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JANUARY 1993

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PROCESSOR



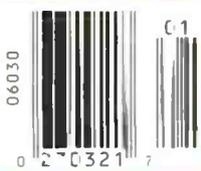
EXCLUSIVE INTERVIEW  
HENRY STEINWAY  
THE PIANOMAN

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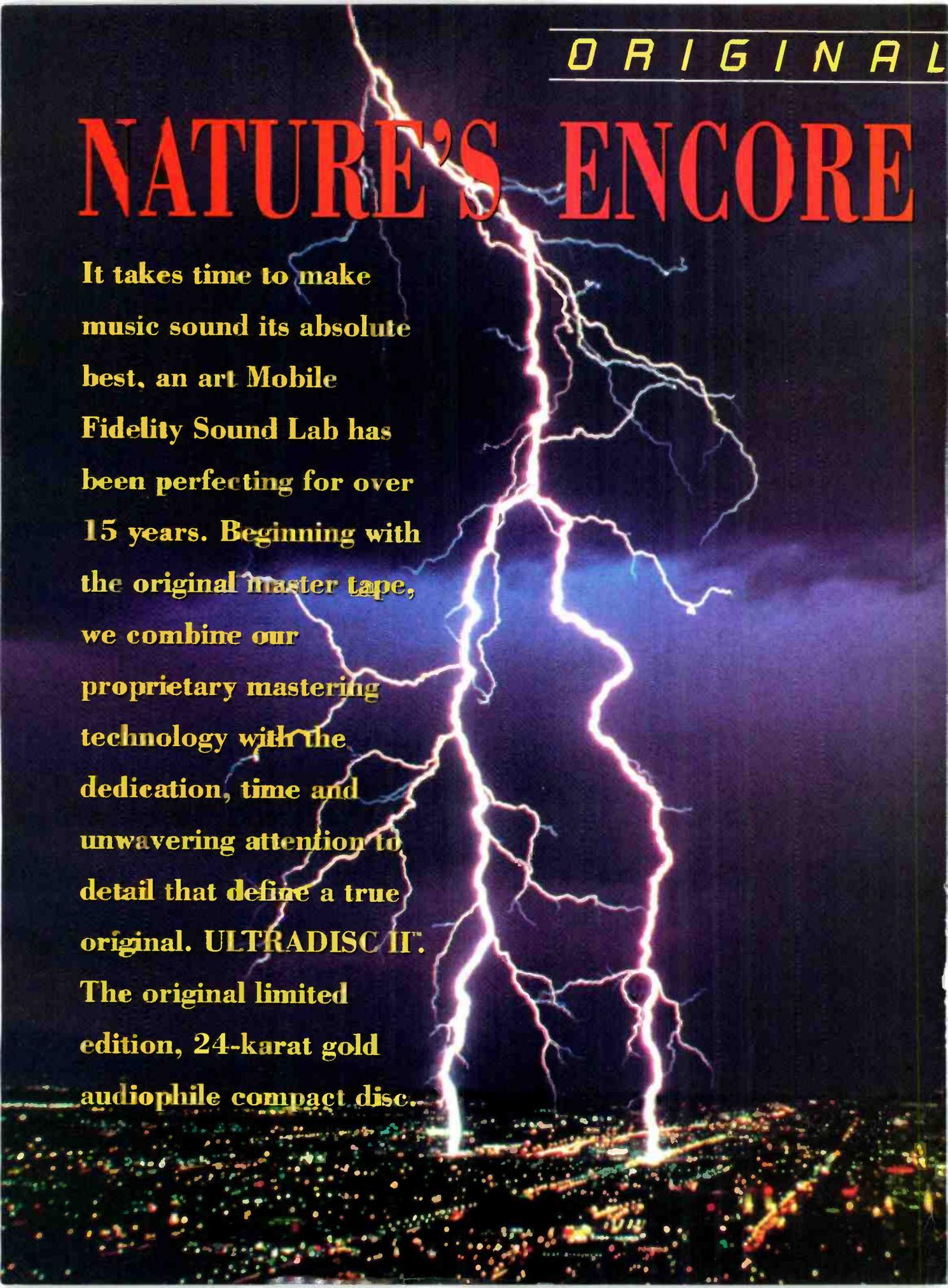
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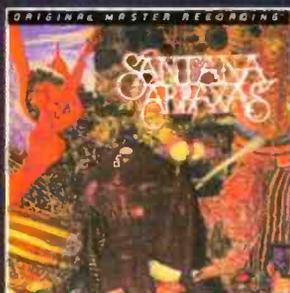
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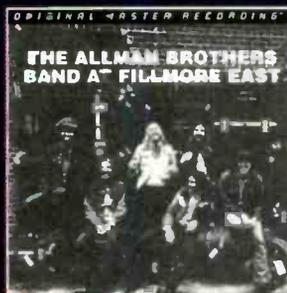
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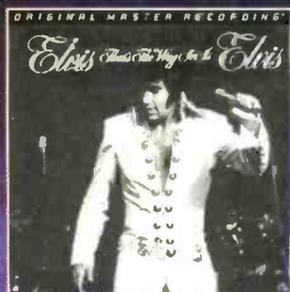
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UDCD 2-538



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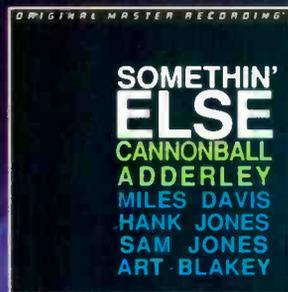
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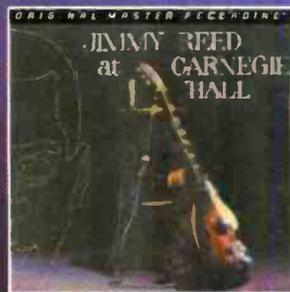
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UDCD 563



UDCD 563



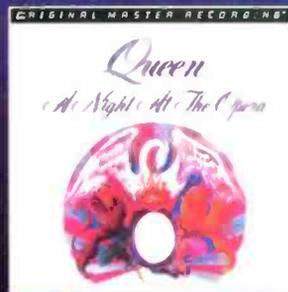
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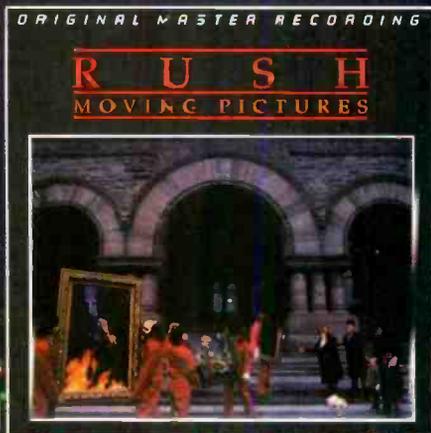


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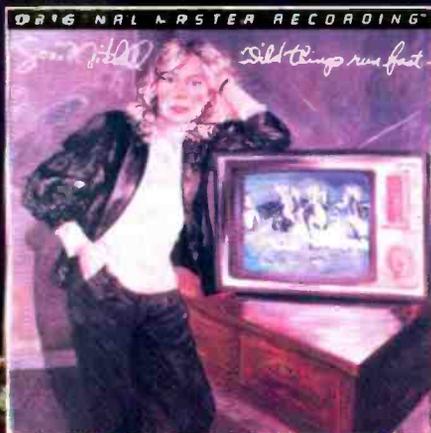
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UDCD 569

### NEW RELEASE



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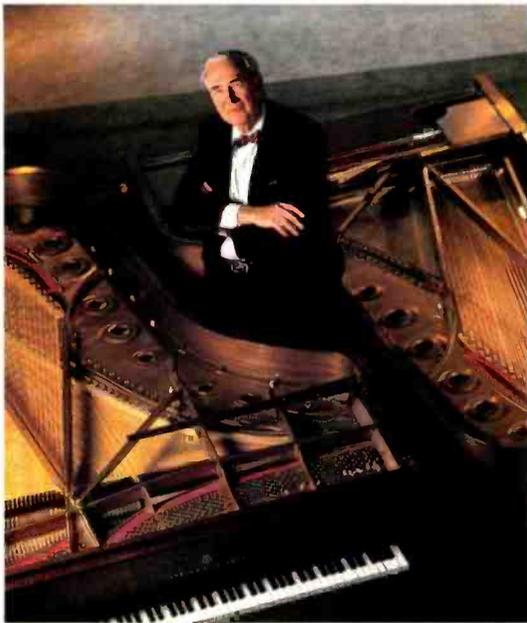
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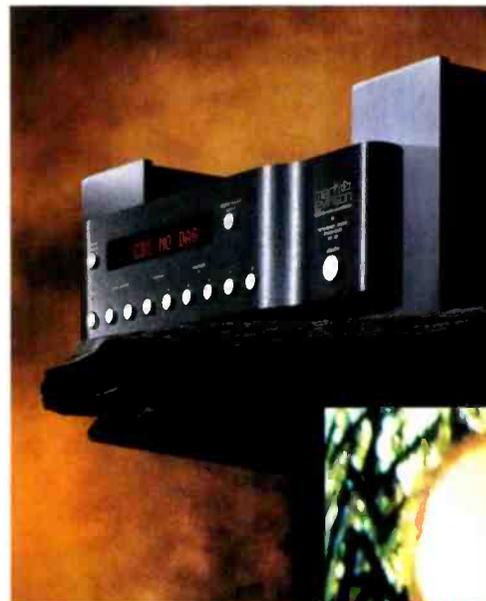
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Nº 30

# REFERENCE DIGITAL PROCESSOR

## PRIDE IN THE DETAILS . . .

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

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



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

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

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

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



mark  
levinson

get lots of press releases, as you might well expect, and somewhere around 50% of them wind up in one of the three circular files which grace my office. Of the rest, almost all are New Products announcements. We currently have 10 five-drawer filing cabinets of them, some of which date back to this magazine's residence on Long Island. It's nothing new for me to get an announcement that a speaker company has been newly formed, and I usually just pass along the item to our Annual Equipment Directory crew, headed by the able Ken Richardson.



However, once in a while I get a release that makes me say, "Hey, that's really nice," usually in appreciation of an unusually well-done piece of equipment. But I got one a couple of days ago that I feel is extraordinary enough that it should be shared, so let me selectively quote it:

Edgar Villchur, founding father of Acoustic Research and inventor of the acoustic suspension woofer and the dome tweeter, has joined Roy Allison to form RDL Acoustics. The pair had, of course, collaborated at AR, and one of their speakers, the classic AR-3, became so

famous that one is on display at the Smithsonian Institution. Villchur decided to finance the new firm when he heard that Allison Acoustics had severe financial problems primarily caused by a failed relationship with its major investor. RDL, an acronym for Room Designed Loudspeakers, will be located in Bellingham, Mass.

In other news, President Bush signed the Audio Home Recording Act into law on October 28th; I gave details about the legislation last month. I learned of the signing when U.S. Sony Software President Michael Schulhof announced it in dramatic fashion at the opening of a huge new MiniDisc production facility in Terre Haute, Ind. (see photo). Located just across the road from Sony Music's CD plant, the new MD factory is even bigger, which shows Sony's confidence in the new format. *Billboard* reports that most of the MD titles now available in Japan are by teen-queen pop idols, and the artists in the 20-unit group-pack for U.S. dealers are rock or pop. Watch for a hardware review in an issue or two, as I am promised an early production unit within two weeks.

Contrary to earlier rumors, PolyGram says they will be shipping 180 DCC titles by early December. David Blaine, Senior Vice-President of PolyGram Group Distribution, said in a press conference (held jointly with Philips, who announced the DCC900 recorder) that some 290,000 prerecorded tapes had been recalled due to "compatibility problems." "Seize the opportunity," I told him later. "Pass them out to journalists as proof of PolyGram's insistence on quality." "Maybe," he responded. "They would make nice paperweights!"

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# History Repeats Itself

History shows that in 1973 the Nakamichi 1000 forever changed the destiny of the audio cassette. Against all odds the world's first true 3-head cassette deck had transformed a medium designed for convenience into a serious audio recordist's dream-come-true.

Now, the dream continues . . . Nakamichi's new line for 1993—consisting of four CD players, three cassette decks, three audio receivers and two audio/video receivers—incorporates Nakamichi's latest technologies and most refined build quality.

Developed through both extensive "live vs. reproduced" listening tests and laboratory measurements, the new Nakamichi line combines outstanding musical accuracy with the most advanced ergonomics and features. For example, the new A/V receivers employ advanced DSP circuitry for both ambience synthesis and Dolby<sup>®</sup> Pro Logic Surround decoding. By performing signal processing entirely in the digital domain, Nakamichi can create the most natural sounding effects . . . without noise or distortion.

The only aspect of the new Nakamichi line that you might find surprising is its remarkable affordability. Audition the new Nakamichi line today, and be a part of history in the making . . . again.



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**Letters? You're Standing in Them**

Dear Editor:

Having read your "Fast Fore-Word" in the September 1992 issue, I'd like to offer my enthusiastic endorsement of CES-type audio shows for consumers.

The turnouts this past year at the Chicago CES and the *Stereophile* Show in Los Angeles should be sufficient indication to manufacturers that there is a huge group of consumers out here who would enjoy the opportunity to review/sample/listen to a broader range of hi- and mid-fi equipment without being slave to the products that one retailer happens to carry. Your suggestion of three shows per year in varying locations is excellent.

I would further suggest that your magazine initiate (perhaps reinstitute—I've subscribed for only three years, so I'm not aware of your past practices) a "Letters" section not wholly devoted to technical questions (as is "Audioclinic"). One of the joys of *Stereophile* is the letters section. The consumer learns a great deal from the multiple points of view that the editors are brave enough to print. However, it concerns me that *Stereophile* has cornered the market on reader response. I believe that *Audio*'s readers could benefit as much from such exchanges.

Kevin J. East  
Herndon, Va.

*Editor's Note:* Ahem. Perhaps our cute title "Signals & Noise" is to blame for your confusion, but the department you're reading right now is indeed our general letters section and has appeared under this name since February 1983. Granted, it has not been published in every issue, but never let it be said that *Audio* is not a tome of the brave.—K.R.

**"O, I.C.," Ys 4N(sic) Xpert Claims, "Lirpa Means 2B a Ts!"**

Dear You Guys:

You just couldn't resist, could you? First you hit us with the Lirpa Labs Stealth gizmo (April 1991), and now you've

sneaked the Lirpa Labs U8-IT ambience and/or surround sound processor into the 35th Annual Equipment Directory (October 1992). "You ate it"? "Doo-wop"? Delay times listed as inbound and outbound? Ambience presets for everything but the echo in the showers at the gym? And that price?

What are you trying to do? See if you can get some potential buyers from the kinds of folks who buy connecting wires at \$25/foot? Find out exactly what kind of nuts actually sit and read the equipment guide (probably the same types who read dictionaries or the entire Yellow Pages)? Or rather did some junior, junior, junior editor on your staff simply want to sneak in his own Kilroy?

Whatever, it was fun finding it, and I'd be really interested in knowing how many other terminally bored and insomniac readers contacted you about the thing.

Rd. Giarc Llerrem  
Sallad, Xet.

**Terminally Bored and Insomniac Reader Contacts Us About the Thing**

Dear Editor:

I was happy to see Lirpa Labs continues to be represented in *Audio*, most recently in your Annual Equipment Directory. Although Lirpa's catalog has been somewhat reduced in recent years (to one ambience device, apparently), your coverage has allowed me to assemble a Lirpa-based system that is unique, if not envied by my audiophile friends.

Donald F. Schmidt  
Phoenix, Ariz.

**P.D.Q. Lirpa's Flying Diddle?**

Dear Editor:

Your report on Hiram Diddle's Congressional Model Subwoofer ("Signals & Noise," April 1992) was very good and worthy of Peter Schickele himself. Perhaps there could be a P.D.Q. model in his honor, one free from room-placement difficulties (avoiding the diddle factors of so many high-end speakers). I'm surprised that

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V.P./GROUP PUBLISHER  
Nicholas Matarazzo  
(212) 767-6035  
V.P./ASSOCIATE PUBLISHER  
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**Michael Bolton**—Timeless (The Classics). *Yesterday; Drift Away*, plus more. (Columbia) 445•494

**Billy Ray Cyrus**—Some Gave All. *Achy Breaky Heart; Could've Been Me*; more. (Mercury) 441•451

**Bobby Brown**—Bobby. *Humpin' Around; Two Can Play That Game*; more. (MCA) 445•403

**Pearl Jam**—Ten. *Even Flow; Jeremy; Once*, plus many more. (Epic/Assoc.) 428•433

**Extreme**—Ill Sides To Every Story. *Rest In Peace*; and more. (A&M) 447•540

**Mariah Carey**—MTV Unplugged. *I'll Be There; Emotions*; others. (Columbia) 441•790

**Genesis**—We Can't Dance. Title Cut plus *Jesus He Knows Me*; more. (Atlantic) 448•936

"Boomerang"—Orig. Sndtrk. Featuring *Boyz II Men; Johnny Gill*; others. (LaFace) 442•335

**Great White**—Psycho City (Capitol) 447•565

**Randy Travis**—Greatest Hits, Vol. 2 (Warner Bros.) 448•662

**Randy Travis**—Greatest Hits, Vol. 1 (Warner Bros.) 448•654

**Vince Gill**—I Still Believe In You (MCA) 448•571

**Sinead O'Connor**—Am I Not Your Girl? (Chrysalis) 447•532

**David Bowie**—David Live (Rykodisc) 438•218/398•214

**Marvin Gaye's Grt. Hits** (Motown) 367•565

**Aretha Franklin**—30 Greatest Hits (Atlantic) 350•793/390•799

**Van Morrison**—Moondance (Warner Bros.) 349•803

**Jethro Tull**—Aqualung (Chrysalis) 345•157

**John Lennon**—Live In New York City (Capitol) 342•774

**Motown's 25 #1 Hits** From 25 Years (Motown) 319•996/399•998

**Best Of Carly Simon**, Vol. 1 (Elektra) 291•856

**Eagles**—Hotel California (Asylum) 286•948

**Meat Loaf**—Bat Out Of Hell (Epic) 279•133

**Boston** (Epic) 269•209

**Barbra Streisand**—Highlights from "Just For The Record" (Columbia) 444•372

**Alice In Chains**—Dirt (Columbia) 445•833

**Suzanne Vega**—99.9° F (A&M) 447•516

**Collin Raye**—In This Life (Epic) 447•268



"Honeymoon In Vegas"—Original Soundtrack (Epic) 444•919

**Bad Company**—Here Comes Trouble (ATCO) 446•203

**Branford Marsalis**—I Heard You Twice The First Time (Columbia) 445•460

**Freddie Jackson**—Time For Love (Capitol) 445•262

**George Thorogood And The Destroyers**—The Baddest Of The Bad (Hits) (EMI) 444•505

**Megadeth**—Countdown To Extinction (Capitol) 444•489

**Pat Metheny**—Secret Story (Geffen) 444•422

**Morrissey**—Your Arsenal (Sire/Warner Bros.) 444•398

**Hi-Five**—Keep On Goin' On (Jive) 444•331

**Stevie Wonder's Orig. Musiquarium I** (Tama) 314•997/394•999

**Guns N' Roses**—Use Your Illusion I (Geffen) 442•087

**Travis Tritt**—T-R-O-U-B-L-E (Warner Bros.) 445•767

**Sonic Youth**—Dirty (Geffen) 444•083

**Ricky Van Shelton**—Greatest Hits Plus (Columbia) 444•067

**Damn Yankees**—Don't Tread (Warner Bros.) 445•759

**Nirvana**—Nevermind (DGC) 442•046

**Kiss**—Revenge (Mercury) 441•436

**Mary J. Blige**—What's The 411? (Uptown/MCA) 445•197

**Lionel Richie**—Back To Front (Motown) 441•063

**Mary Chapin Carpenter**—Come On, Come On (Columbia) 440•560

**INXS**—Welcome To Wherever You Are (Atlantic) 445•023

**Firehouse**—Hold Your Fire (Epic) 439•448

**Kathleen Battle & Wynton Marsalis**—Baroque Duet (Sony Class.) 439•372

**The B-52's**—Good Stuff (Reprise) 439•281

**Al Jarreau**—Heaven And Earth (Reprise) 439•240

**Bob James & Earl Klugh**—Cool (Warner Bros.) 439•232

**Miles Davis**—Doo-Bop (Warner Bros.) 439•224

**David Sanborn**—Up-Front (Elektra) 438•994

**The Cure**—Wish (Elektra) 438•655

**DAS EFX**—Dead Serious (eastwest) 438•630

**Beastie Boys**—Check Your Head (Capitol) 438•499

**Celine Dion** (Epic) 436•782

**Sophie B. Hawkins**—Tongues & Tails (Columbia) 436•402

**Indigo Girls**—Rites Of Passage (Epic) 436•394

**Shabba Ranks**—Rough & Ready (Epic) 436•386

**Tears For Fears**—Tears Roll Down (Hits 1982-92) (Fontana) 436•006

**Tom Cochrane**—Mad Mad World (Capitol) 435•685

**ZZ Top**—Grt. Hits (Warner Bros.) 438•010

## CLASSIC ROCK'S GREATEST HITS

**Foreigner**—The Very Best... And Beyond (Atlantic) 447•524

**Yes**—Yesstory (ATCO) 446•211/396•218

**Steely Dan**—Gold—Grt. Hits (MCA) 435•693

**Steppenwolf**—Born To Be Wild (MCA) 430•678/390•674

**The Allman Brothers Band**—A Decade Of Hits 1969-79 (Polydor) 430•439

**Rod Stewart**—Downtown Train/Selections From The Storyteller Anthology (Warner Bros.) 425•322

**Rush**—Chronicles (Mercury) 423•780/393•785

**Eric Clapton**—Time Pieces (Polydor) 423•467

**Lynyrd Skynyrd Band**—Skynyrd's Innards/Their Grt. Hits (MCA) 381•129

**Trisha Yearwood**—Hearts In Armor (MCA Nashville) 444•042

**Too Short**—Shorty The Player (Jive) 443•788

"Mo' Money"—Orig. Sndtrk. (Perspective/A&M) 443•739

**Guns N' Roses**—Use Your Illusion II (Geffen) 442•038

**Grateful Dead**—Skeletons From The Closet (Warner Bros.) 378•406

**Roy Orbison**—The All-Time Hits, Vols. 1 & 2 (CSP) 377•945

**Fleetwood Mac**—Grt. Hits (Warner Bros.) 375•782

**Journey's Greatest Hits** (Columbia) 375•279

**Best Of The Doors** (Elektra) 357•616/397•612

**The Police**—Every Breath You Take—The Singles (A&M) 348•318

**The Beach Boys**—Made In The U.S.A. (Capitol) 346•445

**Bad Company**—10 From 6 (Atlantic) 341•313

**Joe Cocker's Grt. Hits** (A&M) 320•911

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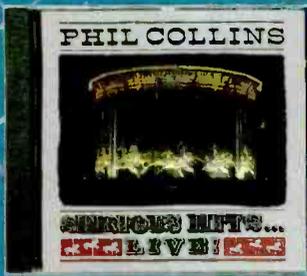


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Diddle's cousin, Clem K., didn't develop a hopper for expediting those factory orders (apologies to Red Skelton) or that C.W. of Dunkenfield isn't a supplier of "shipping" (sipping?) barrels.

One thing seems curious, though. In the United States, humor always seems to be at the expense of the hillbilly, or Southern hick, whether sourced from verbal or written comedy. I have met just as many clowns and fools living in New England, the Midwest, and the West (particularly California) as in the South, but it's the latter who are usually singled out for ridicule.

Paul Bodine, Associate Professor  
School of Fine Arts  
Eastern Illinois University  
Charleston, Ill.

### The South Has Risen Again!

Dear Editor:

While I am not the true audiophile your publication reaches every month, I did have occasion to read a most entertaining and enlightening article in the April 1992 issue pertaining to the Congressional Model Subwoofer. Dare I ask if Prof. Lirpa is a real individual? My ear is not so discerning, though I do enjoy building/tinkering with unique projects—but really, guys, is this bill of materials on the level? Before I make any capital outlay, I'd like some reassurance from the pros as to this subwoofer's credibility.

A. J. Flye  
Charleston, S.C.

*Junior, Junior, Junior Editor's Note:* Prof. Lirpa, currently overseeing construction of his Hoarse Erase P.A. System for Bill Clinton's Inaugural Address, is not available to defend himself or his associates. At press time, us guys and gals at *Audio* could not confirm the composition of the Congressional Model Subwoofer, as we were still awaiting returns (i.e., returned subwoofers, sent to our care, from a number of buyers who are complaining of noise and urging the manufacturer to "Throw the hums out!").—K.R.

### So Much for Lirpa Lager

Dear Editor:

Even though I'm a "beer budget" *Stereo Review* person, I have renewed my subscription to *Audio* magazine—because of

the July 1992 article "Recordable CD: Promises & Problems, Part II" by Michael B. Martin.

The Prof. Lirpa articles are for me a real turnoff.

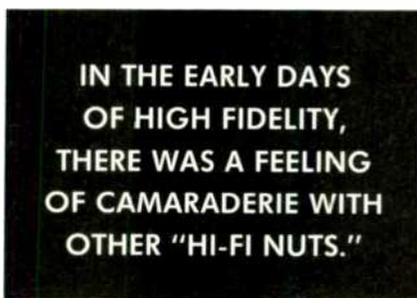
James R. Reeves  
Sacramento, Cal.

### Your Check's in the Mail . . .

Dear Editor:

The 45th Anniversary Issue of *Audio* (May 1992) has moved me to write and let you know why I have come to value your magazine so highly.

The pages of *Audio* exhibit not only a sense of history but also an element of humanity that is unique among publications in the field. Your features on pioneers in music and high fidelity (John Hammond, Henry Kloss, Leiber & Stoller, to name just a few) are always interesting and sometimes priceless glimpses of larger-than-life people who have enriched the lives of us all. *Audio's* practice of paying tribute to colleagues who have passed on is in itself testimony to the essential humanity of the



magazine. Your policy of allowing your authors to have their own voices—like Edward Tatnall Canby's idiosyncratic writing or Bert Whyte's references to personal experiences in the industry—makes *Audio* stand out in a world of anonymous, generic-sounding publications.

In the early days of high fidelity, there was a feeling of camaraderie with other "hi-fi nuts." We were all discovering the joys of assembling systems to make music sound better, and each year saw quantum leaps in our movement toward that goal. (I remember the excitement when my father hooked up our first "real" amplifier, a 10-watt Newcomb monaural amp. Later he and I put together our first complete stereo system, with an H. H. Scott amplifier, JBL speakers in homemade enclosures, and the venerable Garrard RC-88 record changer

and Shure cartridge.) I still have an irrational attachment to glowing tubes, the movement of the reels on open-reel tape decks, and the look of home-built boxes for loudspeakers.

Part of what makes *Audio* so valuable is that to some extent it re-creates that feeling of belonging to a fraternity of people who love music, who appreciate advances in the art of music reproduction, and who appreciate one another.

I thank you for that.

Ron Hale  
Santa Fe, N.M.

### . . . and So Is Yours

Dear Editor:

Congratulations on the 45th anniversary in 1992 of *Audio*, and on your long tenure at the magazine (I remember applying for the job of editor-in-chief myself back in 1973).

The September issue is one of the best I've read in years, probably because it reminded me of the time when I first got interested in audio, and what fun it seemed then. I worked in a store much like the one described in Bert Whyte's "Behind the Scenes" column. The feature on Columbia producer Goddard Lieberson and the article (in the anniversary-year supplement) on loudspeaker designer Paul Klipsch were pleasantly nostalgic as well as informative.

I reserve special praise, however, for Richard J. Kaufman, whose feature on loudspeaker modifications ("With a Little Help from My Friends") made me long for more articles of this type. I tried the foam on my own speakers, and not only does the image seem more palpable, the soundstage seems deeper. All for two bucks! Please consider more articles of this kind, to enable readers to get involved more while leaving less to the engineers, who seem to have forgotten where equipment is used (in the home) and what it is used for (listening to music).

Best wishes for the next 45 years.

Preston William Huey, Jr.  
Pullman, Wash.

### Erratum

In "The Audio Interview: Jack Pfeiffer" (November 1992), the caption that appears on page 48 is incorrect. The pianist is Vladimir Horowitz.

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

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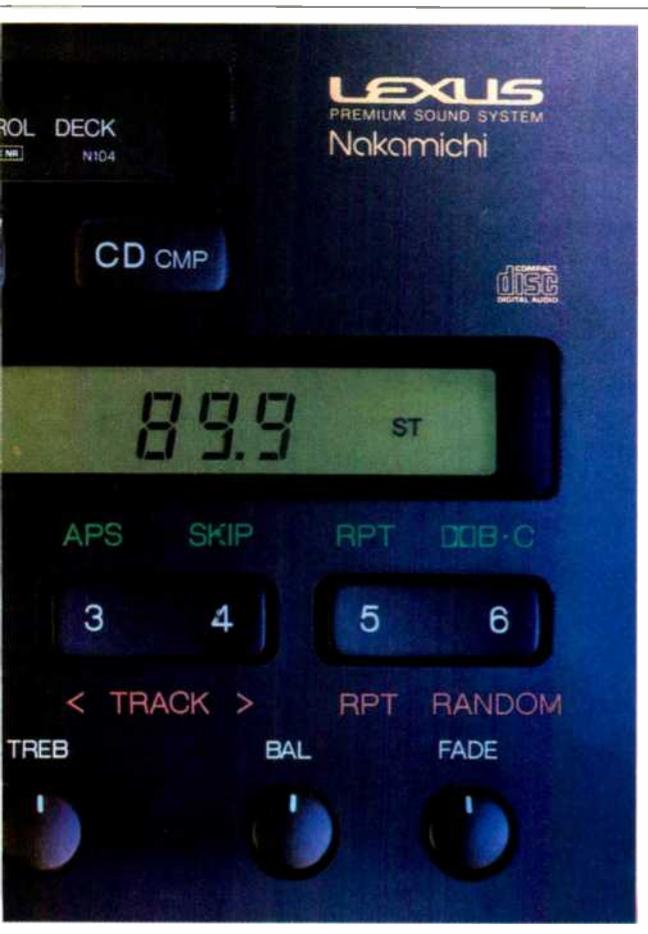
Dare we say, even a living room.

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

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# WHAT'S NEW



## Quad FM Tuner

How do you operate the 66FM tuner? From its remote control, which also operates other components in the Quad 66 system. The FM-only tuner's front panel displays station strength, frequency, and preset number digitally plus the preset's place in memory in analog fashion. Nineteen

stations can be stored, and other stations can be searched for from the remote. Sensitivity for 50-dB quieting is 8 dBf in mono and 28 dBf in stereo, S/N is 76 dB in mono and 70 dB in stereo, and frequency response is within -1 dB from 20 Hz to 15 kHz. Price: \$999. For literature, circle No. 100

## Snell Acoustics Loudspeaker

Smaller sibling to the Type B, the Type B Minor is a four-sided tower. In addition to a 12-inch woofer, it has two 5¼-inch polypropylene-cone midrange drivers with a 1-inch titanium-dome tweeter mounted between them, to minimize off-axis coloration. Price: \$3,390 per pair. For literature, circle No. 101



## Sony Car CD Player

The tuner of the Sony CDX-U8000 has a diversity front-end, three sets of six station memories for FM, and one set of six for AM. The CD section has a one-bit D/A converter. In addition, the unit includes control facilities for an optional external CD changer and TV tuner, plus an input for a Walkman or similar portable stereo. The front panel is detachable for security. Price: \$680. For literature, circle No. 103

## Hafler Tuner/Preamp

The AM/FM tuner section of the Hafler 945 has IHF sensitivity of 6.5 dBf in mono and requires 11 dBf of signal for 50-dB quieting in mono, 34.5 dBf in stereo; alternate-channel selectivity is 63 dB, and S/N is 75 dB in mono, 70 dB in stereo. The preamp section uses J-FET devices and C-MOS signal switching. Other features include remote control, coordinated video switching separate from the



audio section, and tape loops with anti-feedback logic. Bandwidth is 10 Hz to 150 kHz, +0, -3 dB, with no more than  $\pm 0.1$  dB variation between 20 Hz and 20 kHz. THD is

0.02%, and S/N is -100 dB. The unit is available in a silver, 19-inch rack-mounting version or in a 17-inch-wide black cabinet. Price: \$700. For literature, circle No. 102

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# WHAT'S NEW



## Clif Designs Speaker System

The KP-800 system includes a pair of K-200 two-way satellites that measure only 7 inches high and 5 inches deep and a vented subwoofer with two 10-inch drivers. Available finishes are black or white lacquer. Price: \$799 for three-piece system. For literature, circle No. 105

## Adcom CD Changer

The GCD-600 accepts five discs in a front-loading carousel drawer, with either clockwise or counterclockwise disc changing for faster access. Four of the discs can be removed and replaced while one is playing. The output section uses direct-coupled Class-A circuitry based on Adcom's GFP-565 preamp, and the D/A section is a dual 16-bit design with four-times oversampling. Both the fixed and remotely variable outputs have a low, 100-ohm impedance. Price: \$600. For literature, circle No. 104

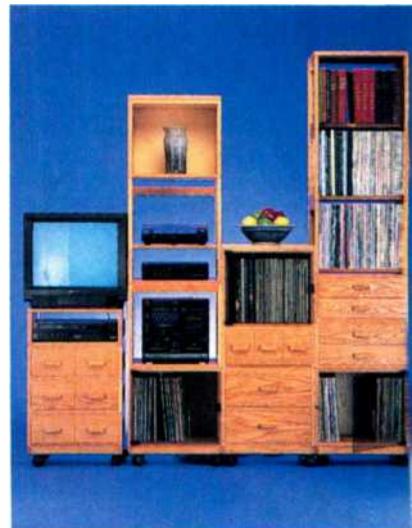


## Niles Weatherized Volume Controller

The Niles Audio WVC-1 volume controller can be mounted to an outside wall or even planted in the lawn for convenient control of outdoor speakers. Based on Niles' SCW-1 volume control, the WVC-1 is built into a fully gasketed, paintable gray plastic enclosure with fittings for connection to PVC conduit. The WVC-1 is rated at 60 watts per channel. Price: \$109. For literature, circle No. 106

## Per Madsen Design Modular Media Rack

Depending on the modules chosen, the Rackit system from Per Madsen Design can be used to hold LPs, LaserDiscs, CDs, video game cartridges, virtually any type of video or audio cassette, and even such miscellany as books, files, computer printers, and a



case of wine. The matching Component Rack modules are available in two sizes: 18 inches wide  $\times$  13 $\frac{3}{4}$  inches deep, to stack with Rackit modules, or 20 $\frac{3}{4}$   $\times$  16 inches, to hold components up to 19 inches wide. Drawer fronts are available in birch or oak. Prices: From \$24.95 to \$199.95 for Rackit modules, \$24.95 to \$79.95 for Rackit-sized Component Rack modules, and \$34.95 to \$94.95 for Component Rack-19 modules. For literature, circle No. 107



Remember the first time you heard a CD? It sounded so good, you hoped the music would never stop.

Which is the whole idea behind the CD changer.

Unfortunately most companies, in their rush to produce one, neglected to isolate the disc that's playing from the changer platform. A big mistake. (Not as big as the Hubble telescope, but pretty darn serious.)

One that transfers internal and external vibrations to the playing disc. Creates resonance. Distorts the sound. And defeats a primary reason for buying a CD player in the first place.

Fortunately Yamaha avoided this common problem by developing an entire line of CD changers that are

virtually vibration-free. A pretty amazing feat in itself.

How they do it is something called PlayXchange. A unique



*Yamaha's PlayXchange System. The only carousel mechanism that doesn't transmit vibration to the playing disc. An important feature that permits four discs to be changed without disturbing the one playing.*

And because you're supposed to spend your time listening to your CDs and not the machine that plays them, Yamaha's developed a new changing mechanism that's exceptionally quiet, quick and reliable.

But you can't judge a superior CD player merely by its changing mechanism. What makes the difference between a good player and a great one has to do with attention to details.

Take Yamaha's new CDC-835 for example. With Yamaha's S-Bit Plus Technology, twin balanced D/A converters and Class A amplification at every stage, the CDC-835 outperforms most single disc CD players on the market.

**S-Bit Plus**

Its fluorescent display can be dimmed or set to automatically

shut off during playback, eliminating any chance of interference.

And the CDC-835 is equally impressive in the convenience department.

Its TOC Memory memorizes the contents on each disc, speeding up access to specific songs, especially during random disc-to-disc play.

And to give your favorite kind of music even more presence,

there's a built-in equalizer with five digital presets.

In fact, the CDC-835 can remember your favorite songs on up to 100 discs and play them back in any sequence. It even remembers EQ settings.

Then there's 5-Disc Tape Edit. A useful recording feature that arranges the tracks you select so they fit neatly on two sides of your tape



*The CDC-835. The only changer with a five-mode digital equalizer*

By now, if you're not quite sold on the CDC-835, you only have two options. You can drop by your nearest Yamaha dealer and let your ears make up your mind.

Or you can buy another changer. Which when you stop to think about it, would be a total shock to your system.

**YAMAHA**



# WHAT'S NEW

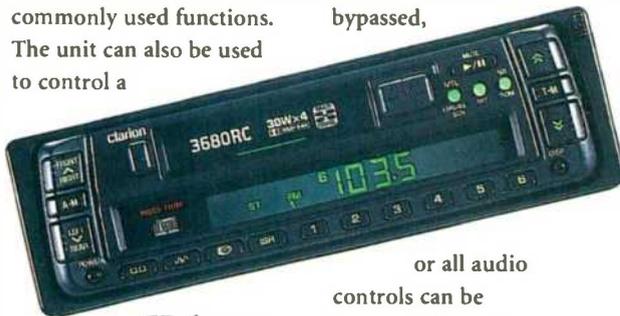
## AudioSource Speaker

Designed as an add-on for people expanding their systems with surround, the AudioSource VS Two speaker has shielded drivers for use near video screens and a built-in 30-watt amplifier with selectable line- or speaker-level input. A signal-sensing circuit automatically turns the system on and off, and levels can be set with a rear-panel control. The driver complement includes two 4-inch woofers and a 1-inch dome tweeter. Rated frequency response is 70 Hz to 20 kHz. The impedance of the speaker-level input is 8 ohms, and the line-level input has a 47-kilohm input impedance and a sensitivity of 350 mV for full output. A passive version, the VS One, is also available. Prices: VS Two, \$159.95 each; VS One, \$119.95 each. For literature, circle No. 108



## Clarion Car Stereo

Detachable for security, the control panel of the 3680RC AM/FM/cassette unit has large buttons at each end for the most commonly used functions. The unit can also be used to control a



CD changer— or up to four changers, with an accessory switching box. The auto-reverse tape section has dual azimuth adjustment and Dolby B NR. Tuner features include

memories for presetting 18 FM and six AM stations, up/down seek and manual tuning, preset scan, and automatic storage of six strong local stations. Tone controls can be bypassed,

or all audio controls can be bypassed for systems controlled by an external preamp. The four-channel amplifier section is rated at 30 watts per channel. Price: \$299.99. For literature, circle No. 109



## Quart Car Speakers

Quart calls the 4-inch QM 100KN-S, the 5¼-inch QM 130KN-S, and the 6½-inch QM 160KN-S "Stealth Coaxials" because they're shallow enough to drop into cars' factory-cut speaker holes. Some of that compactness was gained by mounting the 4-kHz,

12-dB/octave crossover separately and some by the use of neodymium magnets. Bass response ranges from 38 Hz for the QM 160 to 62 Hz for the QM 100, with a rated upper limit of 32 kHz for each. Prices: QM 100, \$219/pair; QM 130, \$239/pair; QM 160, \$269/pair. For literature, circle No. 110



## Philips Active Speaker

Digital signal processing built into the Philips DSS930 is designed to extend and flatten the speaker's frequency response, compensate for the distance between drivers, and eliminate crossover errors. Frequency response is rated at 40 Hz to 20 kHz,  $\pm 0.5$  dB. A built-in, 80-watt amplifier powers the low- and mid-frequency drivers, and a 20-watt amplifier handles the highs. For multi-room applications, speakers can be daisy-chained with a single cable that carries digital signals plus control (source and volume) information; an infrared eye in the speakers allows remote control. Price: \$1,200 each. For literature, circle No. 111

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**Mr. Big: Lean Into It** (Atlantic) 24821

**Yes: Classic Yes** (Atlantic) 50248

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**Jethro Tull: Thick As A Brick** (Chrysalis) 01023

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**Kronos Quartet: Pieces Of Africa** (Nonesuch) 10472

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**Larry Carlton: Kid Gloves** (GRP) 02487

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## Pick the Right Alcohol

In the August 1992 issue, a reader asked why the use of 91% isopropyl alcohol made his tape deck's rubber rollers dry out and crack. I stated that cleaning my own decks with this solution had never caused problems, but another reader has provided more information:

*As a chemist and an enthusiastic tape recordist for many years, I would like to throw a little light on the matter.*

*Actually, both you and your correspondent are correct. The reason is that the isopropyl alcohol purchased from your local drug store is not just isopropyl alcohol and water; it is denatured isopropyl alcohol. Denaturants are added so that the alcohol will not be very tasty if you try to drink it. That is done by law. There are, however, a number of formulas that can be used to denature the alcohol, and it is impossible to tell by looking at the label or sniffing the alcohol just which has been used. Some of the denaturants are pretty nasty materials. I suspect that your reader bought some alcohol containing denaturants that didn't agree with the rubber in his pinch rollers and caused them to decay. On the other hand, the drug store where you bought your alcohol may have carried a variety with "tame" denaturants that had no detrimental effect on your recorders at all. I suspect the problem is in the denaturants, not the alcohol itself.*

*There is a readily available cleaning agent that, for some reason, is ignored: Vodka. Vodka is simply grain neutral spirits (ethyl alcohol) diluted to proof with distilled water. It does not contain sugar or flavoring agents, and should leave no residue of any kind. Ethyl alcohol (ethanol) is also less likely to penetrate rubber or cause any trouble, but it is a very good solvent. In some cases, the normal 86-proof vodka (43% alcohol) will not be strong enough to do a good cleaning job. If that is the case, it is possible to buy a bottle of grain neutral spirits, which is usually 190 proof (95% alcohol). This can be used directly, or you can slightly dilute it with distilled water.*

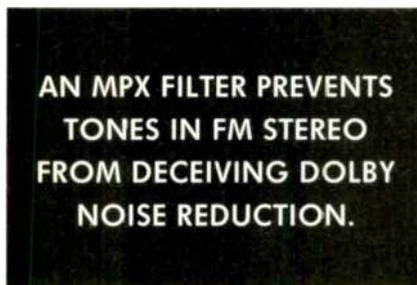
*There are a couple of advantages of using vodka or grain neutral spirits as a cleaning agent. These liquids are relatively mild and unlikely to damage most rubber or plastic, certainly much less so than isopropyl alcohol. Second, if it turns out you do need a stronger solvent, you can always consume the remain-*

*der; you haven't wasted any money. Most important of all, however, there is no denaturant present and no chance of these nasty and unidentified materials causing any problems.—Larry Morgenthaler, Chicago, Ill.*

## MPX Filters and Response Limits

**Q.** *My cassette deck does not have a switch for a multiplex (MPX) filter. Although this deck has a rated frequency response of 20 Hz to 18 kHz, I have read that if a deck has a nondefeatable MPX filter, its response is limited to 15 kHz. Is this really true?—Danny Tse, San Lorenzo, Cal.*

**A.** Your deck may have a nonswitchable MPX filter, or its recording circuitry may be designed to render a filter unnecessary



by rolling off sharply above 18 kHz; check with your dealer or look in your owner's manual. Without an MPX filter or with the filter disengaged, a cassette deck's response can extend to 20 kHz or a bit higher. With a filter, response can extend at most to 18 kHz or so.

The filter's purpose is to cut out any 19-kHz pilot tone and 38-kHz subcarrier in the output signal from an FM stereo tuner. Otherwise, these frequencies may beat with the cassette deck's bias frequency, producing audible noises, and may interfere with proper operation of the Dolby noise-reduction system. Many tuners filter these components out, but most cassette decks include multiplex filters in case a tuner doesn't. Usually, this filter is defeatable.

## How Many Tracks for Mono?

**Q.** *I record the sermons in my church on a stereo cassette tape. When recording a mono signal, is it better to record that signal*

*onto both tracks A and B or to record it on either track A or B?—Scott J. Bergstedt, Pullman, Wash.*

**A.** You probably can't record tracks A and B at separate times, because a recorder's erase head operates when in record mode, and most cassette recorders and decks erase both tracks at once. So if you recorded the second half of the sermon on track B, you'd erase the material you'd previously recorded on track A.

Recording each track individually would save tape. But even if you could record tracks individually, it would probably be best to record the mono signal on both tracks and combine them in playback. This ensures that if one track suffers from dropouts or loses treble because of a grain of dirt or magnetic coating that affects just one gap, the other track will serve as a backup.

If you wish to record on only one track, it is best to record only on track B, the right-hand track. This is because contact between the tape and the heads is sometimes poorer toward the edge of the tape than in the middle, and track A is nearer the edge.

## Hi-Fi VCRs and Dolby NR

**Q.** *Can I use the Dolby NR system of my Hi-Fi VCR for audio recording? The instruction manual isn't clear on this. Also, is the S/N ratio obtainable with my VCR comparable to that which I can obtain with Dolby C NR on a first-rate cassette deck when using metal tape?—M. Grant, Gardena, Cal.*

**A.** In a Hi-Fi VCR, Dolby noise reduction is used only for the linear (edge) track, which is recorded in much the same way as an audio Compact Cassette. Without Dolby NR, the linear track would have a signal-to-noise ratio of only about 45 to 55

---

If you have a problem or question on tape recording, write to Mr. Herman Burstein at AUDIO, 1633 Broadway, New York, N.Y. 10019. All letters are answered. In the event that your letter is chosen by Mr. Burstein to appear in Tape Guide, please indicate if your name and/or address should be withheld. Please enclose a stamped, self-addressed envelope.

# AR

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

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

AR's approach to developing products has brought the world the acoustic suspension loudspeaker, dome high frequency and midrange drivers, the three-point suspended subchassis turntable and liquid cooled drivers. Each of these has become an industry standard because each bettered musical reproduction in a tangible, practical way. These successes come directly from two principles: First, the

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# AR CLASSIC LOUDSPEAKERS

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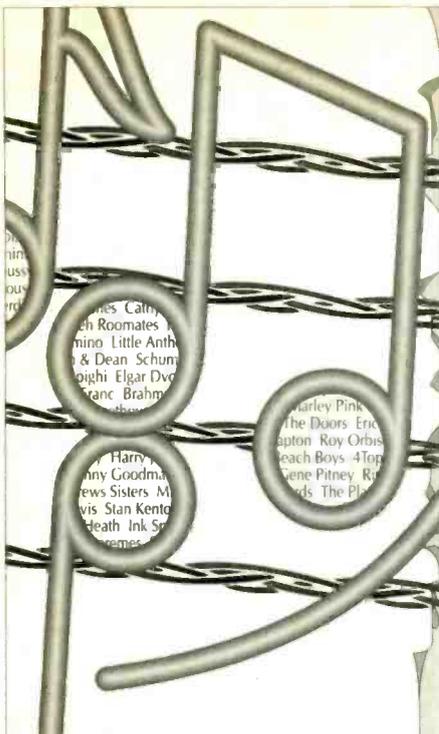
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dB. Hi-Fi recording with a VCR employs FM modulation and takes place on the same tracks as the video recording, whether or not video recording takes place.

With metal tape, most of the best audio cassette decks achieve S/N ratios of roughly 75 to 78 dB. Some good Hi-Fi VCRs achieve S/N ratios greater than 80 dB. The difference is not apt to be profound to the human ear, except perhaps at very loud levels. The areas in which Hi-Fi videotape is superior to audio cassette are low wow and flutter, extended and flat frequency response, and long recording time (six hours or more with a VCR).

## Vicissitudes of Temperature

**Q.** *While attending school I live in a room that used to be a porch, and at night it can get mighty cold. What effect will such cold have on my tape collection? During the day, though, my room warms to a reasonable temperature. Will this fluctuation cause any harm? Will playing the tapes while they're cold cause harm? Is there any risk to the tape deck from the cold temperatures?*—Rob Carroll, Falmouth, Mass.

**A.** Generally, tapes should not be subject to temperatures lower than 30° F or higher than 130° F. Rapid cycling between very cold and very hot might be injurious to tapes, but a fairly slow change from quite cold to room temperature is tolerable. I suggest not playing the tapes when they are still cold; their ability to withstand physical stress improves as they warm up. I doubt that cold temperatures will harm your deck, but to avoid physical stress it should be brought up to room temperature before operation.

## DAT Life

In "Signals & Noise," October 1991, an *Audio* reader asked, "How long will a digital audio tape (DAT) last?" A substantial answer given by Brian T. Karda, Engineering Manager of Loran Cassettes and Audio Products, follows.

Metal-particle tape (MPT) is employed for DAT, which is similar to the metal tape employed for Compact Cassettes. Karda states that MPT can degrade at temperatures as low as 131° F, due to deterioration of the binder and distortion of the base film. Several brands of metal-particle DATs have been tested by Loran; they were all

able to withstand 113°, but at 122°, "One particular brand began to show audible defects and excessive error rate," defined as more than one bad bit in 100 bits. He concludes that "excessive environmental conditions should not be of concern in the studio or home; however, for portable or automotive applications, care must be exercised in storing and playing DAT cassettes." For example, the temperature may go well above 130° in a closed, standing automobile on a sunny summer day.

DAT appears to perform "quite well" in long-term storage. "In an ongoing test, we are attempting to determine the shelf-life of DAT... one-hour DATs were recorded with a music program and tested immediately and every 12 months for error rate, signal level, and audible defects. After three years, none of the recorded DATs have demonstrated any effects or an excessive error rate."

Loran has found DAT to display "exceptional performance" with respect to repeated-play capability. A number of 5-minute sections were recorded with a test tone. (Flaws are audibly more noticeable on test tones than on program material.) Each section was played and rewound 2,000 times, and after every 50 plays critical listening tests and a check of the error rate were performed. "After 1,500 plays, some of the tapes exceeded the allowable error rate and demonstrated some slight audible defects. However, more than half the tapes were still within the error-rate spec [no more than one bad bit in 100 bits, well within the error-correction ability of a DAT deck —H.B.] and audibly unaffected even after 2,000 plays." Thus, Karda concludes, "Some tapes may be more durable than others, but with proper handling of a quality DAT, a quite acceptable life span can be expected—longer than I have played my favorite cassette or CD."

While DAT may never extensively replace the Compact Cassette or CD at the consumer level, Karda points out that DAT has a distinct place in several areas: In the recording studio, in the duplication house, in broadcast stations, and in computer applications ("where there is constant battle for more data in a smaller space"). Altogether, "DAT is a very robust format—a very useful tool for those using the format within its niche." **A**

One might think the last thing the world needs is just another line of loudspeakers. But the six models below are not just another line.

They're new from Harman Kardon. Which explains why nearly every aspect of these six speakers stands in stark physical and theoretical contrast to the other two thousand plus. ■ While new speaker lines often start life in

sales and marketing departments, the concept behind Harman Kardon's speakers originated on a higher plane: a 17 year Canadian government scientific investigation into the largely unexplored frontier between acoustical measurement and listener response. The sum total of that research went into more than a white paper. Harman Kardon adapted

it to bring its first speakers as close to perfection as present technology allows. ■ In speaker engineering and crafting, the commitment was uncompromising, starting with a matched set of competent drivers linked with an equally refined crossover network. This array is housed in an innovative structure the listener will never

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**THESE NEXT**  
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see: a series of internal sub-chambers that reduce unwanted resonance and coloration. In partnership with the driver array, the enclosure provides smoother power response over a generous listening area. ■ The result is a listening system that actually complements room acoustics rather than compensating for them. Finally, in appreciation of the idea that perfection outside

the laboratory really should dress for dinner, the Harman Kardon speakers are wrapped in furniture finishes that fittingly reflect their North American heritage. ■ Until now, this kind of performance and appearance have simply not been available at prices within the reach of the serious music lover. Regrettably there will still be some people who think there are already enough speakers. But Harman Kardon didn't build its very first speakers for casual listeners. We built them for you. In the pure Harman Kardon tradition – architecturally and sonically better.

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\* Audio magazine's 35th Annual Equipment Directory, October 1992.

**Subwoofer Crossover Considerations**

**Q.** *I have read that a weakness in a subwoofer/satellite system could be a gap between the upper frequency limit of the woofer and the lower frequency limit of the satellite speakers.*

*I have considered adding a 12-inch subwoofer to my existing loudspeakers. The frequency response of the speakers that would then become the satellite systems extends down to 60 Hz. The subwoofer's response is 29 to 180 Hz. Because its 180 Hz overlaps the frequencies of the satellites, would these speaker systems blend all right? Is there a gap?—Richard Garcia, Commerce, Cal.*

**A.** If your subwoofer could not handle frequencies above, say, 40 Hz, there would be a gap between its upper cutoff and the 60-Hz cutoff of your smaller speakers. But you have an overlap, the opposite of a gap.

That's not too good, either. The frequencies in the overlapped region, 60 to 180 Hz, may be overemphasized, because both speakers are producing them. Or you may get cancellations, due to phase differences between the two speakers' outputs in this frequency range.

Luckily, overlaps are easier to cure than gaps. Just add a crossover to channel low frequencies to the woofer and everything else to your satellites. In your case, the crossover should be set to something like 100 Hz. This should permit both the satellites and the subwoofer to operate over the flattest portions of their response curves.

**Playing Records Monophonically**

**Q.** *I have a large collection of LPs dating back to 1953. My new receiver, unlike previous units, does not have a button for mono. I can't play my monophonic discs monophonically, and I don't get as good sound because of this. Is there anything I can do to restore this option?—Ralph Corbett, Fullerton, Cal.*

**A.** Monophonic records usually do sound better when played monophonically. Any vertical information picked up by a stereo cartridge playing mono records will include only rumble (some of which may be on the record itself), some distortion

caused by pinch effect (which drives the stylus upward, especially at high frequencies), and noise. Since this information shows up as a difference between the channels, you need only cross-connect the channels to eliminate it.

The easy way is to connect two shielded Y adaptors in series between your turntable and your preamp. You need one Y adaptor with two female RCA jacks and one male RCA plug (such as Radio Shack #42-2436) and one with a female and two males (such as Radio Shack #42-2435). If this hookup gives you hum problems, try detaching your turntable's ground lead from your preamp. If the problem persists, carefully trim back the insulation from one of the two RCA plugs that goes into your preamp and then sever the shield surrounding its center conductor—just be careful not to cut into that conductor or the insulator surrounding it.

**EVEN IF YOUR SYSTEM  
HAS NO MONO BUTTON,  
YOU CAN STILL PLAY  
MONO LPs MONAURALLY.**

A more elegant way, which would save you the trouble of plugging and unplugging things, would be to install four RCA jacks and a single-pole, single-throw switch in a small metal box. Wire the left-channel jack of one pair to the left jack of the other, and do the same for the two right-channel jacks. Wire the switch between the center terminals of one pair's left and right jacks. With the switch open, signals pass through the box unchanged. When you close the switch, the two channels are shorted together, and the signal becomes monophonic. Connect your turntable leads to one pair of jacks, and run a cable from the other to your preamp. It's a good idea to leave the box in plain sight when you set it to mono to remind you to switch it back again for normal stereo listening.

**CD Timing Accuracy**

**Q.** *I recently purchased a new CD player and have a question about its timing accuracy. Considering all of my experiences with open-reel tape decks and cassette decks, I have noticed that few home units approach professional recording and broadcast standards for timing accuracy: 0.1% speed accuracy, or 3.6 S per hour.*

*It was natural for me, therefore, to continue the practice of checking the accuracy of CD players. Most of the players I have owned have run just slightly under the times shown on the CDs. You can imagine my surprise when I checked the accuracy of my new player and found it ran about 12 S per hour faster than the expected timings!*

*You may not think this is a matter of any concern, but this was an expensive purchase, and I would think that it should offer better timing accuracy. I would like your opinion in this matter while I await a response from the manufacturer.—Frank W. Bailey, New York, N.Y.*

**A.** The timing of the data stream in a CD player is controlled by its internal clock circuits. If you can obtain a service manual for your player, you may find a trimmer that can be used to adjust the frequency of the clock oscillator. If the player is still under warranty, the maker should be willing to adjust the clock.

(After I sent this advice to Mr. Bailey, he replied: *My faith is renewed! The manufacturer replaced the clock module with a high-accuracy unit, and the player now times out perfectly.*)

**Are My Loudspeakers Any Good?**

**Q.** *I recently purchased a pair of loudspeakers based on how they sounded at my dealer. I have no stereo components as such, so I connected these speakers to my wife's rack system.*

*At first I was very pleased with the sound, but then the right speaker sounded very "bass heavy." I took the loudspeakers back to my dealer, and he tested the loudspeakers by connecting them to a high-powered amplifier.*

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

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*The dealer could not detect any problems with the speakers and told me that my amplifier was probably not powerful enough to handle the dynamics of the music.*

*So, now what? What should I do if I invest in a high-quality, high-power amplifier and still have this bass problem?—Mark Catlett, Rosenhayn, N.J.*

**A.** It is difficult to answer your question without having been with you when you were evaluating your loudspeakers. About all I can say is that if these speakers sounded as you expected at your dealer and if they now sound poor at home, there may be some problem in your wife's rack system. As I understand it, the sound was fine at first, and then deteriorated. This may indicate that something has gone wrong with the rack system, though it's difficult to imagine what could go wrong that would result in over-accentuated bass.

I really suspect that the bass problem was there all along but that until you became accustomed to the equipment, you failed to notice it.

This bass heaviness may well be the result of room acoustics. Experiment by placing the loudspeakers in different parts of the room and at various distances from walls; you may well find a location that solves the problem.

If you have not resolved this problem, see if you can borrow a friend's system and connect it to your loudspeakers. If you notice a marked improvement in audio quality, you will know that you need better components. If nothing helps, let's hope your dealer will exchange your loudspeakers or refund your money.

### More Hiss on CDs than LPs?

**Q.** *My CDs of rock music from the 1960s and early '70s contain much more tape hiss than those same recordings on the original LPs. This problem does not appear on my jazz CDs, and many of these are from the late '50s and early '60s.*

*Can you explain why this should be so? Also, at what frequency is this hiss occurring? Would knowing this allow me to use my equalizer to cut it down?—Joe Jarocki, Elmwood Park, Ill.*

**A.** I don't have a definite explanation. Possibly, the rock material was so rich in treble that the engineers had to roll the treble off a bit when mastering the LPs, so

as not to cause tracing distortion. This would also roll off any hiss in the master tape. As CDs have no treble saturation problems, they'd require no such roll-off.

Many of the master tapes of these recordings were doubtless made before Dolby noise reduction became popular, so they'll have audible tape hiss. Overdubbing through multiple generations would raise the hiss still higher. Such overdubbing was and is more common with rock than jazz, which might account for the difference. Also, acoustical instruments are more used

**HISS IS NOT A SINGLE FREQUENCY, SO YOU CAN'T EQUALIZE IT OUT WITHOUT LOSING MUSICAL OVERTONES.**

in jazz than rock, and such instruments don't have enough highs to force the engineer to cut back the treble when cutting the LP master. Hiss is usually not a single frequency but a wide band of frequencies that overlap the music, so it's impossible to equalize it out without losing some musical overtones as well.

I'd suggest you experiment by rolling off frequencies in the range from 3 to 5 kHz, where the ear is most sensitive to hiss. Attenuate these frequencies as little as possible, because the sonic quality of the music will also be affected. Try listening to an equalized signal from the CD player and an unequalized signal from LPs, and adjust your equalizer until the two sounds match.

*Editor's Note:* Extra hiss can also occur on CDs that are made from later tape generations than the master used for the LP, or from tapes that have been improperly stored in the decades between LP and CD mastering. When trying to get rid of hiss, I've found it helpful to cut the top-most equalizer band or two to reduce severe hiss; this works best on recordings that don't have much tonal content above 10 or 12 kHz. And the Autocorrelator circuit on some older Carver preamplifiers (it's not on the current ones) does a decent job of reducing hiss but has minimal effect on the music.—I.B. **A**



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*"I have never heard better sound. Period."*

*"Their imaging is truly amazing... I am loathe to let them out of my listening room."*

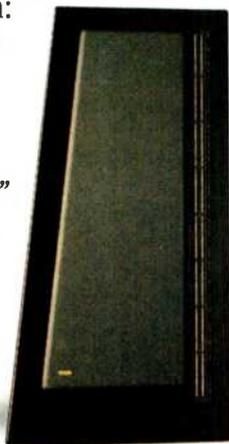
*"...absolutely majestic... a boon for audiophiles."*

*"...clean percussion, authoritative bass and a general sense of ease and openness that I cannot quite get from other fine speakers."*

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# Amazing



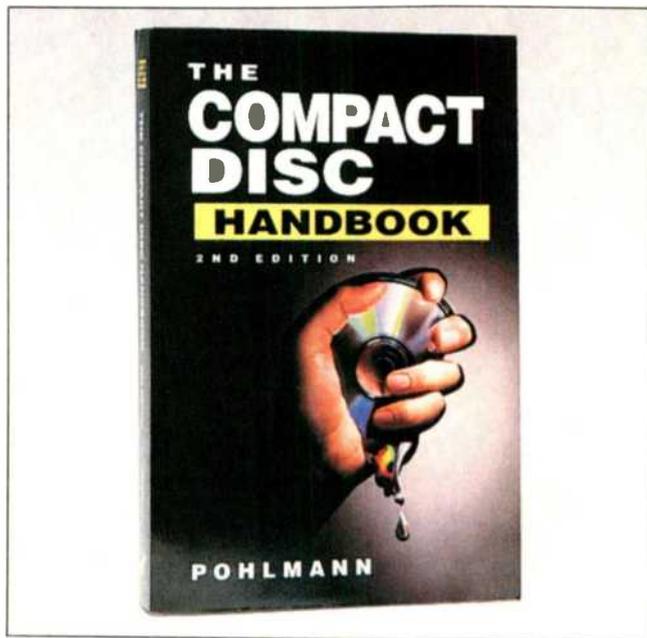
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## SKETCHY ON CDs? GET A GRIP

The new edition offers expanded discussion of diverse disc formats coming into the market.



### The Compact Disc Handbook, Second Edition

Ken C. Pohlmann  
A-R EDITIONS, 349 pp.;  
hardcover, \$49.95; softcover, \$34.95

I had the pleasure of reviewing the first edition of this book for the October 1989 issue of *Audio*. At that time, I wrote in summary that it was a very good book. I can with confidence now upgrade the evaluation to excellent. I had several rather minor complaints about the first edition, and all of these have been eliminated or fixed very nicely. Additionally, there has been some rearranging of the material, and several sections have been expanded. This might be expected in a book about a rapidly changing topic such as the Compact Disc and its immediate derivatives in optical recording.

Anyone with an interest in CD technology will want this edition. Those with in-depth knowledge will

find it a nice review of their understanding and, because of the clarity of the presentation, will take with them some ways of describing digital processes that make it easier to explain CDs to others. (I have found much of this material useful in the classroom.) Those who are relatively new to this technology will find the book a good first exposure to the magic of digital sound reproduction. Even those who already have the first edition will want this version: Besides revisions and rearrangement in the text, many of the figures are considerably improved, and the expanded sections include discussions on noise shaping, data transmission, and the diverse disc formats that are rapidly coming into the marketplace. The second edition is about 20% longer than the first.

Ken C. Pohlmann, as usual in his extensive, popular writing, does an amazingly good job of bringing complex technological concepts within the understanding of those

who do not have advanced training in digital numerics, digital coding, and the like. That is not to say the explanations presented will completely satisfy everyone, especially those insisting on absolute mathematical, scientific, and engineering precision. Nevertheless, the explanations are quite accurate and often by analogy give the reader an understanding of the basis for the "true facts" about these processes. The discussions are never embarrassingly simplified. I found them not only quite satisfactory but in some cases enlightening.

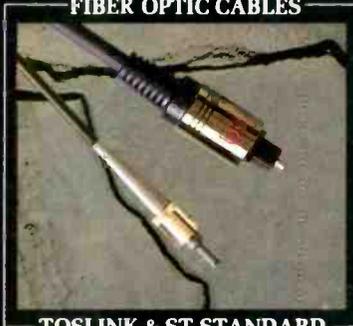
A brief summary of the contents is vital to any book review, so here goes. Chapter 1 (only 12 pages) is a very brief introduction to the Compact Disc. Chapter 2, "Fundamentals of Digital Audio" (30 pages), is written at a modest technical level but should convince readers that digital signal processing does "work." The basics theorems of sampling and quantization are described. Chapter 3, "The Compact Disc System" (54 pages), is as good and complete a description as I have seen anywhere. It is suitable for the technically minded reader, even to the point of being quite challenging in some sections. The serious student of digital signal processing will want to pursue some of the more advanced references given. There is a good amount of discussion concerning the details

**BOTH NEWCOMERS  
AND AUDIOPHILES  
WILL WELCOME THE  
BOOK'S CLARITY.**

of data coding and error correction, and the structure of the information in the data channel is given. Chapter 4, "CD Player Design" (63 pages), really gets to the heart of its subject. All important aspects are covered, such as the transport mechanism, servo controls, optical pickups,

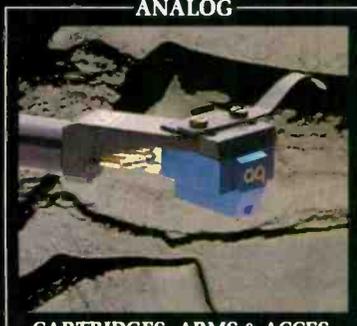
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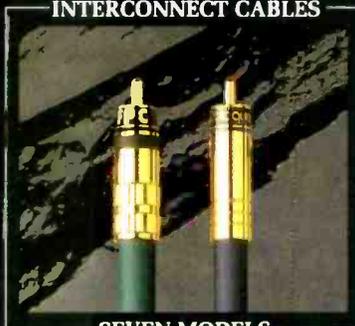
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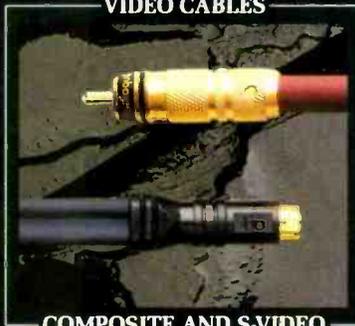
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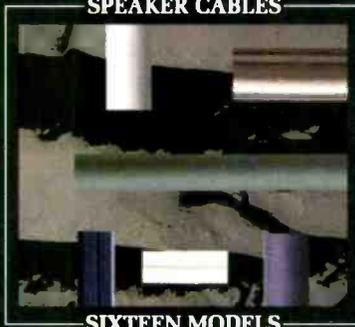
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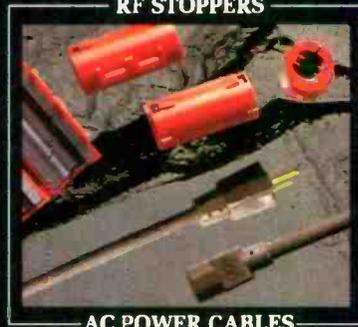
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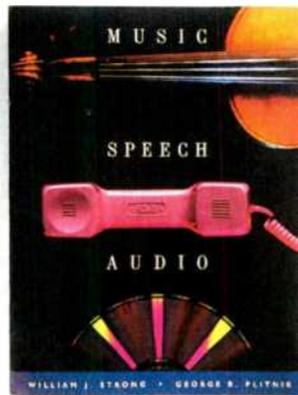
tracking systems, data retrieval, digital filters, and analog-to-digital conversion; also included are the newer techniques of noise shaping and low-bit conversion. Several of the figures in this chapter have been improved and explanations clarified, expanded, or in a few cases contracted in a very appropriate way.

Chapter 5, "Practical Concerns" (45 pages), is a rather nontechnical discussion of possible differences among CD players that are the result of the precise digital process used in a design and the details of how the machinery of a player is put together. This section will help place test reports, such as those found in *Audio*, in proper technical perspective. Described are the tiny amounts of distortion and other residual defects in the reproduction process, as well as the tests needed to define them. The chapter carefully, and correctly, sorts out the real, though slight, imperfections of the digital process from the anecdotal pseudoscience that surrounds so many high-level technologies. Luddites, beware!

Chapter 6, "Diverse Disc Formats" (62 pages), is a tremendously interesting section on derivatives of the CD—or more generically, optical storage—that are becoming important for computer data, interactive audio/video, multimedia materials, television, and even still photography. While this chapter is not of immediate concern to the fan of pure audio reproduction, it is fascinating. At some point it will be hard to decide if the optical information carrier is a "disc" or a "disk."

I have never been able to get very warm about Chapter 7, "Disc Manufacturing" (38 pages), but many readers will be fascinated to learn how relatively easy it is to digitally process audio signals because of the robust nature of digitized information. Equally impressive is the ability to mass-produce tiny physical structures: You can barely see the pits of a CD with a good microscope, but they are there—and very accurately sized and placed at that.

All in all, a very nice book, complete with improved glossary and index. I will recommend it to my students, and I highly recommend it to readers of *Audio* as well as others with interest in digital sound reproduction, particularly that of the Compact Disc. (A-R Editions, 801 Deming Way, Madison, Wisc. 53717.) R. A. Greiner



### Music Speech Audio

William J. Strong and George R. Plitnik  
SOUNDPRINT, softcover, 521 pp., \$35

This is a large-format softcover book intended as a broad-based "student friendly" text on acoustics, aimed at the college underclassman level. William J. Strong and George R. Plitnik have had more than 25 years experience teaching what they aptly call descriptive acoustics at Brigham Young University, and this book is their basic teaching guide. The current version is the third since 1977.

The book is essentially nonmathematical, but it abounds in graphics. Covered in the text are six broad areas:

*Science and Acoustics.* Here the authors discuss the basic physical quantities and their associated derived quantities. This serves as a primer on energy, power, and intensity—information so necessary for developing an intuitive feel for acoustics. Basic vibration is covered, as is compound vibration, a subject that helps our understanding of many musical instruments. Wave phenomena and propagation are then discussed, along with aspects of reflection, refraction, and diffraction. The authors give a clear exposition of the tricky subject of sound level and the decibel.

*The Ear and Hearing.* This section begins with the anatomy and basic characteristics of the ear, including aspects of critical band theory and masking. Threshold, loudness, pitch, and tone color are discussed, along with additional aspects of sound perception such as temporal and spatial judgments and nonlinear action of the ear. Musical scales and basic harmonic relationships are covered, and the section ends with the topics of hearing impairment and noise problems in the environment.

*Listening Environments.* Strong and Plitnik explain how sound behaves in and out of doors and how it can be isolated. Interior sound control is covered, with emphasis on absorption and the control of reverberations. The authors then move on to the elements of auditorium design, relating some of the subjective judgments of hall acoustics to the physical phenomena responsible for them. Finally, a primer on sound reinforcement is provided.

*The Human Voice and Speech.* Normally given cursory treatment in basic acoustics courses, this subject receives special focus here. Physiological aspects are treated in detail, as are speech perception, defects in speech production, and electronic processing of speech. The section ends with a discussion of the singing voice.

*Musical Acoustics.* After introducing the musical envelope and its spectral characteristics, Strong and Plitnik discuss the entire array of traditional musical instrument types. The authors go on to cover electronic instruments and synthesizers, as well as modern principles of sampling musical waveforms for subsequent manipulation.

*Electronic Reproduction of Music.* This section is devoted to high fidelity and its as-

THE AUTHORS INCLUDE  
AN EXPOSITION OF  
THE TRICKY SUBJECT  
OF SOUND LEVEL  
AND THE DECIBEL.

sociated control systems, media, and transducers. Readers are given helpful hints on selecting audio systems and coming to grips with problems in the listening room.

The book's supplementary material includes reviews of basic math, symbols, quantities, units, prefixes, formulas, and functions, as well as brief discussion of ultrasound and infrasound. Also provided are a bibliography (including audio-visual resources) and an index.

I believe that many readers of *Audio* will find this a very informative book to be referred to time and again. (Soundprint, 2250 North 800 East, Provo, Utah 84604.)

John Eargle

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(The good stuff is on the inside)

Fall 1992

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## Audio Quest

### The Low-Down

**E**xpo 92, Seville, Spain: Yes, it was worth waiting two hours to get into the Canada pavilion here at the Worlds Fair. The reason for this most gruesome wait is simple—the word was out that the new 48 frames per second high-definition IMAX film was “something to see.”

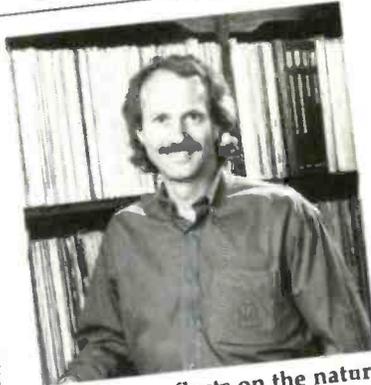
The movie screen was a staggering 19m x 26m (62 ft. x 85 ft.); the definition and detail — the tremendous amount of information — made a 70mm print of your favorite epic movie look like a 19" TV. All this fantastic hardware and software offered an incredible glimpse into lives and places we can't go ourselves.

The viewing experience was fantastic, it was fun. Unprecedented visual accuracy was used to inspire human emotion, and yet, for all the power and might projected by an Arctic-breaker coming straight at you, it was not believable. No one turned and ran for fear of getting crushed. The unbelievability of the experience didn't stop the film from being a complete success. The two million people who stood in line for two hours or more enjoyed what the film did for them; there was no reason to dwell on the limitations.

"So what does this have to do with audio?"

The phenomena I have tried to describe is that accuracy is a means more than an end. By using an extraordinary level of technical accuracy, the high-definition IMAX system enhances its ability to trigger human emotion. Its ultimate failure to truly represent reality was never an issue in the viewers' mind.

Audio systems also employ varying degrees of accuracy in their attempt to allow the listener to appreciate the emotion and sensuality of music. Accuracy in



Bill Low reflects on the nature of music reproduction

an audio system is the most predictable means of executing this noble task.

In some significant ways a reasonable audio system is more believable than the image on an IMAX screen, and yet such believability does not guarantee audio satisfaction. The absolute facts are that a audio system is never perfect — enter *subjectivity and compromise.*

**"The purpose of an audio system is ... to carry your emotions where you want to go."**

"Why is everybody in audio saying something different?"

Mankind has constructed various philosophies as a means of coping with phenomena which do not conform to physical absolutes. Some audio thinkers believe that audio does not require a philosophy because there is an absolute reality we are trying to reproduce. They are correct about the absolute goal, but wrong about the need for a philosophy!

Since perfection in audio does not exist there must be an audio philosophy which helps us cope with imperfection.

*Audio philosophy is understanding the role of subjectivity in prioritizing imperfections, in accepting compromises wisely.*

Some audio thinkers believe any opinion is as good as any other — that it is all subjective — they are wrong! Since there is an absolute goal of ultimate accuracy the role of subjectivity must be confined to a path (or a million lane freeway) which points toward this ultimate goal.

"So what does all this really mean?"

*The purpose of an audio system is to be a vehicle to carry your emotions where you want to go — no matter what type of music you enjoy.*

For the audio manufacturer, this means that scientific method must be employed in order to facilitate awareness of all possible imperfections (distortions) and to reasonably control and choose (juggle) the imperfections in order to arrive at a mixture that does the least harm. Scientific method means gathering all possible empirical data — especially from listening!

For the audio listener, this means: don't think about the equipment, don't second guess the technology of a specific product — just listen and judge its performance in the only way that counts — are you having fun?

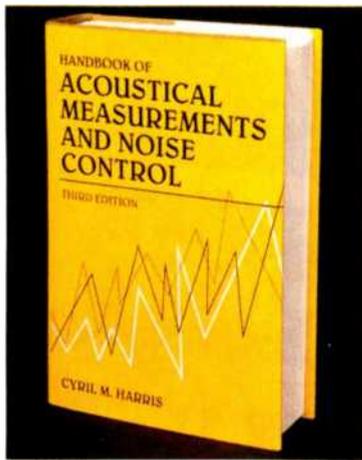
So go out and have some fun! Look for stores that listen to equipment before they buy, look for products whose existence is based on their audio qualities and not their marketing or packaging, and look for salespeople who will sit down and listen to you while they really try to help you get a handle on equipment values, and look for equipment that is a neutral, honest vehicle for your music. Then forget the equipment and enjoy some music!

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### Handbook of Acoustical Measurements and Noise Control, Third Edition

Edited by Cyril M. Harris  
McGRAW-HILL, hardcover,  
1,024 pp., \$89.50

This is the latest version of the classic *Handbook of Noise Control* (the first edition was published in 1957, the second in 1979). Dr. Cyril M. Harris wrote or co-wrote six of the 54 chapters. In the Preface, he indicates that recent developments in digital instrumentation led to the change in the book's title. I did indeed find a lot of information here on acoustical measurements—yet Chapter 5, for instance, describes manually operated sound level meters but does not tell about newer digital instruments that have computing and storage features. I saw nothing in the book about music as an intrusive noise, which was the topic of two relatively recent articles in *Audio* (“Muffling the Neighbors: Ten Tips to Reduce Noise,” November 1990, and “Good Walls Make Good Neighbors,” December 1990). I saw no information on applications of microcomputers to acoustical measurements and calculations. Also missing is information on analysis of room acoustics based on time-energy frequency (TEF) and time-delay spectrometry (TDS).

Generally, the chapters written or co-written by Harris are a little more clear than those of his colleagues; he explains basic principles very well. Nevertheless, the other authors—a mix of professors, consultants, and industry professionals—are all recognized experts in their subject areas. This review focuses on chapters I thought would interest readers of *Audio*.

Chapter 1 is a good primer on acoustics, without too much math. (Both metric and “U.S. customary” units are used here and throughout the book.) Table 1.1 could include the sound power level of normal speech, and Figure 1.1 needs something at the top of the decibel scale, such as jet aircraft noise. I disagree that the “fast” setting of a sound level meter is the basic setting (page 1.18); most noise regulations require the “slow” setting. The addition of decibel levels is treated in great detail—not with math, but by means of nomographs. However, today this addition is easy with a scientific calculator, and computation of the overall A-weighted sum of a set of octave band levels is quickly done on a computer with a spreadsheet program. These modern methods should have been mentioned as alternatives to the cumbersome and inherently imprecise nomographs.

**CHAPTERS ON HEARING  
ARE OF VITAL INTEREST  
TO THOSE WHO VALUE  
THEIR EARS.**

Chapter 2 lists many descriptors for noise level. But while acousticians most often use Leq (the A-weighted, long-term average energy level) to describe noise, its definition here is well hidden under “time.” Chapter 4, on indoor sound, is clear, though the acoustical noise-reduction calculation on page 4.11 could be done more efficiently on a computer with a spreadsheet. Chapter 5, covering acoustical measuring instruments, is excellent. (Small defects: On page 5.6-2, “electronic amplification” should read “equalization.” And contrary to a statement on page 5.17, a sound level calibrator can't work at 4 to 16 kHz because of wave motion in the cavity; typically, the highest frequency is 2 kHz.)

Though Chapter 8 tells all about FFT analyzers, it shows examples of vibration rather than sound analysis (and I have often wondered whether an FFT analyzer is a good buy if used only for sound testing). Chapter 9, on noise measurement, is clear; Chapter 12, on human noise exposure, is a must for all who listen to loud music.

Sound power and intensity testing, covered in Chapters 13 and 14, is applicable to

loudspeakers, though only machinery testing is discussed. Chapter 15 contains important basic information on the effects of noise and reverberation on speech, while Chapters 16, 17, and 18—on hearing, hearing loss, and testing—give all the fundamentals, written by the top experts, and will be of vital interest to those who value their ears. (Perhaps some nonbelievers will be convinced that loud sounds do cause hearing loss.) Consequently, Chapter 21, on hearing protection, will be important to you if you attend concerts with amplified sound or if you use machinery. The actual effects of noise on humans—annoyance, poor performance of tasks, etc.—are detailed in Chapters 23, 24, and 25 (unfortunately, as mentioned before, music as an intrusive noise is not singled out). Chapter 26 shows the related criteria for noise and vibration exposure (nothing on music).

Chapters 27, 28, and 29 include more than you need to know about vibration control—information that nevertheless will be of great value if you want to add vibration isolators to speakers or electronics. Chapter 30, on sound-absorbing material, is simple and practical; a section on Helmholtz resonator absorbers is tacked onto the end, but sound-absorbing concrete blocks that utilize this effect are, strangely, not mentioned. Chapter 31 presents good explanations on how walls, doors, and windows block airborne sound. It is a complete cookbook, except that one would have to obtain copies of standards to learn how to determine a Sound Transmission Class from a set of measured data; the basics on this could have been included.

The topics of structure-borne sound and noise control in buildings will be of interest to those who live in apartment buildings. Many fixes are described in Chapters 32 and 33. Cures for noise from power transformers, fluorescent lamps, and HVAC systems are discussed in subsequent chapters. And Chapter 45—on *plumbing* noise—will be of interest if you have a problem, but sadly the author indicates that most domestic systems are inherently noisy because of economies in design.

The amount of useful information in this book more than makes up for any deficiencies. I'm glad to have it in my library, and I recommend it to readers of *Audio*.

Jon R. Sank

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The Coupled Cavity Bass System, joins such other KEF scientific advances as the Uni-Q<sup>®</sup> Driver, which helps eliminate the adverse effects of room acoustics; and Conjugate Load Matching, which makes it less strenuous for your amplifier to drive your speakers. Together, these advances have earned KEF its international reputation for real-world performance.

For KEF, the world's finest speakers are those that sound best in your home.



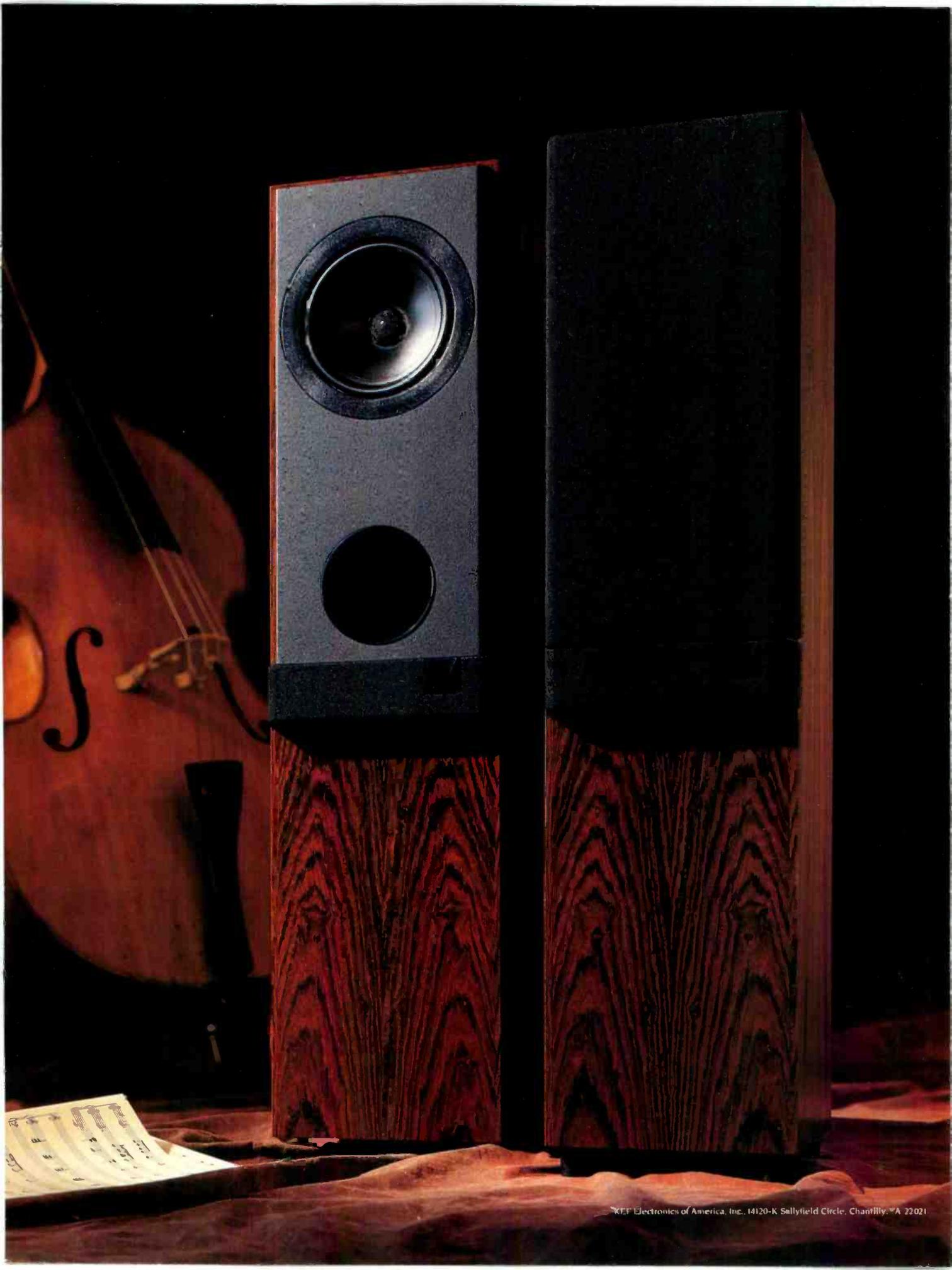
THE KEF COUPLED CAVITY BASS SYSTEM COMBINES DEEP BASS WITH HIGH EFFICIENCY.

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IVAN BERGER

## NOISEBUSTERS



Dynamat's under-hood sound damper: "Open wide and say 'sssh.'"

**O**n many modern cars, you can set the climate control's thermostat to the temperature you want, then leave it alone regardless of how hot or cold the weather gets. Your sound system, though, needs readjustment all the time.

The villain is road noise. Set the tone and level as you pull away from the curb, and the music will be downed out once you hit the highway; set it when you're doing 55 in traffic, and it blasts your eardrums when you stop to pay a toll. Between times, you readjust the volume control as you move between smooth and rough road surfaces or as you pass from a truck-clogged highway to a quiet country road. The greater

dynamic range of Compact Discs has only added to the problem.

From time to time, car stereo manufacturers have added circuits that adjust overall volume level to match changes in ambient noise. I've tried some, and they help a bit—"but not enough," adds Editor Gene Pitts, who has such a system in his '85 Nissan Maxima. One reason they don't help more is that the frequency spectrum of road noise is uneven—heavy in the bass and sometimes with subsidiary peaks in other areas. So, simple volume changes can make some frequencies too loud while letting others remain masked. I've long advocated a three-point approach, combining volume changes, bass control, and very mild

compression to bring up those soft tones that would otherwise be masked by noise. (Other audiophiles, including Pitts, feel that any compression is anathema and that you get the same results by turning up the volume. But in my experience, when all the soft sounds become clearly audible, the loud ones become overwhelming; maybe those other guys have quieter cars.)

Both Alpine's 7525 head unit and Harman Kardon's CSP-1 analog sound processor have both level and bass compensation but no compression. And Jensen now has a prototype Dynamic Sound Optimization (DSO) system that uses all three, plus artificial intelligence. According to Jensen, listeners with DSO in their cars will simply set the volume and tone effects they want, like setting a thermostat. After that, DSO's computing circuits will monitor the level and spectrum of ambient noise and readjust the sound system to compensate. According to Ken Kantor, Jensen's Vice President for Technology, "DSO uses psychoacoustic masking thresholds in real time to add compensation to the music so that perceived loudness will stay constant with changes in ambient noise. There is compression, of a sort, but it's an artifact, because the system is adjusting to the instantaneous noise level tens of thousands of times per second. So it's sort of a cross between active noise cancellation and dynamic

**METHODS TO KILL OR COMPENSATE FOR ROAD NOISE ARE IN THE WORKS.**

compression. 'Compression' normally implies some sort of average behavior, which gives more psychoacoustic artifacts, as opposed to a situation where you're trying to make the music and noise complement each other perceptually, as we are here."

# Pioneer

Rule #23  
All drivers  
are not  
created equal.



# Rules



The speaker on the left is designed with Injection-Molded Polypropylene (IMPP™) cone technology. The speaker on the right is paper. The speaker on the left offers cleaner, richer bass. The one on the right doesn't. The one on the left can handle extraordinary amounts of power without distortion. The one on the right can't. The one on the left is from a full line of new high-performance component speakers from Pioneer.® The one on the right isn't. To find out more, call 1-800-421-1604, ext. 441

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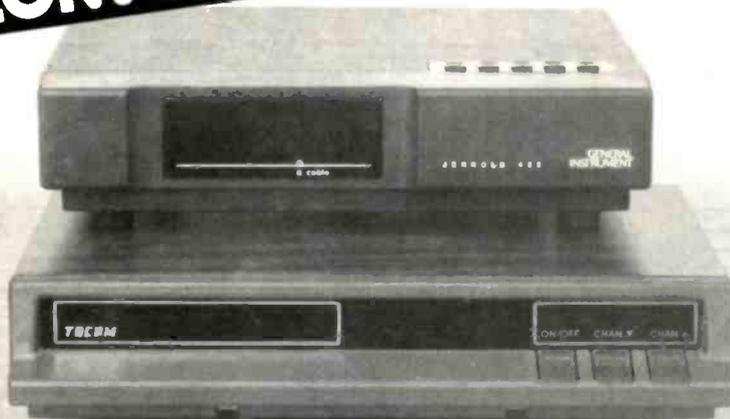
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There is, of course, another way to deal with the effect of road noise on listening: Cut it instead of compensating for it. British car magazines have long carried ads for kits of sound-absorbing mats precut to attach inside the body panels of various European cars. Dynamic Control, of Fairfield, Ohio, now offers Dynamat, a self-adhesive vibration-damping mat available in sheets of various sizes and densities. It should not



**Alpine's 7525 car stereo pits both bass and volume boost against road noise.**

..... only help block engine and outside noises but also kill annoying buzzes and resonances in the body panels themselves.

Another approach, noise cancellation, is now standard in Nissan Bluebird ARX-Z models sold in Japan. The Nissan system analyzes input from four microphones in the car's ceiling and data on engine speed. Based on this information, signals are fed to speakers under the front seats; those signals should reach the passengers' ears at the same time as, but in opposite polarity from, selected engine sounds. In practice, according to Nissan, the system cuts engine noise by about 10 dB at engine speeds of about 4,000 to 5,000 rpm (which means its effects will be most noticeable under hard acceleration), but it has no effect on road and wind noise.

For the ultimate in mobile music listening, you'd probably have to combine all these approaches, and more. First, the car's structure should be optimized to minimize vibration, resonance, and sound transmission and its engine made as quiet as possible. Add panel dampers, noise cancellation, and a signal processor like DSO, and you might wind up with the same sense of dynamic range you get in your home listening—albeit at a louder level. After all, some road noise will still be getting through. A

# Turn Your Stereo Into An All-Out Dolby Surround Pro-Logic System.

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Until now, adding Dolby Surround to a stereo system has been complex and expensive. Add-on decoders were inadequate, costly, and often required separate amplifiers. We've changed all that with our affordable, high performance Pro Logic Add-On Systems.

Both systems are centered around our new PL 100—a Dolby Pro Logic decoder with three channels of amplification (40 watts to the center channel, 15 watts to the surround channels) and a wireless remote. Its built-in signal generator enables precise balancing of the left, center, right and surround speakers. The signal delay applied to the surround channel is selectable for room size. Other controls include master volume, rear

### \$799 Dolby Pro Logic Add-On System.

The center channel speaker in our \$799 Dolby Pro Logic Add-On System is our new magnetically shielded Center Channel (see ad on following page). The rear/side speakers are a pair of The Surround™ II. Unlike any other surround speaker in its price range, The Surround II uses advanced dipole radiator technology. Properly mounted on the side walls of a listening room, their high frequency drivers direct out-of-phase sound signals towards the front and rear of the room. The sound then reflects off the surfaces in the room, finally reaching listeners from all directions, "surrounding" them with sound.

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the PL 100 with our new low-profile Center Channel Plus speaker and our highly acclaimed surround speaker, The Surround. Center Channel Plus is a magnetically shielded

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The surround speakers in this system are The Surround, a dipole radiating speaker with higher volume level capability than The Surround II. We feel The Surround is one of the very best surround speakers made, despite the fact that it costs hundreds less than competing models.

So if you already own a fine stereo system, TV and VCR, why not create an all-out home theater with one of our Dolby Pro Logic Add-On Systems?

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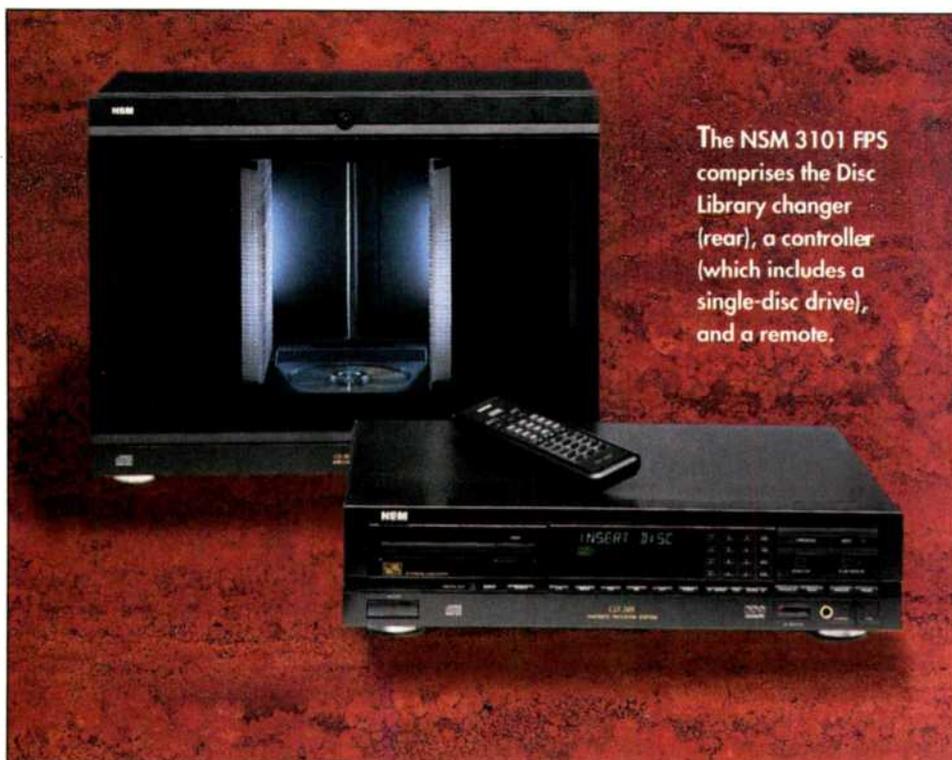


Our new PL 100 Dolby Pro Logic decoder with 3-channel amplifier; low profile Center Channel Plus speaker; The Surround dipole radiating surround speakers. Factory-direct price, \$999.

and center level, and a Phantom mode enabling the use of the PL 100 without a center speaker. Purchased separately, the factory-direct price of the PL 100 is \$399.

BERT WHYTE

## INTO A CHANGER OF DISCS, LOAD THE 100



The NSM 3101 FPS comprises the Disc Library changer (rear), a controller (which includes a single-disc drive), and a remote.

Loose-leaf binders can display CD booklets and double as catalogs for the NSM's Disc Library.



**B**ack in the dark ages of the 78-rpm shellac record, its four-minute playing time per side made a record changer an absolute necessity. Whirring and clanking, the Webcor and Garrard changers of those days played back the recordings at a "lightweight" tracking force of 1½ ounces! Even with the advent of the vinyl LP, changers

were widely used, albeit considerably refined from their predecessors.

Frankly, record changers always were anathema to me and to many other audiophiles. As soon as high-quality single-play turntables like the Rek-O-Kut were available, we fitted them with separately purchased tonearms and cartridges—and as far as most audiophiles were concerned, changers instantly went the way of the dinosaur.

Today, the state of the vinyl LP is best described as moribund, for we now have digital CDs that often provide 75 minutes of music. Oddly enough, in spite of such extended playing time, the changer has made somewhat of a comeback. Manufac-

turers now offer many models of the ubiquitous carousel changer, with a capacity of five or six CDs. A few changers can handle as many as 10 CDs (one even accommodates 18).

There is an inclination among audiophiles to consider CD changers as mass-market products that cannot provide the ultra-refined sound of the best single-disc machines. For those who can afford such indulgences, dedicated CD transports and D/A converters together can cost more than \$20,000! I have been adamant in my support of the high-quality single-disc player.

Nonetheless, for the past several months I have been using a CD changer that, with its 100-disc capacity, surely represents the near ultimate expression of the changer concept. The NSM Model 3101 FPS is actually a changer system, comprising a 100-disc library/changer and a control unit. The changer itself is derived from a German-made CD jukebox mechanism, currently in wide use in the U.S. and throughout the world. Industry veteran Kevin Byrne—formerly of Tandberg and Ortofon, now president of EuroSön, the American distributor of the 3101 FPS—became familiar with the mechanism while on a trip to Germany, and he saw the possibilities for a specialized CD changer for both home audio and commercial entertainment use. What was needed were various refinements to the basic changer and the development of an elaborate control unit.

The NSM's Disc Library is in a heavy black steel enclosure measuring 18½ inches wide × 13¾ inches high × 8¼ inches deep. It has a lockable, hinged, tinted-glass front panel, and the changer will not operate when the panel is open. Inside are two disc magazines, each about 8½ inches high and 5¼ inches square and holding up to 50 discs in numbered, thin plastic slots. The magazines pivot outward so the slots face you for loading, and both magazines are removable (extras can be purchased for \$145 each).

# The Powered Subwoofer That Has The Audio And Video Press Jumping Out Of Their Seats.

A jet roaring in *Top Gun*. The heavy-footed killer robot in *Robocop*. A semi hitting concrete after a 20 foot fall in *Terminator 2*. These are examples of the substantial, very low-frequency effects on the soundtracks of today's movies. Such frequencies are rare in music, and are beyond the capabilities of most speakers designed for music.

The new Cambridge SoundWorks Powered Subwoofer by Henry Kloss was created to reproduce those ultra-low, ultra-strong bass signals with the power and impact you would experience in movie theaters with the very best sound systems. It's designed to *supplement* (not replace) the subwoofer(s) of Ensemble or Ensemble II. It will also work with speakers from other companies.

## Remarkable bass performance.

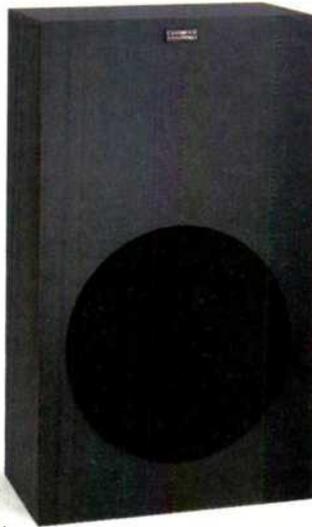
The Powered Subwoofer consists of a heavy duty, 12 inch long-throw acoustic suspension woofer integrated with a 140



watt amplifier—all in a high-pressure black laminate cabinet. Its control panel includes a bass level control and an 18dB per octave, four-position electronic crossover frequency selector (to match the subwoofer to your other speakers).

Additionally, an optional electronic crossover\* will provide 18 dB per octave,

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Powered Subwoofer



Slave Subwoofer

high-pass, line-level filters for the main and center amplifiers. These filters allow you to keep strong, low frequencies of sound effects out of the front speakers. These signals can cause distortion, even in speakers designed for full-range music.

The Powered Subwoofer's bass performance is simply *awesome*. It reproduces accurate bass to below 30 Hz. You'll hear soundtracks the way they were meant to be heard. In fact the bass is *better* than most

*Our Ultimate Home Theater Speaker System consists of our dual-subwoofer Ensemble system, our low profile Center Channel Plus speaker, a pair of our critically acclaimed surround speakers. The Surround, our Powered Subwoofer, our Slave Subwoofer. Factory-direct price: \$1,999.*

theaters! At the press event when we introduced our Powered Subwoofer, we had startled members of the audio and video press literally "jumping out of their seats" during demonstrations of movie soundtracks. The factory-direct price of the Powered Subwoofer is \$599.

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## Optional "slave" subwoofer.

For all-out home theater performance, you can add our optional Slave Subwoofer, which is identical to our Powered Subwoofer except that it lacks the amplifier and controls. It uses the amplifier and controls built into the Powered Subwoofer. Amplifier output jumps from 140 to 200 watts when the Slave Subwoofer is connected.

The combination of the two speakers can reproduce a 30 Hz signal cleanly to a sound pressure level of over 100 dB in a 3,000 cubic foot room! That's enough clean, deep bass for the largest home theaters, and the most demanding listeners. The factory-direct price of the Slave Subwoofer is \$299.

## No compromises. No apologies.

The combination of our Ensemble speaker system, Center Channel Plus speaker, The Surround rear/side speakers, Powered Subwoofer and Slave Subwoofer (see photo at left) creates a home theater speaker system that we believe is the best of its kind.

Although you can spend thousands more on competing systems, we don't know of *any* that outperform this \$1,999 package. If you'd like more information, a free catalog or our new booklet, "Getting The Most From Your Dolby Surround System," call our toll-free number any time.

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**We eliminated the expensive middle-men.** By selling factory-direct to the public, we eliminate huge distribution expenses. Don't be fooled by our reasonable prices. Our products are *very* well designed and made.



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**NEW: Center Channel Plus center channel speaker.** The wide, low profile (25"x4"x6.5") of our magnetically shielded *Center Channel Plus* makes it ideal for placement directly on top of or, with optional support unit, *beneath* a TV. \$219.



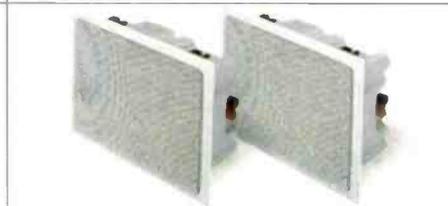
**High performance dipole radiating surround speakers.** The Surround (\$399 pr) & The Surround II (\$249 pr) use dipole radiator technology for surround sound the way it was meant to be heard. Hundreds less than competing speakers.



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**Ambiance ultra-compact speaker system.** We think Ambiance is the best "mini" speaker available, regardless of price. Bass and high-frequency dispersion are unmatched in its category. \$175-\$200 each.



**Ambiance In-Wall high performance speaker system.** We don't know of any other in-wall speakers that match its performance, value and ease of installation. Includes acoustic suspension cabinet, gold plated speaker terminals. \$329 pr.

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At the center of the Disc Library is a vertical metal rod, under which rests the actual player, which employs the same kind of Philips single-beam mechanism that is used in well-regarded CD transports from Naim Audio and Meridian. An ingenious servo-controlled elevator mechanism slides up and down the metal rod, and mechanical fingers extract a CD from its slot and then place it on the player. After playback, the elevator returns the CD to its slot.

Each of the two magazines is supplied with a loose-leaf binder that has 50 plastic pockets for CD booklets. Adhesive numbers are provided to affix to the pockets. This is a very simple cataloging system to keep track of the CDs in each magazine, and it works well in practice. Extra binders are available for \$50 each.

The NSM's controller is essentially a specially modified Philips CD player. It connects to the Disc Library through a standard RS-232 cable (to carry the control signals) and a Toslink optical cable (to carry the digital playback signal). The controller employs Philips bitstream D/A converters, and the analog signal is output from pin jacks on the rear panel. In addition to the fixed analog output, there is a variable analog output operated from the wireless remote control. If you choose to bypass the converters in the controller, you can hook up an outboard D/A converter to the Disc Library's coaxial digital output or its Toslink output.

The controller includes a single-disc CD transport with all the usual features, affording performance typical of the better quality Philips players. The control unit also has a headphone jack with volume control.

As you might expect with 100 CDs, programming can be very elaborate indeed. The controller's Favorite Program System can handle a mind-boggling maximum of 4,000 music selections, partitioned into as many as 99 separate programs. (A program has a capacity of up to 100 tracks or discs.) The Favorite Program System has a non-volatile memory, so when the NSM is turned off, all programming is retained. You can play all 99 programs consecutively; if used for background music, that would make for one helluva party! You can also play them in random order and repeat any or all programs.

For endless possibilities in special programming, you can hook up the Disc Library to any computer's RS-232 serial port and use the optional NSM Sound software (\$600) for PC-compatible computers. A menu-driven library-management package, NSM Sound can sort CDs by title, artist, and type of music—so you can set the 3101 FPS to play music of the French Impressionists, or baroque works featuring harpsichord or viola da gamba, etc. In this context, Bill Gates, the head of Microsoft and reportedly the richest man in America, is installing a number of the NSM changer systems in his home.

The 3101 FPS can also play all 100 CDs consecutively, a process that would require almost five days! (The machine can then repeat all 100, for those who just can't get enough.) Playback options for both individual tracks and discs include intro scan, random play, and repeat (you can also repeat A-B passages). For recording CDs onto analog cassette, DAT, DCC, or MD, there is an automatic pause of up to 5 S between tracks and automatic fade-in and fade-out of up to 20 S. All of the programming and other functions can be accessed from the remote.

I found the changer unfailingly reliable and incredibly fast: Moving from the first to the 50th disc, at opposite ends of one magazine, took less than 10 S. The machine is a bit noisy in changing CDs, but optional longer cables permit location of the Disc Library away from the listening area. In spite of the elaborate programming and other features, the NSM is ergonomically comfortable, and all functions can easily be followed on the comprehensive illuminated display.

I first operated the 3101 FPS in its most basic fashion, with the CDs in the Disc Library processed through the bitstream D/A converters in the control unit and the analog output connected to my preamplifier. Performance was quite good, a typical bitstream sound that was considerably augmented by my high-end electronics and loudspeakers.

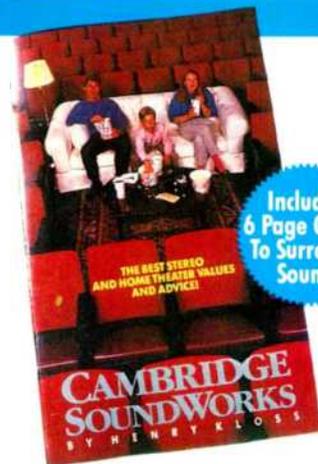
Kevin Byrne stopped by with the intent of hearing the changer hooked up in what he calls the "optimum audiophile mode." Thus, I connected the digital coaxial output of the Disc Library to a Wadia Digital DigiLink, which fed the signal through

AT&T glass fiber-optic cable to the Wadia 2000 D/A converter. The balanced output of the D/A converter was fed to the balanced input on the FM Acoustics Resolution Series 266 preamplifier, which in turn fed balanced signals to the FM Acoustics Resolution Series 811 power amplifier driving Duntech Sovereign loudspeakers. With this setup, the sound quality was of a very high order indeed—exceeded only by using the Wadia WT2000 CD transport in place of the Disc Library itself. Kevin was quite amazed, and very pleased that the changer was capable of such exemplary musical sound.

I had heard that NSM's refinements to the CD transport in the Disc Library had resulted in extraordinary tracking abilities, so I subjected it to the simulated dropouts on the Pierre Verany test disc (PV 788031/32). Impressively, the player was able to cope with every dropout, all the way up to 4.0 nm (3.08 mS!). There were momentary glitches, but correction and stable tracking were virtually instantaneous. Very few CD players, even high-priced separate CD transports, have been able to achieve this level of performance.

People with extensive CD collections of 1,000 or more discs are always trying to find ways of storing them. Consider that a rack 60 inches wide and 70 inches high with seven shelves could accommodate 84 magazines for the NSM's Disc Library. At 50 discs per magazine, this would amount to 4,200 CDs! (Admittedly, 84 magazines would cost more than \$12,000.) Another nice thing about the magazines is that you can load them with discs of favorite composers—one magazine devoted exclusively to Mahler, or Beethoven, or Stravinsky, etc. You could also devote magazines to piano or violin concertos or to Italian, French, or German operas.

The Disc Library gives away very little in sheer performance, when connected to an external D/A converter and other top equipment, and I greatly enjoyed all of the changer's facilities and reliable operation. The NSM 3101 FPS costs \$4,000, and for dyed-in-the-wool CD collectors (or party animals) it is a good value. For such specialized uses as automated radio stations, skating rinks, or any other situation requiring continuous CD playback, the 3101 FPS is indispensable. A



Includes  
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To Surround  
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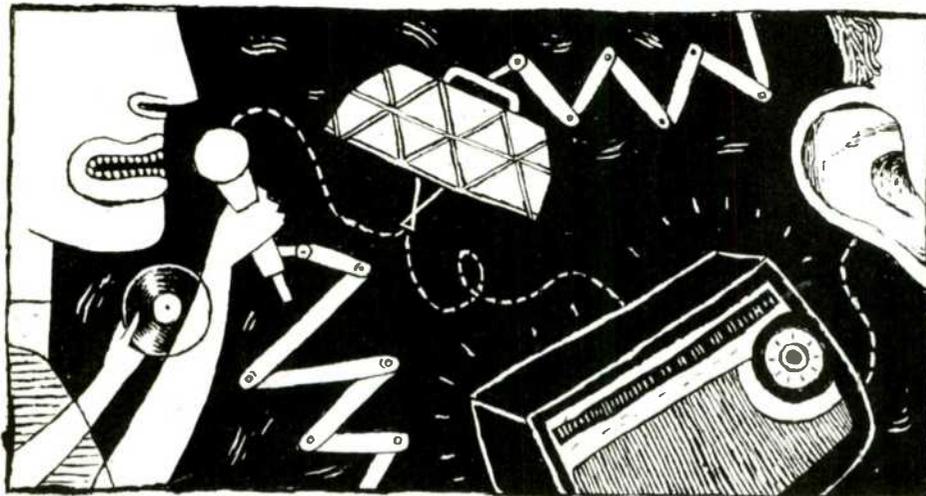
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IVAN BERGER

## DIGITAL: UP IN THE AIR?



**P**hysics, frequency allocations, and competition from TV have made radio a local medium. With the exception of a few clear-channel stations, broadcast-band AM doesn't carry very far, and FM signals have an even shorter range. The radio

**WILL CD-QUALITY RADIO SOUND COME FROM LOCAL FM STATIONS OR FROM SATELLITES? STAY TUNED.**

networks that used to let everyone in a given time zone hear the same program at once have largely been supplanted by network TV. Short-wave radio covers broad areas, but it has limited fidelity. And even FM's fidelity, once the standard by which hi-fi was judged, now plays second fiddle to newer digital media.

All this could change in the next few years. Last October, the FCC proposed that a block of frequencies be assigned for digital broadcasting by satellite. If the proposal goes through, U.S. listeners will eventually be able to receive

CD-quality sound from 30 or 40 stations whose signals will blanket the country. The satellite signals will even reach areas so remote that they get few radio signals now.

Radio broadcasters are up in arms against the proposal, justifiably fearing competition from sky stations that will offer the high-budget slickness of a national medium plus improved sound. Stations have already been hit by competition from cable TV and a growing number of new radio stations. (More than a thousand new stations have been authorized by the FCC in the past decade.) The FM broadcasters hope there will be ways to broadcast digital sound on their band, but since such systems probably won't work on the AM band, owners of AM stations are sure to oppose even that idea.

Satellite CD Radio, a startup company that first proposed a system to the FCC, says that it will not compete for advertising but will raise money from subscribers. There's no assurance, though, that advertising-supported services won't use the new band.

In Japan, the subscriber approach has already been tried, and run into trouble. The St. Giga channel opened up a digital channel in September 1991, but there were so few subscribers that it will probably switch from a paid service to an ad-supported one. By last summer, at least eight other channels were on the air in Japan, and about 10 more were preparing to open. These services all claim CD-quality sound or better, but not all their program material is music. One company broadcasts horse races, live. Another, which operates three channels, plans to link up with special-interest magazines to produce shows on such topics as computer games and Japanese comic books.

The digital satellite services offer clear sound coverage throughout Japan. However, the receiving antenna and decoder/tuner cost about \$1,700, and listeners are charged about \$5 per month for each channel they receive.

### Name Dropping

Watching Cathy Cacchione, our Art Director, lay out some classical reviews recently, I began musing on a singer named Katherine Ciesinski, whom I'd heard (and found convincing and delightful) but whom I had not heard much about.

"Maybe her name won't fit on the CD," said Cathy.



This got me wondering about MiniDiscs. Will the names of Bruce Springsteen, Engelbert Humperdinck (either one), or Leopold Stokowski have to be shortened to fit? Will John Mellencamp find it wasn't enough that he dropped the "Cougar"?

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Bryston's

3B NRB

Amplifier

**B**ryston's new 3B NRB amplifier is a companion piece to the 4B NRB and 7B NRB, with a similarly optimized interface between power supply and signal circuitry, and the same ultra-linear amplification as its larger counterparts. Its 120 watts per channel is a popular size for a wide range of music systems requiring the highest quality source of power. **T**he 3B NRB uses Bryston's proprietary Quad-Complementary output section, which improves linearity to a new standard of accuracy, while virtually eliminating aggressive higher harmonic distortion products. From input to output, all the circuitry in the NRB series of amps has been optimized for the most musical amplification possible, with dual power supplies to provide precise and focused imaging. **N**ew, three-colour LEDs glow green for power-on, yellow for transient clipping, and red to indicate longer-term overload or any other departure from linearity, including shorted outputs, or strong out-of-band information, like RF or DC. Gold plated RCA and XLR input

connectors allow unbalanced or balanced operation at the flick of a rear mounted switch. A ground lift switch separates system ground from audio ground to reduce annoying ground loops and system hum. Finally, switchable monaural operation is available if higher power requirements become necessary. **A**lthough the description of circuit innovations can indicate the research and commitment we bring to the design of the finest audio products, only in the listening does the result of that dedication become clear. Bryston's 3B NRB is capable of doing justice to the most refined sound system, with the subtlest details of the musical fabric revealed in their original form. **W**e invite you to experience the musical accuracy, long term reliability and excellent value the Bryston 3B NRB represents.

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### Hushing Hotels

With enough loudspeakers, you can make a hotel dinner dance acceptably quiet—at least according to patent applications by Jan Naslund of Sweden. Normally, music that's loud enough for dancing is too loud for dining. Naslund's idea is to blanket the ceiling above the dance floor with speakers, 10 of them per square meter, hidden behind a false ceiling. According to the inventor, the sound projects directly downward, with destructive interference cancelling any sound leakage to the sides. Nearby diners



will hear only a murmur. Presumably, however, the system would work only with amplified dance music, not with live acoustic bands.

### Soothing Rock Music

Those who walk between City Hall and Tokiwa Park in the Japanese city of Shizouka will be soothed by soft rock music—that is, by soft music from the rocks that decorate the path. The artificial rocks incorporate weatherproof lighting equipment and speakers, linked by underground cables to a music system. Four of the eight rocks play “mineral music,” made up of sounds produced when rocks and pebbles are rolled; the other four play New Age music. The sonic mix of the two depends on where you stand, so those who tread the path are treated to a changing soundscape.

### Volume Losses

Residents of an apartment house in Liverpool, England complained repeatedly about a 16-year-old woman who played her stereo system until 2:30 a.m. and left it playing while she was out of the house. After 32 warning visits from local police, environmental health officials stepped in and solved the problem—by confiscating her stereo. Officials in at least one part of



London have since confiscated other noisemakers' stereos. Fines for noise nuisances by individuals can run around £2,000 (nearly \$4,000), with businesses paying 10 times that. After such fines, few people will have the heart or the wherewithal to replace their confiscated stereos with bigger and louder systems.

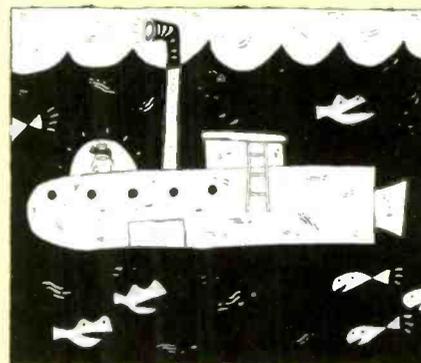
### Material Progress

Tomorrow's submarines may have active acoustic coatings that keep them from reflecting sonar pulses. Day after tomorrow, the same technology may help us get better sound in quieter homes.

The coatings, developed by Prof. Vijay Varadan of Pennsylvania State University, use two layers of a special polymer to sense incoming acoustic waves and inform a feedback controller about them. The controller registers the arrival times of the waves at each layer, gauges their phase and direction from that data, and uses a piezoelectric cell to generate waves 180° out of phase with the incoming signal. With sonar beams cancelled out rather than reflected, the sub becomes invisible to enemy screens.

According to *New Scientist*, a British scientific weekly, Varadan says the same technology could be used to reduce noise from car engines (making the cars quieter

both inside and out), to reduce reverberation in rooms and auditoriums, and even to minimize the nuisance of noisy neighbors. And by manipulating the return signal the system generates, there could be additional acoustical effects:



Delayed returns would make the room sound bigger, shaped-frequency returns could simulate different wall-covering materials, and changes in return-signal phase could also alter the direction of reflections.

### Blinded By Science

Sometimes, the reasons for a product's design sound better than the product itself does. That's why, back in the days when I wrote advertising copy, I made it a rule to write the ad before I heard the product, lest the reality be too disillusioning. (If the product really *did* sound good, however, I would rewrite the ad to take that into account.)

There are a number of reasons why a product can sound scientifically impeccable but musically peccable as all get-out. A designer may proceed logically from flawed premises or draw illogical conclusions from premises that are correct. Designers have been known to get stuck so firmly to one perfectly good idea that they lose sight of the trade-offs it entails. This is not good science, but it often passes for such—at first.

When the science is good but the products are bad, the engineering is often at fault. Perhaps the designer got his numbers wrong or misapplied them. Perhaps the cost of the pioneering new technique was so high that the designer had to penny-pinch in other areas.

In all these cases, the results can be disasters from the listener's standpoint. But as long as the reasoning sounds right, it's still a godsend to the ad copywriters.

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Photograph: Jeanne Strongin

Ignace Paderewski



*Your family has been involved in piano-making for more than 150 years. Could you tell us something about the influences your ancestors have had on music and pianos?*

You have to really go into the history of the house. The family left a small town in Germany and moved to the U.S. in 1850 because of the possibilities here. One of the sons, Charles, had come over a year earlier and had written to the family about America. Business conditions in Germany were very bad, let alone the political conditions, so the family pulled up stakes and moved to New York. They worked for other piano-makers, observed what was going on in the trade, and adopted good ideas of one kind or another. Since there were four Steinways, they could discuss things, think them over, experiment, and take what was good.

They also introduced certain new ideas of their own. One of these ideas was the overstrung grand. They ran the bass strings over the treble strings and spread them in a fan shape. This allowed the moving of the bridge into the center of the soundboard for more volume and more powerful bass. They also developed a downward-projecting flange, which improved the geometry and fastening of the strings. These Steinway innovations were added to the existing idea of a cast-iron plate. Over the years, there were many other technical changes. What the Steinways came up with was a better piano. It actually sounded better, and they continued to experiment.

*Many authorities say that Steinway & Sons pioneered the modern piano more than 100 years ago. How were Steinways different from other pianos?*

The family was obsessed with the idea of perfecting the instrument and using whatever technology was available. There was a period of about 35 years—ending just before 1889, when Theodore Steinway, the eldest of Heinrich's sons, died—when there was immense creativity in pianomaking. Basically the modern piano was developed during this time.

Courtesy of Henry Steinway Collection

  
The Steinway family was obsessed with the idea of perfecting the piano using all available technology.



Rachmaninoff with one of his daughters, circa 1918.





You'll notice some of our early patents by Henry Steinway, Jr., who was sort of the engineer until he died in 1865, are action patents—improvements on the basic Erard piano action. Sébastien Erard [1752 to 1831] of France, who was originally from Alsace, invented the double escapement action. It was improved by Henry Steinway in several ways and continued to be developed by Theodore Steinway into what we think of as the best way of transmitting the player's touch to a hammer being thrown against the string.

*When did that action development reach its maturity?*

I would say it reached its maturity somewhere in the 1880s with the development of what we call the Tubular Metallic Action Frame. The whole wooden action sits on a frame with what was at that time the latest technology: A seamless brass tube into which a hard maple dowel was inserted. The tube was soldered onto a bronze frame, and then the action parts were mounted on that. This system stands the test of time. You can take an 1875 Steinway with this metallic action frame, mount new parts on it, and it will work fine.

*What was the advantage of having the composite construction of the brass in addition to the metal?*

It was to keep the wood from moving. Wood always moves; it swells and shrinks with the season. The brass tube seems to hold it so that the dimensions stay fairly close; the whole idea, when I say "best" and "quality," is to make the thing stand. A Steinway piano must be durable; it must last and last and last. It must also be easy to fix, easy for the workmen to service for those who really want to keep the piano up to standards.

*So 120 years ago Theodore Steinway was designing for easy maintenance?*

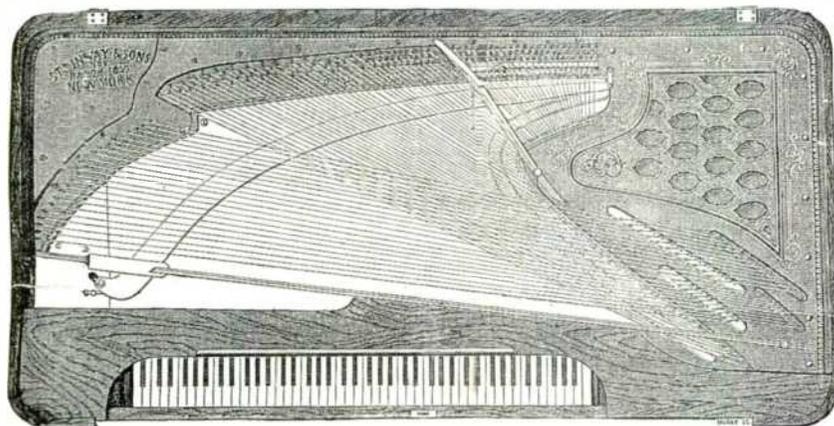
Absolutely. I think that was true throughout the instrument. You can see it in the design of the bent rim, which again was an example of innovative technology. Everybody could bend wood, but they didn't know they could bend things the size of a piano rim. Theodore developed a system to bend thin, 1/8-inch-thick strips of wood around in the shape that is now considered the standard shape for pianos. Before then, the pianos had jointed corners in them, like

furniture. This made the whole structure different. Instead of having a thick bed like the square pianos had, a 2- or 3-inch bed of spruce, the new pianos could just use bracing; then the iron plate goes in, and it makes a "form follows function" kind of structure. Theodore developed the design, and almost everyone builds grand pianos that way now.

In the front of the piano is a big, solid keybed. Theodore went to great lengths to try to keep it from swelling and shrinking, because the grand action not only has to go



Sold in 1853, these "square" instruments made up 95% of Steinway's early output.



An early Steinway square, showing the overstringing of the bass and the string fanning.







“cut through the orchestra,” as they put it. But in solo recitals, when the artists are in total command, they can have a piano to evoke the tone that they want. Pianists are really fascinated by that.

I should mention that the concert grands, although a Steinway is built as durably as possible, have a normal life of somewhere around 10 years. The problem is due mostly to temperature changes. They have to go in a truck whether it’s hot or cold. Then the piano goes into the hall. The halls are pretty good now, but in the old days, sometimes they were freezing cold. The heat was turned on two hours before the concert. The change in temperature is not good for pianos. They get worn out, and we then replace them.

*This means that an instrument might spend a decade being trucked around to various venues in New York City?*

Yes. Sometimes they get dropped. We had some that were ruined at rock concerts. A couple of times they’ve shoved the piano off the stage, and it was broken. Once you break the plate, it’s just junk.

*I’m fascinated with your comments on the distinction between a piano that Horowitz would choose and one Rubinstein might choose. Could a mere mortal actually hear the difference?*

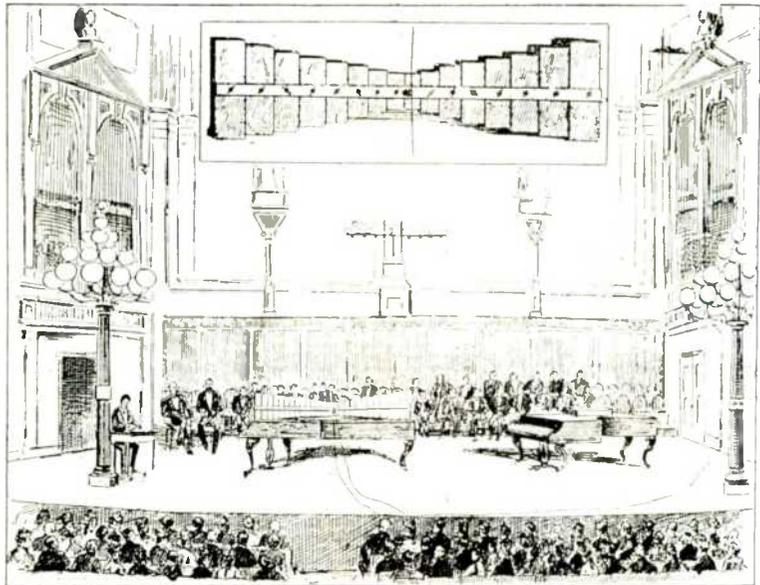
It’s very hard to separate out the touch and the sound in my mind. They have to find a piano they’re happy with. I don’t know whether it’s a hearing thing, a touching thing, or both. It’s got to feel right to the person. It’s not only the great pianist; most of our customers are people who play pretty well, and we hear some mighty good piano playing around here in Steinway Hall.

It’s a mystery, this touch/tone thing. You produce tone by pushing down the key and throwing that hammer the last eighth of an inch against the string. People say it’s mechanical, but it isn’t, because you can hear the same piano played by persons A, B, and C and it will sound different. Each produces a different kind of tone. Whether that’s the silences between the notes, which certainly have an importance, I don’t know, but it’s there.

A



B



The first public transmission of music by wire was in 1877, from Philadelphia (A) to Steinway Hall (B).



A young artist can save himself a lot of money by using the Steinway piano that’s already in the hall where he’s performing.



*William Steinway*

William Steinway

*When you listen to a recording of a Steinway and listen to a Steinway in a hall, what differences do you notice?*

The performance on a record is always note-perfect because they edit. When you're in a concert hall, there are sometimes mistakes and extraneous noises; an artist might hit part of the piano. Not really being a musical expert, when I go to concerts, the one thing I listen for is noises, the pedal squeaks. I remember going to a concert where the bench was squeaking. It drove me crazy. If that was on a recording, they'd stop the recording right away and get a new bench. So the recording is always perfect, maybe too perfect.

In today's world, it's the recording that sets the standard. Everybody learns music from records. The critics who write for *The New York Times*, the engineers, and people who are attracted to music, I bet most came from some small town and never heard a live concert until they were 15. I remember someone from *The Times* writing about that. He'd never been to a concert until he was 15 but had heard all the recordings. The generations before learned it from live performances. I'm not good at saying whether live or recorded piano is better or how they compare.

*But you seem to conclude that there's an unnatural perfection to recordings.*

I wouldn't say it's unnatural. That's the thing to do. Glenn Gould, one of the more

fascinating artists in the world, was convinced that the solo concert was doomed. He may have been right, that recordings and electronics are the wave of the future. *Earlier we talked about the differences in artists' preferences for pianos. I get the impression that each instrument has a personality of its own.*

Yes, that's true. I would say that's the result of the handcrafted manufacturing. What makes it is hard to say. The final regulation brings out the tone, which they try to make as even as possible so that this note and that note at either end of the scale have the same sort of quality, but some pianos will be a little softer or harder in tone overall. More than that, the action of the keys varies as they are fitted to each other and inside the frame. There can be slight touch differences. The touch and tone interrelation is very hard to take apart. You have to get a piano that satisfies.

Then there's the whole area of the soundboard and how it's installed, which, in my opinion, has a lot to do with the bigness of tone and the room you're going to fill. How the board acts must in some way help determine the volume and quality of sound that comes out. Pianos have certain innate differences, and that's good. Nothing in pianos is an exact science. You're dealing with wood, where nothing is absolutely square. We try to build a standard piano, but everybody must pick out the one that best suits them. All the hand-fitting tends to make each one an individual instrument.

*People talk about the "Steinway sound." What do you think that is?*

It's a curious thing. It seems to me that from the start, Steinway seemed to get a unique sound. This is mostly a resoundingness or bigness, a sound that has a bass that rings out and a treble that is pure and articulate. That is the Steinway sound. As opposed to many other things in the music business, it became early on the standard by which all other pianos were judged, and it still remains so. One of our earliest trademarks, in an old Gothic script, was "Steinway, the standard piano of the world."



*Theodore Steinway*

Theodore Steinway

If you look at the organ business, there's no such thing. There is no ultimate pipe organ. In violins, there are the Stradivarius aficionados and the people who like Guarnerius. How much of Steinway's reputation is in the eye and ear of the beholder, and how much is fact, is a little hard to say. But I think Steinway does have a certain unique tone quality.

*We've been talking about regulation quite a bit. It's clear that's a key determinant in the way the piano sounds. Could you describe what's involved in regulation?*

What I'm talking about is what we call "tone regulating" and the English call "voicing" or "toning," which is the final thing. But the first thing that has to happen is that a set of keys comes, and an action arrives from the action department. They have to be fitted to each other and to that individual piano. That's the first of the steps and the first of the quality difference. When the first guy does his operation, known as fore-finishing, he'll do, let's say, a total of eight operations. Then the next guy will go over number five, six, seven, and eight and carry it on to nine, 10, 11, and 12. And then the next guy goes a little further. But they always are refining what's been done before. That's the process of action regulating.

Part of that is the fitting of the dampers, which is very important. The dampers are the gadgets above the strings. The way the dampers move affects sound and silence.

Silence is almost as important as sound in a piano performance. When the damper comes down, the tone has to stop, not ring or make funny noises. Then, when the piano is completely action-regulated and it's been tuned three or four times, it goes to the tone regulator. His job is to then work principally on the hammers, which, up to then, are completely raw from the press. Usually the first thing he does is "skin it off," as they call it. The tone regulator takes a piece of sandpaper glued to wood and pulls it gently over the tops of the hammers. He starts at the far side away from him—the back of the piano—goes up toward the front, and gets a clean felt surface. And the shape is important. It should be pear-shaped. All of this is done while the fallboard is out, so you have the keys and action exposed. The regulators make marks that indicate which notes are too loud, too soft, too high, too low. The keys by this time are all supposedly nice and even and weighted correctly. The regulators have to do this again and again, in and out, in and out. If the piano is too bright, they have to take it apart and stick the felt with needles, which releases the tension that's built into the hammer when the hammer is glued together. That is the essence of the voicing and toning job that makes the sound nice and even.

Incidentally, that's why somebody who plays the piano fairly well should have a voicing done every fifth or sixth year, depending on how much they play. After a time, the hammers get little grooves in them from banging against the strings. You really should have a good regulator—not a so-called tuner, but somebody who knows that branch of the business—come to give a regulating.

*Does a Steinway ever wear out? And besides regulation, what are some of the other basic things owners should do to take care of it?* Most of the 500,000 Steinways built are still around somewhere, unless they were destroyed by fire or something. Like any mechanical device, a piano does get old, but it's true—you can do remarkable things by the installation of new action parts and new felts and hammers. My opin-



*H. Steinway Sr.*

### Heinrich Engelhard Steinway

ion is that a lot has to do with how often the piano is moved. It's really strange that a piano that goes into a home and stays there for 40 or 50 years may sometimes hardly need tuning. It's really adapted to the environment it's in.

You can't generalize about how long a piano lasts. It does have tremendous staying power, but, after all, it's a mechanical thing. Over 100 years old, you're taking a chance. You're getting into a museum piece. That's fine if you want to restore an 1870 Steinway. There's one in the Smithsonian from 1870 that they have restored. It's used in performances to show what an 1870 Steinway supposedly sounded like.

For maintaining a piano, it's good to tune it. The answer to how often it should be tuned is the question "How good is your ear?" Some people don't mind if a piano sinks down in pitch if it does it evenly. Who can tell A-440 from A-338? If you can't, you don't need a tune.

Steinway officially recommends tuning at least twice a year. When the heat goes on,

give it a tuning; in the spring when the heat goes off, give it a tuning. But it really depends on people with very acute ears who play well. I don't mean artists, I mean customers. Some will have it tuned every four to six weeks because it annoys them when it's not at the right pitch.

*But no damage is being done if the instrument is allowed to go flat?*

No, in a way it's almost good for it because no one has tightened up the pins or fooled around with it. As for other recommendations, depending on what people like, you can wipe off the finish. You don't need any elaborate polishes. You should do what you want to; if you want to put Grandpa's picture on it, go ahead. So it gets scratched, what the hell. It's your piano.

We recommend owners place it in a room away from the air conditioner or heater, but in modern houses the circulation is usually so good you don't have to worry about it.

*There are people who will say that the old Steinways are better than the new ones. Some believe they're easier to play or the tone is better. Are there real differences?*

Of course, there must be differences. Over the years we have made certain improvements and changes in materials. But I think there is a large emotional content in this. I started in the business over 50 years ago. Then, the "vintage" period for fine old Steinways was from around 1908 and 1909. As I got older, the period mysteriously moved up. It seems to be just like with the hot cars now; they're the cars the 40-year-olds remember as kids. It's the same with the pianos. The vintage period seems to move up to 40 years. I think this makes sense because people get fond of pianos. They're a part of the family.

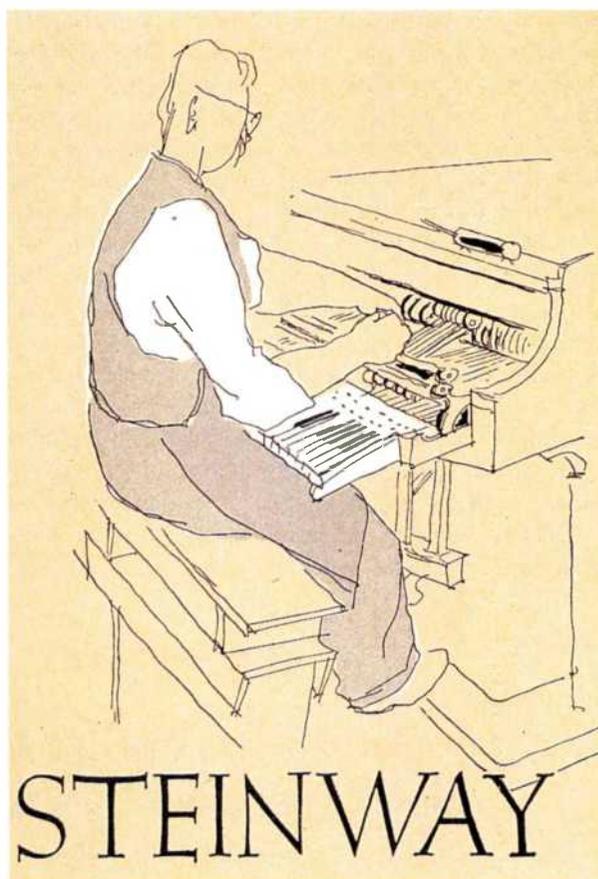


Provided a concert grand piano doesn't get shoved off a stage, it should have a normal life span of about 10 years.

A young  
Vladimir Horowitz.



Today, recordings  
set the standard;  
earlier generations  
usually learned  
their music  
from live  
performances.



The voicing, or  
“tone regulating,” of  
a grand, from a 1948  
Steinway & Sons  
catalog illustrated by  
Susanne Suba.

So you take the view that it's a changing  
fashion?

Yes, I think it's an emotional attachment to  
old pianos. When we used to do repair  
work, sometimes we'd get an old piano in  
with those ugly legs and we'd say, “Don't  
you want to modernize it a little?” They'd  
say, “Don't touch it. We want Grandma's  
piano just the way we remember it.” There  
is an emotional content in piano owning.  
It's an important purchase for any family.

Another factor is that there is a large  
used-piano business—an enormous one.  
There probably isn't a piano store in the  
United States that doesn't have a used  
Steinway. The way to sell that old piano is  
to say, “This is from the vintage period.”  
The vintage period happens to be the age of  
the piano the salesman is trying to sell. It's  
part of the mystique that people like, that  
it's better if it's old.

You mentioned Horowitz as having an influ-  
ence on the fashion in piano tone. Could we  
talk a little more about that?

Horowitz came out of Russia in 1925 and  
played in Berlin first, I think. Berlin was a  
lot more important musically then than it's  
been lately. It was, at that time, a music  
capital. He was a sensation because of his  
enormous digital skill and his brilliant  
tone.

This brought in what was then a new  
style of playing, and many of the younger  
people tried to emulate that. Now, from  
what I hear, it's going back again, and  
many of the younger pianists are seeking  
tone production again rather than bril-  
liance.

Someone mentioned to me, as a passing  
recollection, that just a year or two before  
Horowitz's death, he himself was backing  
away from that brilliant, high-treble-energy  
tone. Do you know if that's true?

No, our regulator used to go up there all  
the time and do exactly what Horowitz  
wanted. I don't know if his tone was chang-  
ing. I don't really see how it could. He was  
getting deep into his 80s and had this  
ability with his fingers all those years. I  
think his fingers were so strong that when  
he let the keys up and got beyond that little

Courtesy of Henry Steinway Collection



point where the hammer kicks back in again, he could give a full blow when the key was only halfway down. Not many could do that. He had a very quick up. Other people come up slower and bang it down again.

*Horowitz altered the fashion in piano tone?* That's the impression I get, but he wasn't the only one. Rudolf Serkin burst on the scene about the same time as Rubinstein. Rubinstein really didn't make a success in the United States until the middle '30s. He'd been here several times before, then he came back under the management of Sol Hurok, who is now no longer with us. Hurok was an old-time manager who really knew how to build careers. He told Rubinstein he had to play a Steinway and record with RCA Victor, which was a big thing at that time. Of course, they made this great success.

Serkin had his own way of playing that was more like the old times, except that it was more musically deep, and some of his tone was terrible. He used to grunt and groan, and sometimes you could hear this. He had fat fingers, and he would play in a way I can't describe. Horowitz, Rubinstein, and Serkin were all different. The younger people wanted to emulate them, and so we had more demand for brighter and brighter pianos.

*So the contemporary sound of the Steinway dates from Horowitz and that period?*

Yes, pretty much. They'd say, "Can't you make it brighter?" and we'd make it brighter.

*There's no question that electronic technology has invaded the world of the piano. There are computer-operated acoustic pianos, the Yamaha Disklavier, the Bösendorfer SE. There*

*are fully electronic instruments for the home, much smaller than the standard piano and cheaper and maintenance-free, more or less. These nearly have demolished the market for inexpensive traditional instruments. Steinway, though, seems to be above this electronic invasion. What do you see as the future of the traditional piano in general and Steinway in particular?*

That's a very interesting thing. I've watched the electronics grow from nothing. The first ones appeared way back in the early 1930s. They experimented by putting a little pickup under the piano strings and amplifying them.

The first experiments were done by Siemens in Germany, both with Bechstein and Steinway. I've seen an electrical Bechstein in the Berlin Music Museum. That was the first one. In the late 1930s, Story & Clark made an upright piano without a soundboard and with a pickup behind the strings called Storytone, together with RCA.

*Do you know if that would have been a magnetic pickup?*

Must have been. A little square gadget of some kind. Everyone in the business laughed at this. Then the war came and nothing happened. After the war, the serious stuff started to happen. We now have to acknowledge that the electronic sourcing of music is here to stay, and there's no question that it is the wave of the future. However, it would seem to me that there will always be a place for the acoustic piano among the aficionados who like to play music on it. Those people won't be satisfied with the electronic piano, although it certainly has advantages. The most obvious for New York City is that you can use earphones and not bother neighbors. And they're reasonably maintenance-free; they don't need tuning or servicing. But for Steinway, I feel, and I guess the new owners do, if they stick to their knitting and make a good piano, there will be a market. A

Photograph: Jeanne Strongin



# MECHANICS HALL



# Meeting

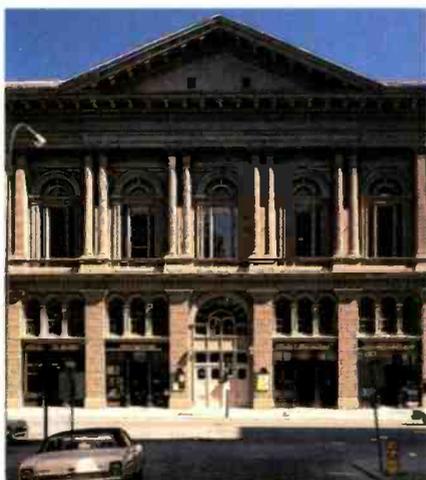
Long laboring in the shadow of the famed Boston Symphony Hall, Mechanics Hall, in nearby Worcester, Massachusetts, quietly continues to provide musicians and recording engineers a sonic preeminence that stretches over 135 years. Once an antebellum showcase whose stage was shared not only by the symphonies and ensembles of its age, but also by such notables as Charles Dickens and Mark Twain, and whose walls echoed early antislavery rhet-

concert halls. Built during the opening shots of the Industrial Revolution, Mechanics Hall was meant to house the activities of the Worcester County Mechanics Association and to function as a living showcase for their talents as artisans. That was no mean feat, for these "mechanics" were promoting themselves in a recessionary climate of their own—Industrial Revolution notwithstanding. Through sheer determination and some local sponsorship,

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*Reminiscent of the great concert halls of Europe, Mechanics Hall was restored in the mid-1970s to its original antebellum*

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*splendor. Today, Mechanics Hall is known as much for its audio qualities as for its historic significance.*

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oric, Mechanics Hall is sought out in the 1990s as a venue for making high-tech digital recordings.

In the past few years since its "rediscovery," Mechanics Hall has been the site of several top CD recordings on such labels as Sony Classical and Telarc. They, in turn, have been able to lure the talents of Yo-Yo Ma, Emanuel Ax, and John O'Connor, partly because of the quality of the hall's sound. Indeed, Yo-Yo Ma has called it "the ideal concert hall," and pianist Anton Kuerti wrote in the guest book, "Just as the hall is so beautiful, one fears to wound it with a single wrong note."

Architectural historians have not been faint with their praise of Mechanics Hall, terming this jewel in the heart of a post-industrial New England city one of the finest remaining examples of pre-Civil War

the hall was finished, but there was not enough money for an organ, a necessity of the day. That came seven years later, and today the organ is historically important in its own right.

Restored to its original elegance in the mid-1970s, it is now easy to see why Mechanics Hall evolved into a focal point for the greater Worcester community. The list of notables to grace its stage reads like a cultural and political Who's Who of the 19th and 20th centuries: Thoreau, Teddy Roosevelt, Caruso, Dvořák, and lately, pop musicians such as Judy Collins, who signed the guest book and added, "This is truly one of the best halls in the world. I always love performing here."

Left to decay in the rush of the mid-20th century, Mechanics Hall nonetheless retained its quality of sound, despite being



# house for Music

Rick Howland

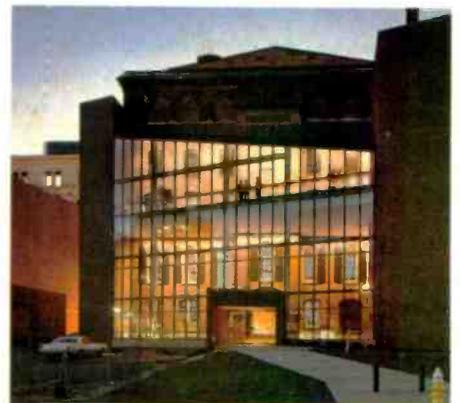


relegated to such unhappy uses as a market and even a roller-derby rink. Amid neglect and tasteless attempts to “modernize” the hall, occasional social, musical, and cultural events were staged. Despite the reconstructions and industrial paint schemes, however, the hall rang true.

Local pressure and the 1970s’ push for historic preservation helped spare the building from the wrecker’s ball and the worst of all American architectural fates—the indignity of giving way to a parking lot. Restoration of Mechanics Hall began about the time of the nation’s Bicentennial celebration and presaged a renaissance in this working-class city some 50 miles west of Boston. The restoration now includes a cast-iron facade, exposure of true Early American graffiti dating to 1869, a wooden ticket kiosk, and the refurbishing of “the Worcester organ.” (The organ is a 52-stop instrument built in 1864 by the Hook



*Nearly camouflaged by the city itself, Mechanics Hall (with its new rear entrance) has become a symbol of the renaissance of the industrial city of Worcester, Massachusetts, some 50 miles west of Boston.*





Brothers of Boston and remains steeped in Worcester's cultural competition with that "other city" to the east. Today, it is the oldest unaltered four-keyboard organ in the Western Hemisphere.)

#### The Modern Era

As one steps off the concrete and asphalt of 1990 Worcester and into the hall, there is an immediate psychic shift back in time, perhaps to a fine European concert hall. A

copied the design of the then-celebrated Miller's Assembly Hall in New York City. Be that as it may, within the environs of Worcester, there are numerous meeting-houses, some built as churches, that bear the stamp of Boyden's skills. Thus, historians are convinced that Boyden did draw heavily on meetinghouse design, however much he was influenced by European design. In early New England, meetinghouses were places where citizens met and voted;

An organ recording in a room too small doesn't have enough reverberation time, and the sound will just not be correct. It will sound dry and will be criticized for not having a fullness of tone. "Engineers know what they want," he says. "That special sound. They know that Mechanics Hall makes a certain sound. Part of that is the reverberation, part is the way the sound decays, and part is the frequency content of the reverberation."



*The hall's size,  
volume, and  
shoebox shape*

*are the main  
reasons for its  
acoustic quality.*

grand staircase sweeps to the Great Hall, embellished with an authentically restored coffered ceiling, original fresco paintings, Corinthian pilasters, and a balustraded balcony. And all this was effected by a self-taught local architect who borrowed heavily from local meeting halls and churches as well as from European performance halls.

What modern-day artists and recording engineers have discovered at Mechanics Hall is the very sound quality architect Elbridge Boyden created in Worcester so long ago. Whether it was intentional on his part or not, we will likely never know.

Having trained as a meetinghouse builder, Boyden was a product of the early 19th-century apprenticeship system. There are obvious design similarities between Mechanics Hall and several great European halls, and some have suggested that Boyden

this required that orators be heard at the back of the hall. In the final analysis, Boyden kept faith with the promise that every word spoken, every song sung, and every note played would be heard and reverberate throughout the hall. Many speakers and musicians today note how well Boyden practiced a science that didn't even have a name when Mechanics Hall was designed some 140 years ago.

Says the hall's technical director, Joseph Chilorio, "What recording engineers are looking for primarily in such a venue is the so-called sound of the hall and the appropriateness of the hall for the kind of music they are going to record.

"The sound of the hall is its reverberation time. And that reverberation time has to be appropriate to the kind of music being performed." Chilorio gives an example:

At Mechanics Hall, low frequencies reverberate a bit longer than the high frequencies. This tends to give the hall "warmth," Chilorio says, yet the high frequencies reverberate long enough to give the hall enough brilliance so the music doesn't sound dead. Upon walking into the hall and speaking in low conversational tones, one can immediately feel the reverberation he's been talking about. Chilorio halts his presentation and claps his hands. "Note the crisp decay," he says. "That comes as much from the materials used in construction as the 'shoebox' design.

"In the days of 1857, you could use wood, brick, and plaster as primary building materials," says Chilorio, and those halls that used wood and plaster "seem to have the best reverberation characteristics. Plaster, especially plaster on brick, gives a

brilliant reverberation and high-frequency sustain. It is a very hard surface which reflects sound in many different directions. The plaster is not smooth and is full of architectural ornamentation. So, when sound hits it, the sound scatters in many directions, giving it diffuse characteristics and allowing the sound to decay uniformly."

In a quiet, empty Mechanics Hall, sound decay is just over 2 seconds. "On a particularly humid day with everything possible removed from the hall, and if the hall's historic organ were to be recorded," Chilorio said that he expects decay time of 2½ to as much as 3 seconds. "One thing engineers have to consider is the time of year they are recording." Since reverb time varies with the season and with humidity, and if you want to record on CD, you have to record all tracks at the same time of the year. He noted Telarc began recording Cleveland String Quartet tracks last May and will come back this May to do the remainder—it just wouldn't sound the same if they came back in February.

### Scientific Soundings

About the time of its refurbishment, acoustical studies of the hall were performed. Consultants were, once they got past their excitement over this "find," lavish in their praise of Mechanics Hall. William Cavanaugh, senior partner in Cavanaugh Tocci Associates, studied the sound quality of the hall and investigated ways to restore and upgrade the facility to late 20th-century standards without sacrificing the "quality of sound" to such urban problems as traffic or to the building's mechanical structure.

Hailing the hall for its "classic proportions" and lack of echo from Day 1, Cavanaugh concluded that the intimate size (only 1,500 seats), volume, distance from stage to listeners, and its shoebox shape were the predominant factors in the hall's acoustic quality. The fact that the hall is on the third floor of the structure (saving more lucrative rental space below for offices and shops) further added to sound quality by isolating the Great Hall from ambient sound, which is critical for sensitive digital



**MECHANICS  
HALL**

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*Recent CDs  
Recorded at Mechanics Hall*

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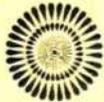
*Rachmaninoff and Prokofiev:  
Cello Sonatas*  
Yo-Yo Ma and Emanuel Ax  
Sony Classical SK 46486  
June 25 to 27, 1990

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*Mozart:  
String Quartets, No. 14 (K. 387)  
and No. 15 (K. 421)*  
Cleveland Quartet  
January 10 and January 15 to 17, 1991

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*Handel:  
Concerti Grossi, Op. 6, Nos. 1 to 6*  
Boston Baroque;  
Martin Pearlman, Director  
Telarc CD-80253  
January 5 to 7, 1992



recording technologies. Both engineers and artists like the hall for that reason—they can use it during the day, unlike some sections of New York City where sessions must take place in the wee hours of the morning.

Intimacy, for 30 years since the "Music Acoustics and Architecture" study by Leo Beranek, has been considered the foremost

attribute for sound quality. Cavanaugh's study rated Mechanics Hall high for intimacy, an element not lost on today's technically minded recording engineer. Liveliness and warmth, second and third in Beranek's "Subjective Attributes in Music Acoustics," remained intact during and after renovation. No sound-absorbing materials were added, and such subtleties as upholstery material were specified to ensure uniform reverberation and faithfulness to the original construction. Cavanaugh measures a mid-frequency reverberation time (average of values at 500 and 1,000 Hz) of 1.6 seconds when the hall is fully occupied.

With all of this good old-fashioned sound around, what more would an historic hall like this need to offer? Early in the hall's renaissance, Chilorio recognized the world-class value of Mechanics Hall and invested his time, skills, and his own money in a cooperative venture to ensure that a studio as state of the art as any in America would be available for recording. Recording companies bring their own basic equipment, and Chilorio supplies speakers, amps, video monitors, and a two-way communications system between the hall and the studio. The facility was good enough to earn the local National Public Radio station, WICN, two prestigious Lucien Wulsin Performance Today Music Awards for recordings engineered and produced by Chilorio. The local production was later nationally syndicated.

With as much history and sound as there is about Mechanics Hall, there is also a 19th-century beauty that can't be captured on audio tape, though it was captured on videotape—a music video of "Only You" by Broadway stars Michael Crawford and Frances Ruffelle. The one continuous session, from 5:00 a.m. one day to 9:00 p.m. the next, was certainly the longest in Chilorio's career.

But to him, that was an historic footnote. Audio is the thing. Mechanics Hall has become part of the music mix, a sounding board with "that special sound." Listed on the National Register of Historic Places, Mechanics Hall is a "Preservation Hall" of another kind. A

# MARK LEVINSON REFERENCE DIGITAL PROCESSOR NO. 30

The No. 30 is in two pieces. The main unit has the digital circuitry and controls in the center, cradled between towers that each hold one channel's D/A and analog circuitry. The other unit contains separate power supplies for the main unit's digital center section and its two analog towers, each connected by a separate cable. My only complaint about the ergonomics is that the No. 30 is *big* and takes up a lot of



**B**oth the transistor and CD, despite offering many technical advantages, often sounded worse at first than the technologies preceding them. In each case, subjective critics overreacted by condemning the new technology. Technical critics overreacted by claiming that the new technology's measured performance was superior and that the subjective critics had to be wrong. The resulting dialectic led to improvements that proved both sides right.

In the case of CD, this process has led to the discovery of digital distortions, the design of D/A converters which provide major advances in both sound and technology, and a steadily improving level of performance which has gradually allowed the Compact Disc to live up to its inherent promise.

The Mark Levinson Reference Digital Processor No. 30 is clearly intended to embody this new state of the art. The No.

30 combines a wide range of advances in D/A converter technology and sound quality. It is superbly built, beautifully finished, and has some very unusual features.

space—though no more so than some preamps with separate power supplies.

The No. 30 also has as many inputs and outputs as many preamps. There are eight

## SPECS

**Frequency Response:** 10 Hz to 20 kHz, +0, -0.2 dB.

**THD:** 0.003% at 1 kHz and 0 dB, A-weighted.

**Dynamic Range:** 98 dB.

**S/N:** 105 dB.

**Channel Separation:** Greater than 110 dB.

**SMPTE-IM Distortion:** Less than 0.005%.

**Digital-to-Analog Conversion:** Two custom 20-bit D/A converters.

**Digital Filter:** Eight-times oversampling.

**Analog Filter:** Bessel-tuned, linear phase to 40 kHz.

**Low-Level Linearity:** To -70 dB, deviation unmeasurable; below -90

dB, approximately +1.7 dB (undithered, referenced to 0 dB at 1 kHz).

**Output Impedance:** Less than 6 ohms.

**Dimensions:** Processor, 19 $\frac{1}{8}$  in. W  $\times$  7 $\frac{1}{4}$  in. H  $\times$  15 $\frac{1}{8}$  in. D (49.2 cm  $\times$  18.4 cm  $\times$  39.2 cm); power supply, 15 $\frac{1}{4}$  in. W  $\times$  5 $\frac{1}{4}$  in. H  $\times$  14 $\frac{7}{8}$  in. D (39.9 cm  $\times$  13.3 cm  $\times$  37.8 cm).

**Weight:** Processor, 34 lbs. (15.4 kg), power supply, 25 lbs. (11.4 kg).

**Price:** \$13,950.

**Company Address:** Madrigal Audio Laboratories, P.O. Box 781, Middletown, Conn. 06457.

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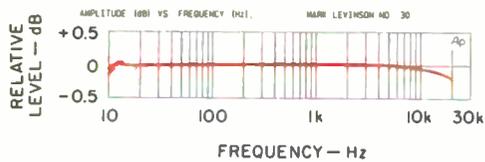
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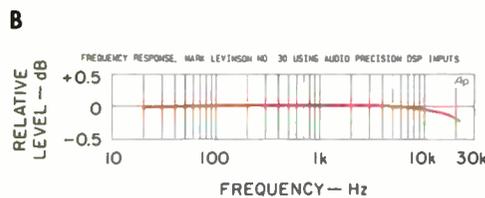
digital inputs—five balanced female XLR connectors, one ST (AT&T) optical connector, and two EIAJ Toslink optical connectors—enough for most professionals. The Levinson Reference Digital Processor No. 30 also has three digital outputs, two male XLRs for listening and recording plus one EIAJ optical output. The analog outputs include two balanced XLR male connectors and one unbalanced RCA jack per

“DAT,” “VCR,” or “AUX” to match your system’s setup.

The input switching is highly sophisticated, using a crosspoint switch on the DSP board, the uppermost of the three boards in the main unit’s center section. The digital input module, on the same board, has individual active termination, retriggering, and balanced driver circuitry for each input. This was done to avoid possible degradation of input signals, especially from unbalanced outputs. To prevent transient noise when switching between inputs, the first input is gently muted, and the signal only returns when the No. 30 has locked onto the new signal.



A



**Fig. 1—Frequency response, both channels, using signals from CD player (A) and from test generator (B).**

channel. Two “Communication Ports” (“Master” and “Slave”) hint at system extensions to come. All of the electrical connectors are gold-plated.

Besides input switching, the front panel has buttons for “Standby” (the unit is never turned completely off), “Digital Record Select” (which allows you to record any digital input while listening to another, effectively providing a digital tape monitor), polarity inversion, and display dimming. Indicator LEDs show status, blinking when the unit is in standby mode and glowing when the No. 30 detects copy-protection codes in the digital bitstream and when the digital input signal conforms to the AES/EBU standard. A large dot-matrix display offers a choice of four intensity levels; it also shows when signals are muted, locked, or absent and identifies the selected input and its sampling frequency. Internal switches allow you to rename any of the eight inputs as “CD,” “LD,” “DBS,”

The No. 30 has clearly been designed for updating. The circuit boards are modular for effective upgrades through board-swapping, and key solid-state devices (including the EPROM that holds the No. 30’s software routines) can be easily replaced.

Madrigal Audio Laboratories, which makes Levinson components, believes that purity and regulation of the power supply are critical to superior digital performance, and has put at least as much emphasis on the design of the power supply as on the digital and analog signal circuitry. A switching power supply is used for the digital section, providing the high power, freedom from variations in input power, isolation, and thermal stability that digital circuits require. The output of this supply is filtered and also has seven separate regulators to reduce noise on the d.c. line. The left and right analog power supplies begin with a.c. filtering and are said to be improvements of the designs in the latest Mark Levinson preamps. These power supplies also have an extremely low rejection ratio, which is rated at  $-80$  dB in the power supply and another  $-40$  dB in the main unit.

Madrigal contends that the data jitter caused at the digital interface receiver (DIR) that locks onto the incoming digital signal is more important in limiting sound quality than the problems dealt with by digital filtering. The company claims that most existing D/A converters have too much jitter to let the rest of the system

resolve at 16 bits, much less the higher bit resolutions used by some D/A converters. Some DIRs, for example, are accurate to approximately 200 nS; the No. 30 has a rated accuracy of better than 100 pS.

The Levinson version of the DIR, called a Digital Audio Interface Receiver (DAIR), uses three separate narrow-aperture phase-locked loops (PLLs), each optimized for a single sample frequency (32, 44.1, or 48 kHz), instead of a single wide-aperture PLL that can cover all three sampling rates. The DAIR’s jitter is said to be more than low enough for the No. 30’s 20-bit resolution at eight-times oversampling.

Madrigal believes that the theoretical advantages of using general-purpose DSP chip sets with proprietary algorithms and high sampling rates are offset by the resulting requirement for much more critical jitter specifications. They also feel that existing transports and circuitry cannot use more than eight-times oversampling without a loss of sound quality because of jitter-related distortion and that, in any case, there is no practical advantage to oversampling rates higher than eight-times.

According to Madrigal, application-specific ICs (ASICs) are more desirable than general-purpose DSP computers because integrating the software into the silicon lets the ASICs run faster. Thus, from their point of view, only if the desired algorithms aren’t available in an ASIC is a general-purpose chip set needed. An added benefit is that the best custom silicon devices have

**THE NO. 30 MEASURED BETTER, IN NEARLY ALL THE MAIN PARAMETERS, THAN ANY D/A UNIT SO FAR TESTED.**

more accurate digital filters than have yet been implemented with general-purpose DSP circuits. After testing a number of devices and algorithms, the company found an application-specific DSP chip from Nippon Precision Circuits that met their requirements.

Each channel module of the No. 30 holds two linear 20-bit D/A converters, one for each polarity of the balanced digital signal. The positive and negative digital audio signals are processed separately, maintain-

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# EVER BE THE SAME

ing differential operation in the digital domain and providing differential analog signals to the analog output buffers. This eliminates the need for inversion circuits in the analog domain.

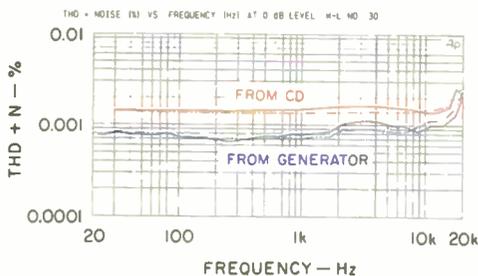
The final analog filter in the No. 30 uses a Bessel-tuned active filter in the output stage for maximum phase linearity. Instead of the voltage op-amps used in the feedback loops of most such circuits, Madrigal uses new and faster current op-amps that are said not to be affected by musical

over the design in any of its preamps and amplifiers, partly due to the use of Teflon boards (whose dielectric constant is low and doesn't change with frequency) for the analog circuits.

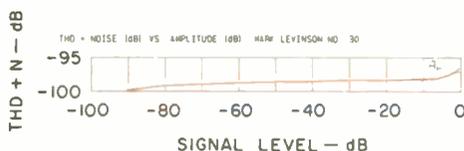
The instruction manual is well written, fun to read, and easy to follow—a comment that rarely applies to high-end literature. But despite its sophistication, I was able to hook up the No. 30 before I read the manual; both connections and operation are straightforward and intuitive.

My subjective impressions of the No. 30's sound are in the usual place, at the end of this review. But to see how this technology measures on the test bench, as well as for a brief listening report, I turn you over to Len Feldman.

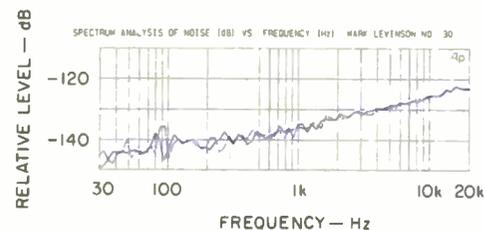
*Anthony H. Cordesman*



**Fig. 2—THD + N vs. frequency, both channels, relative to maximum output level.**



**Fig. 3—THD + N vs. signal amplitude, both channels.**



**Fig. 4—Spectrum analysis of residual noise when playing "no-signal" track of test CD; both channels shown.**

dynamics. Their output buffer has discrete components, with a d.c. servo—rather than coupling capacitors—to improve harmonic accuracy.

The No. 30 has two separate signal paths to enhance channel separation. Madrigal claims that the analog circuitry in each tower of the No. 30 represents an advance

### Measurements

While I will also have a few words to say about the superb sound quality of this incredible processor, my main task is to discuss its electrical performance. I did not see Mr. Cordesman's evaluation before writing this, but I must state, unequivocally, that the No. 30 performed better, in nearly all important parameters, than any D/A converter or digital processor I have yet evaluated—and that the measurements were consistent with what I heard in my abbreviated listening tests.

As I've done with other stand-alone D/A converters, I measured the No. 30 with digital signals from both a CD transport and my Audio Precision test equipment. The AP equipment generates 24-bit data words, then sets the dither levels and assumes that the device under test will simply truncate at the set level.

Figure 1A confirms that the frequency response of the processor, when fed from the digital output of a CD player, is flat within the  $-0.2$  dB claimed by Madrigal, from 10 Hz to 20 kHz. Results are substantially the same for signals generated by the AP equipment (Fig. 1B).

The first difference to show up between CD player-fed signals and signals generated

by the Audio Precision test gear occurred when I measured THD + N versus frequency (Fig. 2). While the results shown for signals fed from a CD player's digital output are the best I have ever obtained (approximately 0.0015% at mid-frequencies), results for the signals generated by the AP test equipment are even better, an incredibly low 0.0008% or so at mid-frequencies. In fact, my usual scale had to be expanded downward to "capture" this plot. Notice, too, that even at the treble extreme of either sweep, the increase usually seen in THD + N is present but minimal, never rising above 0.0025%.

Figure 3 shows how THD + N varies with signal amplitude. For practical reasons, this test was conducted using only the digital output from the reference CD player, with signals that ranged in amplitude from 0 dB (maximum recorded level) to  $-90$  dB. Even at maximum recorded level, the reading is only about  $-97.5$  dB, corresponding to an equivalent THD + N of 0.00133%. At levels below  $-20$  dB, the

**THIS IS THE FIRST  
D/A CONVERTER THAT HAD  
NO TRACE OF A.C. HUM  
OR HARMONICS.**

readings (referred to maximum recorded level) are even lower,  $-98.5$  dB or better.

To isolate the actual THD from the residual noise of the system, I used the FFT spectrum-analysis capabilities of the Audio Precision DSP circuitry while the CD player fed the No. 30 a 1-kHz steady-state tone. By "capturing" the results 16 times, the noise peaks were effectively averaged out, and only two significant actual harmonics of the 1-kHz tone were discernible, at 3 and 5 kHz. Their dB values, when calculated as a percentage of THD, worked out to only 0.00107%.

Channel separation exceeded the published specification by far and was greater than I have measured for any previous CD player or D/A converter. Separation was nearly 137 dB at 1 kHz and was still greater than 124 dB at 16 kHz. What's more, it was virtually identical for both channels.

Signal-to-noise ratio was the same whether I used the "no-signal" track from my CD-1 test disc or a "no-signal" digital



output from the Audio Precision gear. In both cases, S/N was 117.8 dB for the left channel and 117.9 dB for the right channel. While these results are remarkable, the real surprise came when I ran a spectrum analysis of the residual noise (Fig. 4) and found absolutely no noise peaks at 60, 120, or 180 Hz from the 60-Hz line frequency. This is the only D/A converter I have ever tested that showed no measurable hum-related components. Of course, part of this "miracle" arises from the fact that the Mark Levinson No. 30's power supply is a separate component, connected to the processor via cables; no a.c. voltages ever reach the processor itself.

Figure 5 shows deviation from linearity, using undithered signals from 0 to -90 dB and dithered signals from -70 to -100 dB. The slight deviation of less than 1 dB for an undithered signal at -90 dB is better than claimed by the manufacturer and about as good as I have seen with any CD player or D/A converter. Bear in mind that the D/A converters used in this processor are not the increasingly popular one-bit variety that boast near-perfect linearity at the expense of some added noise (when improper noise-shaping is employed, as it sometimes is). Here we are dealing with 20-bit converters, which means that the converters used in the Mark Levinson No. 30 either have near-perfect low-level linearity or have been carefully calibrated externally during production.

In any case, when I used *dithered* signals in the range from -70 dB to -100 dB to

**I ATTRIBUTE THE OPEN,  
AIRY SOUND TO THE  
NO. 30'S SUPERB  
LOW-LEVEL LINEARITY.**

check out linearity at low levels, results were even better. As seen in Fig. 5, I could detect *no deviation from perfect linearity whatsoever!* My usual fade-to-noise test results, shown in Fig. 6, further confirm the No. 30's excellent low-level linearity as well as its low residual noise level and high EIA dynamic range (which I calculated as just over 100 dB). The EIA dynamic range exceeded the published claim, measuring 99.95 dB for the left channel and 99.91 dB for the right channel.

For further confirmation of the superb linearity of this processor, I plotted output versus input, using progressively lower digital input signals generated by the Audio Precision (Fig. 7). I could not easily translate this plot into *deviation* from perfect linearity, but close examination of the graph reveals that even at -100 dB, output matched the input perfectly. What little deviation there is occurs at levels below -110 dB, where the deviation from perfect linearity is still less than 1.0 dB!

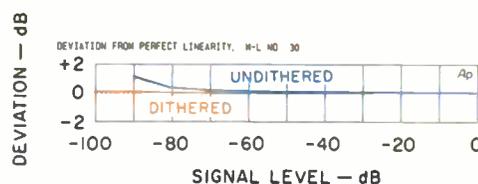
At this point, eager to get the processor off the test bench and into my music system, I made but one additional measurement: A check of frequency (or pitch) accuracy determined by the crystal clock in the processor. That accuracy was within -0.0003%, which means that a middle A musical note recorded at the standard 440 Hz would be reproduced as a frequency of 439.99868 Hz. I suspect that even persons possessing the most perfect "perfect pitch" aren't likely to be upset by this minuscule "discrepancy."

#### Use and Listening Tests

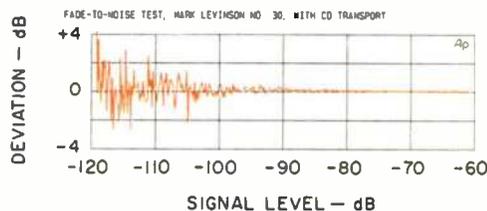
Listening tests were conducted with a minimum amount of electronic equipment in the signal path. The digital output of my reference CD player was fed directly to one of the balanced digital inputs of the Mark Levinson No. 30 processor. The No. 30's analog outputs were fed directly to an amplifier equipped with its own input level control. The amplifier, in turn, fed my reference KEF 105.2 speakers. To be completely honest about it, I did not conduct any comparison tests against other state-of-the-art digital reproducing equipment. I did, however, listen to a fairly wide selection of my favorite CDs and can attest to the fact that they never sounded better. I attribute the open, airy sound quality of this setup to the No. 30's superb low-level linearity and to its ultra-low levels of noise and distortion.

Of course, I would not have expected a processor costing some \$14,000 to deliver sound that was in any way flawed. Using

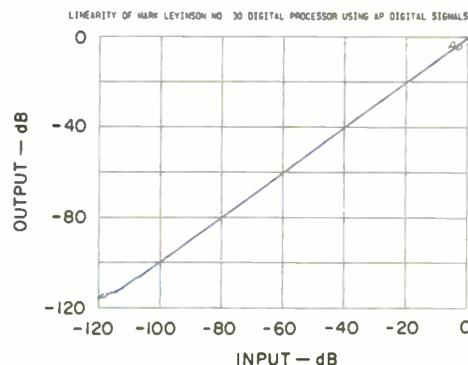
the Levinson in my listening setup, I realized yet again that when the digital circuitry of an audio system is as perfect as this, the limiting factor becomes the source material. Comparing some of my earliest CDs with late releases proved highly revealing. Where software flaws were previously masked by hardware imperfections, suddenly they were easily identified. By the same token, well-produced recent CDs delivered the kind of superb sound that digital naysayers have maintained is inherently



**Fig. 5—Deviation from linearity.**



**Fig. 6—Fade-to-noise test, using dithered signals from -60 to -120 dB.**



**Fig. 7—Output vs. input linearity at 500 Hz, for test generator signals fed via AES/EBU digital input.**

impossible in a 16-bit digital audio system with a 44.1-kHz sampling rate. If the claim for CD of "perfect sound, now and forever" was an overstatement back in 1983, it's closer to the truth when playing CDs and DATs using a processor such as the No. 30. I'm interested to see if Tony Cordesman agrees!

*Leonard Feldman*

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The No. 30 is a truly outstanding reference unit that has led me to reappraise some of my initial judgments of CD sound quality. Many discs sounded far better with the No. 30 than they had with other units.

I evaluated the sound of the No. 30 by comparing it to other top D/A converters like the Theta Digital DS Pro Generation III, the D/A section of a Sony DTC-77ES DAT deck, and to some good CD players such as the Sony CDP-X777ES and Philips LHH500.

**WITH THE NO. 30,  
DIGITAL CAN NOW BEAT  
ANALOG FOR LEVEL OF  
INFORMATION AND  
MUSICALITY.**

I used two different reference systems for these comparisons. The first used a Classé Audio DR-6 preamplifier and DR-25 power amplifiers with Apogee Diva speakers, and the second used a Krell KBL preamplifier, Krell MDA-300 power amplifiers, and Thiel CS5 speakers. As the two systems are in different rooms, with different acoustics, they help me avoid judgments based on a single set of room interactions and listening conditions.

While the Theta did compete with the No. 30 in many ways, the No. 30 outperformed it as well as any competing D/A converter that I could beg or borrow, in three critical respects: The ability to resolve low-level musical and harmonic information, to handle subtle and complex dynamics and musical changes, and to preserve the overall coherence of the music.

The No. 30 manages to combine very flat and extended upper octaves with bass and midrange that do not reveal any special coloration or anomalies. You can check this for yourself by playing back any voice recording where the singer's voice has not been heavily processed, such as Victor Braun's baritone in Schubert's *Winterreise* (Dorian DOR-90145) or Jan DeGaetani's mezzo-soprano on a recording of Schubert's songs (Elektra Nonesuch 9-79263-2).

The bass is tight and controlled, superbly defining and revealing differences in bass frequency, and the mid-bass is equally superb. I noted this especially on the bass

drum on a recording of the Holst Suite No. 1 in E Flat (Reference Recordings RR-39CD); the amazing mix of bass drum and orchestra on "Olympic Fanfare," in the National Symphonic Winds' *Center Stage* (Wilson Audio WCD-8824), and the mix of bass drum, soprano voice, chorus, and full orchestra on Mahler's Eighth Symphony by Robert Shaw and the Atlanta Symphony Chorus and Orchestra (Telarc CD-80267). The No. 30 is equally impressive with all the usual organ spectaculars, and is particularly revealing with the final passages of Eugene Ormandy's recording of the Saint-Saëns Symphony No. 3, "Organ" (Telarc CD-80051).

The No. 30 may lack a certain richness or warmth found in some competing units, but it is yet another advance in terms of accurate timbre, low-level detail, transparency, and coherence. For accurate rather than emphasized upper bass and lower midrange, I have yet to hear an equal.

The midrange is not only flat and detailed, it is richly harmonic and musical. One of my favorite CDs for testing this is the Scott Reiss and Hesperus recording on Golden Apple (GACD 7750) for recorder, violin, viola, and harpsichord. These are very demanding instruments, and playback with most digital processors can be very fatiguing. The Theta Generation III is the only other unit I have found that makes this recording equally listenable, but it does not provide equal resolution of midrange detail in the softer passages.

The upper midrange and treble of the No. 30 are very flat and extended. This can present a slight problem with mediocre recordings, particularly those made with microphones placed too close to the performers or with older digital equipment. Some listeners may prefer sweeter and warmer sound over detail and accuracy. Any serious audiophile, however, is going to want that detail with good recordings, and particularly the recent recordings made with 20-bit equipment. Here the No. 30 is clearly the state of the art.

The Levinson provided the best performance to date with two recordings I use to evaluate the upper midrange and treble in digital processors: The soprano voice in the Julianne Baird/Ronn McFarlane disc *The English Lute Song* (Dorian DOR-90109) and the sound of the harpsichord in Colin

Tilney's recording of Bach toccatas for harpsichord (Dorian DOR-90115).

The No. 30 reproduces the spatial information on the recording and not some ideal in the designer's mind. To hear this, compare the soundstage of virtually any close-miked or multitrack CD—Jennifer Warnes' *Famous Blue Raincoat* (Cypress 661 111-2) or Willie Nelson's *Always on My Mind* (CBS CK-7464-37951-2) are particularly good CDs to try—with the more natural soundstage on a Telarc or Dorian recording. The No. 30 lets the differences come through clearly without changing the apparent size of the soundstage.

Similarly, the No. 30 makes no attempt to provide sharper imaging than is heard in live performance, since that often trades an apparent improvement in left/right definition for an artificial narrowing of individual images and/or loss of depth. The overall merits of accuracy over artificiality are particularly striking in a CD with natural orchestral sound, like the Malcolm Arnold recording of *Arnold: Overtures* (Reference Recordings RR-48CD), as well as in Dorian, Telarc, and Wilson CDs recorded in concert halls or churches. I also prefer the No. 30's natural imaging with recordings that were produced with more defined imaging, such as the guitar and percussion in Bruce Dunlap's *About Home* (Chesky JD-59); the mix of voice, instruments, and rain sounds on "I Get the Blues When It Rains" from Eileen Farrell's *It's Over* (Reference Recordings RR-46CD), and the complex percussion imaging in Jonathan Haas' *Virtuoso Timpanist* (CRD 3449).

Depth is neither enhanced nor restricted by the No. 30. If you listen to the latest Telarc symphony recordings (try track 1 on Mahler's Eighth Symphony), the Dorian recordings in the Troy Music Hall, or a good baroque recording like Ton Koopman's version of the Handel concertos for orchestra (Erato 4528-2), you will hear all of the depth that you expect to hear and a remarkably lifelike performance.

The No. 30 brought a new degree of harmonic coherence to the individual notes of guitar, harpsichord, and violin and to the upper frequencies in piano and cymbals, particularly in low-level passages. I believe this superior performance is traceable to two specific advances in sound quality. One is sheer resolving power; the other is

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transient speed and detail that are excellent at any level of dynamic energy.

The Mark Levinson No. 30 combines excellent transparency with musical credibility and coherence. It also has a remarkable ability to separate and define instruments and voices in complex pieces of music. This ability became clear with every decent recording I have of grand opera or massive orchestral music. It came through beautifully on the Telarc recording of Mahler's Eighth Symphony, in the much lighter fare on the Mackerras and Welsh National Symphony Orchestra recording of *The Mikado* (Telarc CD-80284), and on good organ and choir recordings such as the Proprius label's classic *Cantate Domino* (PROP CDP 7762) or the Bach Choir of Bethlehem's recording of Bach's Cantata No. 140, "Wachet Auf" (Dorian DOR-90127).

As might be expected from its superior ability to reproduce low-level passages, the No. 30 has the lowest apparent noise I have heard in a digital processor. It extends the noise floor you hear in good recordings by removing an additional layer of haze from low-level passages.

The No. 30 performed best with the Madrigal MDC-1 Pro digital interconnect, a three-conductor balanced cable for AES/EBU connections. It performed nearly as well when connected via a version of the MDC-1 Pro cable with an RCA plug at the source end, although I would advise using the AES/EBU connection on those many high-end CD transports and professional DAT decks that have them. Optical cables are a definite second best.

Outstanding resolution in the upper midrange makes this unit more revealing of problems in recordings that relied on poor production values, some of the older and harsher analog-to-digital recording equipment, and aggressively close miking. There is nothing sweet or forgiving about the No. 30.

As is the case with every digital processor I have heard to date, the No. 30 also sounded better with some good recordings than other good ones, and there were a few odd cases where it did not perform as well

**IF YOU HAVEN'T HEARD  
THE MARK LEVINSON  
NO. 30, YOU DON'T  
KNOW WHAT DIGITAL  
SOUND CAN ACHIEVE.**

as I expected with a good recording. No audio component is ever all things to all recordings. There also were a few moments where I would have liked just a touch more bass energy, particularly in the deep bass, and felt other units provided a preferable amount of musicality—although always at the cost of low-level detail.

I believe that the No. 30 really does achieve a level of natural resolution and detail that is more faithful to the original recording than any competing D/A converter, CD player, or digital tape unit I know of. I do not want, however, to leave the impression that it is absolutely without competition. At the very top, the balanced version of the Theta DS Pro Generation III

competes in musicality, being warmer and more dynamic.

Madrigal Audio Laboratories would be among the first to agree that it is not necessary to pay \$13,950 to have many of the advances in digital sound quality provided by the No. 30. The company now offers a No. 35 processor, and it costs just under \$8,000. Madrigal's less expensive Proceed line offers a less sophisticated mix of products with many of these advances. Firms like Audio Research, Krell Digital, Theta Digital, and Wadia Digital offer excellent mid-priced units. Many mainstream manufacturers have top-of-the-line digital products that sound far better than their offerings of one or two years ago, and many of the lesser known high-end companies, such as Audio Alchemy or PS Audio, offer products with outstanding performance.

My subjective comments have tended to focus on recent recordings, including a number made with 20-bit mastering. However, you do not have to listen to audiophile recordings to benefit from units like the No. 30; you will get a similar improvement in listening pleasure with virtually any good recording. While I still do about half of my listening to LP records, I believe that unbiased listening to the Mark Levinson Reference Digital Processor No. 30 reveals that digital sound can now provide a level of information and musicality that analog almost always cannot. If you haven't heard this unit in a state-of-the-art system, playing the very best in recent CDs, you do not know what the state of the art is or what digital sound can achieve. A.H.C.

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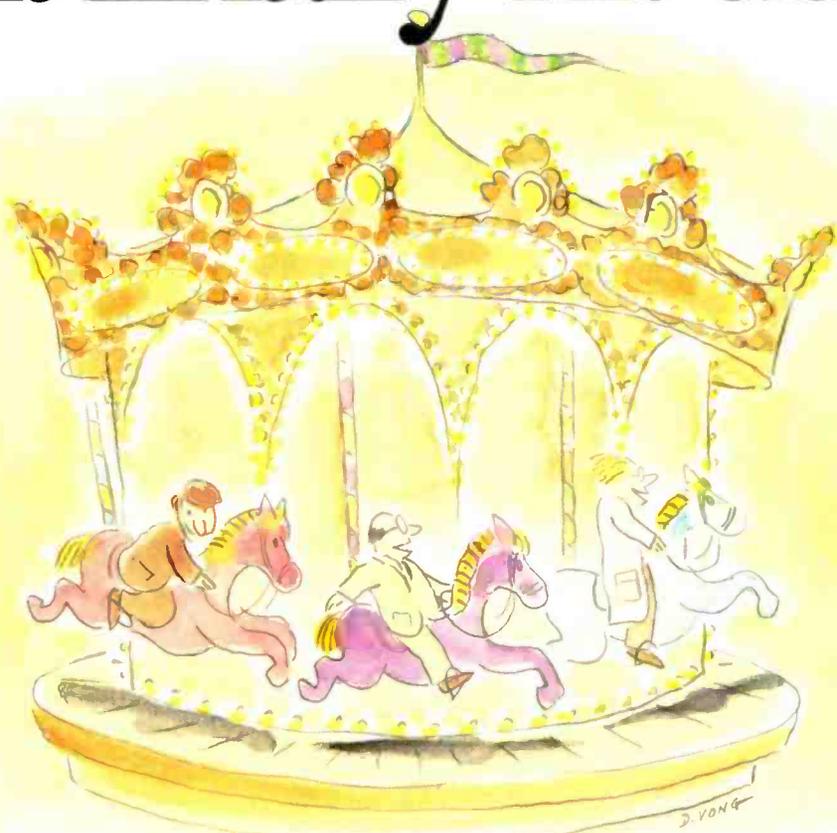
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and round about  
how to improve our  
CD player,  
it finally hit us.



*"This is it!" cried Phil, "Now all we need is a laser beam!"*

## MASTON AUDIO DELUXE REFERENCE SPEAKER SYSTEM



**M**aston Audio, a relatively new loudspeaker company, was founded by Don Maston in 1988. Maston, an electrical engineer, has been professionally involved in the electronics industry since 1970, and for 15 years prior to 1988, he designed loudspeakers for fun. His company offers a line of five speaker systems, costing from \$949 to \$4,975 per pair, sold to the upscale and high-end audio market.

The Deluxe Reference System, the subject of this review, is at the top of Maston Audio's speaker line. It is a modular system, composed of a closed-box woofer module with external passive crossover plus a satellite module with a 7-inch sealed-

box woofer, a 1-inch dome tweeter, and a built-in crossover. The next speaker down in the company's line, the Reference System, is essentially the same but does not include high-end cabling and connectors and has no bi-wiring facilities.

In normal operation, the satellite is positioned on top of the woofer module (taking the place of a stand), and the external crossover is placed behind the woofer, on the floor. The external crossover is connected to the speaker modules with Cardas Hexlink speaker cable and connectors. The external crossover is actually bi-wired to the satellite and includes bi-wire capabilities at its own input.

The upper portion of the system is a self-contained two-way vented box in a trun-

cated pyramid enclosure whose nonparallel sides are said to minimize internal standing waves. To reduce vibration, the enclosure is constructed of high-density particleboard, a massive 1½ inches thick. This system is also available separately as the Full Range Satellite, which falls in the middle of the Maston Audio line.

According to Maston, satellite design goals included: Maximizing transparency and clarity, and paying attention to those details that influence tonal balance, imaging, and low-level detail retrieval. To achieve these goals, listening tests were given the highest emphasis in the design process, and particular attention was paid to minimizing changes in group delay across the critical midrange and high-frequency bands. The sloping front panel of the satellite's cabinet (which aligns the acoustic centers of the mid/bass and tweeter drivers) and the first-order crossover arrangement minimize group-delay changes. The satellite's front panel is covered with acoustically absorbent foam.

The satellite includes a 1-inch titanium-dome tweeter (from MB Electronics of Germany) that is said to have a break-up frequency above 24 kHz. The bass/midrange driver is a 7-inch unit (the Dynaudio

### SPECS

**System Type:** Modular; three-way, floor-standing, sealed system.

**Drivers:** 12-in. cone woofer, 7-in. cone bass/midrange, and 1-in. titanium-dome tweeter.

**Frequency Response:** 32 Hz to 20 kHz,  $\pm 3$  dB.

**Sensitivity:** 87 dB at 1 meter with 2.83 V rms applied.

**Crossover Frequencies:** 115 Hz and 2.25 kHz.

**Impedance:** 8 ohms,  $\pm 2$  ohms.

**Recommended Amplifier Power:** 50 watts per channel, minimum.

**Dimensions:** 48 in. H  $\times$  14 in. W  $\times$  14 in. D (121.9 cm  $\times$  35.6 cm  $\times$  35.6 cm).

**Weight:** 140 lbs. (63.6 kg) each.

**Price:** \$4,975 per pair in oak or walnut veneer with lacquer finish; upper two-way module of system available as full-range satellite, \$1,975 per pair.

**Company Address:** 6416 Via Amigos, San Jose, Cal. 95120.

For literature, circle No. 91



It has been, perhaps, Adcom's toughest act to follow. The GCD-575 CD Player achieved breakthroughs in musicality unsurpassed by CD players at almost any price. *Stereophile* writes, "...in the under \$1000 class the Adcom is the player to beat — or, more to the point, the player to buy."\* *Stereo Review* credits the GCD-575 with "in general pushing the state of the art in digital-disc playback."\*\*

So when the engineers at Adcom went back to the drawing board to try to top their latest success, they were hard-pressed to find areas for improvement. The electronics and sound reproduction were already near perfect. And then, *Voila!* The idea: add a carousel changer.

### Round and round she goes.

One disc, superbly reproduced, was a magnificent accomplishment...but five discs mean five times the enjoyment. In typical user-friendly fashion, the Adcom GCD-600 lets you change four discs while one is playing, offers true random capability for one disc or all five, allows direct clockwise or counter-clockwise access for faster searches, and plays 3" discs without an adapter. The standard remote control gives you complete access to all playback features—including variable volume control—from the comfort of your favorite chair.

### Class "A" without compromise.

The GCD-600's Class "A" analog audio amplifier section uses very fast, low noise, linear gain semi-conductors. These no-compromise audio circuits — based on the proprietary amps used in Adcom's

GFP-565 preamplifier — more clearly define low-level information for superior resolution and dramatically more musical CD reproduction. You will not find such superb component parts in any other CD player at any price.

### The cure for "digititis".

The GCD-600's technically advanced analog and digital circuits and the user-selectable polarity inversion switch are designed to overcome the problems inherent in CD sound. Midrange harshness and glare are dramatically reduced. Sound stage imaging is deeper, more focused, more musically natural. The benefits of digital sound are realized, without the accompanying drawbacks.

### Take the GCD-600 for a spin.

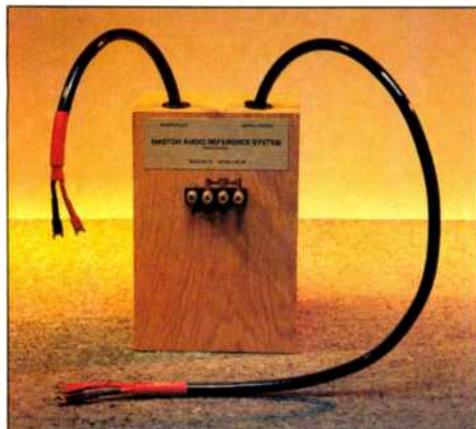
If you've been searching for a CD player that offers the convenience of a carousel changer *and* the sonic superiority of high-end single-disc models, take the GCD-600 for a spin at your authorized Adcom dealer. You won't have to go round and round to decide which CD changer gives you the most sound for your money.

\*Peter W. Mitchell, *Stereophile*, Vol. 12 No. 6, June 1989

\*\**Stereo Review*, 1989

**ADCOM**®  
details you can hear

17W75XL) with a voice-coil whose large diameter (3 inches) is claimed to minimize distortion by reducing cone flexure. The satellite's crossover is constructed on a bottom-mounted p.c. board and contains six parts: Three resistors, two capacitors, and



one air-core inductor. Both capacitors are high-quality Solens metallized polypropylene units. The crossover is a 6-dB/octave first-order design with a series-RC impedance-compensating network across the bass/midrange. The satellite's woofer enclosure is tuned to about 32 Hz with a rear-mounted tube, 2 inches in diameter and 7 inches long. The cabinet is filled with acoustic-damping material to increase its effective volume, as is the woofer cabinet.

That cabinet is a closed box whose internal volume is about 2 cubic feet and which holds an Eminence long-throw 12-inch woofer. The cabinet is constructed of high-density particleboard, 3/4 inch thick. The woofer module's rated frequency response is 3 dB down at 32 Hz, and a low Q of 0.62 is claimed. Maston Audio states that this low Q contributes to tight bass with no added ringing.

The woofer module crosses over to the satellite at 115 Hz via the external passive crossover. According to Maston, if the crossover were mounted inside the woofer cabinet, its components would tend to vibrate with the bass notes, potentially muddying the satellite's acoustic output; mounting it externally minimizes this intermodulation.

The external crossover network, like the satellite's internal one, contains six parts: One resistor, three capacitors, and two inductors. The woofer is driven via a low-pass filter whose schematic suggests a second-order design but whose output rolled

off in my tests at 6 dB/octave from 80 to 500 Hz, only reaching 12 dB/octave above 500 Hz. The satellite is driven by a 6-dB/octave high-pass filter and is bypassed by a series-LC impedance-correcting network. The series capacitor in the satellite leg is a metallized polypropylene unit, while the two remaining shunt capacitors are non-polarized electrolytics, which are not bypassed. An iron-core inductor wound with 14-gauge wire is used in the woofer leg. The external crossover's cabinet is finished in the same attractive wood veneer as the main cabinets. The crossover box has three cone feet mounted on the bottom for support.

### Measurements

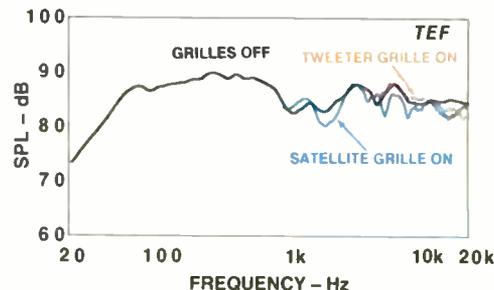
The on-axis anechoic frequency response of the Deluxe Reference System is shown in Fig. 1. Measurements were taken at 2 meters from a point even with the top of the midrange frame, 38 inches from the floor. This position is below the axis of the midrange and tweeter on the satellite's sloping front panel, but it's fairly typical for the ears of a seated listener. A signal voltage of 5.66 V rms was applied, and the measurement referenced back to 1 meter. The response below 250 Hz was derived from 2-meter ground-plane measurements for which the input was reduced to 2.83 V rms to compensate for the ground plane's 6-dB boost. Separate grille-on curves are shown for the metal-screen tweeter grille and for the cloth-covered wood-frame grille of the satellite.

**WITH THE GRILLES OFF,  
FREQUENCY RESPONSE  
FITS WITHIN A 4.8-dB  
WINDOW ABOVE 650 Hz.**

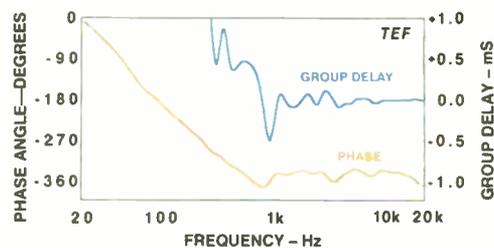
Overall, the response without the grilles fits a window of 7.7 dB between 40 Hz and 20 kHz, with the response above 800 Hz shelved down by about 3 to 4 dB as compared to the response below 600 Hz. Above 650 Hz, the response fits an even tighter window of 4.8 dB. Above 20 kHz (not

shown), the response was flat to about 22 kHz and then rose rapidly to a dome-resonance peak of about 12 dB at 25.5 kHz, with a high Q of about 20.

The satellite's cloth-covered grille causes some fairly severe interference effects in the on-axis response. The small metal-screen tweeter grille causes an increase in output from 4 to 12 kHz and a reduction in response at higher frequencies. I agree with



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



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

Maston Audio's recommendation that all of the grilles be removed for most serious listening. Above 100 Hz, the right and left systems matched within an acceptably close  $\pm 1$  dB.

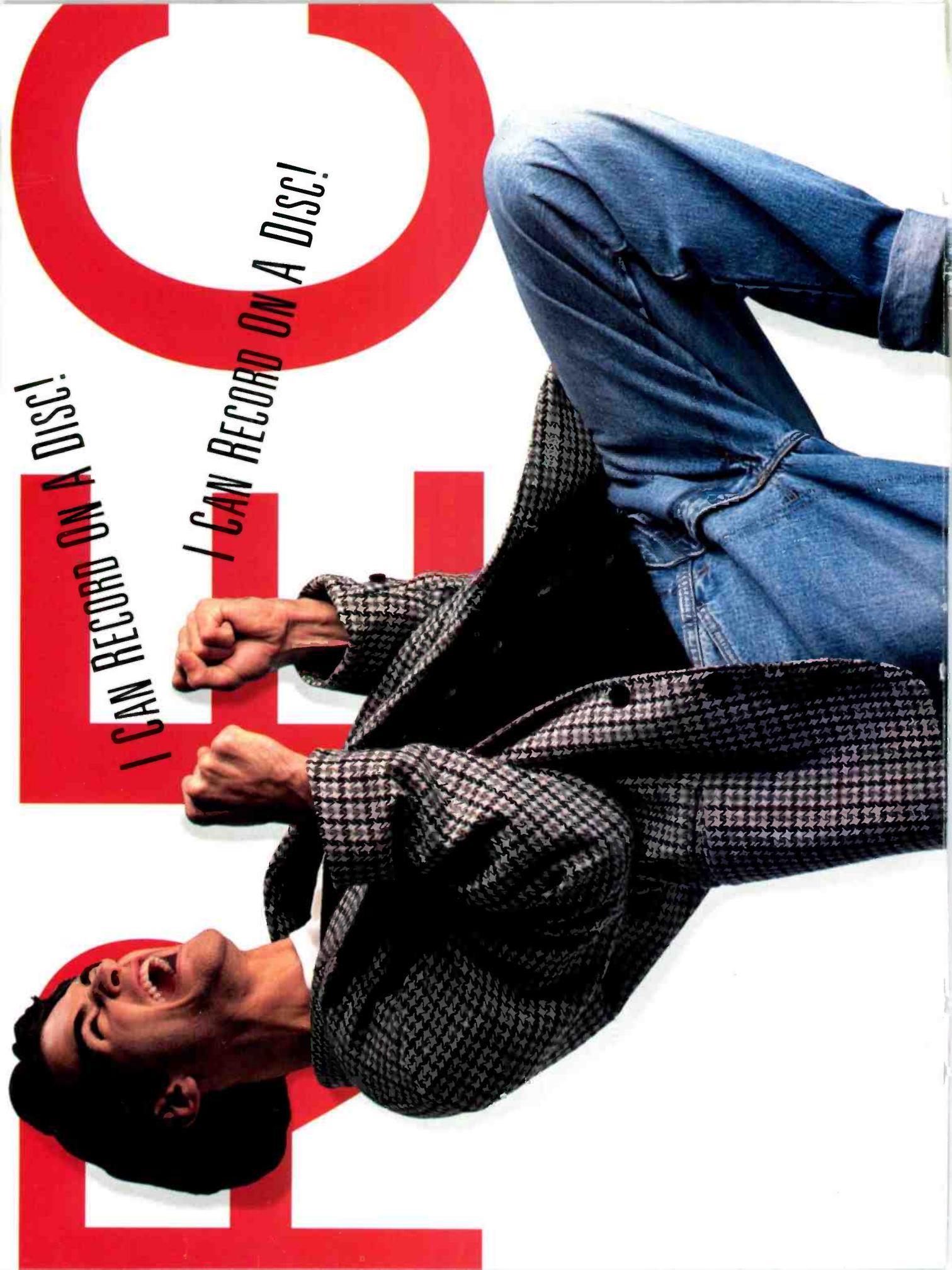
Two minor peaks are exhibited in the tweeter's range, at 2.9 and 5.4 kHz. A 1½-octave response trough is seen between about 750 Hz and 2.2 kHz, where the curve hits the bottom of the response window. The reason for this trough was evident when I measured the individual outputs of the satellite's bass/midrange and tweeter by driving the system through the bi-wire inputs (with the jumper straps removed). In this range, the drivers' acoustic outputs were of roughly equal level and more or less out of phase with each other to varying degrees, rather than being approximately 90° out of phase, the condition that a pure first-order crossover would exhibit.

SONY



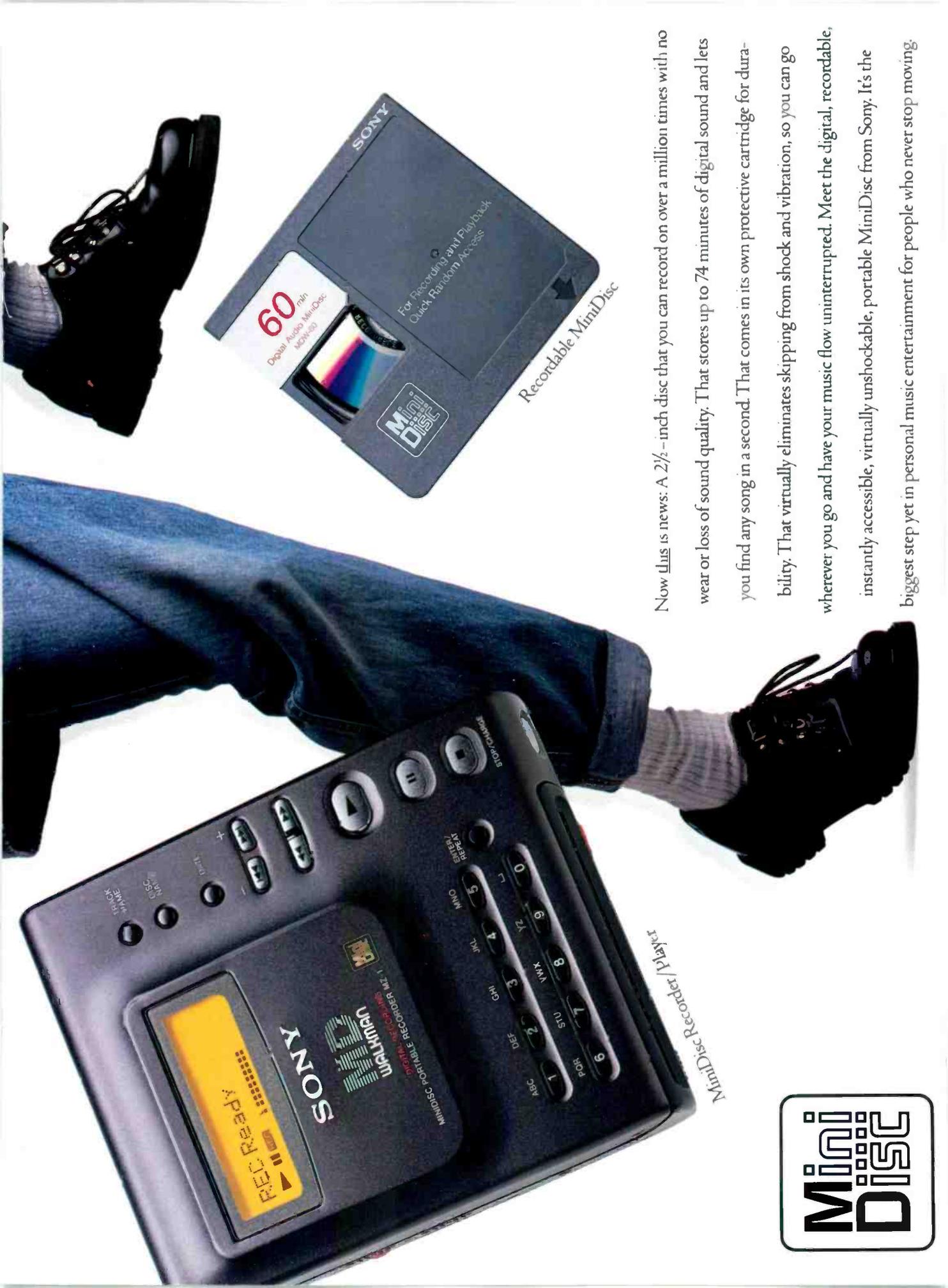
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MiniDisc Recorder/Player





The overall phase response shown in Fig. 2, however, nicely exhibits the desired minimum-phase condition above 1 kHz, with very little group-delay variation (both referenced to the tweeter's arrival time). This indicates that the tweeter polarity is correct for this type of crossover, the phase performance of the crossover itself is cor-

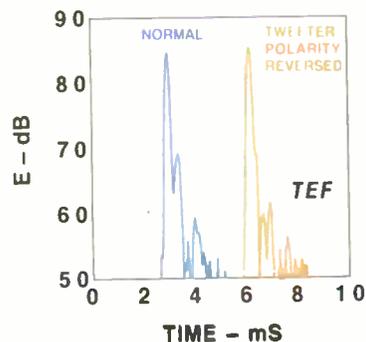


Fig. 3—Energy/time response; see text.

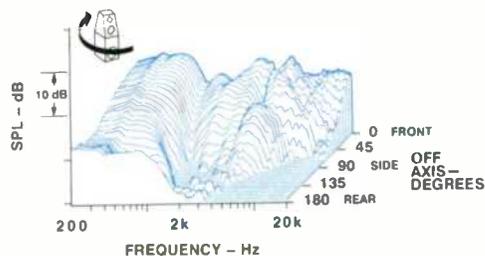


Fig. 4—Horizontal off-axis frequency responses.

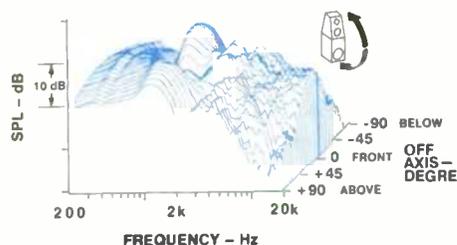


Fig. 5—Vertical off-axis frequency responses.

rect, and the system's drivers are closely aligned. Reversing the tweeter's polarity by reversing its connections replaced the trough of Fig. 1 with a peak centered around 1 kHz, which added an additional 180° of phase rotation. The individual response of the tweeter when driven by its crossover was quite flat from 800 Hz to 20

kHz, with a roll-off of 24 dB/octave below 800 Hz rather than the expected 6-dB/octave roll-off below 2.25 kHz. This deviation from the desired first-order tweeter response was the main cause of the depression in the on-axis response.

Getting back to Fig. 2, you can see that above 600 Hz the phase response stays close to  $-360^\circ$ , which indicates an in-phase condition with the input (any multiple of  $360^\circ$  is in phase with the input). Above 1 kHz, the group delay is essentially zero. The remaining peaks and dips in the curve mostly coincide with aberrations in the on-axis frequency response, which indicates an essentially minimum-phase condition. If the response were equalized flat above 1 kHz, the group delay would also be much smoother.

The Deluxe Reference's energy/time response is shown in Fig. 3. Also shown is performance with the polarity of the tweeter reversed. (This curve was shifted to the right by 3 mS for clarity.) The test parameters were chosen to accentuate the system's response from 1 to 10 kHz, which includes the satellite's crossover region. The curve taken with the tweeter connected normally exhibits a fairly coincident response but has a lower level peak, some 16 dB down from the main arrival by about 400  $\mu$ S. Reversing the tweeter's polarity essentially causes the secondary peak to disappear, which indicates that the acoustic outputs of the midrange and tweeter are out of phase with each other in a part of the range.

Figures 4 and 5 show the off-axis response of the satellite alone. This module's horizontal coverage (Fig. 4) is quite uniform, as seen by the way the ripples in the on-axis curve at the rear of the plot carry over into the off-axis curves.

Figure 5 shows the satellite's vertical off-axis response with the tweeter connected normally. The bold 0° curve halfway back in the plot is the direct on-axis response. The main feature of these curves is a depression at and near on-axis between about 800 Hz and 2 kHz. A pair of roughly symmetrical off-axis peaks in the same range are evident beyond 20° off axis.

This means that the satellite exhibits a pair of directional lobes above and below the axis in the frequency range from 800 Hz to 2 kHz. Reversing the tweeter connections replaced these two off-axis lobes with a single lobe (not shown) aimed more or less straight ahead. However, I am not suggesting that you reverse the tweeter connections, because this would cause decidedly rougher on-axis response and nonminimum-phase time behavior. These are matters that a loudspeaker designer needs to consider.

When the system was subjected to a high-level, low-frequency sine-wave sweep, only one significant cabinet resonance was evident. This consisted of a front-panel resonance of the satellite at about 270 to 290 Hz. The woofer did not exhibit any dynamic offset effects and overloaded gracefully.

The impedance of the Deluxe Reference is shown in Fig. 6. The minimum impedance of 5.1 ohms occurs at 700 Hz, and a maximum of 10.9 ohms occurs at both 100 Hz and 20 kHz. The system should be an easy load for any amplifier. The curve has a max/min variation of only 2.1 to 1, so the

**THE DISTORTION IS  
QUITE MODERATE FOR  
INPUT POWER LEVELS  
OF 50 WATTS OR LESS.**

speaker will be only moderately sensitive to cable resistance. Cable series resistance should be limited to a maximum of about 0.11 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, I suggest that 16-gauge or larger cable be used.

Figure 7 shows the complex impedance. The impedance phase (not shown) reached a maximum angle of  $+34^\circ$  (inductive) at 26 Hz and a minimum angle of  $-15^\circ$  (capacitive) at 230 Hz. As stated, the Deluxe Reference is an easy load for any amplifier. Interestingly, the 280-Hz front-panel resonance of the satellite module shows up as a slight wiggling of the impedance curves in both Figs. 6 and 7, though this may not be visible because of the small scale of our published graphs.

The 3-meter room response of the Deluxe Reference System, with both raw and sixth-octave smoothed data, is shown in Fig. 8. The Deluxe Reference was in the right-hand stereo position, aimed at the listening location, and the test microphone

was at ear height (38 inches) at the listener's sofa position. The system was driven with a swept sine-wave signal of 2.83 V rms (corresponding to 1 watt into the rated 8-ohm load), and the direct sound plus 13 mS of the room's reverberation are included.

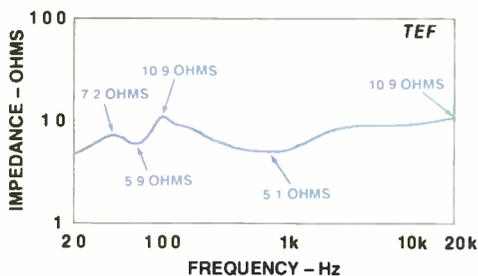


Fig. 6—Impedance.

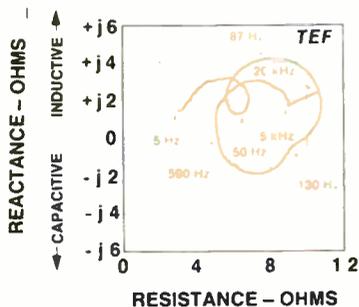


Fig. 7—Complex impedance.

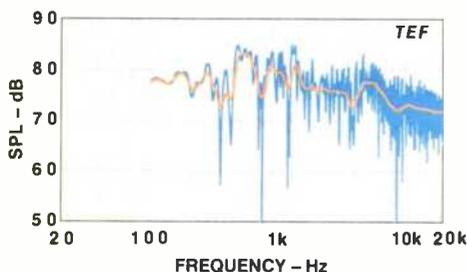


Fig. 8—Three-meter room response.

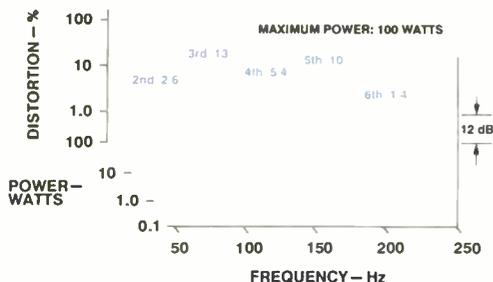


Fig. 9—Harmonic distortion for  $E_1$  (41.2 Hz).

Although somewhat rough, the overall curve fits a 10-dB window from 100 Hz to 20 kHz. Disturbing features include a slight high-frequency roll-off and peaks at 550 Hz, 900 Hz, 1.3 kHz, and 5 kHz. The depression in the on-axis response between 800 Hz and 2 kHz does not show up here, due to the fill-in effects of the reflected energy included in the first 13 mS of sound.

Figures 9 and 10 show the single-frequency harmonic distortion spectra versus power for the musical notes of  $E_1$  (41.2 Hz) and  $A_2$  (110 Hz). Results for a 440-Hz tone are not presented because the only distortion rising above the floor of my measuring gear consisted of about 0.7% second harmonic at full power. The power levels were computed using the rated system impedance of 8 ohms.

Figure 9 shows the  $E_1$  (41.2-Hz) harmonic distortion data. At maximum power, the highest peaks reach moderate levels of 13% third harmonic and 10% fifth harmonic. Below 50 watts, the distortion is quite low but increases rapidly for higher power levels, particularly the higher order harmonics. At 100 watts the Maston Audio generates a fairly loud 102 dB SPL at 1 meter at 41.2 Hz.

The  $A_2$  (110-Hz) data is shown in Fig. 10. At full power, the third harmonic reaches a significant 20%; the next highest harmonic is the fifth, at 7.5%. As with the 41.2-Hz data, the distortion increases rapidly above the 50-watt level. At 110 Hz with an input of 100 watts, the system generates a loud 108 dB SPL at 1 meter.

Figure 11 displays the IM created by tones of 440 Hz ( $A_4$ ) and 41.2 Hz ( $E_1$ ) at equal input power.

The IM distortion rises to a quite significant 25% at full power. Up to 50 watts, however, the IM remains below 7.5%. By driving the woofer and satellites independently through the bi-wire inputs, I identified the woofer as the source of the IM distortion. Apparently, the crossover allows a significant amount of the 440-Hz tone to reach the woofer and thus be modulated by that driver's nonlinearities. Rolling off the woofer faster would decrease the IM.

Figure 12 displays the system's short-term peak-power input and output capabilities as functions of frequency, measured using a 6.5-cycle tone burst with third-octave bandwidth. The peak input power was calculated by assuming that the measured peak voltage was applied across the rated 8-ohm impedance. The peak input power starts at 25 watts at 20 Hz, rises to about 100 watts at 40 Hz, and then decreases

**ON BRASILEIRO,  
BY SERGIO MENDES,  
THE SPEAKERS SHOWED  
THEIR EXCELLENT  
DYNAMIC RANGE.**

slightly to 80 watts at 80 Hz. It then rises rapidly to about 4 kW at 550 Hz, falls to about 1 kW at 1 kHz, and then reaches a plateau above 3 kHz of about 4 kW.

Between 50 and 250 Hz, the output waveshape changed to a triangle at higher power levels, presumably due to inductor saturation in the woofer leg of the crossover. This crossover limitation was confirmed by driving the woofer directly (shown in Fig. 12). This resulted in much greater input and output power, reaching 10 dB higher (10 times the power!) in the vicinity of 100 Hz. The decreased input power in the vicinity of 1 kHz is presumably due to excursion limitations in the bottom of the tweeter's range. As noted earlier, the tweeter is essentially operating at full level down to 800 Hz.

The upper curve in Fig. 12 shows the maximum peak sound pressure levels the Maston Audio can generate, at a distance of 1 meter on axis, for the input levels shown in the lower curve. Also shown is the "room gain" of a typical listening room at

acurus  
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WARNING: The Acurus Direct Input Amplifier™ (DIA) contains no preamplifier or integrated circuits

**W**e know the DIA-100 looks like an integrated amp, *but it's not*. In fact, there's nothing integrated about it. There is no preamp *integrated* with the amp, or any *integrated* circuits (IC's) inside the amp. The DIA-100 is just a very special *amplifier*.

It is so special that the DIA-100 is the **only Direct Input Amplifier™** in existence. With the DIA-100 the sources are connected directly to the input stage of the power amplifier. Not only is there no preamplifier to amplify the signal, there is only a single gain block between the source and the loudspeaker for *unsurpassed purity*.

The Acurus breakthrough of **High Sensitivity Amplification™** is the closest audio engineering has come to achieving the ideal of "a straight wire with gain". The input sensitivity of the DIA-100 is so high that only 1/4 volt yields 100 watts of continuous output power and full dynamic range. From input to output there is only one silver plated switch contact between the source and the loudspeaker. The balance control is out of the circuit when centered and the volume control is laser trimmed for the utmost precision. So here is the second WARNING: One listen to the Acurus DIA-100 and you will be addicted. However this addiction is not hazardous to your health, it is good for your soul.

## MONDIAL DESIGNS LIMITED

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low frequencies, which adds about 3 dB to the response at 80 Hz and 9 dB at 20 Hz.

The peak acoustic output exhibits a depression between 60 and 300 Hz and an octave-wide dip between 700 Hz and 2 kHz. Even with these limitations, with room gain the output exceeds a very usable 110

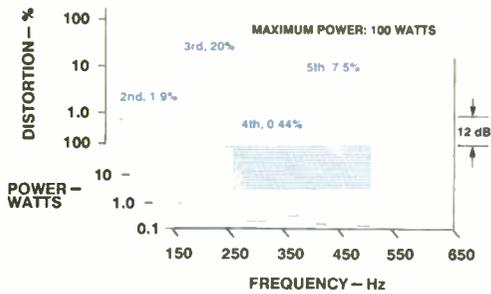


Fig. 10—Harmonic distortion for  $A_2$  (110 Hz).

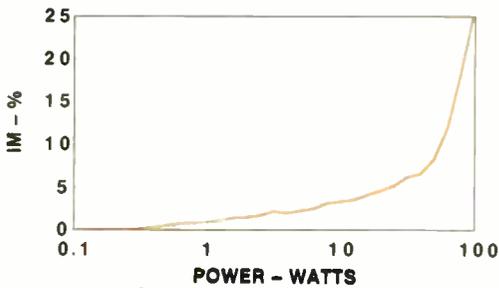


Fig. 11—IM for  $A_4$  (440 Hz) and  $E_1$  (110 Hz).

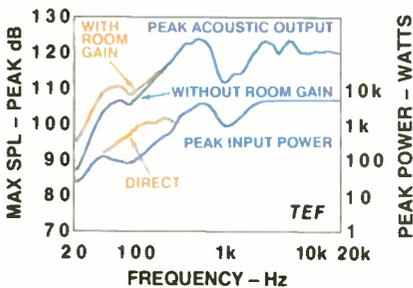


Fig. 12—Maximum peak input power and sound output; see text.

dB above about 40 Hz. The maximum output does not reach 120 dB, however, until about 300 Hz, because of crossover limitations. In a typical room, a stereo pair of Deluxe References can reach much higher low-frequency levels with bass material common to both channels.

### Use and Listening Tests

Even though the Deluxe References are large and, at 140 pounds each, the second heaviest systems that I have evaluated, their modularity saves the day when they must be moved around. Each of the three modules can be lifted and handled easily by one person. (They also can be packed nicely in separate cartons and don't exceed the UPS limit for shipping weight.)

The woofer cabinets are supplied with sharp-pointed cones that screw into the bottom of the cabinet for firm mounting on carpeted surfaces. Locating the satellite on top of the woofer module is very easy because of cone-shaped protrusions on the satellite's bottom, which fit into corresponding indentations in the top of the woofer enclosure.

As mentioned, the Deluxe Reference is supplied with all Cardas cables and connects. Connection at the rear of both satellite and woofer (and crossover) is through gold-plated double-banana jacks that handle very large spade lugs. These jacks are very substantial mechanically and can be tightened with a nut driver to ensure a good electrical connection. Bi-wire capability is fully supported.

Two separate grilles are supplied, one covering the bass unit and one for the satellite module. In addition, the small metal-screen grille that covers the tweeter dome is held in place magnetically and can be removed. All of the speaker's grilles were removed for my listening evaluations.

The appearance, styling, and workmanship of the Deluxe References are outstanding. My review samples had an attractive oak finish. The oak grain on the bass and satellite modules is matched, and the systems are shipped in right and left units for this reason. Acoustically, they are matched well enough that the right and left satellites could be interchanged on the bass modules.

The owner's manual is 13 pages long and goes into much detail on room acoustics,

system placement, hookup, and operation. The manual also covers the design philosophy of all of Maston Audio's speakers and includes a table of specifications for them.

Maston highly recommends two listening configurations that minimize bass standing waves and maximize imaging. The first, more recommended, setup places the speaker and listener very close together near the center of the room. The speakers are one-third the distance from the side walls and rear wall, and the listener is only about one-fourth of the room's depth away from the speakers. For a typical 16-foot-long room, this places the listener only about 4 feet away from the speakers!

The second setup (recommended only if the first is impractical) places the listener

**THE MASTON AUDIO  
DELUXE REFERENCES  
SOUNDED CLEAN AND  
VERY INVOLVING, WITH  
IMPRESSIVE IMAGING.**

farther from the speakers, which are located one-fifth of the room's length from the rear wall; the listener is two-fifths of the room length from the speakers. My usual setup is closer to this second configuration but with the speakers more widely spaced and there is a 10-foot listening distance. Maston Audio also recommends that room reflections be controlled and diffused rather than just simply absorbed by overstuffed furniture, heavy drapes, etc. Maston advises that the Deluxe References should be toed in to face the listener, for best imaging.

My listening was done using Straight Wire Maestro cables hooked to a Bryston 4B power amp and 0.4B preamp, driven by Onkyo and Rotel CD players. The speakers were placed in my usual listening setup, with the Deluxe References placed well out in the room (which is  $15\frac{1}{2} \times 27 \times 8$  feet), about 6 feet from the short rear wall and separated by 8 feet. This left a spacing of about 4 feet from the side walls. The speakers were aimed at my listening position, about 10 feet away.

I did do some listening in the recommended close-in configuration and obtained quite good results. However, it was impractical for me because it did not fit in

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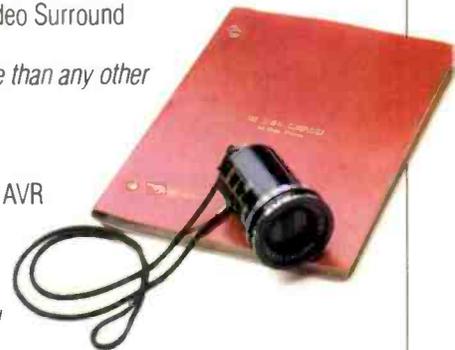
*AV Receivers in the field.*

Unlike so many so-called AV products, Denon AVR  
Receivers deliver audiophile signal quality

(wide dynamic range, high signal-to-noise, outstanding phase linearity and immeasurably low  
distortion) and address what the others overlook: low level steering, rear channel fidelity and precise digital delay.

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that differ from the original, first you must be able to recreate the original.

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PROGRAMMABLE AND RC-160  
SIMPLIFIED AVR REMOTE CONTROLS



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*The first name in digital audio.*

well with the rest of my listening room's furnishings. The close-in setup provided a very analytical and dry sound, akin to near-field speakers in a recording studio or to headphones.

I first listened to a new Sergio Mendes CD, *Brasileiro* (Elektra 61315-2), that demonstrated the Deluxe Reference's excellent dynamic range capability and its first-class imaging and reproduction of sharp percussive sounds. The sensitivity of the Deluxe Reference was essentially equal to that of my B & W 801 Matrix Series 2.

Reproduction of Antonin Kubalek playing piano on *Piano Music of Johannes Brahms, Vol. II* (Dorian DOR-90159) was clean and well balanced, with good bass control and extension. The Deluxe References exhibited a high loudness capability and good recovery of recorded acoustics and ambience. On delicate high-frequency sounds, the Maston Audios were the equal of my reference B & Ws. On pipe organ, however, I did notice some muddying of the mids on bass pedal passages that were very high in level.

The Deluxe References exhibited significant midrange and upper midrange tonal changes on the pink-noise stand-up/sit-down test. Even when I was sitting down, the pink noise had a moderate tonality, indicating response roughness. There was some slight emphasis of the upper bass and lower mids as compared to the pink-noise response of the 801s.

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# JUST THE MUSIC



**"The SONATA FAMILY UNITED** - When used together, the PRO-10 and EX-442 Sonata worked like a pair of world-class figure skaters: each complemented the other to benefit the overall performance. They really worked well in tandem.

On recordings of acoustic music, these components had the ability to differentiate clearly between an instrument's direct sound and the accompanying envelope of reflected and reverberant sound. In many cases, this gave me a clearer sense of what the recording acoustic was like. **Just the music."**

*Bob Bottman Sensible Sound, Summer 1992*

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**THE SOUND WAS FULL  
AND WELL BALANCED,  
WITH A DETAILED  
AND ACCURATE  
SOUNDSTAGE.**

On band-limited low-frequency pink noise, the Deluxe Reference's maximum clean output in the 20- and 25-Hz bands was significantly less than the 801's. At 40 Hz and above, the Maston Audio's output was quite close to the maximum output of the B & W. However, when the excursion limits of the Deluxe Reference were exceeded, its distortion increased suddenly, crying "turn me down quickly!"

On full orchestral material, such as Mozart's Violin Concertos, Nos. 3 and 4 (Sony Classical SK 48031), the Deluxe References provided a very involving sound that was clean and nonstrident and that integrated the various instruments well. I was particularly impressed with the speakers' imaging and soundstage capabilities on this material. They seemed equally at home with high-level rock and with classical music.

The Deluxe References sounded better than some of my measurements might suggest. They were quite easy to drive and provided a full and well-balanced sound with an accurate and detailed soundstage, coupled with excellent dynamics. However, their vertical coverage and response were a bit uneven, and their bass distortion could have been lower. On balance, however, the virtues exceed the weaknesses. As with any high-end speaker, the "buy" decision depends heavily on whether the strengths and weaknesses mesh with your needs, expectations, and listening requirements. The Maston Audio Deluxe Reference Systems are serious contenders in the high-end market and should be listened to.

*D. B. Keele, Jr.*

AUDIO/JANUARY 1993

# Chronicle

Since 1976, Coustic has consistently created and manufactured some of the highest quality equipment on the car audio market.

From its introduction in 1978, the memorable RX-3000 has drawn incredible consumer demand. In the early eighties, the unforgettable EQ-8370 maintained strong popularity for an amazing stretch of seven years. Then, of course, there was the AMP-500/300 power amplifier series with its superb sonic reproduction capability.

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Since its introduction in 1985, the AMP-380/190 has become an industry classic. It is the first amplifier ever designed to utilize HEXFET® components in its Pulse Width Modulated (PWM) power supply.



**EQ-1030 Real-Time Analyzer/Pre-Amplifier/Active Crossover**

Selected as "one of the most innovative consumer products of 1986" at the Innovations '86 Design & Engineering Exhibition event held at the 1986 International Summer Consumer Electronic Show. The EQ-1030, a programmable 7-band EQ designed with pink noise generator, microphone and detachable electronic crossover, is the first and only product of its kind ever to be created for the automotive environment.



**XM-3 Mobile Electronic Crossover** (U.S. Pat. #4,905,284)

The most popular and widely imitated electronic crossover ever created, the trend-setting XM-3 is well recognized in the industry for its unique features.

*"The XM-3 is an installer's dream come true... but the real beauty lies in the crossover's ability to be configured for practically any amplifier/speaker system you can think of... it's a very useful product and a tremendous value."*

Michael Smolen  
User's Evaluation,  
CAR STEREO REVIEW  
Summer 1988

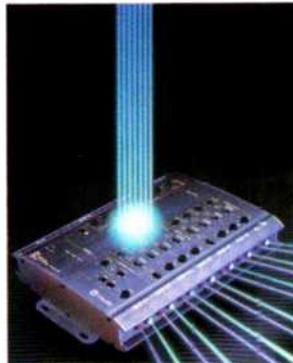


**AMP-460 Power Logic Component Amplifier**

The first of Coustic's **Power Logic** Component automotive power amplifier line, the AMP-460 was honored as "one of the most innovative consumer products of 1990" at the Innovations '90 Design & Engineering Exhibition.

*"It offers an excellent design, quality construction, reliable operation, and great sonics while avoiding the distraction of useless bells and whistles... in short, this is a very cost-effective but still hi-fi amplifier."*

Ken C. Pohlmann  
Test Reports,  
CAR STEREO REVIEW  
May/June 1990



**XM-7 Multi-Function Mobile Electronic Crossover** (Patent Pending)

The "reference standard" for electronic crossover design technology, the XM-7 was recognized as another "one of the most innovative consumer products of 1990" at the Innovations '90 event.



**RTA-33 30-Band One-Third Octave Real Time Analyzer.** (Patent Pending)

The world's smallest, most powerful and amazingly accurate Real Time Analyzer, the RTA-33, earned Coustic yet another honor as "one of the most innovative consumer products of 1991" at the Innovations '91.

Utilizing DSP technology, the RTA-33 represents a major breakthrough in precision instrumentation.

*"The 33 is an excellent RTA. In terms of design, Coustic's engineers have stepped up to the plate and hit a home run. No other RTA offers this combination of small size, versatility, special features, precision, and price... The RTA-33 simply rewrites the rules."*

Ken C. Pohlmann  
User's Evaluation,  
CAR STEREO REVIEW  
Jan/Feb 1992



**RX-739 Car Radio/Cassette**

An evolutionary improvement, Coustic's new 1992 series of full-featured Car Radio/Cassette Players is a fusion of technological ingenuity, functionality and dynamic ergonomics.



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# OPTIMUS DCT-2000 DCC RECORDER

## SPECS

### Digital Cassette (DCC)

Frequency Response: 5 Hz to 20 kHz,  $\pm 0.5$  dB.

S/N: Playback, 110 dBA; record/play, 95 dBA via digital input and 90 dBA via analog inputs.

THD at 1 kHz: Playback or record/play via digital input, 0.0035%; record/play via analog inputs, 0.005%.

IM Distortion:  $-80$  dB at  $-4$  dB recorded level.

Channel Separation: Playback or record/play via digital input, 85 dB; record/play via analog inputs, 60 dB.

### Analog Cassette

Frequency Response,  $\pm 3$  dB: Type I tape, 40 Hz to 16 kHz; Type II, 40 Hz to 17 kHz; Type IV, 40 Hz to 18 kHz.

S/N: Without noise reduction, 55 dBA; with Dolby B NR, 65 dB (CCIR-weighted); with Dolby C NR, 75 dB (CCIR-weighted).

THD at 1 kHz: Maximum, 1%.

Channel Separation: Minimum, 45 dB at 1 kHz.

Wow and Flutter: 0.1% wtd. rms.

### General Specifications

Input Impedance: 47 kilohms,  $\pm 10\%$ .

Input Sensitivity: 600 mV,  $\pm 1$  dB.

Line Output Impedance: Less than 1 kilohm.

Line Output Level: DCC, 2 V rms; analog cassette, 700 mV rms.

Operating Temperature Range: 32° to 109° F (0° to 43° C).

Dimensions: 17 $\frac{3}{4}$  in. W  $\times$  5 $\frac{1}{4}$  in. H  $\times$  12 $\frac{1}{4}$  in. D (44.1 cm  $\times$  13.3 cm  $\times$  31.1 cm).

Weight: 14 lbs. (6.4 kg).

Price: \$699.95.

Company Address: Radio Shack, 700 One Tandy Center, Fort Worth, Tex. 76102.

For literature, circle No. 92

PASC system does not record data that humans would not hear in any particular case. This technique makes it possible to digitally record music signals on a cassette whose tape moves at the same slow speed as that of the familiar analog audio cassette. Furthermore, since the tape-drive mechanism is basically the same as that in analog cassette decks, all DCC decks are able to



It's been well over a year since Philips announced their development of the Digital Compact Cassette (DCC) format. While that giant European company was introducing two models of this newest type of digital tape recorder, Tandy Corporation, best known for their thousands of Radio Shack retail outlets (and a strong supporter of DCC since it was announced), beat Philips in bringing the first DCC deck to market. As David Ranada and I explained in our feature articles (in the September 1991 and February 1992 issues, respectively), the DCC format utilizes a digital data-reduction technique known as PASC (Precision Adaptive Sub-band Coding). Simply stated, PASC reduces data rate by a factor of approximately 4 to 1, based on well-documented psychoacoustic principles. In essence, the

play back analog cassettes, although they cannot record signals in an analog format.

The Optimus DCT-2000 (Tandy uses the "Optimus" label for its higher end audio products) takes full advantage of just about all of the capabilities of the DCC format. It permits you to connect a digital program source, such as a CD player having a digital output (coaxial or optical), for direct single-generation digital-to-digital dubbing. An ID cueing system lets you add ID markers to a DCC tape for more control over tape playback, and an automatic search system helps you quickly find the beginning of any track on a DCC tape. A time display shows the elapsed time of an entire DCC tape or a single selection, in hours, minutes, and seconds. Text display shows the album title, song title, and album credits on prerecorded DCC tapes, if those

# PURE PERFECTION



The unique Celestion 30C Transmission Line loudspeaker with its slim and beautifully finished cabinet, transcends expectations.

The newly designed Celestion Transmission Line system-C.T.L.\*- produces a deep extended and dynamic bass response, which, combined with its perfectly

balanced high fidelity sound, makes this floor standing loudspeaker a unique listening experience.

The new Celestion 300 joins the award winning Celestion 100 to create pure perfection in two exceptional loudspeakers.

Unmistakably Celestion.

1 0 0 3 0 0

**CELESTION**

tapes are encoded with such information. Track programming lets you program the deck to play only selected tracks on a DCC tape. Automatic reverse play lets you set the deck to play one or both sides of a DCC tape or to play both sides continually, up to eight times. A record mute function allows you to record a silent section on a DCC tape. And besides playing stereo DCC

tapes, the DCT-2000 can play prerecorded mono DCC tapes, which reallocate the tape's data space into four segments, doubling the playing time (up to three hours) by using half as many channels.

For playing back analog cassettes, the DCT-2000 is equipped with Dolby B and Dolby C noise-reduction circuitry. A remote control lets you operate the deck's

main functions from anywhere in your listening room. However, the remote does not have number buttons, so you can't access a given track of a DCC tape directly, as you can on most CD or DAT machines. You must punch the controls for the Automatic Search Music System (ASMS) the appropriate number of times to get to a given track number. For example, if you are playing track 1 and want to access track 7, you press the forward ASMS button (either on the front panel or on the remote) six times. I noted that track access was no faster than what we are accustomed to with analog cassette decks. Specifically, fast-winding a 90-minute cassette from one end to the other took two minutes and six seconds!

#### Control Layout

The display at the upper left of the DCT-2000's front panel provides all sorts of information, including track number, time of current selection, remaining track time, remaining total time, and if you choose, an arbitrary numeric count. Also shown are the type of tape being played (digital or analog), the direction of tape travel, and whether a prerecorded DCC is a two-segment stereo or four-segment mono recording. As mentioned, for prerecorded DCC tapes, text detailing the name of the artist or the selection can be shown. The display also features a bar-graph stereo level indicator, which is vital when you record via the analog inputs, where "digital overload" might easily occur.

The tape compartment is in the center of the front panel. To its

right are a dozen transport controls: Six large buttons open and close the drawer, start recording, and control "Pause," "Play," "Stop," and direction of tape travel; six smaller keys handle auto reverse, record muting, fast forward and rewind, and forward and reverse track search.

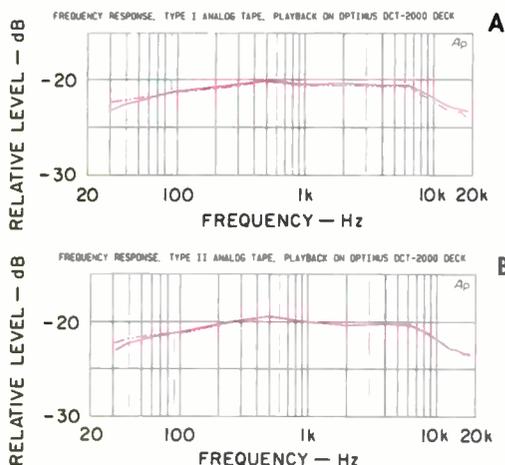
**DCC RECORD/PLAY  
LINEARITY WAS  
VIRTUALLY PERFECT,  
EVEN BELOW -100 dB.**

The on/off switch and remote-control sensor are at the lower left, next to a swing-down panel that discloses secondary controls. These include a three-position input selector ("Analog," "Digital," and "Optical"); a three-position "Dolby NR" switch ("Off," "B," and "C") for playing analog tapes; buttons for enabling automatic "ID" codes at the start of each selection; keys for writing and erasing start, skip, and reverse ID codes, and a button for renumbering IDs. Other controls here set the counter and display modes, the input balance, and recording level. At the lower right corner of the front panel are a stereo headphone jack and its level control.

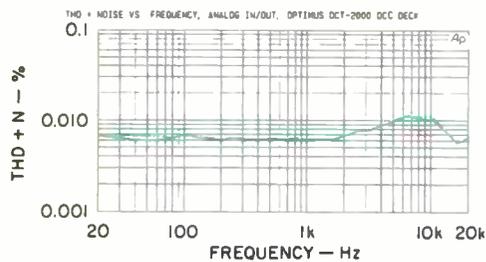
The rear panel of the DCT-2000 has analog input and output jacks as well as coaxial and optical digital input and output terminals. The remote control handles all functions of the 12 buttons on the upper right corner of the front panel except for auto reverse and "Open/Close." The remote also allows you to select display and text modes.

#### Measurements

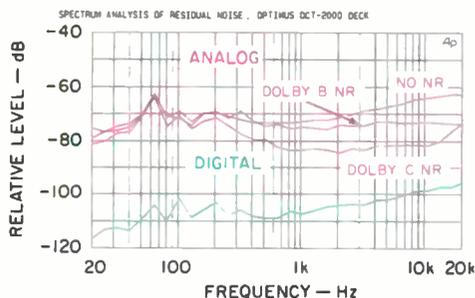
In testing a DCC recorder for the first time, I was faced with many decisions. Philips has pointed out that conventional single-tone measurements will not properly depict the acoustic performance of a DCC machine; only subjective listening tests will be meaningful, they have said. As an engineer devoted to objective electronic measurement, I found this hard to accept. My aim was to make some conventional measurements of the DCC deck's performance and then devise some additional tests that might show some of the deficien-



**Fig. 1—Frequency response, for playback of Type I (A) and Type II (B) analog test tapes.**

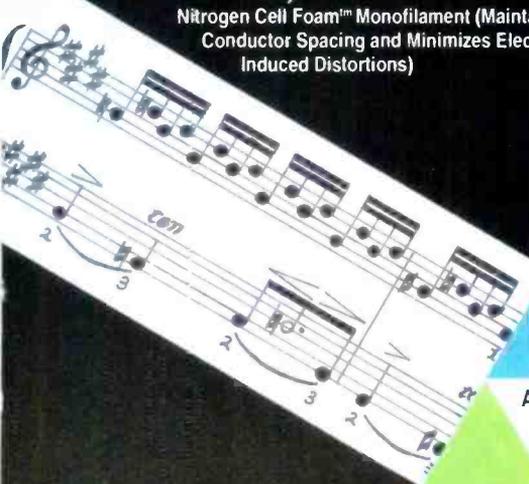
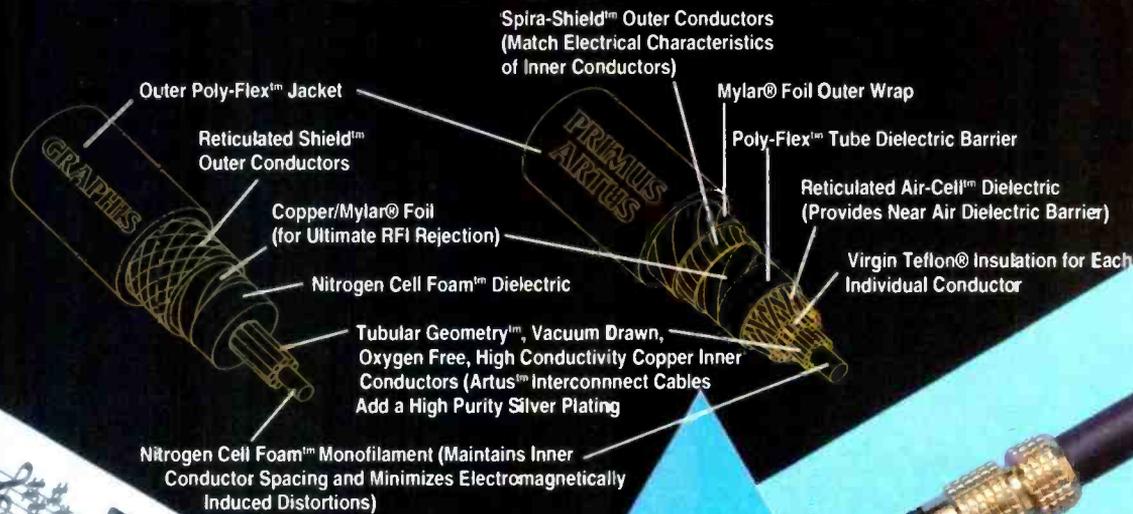


**Fig. 2—THD + N vs. frequency for DCC record/playback via analog inputs and outputs.**



**Fig. 3—Spectral distribution of tape noise for analog playback on Type I tape and DCC record/play of "no-signal" digital input.**

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cies (if any) of the PASC encoding system. In the future, as more studies are made of this and other bit-rate reduction schemes, I hope to come up with additional objective testing methods that will “separate the men from the boys” as far as both DCC and MD (MiniDisc) products are concerned. For the moment, let’s take a look at the results of the conventional measurements.

There turned out to be no point in showing frequency response curves for DCC recordings made via the analog inputs. When I used single-frequency sweeps, the curves were absolutely ruler flat from 20 Hz to 20 kHz—far flatter, in fact, than the frequency response of most CD players. In an attempt to exercise the PASC system more completely, I then tried wide-band white noise as a signal source. The response was also essentially flat over the entire audio range, but the curve was so full of fluctuations caused by random noise that it would be misleading to show it. And it should be noted that all these tests were run at maximum recording level; otherwise, the PASC psychoacoustic encoding might have come into play to eliminate certain tones and frequencies during the random-noise test.

Next I checked frequency response when the deck was playing back calibrated *analog* cassettes supplied by BASF. These tapes have fixed tones extending from 31.5 Hz to 18 kHz. With a calibrated Type I tape, response is down about 3 dB at 18 kHz and, at 31.5 Hz, is down about 2.8 dB for the left channel and 2.5 dB for the right (Fig. 1A). Results are virtually the same with a calibrated Type II analog tape (Fig. 1B).

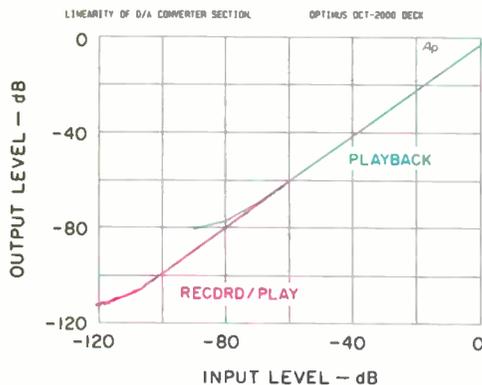
Returning to the digital recording mode, I used the analog inputs to tape signals from 20 Hz to 20 kHz at maximum (0-dB) level. During playback, I plotted the DCT-2000’s THD + N as a function of frequency (Fig. 2). Over most of the bass and midrange, the results hover around the 0.006% mark, increasing to around 0.01% in the region near 10 kHz and decreasing above that frequency to a level of 0.006% again at 20 kHz.

I recorded a “no-signal” track via the DCT-2000’s coaxial digital input and plotted the noise spectrum in playback (bottom curve, Fig. 3). Results are far superior to anything I could have achieved with any analog tape recorder. Measuring overall S/N with stan-

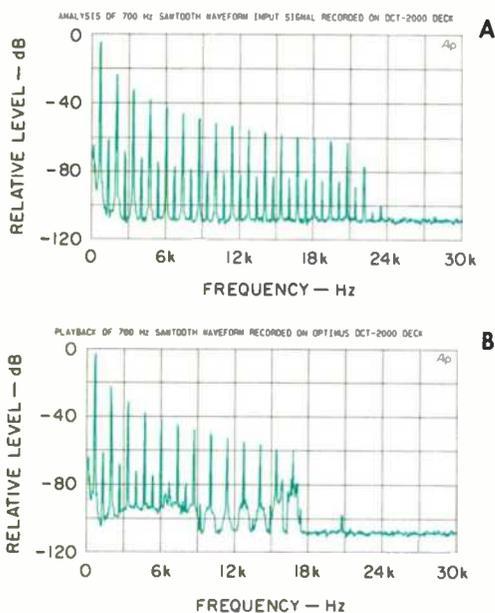
dard A-weighting, I came up with a figure of 90.34 dBA for the left channel and 90.03 dBA for the right channel, using the same tape I had recorded via the analog inputs. Recording a “no-signal” condition via the coaxial digital input resulted in a playback S/N ratio of just over 92 dBA.

By contrast, playing an analog cassette and using a reference level of 250 nWb/meter (upper curves in Fig. 3), I measured overall weighted S/N of approximately 57 dBA without noise reduction, 65 dBA with Dolby B NR, and 72 dB with Dolby C NR. Both Dolby systems worked as expected, with Dolby B NR suppressing high-frequency noise by about 10 dB and Dolby C NR extending its action down to somewhat lower frequencies.

Figure 4 shows two tests of linearity. The “Playback” curve was made with a test tape supplied by Philips that carries gradually decreasing levels of a 1-kHz signal. This curve is reasonably linear down to around -80 dB, but residual noise prevented me from getting a meaningful reading below that level. On the other hand, a signal of decreasing level recorded (via the DCT-2000’s coaxial digital input) and played back shows virtually perfect linearity down past -100 dB.



**Fig. 4—Output vs. input linearity at 500 Hz, for playback only of prerecorded tape and for record/play.**



**Fig. 5—Spectrum analysis of 700-Hz sawtooth test signal at input to DCT-2000 (A) and from DCC playback (B); see text.**

**BECAUSE OF PASC  
ENCODING, MANY  
CONVENTIONAL TESTS  
DON'T PROPERLY SHOW  
WHAT DCC CAN DO.**

For experiments with various signals designed to show the effects of the PASC data-reduction system, I was advised by a correspondent that using a 700-Hz sawtooth input signal might be worth trying. I therefore made a spectrum analysis of the harmonics of such a waveform as applied to the DCT-2000’s analog inputs (Fig. 5A). Note that both even and odd harmonics show up at gradually decreasing amplitudes as higher and higher frequencies are plotted. This sawtooth waveform was then recorded onto a DCC tape and played back. A spectrum analysis of the playback signal (Fig. 5B) reveals that the even harmonics, evident out past 20 kHz for the input signal, are only present up to around 9 kHz when the recording is played back. Clearly,

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the PASC system is "eliminating" the higher order even harmonics, on the basis that such low-amplitude harmonics should be inaudible, or masked, in the presence of the high-amplitude odd harmonics. Also note in Fig. 5 that while odd-order harmonics of the input signal are evident beyond 20 kHz when the input signal is analyzed, such odd-order harmonics extend only to around 17.5 kHz in playback.

For my last bench test, I returned to the analog cassette mode to measure wow and flutter of the deck's drive mechanism. Of course, when playing either prerecorded or home-recorded DCC tapes, wow and flutter is not a factor. However, for analog cassettes, wow and flutter does need to be considered. For my DCT-2000 sample, wow and flutter hovered around 0.1% wtd. rms; the unweighted peak reading was about 0.2%.

#### Use and Listening Tests

In addition to a supply of blank DCC tapes, I was armed with prerecorded cassettes from such diverse labels as Arista, A&M, and London. One outstanding recording I listened to was Mahler's Sympho-

ny No. 1 (London 425-718-5). The complete absence of tape hiss when playing a tape is, in itself, remarkable, but I had become accustomed to that from DAT recorders. What impressed me most here was

**THE CLEAN,  
DISTORTION-FREE  
SOUND IMPRESSED ME  
EVEN MORE THAN THE  
ABSENCE OF TAPE HISS.**

the clean, distortion-free sound of the Cleveland Orchestra under the baton of Christoph von Dohnányi, its music director. The symphony runs nearly 55 minutes, so the fourth movement played back in the reverse direction of the tape. (As will be true in all DCC decks, tape reversal is automatic). Although I have another version of this Mahler symphony, on a Denon CD, the two performances are not identical so I saw little point in comparing the sound of the CD with that of the DCC.

Subjectively, all of the recordings I had on hand sounded fine. I could detect no

audible anomalies caused by the PASC data-reduction system, but I had no way to compare the DCC tapes with their CD equivalents. In earlier controlled comparison tests of CDs versus DCCs, several of my colleagues and I were able to detect minute differences in sound quality. Those differences, however, did not lead any of us to express a *preference* for the CD over the DCC or vice versa. All I could say during those tests was that I could detect very minor differences when synchronized switching occurred.

Tandy is to be commended for bringing the Optimus DCT-2000 to market so quickly and for executing its design so well. I must confess that the lack of "instant" access to a given selection on a DCC tape bothered me a bit because I am so used to the fast track access of DAT recorders, let alone the even faster access of CD players. I would repeat that this is only my first test report on this new tape recording format. As I become more familiar with DCC and develop more revealing test signals, I would hope that I will be able to explore this new medium in even greater depth down the line.

Leonard Feldman

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## JVC HA-D990 EARPHONES



### SPECS

Transducer Design: Dynamic.  
Coupling to the Ear: Circumaural  
Equalization: Not specified.  
Sensitivity: 106 dB for 1mW.  
Maximum Output: 126 dB for 100  
mW.  
Impedance: 65 ohms.  
Price: \$119.95.  
Company Address: 41 Slater Dr.,  
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For literature, circle No. 93

### MEASURED DATA

D.c. Resistance: Left, 65 ohms; right,  
64 ohms.  
Absolute Polarity: Positive.  
Cord: 10¼ feet long, from left ear-  
cup, with gold ¼-inch stereo  
phone plug.  
Adjustments: One-piece headband  
and bail with detents.  
Weight: 8.0 ounces.

**T**he HA-D990s were, until recently, JVC's top-of-the-line non-wireless earphones. The cord's gold stereo plug is an immediate indication of their high quality, intended to catch the eyes of audiophiles who know the value of good, corrosion-free connections. Oxygen-free copper wires are used for the cord and copper-clad aluminum wire for the voice-coils. The HA-D990 is part of JVC's broad range of home entertainment products that also includes TVs, VCRs, camcorders, receivers, CD players, cassette decks, etc. The company has had a long-

time commitment to this market, and its products have earned an enviable reputation for quality.

The headband of the HA-D990 is designed as one piece rather than a separate headband and bail used in some other earphones that I have reported on in past issues. The bails are short pieces of metal with detent notches pressed into them at intervals of about 4 mm (approximately 5/32 inch), allowing for a reasonably fine adjustment to any head size. The metal bails slide in and out of plastic retainers that are fixed to the ends of the headband. The wire for the right earphone element exits from the rear of the earcup; it then passes through the headband and enters the left earcup. Along this path, the wire is clamped by a retainer on the plastic yokes that hold the earphone cups. The flexible earphone cord is straight, not coiled; it exits from the bottom of the left earcup through a flexible strain relief.

The yokes are modern versions of the type that were used on some of the earliest earphones, such as the "cannonballs" old-timers may remember. The top of the yokes also swivel to allow a really good fit to the head. The cups are made of plastic, and each has a slot in the edge of the rim to retain the earcushions. The dynamic earphone elements are mounted into removable plates that are held to the face of the earcups by four screws. There are foam buffers at the top and bottom of the earphone elements to reduce reflection and diffraction effects. The earcushions also have an acoustically trans-

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parent foam insert that covers the earphone element when the cushion is in place. The earcups are embossed with a gold "L" and "R" for easy channel identification. The foam-filled vinyl cushions are reasonably comfortable but not exceptionally so. They are a little too small for most ears, smaller than

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## EARPHONE EVALUATION

PARAMETER	RATING	COMMENTS
Overall Sound	Very good	"Good binaural quality" and "Bright and forward"
Bass	Good	"Reduced, compared to midrange"
Midrange	Excellent	"Very good" and "Natural"
Treble	Good	"Less than reference 'phones" and "Dull"
Overall Isolation	Fair	"Not much isolation"
Bass	Poor	"No bass isolation"
Midrange	Fair	"Easy to hear outside voices"
Treble	Good	"Outside highs reduced"
Comfort	Fair	"Loose fit"
Value	Very good	"Good value, compared to other earphones"

**GENERAL COMMENTS:** Good articulation on voice due to the bright, forward sound; reasonably good bass; overall good value.

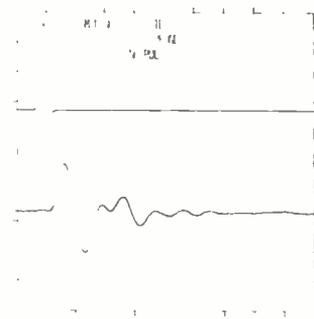
most circumaural types that completely surround the outer ear but larger than supra-aural types that sit on the outer ear. The headband tension that keeps the earphones in place is very modest. This, coupled with their light weight, could let the HA-D990s make you forget that you had them on if only the earcushions were a little larger. As it is, it's hard to forget the pressure, especially on the earlobes.

Although the HA-D990 earphones are of the "sealed" type, the integrity of the seal is affected by leaks around the outer ear. This can cause the level in the range from about 100 to 300 Hz to be reduced somewhat, compared to the midrange; the listening panel's comments tend to confirm this. Pressing the JVCs more tightly against the head increases the output in this range and gives a fuller sound. The dynamic transducers appear to have been designed to compensate in part for the lack of a tight seal; the output in the bass range is still reasonably good, and the sound of bass drums and double bass is very good (although at a lower level than the mid- and high-frequency range). Below 64 Hz, the bass response rolls off gradually, with the output at 32 Hz down only about 8 dB. The lack of a tight seal also affects the attenuation of outside sounds, which can be heard (although with moderate attenuation).

Members of my listening panel who auditioned the JVC HA-D990 earphones were asked to listen to various types of program material and write down comments. I compared their comments with my measurements and found good correlation between

them. For example, all panel members heard a definite change in the lower range when I asked them to press the earphones more tightly against their heads; comments such as "richer" and "fuller" were made. Before doing this, with the earphones in a normal condition and no extra pressure applied, the comments about the perceived bass quality were "good, but not tight," "diminished," and "reduced, compared to the mid-

range." Panel members commented that the sound of the JVC HA-D990s was "natural" and "forward," which also correlates well with my measurements. JVC has designed the HA-D990 earphones to have a diffuse-field response, and it matches the diffuse-field equalization of the B & K measuring system more closely than any other earphones that I have ever measured. The Stax SR-Lambda Pro Earspeakers, which I use as reference, show a dip at 2.8 kHz when measured with the B & K system's diffuse-field response



**Fig. 1—Cosine-pulse test.**

(see the April 1991 issue), and the listening panel all commented that the HA-D990s sounded brighter and more forward than the reference earphones. One panel member, who is an expert on binaural sound recordings, remarked that the HA-D990s had "very good binaural localization."

The response of the HA-D990s extends flat up to about 12 kHz; above this frequency the roll-off is very gentle, with the output at 18 kHz being down about 10 dB. Comments on the treble range, such as

"less than the reference earphones," indicated this also.

Figure 1 shows the output of the HA-D990s for a 20-kHz cosine input. The input pulse is seen at the top, and the output from the earphones below. After the input has stopped, the output shows a touch of "ringing" caused by diminished output above 12 kHz and the phase shift that accompanies it. It also shows that the HA-D990 earphones produce a positive acoustical output for a positive electrical input but with the appearance of a sine wave. This corresponds to the phase shift that I

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INEFFICIENT TO USE  
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measured, about 90° from 3 to 20 kHz, and may correlate with comments that the articulation of voices was not as clear as with the reference Stax SR-Lambdas. The panel members also commented that the difference in sound when absolute polarity was switched back and forth was easier to hear with the reference earphones.

The HA-D990's 65-ohm impedance makes these earphones louder than earphones that have higher impedance; this is apparent when you switch back and forth between the JVCs and these other models. The headphone outputs on most portable CD players and cassette machines have a low voltage swing, so if you have been looking for audiophile-quality earphones to use with them, the HA-D990s are just the ticket. They can produce very high sound levels with relatively little input power, and their load impedance is still high enough that the output impedance of most sources will have very little effect on the shape of their frequency response.

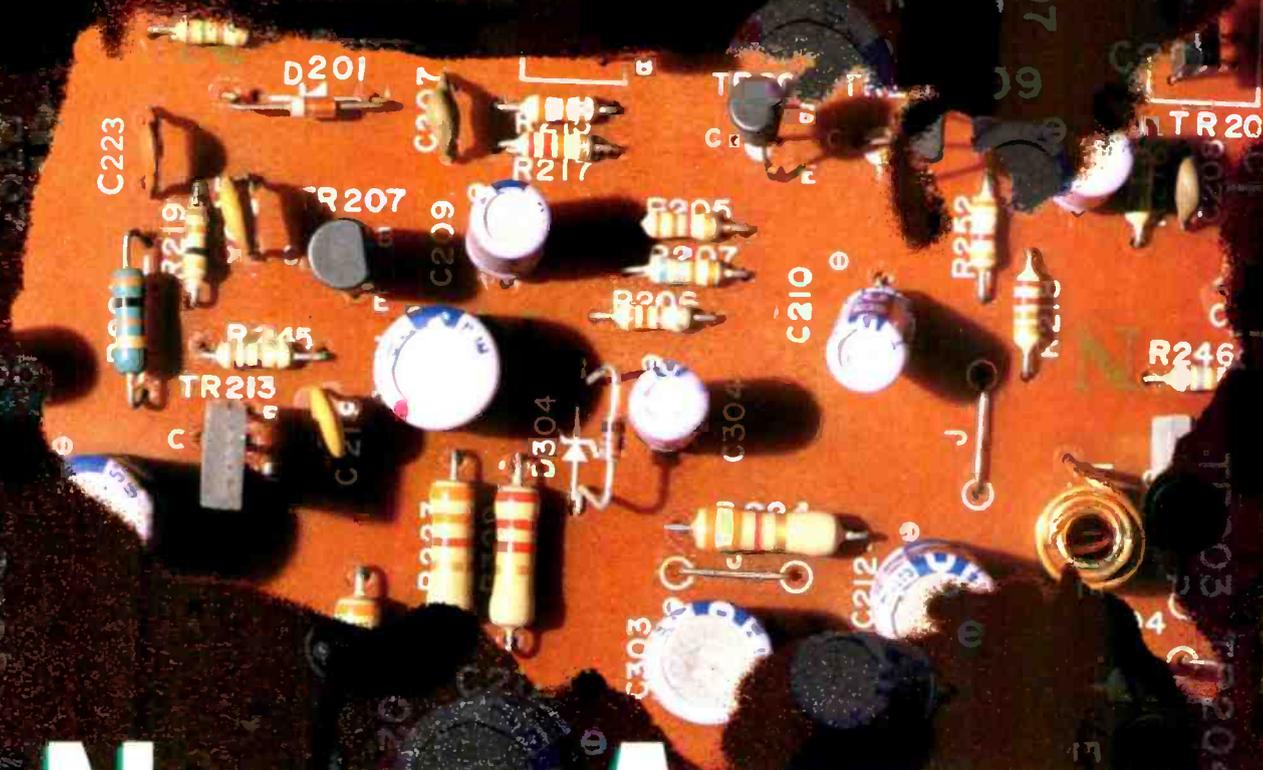
The listening panel gave the HA-D990 earphones an overall rating of "very good" for sound quality. I found them to be better than some earphones that cost two or three times as much. I have done a lot of listening to them and have grown to like them very well. For the price, they are a very good value.

*Edward M. Long*

ADVERTISING SUPPLEMENT

# ELECTRONICS IN

# NORTH AMERICA





ELECTRONICS IN  
NORTH AMERICA

**T**he electrical reproduction of sound is not quite a century old, yet in that fragment of time, we have advanced from the electromechanical creations of Bell and Edison to the electro-optical wizardry of digital audio.

In America, where it all began, the belief that a better way always exists was the high-octane fuel that fed the engine of technical progress. That engine has pushed and pulled the hi-fi industry down a long and often twisting

road in search of accuracy and realism.

While the loudspeaker industry was busy searching for new and better methods of converting electrical energy back into sound, the electronics industry was deeply involved in the pursuit of the best methods, devices, and circuit topologies to produce that electrical energy in the first place.

This is the chronicle of some of those whose passion for sound put them on the pathway to innovation in pursuit of those goals.

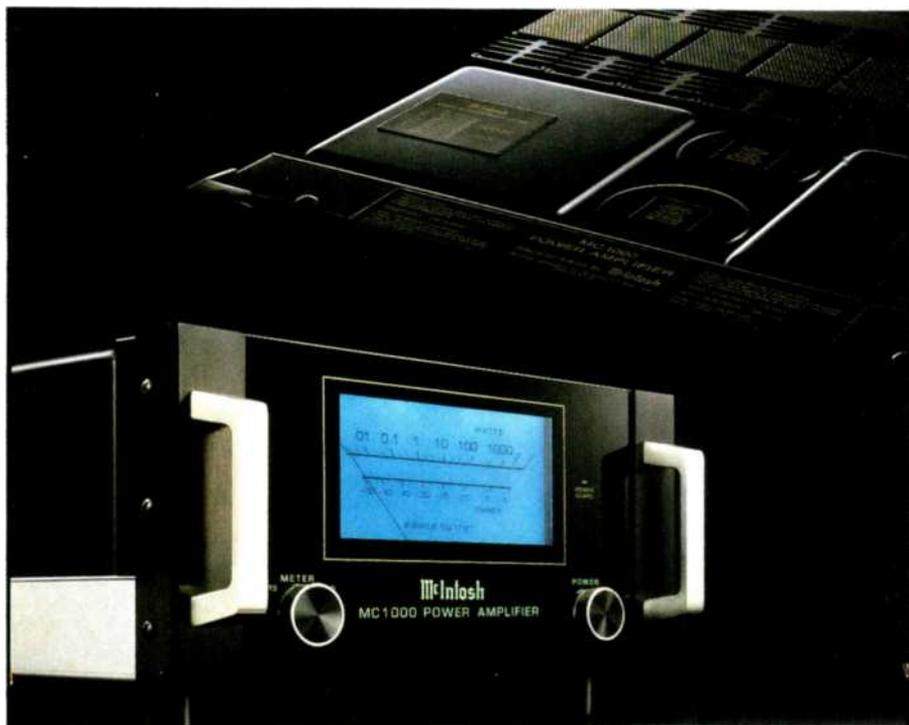
## McIntosh®

One of the most recognized U.S. high-end electronics brand names the world over is McIntosh. In fact, most serious audiophiles would agree that the whole concept of ultra-high-performance audio electronics was essentially invented by Frank McIntosh in his relentless pursuit of perfection.

In 1946, with the post-World War II electronics boom in full swing, Frank H. McIntosh, who had done considerable work on power amplifiers during the war for the Army, was deep into a personal research project aimed at producing a better-quality audio amplifier. Driven by the conviction that measured performance and real-world sonic quality were not mutually exclusive, McIntosh channeled his R&D effort toward producing a power amplifier that would have both. In 1947, he organized his efforts under the Scientific Laboratories name, with 1,600 square feet of offices in Silver Springs, MD.

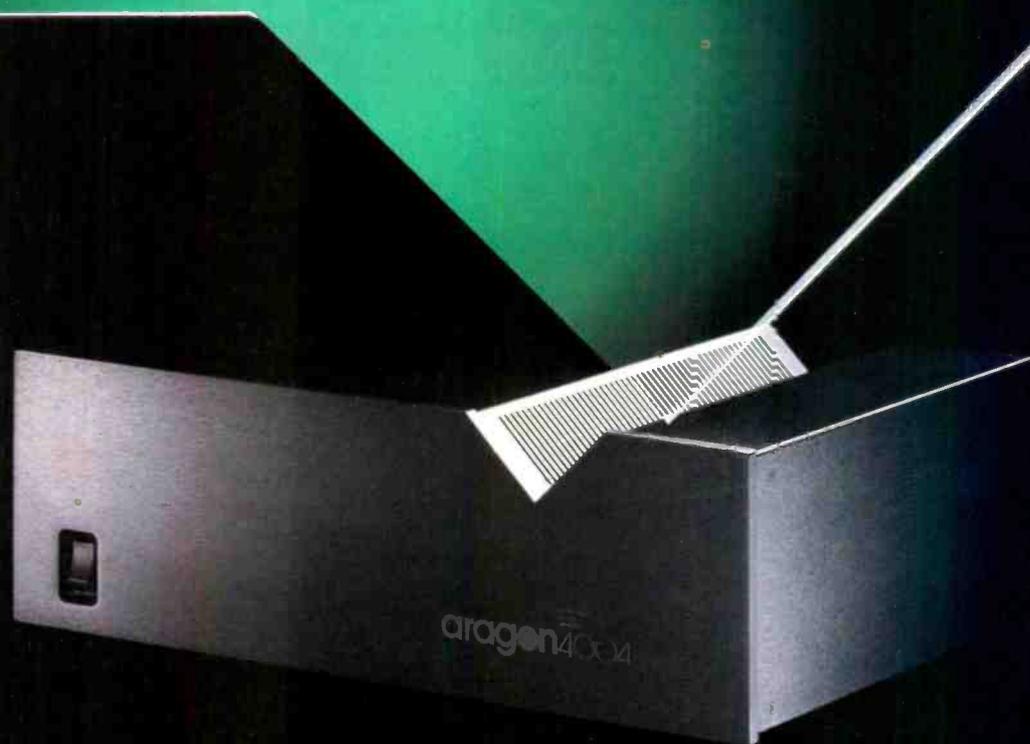
Two years later, the unity coupled circuit designs, which achieved the required low distortion and high power, were complete, and Frank McIntosh organized the designs into the symmetrically driven, balanced output stage, improved upon but still found in the company's products today.

The unity coupled model 50W-1, introduced in 1949, produced 50 watts at less than 1% distortion over the 20 Hz to 20 kHz band. No other amplifier on the market at the time even came close to meeting that performance level. In fact, the design was so unique that five patents were applied for, and the first was granted that same year to the renamed McIntosh Engineering Laboratories. Since then, more than 34 additional



# aragon amplifiers

the beast within the beauty



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

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

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

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## ELECTRONICS IN NORTH AMERICA

patents on fundamental improvements to audio design have been granted to the company.

In 1951, the company moved to the city that was to become its permanent home, Binghamton, NY. By 1957, the constant growth permitted the company, now called simply McIntosh Laboratory Inc., to construct its facilities at 2 Chambers Street. Today these facilities occupy more than 100,000 square feet and shelter more than 200 employees.

Fiercely independent, McIntosh the man and McIntosh the company have always done things their way. The pride in producing not just a high-quality product but the best possible product has always been an integral part of everything that comes from Binghamton.

Much in the style of Rolls-Royce, McIntosh products are still manufactured in the same slow, careful way, with individual craftspeople who take the time needed to do the job the McIntosh way. If the company cannot find a component built to its exacting standards, it will produce it in-house, refusing to bend the rules of quality and the almost half-century of tradition found in every "Mac."

Ron W. Fone, McIntosh's president, says, "We know that the only thing that really matters is a satisfied customer, given that we build our products to last for a lifetime."

The McIntosh legend is today a part of Clarion Shoji Ltd., which acquired the company in 1990. The new ownership has brought with it a renewed desire to refine the McIntosh legend and maintain the distinctive culture so carefully established over the last 40+ years.

A few new machines have been added to the production process, including a unique, high-pressure water-jet glass-cutting/engraving system to produce the classic Mac glass-front plates.

However, Fone says, "None of the machines we have added, or the changes we have implemented, will in any way affect the uniqueness of a product proudly hand-built in Binghamton, NY, by a dedicated American workforce process that made McIntosh what it is."

Now in its 43rd year, McIntosh has

added 12 new products to the legend in 1992, including the MC 1000, the company's first ultra-high-power amplifier with a peak current rating of 160 amperes and more than 6,000 watts of power reserve.

In addition to the MC 1000, the company has also recently premiered the limited-production (hand-built to order) XR 290 loudspeaker system, which uses 40 separate drivers arranged in three separate parallel

columns and an expanded series of pre-amplifiers, CD players, tuners, multichannel amplifiers and control centers to meet the demands of its home-theater and audiophile customers.

As for the future, Fone notes that, "as a part of the ongoing product and company development process, we intend to build on our strengths and keep the legend of McIntosh at its full potential."

## audio research

The mid-1960s were a time of great change in the U.S. hi-fi industry. During those years, a great deal of creativity and energy was poured into the search for accurate musical reproduction, and many of the names that are legend today were established. William Z. Johnson was one of those whose conviction and passion put him at the forefront of that movement.

Johnson, who started designing custom electronics in the 1950s and operated a specialty audio store well into the 1960s, was dissatisfied with the solid-state amplifier and pre-amplifier designs coming to market. The products lacked musicality and definition, he thought.

He believed that if a product was designed for music and not just to generate numbers or to meet a price, the realism and depth associated with live music could be re-created. With that single goal in mind, he founded what became Audio Research in 1969, and he almost single-handedly revived vacuum-tube designs during the early 1970s.

Bucking the industry trend toward smaller, lighter, and cheaper solid-state implementations, Johnson put the music first and deliberately avoided the debate that ensued. He stated the Audio Research philosophy quite simply: "Use the best gain device (regardless of type) for the circuit application." The choice

between tubes and semiconductors is made depending on the application. "We use tubes in our products where they can make the most telling and directly audible contribution to musicality. We use semiconductors where their inherent low noise and operating stability give the user the greatest advantage."

As one of the oldest continually operating (more than 23 years) concerns in American consumer audio, Audio Research has contributed many products that are now considered benchmarks. With the singular focus Johnson placed on designs that emphasize balance and life-like dynamics, Audio Research has slowly and carefully expanded its product line, avoiding riding the industry bandwagon or jumping in on any momentary technological flash.

This measured progress is a result, in part, of the prodigious amount of time devoted to extensive listening tests for each design, from early prototypes to every finished unit. Michael Harvey, U.S. Sales and Marketing Director, noted that this no-compromise approach has been





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For over 20 years, professional audio engineers have relied on the superb quality and control of Lexicon Digital Effects Processors. So much so that today, over 80% of the most successful productions—music *and* movies—are processed with a Lexicon.

Unlike other processors, The Lexicon CP-1<sup>Plus</sup> CP-2 and CP-3 Digital Surround Processors don't compromise music performance for film sound. (The original CP-1 can now be upgraded to be a CP-1<sup>Plus</sup> by your dealer in a matter of minutes.)

The highly acclaimed CP-1 was Lexicon's first home audio product. Its spectacular performance with both music and film sound prompted critics to hail it as one of the *most important advances in audio history*.

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The top-of-the-line CP-3 is the standard to which all other home theater processors are compared. No other product can enhance the musical experience and film sound reproduction as completely and comprehensively.

In a few short years, Lexicon's processors have won virtually every major award in the audio and video industries. Their unrivaled performance comes from the same digital signal processing that is used on nearly every professional recording made today.

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## ELECTRONICS IN NORTH AMERICA

further expanded with the company's recent move into its new 62,000-square-foot facility.

"Because listening is so integral to our philosophy, we made sure that our new space not only improved the manufacturing environment, but that it also allowed our 60+ technicians and support staff to have all the evaluation space they need to properly quality-assure each unit we build."

The pure American craftsman, hand-built approach taken with every product includes 100% screening of every active component used, plus a process of multilayer inspection, burn-in, re-inspection, and sonic evaluation. The company believes that it should also go to great lengths to ensure the long-term value of its

## MONDIAL

When Anthony Federici was 18 years old, he spent the summer traveling in Europe after completing his term at school in England. During that trip, he went to Modena, Italy, to try and visit the Ferrari factory without an appointment. Knowing that Enzo Ferrari owned the restaurant across the street from the facility, he went in to find out how to get a tour.

Sitting there was the master himself.

He, to Federici's complete surprise, let him sit down and chatted briefly with the young American, smiled, nodded, and said to one of his associates, "Show him everything."

That experience, says Federici, "had a major influence on how I view manufacturing, and why I view what we do at Mondial as art as much as it is industrial design. Being able to watch the master craftsmen at Ferrari turn out the little jewel-like valves, seeing how they X-rayed each car before delivering it, and being able to stand and observe how each engine was tested and fine-tuned over many hours to produce the unique Ferrari sound and performance, I received a perspective on quality and precision that is reflected in every product we make today."

Many years later, when Federici was working retail audio sales to gain a further understanding of the business and to balance his passion

products. In this regard, Audio Research has two unique operating practices: First, any product ever produced can still be serviced by the factory; second, in many cases, the older products can be upgraded in performance at a relatively nominal cost.

By assuring that the customers' purchases will have real residual value, Audio Research adheres to a core U.S. hi-fi industry maxim: "Build the best, build it to last, make sure it does." For example, a number of older arc products sell for as much used as they cost new.

The current product line is divided into three categories: designs that use only vacuum tubes, hybrid designs that mix semiconductors and vacuum tubes, and designs based only on semiconductors. Each family offers the user the most advanced implementation of Bill Johnson's founding principal that "the music comes first."

For 1993, the company plans three significant product introductions. The



first, the D-200, which is priced at about \$2,000 and offers 100 watts per channel, will expand the solid-state amplifier line. At the other end of the scale are two new all-tube units: the Reference 1, a 100 watt, monaural, ultra-high-end amplifier offered at approximately \$7,500, and the fully balanced Reference 2, a line-stage pre-amplifier that costs approximately \$9,000 and will offer the audiophile community a new level of maximum-performance systems.



From this experience was born Acurus, a line of American-made, American-designed components that bring high-end performance to a wider market.

With four products—the A-250 amplifier, the L-10 pre-amplifier, the P-10 phono pre-amplifier, and the revolutionary DIA 100 Direct Input Amplifier—the Acurus family has rapidly become a highly respected, accurately engineered remedy for high price tags.

An example is the unique capabilities of the DIA 100, which permit high-level sources such as CD players, tape units, and tuners to be directly connected to the power amplifier through an integral passive control section. As Federici explains, "This approach truly simplifies the signal path and, so, dramatically reduces the cost of extraordinary performance."

By carefully examining each area of design, manufacturing, parts sourcing and, of course, sonic performance, the Mondial team was able to create, with Acurus, a family of circuit topologies and packaging that permitted such ideas as the DIA 100 and other significant cost reductions, yet maintained a performance level closer to that of components at three and four times the price.

Employing completely symmetrical circuit implementations, dual mono dc operation, a single silver contact switch in the pre-amp audio path, and many of the design achievements from the Aragon products, Acurus has, in the words of one reviewer, "created a sound that must be heard to be believed. Fabulous (all-American) quality for the price of an imported mid-fi."

A B A L A N C E D      A P P R O A C H

*Limited*

Since its first product, music has been the measure of performance at Acoustic Research. Introducing AR Limited, a system of audio components that continues that tradition. Built to be listened through, not listened to, AR Limited is the work of some of the best minds in audio. The technology employed keeps these components from implying their own presence. You hear music, not hardware. This musical integrity is delivered by a symmetrical, fully balanced architecture and hand-crafted construction. In keeping with the AR tradition of innovation and value, the AR Limited components are worth more than they cost. A balanced approach to high end audio.

AR Limited is available only from a small, select group of audio retailers. Please call us for the name of one near you. AR Limited won't be everywhere, but, if you care about music, it should be in your home.



*Loudspeaker. A Symmetrical Radiation Array creates a virtual point source.*

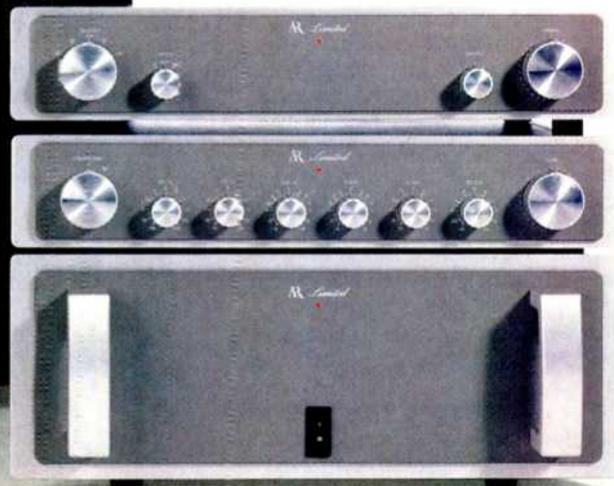
*Preamplifier. High-current buffer technology, true balanced operation. Custom made 4-section, 58-step precision attenuator.*

*Spectral Equalizer. Six carefully chosen turnover points allow accurate compensation for errors in mastering and recording.*

*Amplifier. Class A to 20 Watts, high-bias Class AB beyond that point. Balanced and unbalanced inputs.*



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## ELECTRONICS IN NORTH AMERICA

for high-end equipment, he discovered a second major theme that would guide the company. "Anyone can produce ultra-high-quality equipment when price is not a part of the business equation. My goal was to create a company that could do three things: produce equipment of the highest quality, measured on a world scale; offer the best value possible, as compared to any product at the same cost; and ensure that the look and feel of our products creates a total experience, on both the tactile and aural levels, that is clearly first-class."

Since Mondial was founded in 1986 by Federici and Paul Rosenberg, the company's products have experienced the rapid growth and world-wide acceptance that are testament to the clarity of their vision and to the technical skills of the team they assembled to realize that vision.

Working with their engineering team and artist Robbii, Federici and Rosenberg have successfully developed two separate lines of U.S.-designed, proudly hand-crafted in America, high-end audio products that have set new standards for the value-to-quality equation worldwide. In fact, more than 30% of the sales for the Aragon and Acurus products are outside the United States.

In their persistent pursuit of quality, the partners and their engineering team have taken what might be viewed as an old-fashioned approach to component parts selection. "Some people may believe that you can start with low-grade parts and, using some mystical ritual, create high-quality products," Federici says. "I have never seen that happen, not in audio or, for that matter, in any other area."

Going back to basic American values, and working from the premise that, to produce world-class quality, you must begin with the best possible ingredients, Mondial uses only parts that can meet or exceed the technical requirements. They go further, however, and choose to employ parts that also have a certain feel and style.

For example, only epoxy-dipped resistors are used. These components are completely sealed, and their performance will remain identical in Los Angeles, Bangkok, or London.



Since its introduction, the Aragon line has consistently received best in performance and sound ratings from critics around the world. Aragon has created a real stir within the high-end community because of superb sound quality and real-world, relatively modest pricing.

Hundreds of comments, such as, "The biggest bargain in high-end audio," have made the products the choice of dozens of other manufacturers in their own R&D programs, including major record companies, loudspeaker manufacturers, and high-end cable and interconnect producers.

These companies choose these products not because of their cost, but simply because of their performance. Manufactured by contractors who also produce medical and military electronics, the Aragon products are the only high-end electronics that meet full military standards for quality, performance, and reliability.

Even though duty and transportation costs in some cases double their price, the Aragon family is rapidly becoming the choice of audiophiles around the world because they represent the very best that America can produce. Even when compared to products that are locally made or imported, which often cost many times more, reviewer after reviewer was hard-pressed to find any equal to the Aragon products.

The current line consists of two essentially identical power amplifiers (which differ only in the output capabilities), a pre-amp, a D/A converter and a tuner.

A showcase for the unique design of Robbii, the 2004 and 4004 power amplifiers provide dual monoblock configurations, massive power supplies, power transistors that are individually matched to more than 30 separate parameters, and gold-plated connectors from Tiffany.

The new 18K pre-amp, with its dual mono configuration, isolated power supply and discrete, fully Class A operation, is clearly in the tradition of its predecessor, the 24K. The D2A D/A converter and 4T2 tuner provide performance standards on a par with the best available.

Aragon has raised the stakes in high-end audio. In the finest American tradition, Mondial found a better way to produce a better product and showcase for the world the excellence of American workmanship, design, and sonic purity.

That level of performance and quality, a product of the experience Federici and Rosenberg gained during the Aragon product-development project, have also been brought down to a price point that would be directly competitive with any mid-level foreign or domestic product.

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

Leonard Feldman, Audio

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MODELS SHOWN ARE THE A400, P100, AND T100

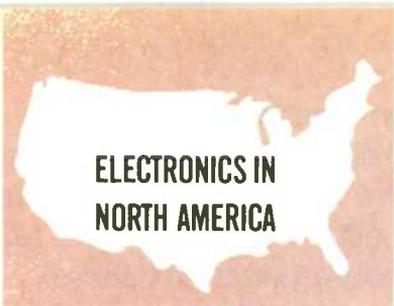
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The volume controls are made in England by Penny & Giles, a company known for supplying parts to the makers of six-figure recording consoles. Each unit is made from conductive plastic, not carbon. Each unit is serial-numbered and hand-tuned, and all use double gold

wipers for extreme reliability and totally transparent operation.

"It's not that we couldn't use a good part from someone else," Federici notes. "It's just that the feel and operation of these units is so smooth and effortless. Even more important, the use of such tight-tolerance parts guarantees the purchaser unit-to-unit consistency in all of the Mondial products. It is also an integral part of our promise to the customer that when they buy our components, they will get what they paid for."

It is this dedication to American values, coupled with a real-world value philosophy, that garnered Mondial a 1992 Hi Fi Grand Prix in Asia, along with awards for design and engineering from the Consumer Electronics Show in 1987 and 1988.

It is also what led the Smithsonian Institution in Washington, DC, to choose Mondial products (a complete Aragon system) to reproduce the sound of their musical-instrument collection through a pair of ultra-high-end, American-made Apogee dipole loudspeaker systems.

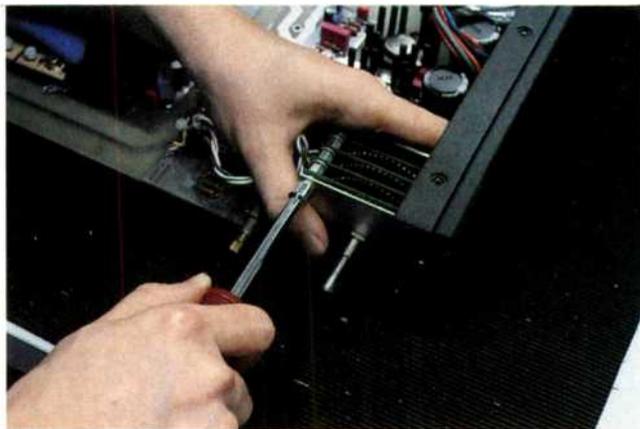


**"LIMITED"  
COMPONENTS**

Acoustic Research, incorporated in Cambridge, MA, in 1954 and now a independant division of International Jensen Inc., is one of the original "founding fathers" of the American hi-fi industry.

AR's contributions to the history and development of the American loudspeaker and electronics industries are now the stuff of which legends are made. Those contributions began with the AR1, the world's first acoustic-suspension, hi-fi loudspeaker system, and continued with the AR3, which featured the world's first dome mid-range and high-frequency drivers. AR was also the first to develop high current amplification, and the first to use liquid-cooled drivers. There have been dozens of other significant contributions to the science of sound reproduction from Acoustic Research, which has always been a company that is not afraid to pioneer and is driven by a simple goal: "performance beyond price."

The AR "Limited" series of components and loudspeakers are the continuation of almost four decades of American design leadership and innovation. By forging a truly unique partnership of the best minds and ideas in American high-end audio, the Limited team has been able to bring a powerful combination of engineering, acoustics, and design to the process of producing world-class products that offer the distinctive combination of unrivaled sonic performance, real value, and guaranteed longevity supported by an unmatched warranty.



**AudioControl**®



AudioControl is the world's leading manufacturer of high quality equalizers and spectrum analyzers.

We are the best because we *specialize* in forming a perfect match between stereo components and listening rooms. We are the best because of our pro sound heritage, passion for musical pleasure, quest for the highest possible quality, and adherence to our principles for the last 14 years. Built in the USA. Five year warranty.

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**ELECTRONICS IN  
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As a ground-breaking part of that warranty program, any Limited component returned for service or maintenance will automatically be checked, adjusted and fine-tuned to within  $\pm 1$  dB of the original specifications before being returned to its owner.

A team of high-end specialists, headed by David Day, Director of Engineering at Acoustic Research and co-designer of the world-standard Day-Sequiera FM tuner (which his firm, Davidson-Roth, manufactures), set out to design a group of exclusive high-performance products. Those products would be hand-built in the United States and would offer the kind of sonic performance associated with that small group of the very best high-end audio products.

The project started with a clean sheet of paper and examined every aspect of design, manufacturing, parts selection and evaluation, and electrical performance. Their objective was to set new benchmarks for flexibility, audio transparency, and compatibility.

For example, to maximize flexibility, each Limited electronic component can operate either balanced or unbalanced. Extensive testing has also ensured that they can be safely matched with almost every other component made by anyone.

With regard to audio transparency, the amplifier and associated control electronics of the Limited series truly return exactly the signals delivered. Any changes are solely at the discretion of the user.

To achieve this level of performance, each unit is subject to a testing and quality-assurance program of military toughness. After the hand-crafted manufacturing process is completed, the product must pass through a complex battery of tests designed to measure all aspects of audio performance. Once that rigorous procedure is complete, the units are put into a torture rack, where they are subjected to a lengthy "burn-in" period. Once that test is complete, all previous measurements are re-verified.

Of course, all of this care takes time, and that is why the Limited products will only be available in

small quantities through a very carefully selected network of specialist dealers and distributors. Chosen for their depth of knowledge, their service and technical capabilities, and, most important, their love of music, this network is bringing to the world the pride of all-American design and the unique characteristics embodied in the first Limited.

Unique to the line are a Spectral Equalizer system, which will allow the

user to shape and correct frequency balance errors that may have occurred in the mixing and mastering processes; a 200 watt per channel power amplifier, which will operate in Class A mode for its first 20 watts of power output, and then in a high-bias Class AB mode up to its maximum output; a pre-amplifier and a reference-quality loudspeaker system that employs proprietary Acoustic Research drivers.

*The  
Mod Squad*

It is the mid-1970s.

College student Steve McCormack sits down to build a Dynakit amp and pre-amp. His only goal: better musical reproduction than he has had.

Joyce Fleming, a managing editor of *Psychology Today*, leaves the corporate magazine world to form an editorial services company. Her goals: independence and exploration of the American dream.

Operating a successful audio company was far from the minds of these partners, who joined forces in 1982 to form the Mod Squad.

Fleming refined her business and marketing skills.

The birth of the Mod Squad in 1982 resulted from McCormack's and Fleming's conviction that there was a market for customizing the performance of other companies' products (hence the name), from their firm belief in the American dream, and from their classic American willingness to risk everything to be independent and follow that dream. Two years later, in 1984, came the product that firmly established the company as a name in high-end audio. That year they introduced



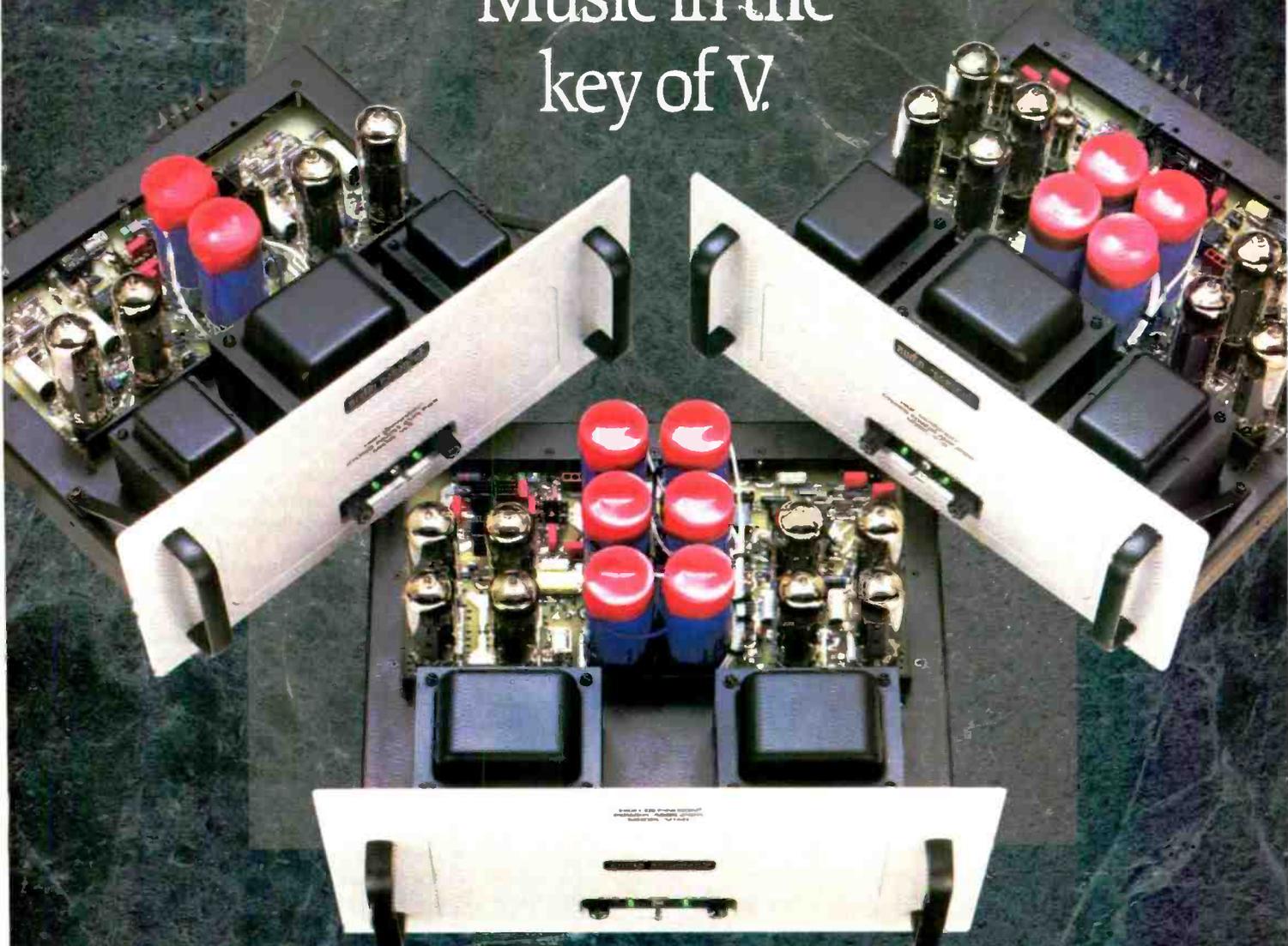
These two entrepreneurs followed very different routes until their professional paths crossed in 1980, when both were employed by a high-end Canadian manufacturer. Throughout the late 1970s, McCormack worked in audio retail. He developed his tendency to tinker by modifying high-end components—upgrading a part here, bypassing a capacitor there—always in search of more natural musicality. Meanwhile,

Tiptoes, the sophisticated aluminum cones that spawned all of the "spiking" feet now pervasive in the industry.

A bit later, in 1985, the company originated yet another new industry category with the introduction of its Line Drive, a passive, line-level pre-amplifier specifically designed for CD-based music systems.

Now, almost a decade and one million Tiptoes later, with a Hi-Fi

# Music in the key of V.



The world's great music has never sounded better than when played through an Audio Research Classic series amplifier – until now. Because the new "V" series hybrid power amplifiers raise your favorite music to a harmonious new pitch. With greater powers of resolution, focus and dynamic expression than ever before.

With three new models – the V35 and V70 stereo, and V140 monoblocks – the "V" series allows you to match this exciting new level of performance to the level of power you actually need. Each model sounds as wonderful as the next, within its respective power range. So you don't have to sacrifice sonic quality or spend more than you need to.

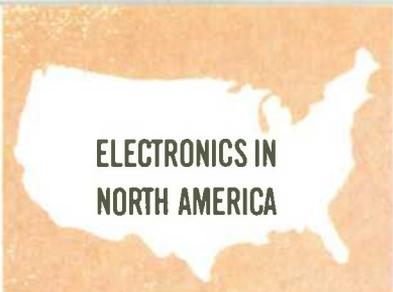
The "V" amplifiers employ a fully balanced circuit topology, input-to-output to reduce extraneous noise and improve dynamic contrasts. A patented D E C. circuit and advanced coaxial capacitors also help reduce distortion through the critical midband frequencies. At startup and shutdown, sophisticated new circuits ease the "V" amplifiers into and out of their normal triode operating mode while the V70 and V140 models also have fan cooling to help extend tube life.

Music in the key of "V" isn't for everyone. But if music is more than sonic wallpaper in your life, then you really deserve to hear what the "V" series amplifiers are all about.

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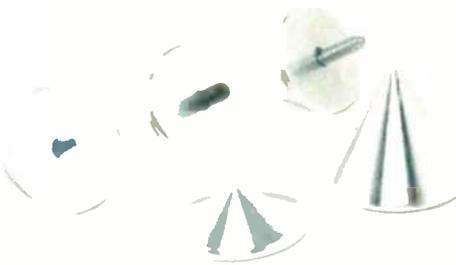


## ELECTRONICS IN NORTH AMERICA

Grand Prix for Accessories award and a U.S. patent under their belt, the partners have left the modification business (discontinued in 1988) to pursue manufacturing exclusively. They employ 20 people at their facilities in Leucadia, CA, and export slightly more than 40% of their production to 23 foreign countries.

The current product line, designed by and named for McCormack, revolves around one core concept: Design by ear and build by hand. McCormack developed this concept during more than 20 years of experimentation with creating musicality in the real world. It is something just not found in any engineering textbook.

McCormack says, "It came about simply because, the more modifications I did, the more convinced I became that, with careful experimentation and extensive listening, I



could build components that have natural musicality, the sense of hearing things through a system that I had not heard before. Not just detail, not just depth, but the complete message created by the musicians."

For McCormack, designing by ear means it is not possible to design high-end components by meeting a set of electrical specifications. When you design only by the numbers, he says, "you end up with performance that is unsatisfying and often not very musical. Only by listening extensively to a product during its development can you make the hundreds of necessary decisions without losing the focus on the real goal: recreating the music.

"However, once a design is completed, there are still an infinite

number of ways to actually realize the product. Each choice may only have a small impact on the final outcome, but they add up and can seriously flaw even the best circuit topologies.

"Building by hand makes all of the options available because it eliminates the often severe limitations imposed by the requirements and rigors of a machine-driven production line. The opportunity to use sonically superior parts not designed for automated assembly, combined with the internally motivated care of perfectionist craftspeople (which no robot can ever contribute), are the elements that combine to produce each McCormack unit."

"We insist on hand-built products because that is the only way we can assure our customers of sonic superiority and the best reliability," Fleming explains. "Our technicians take pride in themselves each time their work passes our extremely rigorous quality-control procedures. The continual stream of communication from our satisfied customers the world over are all the proof we need that this system is working."

## Soundcraftsmen

The story of Soundcraftsmen is, at its heart, the tale of a partnership. Two very different people joined together to create one of America's most innovative and forward-looking electronics providers.

The original company was started in 1961 by Californian Ralph Yeomans. The small local company became a national entity in 1968 when Paul Rolfes, an engineer with multiple patents in the field of high-speed amplification technology, joined with Yeomans to design the first Soundcraftsmen equalizer. That product, which was patented in 1971, launched a family of novel and creative products that combined Rolfes' engineering skills with Yeomans' marketing and advertising abilities.

The company brought to market what has been generally accepted as the first 10-octave graphic equalizer whose performance characteristics made it compatible with all existing hi-fi equipment. By merging a number of innovative circuit designs with an easy-to-understand user interface, that unit opened the door to real electronic system control and

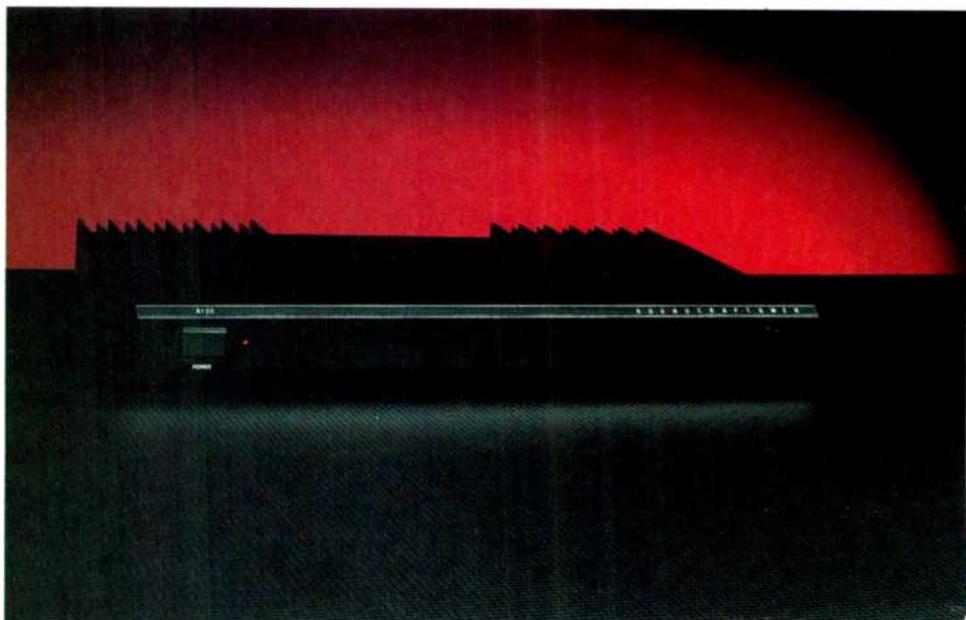
equalization for a large number of users.

Shortly thereafter, Soundcraftsmen introduced the first combination pre-amplifier/10-octave equalizer. That unique product set standards for control, flexibility, and performance far ahead of anything else available at the time. It also showcased what was to become the legendary sonic

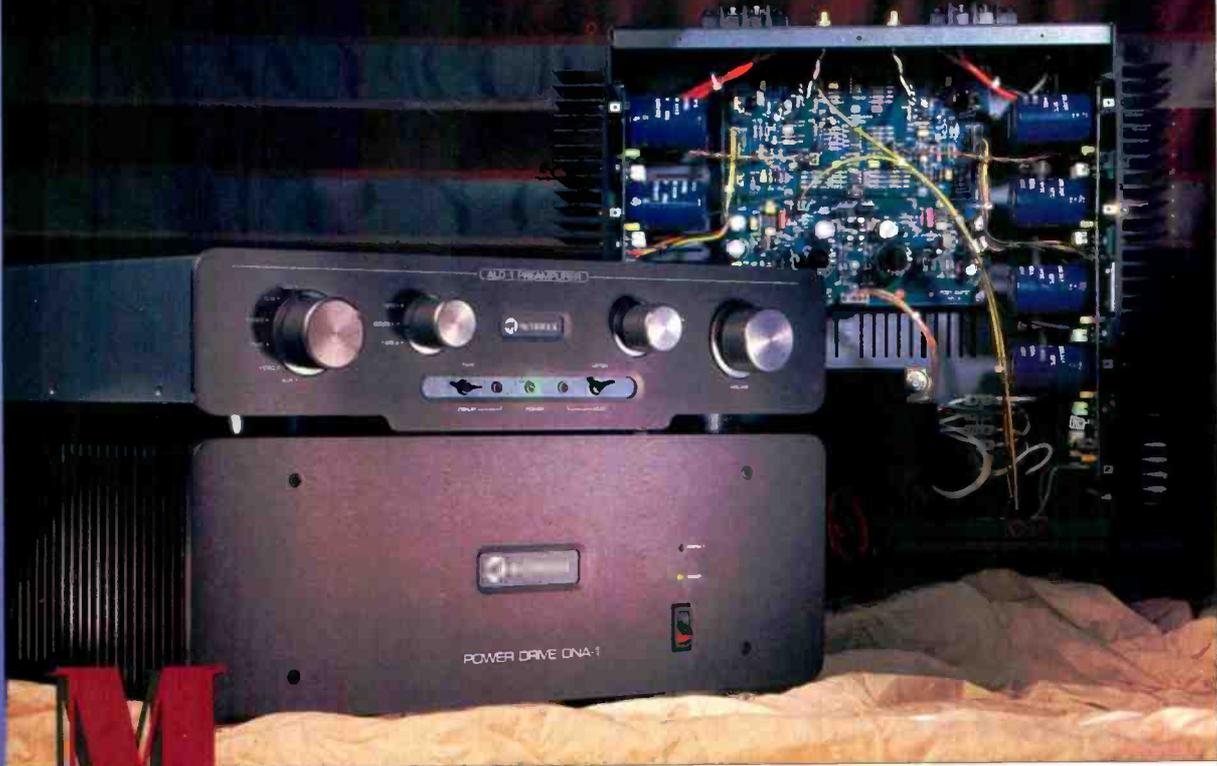
performance capabilities of the whole Soundcraftsmen family.

The equalizers were soon finding their way into professional applications, and the company expanded its product line to include units specifically tailored for that purpose.

Applying its blend of American innovation and engineering to the design of power supplies, which are



Photographs by Albert Porter



**M**

*made in America, McCormack components are respected around the world for their rich musicality, the ultimate luxury in audio products.*

Coveted awards from France and Japan, and admiring reviews from 44 publications in 18 countries prove their universal appeal. Steve McCormack's remarkable designs – compact disc players, preamplifiers and amplifiers – deliver the emotional experience of live music at affordable prices. When you want unsurpassed musicality and true value, buy the best – buy McCormack.



JAPAN – "The Signature CD Player is very focused, very musical. It gives the correct presentation for all types of music from classical to jazz."  
– STEREOSOUND



ITALY – "The McCormack system (Phono Drive, Line Drive and Power Drive) is a true, wonderful revelation... authoritative and sweet, vigorous and graceful, delicate. All these qualities are present in a superb soundstage."  
– STEREO



TAIWAN – "Steven McCormack creates a living musical life through his Power Drive amplifier."  
– MUSIC & MUSICIANS MONTHLY



FRANCE – "This McCormack Signature is today the best CD player that we have heard. It delivers the richest resolution and the most detail with complete consistency."  
– DIAPHRON HARMONIE



NORWAY – "The Deluxe Line Drive is a must for audiophiles... In combination with today's best CD players, it really proves itself worthy."  
– AUDIO

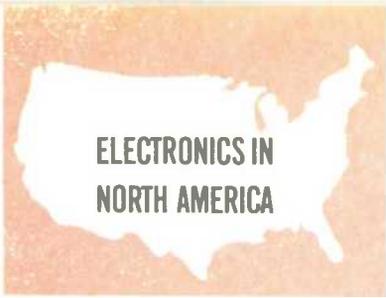


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## ELECTRONICS IN NORTH AMERICA

the heart and sole of all power amplifiers, Soundcraftsmen produced the first signal-tracking, multiple-rail-voltage (Class H) power supply; the first fully electronic, automatically resetting crowbar protection circuit; the first automatic, low-impedance power-supply selection circuit; and the first phase-control-regulation power supply.

The application of these innovations has allowed the company to produce a range of power amplifiers, used by professionals and consumers, that continually garner rave reviews from highly respected industry publications and consistently offer the consumer one of the best dollars-to-performance ratios available anywhere.

In January 1991, MTX and Loyd Ivey purchased Soundcraftsmen. Ivey, President/CEO of MTX, and an all-American audio pioneer in his own right, acquired Soundcraftsmen because it dovetailed so well with MTX. "It was a natural complement to the MTX product lines—an all-American car/home audio loud-speaker manufacturer combining talents with an all-American electronics manufacturer."

Since the acquisition, a great deal of design and engineering time has been invested in product refinement and new-product development. "As a result of this substantial investment," Ivey explained, "the future of MTX Soundcraftsmen has been forged with the development of two new lines of electronic components, for both the consumer and professional markets, with a strong focus on home audio entertainment systems.

"By building on the three decades of sonic leadership in performance and value, and working with Paul Rolfes, our goal was to retain the leading-edge technology and innovation while refining and improving a new highly contemporary styling package.

"The company devoted a great deal of time to speaking with the dealers to gain a detailed understanding of what they and their customers needed. The results of this effort are now available in the consumer products line, which features three power amplifiers, a

pre-amplifier, a tuner, and a CD player.

"The professional line now includes a pre-amplifier, a tuner and two graphic equalizers, which are all-rack mountable, along with seven power amplifiers that encompass the full range of power and feature combinations, all in the uniquely innovative style associated with the MTX Soundcraftsmen heritage."

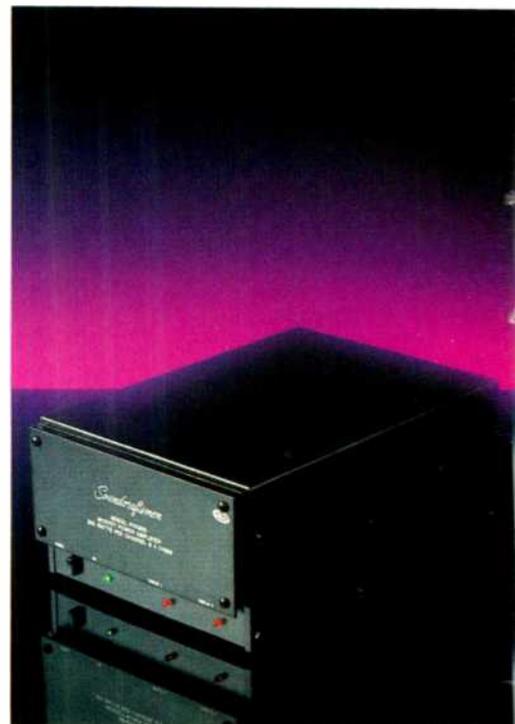
MTX Soundcraftsmen intends to keep its reputation as a company that produces quality first. "Our fundamental strategy is to refine retail placement for both the consumer and the professional lines," Ivey says. "This will ensure that the dealers and our customers receive the best possible products. In essence, we want to unquestionably guarantee that, in its fourth decade, MTX Soundcraftsmen will remain clear proof that quality design, creative engineering, strong partnerships, and world-class workmanship are alive and well in America."

## Lexicon

In 1971, Dr. Francis F. Lee, Professor of Electrical Engineering at the Massachusetts Institute of Technology (MIT), and Charles Bagnaschi, formerly Principal Engineer and Manager for Honeywell Information Systems' Advanced Hardware Research and Development Group, formed a company that was to forever change the face of professional and consumer audio.

That company was called Lexicon, and in that same year it introduced the Delta-T 101, which was the world's first true digital delay line for audio signals. American engineering expertise and ingenuity, coupled with the passion of Lee and Bagnaschi, produced a totally new product category that almost overnight changed the working methods of professional recording engineers and sound-system designers the world over.

Two years later, the company once again broke new ground with the Varispeech 1, the world's first digitally based pitch shift/time compression system. 1974 saw the birth of the Delta-T 102, which expanded the possibilities and also smashed through the 90 dB dynamic-range barrier for the first time.



In the late 1970s, Lexicon developed the model 93, which set the standard for digital delay and modulation effects processing as we know it today. Also developed in the late '70s was the model 224, the first widely accepted digital reverberation processor in the marketplace. In 1984, the company won a technical Emmy from the Academy of Motion Picture Arts and Sciences for its model 1200 Digital Time Compressor, another technological breakthrough in digital signal processing.

Four years later, in 1988, Lexicon introduced its first consumer audio product and once again completely changed the way digital audio processing was perceived, much as the company had done numerous times on the professional side of the fence. The CP-1 Digital Surround Processor offered the consumer a fully digital implementation of the Dolby Pro-Logic, along with unparalleled flexibility, control, and accuracy.

That ground-breaking product was soon followed by two other audio environmental processors, the CP-2 and the CP-3. The CP-2 brought the patented Lexicon concepts of Auto-Azimuth and the flexibility of DSP to a wider audience; the CP-3 introduced

First in a series

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The look and the design, the feel and 'sound' of the controls, the way the parts mesh together,

the strength and heft of its construction; all these McIntosh qualities are not mere adjuncts to superb sonic performance, they are essential to the definition of the highest quality. In fact, for more than 40 years, the design and construction of McIntosh products have set a standard of quality not only for audio components, but for the finest products of any kind.

**McIntosh**<sup>®</sup>  
Components of Excellence



## ELECTRONICS IN NORTH AMERICA

the world's first digital implementation of the LucasArts Home THX Cinema audio system decoding and processing. The CP-3, with its unique application of Lexicon's 20 years of professional digital audio experience, can also create for its user virtually any listening environment imaginable with startling realism and astounding depth.

Uniquely positioned in the professional and consumer portions of the industry, Lexicon is an integral part of the process that brings change to the world of digital audio. The consumers' demands for higher-quality source material for their systems are met by professionals who employ Lexicon's new generation of digital processing systems, which offer 20-bit audio.

These systems have set the world standard for time modification and digital audio conversion. The company's OPUS Digital Audio



Production and Editing systems are used every day in the broadcast, recording, and post-production industries. By adapting and using the technologies developed for the most demanding professional applications, Lexicon's consumer audio processors provide the user with edge-of-the-art performance that will not be rendered obsolete overnight.

Because the heart of the system is software, changes and enhancements can be added to the processor in the field. For example, Lexicon has just introduced a new processor, the CP-1 Plus, to replace the original CP-1. However, for owners of the CP-1, all of the same enhancements are available in the form of an upgrade kit.

By simply having the dealer or local distributor change a ROM (read-only memory) chip, purchasers can instantly bring their units to current standards of performance. This unique ability, inherent in the CP-series designs, is one of the biggest advantages of having fully digital, software-controlled processing systems. This concept of planned non-obsolescence, which has kept Lexicon in a position of industry leadership for more than two decades, is the key to the products and systems now in development. The future, as Lexicon sees it, will offer the consumer a digital audio environment with options and entertainment flexibility of truly amazing capabilities.

# AudioControl

The U.S. hi-fi industry has often been the beneficiary of technology and ideas that were originally created in other markets. The individuals and concepts that make the greatest contributions have

historically come from our own professional audio industry. In fact, a significant number of today's well-known consumer brands actually began as an outgrowth of our suppliers to the professional industry.

AudioControl, founded in 1977 by Greg Mackie and a team of creative engineers, who have also founded TAPCO and several companies since then, is one of those companies. The members of that group drew on their extensive experience with professional-audio product design and manufacturing to create a series of designs that allowed AudioControl to offer the market a line of affordable products with professional-grade performance and specifications.

The company, which is based in the Seattle area, quickly garnered an almost cult-like reputation and large numbers of extremely loyal customers and dealers through its uniquely humorous and non-conformist literature, advertising and owner's manuals.

Taking a page from the professional market's roots, AudioControl has contributed a number of innovations to the industry



**acurus**  
Accuracy from the U.S.



**“...this new Acurus stuff from Mondial must be heard to be believed – fabulous sound for the price of Japanese Mid-Fi.”**

*– Lewis Lipnick, Stereophile Magazine, August 1991, Volume 14 Number 8*

**“The sound of the amplifier is nothing short of astounding. With the Acurus preamplifier it becomes an impressive system.”**

*– The Inner Ear Report, Spring 1992, Volume 4 Number 4*

America has just eliminated any reason to buy a foreign made product from the brands listed below. Acurus is made in the U.S. by Mondial Designs Ltd., recipient of the 1992 Grand Prix Award from Asia. The Acurus A250 was reviewed in Germany at 314 watts per channel into 8 ohms/580 watts per channel into 4 ohms and placed in the same category as amplifiers selling for twice the price. If you want the best quality and value in audio components, do what the Europeans and Asians do...buy American...buy Acurus.

Adcom

Hafner

Luxman

Nakamichi

Pioneer

Sony

Denon

JVC

Marantz

Onkyo

Rotel

Technics

Harmon Kardon

Kenwood

NAD

Parasound

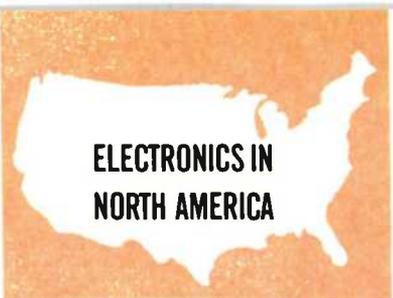
Sherwood

Yamaha

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**ELECTRONICS IN  
NORTH AMERICA**

over its 15+ years by religiously following a very simple principle: Offer combinations of features in one simple, easy-to-use unit that maximizes value and flexibility.

For example, the company's Richter Scale combines a 1/2-octave bass equalizer, a warble-tone test analyzer and a 24 dB/octave Linkwitz-Riley electronic crossover, providing everything a quality subwoofer system could need to perform at its maximum potential.

AudioControl was the first to incorporate a fully implemented 18 dB Chebyshev alignment subsonic filter into all of its designs, furnishing the user with maximum speaker protection and minimum intrusion into the low bass. The company also was the first to offer a home-use five-band equalizer optimized for two-way loudspeaker designs (the model 520); the first to gang left and right EQ channels together to help track and maintain the stereo image and channel alignment; and the first to produce a combination single-octave equalizer and real-time audio analyzer (the C-101), which is still in production and remains a very popular product in automotive and home audio applications because of its combination of professional-quality filters, ease of use, and made-in-America value.

AudioControl also introduced the industry to the concept of digital bass restoration with its patented Phase

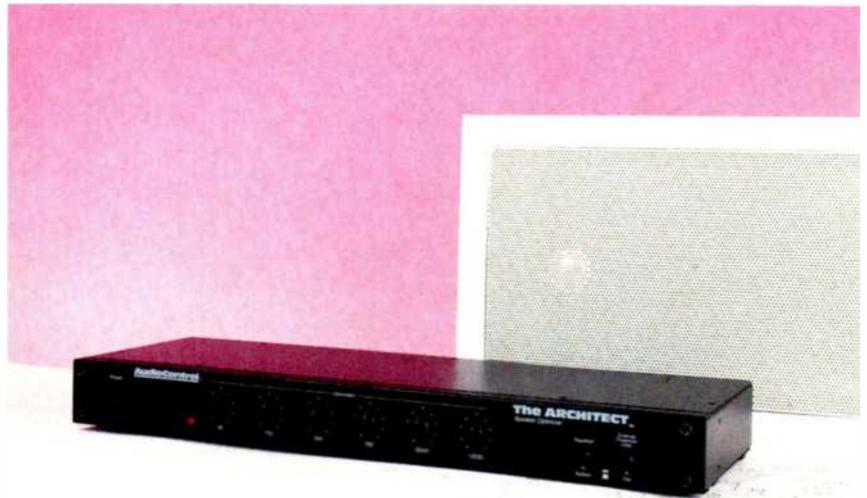
Coupled Activator products. Using a proprietary technology, the PCA recovers lost bass fundamentals from older recordings, from newer recordings that employ a low-bass cutoff filter because they were mixed for mass-market distribution, and from most audio tracks on videotape and videodisc.

Most recently, AudioControl, maintaining its dual traditions of providing American innovation and bringing professional technology to consumer applications, was the first company to bring to the consumer marketplace 1/3-octave, constant-Q equalization and 1/3-octave audio analysis. The C-131 equalizer, in combination with the R-130 analyzer, introduces capabilities formerly restricted to specialist, professional-only equipment.

The future for AudioControl is tied

directly to the continuation of its core philosophical concepts. Thomas Walker, the company's president, put it this way: "Part of our growth must come through applying our knowledge to cost-effectively solving many of the problems now being encountered in the home-theater marketplace. In addition, we must work diligently to ensure that American audio value and innovation continue to make our products the best value for the money at all levels, around the world."

Of course, the singular company style and attitude will be an integral part of this process. Walker summarized it quite neatly: "The whole point of all this is to keep our customers happy with the best service possible, to make a good stereo/home entertainment system sound better, and to have some fun."



**ELECTRONICS IN NORTH AMERICA**

# BEYERDYNAMIC DT 911 EARPHONES

**B**eyerdynamic has been making earphones and microphones for a long time, and the company's dedication to earphone research and engineering has made it a world leader in the field. Their line of non-wireless earphones is topped off by the DT 911 and DT 911 Special; the latter is a DT 911 packed in a lightweight roadcase with a two-disc demo CD, *Dynamic Sound Power Test*. The CDs' short tracks include the sounds of various percussion instruments, from large bass drums all the way to tinkling bells. Other tracks include organ, brass band, and voice recordings as well as a section devoted to the sounds of high-performance cars and motorcycles. I think that the extra \$50 for the Special version is a super value.

Upon opening the roadcase, I found the DT 911 Special earphones nestled in die-cut foam. The plywood case, which measures 14¼ × 11¼ × 5½ inches, is sheathed in aluminum and has corner protectors, two large clasps that can be locked with a key, and four rubber feet on the rear side. The foam has a cutout for the demo CD, and I discovered that this cutout is also perfect for storing a portable CD player. The DT 911's felt headband is a separate strip that floats within the yoke, each end terminated in a clamp that slides along the yoke. Detents hold the headband in place after it has been adjusted by the user. The detents are molded into the plastic yoke at intervals of about ½ of an inch, or 4 mm, like some other earphones I have tested recently. The bails holding the earcups are of the same plastic as the yoke, and they swivel slightly to allow the earcups to fit perfectly to any head. The headband tension that holds the earphones on the head is very light. Thanks to the modest headband tension and relatively light weight, you can easily forget you're wearing the DT 911s, even after prolonged listening. The earcushions, which are large enough to completely sur-



round most ears, are made of soft foam-filled, velvet-like material and are very comfortable. The inner face of the transducers is covered by a very thin, reticulated, open-cell foam.

The cords from each earcup branch for about 14 inches before joining the main, coiled cord. Each earcup has a colored insert near the strain-relieved cord exit, with the right channel marked "right" in black lettering on a red background and the left channel marked "left" on a yellow background. I like this very much, since it makes the earphones easy to put on correctly, even in dim lighting. I wasn't able to open the DT 911s to look inside without damaging them, but the brochure shows that there are 10 parts, including the transducer element.

## SPECS

**Transducer Design:** Dynamic.  
**Coupling to the Ear:** Circumaural.  
**Diffuse-Field Equalization:** Not specified.  
**Sensitivity:** 98 dB for 10 mW.  
**Maximum Output:** 115 dB for 50 mW.  
**Impedance:** 250 ohms.  
**Price:** \$349.95; with hard case and two-CD demo album, \$399.95.  
**Company Address:** 56 Central Ave., Farmingdale, N.Y. 11735.  
**For literature, circle No. 94**

**MEASURED DATA**  
**D.c. Resistance:** 259 ohms (left and right).  
**Absolute Polarity:** Positive.  
**Cord:** 10¼ feet long, from both earcups, with gold ¼-inch stereo phone plug.  
**Adjustments:** Headband slides in yoke, with detents.  
**Weight:** 9.7 ounces.



The Beyerdynamic earphones are the open type, and their transducers are designed to produce good bass output even without a perfect seal between the transducer and the ear. Normally, open earphones have reduced output in the bass range compared to sealed types, but my measurements and comments from members of the listening panel indicate that Beyerdynamic engineers have overcome this problem quite well. Because of the open design, the attenuation of outside sounds is minimal, and it is quite easy to carry on a normal conversation while wearing the DT 911s.

I use a listening panel to assess the subjective sound qualities of products that I review. I asked its members to audition and rate the DT 911 while they were listening to various types of program material and to make written comments. I then tried to correlate their comments to my technical measurements of the earphones.

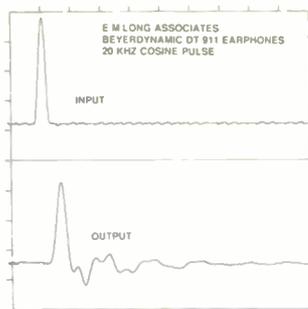
In the bass range, my measurements showed a gentle roll-off of about 10 dB from below 200 Hz all the way down to 20 Hz; this test was made without the seal between the DT 911s and the head that occurs naturally when you put on the earphones. A perfect seal would result in a flat response to 20 Hz. Comments from the listening panel—such as “excellent timbre,” “bass very realistic,” and “lowest notes full and solid”—correlate well with my technical measurements. They also indicate that the DT 911s provide a sufficient seal to produce a flat bass response.

The articulation of voices was judged to be “very good,” while the sense of presence seemed “slightly forward” and “brighter” compared to my reference Stax SR-Lambda Pro Ear-speakers. When measured using a diffuse-field response equalization, the SR-Lambdas have a broad dip in response in the presence range around 3 kHz compared to the DT 911s, so panel comments again correlate well with my measurements. It appears that Beyerdynamic engineers have done a reasonably good job in designing the DT 911 to have a diffuse-field response. (There is still

no good consensus about the best way to measure earphones or about the exact equalization necessary to account for the way we hear sound when using them.)

Comments from the listening panel about reproduction of sounds in the high-frequency range—“smooth and extended” and “very realistic”—also correlated well with the measured response of the DT 911.

Figure 1 shows the Beyerdynamic’s output for a 20-kHz cosine-pulse input. The



**Fig. 1—Cosine-pulse test.**

output waveform is very close to that of the input pulse, and listener comments (such as “excellent transients” as well as “superb details”) confirm the DT 911s’ excellent high-frequency extension and control; the output shows almost no ringing. The waveform also indicates that the DT 911s pro-

## EARPHONE EVALUATION

PARAMETER	RATING	COMMENTS
Overall Sound	Excellent	“Exceptionally smooth” and “Good perspective”
Bass	Excellent	“Solid” and “Excellent timbre”
Midrange	Very good	“Very good” and “Good articulation of voices”
Treble	Excellent	“Very realistic” and “Smooth and extended”
Overall Isolation	Poor	“Outside sounds are easily heard”
Bass	Poor	“Low-pitched sounds are easy to hear”
Midrange	Poor	“It’s easy to carry on conversations”
Treble	Fair	“Outside highs reduced somewhat”
Comfort	Very good	“Good fit” and “Easy adjustment”
Value	Very good	“Good value”

**GENERAL COMMENTS:** Very smooth sound, with reduced upper midrange giving a slightly recessed perspective; excellent bass; overall very good value.

duce a positive acoustical output for a positive electrical input. All of the panel members commented that they could hear a change in the sound when the absolute polarity was switched back and forth. They also agreed upon the preferred polarity for particular selections.

The measured impedance of these earphones is 239 ohms for both channels; the impedance of the source, whether it is a receiver or CD player, will have a negligible effect on the output level or on the response shape. The DT 911s have enough sensitivity to be used with portable CD players but won’t provide loud levels. My measurements also showed that the output level and frequency response of the left and right channels are more closely matched than with most other earphones that I have evaluated.

The Beyerdynamic DT 911 earphones are very comfortable even when worn for long periods. The listening panel rated them as “excellent” for overall sound quality and “very good” for physical attributes. The DT 911s are very close in sound to the Stax reference earphones. The high-frequency performance of the Stax is slightly better, but the upper midrange of the Beyerdynamic is a little more realistic sounding. Considering the price difference, I have to recommend the DT 911s to anyone looking for high-quality earphones at a reasonable price. *Edward M. Long*

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**Nothing  
Will Ever  
Sound The Same  
For You Again.**

## CAMBRIDGE SOUNDWORKS SURROUND SYSTEM



**R**ecognizing that many people who want home theater surround setups already own adequate stereo systems, Henry Kloss and his design team at Cambridge SoundWorks have come up with a variety of add-on surround components. The system I've just tested and auditioned consists of the PL100 surround decoder/amplifier (\$399) powering a Center Channel Plus speaker (\$219) and a pair of dipole Surround (\$399 per pair) speakers. If purchased as a system, the price is

\$999, a slight saving over the total cost of the individual components. Those wishing to economize a bit can get the smaller Surround II and Center Channel speakers at \$249 per pair and \$149, respectively; the more affluent can add the Powered Subwoofer (\$599) and perhaps even use its amplifier to drive the \$299 Slave Subwoofer.

The PL100 includes a Dolby Pro-Logic surround decoder plus amplifiers to power the extra speakers needed for surround: 40 watts for the center channel and 15 watts for each of the two rear or side channels. A remote control and a built-in test-signal generator let you accurately balance the left, right, center, and

surround channels from your listening position. The surround channel's time delay is selectable, to compensate for the size of your room, and there's a line-level output for a powered subwoofer, with user-selectable crossover frequencies of 80 or 150 Hz.

In addition to Pro-Logic decoding for Dolby Surround program sources, the PL100 has a "Hall" mode that delivers surround-like ambience based on the out-of-phase

components of unencoded program sources, and a "Matrix" simulated-stereo mode for monophonic material. The unit also has controls for overall, rear, and center level plus a switch to select the usual "phantom" mode for systems without center speakers.

The PL100's center-channel amp rolls off below 100 Hz, like most center-channel amplifiers for Dolby Pro-Logic systems. The surround channels also roll off, below about 60 Hz and above about 7 kHz. In my lab testing, I found that the center and surround amplifiers more than met their power specs.

The Center Channel Plus has four long-throw 3-inch woofers and a

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For literature, circle No. 95

# “Nothing Short of Stunning”\*

“Nuances and subtleties barely hinted at by other processors were revealed with clarity by the Gen. III.”

“...Gen. III’s remarkable transparency, a crystal-clear picture window on the music that allowed me to look deep into the soundstage.”

“The Gen. III’s huge, spacious, three-dimensional rendering made the loudspeakers and listening-room walls truly disappear.”

“The sheer sense of instruments hanging in space, completely free of the loudspeakers and unfettered by room boundaries, was awesome.”

— *\*Robert Harley, Stereophile*  
Vol. 15, No. 10, October 1992

“Theta Generation III DS Pro does not merely sound better than other digital processors. It literally redefines what digital music can sound like.”

“With the Theta Generation III, we hear into the music as we have never heard from digital, its stunning and effortless transparency is reminiscent of the clarity we have heretofore encountered only from the world’s very finest turntables...”

“...Theta DS Pro Generation III can give you a total musical experience that you can’t get anywhere else from digital.”

— *Peter Moncrieff*  
*International Audio Review #64*

“...the most sonically impressive and musically accurate digital replay I’ve yet experienced in my reference system.”

“...the closest thing to the holy grail of digital audio...”

“Better than anything I’ve yet experienced in the digital domain.”

— *Lewis Lipnick, Stereophile*  
Vol. 15, No. 10, October 1992



## *Digital Done Right*

### **Theta Digital Corporation**

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tweeter. The frequency range of the outer two woofers is limited, so the array's effective width will decrease with increasing frequency to maintain proper dispersion characteristics. The cabinet is 25 inches wide, 6½ inches deep, and only 4 inches high, so it can sit on top of a TV set; with an optional support (\$25) behind the speaker, the Center Channel Plus can also be used as a base for a TV set.

Sharp imaging, which lets you precisely gauge the location of sounds in space, is desirable in a stereo system's main speakers

but very undesirable in surround channels. So the Surround speakers are dipoles, designed to direct their sound away from the listener, to be reflected by the front and rear walls for maximum dispersion. Each speaker in the pair has tweeters facing front and rear (the side of the speaker faces the listener) and a 4-inch woofer.

Installing this add-on surround system was simple, thanks to the thorough and well-illustrated owner's manual supplied with the PL100. The PL100 connects to any tape monitor loop in your system. All the

tape monitor jacks on my preamp were occupied, but the PL100 has its own tape in and out jacks, so I just plugged it in between the preamp and my tape deck. Adjusting sound levels took only seconds and was as accurate as I could have wished. I was also especially pleased by the way the Center Channel Plus fit directly atop the 32-inch TV I use in my home theater.

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Listening to blockbuster films on S-VHS tape and LaserDisc, I was impressed that the Surround speakers made it impossible to identify just where the surround sounds were coming from, just as they were designed to. In many ways, the surround sensation I experienced was every bit as good as any I have heard from far more expensive installations.

If there is one thing I would have liked to have in this system, it would have been a powered subwoofer (for which the PL100 does provide an output) to augment the deep bass rumblings in such films as *Raiders of the Lost Ark* and some of the *Star Trek* films that are in my collection. For music recordings (whether from video or stereo audio sources), I did not feel the need for the subwoofer quite as much, but that's probably because the selections I chose were either solo piano performances (including Vladimir Horowitz's *The Last Recording*) or chamber music groups.

In summary, audio pioneer Henry Kloss has come up with a reasonably priced set of components that, bought separately or as an add-on package, should convince many audio enthusiasts that converting to a home theater surround system need not cost tens of thousands of dollars. Kloss has been making good sound available to music lovers for several decades, and it's nice to see him adding his considerable skills to this exciting and burgeoning field of audio/video integration. *Leonard Feldman*

AUDIO/JANUARY 1993

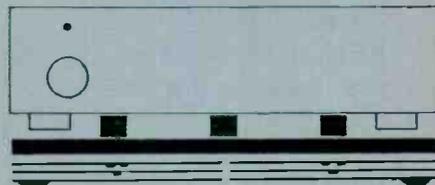
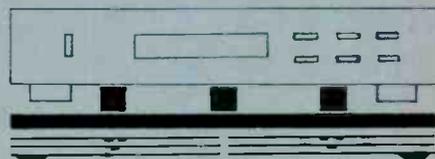
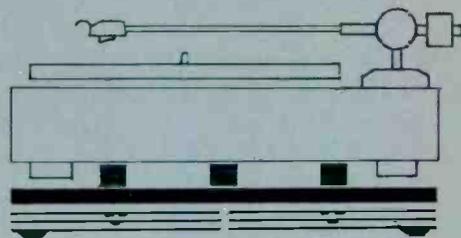
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# How to deal with the crisis in (Or didn't you know

Yes, there's a serious crisis. It preoccupies some of the keenest scientific minds in audio today. It worries the hell out of knowledgeable and responsible audio journalists, such as those on the masthead of *The Audio Critic*. It can best be characterized as a crisis of accountability.

Consider something like the following:

"The sound of this preamplifier lives up to its \$5000 price tag. Using the line amplifier stage through the CD input, I heard soundstaging considerably superior to that of the XYZ preamp. Front-to-back depth was incredible, and the width of the orchestra seemed to have almost doubled. There was more air around individual instruments than with the XYZ, and transients were more precisely defined. Rhythm and pace, good as they are with the XYZ, were also far superior. The only very small reservation I have is a slight lack of liquidity in the upper midrange."

Sounds familiar? It is the reviewing style that put the so-called underground or alternative audio publications on the map, a form of soft-core pornography for the immature, indiscriminating audiophile. They call it "subjective reviewing." We at *The Audio Critic* call it misleading, irresponsible rubbish. The professionals and academics of the scientific audio community have the utmost contempt for it but seldom speak up loudly and clearly to oppose it. As a result, it has insinuated itself into everyday audio parlance and gained a kind of creeping credibility in audio circles that ought to know better. Mainstream audio publications generally guided by science and common sense—such as the one you're now reading—are

being pooh-poohed and dismissed in high-end audio salons and guru-dominated audio clubs in favor of these highly opinionated but essentially untutored "golden-eared" journals, which have smaller circulations but greater tweako appeal. It's a full-blown crisis in the communication of consumer information.

## The simple truth.

Let's get this straight once and for all. That reviewer of the \$5000 preamp is only *asserting* that he can hear the differences he is describing but in fact he can't. He certainly can't *prove* to a neutral observer that he can hear them. He may actually believe that he hears the differences or he may be bluffing, but that's beside the point. The bottom line is that in a blind test, with the brand names and prices withheld from him, the levels precisely matched, and the sound from the equipment the only available clue, his golden ears suddenly turn to tin—he gets roughly half of his identifications right, exactly as if he were just guessing wildly. This has been demonstrated so many times in so many controlled tests that at this point an "anecdotal" subjective report of sound quality without the supporting evidence of such tests is totally lacking in credibility.

The above applies not only to a preamplifier line stage (which is a good example as a very simple linear signal path, whereas the phono stage could conceivably have audible RIAA equalization errors) but also to well-engineered, *uneccentric* power amplifiers, the newer CD players and outboard D/A processors, speaker cables, interconnects, etc., not to mention such obviously inaudible "improvements" as the green edge treatment

for CDs and the clock that cleans up the AC power in your wall. There are no authenticated blind tests proving that anyone ever identified any audible differences in these categories with any degree of reliability. (Incidentally, 3 or 4 tries are utterly meaningless in a blind listening test. Getting 13 out of 16 right begins to be statistically meaningful.)

The situation is considerably complicated by the fact that there are indeed major audible differences, depending on design and/or deployment, in various other categories, such as loudspeaker systems, microphones, phono cartridges, listening rooms and room treatments, recording studios and concert halls, and particularly the recording setups used by the many different record companies. (If you want to hear subtle differences in soundstaging, compare a John Eargle recording on Delos with a Jack Renner recording on Telarc—not two preamps. Or if you want to hear subtle differences in transient detail, compare a jazz recording on the dmp label with one on Chesky—not two interconnects.) Unfortunately, tweako reviewers get away with shuttling back and forth between the genuinely audible differences and the purely fictitious ones without shifting gears or showing the slightest concern for accountability. When challenged by serious, scientific audio practitioners, they almost invariably refuse to participate in blind listening tests on the grounds that the latter are not valid. (All those Ph.D.s of experimental psychology who devised the tests are wrong, you see.)

There's only one area where the golden-eared subjectivists of the alternative audio press show

# audio equipment reviewing. there *was* one?)

absolute consistency, integrity, and even a simple-minded kind of accountability—the area of price. They can be counted on to hear greater front-to-back depth, better rhythm and pace, more air around the instruments in a \$5000 preamp than in a \$2500 one. Guaranteed. It's a sociocultural comedy that can make you laugh or cry, depending on your perspective.

## **The antidote to all the rubbish.**

Now consider *The Audio Critic*. It has been called the alternative to the alternative audio publications. It combines passionate involvement, attention to the smallest technical details, and a no-holds-barred editorial stance—in other words, the “underground” flavor—with a hard-nosed, show-me attitude in engineering matters and listening procedures. If we can't prove it and document it, we don't say it, or at least we qualify it very explicitly. Accountability is our stock-in-trade.

What, specifically, will you find in *The Audio Critic*? Measurements, yes—with the Audio Precision System One, calibrated microphones, digital oscilloscope, etc.—but that's not unique. Where we differ from other reviewers who report such measurements is in the way we react to the engineering flaws we discover. We never sweep them under the rug or explain them away, whether it's a \$5000 or a \$400 piece of equipment. (That's right, we aren't exclusively high-end, far from it.)

And that's only the beginning. Our reviews analyze electronic circuitry and evaluate it for engineering excellence almost as if the designer had submitted it as an exercise in an EE school. Speaker designs are critiqued with

similar rigor for compliance with the laws of physics (some try to fudge that) and with the most enlightened electroacoustic design practice. Build quality in each case is carefully assessed to determine whether the consumer's money goes into parts and labor or the early-retirement fund of the manufacturer. After you've read one of our issues, you'll know exactly why component X is preferable to Y and why you should completely stay away from Z. We don't leave you wondering.

Of course, there's a lot more than just equipment reviews in *The Audio Critic*. Our survey articles exploring an entire technology (e.g., CD player design, deep bass reproduction, preamp circuitry) are minor classics. Our letters column has been a forum for some of the most famous names in audio, as well as for tweako cultists who usually get clobbered by the Editor. (The fans love it!) One of our most popular columns is “Hip Boots: Wading through the Mire of Misinformation in the Audio Press.” Our CD reviews are also widely admired.

## **But what about listening tests?**

We have to come back to this basic issue, which is the epicenter of the audio information crisis.

Yes, we do lots of listening; we aren't just measurement freaks, although the tweako magazines would love to label us as such. But no, we really don't believe that a listening comparison between components A and B is even worth discussing unless (1) the test is double-blind—meaning that not even the test giver knows the right answers—and (2) the levels are matched *by meter* within 0.1 dB, since level differences as small as 0.3 dB are perceived by

most people as differences in quality, not loudness. We use the ABX Double Blind Comparator, a computerized switching device that takes care of these requirements. No other audio journal uses it routinely as we do. Enough said.

## **Subscription information.**

*The Audio Critic* is at the moment a quarterly, aspiring to become a bimonthly in the not too distant future. A subscription for four consecutive issues, starting with the current issue, costs \$24 if you live in the U.S.A., Canada, or Mexico, and \$38 if you live in any other country. The current issue at the time this ad appears is No. 18. **Special offer!** Issues No. 16 and 17, although not the latest, will help you gain a quicker and better understanding of what *The Audio Critic* is all about and will be included on request with new \$24 subscriptions for just \$5 extra (i.e., \$29 total). That's an unprecedented 58% discount off those back issues! To new \$38 subscribers from overseas the extra charge is \$8 (i.e., \$46 total). Send your check or money order to:

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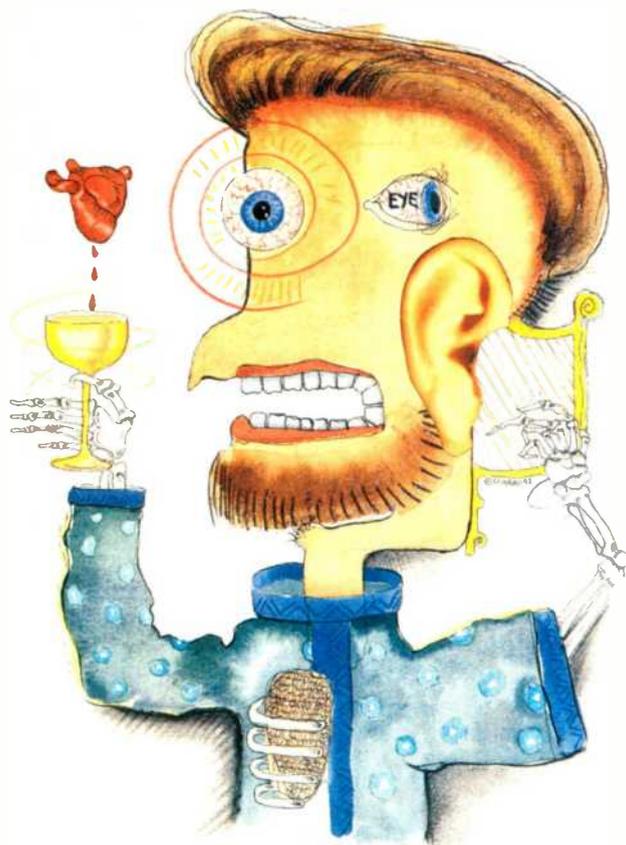
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# CLASSICAL RECORDINGS



## PROKOFIEV ..... SCYTHIAN SUITE

**Prokofiev: Scythian Suite, Op. 20;  
Alexander Nevsky (cantata),  
Op. 78**

Ludmila Shemchuk, mezzo-  
soprano; Danish National Radio  
Choir and Symphony Orchestra,  
Dmitri Kitayenko  
CHANDOS 9001, CD; DDD; 62:57

**Prokofiev: Scythian Suite, Op. 20;  
Alexander Nevsky (cantata),  
Op. 78**

Carolyn Watkinson, mezzo-  
soprano; Latvia Chorus;  
Leipzig Gewandhaus Orchestra,  
Kurt Masur  
TELDEC 9031-73284-2, CD;  
DDD; 55:59

**Prokofiev: Scythian Suite, Op. 20;  
Stravinsky: The Rite of Spring**

Dallas Symphony Orchestra,  
Eduardo Mata  
DORIAN DOR-90156, CD;  
DDD; 60:21

**Prokofiev: Chout (The Jester Who  
Outwitted Seven Others), Op. 21**

USSR Ministry of Culture  
Symphony Orchestra,  
Gennady Rozhdestvensky  
MELODIYA 10-00050, CD;  
DDD; 56:19

**T**he Scythians drank blood and did all sorts of other revolting things. They flourished on the northeastern shores of the Black Sea between the seventh and third centuries B.C.; Herodotus left a reasonably complete catalog of their nastinesses. (In all fairness, they also created extraordinary ornaments in gold, among the rarest treasures in St. Petersburg's Hermitage museum.)

For the 23-year-old Sergei Prokofiev, at the wildest of his early wild-man period, the Scythians proved irresistible when he set out to emulate the all-out scandal Igor Stravinsky, then 33, had created in Paris the year before (1913) with *The Rite of Spring*, the masterpiece about prehistoric Russia. However, Sergei Diaghilev, whose Ballets Russes the Stravinsky brouhaha had almost torpedoed, refused to stage Prokofiev's score (he softened the blow by commissioning the black-comedy ballet *Chout*), so Prokofiev recycled much of his intended ballet music into the Scythian Suite. When he conducted its world premiere in St. Petersburg in 1916, he had 140 players going full blast and took as a souvenir the drumhead one percussionist, egged on by the composer/conductor, had pounded right through.

The cantata drawn from the score for Sergei Eisenstein's masterpiece

film *Alexander Nevsky* shows a totally different facet of Prokofiev's genius: In writing some of the most distinguished of all movie music, he also provided a prime example of a major composer writing immediately assimilable music without in any way writing down to his audience. Even those who habitually shy away from 20th-century music can enjoy *Alexander Nevsky* at first encounter, and even love it.

Each of these Scythian Suite recordings has its virtues. One rejoices to see Dorian—a high-quality label from its inception, now in out of the way Troy, N.Y.—taking the plunge

**THE RITE OF SPRING  
CREATED A SCANDAL  
THAT PROKOFIEV  
HOPED TO EMULATE.**

into recording an important symphony orchestra, and with especially impressive sound, as usual. Eduardo Mata takes a controlled rather than an abandoned approach to the music, concentrating on clarity of texture, and the Dallas Symphony Orchestra does sound impressive indeed.

Kurt Masur and his Saxons, rather surprisingly, lace into the Suite with



**20th-Century Baroque: Modern Reflections on Old Instruments**

*Rembrandt Chamber Players*  
CEDILLE CDR 90000 001,  
CD; 60:27

This is an interesting if sometimes exasperating collection, featuring the harpsichord as inspiration for four recent composers. The instrument is beautifully recorded and correctly balanced against the louder solo instruments, for a splendidly accurate audio.

Memories! The very first recording of "modern" music I ever bought, back as a college student, was a 78-rpm album of the Manuel

de Falla harpsichord concerto, composed for the famed Wanda Landowska in the very early 1920s. It was awful. The recording engineer, obviously mike-happy, thought he should amplify the harpsichord to huge proportions as the featured solo instrument, but it roared and raged like a demented Spanish bull, drowning out the rest. The slow movement was the worst; I can hear its obstinately ugly repetitions still. Now, at last, an intelligent engineer has put the harpsichord where it belongs, creating a gentle, wiry sound. But the piece is still ugly, in the harsh, dissonant manner of the early-'20s "modern." Falla tried much too hard to update himself, I think. You'd do best to play this once and then skip it forever.

Ah, what a contrast, the Elliott Carter, as of 1952! He, too, has always been interested in new uses for the harpsichord, but so much more knowledgeably. (He wrote a fascinating piece for two orchestra

groups, one with a piano and the other a harpsichord.) This work is wholly dissonant but surprisingly easy to listen to. No ostentation, no deliberate ugliness at all. One of our best composers, still going today in his 80s, this Carter. He is a master of instrumental tone color.

The third work, by Ilja Hurnik, an emigrant Czech, is of the same period but very different in sound—a modern baroque synthesis, Bach/Vivaldi-like yet contemporary. Nice piece.

The last work, unfortunately, suffers from vocal disease—by which I mean an excellent singer who, typically, has learned to sing LOUD and does not moderate her tones for the microphone and small space. The songs by Domenick Argento are fine if you cover your ears. But then you miss the harpsichord, plus the other instruments! This man is Italian-American, writing in 1958, and his songs, oddly, are to Elizabethan (I) texts. *Edward Tatnall Canby*

**On this CD of 20th-century works for the harpsichord, an intelligent engineer has at last put this instrument where it belongs.**

the sort of slam-bang ferocity Prokofiev probably wanted; however, the more tender passages Masur also handles with great sensitivity. In the *Nevsky*, the Latvian choir provides a robustly appropriate timbre, linguistically as well as vocally, and the rich-voiced soloist, Carolyn Watkinson, sounds comfortable in Russian.

Dmitri Kitayenko takes a more Romantic approach towards both works, not hesitating to broaden the tempo whenever he feels like it. His Danish choristers don't quite match Masur's imported Latvians, but *his* soloist, Ludmila Shemchuk, brings to her poignant aria—a search for a beloved face among an entire battlefield of dead warriors—a kind of depth that perhaps demands an authentic Slavic soul.

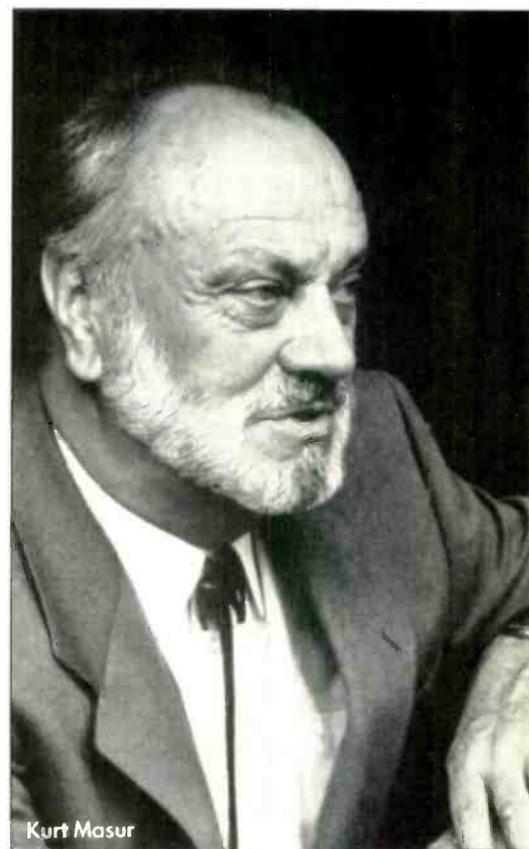
If you want to move on and hear the larky Prokofiev ballet Diaghilev did find worth staging, treat yourself to Gennady Rozhdestvensky's characteristically masterful performance of *Chout* (pronounced, quite simply, Shoot). One marvels, sadly, that this delicious music has almost disappeared from concert programs. *Paul Moor*

**Tchaikovsky: Symphony No. 3, "Polish"**

*Leipzig Gewandhaus Orchestra, Kurt Masur*  
TELDEC 2292-46322-2

Tchaikovsky seems to have always been a masterful, totally professional writer of music for orchestra, one of the real geniuses on that technical plane. It took him a while, however, to get past skilled complexity into the big themes, the big moments, that catch the public ear even today. You can hear it in this seldom heard but wholly mature symphony, just as skillfully made as the later ones. The difference is simple: No big tunes, just a batch of captivating short ideas (when you take time to hear them) wrought into great climaxes, of course, yet still not easy to remember. This symphony takes a more aware musical mind than the later works, where you can choose to study the immense detail or just swoon to the tunes.

The modern Gewandhaus Orchestra remains one of the world's top ensembles, a continuing tradition of 250 years, back to



Kurt Masur

Bach and Telemann. No mere Nazi or Communist regime could kill this sense of musical self—that's obvious in the listening. The sound is distinctively mellow, almost fruity, but utterly disciplined as well. In its peripatetic conductor, the orchestra has one of the best, Masur, who also conducts all over the place, including the New York Philharmonic. (I wish him luck there; a bit of fruitiness and plenty of discipline would do no harm to our finest!)

Edward Tatnall Canby



Barbara Westphal

**Brahms: Sonatas,  
Op. 120, Nos. 1 and 2;  
Scherzo in C Minor**

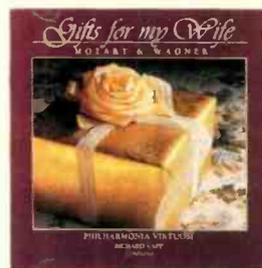
Barbara Westphal, viola;  
Ursula Oppens, piano  
BRIDGE BCD 9021

The Clarinet Sonatas of Opus 120 were Brahms' last and finest music. But he himself made transcriptions for viola as an alternative. Surely this is the finest recording ever made of the viola versions as well as the early "F. A. E." Scherzo. There have been two schools of viola playing: The cold-in-the-head sound of the earlier 20th century and the sweet, limpid, pure, and in-tune sound we hear on this recording, which simply has to be the sound Brahms had in mind. This is a superb set of performances with beautifully balanced micro-phonics as well.

Edward Tatnall Canby

**Gifts for My Wife**

Philharmonia Virtuosi,  
Richard Kapp  
ESS.A.Y CD 1020, CD; 65:10



The ancient and unsavory term "chamber orchestra" is, thankfully, about dead, and it's about time. This is sublime music for "chamber orchestra" but minus the name and the solemnity. Good! It makes a clever and imaginative CD program, beautifully played. Richard Kapp, who inhabits the urbs and exurbs of New York, had the imagination to see how beautifully two contrasting works—Mozart's Serenade No. 10 in B Flat, K. 361, and Wagner's Siegfried Idyll—could be on a single disc, each played in its own manner as though a wholly different performing group were on hand for each piece.

Yes, each *was* composed for a new wife. It *sounds* likely that Mozart's work is one of his very greatest, and in such an unlikely serenade form, usually on the superficial side. Mozart had at last escaped hated Salzburg for limitless Vienna—and had married the well-known Constanze, after losing out on her sister Aloysia a few years before. As for Wagner, it was a serenade to end all serenades, played on the stairs outside his wife's room on her 33rd birthday morn-

ing. A tiny piece by Wagner standards, a mere 17+ minutes, but one of his finest as well. By remarkable coincidence both these works require 13 instrumentalists.

"Virtuosi" in the ensemble's name is no exaggeration. These are first-rate players, and Richard Kapp, for all his new-style playfulness, is an excellent conductor and a very fine stylist. You will understand this the instant you hear the awesome sound of Mozart's 13 instruments, 12 winds and a string bass to hold down the bottom. Similarly, Wagner's music, beginning with only a quiet string quartet, gradually expanding, is beautifully styled for its own different message.

Both these wives long outlived their busy husbands, and in terms of conventional propriety, the less said about Cosima Wagner, the better. Yet she was a great lady, and the Wagner romance was very much real.

Edward Tatnall Canby



**Mozart: Sinfonia Concertante  
in E Flat, K. 364;**

**Concertone in C, K. 190**  
Cho-Liang Lin, violin;  
Jaime Laredo, violin and viola;  
English Chamber Orchestra,  
Raymond Leppard  
SONY CLASSICAL SK 47693,  
CD; 59:38

If you like Mozart in half-minute doses, stay away; if more is better, then this sinfonia concertante is an experience, the very top. I fell for it in 78-rpm days, a wonderful recording, absolutely worn to death by me, with Albert Sammons and Lionel Tertis and that once-ubiquitous English conductor, Sir Hamilton Harty. I can still hear the side breaks. This new English performance is less sturdy than the old one. Cho-Liang Lin plays a somewhat mild and hesitant violin, Jaime Laredo a superbly accurate and rich-toned viola. Raymond Leppard's conducting is a bit mannered, sometimes on the unduly slow side, sometimes pushing the music fast. Nevertheless, this is an unusual double concerto, with the two instruments, mostly an octave apart, playing

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like Siamese twins, every moment in sync, one, then the other, even for the double-double-stop cadenzas! One almost hears them bowing to each other: "After you!" This was Mozart himself, of course, who rejoiced in this kind of musical byplay.

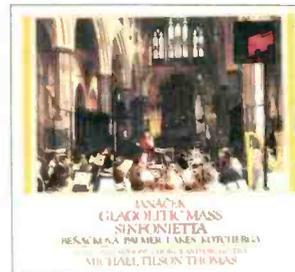
The concertone is earlier and nearer to Mozart's light entertainment works, divertimenti, cassations, anything that wasn't to be taken too seriously. But it is indeed larger than most of those, and more elaborate. The two solo violins are not as effective in dialog as the contrasted violin and viola,

sounding too much alike, but an unofficial oboe solo (not named) adds a useful third member for a better contrast.

Note that directionality here, so much our preoccupation in recording, is not important. In live performance the players stand together and are heard from the same place, and you can *see* who is playing what. The audio men who made this recording were wise; they have *not* tried to separate the pairs of instruments widely apart on each side. Good musical judgment. Or was it the Recording Director?

Yes, we must always adapt "live" music to the demands of the audio medium. But always with the original intentions in mind.

*Edward Tatnall Canby*



**Janáček: Glagolitic Mass;  
Sinfonietta**  
*London Symphony Chorus  
and Orchestra,*  
*Michael Tilson Thomas*  
SONY CLASSICAL SK 47 182,  
CD; 64:23

Michael Tilson Thomas' version of the Glagolitic Mass (Slavonic Mass) makes a strong case for a triumvirate of hi-fi sacred spectaculars—with the operatic Verdi Requiem and the surround sound Berlioz Requiem—even though it is properly a Mass, not a Requiem.

Janáček was not particularly devout, stating that his intention in the Glagolitic Mass was to express faith in the certainty of the Czech nation. Composed in 1927 using an early written form of the Slavonic language, this remarkable eight-part anthem of praise to Creation is rich in folk character, with a monumental unity achieved by growing the entire Mass out of a single musical cell. Stirring brass fanfares punctuate the work, and the tensions of the preceding traditional Mass sections are relieved in a penultimate, unnerving, wildly expressive organ solo movement.

Two of the four vocal soloists provide a touch of authenticity with their Slavic origin, and Thomas and his London Symphony Orchestra players have a solid connection after four years together. The audiophile-coveted venue of All Saints Church, Tooting, London and Sony's 20-bit technology capture a balanced and spacious sonic. Sharing the deluxe boxed CD is perhaps Janáček's best-known instrumental work, his Sinfonietta, which is also redolent of military fanfares and folk music influences.

*John Sunier*

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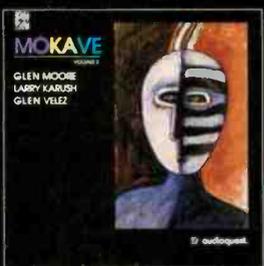
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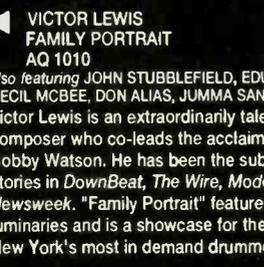
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Robert Lucas has received universal praise from the world-wide blues community for his first two releases on AudioQuest. "Built For Comfort" is a tasty combination of solo, duo and group offerings with backing musicians including Stephen Hodges (Tom Waits, James Harman) drums, and Freebo (Bonnie Raitt), tuba. "Built For Comfort" is Robert's best yet!



◀ **MOKAVE VOL. 2**  
AQ 1007  
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said *DownBeat* in a rave review of Mokave Vol. 1. Vol 2 features more from the masters of world music and improvisation. Those who have heard Vol. 1 already know. Mokave is earthy, funky, cerebral and a lot of fun!



▶ **VICTOR LEWIS  
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*also featuring JOHN STUBBLEFIELD, EDUARDO SIMON,  
CECIL MCBEE, DON ALIAS, JUMMA SANTOS*  
Victor Lewis is an extraordinarily talented drummer and composer who co-leads the acclaimed group Horizon with Bobby Watson. He has been the subject of recent feature stories in *DownBeat*, *The Wire*, *Modern Drummer* and *Newsweek*. "Family Portrait" features an all star cast of jazz luminaries and is a showcase for the composing talents of New York's most in demand drummer.



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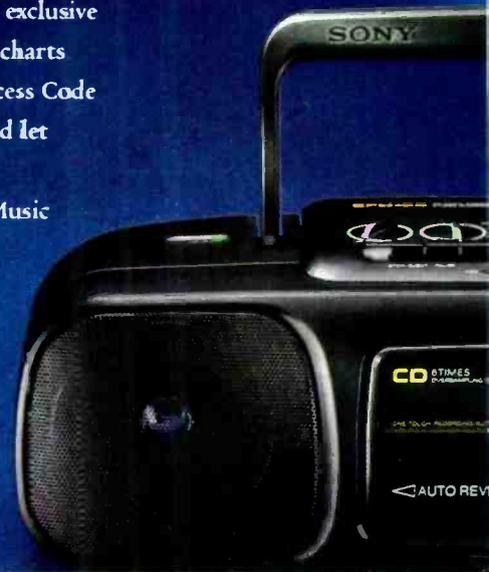
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**J. S. Bach: Three Suites, BWV 1007-9**

*Marion Verbruggen, recorder*  
HARMONIA MUNDI 907071

Not the best introduction to the Bach Suites, this CD will be enticing to lovers of Bach or the recorder and quite pleasant for the generalist baroque collector. Prepared by the artist, these three transcriptions were originally for solo cello. Ms. Verbruggen negotiates the technical difficulties well, though double stops on a recorder just don't. Any player of these Suites must keep an easy and accurate sense of the pace and rhythm, as these *are* dances—minuets, gigue, gavottes, and so forth. Yo-Yo Ma's celebrated cello set does not help as a model, being somewhat sweepingly Romantic. Those of Janos Starker from the mid-1960s seem to me to be the best in this regard, with these somewhere between.

This recording is set up a bit too distant for my taste, as slap from the walls is somewhat pronounced and uneven across the frequency ranges. The room also bothered me, until I read that Skywalker Sound was the venue. I said, ah ha, it was done in that big room of theirs, the one with the huge distance up to the ceiling. *E.P.*

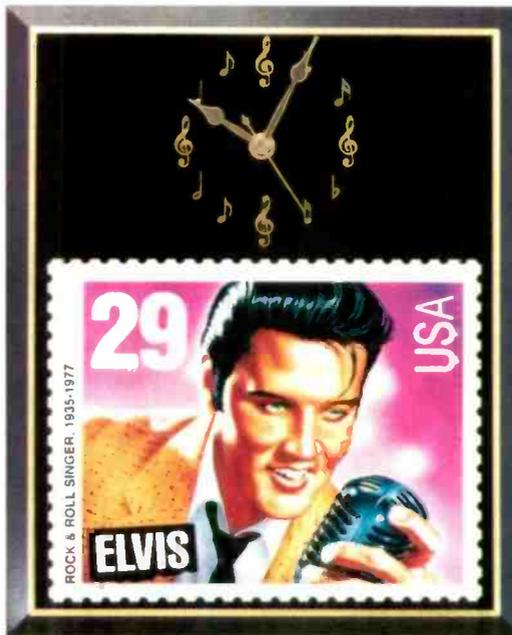
**Charles-Valentin Alkan:**  
**Concerto for Solo Piano**  
*Marc-André Hamelin*  
MUSIC & ARTS CD-724

Not only is Alkan's music strange, but also his life and even his death: Was he really crushed by a copy of the Talmud, or did he merely fall off a ladder in his library? Brave young Marc-André Hamelin (dubbed the best Canadian pianist since Glenn Gould) has tackled this piece—sometimes called the most stupendously resplendent piano work of the 19th century—even if the only other recording, by piano giant John Ogdon, is out of print.

Most of Alkan's music is fiendishly dense and difficult, but the colossal three-movement work (of which the first runs a half hour) additionally demands the single player portray the interplay between orchestra and soloist! This obsessive, virtuoso, hi-fi fantasy makes the piano version of, say, "Pictures at an Exhibition" sound like "Für Elise." Breathtaking pianism and clean, close-up recording. *John Sunier*

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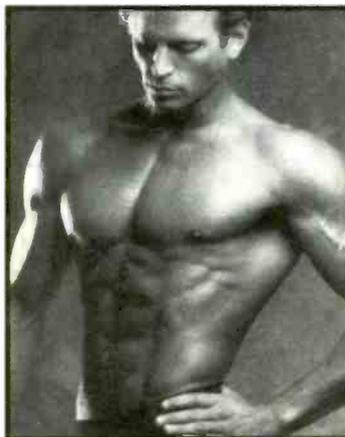
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# ROCK ~ POP RECORDINGS

## LOVE AND DANGER ..... JOE ELY



### Love and Danger

Joe Ely

MCA MCAD-10584, CD; 42:23  
Sound: A, Performance: A

**L**ove and Danger is a perfect title for Joe Ely's first studio recording in four years, as these themes permeate the album. For that matter, love and danger have always figured heavily in Ely's songs.

Though co-produced by Ely and MCA Nashville's Tony Brown, this is not just a country album, rest assured; it is at least as much a rocker that sizzles end to end with an attractive edginess. The core band includes Joe's longtime guitar side-

kicks David Grissom and Lloyd Maines, keyboard whiz Reese Wynans, and the rhythm section of Davis McLarty and Jimmy Pettit, all of whom do their parts with swaggering confidence.

Ely wrote seven of the 10 songs. "Sleepless in Love," an ideal opener, depicts a couple swept up in a passion they cannot control. "Pins and Needles," with a distracting quavering vocal effect, and "Love Is the Beating of Hearts" are about aching and yearning. "Highways and Heartaches" rocks mightily while musing about separation and estrangement. "Settle for Love," originally on Ely's *Dig for Love* (Hightone Records,

1988), deserves its place here as well, fitting both sound and theme.

The songs Ely didn't write rank with his own. Ex-Blaster Dave Alvin's "Every Night About This Time" tells of a woman who can't make it to morning without falling in love. And the two songs by fellow Austinite Robert Earl Keen are the album's best tracks. There's the scary and funny yarn about a hothead who uses his gun only "Whenever Kindness Fails." But the centerpiece of the album is "The Road Goes On Forever," a James M. Cain-like story of deadly twists and deceptions with characters so vivid that the song could serve as a treatment for one hell of a movie.

It's been 20 years since Joe Ely first recorded with Jimmie Dale Gilmore and Butch Hancock in the legendary West Texas band The Flatlanders, and 15 years since he moved east to Austin and began his solo career. *Love and Danger*, Ely's ninth album, quite simply is his finest and most fully realized work, a total scorcher that has it all: Compelling songs, thrilling performances, and production that is both crackerjack and sympathetic.

Michael Tearson

Photograph: ©David Gahr



puzzle  
dada

I.R.S. X2-13141

At times acerbically funny yet always striking some sort of emotional chord, dada poses James Stockdale-like questions of existentialism ("Who am I? Why am I here?") in tuneful, hook-laden songs. They're an L.A. trio who, when showing off the elegance of their harmonies, often remind me of Crowded House

and even Simon and Garfunkel—but Paul Simon was never this witty. The dialectical “Dizz Knee Land” almost too politely tells Joe Montana where he should *really* go. “Dorina,” more charged than cynical, tells the story of a barfly’s idealization of womanhood, via his alcoholic hallucination. Key to this package is guitarist/singer/co-songwriter Michael Gurley, whose exceptional playing adds the perfect finishing touches. *Mike Bieber*



**King of Hearts**  
Roy Orbison  
VIRGIN V2-86520

*King of Hearts* is much more than a post-humous collection of leftovers, as there are some serious gems here. For my taste, the duet with k. d. lang on “Crying” and the thrilling urgency of “I Drove All Night,” recorded earlier by Cyndi Lauper, are worth the price of admission. Soaring performances like “Love in Time” and “Wild Hearts Run Out of Time” are welcome newcomers. Roy rarely gave less than his best, and if you liked his brilliant 1989 album *Mystery Girl*, you won’t want to miss this one. *Michael Tearson*



**Shimmering, Warm & Bright**  
Bel Canto  
DALI/CHAMELEON 61412-2

Bel Canto takes its name from the classical vocal style that translates as “beautiful singing,” but the Norwegian duo’s refer-

**Nerve Net**

Brian Eno  
OPAL/WARNER BROS. 9 45033-2,  
CD; 64:27  
Sound: B, Performance: B-

**The Shutov Assembly**

Brian Eno  
OPAL/WARNER BROS. 9 45010-2,  
CD; 57:29  
Sound: B, Performance: B-

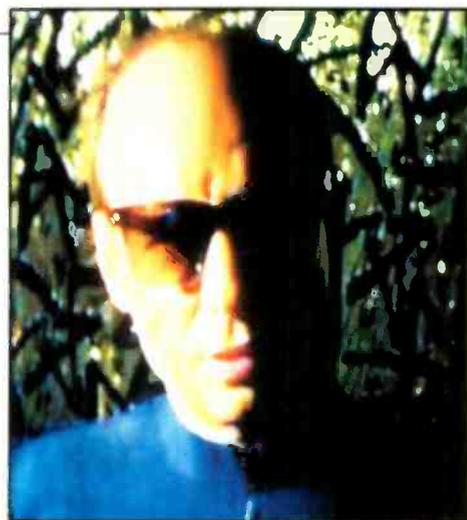
*Nerve Net* is a cyberpunk vision of exposed synapses on the verge of breakdown. It’s a virtual-reality cauldron with African horns and percussion merged with mechanistic grooves and psychedelic shifts in perspective. Here, Brian Eno is looking back as much as forward, matching techno-rave with early fusion. There are swampy jazz riffs that

**BRIAN ENO IS CLEARLY  
DRAWING NAVIGATIONAL  
CHARTS FOR MUSIC OF  
THE NEAR FUTURE.**

could’ve come from a Sun Ra session or from Joe Zawinul in a particularly off-kilter mood. Juxtaposing ensemble performances with studio manipulations, Eno turns Miles Davis’ *On the Corner* grooves into a postmodern acid trip.

As Miles did, Eno assembles forces and then mixes and matches the results. In the malevolent “Ju-ju Space Jazz,” he opens up a window into a drunken cocktail party, with

ences are closer to modern rock and electronic music than to Italian opera. The mysterious warblings draw comparisons to Cocteau Twins and Dead Can Dance—and with its third U.S. album, *Bel Canto* is overdue for recognition in the same gothic-art crowd. The techno-primitive tracks use Norwegian folk melodies, chromium synthesizer arrangements, sampled percussion,

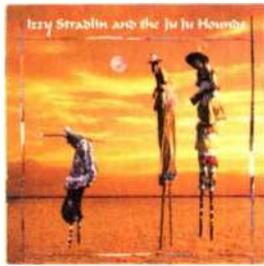


Robert Fripp playing cool-jazz guitar. Conversely, Fripp lacerates the low-key shuffle of “Distributed Being” with a vicious solo that’s full of the fractured fury he brought to an earlier Eno work, “Baby’s on Fire.”

Eno hasn’t abandoned the quiet zone of his ambient music, however, as we learn from the simultaneous release of *The Shutov Assembly*, a recording in the spirit of *Music for Airports*. Eno brings the same sense of space and envelopment to this material as he does to *Nerve Net*. Sounds swirl in a mist, details emerging at times as bits of melodies hover around the edge.

Both albums could have used a compelling melody or a trenchant lyric. (Those were left behind on *My Squeelchy Life*, the album Eno pulled from scheduled release last year.) But on *Nerve Net* and *The Shutov Assembly*, the producer of U2 and ambient music is clearly drawing the navigational charts for music of the near future. *John Diliberto*

and ethnic strings such as hammered dulcimers and ouds evoking Moorish rhythms. Anneli Drecker spins her voice—unquestionably bel canto—with Arabic ornamentation on “Le Temps Dégagé,” in music that hovers between dervish and dance-floor. The duo is almost too perfect to a fault in its precision, but that’s part of the charm. *John Diliberto*



**Izzy Stradlin  
and The Ju Ju Hounds**

*Izzy Stradlin and The Ju Ju Hounds*  
GEFFEN GEFD-24490

Were this album by an unknown, it might not cause a stir—but emblazoned with the marquee name of Izzy Stradlin, it compels us to find out how well the Guns n’ Roses refugee has survived. And hey, he’s done quite well indeed. Stradlin sounds less like a child of Gn’R than a crossbreed of Sn’F—Stones and Faces—and it stands to reason, what with the nimble leads of one-time Georgia Satellite, now Ju Ju Hound guitarist Rick Richards, plus guest appearances by Ron Wood, Ian McLagan, and Nicky Hopkins. The material may not carry any rock of ages, but it’s sturdier than it would have been with a broken Axl, and a lot less hysterical (choose your meaning).

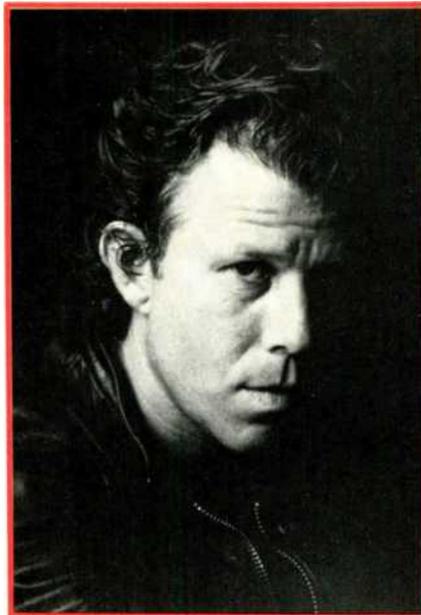
*Ken Richardson*



**Bone Machine**

*Tom Waits*  
ISLAND 314-512 580-2

Tom Waits always had a pretty bleak world outlook, but on *Bone Machine* he’s created the folk music of the post-apocalypse. Here’s a field recording from the bowels of the earth, capturing bare-bones instrumentation of sticks, piano, bass, and percussion that sounds like boxes and tin cans. Over this exposed and brilliantly calculated atmosphere, Waits’ patented drunken growl intones songs of despair, murder, and suicide that are ripped from



**Fragments of a Rainy Season**

*John Cale*  
HANNIBAL HNCD 1372

This 20-song acoustic program, recorded live in Europe in early 1992, serves admirably as a post-Velvet Underground career retrospective of this talented Welshman. John Cale is a probing songman who touches nerves deeply, as he demonstrates here in the romantic and melodic “A Child’s Christmas in Wales,” “Paris, 1919,” and “Buffalo Ballet.” “Guts” and “Fear (Is a Man’s Best Friend)” stand out for their edgy raggedness. Also included are an odd cover of “Heartbreak Hotel” and Cale’s trilogy based on Dylan Thomas poems.

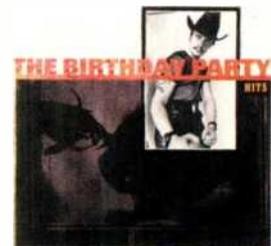
*Michael Tearson*



**Blue on Blonde**

*Jonathan Gregg  
and The Lonesome Debonaires*  
JAGDISC 007

New York City-based Jonathan Gregg and company play loud, Austin-style rave-up rock ‘n’ roll not unlike that of Joe Ely, John Hiatt, or Blue Rodeo. Yet for all of their excellent songs (there are plenty) and burning guitar (both Gregg and Michael McMahon count Vernon Reid among their fans), they still find that the N.Y.C. music industry prefers Pearl Jam clones and Nirvana-be’s. The homemade *Blue on Blonde* is Gregg’s solution to his “unsigned” dilemma. High points include the very funny



**Hits**  
*The Birthday Party*  
4AD 9 45087-2

Fueled by rebellion, dissonance, sloppy yet effective musicianship, and the apocalyptic vocals of Nick Cave, The Birthday Party was the rock ‘n’ roll *Sturm und Drang*

Photograph: Frederic Ohlinger

*Mike Bieber*

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**WHAT HITS LACKS IN HUMMABLE MELODIES, IT COMPENSATES FOR IN BEAUTIFUL, HAUNTING GUITAR-BASED NOISE.**

of post-punk London. Originating in Melbourne, Australia as The Boys Next Door, the band relocated to England in 1980 and spat out various EPs and LPs while attaining a sizable following on the strength of its live performances. Not many could tolerate The Birthday Party's free-form clamor—and the band certainly never *had* any hits, as the title of this 19-song compilation (and first domestic release) facetiously suggests. But what it lacked in hummable melodies, it more than compensated for in beautiful and haunting guitar-based noise.

*Mike Bieber*

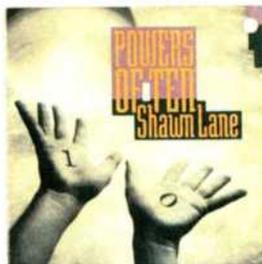


**Tubular Bells 2**

*Mike Oldfield*  
REPRISE 9 45041-2

"It's a sequel!" "No, it's a remake!" "You're both wrong: It's a sequel *and* a remake!" Which means that Mike Oldfield retraces his original work but inverts or otherwise cleverly rewrites each segment. So spectacular riffs are now different spectacular riffs, the guitars sounding like bagpipes are now the genuine P.D. Scots Pipe Band and Celtic Bevy Band, and Viv Stanshall's "mandolin" is now Alan Rickman's "Venetian effect." Ten minutes *longer* than the original but never tedious, the new work has an up-to-the-minute flavor (with help from co-producer Trevor Horn) yet stays true to the instrumental variety of the 1973 recording. Guarantee: Your cynicism will give way to joy over Oldfield's success at pulling this off with both humor and respect.

*Ken Richardson*

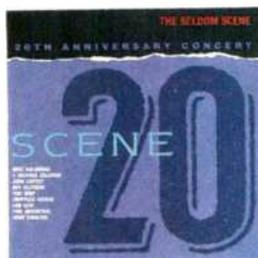


**Powers of Ten**

*Shawn Lane*  
WARNER BROS. 9 26621-2

Shawn Lane singlehandedly wrote, arranged, performed, engineered, and produced his solo debut (save for one track by Ray Gomez and occasional mixing help). Deftly covering styles that range from poetically flaring progressive virtuosity à la Eric Johnson to soaring, Allan Holdsworth-ian fusion and grandiloquent keyboard suites of Gershwin-esque impressionism, this formidable guitarist shows chops complemented by mature restraint and sophisticated compositional skills. The sound is big and symphonic, with Lane's artistry quite stunning.

*Michael Wright*



**Scene 20:**

**20th Anniversary Concert**  
*The Seldom Scene*  
SUGAR HILL SH-CD-2501/02

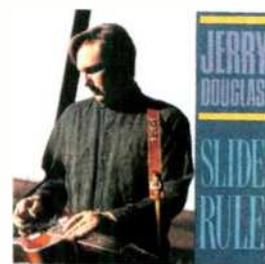
Each of the three incarnations of this great bluegrass group plays a set here, captured at the Birchmere, the band's home base in Alexandria, Virginia. The original (1971 to '77) and current ('86 to '92) Seldom Scenes are thrilling, but the middle lineup ('77 to '86), dominated by guitarist Phil Rosenthal's songs, is tedious. Old friend and one-time neighbor Emmylou Harris joins the original Scene for "Satan's Jeweled Crown." (Sugar Hill Records, P.O. Box 4040, Duke Station, Durham, N.C. 27706.)

*Michael Tearson*

**Hollywood Town Hall**  
*The Jayhawks*  
DEF AMERICAN 26929-2

The country-tinged rock of The Jayhawks is both ingenuous and unaggressive, usually comfortably laid-back in mid and slow tempos. But this just makes the band all the more likable, as it emphasizes the high-quality songwriting. *Hollywood Town Hall*, The Jayhawks' third album, is their first on a major label and certainly won't be their last. Keyboard support by both Benmont Tench and Nicky Hopkins is a plus.

*Michael Tearson*



**Slide Rule**

*Jerry Douglas*  
SUGAR HILL SH-CD-3797

Perhaps no slide Dobro guitarist has achieved the fluid artfulness of Jerry Douglas, and his virtuosity is amply heard on *Slide Rule*, a set that finds him returning to his bluegrass heritage. Douglas' band cooks throughout this exquisitely recorded session, although occasional vocals add a slightly uneven edge. *Slide Rule* is the kind of music that, especially when Douglas cuts loose, can send shivers up and down your spine.

*Michael Wright*

**Temporary Road**  
*John Gorka*  
HIGH STREET 10315-2

On his best album yet, John Gorka's sensitive songwriting remains a great strength, but he's not as customarily downbeat. The opener, "Looking Forward," sounds positively sunny! The album's energy level is also uncharacteristically high; even the slow numbers are performed with buoyant confidence. Key contributors include guitarists John Leventhal and Roy Rogers, vocalists Nanci Griffith and Cliff Eberhart, and bassist Michael Manring.

*Michael Tearson*

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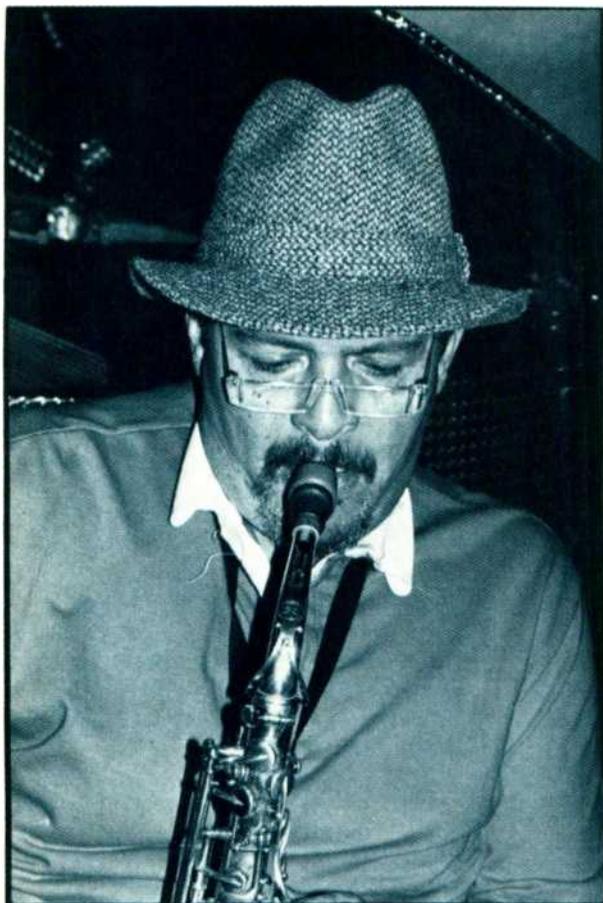
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# JAZZ ~ BLUES RECORDINGS



Photograph: ©David Cahr

## RHYTHM OF THE EARTH ..... JACKIE McLEAN

### Rhythm of the Earth

Jackie McLean  
ANTILLES 314 517 075-2,  
CD; DDD; 58:33  
Sound: A, Performance: A

In recordings he made as a 1960s modernist, alto saxophonist Jackie McLean benefited from engineer Rudy Van Gelder's better-than-live mix: McLean's acidic sound was distinct and centered wherever it probed, and his creative sidemen were always audible despite the intricate density of their excited syncopations.

So it goes with *Rhythm of the Earth* (originally released by French Polydor), McLean's third album since his reemergence a couple of years ago. He remains an improviser unharmed by the time he spent directing the jazz program at the University of Hartford's Hartt School of Music. Having debuted with Miles Davis in the '50s, McLean will probably never lose his edge of bluesy angst.

If McLean's younger band members aren't quite as tempered by experience, they nevertheless strive to tell a gritty story. Trumpeter Roy Hargrove sometimes overreaches, but his burnished tone and upwardly spiraling lines get hot before they burn out. Trombonist Steve Davis blows dark, burly, and rhythmic (like McLean's '60s 'boneman Granchan Moncur III). Vibraphonist Steve Nelson and pianist Alan Jay Parker lock in with bassist Nat Reeves and drummer Eric McPherson's emphatic propulsion so that not even the 15½-minute title track drags.

And yes, Van Gelder's at the board. The horns blend richly yet retain their singularities. McPherson's bass drum is *felt*, as is his crisp high-hat attack. Nelson's vibes resonate without muddying the pianist's chords. Consequently, one can listen deeply to the strata of interacting parts or track the solos on the surface while simply feeling the world shift underneath. Either way, given the no-nonsense integrity of this project and the "kids'" ability to help make something special of it all, it's great to have Jackie Mac back.

Howard Mandel



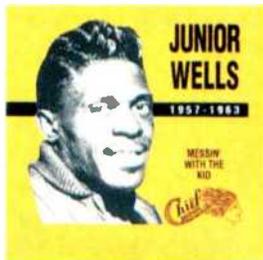
### Perfectly Frank Tony Bennett COLUMBIA CK 52965

Tony Bennett's voice is rich and true, slightly whiskered, aged in oak. And his interpretations here, sup-



ported by the silky sophistication of pianist Ralph Sharon's trio, are elegantly mature. These so-called "Torch and Saloon Songs of Sinatra"—24 of them in a program of 70+ minutes—are American standards that include "Night and Day," "The Lady Is a Tramp," and "One for My Baby." Bennett seems to live every turn of phrase by the likes of Porter, Gershwin, Rodgers, Mercer, and Arlen. Even with such keynotes in place, it's remarkable the singer so completely infuses warmth into an homage to the symbol of cool cynicism, the man Bennett calls "King of the Entertainment World." To be perfectly frank, forget about Sinatra and know that the monarch of lounge bel canto wears his crown too modestly.

Howard Mandel



**Messin' with the Kid**  
Junior Wells  
PAULA PCD03

Long before his passion decayed into mere posture as a foil for guitarist Buddy Guy, Junior Wells was one of Chicago's most popular bluesmen. When he recorded these 23 tracks (1957 to 1963), Wells was a virile, commanding singer in the Muddy Waters mold. Even better, he was an outstanding harp player who was Muddy's first choice to replace Little Walter in Muddy's band. Not surprisingly, these sides with Wells as bandleader rank among the finest early Chicago blues. "Little by Little," "Come on in This House," and the threatening title track are all recognized classics. Even the B-sides are memorable: When Wells bellows the pop trifle "I Need Me a Car," you know that he'll have one—and soon. His bands are first-rate, as shown by "Universal Rock," an instrumental that is one of guitarist Earl Hooker's undisputed claims to greatness. If you don't have these sides, get them. (Sue Records, P.O. Box 1125, Shreveport, La. 71163.)

Roy Greenberg



Photograph: Frank Lindner

**The Complete  
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Sonny Rollins  
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What can you say about Sonny Rollins, or about a seven-CD box set that compiles all of the fantastic, wonderful, unbelievable music he made for Prestige from 1949 through 1956? So much music, all great. And made with some of the best; alphabetically, Walter Bishop, Jr. to Julius Watkins, with 34 others in between. More than half of them deceased, though, and that's sad. I've listened to this material since I fell in love with jazz 20 years ago—hell, it *made* me fall in love with jazz! Pick any of the 90 cuts, and there it is—that silk-like, relentless, muscular, and melodic sound. More than 40 years after the start, the cat's still making great music.

Jon W. Poses

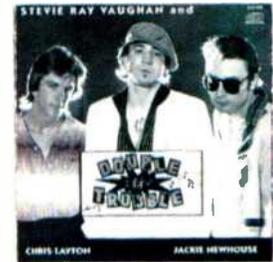


**Take One**  
T. S. Monk  
BLUE NOTE CDP 7 99614 2

The obvious headline for this one is "The Son Also Rises." T.S., son of Thelonious Sphere Monk, is a fully matured drummer

who has been playing funk, soul, and fusion for the past two decades. *Take One*, however, is an extremely hip album of straight-ahead jazz, the kind that would make Monk Sr. proud. The selections include a smattering of pieces by the elder Monk's contemporaries, such as Kenny Dorham ("Monaco"), Hank Mobley ("Infra-Rae"), and Elmo Hope ("Boa"). Also here are three Thelonious tunes, among them an interesting reading of "'Round Midnight." Only pianist Donald Brown's "Capetown Ambush" represents writing from the current realm. Working with pianist Ronnie Mathews, bassist James Genus, trumpeter/co-producer Don Sickler, tenorist Willie Williams, and altoist Bobby Porcelli, T.S. delivers a very creditable date. We'll have to see where "young" Monk goes from here.

Jon W. Poses



**In the Beginning**  
Stevie Ray Vaughan  
and Double Trouble  
EPIC EK 53168

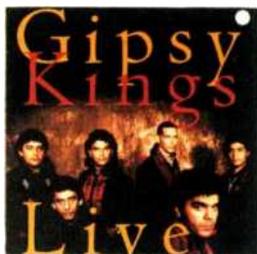
On the eighth day were created the guitar gods—like Stevie Ray Vaughan, who is captured here playing live over an Austin radio station in 1980, several years before hitting superstature. Unlike the juvenilia of many other stars, this is a mature performance packed with the throaty, jazz-inflected guitar sound and inspired, overpowering picking that sent 1983's *Texas Flood* blazing across the firmament. The original neck-wrenching boogie "Love Struck Baby" and the eight-minute chord-throttling jam on "Tin Pan Alley" make you want to shake your body at the compelling energy—and shake your head at the irresistible talent. Even the somewhat primitive sound of this two-track recording lends an air of authenticity and immediacy to these supernatural blues. This is essential stuff for fans of SRV, blues, and six-string histrionics.

Michael Wright

**MY HORNS OF PLENTY  
FEATURES COLEMAN  
ON TENOR, ALTO, AND  
SOPRANO SAXOPHONE.**

**My Horns of Plenty**  
George Coleman  
VERVE 314 511 922-2

George Coleman's association with pianist Harold Mabern dates to their shared Memphis childhoods, which might help explain why the pair's musical interaction seems to be ever-present on Coleman's *My Horns of Plenty*. The album features Coleman on resonant tenor ("Lush Life"), lyrical alto ("Old Folks"), and sometimes Coltrane-esque soprano ("Conrad"). In addition to Mabern, *My Horns of Plenty* includes top-flight bassist Ray Drummond and drummer Billy Higgins. Taken as a whole, this quartet demonstrates a great deal of diversity, showing a penchant for swinging hard on Coleman's "Conrad" or evoking sensitivity on "Lush Life," which opens with an enthralling three-minute Coleman/Mabern duet. *Jon W. Poses*



**Live**  
*Gipsy Kings*  
ELEKTRA MUSICIAN 9 61390-2

Having marched to an increasingly fluffier drummer of late, The Gipsy Kings bring back on *Live* some of the vitality that originally lit the fire of this pop flamenco ensemble. Hummable melodies that are wedded to acoustic guitar rasgueados with touches of keyboards and percussion still guide this dual-family unit, but the Arabic-blues inflections in Nicolas Reyes' gravelly vocals return to prominence while the edge



Photograph: ©David Gahr

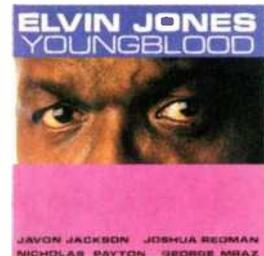
of improvisation infuses the guitars with warm energy. Mostly featuring songs from previous albums, this set is fairly well recorded given the difficulties taping acoustic instruments in large venues; expect a bit too much audience participation but an otherwise compelling nouveau-flamenco experience. *Michael Wright*



**The Complete Blue Note Recordings  
of Art Blakey's 1960 Jazz Messengers**  
MOSAIC 141

Art Blakey's 1960 and 1961 unit—featuring trumpeter Lee Morgan, saxophonist Wayne Shorter, pianist Bobby Timmons, and bassist Jymie Merritt—is arguably the best of the many incarnations of Jazz Messengers that have graduated from this institution in its 35-year existence. The playing of this particular quintet is the epitome of hard-bop. On Timmons' "Dat Dere," the musicians define the meaning of soulful, with Blakey's steadiness and familiar tomtom sound driving them all the while. As with all of its sets, Mosaic takes the completist approach, which makes this seven-CD collection so much more impressive.

Listened to as a whole, it stresses the obvious point that the "Marsalis Gang" and others holding forth in today's straight-ahead bag still have a way to go. (Mosaic Records, 35 Melrose Pl., Stamford, Conn. 06902.) *Jon W. Poses*



**Youngblood**  
Elvin Jones  
ENJA ENJ-7051-2

This piano-less, three-horn quintet date is exquisite and invigorating. Elvin Jones fills *Youngblood* with dynamic passages, many that hold excitingly unpredictable twists and turns. It's quite serious in tone, jarring at points, and there's no escaping the fact that the newest generation of jazz musicians has arrived—here in the persons of tenor saxophonists Javon Jackson and Joshua Redman and still-teenaged trumpeter Nicholas Peyton. Bassist George Mraz has never sounded so deliciously free, seeming quite comfortable in the leader's rigorous framework. As for Jones, his drumming sounds so big, so full of energy, so up-to-the-minute, it's scary.

*Jon W. Poses*

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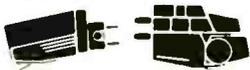
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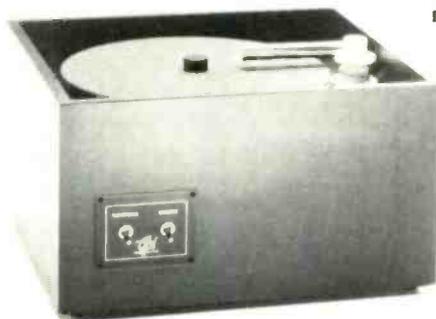
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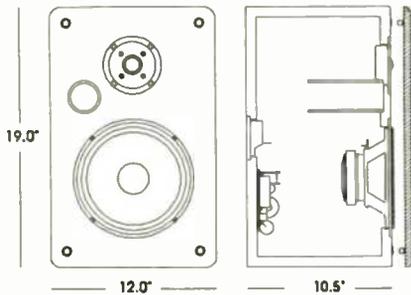
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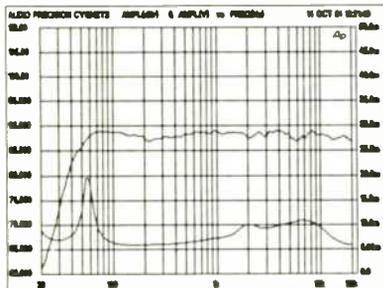
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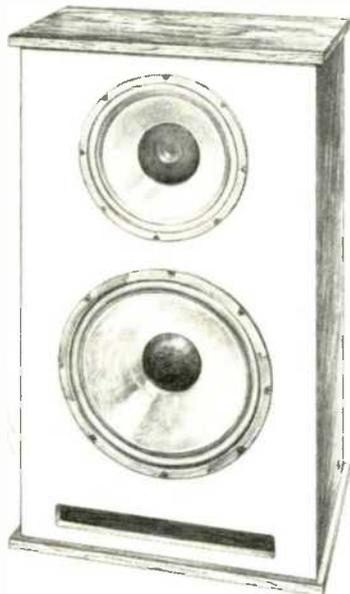
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