldly guitar figure, strange "boinging" sounds, and nasal vocals reminiscent of Neil Young; "Cool as Kim Deal" shimmies to a chiming '60s organ line; and "Every Day Should be a Holiday" revs alongside an electronically treated beat borrowed from The Jesus and Mary Chain.

There's not much originality here; the band's dazed-out sensibility recalls The Velvet Underground's "Sister Ray," and its use of celestial harmonies can be credited to English bands like Ride and The Stone Roses. But The Dandy Warhols don't care about advancing music. The band is more concerned with conjuring up the ideal atmosphere, and in many ways, they do. *Jon Wiederhorn*

I Can Hear the Heart Beating as One
Yo La Tengo
MATADOR OLE 222, 68:18
Sound: B+, Performance: C

Yo La Tengo has been one of indie-rock's favorite sons ever since it emerged from the "jangly" '80s Hoboken scene and started appropriating feedback and drone elements inspired by The Velvet Underground. This ain't a band with a former rock critic (singer/guitarist Ira Kaplan) for nothing.

But on *I Can Hear the Heart Beating as One*, songs meander with abstract concepts for titles ("Stockholm Syndrome," "Moby Octopad") and pedestrian mumbling for singing. And, as if for the sake of being current, the band emulates the trendy elements of today's music scene, throwing in a trip-hop beat here and a blast of nuevo-Krautrock there.

Still, Yo La Tengo refers to rock's past with a strange but free hand, evident in its cover of The Beach Boys "Little Honda," which here sounds more like an indecipherable, joyless ripoff of The Jesus and Mary Chain. They even borrow a Grand Funk Railroad song title for "We're an American Band." But where Grand Funk infused the song with a corny, patriotic slant, Yo La Tengo can only drone in a stuporous swamp of listlessness. *Rob O'Connor*

J&R MUSIC WORLD®

Receivers

Technics SA-AX710
Home Theater Receiver
•120 watts x 2 or 100 watts x 5 •Dolby Pro Logic Surround •Dolby 3 Stereo •Sound Field Control •Subwoofer output •Home Theater remote
$399.99 (TEC SAAX710)

Technics SA-EX110
•100 watts/channel, 30-AM/FM presets, A/V remote control $159.99

Sherwood RV-4050R
•60 watts x 2 or 50 watts x 3 + 20 watts rear, Dolby Pro Logic, remote $159.99

Harman Kardon AVR20MKII
•A/V, 60w x 2 or 50w x 3 + 20w rear, Dolby Pro Logic, high-current (low impedance drive) ..... CALL

Sony STR-DE805G
•VisionTouch® A/V, 120w x 3 + 50w x 2, joystick point & click remote ..... CALL

A CD Player For The Demanding Listener

Dynaco CDV-PRO
HDCD Vacuum Tube CD Player
•Plays standard & new high-definition CDs •Uses dual 20-bit Burr-Brown D/A converters, Pacific Microsonics digital filter & tube output stage; the result: smooth sound with precise imaging •20-track programming •Headphone jack with volume control •Remote control
$799.99 (DYO CDVPRO)
Mfr. Sug. Retail $1099.95

Audiophile

Harman Kardon AVI200 MKII
A/V Integrated Amplifier
•75 watts x 2 or 65 watts x 3 + 25 watts x 2 •Dolby Pro Logic, Theater, Stadium & Dolby 3 Stereo modes •Subwoofer output
$349.99 (HK AV1200MKII)

Dynaco Stereo 160
•Power Amp, vacuum tube design, 75 watts/channel $1499.99

Dynaco PAT-6
•Preamp/AM-FM Digital Tuner, remote control, headphone jack $349.99

Philips DCC900
•DCC Recorder, Plays/records DCC tapes, plays cassettes, 75% OFF Mfr. Sug. Retail $199.99

Koss ESP/950
•Electrostatic Headphones, reference quality, includes carrying case & battery pack $449.99

CD Players/Changers

Technics SL-MC400
110 + 1 Disc CD Changer
•Front load •Quick disc change mechanism •Quick single play function •Group play function •32-track programming •Remote control
$199.99 (TEC SLMC400)

JVC XL-V282
•Single-disc player, 32-track programming, disc stabilizer, remote control $149.99

Sherwood CDC-6050R
•5-disc changer, 32-track programming, remote control $159.99

Sony CDP-CX250
•200-disc changer, 8-category Custom File™, 32-track programming, remote control ..... CALL

TEAC AD-500
•CD Player (single)/Cassette Recorder Combo, cassette pitch control, remote control $279.99

Cassette Decks

TEAC V-8030S
Stereo Cassette Deck
•3-heads/motors •Quartz lock dual capstan drive •Dolby S/B/C/HX-Pro •CD direct input •Remote •110/220 volts
$699.99 (TEA V8030S)

TEAC V-377
•Dolby B, 1-touch record, peak-level meters, 110/220v $69.99

Sony TC-WE305
•Dual Cassette, 2-speed dubbing, Dolby B soft-touch transport $99.99

Technics RS-TR272
•Dual auto-reverse, Dolby B/C/HX-Pro, 2-speed dubbing $159.99

TEAC V-1030
•3-heads, Dolby B/C/HX Pro, fine bias control, electronic tape counter, remote, 110/220v $299.99

Mini Systems

JVC FS-2000
Ultra Micro Audio System
•20-track programmable top-loading CD player •15-FM/15-AM presets •Subwoofer output •Cherrywood speakers •Remote control
$349.99 (JVC FS2000)

JVC UXT3-BK
•20-track programmable CD player, auto-reverse cassette, 15-AM/15-FM, remote $199.99

Aiwa NSX-A30
•3-disc CD changer, dual cassette, AM/FM, 30 watts/channel, remote $229.99

Panasonic SC-AK20
•5-disc CD changer, dual auto-reverse cassette, AM/FM, 3-D Space EQ, remote $249.99

Denon D-850
•Home Theater System, 3-CD changer, AM/FM, dual cassette, 35w x 3 + 15w x 2, remote ..... CALL

Speakers

Aiwa TS-W9
Powered Subwoofer
•100 watt built-in amplifier •8" speaker •Magnetically shielded •60/90/120-Hz crossover settings •Bass level control
$129.99 (AIW TSW9)

Yamaha YST-SW20
•Powered Subwoofer, 25 watts, shielded WAS $149.99 ..... $79.99

Cerwin-Vega L7-BK
•2-way, 7" woofer, 75 watts power handling, built-in circuit breaker, black ..... pr $129.99

Yamaha NSA-P150
•Center Channel/Surround system with 3 speakers $149.99

Bose® 501™ Series V
•Direct/Reflecting® Floorstanding Speakers, 5.25" woofer, black ..... pr $518.00

JBL Specials

69% OFF Mfr. Sug. Retail of $659

JBL Pro III Plus
Compact Speakers/Subwoofer
•Ultra-compact Pro III magnetically shielded speakers with 1" tweeter & 5" midrange + 8" subwoofer •Handles 100 watts •4 ohms
$199.99 (JBL PROIIIPLUS)

JBL Control 1C
•Mini Speakers, 2-way, 5.25" woofer, magnetically shielded WAS $149.99 ..... pr $99.99

JBL SC305
•Center Channel, 2-way with two 5" woofers & titanium dome tweeter, shielded, black $129.99

JBL ARC50
•2-way, 8" woofer, titanium tweeter, black Mfr. Sug. Retail $539.90 ..... pr $179.99

JBL ARC90
•3-way, 10" cast-frame woofer, titanium tweeter, black Mfr. Sug. Retail $859.90 ..... pr $299.99

Turntables

Thorens TD180
3-Speed Belt Drive Turntable
•33, 45, 78 r.p.m. •Automatic shut-off & auto-retract •Synchronous motor •External power supply •Includes Stanton cartridge
$299.99 (THN 180)

TEAC P-595-MV
•Semi-automatic, belt-drive, includes cartridge, 110/220v $89.99

Aiwa PX-E850
•Fully-automatic, includes built-in phono preamp & cartridge $119.99

Thorens TD280 Mk IV
•Belt-drive, 33/45, auto shut-off, includes Stanton cartridge $369.99

Technics SL-1200II
•Professional Direct Drive, quartz lock, pitch control, resonance damping chassis $479.99

Audio/Video Add-Ons

Technics SH-AC300
Digital Surround Processor
•Decodes the Dolby Digital (AC-3) input signal from DVD player to send to select receivers •CINEMA Re-Equalizer circuit •Dual digital inputs •Remote
$299.99 (TEC SHAC300)

Sony RM-V12
•Universal remote, replaces 4 remotes, preprogrammed $14.99

Target BT1
•Tilt & Swivel Speaker Wall Bracket, holds 22 lbs. ..... pr $29.99

Terk AM-FMQ
•Powered AM/FM Antenna, selectable modes to minimize noise $79.99

Sony INT-W100 Web TV
•Internet Terminal, built-in modem, requires WebTV® service, WAS $329.99 ..... $249.99

VCRs/Camcorder

Panasonic PV-4652
VHS Hi-Fi Stereo VCR
•4 heads •VCR Plus+ •Real time counter •Digital auto tracking •8-event/1-month timer •Universal remote
$199.99 (PAN PV4652)

General Electric VG-4261
•VHS Hi-Fi Stereo, 4 heads, VCR Plus+, universal remote control $199.99

JVC HR-VP638
•VHS Hi-Fi Stereo, 4 heads, VCR Plus+, jog/shuttle, remote $279.99

Sony SLV-940HF
•S-VHS Hi-Fi Stereo, 4 heads, VCR Plus+, cable mouse controller, remote $299.99

Sony CCD-TRV82
•Hi8mm Handycam Vision™ Camcorder, 4" SwivelSteen™, 30x-digital/15x-optical zoom CALL

DVD Players

Sony DVP-S7000
DVD/CD Player
•Over 500 lines of horizontal resolution •Plays DVD, audio CD & video CD formats •Includes 4 bonus DVD discs & remote control
CALL (SON DVPS7000SB)

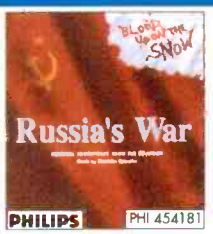
RCA RC5200P
•DVD/CD Player, Dolby Digital (AC-3) capable (with select receivers) ..... CALL

Toshiba SD-2006
•DVD/CD Player, Dolby Digital (AC-3) surround sound capable (with select receivers) $479.99

Toshiba SD-3006
•DVD/CD Player, Dolby Digital (AC-3) surround sound $579.99

Panasonic DVD-A300
•DVD/CD Player, built-in Dolby Digital Decoder (AC-3) & karaoke functions ..... CALL

Music



Russia's War
Blood Upon The Snow
Original soundtrack from the TV series
$11.99 CD

Mstislav Rostropovich: *The Moscow Recordings,* 1950-1974
ANG 72016 ..... 13-CD Set **$71.37**

Shostakovich: *Suites for Jazz Orchestra,* Dmitri Kitaenko
RCA 68304 ..... CD **$12.99**

CALL TO ORDER MUSIC REVIEWED IN THIS ISSUE!

CALL US TOLL FREE FOR ITEMS NOT LISTED IN THIS AD — **SE HABLA ESPANOL**

SEND MONEY ORDER, CERTIFIED OR CASHIER'S CHECK, MASTERCARD, VISA, AMERICAN EXPRESS or DISCOVER CARD (include Interbank No., expiration date and signature) To: J&R Music World, Dept. AU708, 59-50 Queens Midtown Expwy, Maspeth, Queens, NY 11378. Personal and business checks must clear our Authorization Center before processing. Shipping, handling and Insurance Charge (Continental US) is 5% of the total order with a $4.95 minimum for orders up to $500; 4% for orders over $500 to $1000; and 3% for orders over $1000. For heavyweight/over-sized items, shipment by air, or to Canada, Hawaii, Alaska, Virgin Islands & Puerto Rico please cal for information. DO NOT SEND CASH. Sorry, no C.O.D.'s. NY residents please add sales tax. ORDERS SUBJECT TO VERIFICATION & ACCEPTANCE. NOT RESPONSIBLE FOR TYPOGRAPHICAL OR PICTORIAL ERRORS. ALL MERCHANDISE SHIPPED BRAND NEW, FACTORY FRESH AND 100% GUARANTEED. Some quantities may be limited.

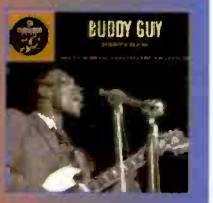
City of N.Y. Dept. of Consumer Affairs License Numbers 0900310/0900615/0900616/0900617

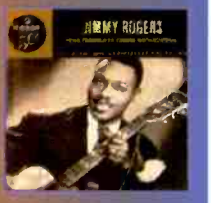
Visit J&R MUSIC WORLD at 31 Park Row, NY, NY

☎ Shop By Phone or to order a FREE CATALOGUE 24 Hours A Day, 7 Days A Week

1-800-221-8180

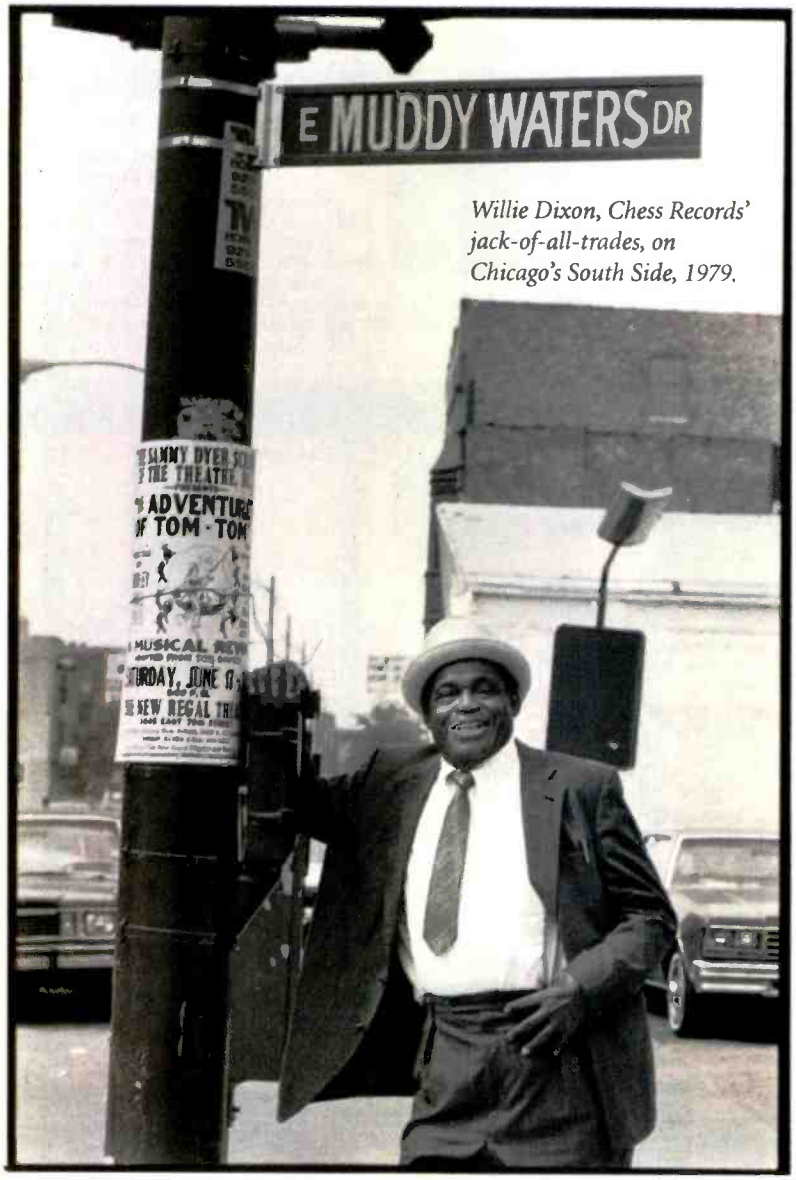
CIRCLE NO. 12 ON READER SERVICE CARD





JAZZ~BLUES

RECORDINGS



Willie Dixon, Chess Records' jack-of-all-trades, on Chicago's South Side, 1979.

Photo: David Gahr

Fifty years ago, Phil and Leonard Chess—two brothers living in Chicago—created a record company that would be responsible for some of the most important blues, R&B, and rock 'n' roll records of all time. This material would exert a huge influence on early British invasion bands and, therefore, the course of rock music itself. To celebrate this golden anniversary, MCA (which owns the indispensable Chess catalog) has released nine commemorative CD compilations—the first batch of a projected year-long series—that capture the essence of Chess Records.

Digitally remastered using 20-bit technology, the CDs in this series also feature rare photos and comprehensive liner notes. Much of Chess's catalog was a revelation in its time. Bo Diddley's tremelo-drenched guitar and primitive, pounding jungle beat (the so-called "Bo Diddley beat," which has been appropriated by everyone from Buddy Holly to The Smiths), for instance, were as revolutionary in 1955 as Sonic Youth's dissonant feedback seemed in the '80s. Chuck Berry's signature guitar style virtually defined rock guitar and continues to serve as a template for would-be rockers. It's difficult to imagine how rock 'n' roll would have evolved in later years without such fundamental building blocks as Diddley's "Road Runner," "Mona," and "I'm a Man" or Berry's "Johnny B. Goode," "Reelin' and Rockin'," or "Roll Over Beethoven." This material is heard on two compila-

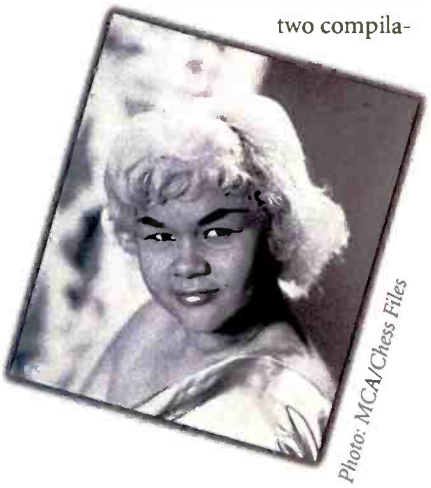


Photo: MCA/Chess Files

The Chess 50th Anniversary Collection

HIS BEST
Bo Diddley
MCA/CHESS CHD-9373, 58:01

HIS BEST, VOLUME 1
Chuck Berry
MCA/CHESS CHD-9371, 52:54

HIS BEST
Howlin' Wolf
MCA/CHESS CHD-9375, 55:53

BUDDY'S BLUES
Buddy Guy
MCA/CHESS CHD-9374, 53:20

HER BEST
Etta James
MCA/CHESS CHD-9367, 60:33

HIS BEST, 1947 TO 1955
Muddy Waters
MCA/CHESS CHD-9370, 59:57

THE COMPLETE CHESS RECORDINGS
Jimmy Rogers
MCA/CHESS CHD2-9372
Two CDs; 2:24:48

CHESS BLUES CLASSICS, 1947 TO 1956
Various Artists
MCA/CHESS CHD-9369, 46:57

CHESS BLUES CLASSICS, 1957 TO 1967
Various Artists
MCA/CHESS CHD-9372, 46:35
Sound: A, Performances: A+

tions that catch these artists in their 1950s heyday and well into the '60s.

Berry is captured here in his late-'50s glory on numbers like "Maybellene," "Memphis," "Too Much Monkey Business," and "Brown Eyed Handsome Man," a tune that, as stated in the liner notes, "spoke volumes about the emergence of African-American men from the shadows of prejudice and segregation in mid-50s America."

The raspy-voiced Howlin' Wolf is positively ferocious on his 1954 classic "Evil" and equally vicious on his 1956 hit "I Asked for Water," both of which are heard on *His Best*. It's easy to understand (considering his intense, gargled-with-razor-blades growl) why some thought Wolf was possessed by the devil. His wild performances, in which he would roll his eyes psychotically and flash his tongue while rolling on the floor, helped perpetuate that myth. This must-have compilation also includes the Willie Dixon-penned gems "Spoonful," "The Red Rooster," "Wang Dang Doodle," and "I Ain't Superstitious." (In addition to serving as a session bassist and recording artist in his own right, Dixon wrote material for most of the Chess roster.)

Current reigning blues guitar god Buddy Guy is captured on *Buddy's Blues* at his sizzling best, especially on material from early '60s sessions such as "First Time I Met the Blues," "Let Me Love You Baby," "Stone Crazy" and "Leave My Girl Alone." Here, Guy's guitar tone is clean and unaffected—nothing like the raucous, rock-inflected distortion sound that he deploys today. Still, the vicious staccato attack Guy puts to use on these tracks cuts just as deep.

Other bone-chilling CDs in the series compile classic material by Etta James (including "At Last," "Tell Mama," and "I'd Rather Go Blind") and Muddy Waters ("Rollin' and Tumblin', Part 1," "Long Distance Call," "I'm Your Hoochie Coochie Man," and "Mannish Boy"). Also in this initial batch of releases is a twofer of former Muddy Waters sideman Jimmy Rogers' entire Chess output and two separate compilations—*Chess Blues Classics, 1947 to 1956* and *Chess Blues Classics, 1957 to 1967*—featuring John Lee Hooker, Lowell Fulson, J. B. Lenoir, Otis Rush, Little Walter, Elmore James, and Sonny Boy Williamson. Pick up any single CD in this fabulous series and you've indeed got real-deal blues, direct from the heart of Chicago. *Bill Milkowski*

Nashville

Bill Frisell
NONESUCH/ATLANTIC 79415, 63:05
Sound: A, Performance: A

Calling Bill Frisell an extraordinary jazz guitarist is only a half truth, because it implies that he's a jazz cat through and through.

Nashville, his most recent release, reveals another side of Frisell's otherworldly musical sensibility. No, he isn't wearing a Stetson hat or playing the Grand Ole Opry just yet, but *Nashville* is a slight departure from his more improvisational and experimental body of work. Frisell's still at his best, though, with the hallmark spaciousness that allows his compositions' beautiful melodies to linger, melt, and dissipate.

With colorful assistance from, among others, legendary bluegrass Dobro player Jerry Douglas, members of Union Station, and vocalist Robin Holcomb on a few tracks, Frisell's uncanny improvisational creativity and understated gossamer-tone are brought to the forefront. With hints of bending, microtonal jazz threading through his delicate melodies, Frisell takes us through a rich, slow-weaving course of 14 tracks that hang in the air like the smell of freshly cut grass on a summer night. From the traditional feel of "Keep Your Eyes Open" and "Shucks" to the moody, somehow psychedelic "Gone," this is a truly evocative record, calling forth memories of a time and place that may be foreign but somehow seem familiar. *Michael Gelfand*

Music Evolution

Buckshot LeFonque
COLUMBIA CK 67584, 64:22
Sound: B+, Performance: B+

The Branford Marsalis-led Buckshot LeFonque is a loose assemblage of daring musicians who are willing to mix things up a bit. And on *Music Evolution*, the follow-up to the project's eponymous 1995 debut, Buckshot LeFonque continues to meld jazz with rap and R&B elements, although with a sense of purpose and identity that was lacking in the band's first effort.

On the album's opener "Here We Go Again," turntable scratches and a disjointed rap bounce over a stop-start backbeat as Marsalis's sax lines whirl. Next, the smooth-flowing title track clearly states Buckshot LeFonque's aesthetic: "Add a little this, take out a little that/Then you'll come up with that jazz called rap." R&B, in many of its past and present incarnations, takes center stage. James Brown gets props on "James Brown"; "Better Than I Am" recalls the classic ballads of Stevie Wonder; On "Jungle Groove," jungle—the dance music that no one can really dance to—gets wrapped in colorful, propellent Avant-Jazz ribbons; and Brazilian influences surface on "Samba Bop." *Marie Elsie St. Léger*

CD STORAGE CONNECTION
FOR ADVERTISING INFORMATION
CALL 1-800-445-6066, 9AM-5PM EST.

Component Storage +


Combo 3R


Combo 4R

+ Quick, no tool assembly.
+ Solid steel support system.
+ 15 standard models.
+ Custom units available.
+ Flexible shelf spacing.
+ Solid oak, walnut, cherry or black MDF shelves.


Combo 8R

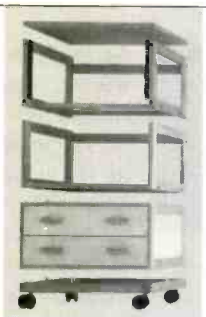
Get your free information kit today!

SORICÉ PO Box 747-71 Nutley, NJ 07110

Call: 800-432-8005 Fax: 201-667-8688

e-mail: soriceav@aol.com

Modular stackable oak units hold all recording formats & components

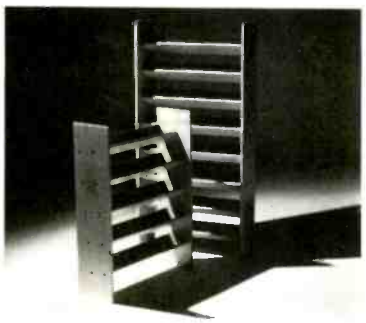


Tabletop Rail Rack
Component Rack
Drawers
Dolly

America's best disc, tape and component storage system

Free mail-order brochure
(please mention Audio)

Per Madsen Design (415) 822-4883
P.O. Box 882464, San Francisco, CA 94188



STORADISC™ - See why CD Review picked our Library Series as their "top choice". Fine-furniture quality in a variety of finishes and sizes. Call or write DAVIDSON-WHITEHALL, 555 Whitehall Street, Atlanta, GA 30303. 1-800-848-9811.

ADVERTISERS...

Reach proven mail order buyers! They turn to us when they are looking for purchasing information and advice.

Advertise your products and services in a low-cost environment that sells. Millions of your prime prospects can be found in the industry leading titles of ***Hachette Filipacchi Magazines, Inc.***

To place a classified ad, simply call us ***Toll-Free*** and reserve your space today!

1-800-445-6066 (9am-5pm EST)

or Fax your order to 212-767-5624.

BILLY BAGS®
AUDIO/VIDEO FURNITURE DESIGN

*"We'll even design a piece to your exact specifications!" Our **CUSTOM** design department is fast and affordable. We also offer over 100 stock designs of unequaled quality.*


PRO1000 Holds 1000 CDs


PRO34 Audio/Video Rack
The Wave CD Storage


5005 Component Center
2300 Audio Rack


Visit your local stocking dealer and browse through our new catalog.


The Audio Duster
A Must
Now only $19.95

*Call us today for your local dealer and a copy of our detailed **Newsletter** with product photos and specifications...*

4147-A Transport St. • Ventura, CA 93003
805/644-2185
Fax: 805/644-0434 • E-mail: billy@billybags.com
http://www.billybags.com

The AUDIO CD STORAGE CONNECTION

puts manufacturers of CD storage units in touch with the ideal audience... CD purchasers unsurpassed in size, buying activity & the need for storage of their ever-growing CD collections! For advertising information call:

1•800•445•6066
(Monday-Friday, 9-5 EST)
or Fax 212-767-5624

CALIFORNIA

dream system

Call us today and let us make your dreams a total reality!

Reference AudioVideo
Ask us how.

310 517-1700
310 517-1732 fax

18214 Dalton Avenue, Dept A
Gardena, CA 90248
email: rav2000@aol.com

Certified installations (CEDIA, THX)
State contractor's license #725552

MAINE

Your world class resource for audio and home theater systems.

Acurus ... ADA... Aragon ... Audio Research ... Bryston... B&K... Citation... Creek ...Grado ... JM Labs ... Jolida ... Magneplaner ... Magnum Dynalab ... Mark Levinson ... MBL... Meridian... Meadowlark... M&K... NAD... NEAR... Parasound... Proceed... PSB ... Revolver ... Rotel ... SME ... Sota ... Stewart ... Sumiko ... Symdex ... Transparent Audio ... Vidikron... and much, much More!

Hi Fi Exchange

Foreside Mall – Route 1
Falmouth, ME 04105
(800) 244-2326
Home of *LK Smith* signature theaters.

ILLINOIS

VISIT THESE SPECIALTY RETAILERS FOR PROFESSIONAL CONSULTATION.

DEALER SHOWCASE

ILLINOIS

HOLM AUDIO HOME OF THE BEST
Audio - Video - Products

SERVING THE CHICAGOLAND AUDIOPHILE

Alon	Elac	Merlin	Sonoran Cables
Ampro	Ensemble	Meso Baron	Sota
Apogee	G&D Transforms	Mobile Fidelity	Sovtek
ATI	Gold Aero	Monitor Audio	Sunfire
Audio Alchemy	Golden String	Montana Speakers	System Audio
Audio Magic	Golden Tube	MØRCH	Synergistic Research
Audio Note	Gradient	Muse	T.A.D
Audio Prism	Grado	NAD	Tannoy
Audioquest	Hooker Furniture	Nordost Flotline	Target
Audiovector	Jolida	Pink Triangle	TDL
Bedini	Joseph Audio	Pope Music	Thorens
Black Diamond Racing	Joule Electra	PS Audio	Timbre
Camelot	JVC Discs	QED	Toshiba
Cary	Kusma	Reference Recordings	Townshend
CEC	Lightspeed	Rega	TPC
Chesky	Lovan	Roomtunes	Unity Audio
Chiro	Magnum	Runco	Ultrasystems
Classic Records	Marigo	Salamander Designs	Vampire
Copland	MBL	Sennheiser	van den Hul
Duntech	McCormack	Sheffield	Von Schweikert Spkrs
Dynaudio	Melos	Shure	VPI
Ear Max	Meridian	Signature Audio	VTL
		Solid Steel	Wilson Benesch
		Sonic Integrity	Zyp

TRADE INS WELCOME
Ask About Our 1-Year/100% Trade Up Policy!

450 Ogden Avenue
Lisle, IL 60532

Phone: (630) 663-1298
Fax: (630) 663-1198

PENNSYLVANIA

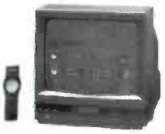
VIDEO PLUS AUDIO

6533 Roosevelt Blvd., Philadelphia, PA 19049
If you don't see what you're looking for, please call

SPEAKERS & SUBS
AUDIO COMPONENTS

VIDEO EQUIPMENT

HOME THEATER PACKAGES



Acoustic Research
Atlantic Technology
Bose, Canon
harmon/kardon
Jamo, JBL,
JVC, Kenwood,
Monster Cable, NAD
Sony, Toshiba, Infinity
and much more!

or call us for door to door delivery

800-226-6784

http://www.videoplusaudio.com
email: DTLVPA@aol.com

MASSACHUSETTS

The Best Values In Hi End Hi-Fi.

audio studio

Authorized sales and service for:
Audible Illusions, Audioquest, B&K, Beyerdynamic, Counterpoint, Dual, Klyne, Maplenoll, Marantz, Mirage, Mission, Monster Cable, Morel, NAD, Nakamichi, Oideion Products, Ortofon, Project, Proton, QUAD, Renaissance Audio, Revox, Sennheiser, SME, Shure, Stax, Straight Wire, Sumiko, Thorens, Velodyne, VPI, and many more.

414 Harvard St., Brookline, MA 02146
(617) 277-0111
FAX (617) 277-2415
INTERNATIONAL BUSINESS ACCEPTED

NEW YORK

SHOP US LAST

FACTORY AUTHORIZED DEALERS
HOME THEATER

SINCE 1979
ADS • ALPINE • ATLANTIC TECH
BOSE • CARVER • DENON • INFINITY
KENWOOD • NAKAMICHI
ONKYO • SONANCE • SONY ES
VELODYNE • YAMAHA*
and many we can't print!

CAR STEREO

The Sound Approach
6067 Jericho Tpke., Commack, NY 11725
800-368-2344
FULL FACTORY WARRANTY
*IN-STORE WARRANTY

TEXAS

AUDIO BY DESIGN

MAKE US AN OFFER... WE DELIVER!

Acurus	Mirage
Angstrom	Niles
Aragon	Onkyo
Arcam	Parasound
AudioQuest	Quicksilver
Bryston	Rega
CAL Audio	Ruark
Citation	SharpVision
Enlightened Audio	Snell
Denon	Sonic Frontiers
Melos	Stand Design
Jolida	Threshold

FACTORY AUTHORIZED
CALL FOR LINES NOT LISTED
(512) 458-1667
911 W. Anderson Ln. #116
Austin, TX 78757

MICHIGAN

POWER To The People

FOR A FREE CATALOG CONTACT
ME•NIS•CUS
MENISCUS AUDIO GROUP

4669 S. Division
Wyoming, MI 49548
1-800-536-3691
E-mail: meniscus@iserv.net

10,000 Satisfied Customers Strong

PENNSYLVANIA

21 spectacular show rooms in our new, state-of-the-art facility!

SOUNDEX
HIGH-END AUDIO • VIDEO • HOME THEATER

1100 Easton Road
Willow Grove, PA 19090
215-659-8815

Acurus • Anthem • Aragon • Audio Alchemy • Audio Research • B&K • Cal Audio Labs • Dunlavy Audio Labs • Dynaudio • Faroudja • Forté • Grado • Krell • Lexicon • Magnum Dynalab • Mark Levinson • Mirage • Niles Audio • Onkyo • Pioneer Elite • ProAc • Proceed • Sonic Frontiers • Sony • StraightWire • Sumiko • Tara Labs • Threshold • Tice Audio • Transparent Cable • VPI • Vidikron • Wilson Audio •
AND MANY MORE!

VERMONT

SENSIBLE, PERSONAL HI FI ADVICE,
TOLL-FREE

HERE IN VERMONT, PEOPLE DEMAND VALUE
WE DON'T WASTE CUSTOMERS' MONEY,
AND NEITHER DO THESE FOLKS:

ADCOM ATLANTIS AUDIOQUEST
B&W CASTLE GRADO
MONSTER NAD ONKYO
ORACLE PSB ROTEL*
STANDESIGN TARGET
TDL WHARFEDALE

* TERRITORIAL RESTRICTIONS

100% FINANCING AVAILABLE
FREE INSTALLATION IN NEW ENGLAND & N.Y.C.
5-YEAR WARRANTIES ON ALL NEW EQUIPMENT

800 456-4434
(802) 257-5855

SCIENTIFIC STEREO
128 MAIN ST — BRATTLEBORO VT 05301

DEALER SHOWCASE

VIRGINIA

Musicscope Co. Ltd.

The Quality Audio/Video Store

Tel:(703)938-1111

Serving Northern Virginia/DC/MD area

***AudioQuest**	***AudioPrism**
*Ampro	*Anthem
***B&K**	***Bryston**
***Citation**	*Carver
***Denon**	***Faroudja**
*Harman/Kardon	*Luxman
***NHT**	***Nakamichi**
*Panamax	*Panasonic Superflat
***PSB**	***Pioneer/Elite**
*QED	*Runco
*Stewart	***Shahinian**
***Theta**	*Tara Labs
*Target	and much more.....

http://www.musicscope.com

WISCONSIN

the Happy Medium

Expensive Electronics Without the Expense!

- ARCHITECURAL AUDIO
- DAT
- MINIDISC
- WORLD BAND RADIO
- PRO WALKMAN
- CABLES
- FIELD RECORDERS
- DSS
- SONY DST
- CUSTOM INSTALLATION
- HOME THEATER
- ACCESSORIES

• ADS	• NAD
• AMC	• NAKAMICHI
• ATLANTIC TECHNOLOGY	• NILES AUDIO
• BANG & OLUFSEN	• ONKYO
• CARVER	• PANAMAX
• CELESTION	• POLK AUDIO
• GRADO	• PSB SPEAKERS
• HARMAN KARDON	• SANUS SYSTEMS
• JVC	• SUNFIRE
• KEF	• SONY ES
• LEXICON	• TARGET
• MONSTER CABLE	• THORENS

430 State Street • Madison, WI 53703 • FAX 1(608) 255-4425

1-800-906 HI-FI (4434)

VIRGINIA

THE BEST IN HOME GROWN AUDIO

With over 20 years of experience in hi-end audio equipment, we proudly inventory the following products:

◆ Quad	◆ Spendor
◆ Accuphase	◆ Coda
◆ OCM	◆ Kimber
◆ Clayton	◆ B&K
◆ Cardas	◆ Kora
◆ Epos	◆ YBA
◆ Von Schweikert	◆ Alon
	◆ Creek

We have a huge assortment of accessories and many more brands to choose from. We also offer a large inventory of used equipment.

Call For Information Toll Free:

1·800·752·4018

Hi-Fi Farm

616 Plaza, Suite 5, Moneta, VA, 24121

Or Order On Line At:

http://www.hififarm.com

DEALERS...

The best place to be seen is where people are looking. And each month, both enthusiasts & dealers read **AUDIO** for information.

The **AUDIO** **Dealer Showcase** is an ideal forum to reach interested audio/video enthusiasts who are active buyers themselves, and who advise others on stereo and video purchases.

The Dealer Showcase is an exclusive section designed to showcase your advertising in **AUDIO**.

To place your ads, or for further information call Toll Free:

1-800-445-6066

9am to 5pm est

or

Fax your order to

(212) 767-5624

VISIT THESE SPECIALTY RETAILERS FOR PROFESSIONAL CONSULTATION.

CLASSIFIED ADVERTISING

PLEASE NOTE: It is impossible for us to verify all of the claims of advertisers, including product availability and existence of warranties. To confirm that an advertiser is authorized to sell a product, we suggest you contact the manufacturer directly. Please review our *Tips for Mail Order Purchasers* in this section.

AUTHORIZED

AUDIOPHILE & SCHOLAR

UNIVERSITY AUDIO SHOP, MADISON, WI

AUDIO RESEARCH, KRELL, Linn, YBA, Aragon, Acurus, B&K, MARTIN LOGAN, VANDERSTEEN, NHT, PARADIGM, Spica, Hales, Totem, Von Schweikert, Ariel, Creek, EAD, Micromega, CAL, Golden Tube, Tara, Lexicon & Thiel. (608) 284-0001.

OUR 21ST YEAR! CALL 1 (800) 826-0520. ★ NAD ★ SONY ES ★ ONKYO ★ CARVER ★ KEF ★ HARMAN KARDON ★ LEXICON ★ ADCOM ★ NAKAMICHI ★ AMC ★ POLK AUDIO ★ SUNFIRE ★ ATLANTIC TECHNOLOGY ★ PROAC ★ TARGET ★ VELODYNE ★ PSB ★ PANAMAX ★ MONSTER CABLE ★ JAMO ★ GRADO ★ AUDIOCONTROL ★ CELESTION ★ THORENS ★ SANUS SYSTEMS ★ NILES AUDIO ★ OMNIMOUNT ★ SOUNDSTREAM ★ ROCKFORD FOSGATE ★ SOUND SELLER, BOX 224, 2808 CAHILL, MARINETTE, WI 54143-0224.

STEREO WORLD IS YOUR DISCOUNT SOUND SOURCE SUPER DEALS ON: SONY, PYLE, DENON, ADS, CLARION, AUTOTEK, JVC, LANZAR, POLK, BLAUPUNKT, PIONEER, SCOSCHE EFX, PANASONIC, INFINITY, ADVENT CAR, KITS, BASSBOXES AND MUCH MORE! CALL OR WRITE FOR FREE SALES FLYER. FREE UPS! OUR 8TH YEAR. VISA/MC; COD. P.O. BOX 596, MONROE, NY 10950. (914) 782-6044.

FOR SALE

SAVE 40% ON HIGH-END home speakers, subwoofers, amplifiers. FREE CATALOG, 3021 Sangamon Avenue, Springfield, IL 62702. 1-800-283-4644.

AUDIO BY VAN ALSTINE ΩMEGA III active feedback amplifiers, full function buffered preamplifiers, basic line-headphone preamplifiers, phase inverters, and parallel processing DACs provide stunning clarity and musicality with economical prices, rugged engineering, and long-term durability! New ultratransparent **BIRO LOUDSPEAKERS** give $6000 performance for under $1600. **FET-VALVE** hybrid tube DACs, amplifiers, and preamplifiers achieve ultimate faithfulness to the spirit of the music. Active feedback circuits for **DYNACO** and **HAFLER** amplifiers set new standards for transparency, dynamic range, and liquidity. Recycle your **PAS, PAT-4, PAT-5,** and **ST-70** with AVA circuits (kit of wired) from $199 including new cards and precision controls. Free illustrated catalog with reviews. Audio by Van Alstine, 2202 River Hills Drive, Burnsville, MN 55337. (612) 890-3517. Fax: (612) 894-3675. E-mail: avahifi@aol.com

BUY DIRECT FROM JAPAN AND SAVE $$$! SUPPLIERS OF JAPANESE FAMOUS BRANDED ELECTRONICS. WORLD-WIDE SHIPPING AVAILABLE. RAMSONS CORPORATION (JAPAN) LTD. TELEPHONE: 6-271-6185; FAX: 6-271-6183. E-MAIL: ramsons@sun-inet.or.jp

MUSICAL CONCEPTS SIGNATURE

Signatures have arrived! New mods with **HyperFast** diodes, **BlackGate** caps and more. **Signature** updates for all previous mods—now! **Adcom, Audio Alchemy, B&K, Dyna**(tubes, too!) and **Hafler** mods! **PA-2** front-end board for Hafler amps! **Signature** CD is ready! Enigma, Epoch CD players and CDT-4 Transport $795—Highly-rated by *The Audio Adventure*. Marantz, Rotel, Pioneer CD mods. Musical Concepts, 5749 Westwood Dr., St. Charles, MO 63304. (314) 447-0040.

FOR SALE

AUDIO CONNECTION
NEW JERSEY'S BEST SELECTION

BEST SOUND AT THE SHOW FOR LESS THAN $50,000!

• Vandersteen	* Rotel	• Wadia
* B and W	• Sonic Frontiers	• Cary
• Proac	• Audible Illusions	• Arcam
• Kimber Kable	• AudioQuest	• Audiolab
• Caudas	• Quicksilver	• Ayre

* No mailorder: B&W, Rotel

615 Bloomfield Avenue, Verona, New Jersey 07044
Phone: (201) 239-1799 • Fax: (201) 239-1725

SINGERS! REMOVE VOCALS
Unlimited, Low Cost, Instantly Available Background Music from *Original Standard* Recordings! Does Everything Karaoke does... *Better and* gives you the Thompson Vocal Eliminator™
Free Brochure & Demo Tape
LT Sound Dept AU-1
7980 LT Parkway, Lithonia, GA 30058
Internet-http://ltsound.com
24 Hour Demo/Info Request Line (770)482-2485-Ext 51
When You Want Something Better Than Karaoke!

THE NEW PRODUCTS ARE HERE! The UTP-1 ($1295) and the UCD-1 ($995) combine improved sound with new cosmetic appeal. Our Basic Player ($549) and the **Reference One** transport ($649) have made BOUND FOR SOUND'S Components of Merit list. Low jitter kits still available. **G&D TRANSFORMS**, (602) 650-1155. E-mail Transforms@aol.com

SAN FRANCISCO AREA—IRRESISTABLY priced audiophile components/accessories. Shipped/delivered. All prices! By appointment only. 444 Eastwood, Petaluma, CA 94954. (707) 765-1992.

AUDIO CABLES & MORE

DON'T PAY EXORBITANT PRICES ! FOR TOP QUALITY !

We have equaled the high-priced brands. Sonic equivalents at a fraction of their cost. We demystify wire technology. Ask for literature.

AND MORE! DACS, Anti-Jitter Units, CD Players/Transports, Speaker Stands. Speakers, Home Theater, Prologic, Accessories-& MORE. Call 800-321-2108 24hrs./day for free catalog.

L A T INTERNATIONAL
Dept. A 317 Provincetown Road
Cherry Hill, NJ 08034

HI FI EXCHANGE. Large selection of quality USED highend components at huge discounts. We buy, sell & trade. Call for inventory list. (718) 423-0400 or visit our showrooms at 251-11 Northern Blvd, Little Neck, NY 11363.

FOR TWENTY-FIVE 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. SOUND INVESTMENT CORPORATION, 3586 PIERCE DRIVE, CHAMBLEE, GA 30341. (800) 659-TAPE (8273), IN GA (770) 458-1679. FAX: (770) 458-0276.

FREE SHIPPING! PLUS:
FRIENDLY ADVICE! MIRAGE, PS, KEF, PARASOUND, KINERGETICS, NAD, AUDIOQUEST, CARVER, KIMBER, STRAIGHTWIRE, MORE! READ BROTHERS, 593 KING, CHARLESTON, SC 29403. (803) 723-7276.

USED & DEMO HIGH-END & HOME THEATER EQUIPMENT AT UNBELIEVABLE SAVINGS! CALL OR E-MAIL OR FAX FOR YOUR FREE CATALOG—VOICE/FAX: 609-799-9664. E-MAIL: Savant@SavantAudio.com WWW.SavantAudio.com

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, who pays the postage for returned merchandise, and whether there is any "restocking" charge.
3. Understand the product's warranty. Is there a manufacturer's warranty, and if so, is it from a U.S. or foreign manufacturer? **Note that many manufacturers assert that, even if the product comes with a U.S. manufacturers warranty card, if you purchase from an unauthorized dealer, you are *not* covered by the manufacturer's warranty. If in doubt, contact the manufacturer directly.** In addition to, or instead of, the manufacturer's warranty, the seller may offer its own 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. If you pay by credit card, you may have a greater recourse in the event the advertiser does not perform. (Check the complaint procedures of your credit card companies). 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 Post Office.

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 Susan Ross, Special Marketing, 45th floor, Hachette Filipacchi Magazines, 1633 Broadway, NY, NY 10019. Be sure to include copies of all correspondence.

FOR SALE

DJ & Nightclub
Sound, Lighting & Video CATALOG
FREE 88-Page Catalog with a huge selection of name brand professional gear for DJ's, Clubs & Musicians all at discount prices!
Call Today 800-672-4268
Mail Order Center: 11711 Monarch St., Garden Grove, CA 92841 *Retail Super Store:* Music To The Max 14200 Beach Blvd., Westminster, CA 92683 (714) 379-1994

PRO SOUND & STAGE LIGHTING™ OUR 20th YEAR!

WHOLESALE CONNECTION
TO ORDER CALL **1-800-226-2800**
http://www.wholesaleconnection.com

Receivers

JVC			
RX518	Call	RX718	Call
RX618	Call	RX818	Call
TECHNICS			
SAEX500	Call	SAEX900	Call
SAEX700	Call	SATHX50	Call
KENWOOD			
KRV6080	Call	KRV9080	Call
KRV7080	Call	KRV990D	Call
KRV8080	Call	KRX1000	Call
PIONEER			
VSX455	Call	VSXD704S	Call
VSX505S	Call	VSXD903S	Call
VSX604S	Call	VSXD3S	Call
HARMON KARDON			
AVR20	Call	AVR80	Call
AVR25	Call	FL8300	Call
AVR70	Call	FL8450	Call
ONKYO			
TXSV525	Call	DXC220	Call
TSXV727	Call	DXC320	Call

CALL FOR OTHER BRANDS

CD Players

JVC			
XLF152	Call	XLM218	Call
XLF252	Call	XLM418	Call
TECHNICS			
SLPD887	Call	SLMC400	Call
SLPD1010	Call	SLMC50	Call
KENWOOD			
DPR4080	Call	DPJ1070	Call
DPR5080	Call	DPJ2070	Call
DPR6080	Call		
PIONEER			
PDF605	Call	PDF905	Call
PDF805	Call	PDF1005	Call

CALL FOR OTHER BRANDS

Tape Decks

JVC			
TDW218	Call	TDW718	Call
TDW318	Call	TDV662	Call
TECHNICS			
RSTR252	Call	RSTR575	Call
RSTR373	Call		
KENWOOD			
KXW4080	Call	KXW6080	Call
PIONEER			
CTW505	Call	CTW704RS	Call
ONKYO			
TARW411	Call	TARW505	Call

CALL FOR OTHER BRANDS

DAT RECORDER
Portable & Home Call

MINI DISC RECORDER
Portable & Home Call

DVD • *Now Available*

DSS • *All Brands Available*

Camcorder

JVC			
GRAX810	Call	GRAX1010	Call
GRAX910	Call	GRVD1	Call
PANASONIC			
PVD406	Call	PVD506	Call
SHARP			
VLE39	Call	VLE49	Call
CANON		**SONY**	
ES5000	Call	CCDTRV30	Call

Portable CD Players

SONY			
D247	Call	D844	Call
D242CK	Call	D848	Call
KENWOOD			
DPC662	Call	DPC861	Call
PANASONIC			
SLS241C	Call	SLSW202	Call
SLS341C	Call	SLSW404	Call

CALL FOR OTHER BRANDS

Home Speakers

BOSE			
AM5II	Call	901	Call
AM7II	Call	701	Call
LS12	Call	501	Call
LS20	Call	301	Call
100BK	Call	151BK	Call
INFINITY			
RS2000.2	Call	SM65	Call
RS2000.3	Call	SM85	Call
RS2000.4	Call	SM105	Call
RS2000.5	Call	SM125	Call
RS2000.6	Call	SM155	Call
RSVIDEO	Call	VIDEO1	Call
B.I.C.			
ADATTO	Call	V802	Call
V52si	Call	V504	Call
V52clr	Call	V604	Call

Powered Subwoofer

INFINITY		BU1	Call
INFINITY		BU2	Call
MTX		PSW101	Call
KENWOOD		SW200	Call
KENWOOD		SW300	Call
B.I.C.		V1000	Call
B.I.C.		V1200	Call
AIWA		TSW5	Call
AIWA		TSW9	Call

Mini Systems

AIWA			
NSXV8000	Call	NSXAV800	Call
NSXV9000	Call	NSXAV900	Call
PIONEER		**PANASONIC**	
CCS205	Call	SCCH64	Call
CCS305	Call	SCCH94	Call
JVC			
UXC30	Call	MXD7T	Call
MXD47	Call	MXD8T	Call

Car Stereo

JVC			
KSRT404	Call	KDGS711	Call
KSRT414	Call	KDGS911	Call
KDMK78RF	Call	KDMK79RF	Call
PIONEER			
KEHP404	Call	DEH53	Call
KEHP505	Call	DEHP625	Call
KEHP606	Call	DEHP725	Call
KEHP808	Call	DEHP825	Call
DEH49	Call	DEXP88	Call
DEH59	Call	CDXFM67	Call
DEH43	Call	CDXFM128	Call
KENWOOD			
KRC302	Call	KDC5005	Call
KRC502	Call	KDC6005	Call
KRC702	Call	KDC7005	Call
KRC802	Call	KDC8005	Call
KRC902	Call	KDCPS905	Call
KDCC604	Call	KDCC803	Call

Radar Detectors

BEL			
840i	Call	945i	Call
850sti	Call	615sti	Call
855sti	Call		
WHISTLER			
1430SWH	Call	1490SWH	Call
1465SWH	Call		
UNIDEN			
LRD6199	Call	LRD6499	Call
LRD6399	Call		

Telephones

SONY			
SPPQ120	Call	SPPD900	Call
SPPQ25	Call	SPPID910	Call
PANASONIC			
KXT9500	Call	KXT9550	Call
KXT9520	Call	KXTC930	Call

Laser Discs

PIONEER			
CLDD505	Call	CLDD704	Call

Call for Brands & Models Not Listed

24 HR. FAX (516) 564-9593
We accept M/C, Visa, Amex, & C.O.D.
P.O.'s Welcome
We ship UPS & FEDEX
WHOLESALE CONNECTION 361 Charles St., West Hempstead, NY 11552

ADVERTISING
CALL 1-800-445-6066, 9AM-5PM EST.

CLASSIFIED
FOR ADVERTISING INFORMATION

AUDIO CLASSICS, LTD. www.audioclassics.com Buys-Sells-Trades-Repairs High End & Vintage Equipment. 607-865-7200 8AM-5PM M-F ET, Fax 607-865-7222 **Moving Sale - Make an offer!** Call for condiontion. **AMPLIFIERS:** Accuphase P260 $699; Adcom GFA565 $999; Air Tight ATM2 $4495; ARC CLASSIC-30 $1367, D115 $995, D120 $599, M100 $2355, M300-MKII $4939, V140 $3875, VT60 $1995; B&K TX4430 $1328; B&W MPA1 $599; Carver A500X $697, A760X $945, AV505 $700, AV634 $251, AV806X $1139, TFM15CB $364, TFM25 $442, TFM55X $797, TFM75 $1604; Cary CAD300B $3311, CAD300SE $2583, CAD301SE $2735, CAD805 $3799; Classe DR8 $1063; CJ MF2100 $899; Counterpoint SA220 $1595; Crown D150A-II $379, REF-2 $2145; Golden Tube SE40 $714; SE300B-MKII $1399, SE-100 $1691; HK CITATION-II $455; PA2400 $531; Krell KMA100 $2735, KMA200 $3647, KSA100-II $1443, KSA100S $2735, KSA150 $2399, KST100 $1499; Marantz 9-II $3568, MA500 $218; McIntosh MC30 $299, MC60 $799, MC75pr $2500, MC150 $2256, MC225 $455, MC240 $683, MC275-II $2963, MC500 $4559, MC502 $599, MC752 $569, MC754 $599, MC1000 $3799, MC2105 $549, MC2120 $599, MC2300 $1199, MC2505 $365, MC7100 $994, MC7104 $1499, MC7106 $2632, MC7108 $1270, MI200 $1759; Mesa BARON $3158; PS Audio DELTA-200 $1094, DELTA-250 $1291, TWO-C $149; Sonic Frontiers SFS40 $899; Sound Valves VTA70 $399; Sunfire $1884; Tandberg TPA3026A $599; Yamaha M70 $227. **CASSETTE DECKS:** Marantz SD545 $243, Nakamichi DRAGON $1063, RX202 $299. **CD PLAYERS:** CAL TERCET $299; Carver SDA370 $476; Denon DCM360 $291, DN961FA $1465; HK FL8450 $248, Marantz CD53 $199, CD63SE $349, McIntosh MLD7020 $1519; Rotel RCD820 $227. **CD TRANSPORTS:** Audio Alchemy DDS-1.0 $167; CJ DR1 $1291; Krell DT10 $4099. **DIGITAL PROCESSORS:** Aragon D2A-II $719; Audio Alchemy DITB $144, DTI $113, XDP $136; ARC DAC1-20 $1199; CAL SYSTEM-1 $873; CJ DA3 $873; Enlightened Audio DSP1000 $455; Krell SBP32X $1063, STUDIO-2 $1063; PS Audio DIGILINK-3 $493, SUPERLINK $303, SUPERLINK-II $455; Sonic Frontiers SFD1 $987; Wadia DIGIMASTER-32X $759. **EQUALIZERS:** McIntosh MQ101 $151, MQ104 $99, MQ107 $113, MQ108 $299; White 4500 $227. **HEADPHONES:** Stax LAMBDA-CLASS-MX $651, SIGMA-PRO-T1 $987, SR001 $399, SR34-PRO $162, SR-LAMBDA-SIG $607, SRD7SB $136. **INTEGRATED AMPS:** Cary SLI50 $1519; McIntosh MA230 $227, MA5100 $243, MA6200 $987, MA6400 $1995, MA6800 $3343; Spark 530 $899. **PREAMPLIFIERS:** Adcom GFP555 $113; Air Tight ATC2 $3495; ARC LS2 $1215, LS7 $1226; Carver C5 $341, C20V $455; Classe DR6 $1099; Coda 01P $1499; CJ PREMIER-10 $2083, PV12L $1215; Counterpoint, SA5000 $2299; Golden Tube SEP1 $832; Hafler DH110 $136; HK CITATION-25 $237; Krell KRC $3647, KSL2 $1823; Lazurus CASCADE-BASIC $299; Marantz 7T $265; McIntosh C20 $799, C22 $1499, C22-II $1671, C24 $189, C26 $265, C27 $455, C28 $189, C32 $569, C37 $1063, C38 $1776, C39 $2995, C504 $379, C710 $799, CR10 $911, CR12 $1671; Mod Squad LINE-DRIVE-D $531; Nobis PROTEUS $1299; Theta DS-PRE-GEN-III $1823; VAC VINTAGE-LINE $759. **RECEIVERS:** B&O 5000 $189; Carver HR742 $474, HR875 $638, HR895 $950, HTR880 $582; HK AVR30 $706, HK3350 $276; Marantz SR73 $417; McIntosh MAC4100 $873, MAC4200 $1519; Sony STRG1ES $417. **SPEAKERS:** Apogee COLUMN $995, IN-WALL-3 $995, SLANT-8 $3036, STAGE $2276; B&W 804-MATRIX $1715, DM640 $835; Bozak B310B $995; Carver ALIII-PLUS $1519; Celestion SL600 $683; Harbeth LS5/12A $759; Jamo ART $170; JBL SVA1800 $1199, SVA2100 $1474; Joseph RM7SI $1089; KEF 104/2 $1063, FOUR $3039, LS3/5A-SIG $1191, ONE $1155, TWO $1660; Klipsch CHORUS $683, HI-SM $151, K-HORN $2279; Martin Logan SEQUEL-II $1519; McIntosh HT3 $318, LS350 $455, ML1C $189, XL1W $113, XR5 $265, XR7 $379, XR14 $455, XR240 $683, XRT18 $1519, XRT24 $3039; NEAR AEL1 1 $242, AEL2.0 $493; Ohm 4 $759; Platinum STUDIO-1 $792; Rogers LS5/9 $455; Sound Lab QUANTUM $2051; Tannoy D5R $300, D10 $272, D20 $397, D30 $599, D50 $952, D70 $1136, D80 $1349, D700 $3747, PS115 $899, SUBSAT-3 $529, 10-II $1709, 12-II $2341, 15 $3039, 600 $623; Video Acoustics THEATRE $379; Wharfdale 505.2 $151. **SPEAKERS-RAW:** JBL 2220A $188, 2220J $136; Stephens 10o $75; TAD TD4001 $759. **SUB-WOOFERS:** BIC V12 $425; M&K MX2000 $759; McIntosh HT2 $899, Velodyne F1000 $729, ULD-15-II $1177. **SYSTEMS:** Denon POINT-COMBO $405. **TAPE DECKS:** Sound Technology 1500A $1519; Teac X300R $227. **TEST EQUIPMENT:** Audio Control R130 $598, SA3050A $954; McIntosh AA2 $440, MI3 $379. **TUNER PREAMPS:** Carver CT3 $350, CT26V $530, CT27V $569, CT28V $638, CT29V $820; McIntosh MX110 $349, MX112 $265, MX113 $455, MX114 $319, MX117 $987, MX118 $1519, MX130 $2429. **TUNERS:** Accuphase T109 $2469; Sequerra STUDIO $1823; Fanfare FT1 $1053; HK CITATION-IIIX $129; Magnum ETUDE $1087, FT-R $431; McIntosh MR55A $299, MR65 $299, MR65B $349, MR66 $399, MR67 $399, MR71 $499, MR77 $341, MR78 $987, MR80 $911, MR500 $531; Tandberg TPT3001A $645. **TURNTABLES:** ARXA $196, VPI HW19-III $911, HW19-JR $816, TNT-3 $3844. **AUDIO CLASSICS, LTD. www.audioclassics.com** 34 Gardiner Pl., POB 176AAA, Walton, NY 13856 **607-865-7200** 8AM-5PM M-F ET

FOR SALE

SATURDAY AUDIO EXCHANGE—Chicago's Source For Discontinued, Demo, Used & New Home Audio Equipment For 15 Years. For Information Call 773-935-U-S-E-D Or See Our Online Catalog At http://saturdayaudio.com

LOWEST DISCOUNT PRICES! ADCOM, B&K, B&O, BRYSTON, B&W, CARVER, CELESTION, CITATION, CLASSE, DEFINITIVE, DENON, DYNAUDIO, H/K, KEF, LEXICON, LUXMAN, MIRAGE, NAKAMICHI, NHT, ONKYO, PIONEER ELITE, POLK, ROTEL, SUNFIRE, TANDBERG, THIEL, VELODYNE, WADIA, WILSON, MANY MORE. INCORPORATED 1964.

NORCROSS, INC.
(770) 772-7700

MONEY SPENT SOUNDLY

AUDIO EXCELLENCE, INC.

THE BEST AUDIO & VIDEO EQUIPMENT FROM ALL MAJOR MANUFACTURERS
DENON • NAKAMICHI • ONKYO
SONY ES • YAMAHA • BOSE • KLIPSCH
B+W • VELODYNE • AND MORE!
SPECIALISTS IN HOME THEATRE SYSTEMS & HIGH-END AUDIO

CALL NOW (212) 229-1622
145 West 24th Street, New York, NY 10011
All Major Credit Cards Accepted

HOME THEATER SPECIALISTS

ABC
American Buyer's Club Int.
1-800-354-1324
FAX your order: 908-294-7480
VISIT OUR WEBSITE
WWW.STEREOABC.COM

RECEIVERS
YAMAHA
RX-V990 ..... AC-3
RX-V2090 ..... CALL
HARMON/KARDON
AVR80 MK II ..... CALL
AVR25 MK II ..... CALL
DENON
AVR3200 ..... CALL
AVR3600 ..... AC-3
AVR5600 ..... THX
SEPARATES
NAD
218 THX ..... AMP
PARASOUND
P/SP-1000 ..... PRO-LOGIC
HCA 1206 ..... AMP
ADCOM
GTP ..... PRE AMP
GFA7000 ..... AMP
CARVER
TFM35X ..... CALL
DVD PLAYERS
PIONEER
DVL700 ..... CALL
SONY
DVP-S7000 ..... AC-3
RCA
S200P 449

SPEAKERS
KEF
Q70 ..... CALL
MODEL THREE ..... CALL
PSB
STRATUS GOLD ..... CALL
STRATUS MINI ..... NEW
CAMBER
LASER and TI SERIES ..... CALL
ATLANTIC TECHNOLOGY
SYSTEM 350 THX ..... IN STOCK
BOSE
AM 10 ..... NEW LOW PRICE
AM 7 II ..... LOWEST PRICE
MIRAGE
MANY MODELS ..... CALL
BIC
V62 SI ..... TOP RATED
BIG SCREEN
HITACHI ..... AUTHORIZED
TOSHIBA ..... DEALER
SONY ..... CALL
RCA ..... CALL
SUBWOOFERS
VELODYNE
FSR-12 ..... LOWEST
KLIPSCH
KSW 200 ..... CALL
MIRAGE
BPS 150i ..... IN STOCK

FRIENDLY PEOPLE & EXPERT ADVICE!
For info & customer service call 908-780-6600

MILLION DOLLAR INVENTORY
5 YEAR WARRANTIES AVAILABLE ON ALL PRODUCTS
ABC 130 Highway 33 • Englishtown, NJ 07726
All products are new USA merchandise covered by the manufacturers warranty or ABC's exclusive limited warranty. MEMBER OF THE BETTER BUSINESS BUREAU

STEVE'S CONSIGNMENT SHOP HI FI FARM AND STEVE'S AUDIO ADVICE NOW OFFERS CONSIGNMENT OPPORTUNITIES FOR THE USED AUDIO MARKET. TOP DOLLAR OFFERED. CALL FOR INFORMATION. NEW EQUIPMENT ALSO. CALL 1-800-752-4018.

LOUDSPEAKERS

CUSTOM ACTIVE ELECTRONIC CROSSOVERS. 6 to 36 dB/Oct. Also Snell, Magnepan versions. DB SYSTEMS, POB 460, RINDGE, NH 03461. (603) 899-5121.

SOLEN

EUROPEAN **SPEAKER DRIVER UNITS CATALOG**

AIRBORNE
LA PASSION DU HAUT-PARLEUR
AUDAX
DYNAUDIO®
FOCAL
LPG
Peerless
scan-speak
seas
vifa

SOLEN **CROSSOVER COMPONENTS CATALOG**

HEPTA-LITZ **INDUCTORS PERFECT LAY HEXAGONAL WINDING**

STANDARD INDUCTORS PERFECT LAY HEXAGONAL WINDING

FAST CAPACITORS METALLIZED POLYPROPYLENE

SOLEN CROSSOVER & SPEAKER PARTS

SOLEN **INC.**
4470 Ave. Thibault
St-Hubert, QC J3Y 7T9
Canada
Tél.: 514-656-2759
Fax: 514-443-4949
E-mail : solen@quebec.net
WWW : http://www.quebec.net/solen/

Catalog US$8.00 Refundable

LOUDSPEAKERS

TRUE SUBWOOFER

With phenomenal *true* deep bass extending below 20Hz with low distortion at a very affordable price.

The HRSW12V will extend the bass of your stereo or video system for that "air shaking all around you" effect.

HSU Research HRSW12V

Here's what experts are saying about the HRSW12V:

"...the Hsu has to be considered an outstanding bargain."
Robert Deutsch, *Stereophile Guide to Home Theater* Vol. 1 No. 2, 1995

"Prodigious bass that shakes the walls"..."one heck of a thunder buster."
John E. Johnson, Jr., *Secrets of Home Theatre and High Fidelity*, May 1995

"...this woofer achieves a combination of extremely quick speed and gut massaging bass impact that I have seldom experienced from any subwoofer."
Peter Mitchell, *Stereophile* Vol. 18 No. 1, January 1995

"has developed an enviable reputation in its few short years of existence"
Thomas J. Norton, *Stereophile Guide to Home Theater* Vol 1 No. 1, 1995

"Hsu's HRSW12V is a wonderful subwoofer. It's good looking and simple to use, and its performance invites nothing less than superlatives, especially given its price"
Tom Nousaine, *Sound & Image*, February/March 1995

"The HRSW12V is one of the most potent subwoofers we have used. Sonically, it is all one could wish for, and the price is right."
Julian Hirsch, *Stereo Review*, December 1994

"...all of the non-boomy, stomach-massaging bass energy was coming from a single 12-inch powered subwoofer..."
Peter Mitchell, *Stereophile* Vol. 17 No. 4, April 1994

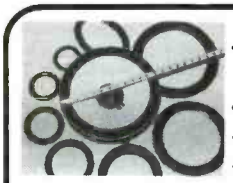
"...delivered enough punch to shake the sturdiest shelf..."
Brent Butterworth, *Video Magazine*, April 1994

Send for full details on the12V and the new 10V.

Write or call:
HSU RESEARCH
14946 Shoemaker Ave. Unit L
Santa Fe Springs, CA 90670
1-800-554-0150 (Voice)
1-310-404-3848 (Voice/Fax)

Sold factory direct with a 30 day trial - money back guarantee. 5 year manufacturer's defect warranty.

LOUDSPEAKERS



ROTTEN FOAM?
- Simply Speakers - Factory Authorized Service - All Brands JBL, Bose, Advent, EPI, CV, AR, Infinity & More !
- Worldwide Service - Reconing & Refoaming.
- Huge selection of D.I.Y. Foam Kits - We Ship Daily !
- Foam Rot Preventative Kits.

CALL TOLL FREE TODAY !

1-800-767-4041 = SIMPLY SPEAKERS. MC/VISA/NOVUS/AMEX. 11203 49TH STREET N., CLEARWATER, FL 34622. E-MAIL: Simplyspkr@AOL.COM. D.I.Y. KITS INCLUDE: ILLUSTRATED INSTRUCTIONS, ADHESIVE & TECHNICAL SUPPORT. BEST PRICES / SERVICE / WARRANTY—GUARANTEED!!

REPAIR FOAM ROT YOURSELF!
- Save $$$ with original kit!
- Kits to fit any speaker—Advent, AR, JBL, Bose, Infinity, EV, etc.
- Surrounds, adhesive & instructions
- MC/VISA/Discover—no CODs
- Call with make & model for best price
- Phone 24 hrs. 704-697-9001

or Toll Free **800-747-3692**
P.O. Box 1088 • Flat Rock, NC 28731

STEPP AUDIO TECHNOLOGIES

PARTS EXPRESS ELECTRONICS & MORE SPEAKER CATALOG

The Parts Express catalog is a must for the serious speaker enthusiast! We are a nationally known electronics distributor that takes pride in our huge selection of products and our first rate customer service. We stock a dizzying array of audio related components including raw loudspeaker drivers for home and car, home theatre products, connectors, wire, test equipment, plus numerous accessories. So what are you waiting for ... call for your FREE 244 page catalog today!

Source Code: AUM

1-800-338-0531

Parts Express™
340 E. First Street, Dayton, Ohio 45402-1257
Phone: 937/222-0173 ◆ Fax: 937/222-4644
E-mail: sales@parts-express.com

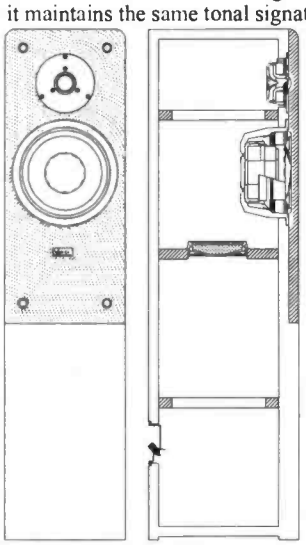
ARIES

Dynaudio and Madisound are proud to present the Aries speaker system.

The **Aries** showcases the newest Dynaudio loudspeakers, the Esotec D260 tweeter and Esotec 20W75 woofer, in a compact tower design.

The **woofer** is a cast frame 8" unit built around a 3" voice coil. The large voice coil design is a Dynaudio specialty and provides many advantages. The surface area of a large coil dissipates heat very well, reducing distortion. The large motor is very responsive, changing directions without lag time, even during the most demanding transients.

The **tweeter** is the famous Esotec D260 dome unit, which is well on its way to becoming the standard of comparison for high frequency drivers. The unique transmission line back chamber gives the D260 a totally clear and unrestrained sound, and even at high output levels, it maintains the same tonal signature.



The **Aries crossover** is a 6dB network, created and perfected by Dynaudio factory engineers. The tweeter has an all pass filter integrated for a flat phase response. The impedance is constant at 4Ω, through the use of RC and RCL filters. The construction makes use of premium parts: metalized polypropylene capacitors, Lynk non-inductive resistors, and premium coils as specified by Dynaudio for quality and wire gauge.

The **Aries system** comes with prefinished oak veneered cabinets, in either a clear or black stained finish. The cabinets come with quarter round solid oak corners. Grills are included and attached with fastex fasteners; the black grill covers the drivers, leaving the wood visible on the lower third of the cabinet face. The dimensions of the cabinets we provide are: 9" wide x 37.75" tall x 11.25" deep.

If you choose to build your own cabinets, we can provide detailed drawings for guidance.

Aries kit with prefinished oak cabinets: $1024 / pair

Aries kit with all parts, except cabinets: $624 / pair

MADISOUND SPEAKER COMPONENTS
8608 UNIVERSITY GREEN
P.O. BOX 44283
MADISON, WI 53744-4283 U.S.A.
TEL: 608-831-3433 FAX: 608-831-3771
e-mail: madisound@itis.com
Web Page: http:/www.itis.com/madisound

MA-2 REFERENCE

Breathtaking Performance

Legendary Customer Satisfaction

For your free catalog on this and other exciting products, please contact

ME•NIS•CUS
MENISCUS AUDIO GROUP
4669 S. Division • Wyoming, MI 49548
1-800-536-3691
E-mail: meniscus@iserv.net

Look for us also in the Dealer Showcase

ONLY ONE BRAND Ohm
www.OhmSpeaker.com

Service, upgrades, trades and new speakers. Factory direct from Ohm Acoustics, 241 Taaffe Place, Brooklyn NY 11205 (718) 783-1555; FAX (718) 857-2472; email OhmSpeaker@AOL.com

TUBE TRAPS—the original corner bass trap upgrade for high end audio. Factory demo product sale: 1-800-ASC-TUBE.

SPEAKER RECONING
RE-SURROUND
REPLACEMENT SPEAKERS

Are your speakers blown, foam rotted or just sounding tired? We are one of the largest and most experienced repair centers nationwide. We offer:

- Factory Authorized Service: ADS, Advent, Altec, Bose, Cerwin-Vega, EPI, EV, Infinity, and JBL.
- Professional Service
- Fast turn-around
- Grille Repair
- Replacement Grilles

Hard to Find Parts for Most Brands!
Over 50 years of experience rebuilding speakers.
Have the Experts at Midwest rebuild your speaker!

MIDWEST SPEAKER
800-883-9172
293 N. Snelling Av. St. Paul, MN 55104

LOUDSPEAKERS

Read about the famous NEW-FOAM Repair process in *Stereo Review* June 1996

Standard and Deluxe NEW-FOAM Kits

NEW-FOAM Coming soon Foam Grilles

Satisfaction Guaranteed or Your Money Back

Speaker Repair & Replacement Parts
Worldwide Service Since 1979

1-800-NEW-FOAM = 1-800-487-2349
WORLDWIDE SPEAKER REPAIR, PARTS, AND ACCESSORIES. Call us with your speaker problems. VISA/MC/AMEX/DISC. www.NEWFOAM.com

JBL

$499.95 FOR PR. OF JBL
4312CBK STUDIO MONITOR SPKRS! BRAND NEW! USED BY 70% OF ALL RECORDING STUDIOS FOR MIXING & EVALUATION. 3-WAY WITH 12" WOOFER, 5" MIDRANGE & DOME TWEETER. 100 WATT CAPACITY. MFC. **LIST $950/$1380 WALNUT.** JBL PARAGONS $9,999. HARTSFIELD 085s $6,999(REPRO)-$17,999(ORIG)/PR. OLYMPUS S8-R $3,999/PR-L200 $1,999/PR. **W.E. 300Bs $350/EACH(NEW)** SHIPPED WORLDWIDE. VISA/MC. HAL COX, SINCE 1947. (415) 388-5711, FAX: (415) 388-3359. 164 TAMALPAIS AVENUE. MILL VALLEY, CA, 94941. SAN FRANCISCO AREA.

BIRO TECHNOLOGY. Find out about the top-rated loudspeaker line that's setting new standards of musicality, accuracy, and value. Biro Technology, Box 582, Minneapolis, MN 55014. (612) 786-6643. biro@winternet.com

RECORDS

LV/CD/RECORD COLLECTOR'S SUPPLIES. Jewel boxes, jackets, sleeves, etc. CABCO-641, BOX 8212, COLUMBUS, OH 43201. (614) 267-8468. JProto1@AOI.com

HALF MILE VINYL. Large Inventory Quality Preowned LP's cleaned and graded. Send SASE for catalog to Box 98, East Wareham, MA 02538. Call 508-295-2508.

NEEDLES/CARTRIDGES & Belts--Expert Consultations, All Major Brands, One of Largest Stocks in Country including Old/Obsolete Models. NEEDLE EXPRESS. 1-800-982-2620.

KAB ELECTRO-ACOUSTICS
Preserve + Enhance + Restore™
"Serving The Record Collector and Sound Enthusiast" **FREE CATALOG** • 908-754-1479 x **WWW.KABusa.COM** • P.O. Box 2922 • Plainfield • NJ 07062-0922 Visa/MC/AmEx.

AUDIOPHILE RECORDS

The #1 source for audiophile LP's & CD's

Analogue Productions, Mobile Fidelity, Reference, Chesky, Sheffield, Classic, Audioquest, DCC, Golden Strings HDCD's, [RCA LSC, Mercury, EMI & Decca originals & re-issues] & much more!

CATALOG
$5 USA, $10 elsewhere, refunded with order.

ACOUSTIC SOUNDS
P.O. BOX 1905
SALINA, KS 67402-1905 USA
INFO (913)825-8609
FAX (913) 825-0156
1-800-716-3553

WANTED TO BUY

MARANTZ & ALL VINTAGE EQUIPMENT, HIGH-END. No one pays MORE, working or not! N.Y.S.I. (718) 377-7282, 2-6pm, WEEKDAYS.

WANTED TO BUY

DAVID YO, always paying top for: Tube Marantz, McIntosh, Leak, Quad, Western Electric. Vintage speakers by Western Electric, Tannoy, JBL, Altec, Jensen, EV. Thorens TD-124, Garrand 301. PO Box 80371, San Marino, CA 91118-8371. Telephone: (818) 441-3942.

WANTED: 1930'S-1960'S VINTAGE EQUIPMENT. AMPS, PRE-AMPS, SPEAKERS, TUBES, ETC. MARANTZ, MCINTOSH, ALTEC, JBL, JENSEN, E.V., **WESTERN ELECTRIC**, TANNOY, ETC. SUMNER MCDANEL: 800-251-5454.

WANTED: TUBE HI FI, CORNER/HORN SPEAKERS! Altec, Jensen, Marantz, Leak, Quad, McIntosh, Western Electric, EV, JBL, Tannoy ETC. Sonny (405)737-3312. Fax 3355.

CASH for USED AUDIO & VIDEO EQUIP. BUYING and SELLING by PHONE. CALL for HIGHEST QUOTE. **(215) 886-1650** Since 1984. The Stereo Trading Outlet, 320 Old York Road, Jenkintown, PA 19046. WEB SITE Catalog: www.tsto.com

AUDIO CLASSICS BUYS-SELLS-TRADES-REPAIRS High End Audio Components. CALL for a quote. See our ad at the beginning of the classifieds. **AUDIO CLASSICS, LTD.**, POB 176WB, Walton, NY 13856. Phone: 607-865-7200. 8AM-5PM EST Mon.-Fri., FAX: 607-865-7222.

SERVICES

Audio Equipment Built, Repaired, Modified and Restored by Richard Modafferi, independent consultant to Audio Classics, Ltd., inventor, and former Senior Engineer at McIntosh. **AUDIO CLASSICS, LTD.** POB 176RTM, Walton, NY 13856 Phone: 607-865-7200 8AM-5PM EST Mon.-Fri., FAX: 607-865-7222.

BLANK TAPES

1-800-TAPE WORLD or 1-800 245-6000
We'll beat any price! 5.95 SHIPPING • FREE CAT.

SONY		MAXELL		TDK		FUJI	
DAT-120	5.99	XLII-90	1.59	CDR-74	4.99	SVHS-T120	6.49
DAT-124 PRO	8.99	XLII-S 90	1.99	D-90	.79	HI 8 120	5.99
T-120V	1.69	T 120 HGX	2.49	SA-90	1.49	8MM-120	3.49
L-750BTHG	4.49	ST 120	6.99	SAX-90	1.99	DR-I-90	.69
ST-160	7.99	DAT-124 PRO	7.99	SAX-100	2.49	JVCST120	5.99
MDW-74	5.99	UD35-90	8.99	T 120 EHG	2.49	XEII-30 PRO	.99
TDKDVC60	10.99	UR-90	.79	DAT-120	6.49	CDRXG-74	6.99

TAPE WORLD 220 SPRING ST., BUTLER, PA 16003. FAX 800-322-8273
OVER 500 DIFFERENT. SAME DAY SHIPPING. M-F 8-5

CABLE TV

CABLE TV CONVERTERS, DESCRAMBLERS. Great Price and Quality Service. Satisfaction Guaranteed. EAGLE ELECTRONICS INC: 1-800-259-1187. Visa/MC/Amex/Disc accepted.

CABLE TV DESCRAMBLERS

Best Buys
Best Service
Full Warranty

800-835-2330

CABLE DESCRAMBLERS/CONVERTERS. REPLACEMENTS FOR ALL MAJOR BRANDS. BEST PRICES! MONEYBACK GUARANTEE! FREE CATALOG. ALLSTAR: 1-800-782-7214.

CALL 1(800)-72-BOXES FOR UNBEATABLE PRICES ON CABLE CONVERTERS & DESCRAMBLERS. MONEY-BACK GUARANTEE. DEALERS WELCOME. VISA/MASTERCARD/DISCOVER/C.O.D. QUALITY ENTERTAINMENT. WE WILL NOT BE UNDERSOLD!!

CABLE TV CONVERTERS & DESCRAMBLERS. FREE 30 DAY TRIAL, FREE ONE-YEAR WARRANTY, QUALITY EQUIPMENT. VISA/MC/COD. PC ELECTRONICS: 1-800-675-7125.

CABLE TV DESCRAMBLERS BARGAIN HEADQUARTERS. ALL BRANDS, MONEY BACK GUARANTEE. MAKE YOUR BEST DEAL WITH US! GATEWAY ELECTRONIXS 1-888-422-2533.

CABLE TV

WORLDWIDE ELECTRONICS

Why Rent?
CABLE TV CONVERTERS & DESCRAMBLERS
1 YEAR WARRANTY!
SAVE SAVE
ABSOLUTELY LOWEST WHOLESALE/RETAIL PRICES!
30 DAY MONEY BACK GUARANTEE!
MASTERCARD • VISA • DISCOVER • AMEX • COD
NO FL SALES
1-888-430-4301
http://www.wwcableboxes.com

WHOLESALE PRICING RFTS SILVERS GOLDS WIRELESS AND ALL CABLE BOXES. MEGA 800-676-6342.

CABLE DESCRAMBLERS
& Turn-On Chips
- Lowest Prices
- 30 Day Money Back Guarantee
- 1 Year Warranty
- Dealer Pricing

MasterCard VISA
888-51-CABLE
http://wahoo.netrunner.net/~southern
southern electronics
10097 Cleary Blvd. • Suite 285 • Plantation, FL 33324
NO FL SALES PLEASE

CABLE DESCRAMBLER/VIDEO OUTLET. ORDER TODAY AND HAVE IT TOMORROW. 30 DAY TRIAL—1 YEAR WARRANTY. WE WILL NOT BE UNDERSOLD. ALL NEW EQUIPMENT. MOST CREDIT CARDS & C.O.D. CALL NOW: 1-800-586-9920.

Cable TV
Converters/Equipment
Buy direct from the wholesaler
We will beat any advertised price
DEALERS WELCOME
CD Electronics
30 Day Money Back Guarantee
1-800-842-9670
http/www.cdelectronics.com/cd

CABLE DESCRAMBLERS. BELOW WHOLESALE PRICES. 30 DAY MONEY-BACK/LOW PRICE GUARANTEE. NOBODY BEATS US! THE CABLE STORE 1-800-390-1899.

CABLE T.V.
Converters & Equipment
Lowest prices guaranteed!
30-Day Money Back Guarantee
1-year warranty
DEALERS WELCOME!

PLEASE HAVE NAME & MODEL NUMBER READY.
VISA, MC, C.O.D.
VEGA ELECTRONICS
(800) 888-5585

NEW PRODUCTS

PARTS AND ACCESSORIES

HOME THEATER

AD INDEX

AUDIO, August 1997, Volume 81, Number 8. AUDIO (ISSN 0004-752X, Dewey Decimal Number 621.381 or 778.5) is published monthly by Hachette Filipacchi Magazines, Inc., a wholly owned subsidiary of Hachette Filipacchi USA, Inc., at 1633 Broadway, New York, N.Y. 10019. Printed in U.S.A. at Dyersburg, Tenn. Distributed by Warner Publisher Services Inc. Periodicals postage paid at New York, N.Y. 10019 and additional mailing offices. One-year subscription rates (12 issues) for U.S. and possessions, $24.00; Canada, $33.68 (Canadian Business Number 126018209 RT, IPN Sales Agreement Number 929344); and foreign, $32.00.

Subscription Service: Postmaster, please send change of address to AUDIO, P.O. Box 52548, Boulder, Colo. 80321-2548. Allow eight 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 303/604-1464; fax, 303/604-7455.
Back Issues: Available for $6.95 each ($8.25 Canada; $13.25 other foreign) in U.S. funds. Please add $1.00 for the Annual Equipment Directory (October issue). Send a check or money order to ISI/AUDIO Magazine, 30 Montgomery St., Jersey City, N.J. 07302, or call 201/451-9420.

PlayBack

ONKYO INTEGRA A-9911 INTEGRATED AMPLIFIER

Onkyo integrated amps and I go way back to the old A-7022 and A-7 of the 1970s, which were powerful, full-featured, nice-sounding models that never broke. With that in mind, I expected the elegant-looking A-9911, priced at $1,195.95, to be another high-quality amp. And it is.

The A-9911 is rated at 90 watts per channel into 8 ohms and contains Onkyo's non-negative feedback circuitry, which is said to lessen harshness. Other features include defeatable tone controls, an MM/MC phono preamp, an infrasonic filter, two dedicated tape loops, and a processor loop that can also be used for taping. An "Amp-Direct" input bypasses the source selector and tone controls. My only complaint is that there are no preamp out jacks.

GRADE: A-

The A-9911 conveyed an excellent sense of detail and space, and its bass was tight. I noted a slight brightness with my speakers but not enough to bother me. There was no harshness when reproducing treble-rich instruments, such as hi-hat cymbals, or brass. As I expected, all the controls operated smoothly and solidly, with no unwanted noise. Better make some room in the rack, however; this amp is rather bulky. (**Onkyo**: 200 Williams Dr., Ramsey, N.J. 07446; 201/825-7950.)

John Gatski

For literature, circle No. 120

Sony MDM-X4 Multitrack MiniDisc Recorder

In the five years since its introduction, MiniDisc has not been embraced by the public as much as its creator, Sony, envisioned. But though consumer MD portables and home decks have had only modest success, a lot of activity has taken place on the semiprofessional and broadcast sides.

Sony's MDX-X4 multitrack MiniDisc recorder ($1,250) is a case in point. Aimed more at musicians than audiophiles, it offers the convenience and portability of traditional "four-track" (actually, four-channel) cassette recorders, the convenience and precision of basic digital editing, and sound quality that almost matches CD's.

The MDM-X4 can use regular music MiniDiscs but seems designed for MD Data discs. The music discs, about $8 each, can be used only for two-track recordings. The MD Data discs, at $20 each, are not cheap but can be used far more flexibly. You can record on them for 37 minutes in four-track mode, 74 minutes in two-track (not just stereo, as the tracks can be recorded individually), or up to 148 minutes in mono.

GRADE: B+

The MDM-X4 is feature-laden and relatively easy to use. Its editing functions include a jog/shuttle wheel for coarse or fine cueing and features that let you overdub, bounce signals between tracks, and perform timed punch-in and punch-out. The built-in mixer has controls for one stereo and four mono sources, three-band equalization for each track, and panning. Connections include a headphone jack, two XLR balanced mike inputs, four ¼-inch phone-jack inputs, separate outputs for all four tracks, and processor loops consisting of two AUX outputs and two sets of stereo returns.

If you are used to four-track cassette sound, you will find that the MDM-X4 walks all over the small tape format, especially for multitrack recording. My overdubbed recordings of electric and acoustic guitar were impressive. The only negative is the price of MD Data discs. (**Sony**: Sony Dr., Park Ridge, N.J. 07656; 201/930-1000.)

John Gatski

For literature, circle No. 122

Grado Laboratories SR40 Headphone

Grado has made unusual-looking, wonderful-sounding headphones for several years but only open-back models that do not seal the music in and keep noises out. That's because it's difficult to make a closed-back headphone that retains the airy, spacious sound of the company's Reference headphones, says company president John Grado.

The SR40 ($39) is a compromise: the drivers of Grado's SR60 'phones ($69) housed in sealed earcups that strengthen the bass as well as provide moderate isolation. An adjustable, plastic headband holds each foam-padded earpiece.

GRADE: B+

The SR40 sounded brighter than Grado's popular SR80 ($95) yet still had decent bass. It sounded good on jazz and acoustic music but was a little more sizzly on pop music that had abundant treble. The SR40 retains a good deal of the more-expensive Grados' stereo imaging abilities and certainly imaged better than the cheaper headphones packaged with most portable CD players. Also, it could play loud with little input power. My only real objection was the ear pads' snugness. (**Grado Laboratories**: 4614 7th Ave., Brooklyn, N.Y. 11220.)

John Gatski

For literature, circle No. 121

MARANTZ
SR-880
DOLBY DIGITAL
A/V RECEIVER

AWARD WINNING SOUNDTRACKS DESERVE AN AWARD WINNING A/V RECEIVER.

INNOVATIONS® CONSUMER ELECTRONICS SHOWS
DESIGN & ENGINEERING SHOWCASE HONORS 1997

SR-880 DOLBY DIGITAL A/V RECEIVER:

• dual DSP decoders for Dolby Digital and conventional Dolby Surround • 3 way Dolby Digital inputs: RF, optical, and coaxial • 5 channel high current power amp, 110W continuous (8 ohms) front, 60W continuous rear • AM/FM tuner with station naming • 5 pre-amp outputs • 5 video inputs, 4 audio inputs, with A/V copy features • composite and S-video switching • advanced multi-room mode • data-in jack for third-party multi-room remote systems • on screen display with setup menus • headphone jack with auto stereo switching • sleep timer • quality banana jack speaker terminals

RC2000 LEARNING REMOTE:

• total control of your A/V equipment • learns hundreds of IR codes • macro keys store 20 commands each for one-button operation • LCD window and keys illuminate automatically • ergonomic design with logically grouped functions • LCD displays up to 32 special commands for each component • label naming feature • built-in commands for popular DSS equipment • built-in commands for Marantz and other brands using RC-5 codes

DOLBY DIGITAL

Selecting the right receiver to upgrade or build a new home entertainment system around can be overwhelming. But, now its easy to pick a winner – pick Marantz!

The Marantz SR-880 features Dolby Digital (AC-3) decoding, which delivers the surround sound realism you normally find only in commercial theaters.

The SR-880 includes five powerful high current amplifiers (450 watts total) in the service of dual, all-digital DSP decoders – one dedicated to Dolby Digital (AC-3) soundtracks (laser disc, DVD), the other to conventional Dolby Pro Logic (video tape, TV, DSS). And the SR-880 gives your system room to grow by supplying 5.1 channel pre-amp outputs for connection to external components (subwoofer, equalizer, larger power amps).

Think of the SR-880 as your complete home theater command center. It houses an advanced AM/FM tuner and manages a diverse assortment of A/V sources. By adding an external stereo amplifier and speakers, the flexible multi-room/multi-source mode provides a second listening zone with access to any of the connected A/V sources, for full dual zone control.

And, no home theater would be complete without the remarkable RC2000 learning remote, thoughtfully included with the SR-880. The RC2000 – also available separately – is preprogrammed for controlling Marantz components, and is easily configured to operate your entire system with single-button "macro" convenience.

Audition the award winning SR-880 receiver at your Marantz audio/video specialist and experience how theater like your home theater can sound.

marantz®
PURE HIGH FIDELITY

Marantz America, Inc.
440 Medinah Road, Roselle, IL 60172-2330 Tel 630-307-3100 • 630-307-2687 Fax
www.MarantzAmerica.com

"the RC2000 has transformed my life"

A. Griffin
Home Theater Magazine
November 1996

ALL YOU NEED IS ONE!

Get total control and complete convenience with the Marantz RC2000 learning remote.

"Of the interconnects I know well, my top choice is Esoteric's Tech 2ii series..."

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

...Only From Esoteric Audio.

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

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

ESOTERIC AUDIO USA

(770) 867-6300 44 Pearl Pentecost Road, Winder, Georgia 30680

CIRCLE NO. 7 ON READER SERVICE CARD