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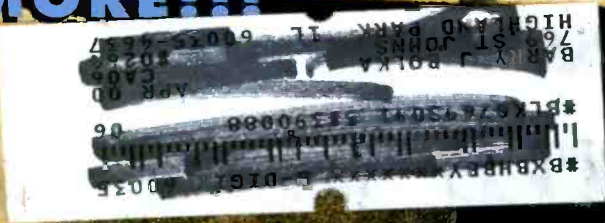
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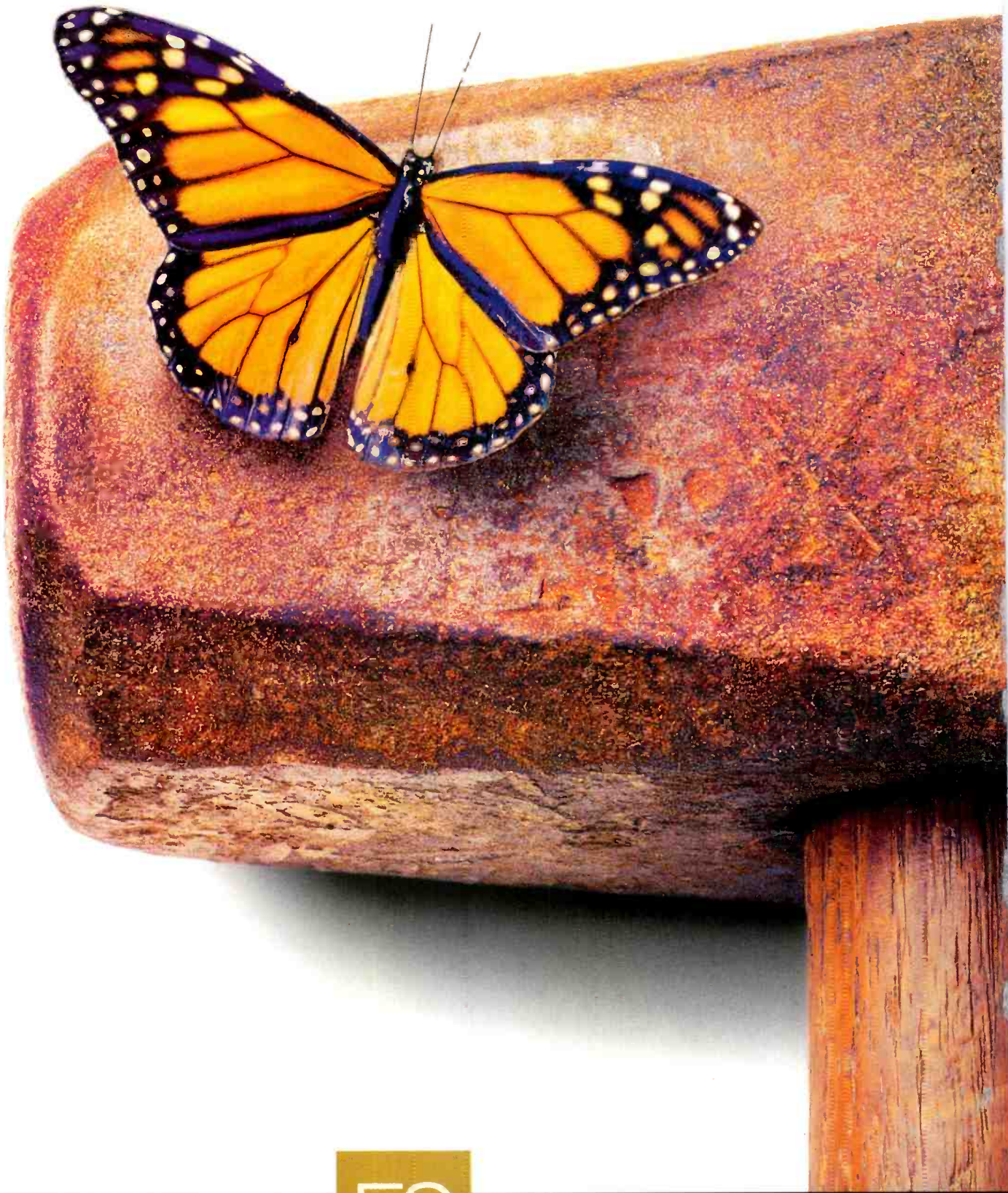
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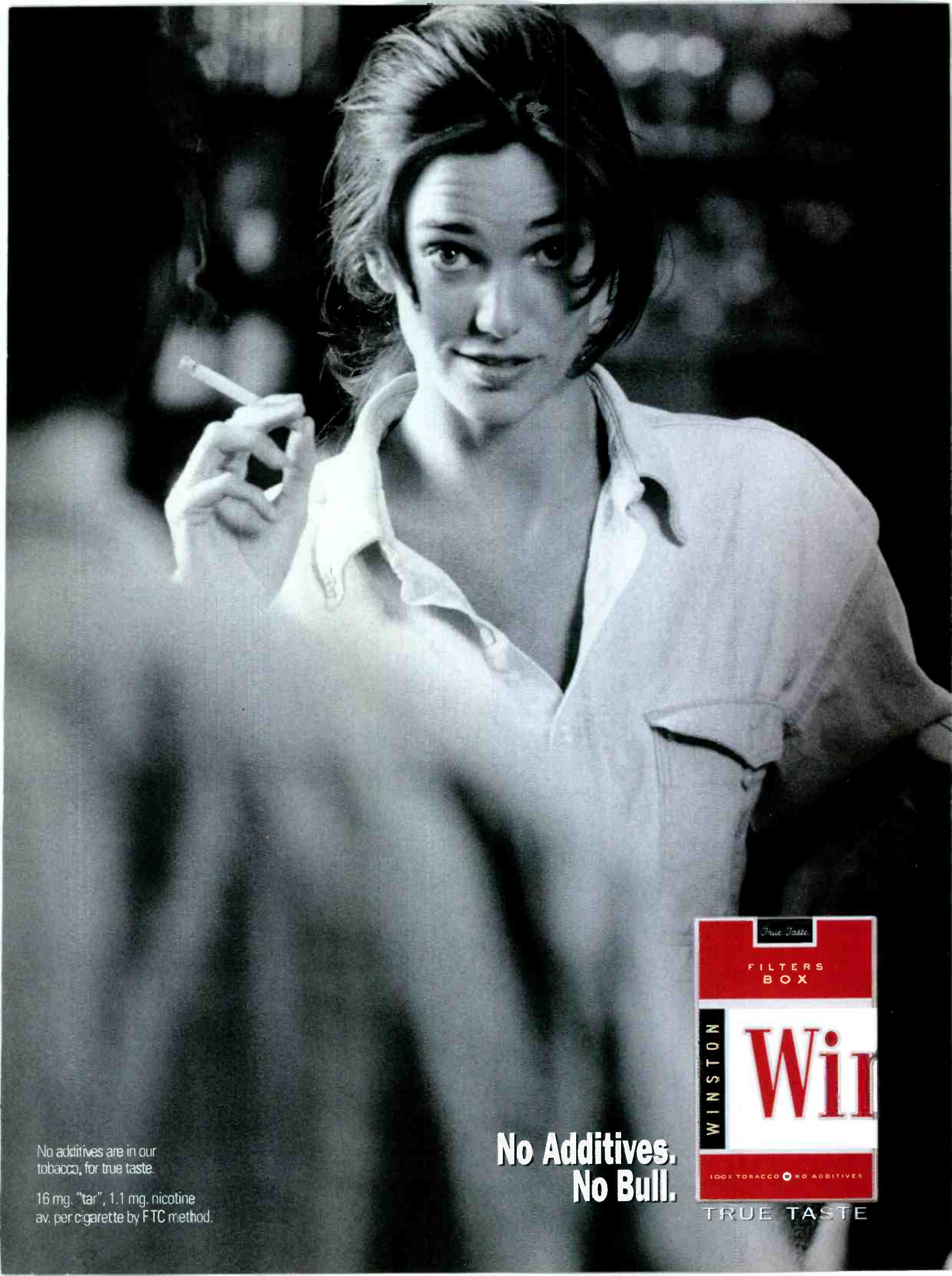
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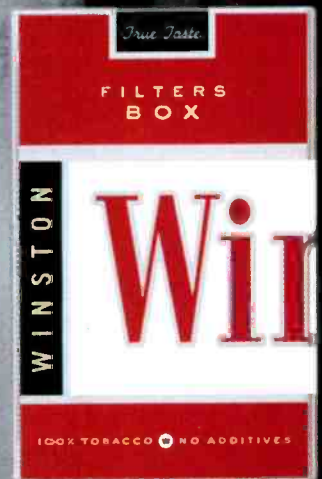




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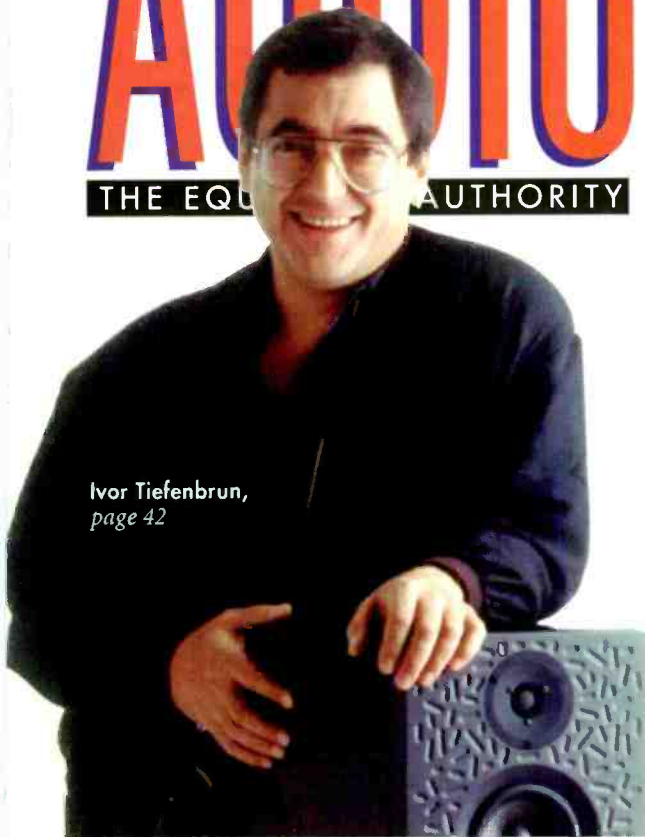
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PLAYBACK

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Here we are, just 12 months from the year that will pivot us out of the 20th century and into the 21st. Not even Dick Clark will be talking about hi-fi next New Year's Eve, but I think, fittingly, we will be wrapping up a period of furious innovation and entering one of consolidation. Which is probably a good thing. A lot has happened over the past few years; most of us could use a little time to digest all the changes.

This year will bring the transition from analog to digital media, which began nearly 20 years ago with the Compact Disc, to the doorstep of completion. The most obvious harbinger, the start of digital television (DTV) broadcasting, occurred a couple of months ago. But there are other signs. The number of digital inputs on a preamp is fast becoming more important than the number of analog inputs. CD-R and MiniDisc have overtaken the venerable Compact Cassette among performance-oriented home recordists. And DVD is becoming a mainstream A/V format, fast supplanting the (analog-video) laserdisc and perhaps eventually the (analog-everything) videocassette, as well.

This year the last major pieces (except for digital radio) should fall into place: the advanced IEEE-1394, or FireWire, digital interface (see "Hot-Wiring Your Hi-Fi" in the November 1998 issue) and a high-performance multichannel successor to the CD. The latter could be DVD-Audio or the Sony/Philips Super Audio CD, though DVD-Audio seems likely to have the lead in both hardware and software support out of the gate. Either way, the connection of choice eventually will be FireWire to the same digital preamp/processor that will be routing and converting the signals from all your other audio and A/V components.

Last month I talked almost entirely about the dark, political side of what's going on with DVD-Audio, but essentially all of the other news about the format is good. By the time you read this, there should be a firm standard in place, and

everyone's efforts will be directed toward getting the necessary hardware and software into production. Nobody will commit to a solid launch date, at least not yet. However, the goal seems to be second or third quarter of this year, perhaps within just a few months.

It will be wonderful to have at long last a broadly supported, no-compromise, music-oriented multichannel audio format. I have never met anyone who has experienced really good multichannel music reproduction in his own home who has wanted to go back to two-channel. We shouldn't have to put on a movie to get the most exciting and realistic sound available.

Will DVD-Audio (or Super Audio CD) eventually supplant CD? Or will it be just a niche format or even an outright failure? I don't know. Except perhaps in terms of album art, CD was better in every respect than the format it replaced so quickly. Neither of its presumptive heirs has an advantage that large. With respect to durability, portability, and general convenience, the various 12-centimeter disc formats are all about on par with one another. The new guys will have to compete almost entirely on sound and features, where they will hold the advantage. DVD-Audio has some really nifty navigational features—enabling you to cue by song lyric, for example. The new formats *should* beat CD handily on sound, too. Still, it's at least as easy to muck up a five-channel recording as a two-channel one, and few producers, engineers, or artists have much experience yet with multichannel. We'll have to hope for the best on that.

So here's to a great new year for audiophiles everywhere. May fortune smile upon us as we clamber toward the next millennium.



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LETTERS

I Love You, You Love Me...

As someone with a publishing byline, I would normally not write a letter to a magazine similar to our online *TNT-Audio*. In this case, however, I feel rather angered by comments in a letter from Dr. Barney Vincelette that you published in your July 1998 issue. In his letter, Vincelette asserted that "These excessively loud 'alternatives' and those who listen to them are not important enough to consider in defining transparent sound reproduction." Later on in his letter, he describes those who listen to "alternative" (read, nonclassical) forms of music as "drunk or otherwise drugged to the degree that they do not hear distortion."

Vincelette does not seem to understand that by defining "music" as only classical music originating in the Western world, and by proposing to set standards applying worldwide, he is both intolerant and racist. Many cultures have their own forms of music. To set the white man's music as the standard, he ignores the vast majority of people alive today.

By declaring anything he does not like as possessing no artistic content, Vincelette verges on taking the same approach to art that was taken in Nazi Germany and the former Communist countries in Eastern Europe. (I am from the former East Germany.) Anything not to the liking of some individuals was declared "un-German," "anticonnunist," or "decadent" and promptly banned. However, I'm sure none of these complaints will convince a learned man like Vincelette that his position is wrong, so here is another thought: Classical music now makes up less than 10% of the music sold in the world. Most current classical releases are lucky to break even, never mind making a profit. Without the profits from the sales of "alternative" forms of music, record labels would not be able to release classical music.

So maybe Vincelette should consider allowing the majority to set the standard according to their want (as is the usual approach in democracies) and simply show some tolerance to those that show enough

tolerance to keep what he defines as music alive.

For the record, I listen to all types of music, mainly on vinyl, with a 12-watt/channel single-ended amp and efficient speakers that allow me volumes in excess of 105 dB. And I'm not regularly drunk or otherwise drugged (but am rather fond of single-malt whiskey and Irish stout). *Thorsten Loesch*
London, England

Erase the Video

Although I enjoy *Audio* very much and keep all of the issues, lately there has been an influx of video information that dilutes the purpose of the publication. As a video professional, I know of a number of video publications. So why is there so much video in *Audio*?

In the last issue, the rock music review section was missing—probably by the space taken over by video. *Horia Patrascu*
via e-mail

Editor's Reply: With rare exceptions, we do not cover video on its own, but only insofar as it connects with audio through home theater, which has become a very important element of the audio scene. It would be a bit silly, after all, to review a DVD player without saying anything about its video performance. The absence of rock music reviews for the issue you mention was a result of space constraints in general rather than anything having specifically to do with video coverage. We often do not have room to run all four of our regular software review sections, so we rotate among them when necessary.—*M.R.*

Save the Music!

My subscription to *Audio* is useful to my son-in-law, who is in the forefront of the digital video/audio revolution with his own business, but not that useful to me. I am struggling with mammoth collections of classical music, opera, big band, American musical theater, and old radio on vinyl LP plus open-reel tape and audio cassette recordings. The prime mover here is the

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music, because it would be impossible and improbable to have all of this available on Compact Disc.

There must be a lot of us “dinosaurs” throughout the United States—I can’t be the only one. But I’m the only one I know with three turntables, two open-reel recorders, and one dual-well cassette deck. I have also segued into a huge collection of videotapes. Again, the material is old, from the heyday of the motion picture industry’s studio system.

We collectors should have a club of our own! Our collections will die with us when all of us “Depression babies” have passed away. Our children have different musical tastes and couldn’t care less about our ancient stuff.

I’ve never seen a letter like this in any magazine devoted to preserving the “sound of music” in America. So what’s the answer? Surely I’m not the only woman who, when attending her first opera at the age of 12 and expecting to hear the music of Tchaikovsky (since the opera was *Romeo et Juliette*), felt initial disappointment but then elation as Bidú Sayao and Jussi Bjoerling started singing.

*Marjorie Beckmann
City of Industry, Cal.*

Born Again

I was somewhat irritated when I read Eric Buschvia’s letter in the September 1998 issue. He states, “The only components that have been shown to make clearly audible differences are speakers and room acoustics.” He also insists that all of the remaining components of an audio system have no real sound of their own. Arggg! After some thought, I calmed down and surmised that Buschvia probably has not spent much time investigating the validity of his claims or has not visited the showrooms of stereo dealers who love what they do and take the time to put together systems that reach the pinnacle of high end.

A few years back, I felt somewhat the same as Buschvia. I had read many articles that substantiated his views. As I was meandering through one of my favorite audio stores, I noticed a pair of cables sitting on a shelf and commented to the salesman that these cables were a waste of money and that decent zipcord is all a person needs. He suggested that I take the cables home and try them out. I did just that and was amazed at

the difference I heard. My curiosity was piqued at that point. I went on to try different amps, preamps, tubes, DACs, interconnects, cables, and speakers. I found that some of them sounded very much the same, whereas others simply astounded me. Trust me when I say that I was a cynic throughout this entire process.

Most of the audio stores I visited did not take the time to carefully set up or match their components, so the sound I heard was good but, like Buschvia said, much the same. However, a few stores had systems that, to this day, I still dream about. One of them produced a soundstage so real that I actually got up and looked behind this very large loudspeaker to see who was back there, only to realize that what I heard was in the recording. I was floored! I couldn’t detect that the sound was coming from the speakers in front of me. What I heard was every instrument and every voice—separate and distinct—each placed in a three-dimensional space. This system, like a few others I have listened to, had no sound of its own; it just sounded real!

I came to realize that components work synergistically with each other. There is no perfect cable, interconnect, or component. You can buy what you believe to be the best available and then find that a lesser system sounds better. The difference is the way these pieces work together. That’s the most difficult part of building a dream system, trying to find this synergy without spending money on the wrong pieces. Another thing is that if you can’t hear these differences between your components, then perhaps your loudspeakers do not have the necessary resolution. Buschvia was right about speakers: They are the starting point. No system can be any better than its speakers. You would be amazed how the same speaker will sound with the right versus the wrong equipment.

I now regret that I ever listened to those “everything sounds the same” advocates. I wasted a lot of time and money over the years because I didn’t go out and listen for myself.

*Steven A. Surprenant
Bourbonnais, Ill.*

Up with Auricles

I disagree with reader Eric Buschvia who, in his September letter, advocates the elimination of “Auricles” from the pages of *Au-*

dio. Those reviews, particularly with Tony Cordesman’s high credibility and remarkable gifts at describing what he is hearing, feature some of the best audio writing today.

For example, Cordesman’s September 1998 review of the Martin-Logan CLS IIz was on target in describing these speakers and their sound. I, too, am fixated on planar electrostatics, but I could not afford KLH 9s in the late ’50s or early ’60s. I have owned CLSs for 12 years, from their introduction through successive upgrades to their current IIz form, and I share Cordesman’s enthusiasm for this classic speaker. His caveats, such as taking care to match the speaker with active crossovers and subwoofers, I know from experience.

Concerning equipment reviews, there seems to be two religions in the world of audiophilia: the objective scientist approach and the subjectivist school of the so-called “underground” audiophile magazines. For me, the essence of the problem is communicating accurately to the reader what a given component sounds like (since I disagree with Buschvia that only speakers and rooms have a sound of their own). Some writers communicate extremely well in *Audio*, providing extensive charts and graphs of a component’s measurements and a short subjective commentary at the end. Others, like Cordesman, do this purely in English, without the charts and graphs.

But does a review have to contain charts and graphs to communicate accurately how a component sounds? Put another way, just because a review contains measurements, charts, and graphs, is it an accurate description of a component’s sound? The answer to both questions is no, but the subjective reviewer must overcome many pitfalls where properly conducted objective measurements will not bail him out, such as listening bias, lack of level matching, incomplete testing, lack of adequate reference standards, etc. I agree with Buschvia that many of the subjectivist hi-fi magazines fall into these and other traps. But I still subscribe to many of them because of their coverage of the high end and music.

The key word for me is credibility. *Audio* is about as good as it gets in this department, and Cordesman is one of the best at maintaining the credibility and integrity of his reviews.

*Carl J. Weber
Philadelphia, Pa.*

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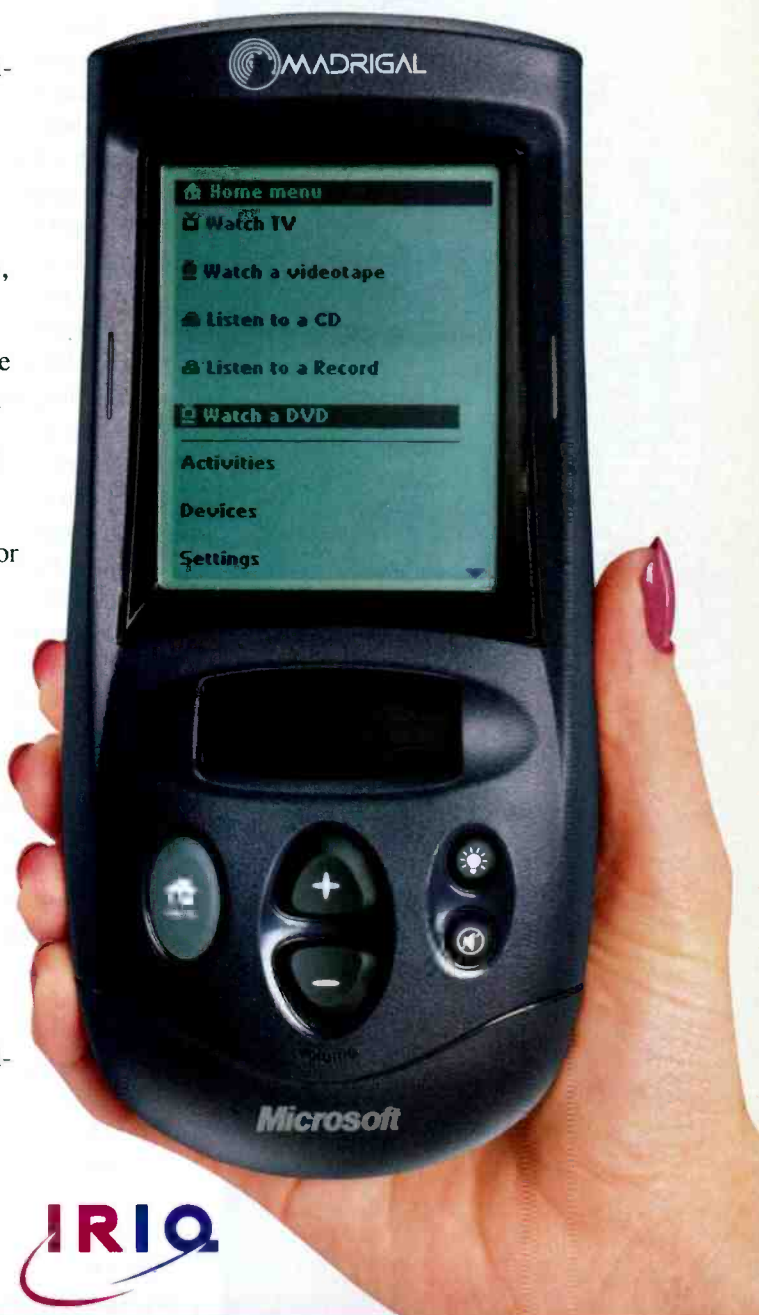
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Northampton Audio; Northampton Pittsfield Radio; Pittsfield.
MD- Gramophone; Baltimore Elicott City Myer-Emco; Gaithersburg,
Beltsville Rockville Soundscape; Baltimore.
MI- Contemporary Audio; Okemos Pecar's (Detroit) Troy.
Classical Jazz Holland Sound North; Iron Min. Stereo Center FRAV;
Flint Court St. Listening Room; Saginaw.
MN- Audio King; Minneapolis & Suburbs Rochester, St. Cloud.
Audio Designs; Winona.
MO- Independence A/V; Independence RMS; Springfield.
Sound Central; St Louis.
MS- Ideal Acoustics; Starkville McLelland TV; Hattiesburg.
Players A/V; Ridgeland.
MT- Rocky Mt. Hi Fi; Great Falls.
NC- Audio Video Systems; Charlotte Audio Visions; Wilmington.
Kelly's Home Center; Fayetteville Now Audio Video; Durham,
Greensboro Raleigh Winston Salem Tri City Electronics; Conover.
NE- Custom Electronics; Omaha Lincoln.
NH- Cookin'; Nashua Manchester Newington Salem S. Nashua.
NY- Camera and TV Stop; Medford Egg Harbor Monmouth Stereo;
Shrewsbury Woodbridge Stereo; West Caldwell Woodbridge.
NJ- Ultimate Elect.; Albuquerque Sound Ideas; Albuquerque.
NV- Ultimate Elect.; Las Vegas.
NY- Audio Breakthroughs; Manhasset Audio Den; Lake Grove.
Clark Music; Albany Syracuse Stereo Exchange; Manhattan.
Hart Elect.; Vestal Listening Room; Scarsdale Media Room; Mt.
Kisco Park Ave. Audio; Manhattan Rowe Camera; Rochester.
Speaker Shop; Amherst.
OH- Absolute Theater; Powell Audio Craft; Akron Cleveland.
Mayfield Hts.; Westlake Audio Etc.; Dayton Belden Audio; Canton.
Classic Stereo; Lima Ohio Valley Audio; Cincinnati Paragon Sound;
Toledo Stereo Visions; Columbus Threshold Audio; Heath.
Unique Home System; Cincinnati.
OK- Audio Dimensions; Oklahoma City Photo World; Stillwater,
Shawnee Ultimate Electronics; Tulsa.
OR- Bradford's HiFi; Eugene Kelly's Home Cir.; Salem.
Magnolia HiFi; (Portland) Beaverton Clackamas Stereo Plant; Bend.
PA- Audio Junction; Pittsburgh Audio Lab; Fairless Hills Gary's Elect.;
State College GNT Stereo; Lancaster Hart Elect.; Blakely.
Hi Fi House; Abington Broomall, Camp Hill Harrisburg.
Listening Post; Pittsburgh Palmer Audio; Allentown Stereo Shoppe;
Selinsgrove Williamsport Stereoland; Natrona Heights.
The StereoShop; Greensburg.
RI- Stereo Discount Cir.; Providence.
SC- Custom Theater & Audio; Myrtle Beach Music Masters;
Greenwood Upstairs Audio; Columbia.
SD- Audio King; Sioux Falls Sound Pro; Rapid City.
TN- College HiFi; Chattanooga Hi Fi Buys; Nashville Now Audio Video;
Knoxville Modern Music; Memphis Sound Room; Johnson City.
TX- Home Entertainment; Dallas Houston Plano Audio Tech; Temple.
Audio Video; College Station Bunkley's Sound Systems; Abilene.
Bjorn's; San Antonio High Fidelity; Austin Krystal Clear; Dallas.
Marvin Electronics; Ft. Worth Sound Box; San Angelo.
Sound Quest; El Paso.
UT- AudioWorks; Salt Lake City Stokes Bros.; Logan Ultimate Elect.;
Layton Murray Orem; Salt Lake City.
VA- Myer-Emco; Falls Church Tyson's Corner Fairfax Audio Connection;
Virginia Beach Audiotronics; Roanoke Home Media Store; Richmond.
WA- Bunch-Finegan TV; Kennewick Magnolia HiFi; Seattle & Suburbs.
Tacoma Silverdale Spokane Pacific Sight & Sound; Wenatchee.
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Stereoland Windsor Treble Clef Ottawa.
Mexico- Contact Grupo Volumen; Mexico City.

AUDIO CLINIC

JOSEPH GIOVANELLI

Saving an Old Mac

Q How can I preserve my 20-year-old McIntosh tube stereo receiver? My dad used it for eight years, I used it for seven, and it was originally second-hand. I love its sound, but I fear that eventually it will die. I use it three or four hours a day, and, after turning it off, I cover it with a cloth to keep dust out.—Robert Bianchi, via e-mail

A There is very little you can do to prolong the useful life of your receiver beyond keeping it clean. If your environment is very dusty, keep the tubes free of dust, especially the output tubes. Although I have no real proof of it, it has always seemed to me that dust restricts the radiation of heat from the tubes. Given the high price of output tubes, anything you can do to prolong their life would be worthwhile. And be sure to check the bias settings and balance on the output stages. This will also help prolong tube life, including that of the rectifier.

Eventually the electrolytic capacitors will decrease in capacitance, and low-frequency response will suffer. Subsequently you will hear some hum, as filtering becomes poor. As capacitors deteriorate still further, the receiver may become unstable and begin to oscillate, or "motorboat."

As for that cloth, I suggest that you cover the receiver only after its tubes have cooled.

DAT Running Times

Q When I record on 120-meter audio DATs, I get two hours of recording time at a sampling rate of 44.1 or 48 kHz or four hours of recording time at 32 kHz. But when I tried a 120-meter computer DAT, a Sony DGD-120M DDS2, I got twice my normal recording time. How is this possible? And can I safely use the computer tape in my DAT deck?—Antonio Hernandez, via e-mail

A The numbers on audio DATs stand for minutes of recording time rather than length, just as they do on analog audio cassettes. (A C-120 cassette or a D-120 DAT will each hold two hours of normal recording. The normal tape speed for DAT recording is 8.15 millimeters per second; this cor-

responds to 489 millimeters per minute, or 58.7 meters in two hours.) But the DDS2 tapes I found in my local computer store were sold by length, and the 120-meter computer DATs I bought can carry four hours of audio at normal sampling rates, twice what D-120 audio DATs do. (They also cost about twice as much.)

I can't see where it would hurt anything to use the Sony computer tape. My guess is that it's intended for computer backup, an application that requires stringent quality control to avoid dropouts and loss of data. Thus, this tape should be of even higher quality than audio DATs. From what I've seen, computer DATs are safe to use in audio decks, though their thinner substrates might lead them to stretch when wound rapidly. Stretching would be most likely in "renumber" mode, which stresses the tape more than other operations do.

Is Smaller Louder?

Q How can a 50-watt amplifier play louder than one rated at 100 watts when everything else remains constant? A salesman told me that the 50-watt amp he was demonstrating sounded louder because it produced less intermodulation (IM) distortion—and hence was cleaner—than the 100-watter (which, by the way, was also less expensive). Is this plausible? And is transient intermodulation distortion (TIM) the same as IM distortion? If not, can each play a role here?—Brian Jacobs, Brewer, Maine

A If everything is really equal except for power output, the 100-watt amp will play louder than the 50-watter. The difference in power represents only 3 dB, which most listeners describe as "slightly louder." Of course, everything is not equal: In your example, the amplifier having the higher

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

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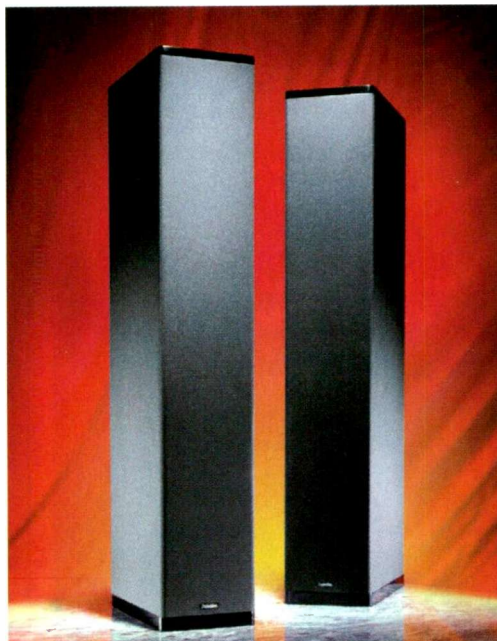
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power output apparently didn't sound as loud as the lower-powered amp. The most likely reason for that, however, would be that the lower-powered amp had higher gain and thus produced more output for a given volume setting. The power difference affects only *maximum* output level, which is difficult (and unpleasant) to judge by ear. It is possible that an amp rated at 50 watts into 8 ohms could play louder than an amp rated at 100 watts into 8 ohms under certain circumstances, depending on the designs of the amps and the impedance of the

loudspeakers, but I doubt that was a factor in your case.

TIM is a particular type of IM distortion. IM distortion results when two different tones or frequencies fed into an amplifier combine to form a third tone that is not present in the input signal. This added tone is intermodulation distortion. It is measured as a percentage of the total signal, and it is constant for any given power output and any given pair of frequencies. Transient intermodulation distortion, which is rare, occurs when the input signal requires the

output to change faster than the amplifier can respond.

Cassette Deck Blues

Q My tape deck is a three-head, single-well model that has Dolby S noise reduction, manual bias and record level controls, and a test-tone generator. When I tried dubbing from a MiniDisc recorder to this tape deck, I found that some of the tapes lacked crispness but sounded better if I pressed the tape-compartment door during playback. I resent such cheapola behavior from a quality deck, but I'm also puzzled by it. If I can get good highs by pressing the tape door during playback, then the deck must have recorded those highs properly. So why can't it play them back that way? The recording and the playback gaps are on the same head assembly, so azimuth should not be a problem. Is there anything I can do to get the best sound out of my cassettes?—Eric Wong, via e-mail

A Frankly, I'm as puzzled as you about this. I can, however, cite several things that can cause high-frequency loss.

The variations in frequency response you described probably mean that the tape is not running properly through its intended path. This can be the result of dirty pinch rollers, capstans, and heads. If you have been cleaning them regularly and the problem persists, you may need to replace the pinch roller. A worn roller can cause the tape to squeeze out of its path, skewing azimuth. It can happen during recording or playback. Therefore, some tapes may never play correctly, even on a machine that is running properly.

You may discover that the thinner the base material of the tape you use, the worse this problem becomes. For serious work, C-90 cassettes are about the thinnest tapes I recommend.

Another potential source of your trouble is too much or too little tension, especially on the deck's take-up spindle. The supply spindle is usually not a consideration in this instance.

It is also possible that you have used this deck so much that the heads are worn. If they are no longer square against the tape, the tape may tend to wander. If the heads are not worn out, it may be that the mounting has been misadjusted. Great care must be exercised when adjusting tape heads.

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VCR Purring Noise

Q With commercial tapes, my VHS Hi-Fi VCR often produces a fluttering, purring noise that I hear from my speakers during dialog sequences, when nothing else is on the soundtrack. The tapes I record myself don't have this problem. I tried using the tracking control on prerecorded tapes, but the noise went away only when the audio output was switched to mono. I've tried different speakers and amps, but that hasn't helped. What's wrong?—Josiah Thorne, via e-mail

A The fluttering noise is a rather common condition with VHS Hi-Fi VCRs. It results from switching problems between the two Hi-Fi play heads on the video head drum.

There are several things you can do to remedy this. Check that the video drum and the heads are clean. Oxide that sheds from tapes can clog the tiny gap in the video heads and produce less than perfect contact between the moving heads and the tape passing over them. Oxide on the head drum will tend to lift the tape from the drum and reduce the penetration of the head into the tape. And the oxide buildup

may scratch the surface of the tape as it passes over the drum. The heads (video and audio) are almost flush with the drum's surface, so the drum must be kept very clean.

The reason why some tapes play fine even when the drum needs cleaning is that some tapes are recorded with greater signal penetration than others and hence play okay. Eventually they won't.

Your machine's tracking accuracy may not be acceptable. The tapes you record yourself play fine because they are recorded and reproduced with the same tracking errors. But if you adjust the tracking so that correctly recorded tapes play fine, your own recordings may not play properly.

To isolate the problem, borrow a standard test tape from a good video service shop. If you find that you must readjust your VCR's tracking, make copies of your favorite videotapes on a machine that is working properly in *all* respects. Now you can have a video technician recalibrate your VCR's tracking. If you're technically proficient, you can even do it yourself, using a videotape that is known to be good. In

other words, use a videotape that has been recorded on a perfectly adjusted VCR. Likewise, the tape itself must be pristine: straight-edged and free of wrinkles. After making sure that your VCR's tracking control is at its mid-position, adjust the tracking position of the *internal* control head, using the cam on which that head rests (the cam is inside the VCR). If your VCR has automatic electronic tracking, override it so the action of the control is centered between the two ends of its range.

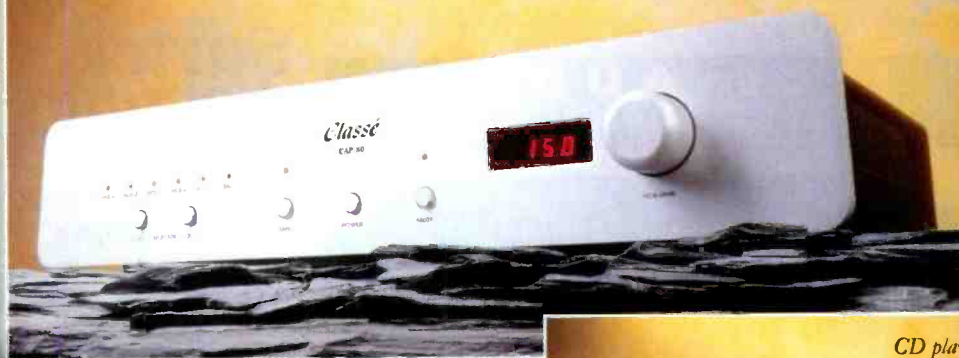
Another fault that can trigger head-switching noise is incorrect positioning of the tape guides that steer the tape as it passes over the spinning head drum. When the guide height is wrong, correctly recorded tapes don't play well because the envelope switching points are not aligned with the heads, thus preventing a seamless transition between them. Readjust the tape guides by using an appropriate test tape that's in good condition.

One last possible explanation for your difficulties is that some of the offending videotapes may have been recorded with too little record-head current. **A**

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WHAT'S NEW

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There's nothing like the orange glow of the SQ-38s amp's tube filaments to kindle the fires of nostalgia in audiophiles. This Class-AB amp is rated at 30 continuous watts per channel into 6 ohms, from 20 Hz to 20 kHz, with THD of 0.5%. Features include three line-level inputs, a CD input, a phono preamp, a tape monitor loop, a line-straight bypass switch, and bass, treble, balance, and volume controls. Price: \$3,500. (Luxman Electronics, 612/333-1150)

LAMM MONO AMP



A single-ended, Class-A tube design using a regulated, high-current power supply, the ML2 is said to re-create the original spectral balance and harmonic structure of recorded music quite accurately. Output power is rated at 18 watts into loads of

16, 8, or 4 ohms, from 20 Hz to 20 kHz, with no more than 3% THD; THD at 1 watt is specified at 0.7%. You can measure and adjust the output tubes' plate voltage and current through two holes in the chassis. Price: \$14,645 each. (Lamm, 718/368-0181)

SIMAUDIO PREAMP

Because it contains no coupling capacitors, the single-ended, Class-A P-5 preamp is said to have an extremely short signal path. Moreover, at any gain setting, the signal passes through only one metal-film resistor. The P-5 has six inputs (one balanced) plus balanced and unbalanced outputs. A phono stage is optional. Frequency response is rated at 20 Hz to 20 kHz, ± 0.1 dB, and THD at 0.05%. An external power supply and a remote control are included. Price: \$3,995. (SimAudio, 450/445-0032)



TICE AUDIO AC POWER CONDITIONER



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high-current circuits (totaling 1,875 watts) for power amps and three 300-watt circuits for source components. Six-point spike and surge protection is provided, as is low-noise filtration for each of five outlet groups. Price: \$1,499. (Tice Audio, 561/575-7577)

Sovtek Vacuum Tube

Modeled after the vintage RCA 6L6GC "backplate" tube, the 6L6WXT+ has a larger plate, and its improved grid structure is said to increase power handling. Mica spacers and metal springs are used to reduce tube rattle and microphonics. Sovtek claims this tube delivers better tone and performance than a 6L6 or a KT66. The 6L6WXT+ is also said to yield 20% higher output than the Sovtek 5881WXT. Price: \$22. (Sovtek, c/o New Sensor, 800/633-5477)

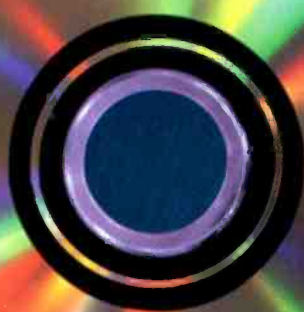




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MTX Car Stereo Amp

Claimed to remain stable even into 0.5-ohm multiple-subwoofer loads, the Thunder 225HO is intended for those who want clean performance in their cars at bone-crushing SPLs. Output power is rated at 200 watts per channel into 0.5 ohm at 0.5% THD, 100 watts per channel into 1 ohm at 0.3% THD, and 50 watts per channel into 2 ohms at 0.1% THD. S/N ratio is pegged at 110 dB, A-weighted, with frequency response specified at 20 Hz to 20 kHz, ± 0.25 dB. Price: \$579.95. (MTX, 800/225-5689)



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The modular nature of Synergy System cabinets enables you to connect them easily, to stack them on top of each other (with vertical extenders), and to place them side by side (with bridging shelves or peninsulas). Tops and bases are available in American cherry or dark walnut with satin aluminum or matte black pillars;

side panels are available in various finishes. Options include wheels, casters, storage drawers, polished aluminum feet, and wood-framed doors with panels of frosted glass or perforated steel. Prices: tower shown, from \$965; TV stand shown, from \$830. (Salamander Designs, 800/206-5658)



Bose Home Theater Speakers

The Acoustimass 15 comprises a powered bass module and five double-cube speakers. Bose says that although the cubes are 40% smaller than their predecessors, their new magnetic structure, larger voice coils, and long-excursion drivers enable them

to deliver greater acoustic output. The powered woofer module performs bass extraction and summation for as many as six channels and will directly accept the sub output from a Dolby Digital (AC-3) receiver. Price: \$1,399 per system, in black or white. (Bose, 800/444-2673)

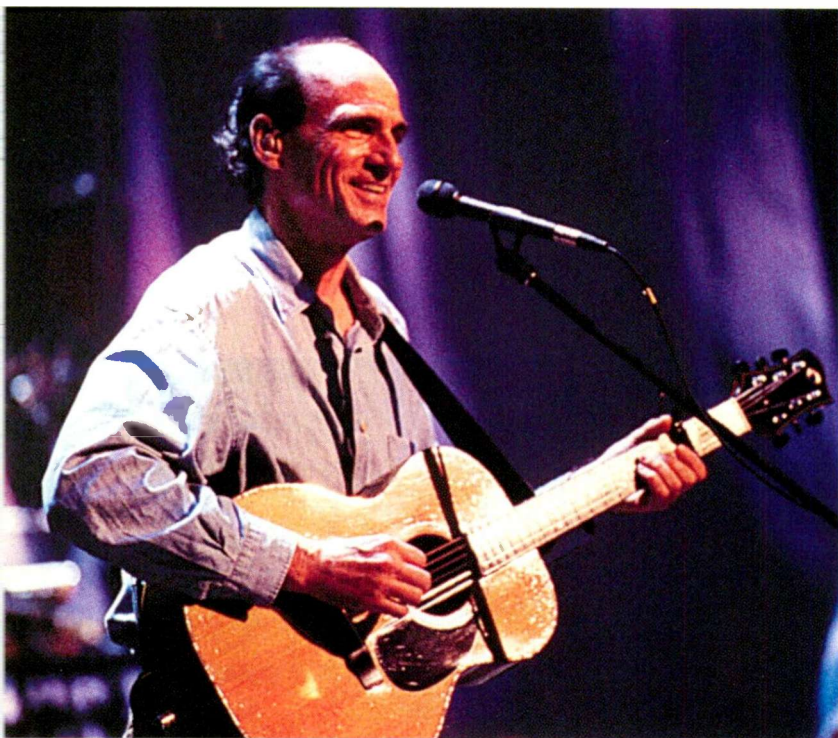
NAD PHONO PREAMP

Designed to be an affordable companion for A/V receivers or preamp/processors lacking a phono stage, NAD's PP-1 is rated to deliver ample gain for any moving-magnet phono cartridge. RIAA response accuracy is specified at ± 0.5 dB,



and input overload figures are 55, 63, and 580 millivolts at 20 Hz, at 1 kHz, and at 20 kHz, respectively. The external power supply (15 volts DC) is regulated for low noise and resistance to hum. Price: \$129. (NAD, 800/263-4641)

SWEET BABY JAMES IN DOLBY DIGITAL



James Taylor live sounded good, but Taylor on DVD sounds even better.

Trailers, some with dish antennas, and eighteen-wheelers lined the street behind New York's Beacon Theatre on a warm spring evening last year. There was a perceptible hum, not just from the cooling units and auxiliary generators in the semis but in the air itself. In an hour, singer/songwriter James Taylor was to begin a concert that would be televised live, nationwide, on PBS and simultaneously recorded on a 48-track, 24-bit digital machine and a digital video recorder. Inside the trucks, music producer and engineer Frank Filipetti sat behind a Neve/AMS Capricorn 24-bit digital console linked to a Sony PCM-3348-HR 48-track, 24-bit recorder; in an adjacent trailer, video director Beth McCarthy prepared to call the shots from the seven-camera setup inside

the theater. Eventually, the edited videotape would be combined with a 5.1-channel Dolby Digital (AC-3) audio mixdown—supervised by Filipetti and Taylor himself—for a DVD recording of the concert on the Columbia label.

Like legions of fans in the '70s, I'd bought *Sweet Baby James* on vinyl, and I even learned to play a respectable version of the title song on my Guild guitar. But I hadn't heard Taylor live in years, though I'd seen him on TV once or twice and had always admired his impeccable musicianship, strong melodic gifts, unerring pitch, and consummate band and backup singers. So before I left my apartment and walked over to the Beacon, I slipped an S-VHS tape into my VCR and programmed it to record the televised concert. What the heck, I thought, it would be interesting to compare the live concert with the televised version.

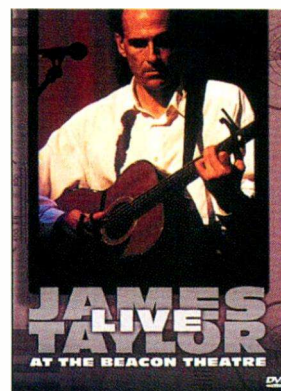
In a talk to journalists right before the concert, Frank Filipetti (who won a Grammy in 1997 for engineering Taylor's *Hourglass*) noted that his goal for the Dolby Digital 5.1-channel mixdown (to be done several months later) was to capture the concert's spirit and the ambience of the Beacon

Theatre. "There are two different possible mixes," he said, "either putting you in the tenth row of the audience or up on stage with James and the band."

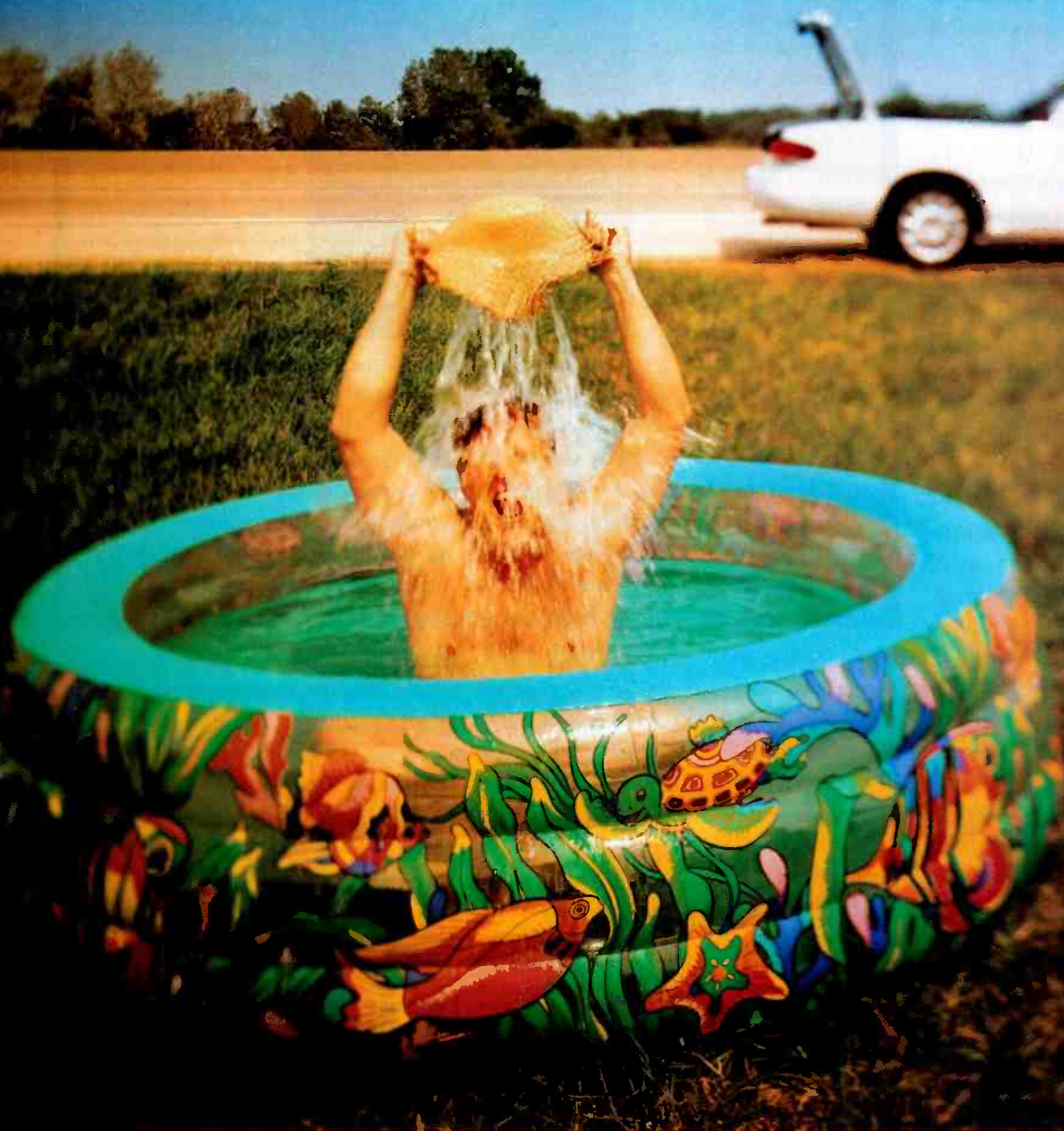
I admit I feared the worst. I worried that having five channels to play with just might tempt Filipetti to mix some of the musicians into the surround channels, in a nightmarish replay of the bad old days of quadraphonic sound. My fears, however, proved groundless: The DVD of *James Taylor, Live at the Beacon Theatre* (CMV CVD 50171) is an extraordinary audio and video document. As good as the sound reinforcement was at the live concert (and it was *very good*), the 5.1-channel Dolby Digital soundtrack on the DVD is so pristine and unsullied, it makes the live event pale by comparison.

At the Beacon, for example, from my seat in row M, I could barely hear any electric bass; on the DVD, the low-frequency effects (LFE) channel beautifully delineates Jimmy Johnson's tasty bass riffs on "How Sweet It Is" (track 12) and on J.T.'s cover of the Buddy Holly classic "Everyday" (track 5). When other band members take instrumental breaks, the TV director, choosing from the seven cameras, instantly directs your focus to a close-up shot of the instrument. Even more convincing, with 48 channels and dozens of mikes at his disposal, Filipetti has mixed the audio in perfect synchronism with the video while maintaining the correct acoustical perspective. This is a stunning example of multimiking enhancing the live event: It's almost like re-experiencing the concert through a magnifying glass.

So seductive is the the DVD's sound that you immerse yourself in the concert in your living room. Or, rather, your living room disappears: The ambient surround channels wrap the audience around you to the sides



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and rear, and the sense of being in a large performance space is striking.

Moreover, the DVD transports you, acoustically and visually, up to the keyboard for Clifford Carter's wonderful piano breaks on "Steamroller Blues" (track 23); at the concert, I missed them because they were lost in the soup of reverberant sound. And on "How Sweet It Is" (track 12), the acoustical edits and camera cuts to Steve Jordan's drum riffs and Jimmy Johnson's bass (both solidly defined on the soundtrack) generate a rhythmic momentum that drives the song forward.

Filipetti's deft and seamless 5.1-channel audio mix is wonderfully natural. As you listen to "Shower the People" (track 11), you'll hear Taylor in the center, with the backup singers smoothly wrapping from slightly left of center along the left side of your listening room. This is virtually the same acoustic perspective as at the concert. And in the middle of the song, when the camera cuts to the marvelous backup singer Arnold McCuller for his stunning gospel/soul obligato, you see him—and hear him—up close. It's exhilarating.

Of course, the pristine quality of the DVD's soundtrack did not happen by accident: All of the analog microphone signals were digitized by mike-preamp A/D converters at the edge of the stage, then fed by fiber-optic cable to the 48-track digital recorder in a trailer parked behind the theater.

When I compared my two-channel S-VHS videotape of the televised concert to the Dolby Digital 5.1-channel DVD (I synchronized them in playback), the DVD's three-dimensional soundfield was replaced by a dry, flat, compressed stereo soundstage; an analog murkiness distanced me from any sense of being there. The S-VHS images, even with digital video noise reduction engaged, were smeared and indistinct, and there was obvious chroma noise in areas of saturated color.

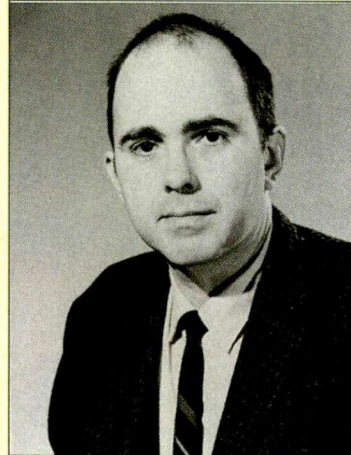
Switching back to the DVD was liberating. My small Manhattan living room seemingly became the concert space, and the sumptuous, wonderfully clean multi-channel sound rolled over me like a great acoustical wave. I could see every drop of perspiration on J.T.'s forehead in perfect detail, there was no video noise, and the lighting effects were as beautiful and colorful as at the live event. I liken the effect of

CODA: JON R. SANK

Jon R. Sank, formerly a Contributing Editor of *Audio*, died on August 25, 1998, at the age of 64. His microphone reviews and articles appeared in this magazine for more than a decade, beginning in 1977.

From 1957 through the 1970s, Sank worked as an engineer in RCA's microphone group, where he designed the BK-12 lavalier and BK-11 bidirectional mikes, many of which are still in use on TV. (You may have seen BK-11s on the desks of late-night TV talk-show hosts.) "I was... fortunate to work with several of the great pioneers in acoustics," he later said of his RCA experience. He also designed custom RCA microphones for Perry Como's road tours and for Presidents Dwight D. Eisenhower and Lyndon B. Johnson.

After leaving RCA, Sank formed his own firm, Cross Country Consultants,



where he worked on noise abatement, church sound reinforcement, and microphone testing. For nearly 20 years, he was Secretary and Treasurer of the Delaware Valley Chapter of the

Acoustical Society of America and was also active in the Audio Engineering Society (which honored him in 1997).

James Kogen, now retired from Shure Brothers, told me that Sank "was an excellent engineer. I consulted with him many times and always received an honest answer, even if

it was one I didn't want to hear. Engineering is a profession where one can succeed simply by being competent, dedicated, and honest. I have been privileged to know and work with some wonderful engineers over the years and am proud to count Jon Sank among them." *I.B.*

switching from the pallid analog S-VHS playback to the DVD to what I've experienced watching HDTV with a good Dolby Digital soundtrack. It's hypnotic, and you don't want it to stop; the superior aural and visual images upstage everything.

James Taylor, Live at the Beacon Theatre may well be the best-sounding and most splendidly mixed pop recording I've ever heard—or seen. *Alan Lofft*

WARMTH AND WAVELENGTH

Two of our senses, sight and hearing, are wavelength-dependent. We read long light wavelengths as red, short ones as blue. And we hear long sound wavelengths as bass, short ones as treble. In each case, we describe predominantly long-wave signals as "warm." Why?

It's obvious why we call reddish light warm: Fires and red-glowing embers are far warmer than the chill blue of a winter's day. True, heating objects past the red-hot stage

makes them glow ever bluer—but, on the other hand, heat radiation is carried by infrared light, whose invisible rays have even longer wavelengths than red light does.

When we describe sound as warm, are our minds subconsciously relating its long wavelengths to the long waves of red light? If so, how did we intuitively make that connection?

We also make a quite conscious connection between light and sound when we speak of white and pink noise. White light, like white sound, is random and contains all possible frequencies or wavelengths in equal measure. Pink noise is white noise that has been warmed a bit by reducing its high-frequency energy without reducing its high-frequency content. That is, all frequencies from 20 Hz to 20 kHz are present in pink noise, but the amount of energy in the octave from 10 to 20 kHz is equal to the amount between 100 and 200 Hz. In white noise, the higher octave contains 100 times the energy of the lower. *I.B.*

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MAMA MEDIA!



Layla, Marantz's CD player/receiver (above), has four tiny joystick controls. Audiogram's Pierre 1 preamp (right) is dramatically styled.



shows, the retailers get to see a vast percentage of their suppliers under one roof, the press gets plenty of page-filler, and the public gets to play with new toys without a salesman hovering nearby. And such shows are good indicators of trends within the industry in the coming year. Recent exhibitions in London and Milan were smash hits, suggesting that the downturn in interest in hi-fi might just be media-driven paranoia.

Once you've been to a number of shows, you learn how to "read" the crowd. No, it doesn't turn you into Nostradamus; otherwise, we'd all be filthy rich because we'd open up stores and stock only the winning brands. (One wry pundit told me years ago, after a show organizer had been roundly criticized by an exhibitor because his room was empty, "Those who aren't selling product probably haven't got anything worth selling.") But you can get a pretty

Why hi-fi shows haven't taken off in the United States, I'm at a loss to explain. Like a CD on repeat, I keep hearing how hard it is to find stores outside of major U.S. cities that have decent selections of high-end equipment. Which is precisely why just about every country in Asia and Europe has annual hi-fi shows: so the public can get a taste of a huge range of hi-fi, a selection beyond the grasp of all but a handful of top retailers. Even the smallest shows attract 100+ brands, while the biggies are good for 200 to 300 names.

Exhibitors might complain that they see the same faces year in and year out, but who do they think makes the effort to go to a hi-fi show? Audiophiles, that's who. And if it means that Romans are prepared to fly or drive up to Milan, just as San Franciscans would spend hours on the Pacific Coast Highway to visit a show in L.A., so be it. Whatever the crowd, the fact remains that at hi-fi

good idea of what's going to sell and what isn't. Or, at worst, what will earn column inches and what will fall by the wayside.

**EVEN THE SMALLEST
HI-FI SHOWS
ATTRACT 100+ BRANDS,
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200 TO 300 NAMES.**

At a show a few years ago, Sonic Frontiers demonstrated a prototype of a top-loading CD player that opened like a leaf-shutter in a camera. So what did I see this morning when I went to the newsstand? That Sonic Frontiers CD player on the cover of a British mag-

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Zingali's speakers feature wooden horns sculpted from solid poplar.

azine—and not, I hasten to add, a hi-fi title but a mainstream toys-for-the-boys journal.

Last month, I described a few highlights of Great Britain's main event at Heathrow Airport. And, sure enough, those were the products that seemed to have more than hobbyist appeal. The return of Quad, as well as Arcam's creation of the first true digital tuner, are the stuff that even newspapers can write about without fear of addressing only audiophiles.

Two weeks after the doors closed for the final time at Heathrow (1999's event will be in Central London), the industry moved on to the 11th annual TOP Audio show in Milan. As you'd expect because of geographical proximity and the passage of a mere fortnight, many of the exhibitors at the Hi-Fi Show at Heathrow also appeared at TOP Audio. High on the must-see/hear lists were Sony's Super Audio CD, the new Sonus Faber Amati Homage flagship loudspeaker, new DVD players, and the first European demos of American products launched during the summer. In effect, what we get is a touring company. But all shows differ because each offers pride of place to homegrown components. Indeed, it would be most curious if the Frankfurt show weren't full of German hardware or the U.K. show full of British goodies.

Because Italy is probably the most exciting hi-fi-producing country in the world right now and the scene there is less jaded than the more mature markets in the U.S. and the U.K., TOP Audio was bursting with

novelties. Alas, though many will never venture beyond the Italian borders, there are some products you should know about, if only to lust after them.

Audiogram, part of a company called Archidee, is best known for its equipment stands and for being the Italian importer of Naim Audio's electronics. The company also makes a handsome, relatively inexpensive full-range electrostatic speaker. At TOP Audio, Audiogram showed a new line of solid-state electronics that defies reason—precisely the kind of equipment that the British used to be known for but with frills only the Italians could imagine.

Based in Pisa, Audiogram seems to know its market inside out. Of course, I say this as an outsider, but I've seen how much respect the company has been given at every TOP Audio I've attended. And it's amazing when you realize that Audiogram is overseen by a woman. (Sorry about the stereotype, but Italians are unashamedly traditionalists when it comes to gender roles. Italian men still hit on women with lines that would have American men facing harassment suits.)

All Audiogram models in the new line feature remote control and sleek, to-die-for looks. The front panels are split horizontally, with the top and bottom segments finished in brushed metal. The center strips

are black, back-lit "windows." Audiogram's MB1 and MB2 are integrated amplifiers, rated at 40 and 60 watts/channel, respectively. The same chassis is used for the Pierre 1 line-level preamp, which is designed to drive the PI W01 and PI W02 stereo power amplifiers, rated at 45 and 65 watts/channel, respectively. To complete an Audiogram system, there's the CD-A CD player,

which has 18-bit Analog Devices D/A converters. The Italian prices were shockingly low, so I'm a bit leery of guesstimating what the prices would be in the U.S. Let's just say that the least-expensive integrated amp might sell Stateside for less than \$800 if the company found an importer that wasn't an avaricious pig.

Although GRAAF and Unison Research, the heaviest Italian hitters in the tube arena, weren't at TOP Audio, the show was still

rife with tubeware. Master Sound exhibited its line of handsome amplifiers, all styled in what has become something of a norm for Italian tube amps: solid-wood end panels, copper cladding, and Cary-

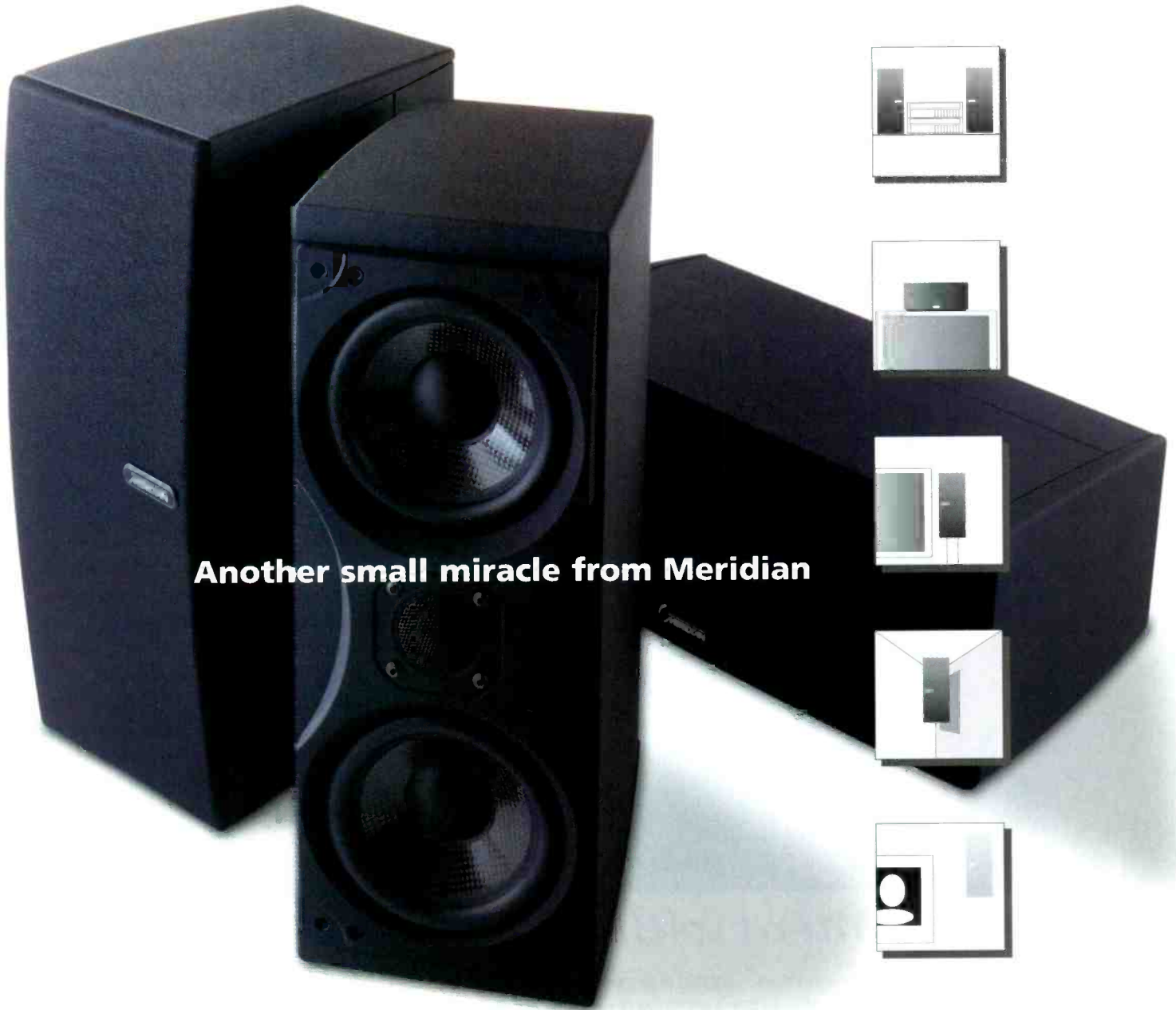
like dimensions. I found the Reference 845 particularly tempting. This Class-A integrated amplifier is rated to deliver 40 watts/channel from four 845 tubes. For those who prefer the 300B to all other tubes, Master Sound's 300B SE is a single-ended integrated amp yielding 20 watts/channel from a quartet of said devices; the Due Venti SE is similar but has a quartet of what look like EL34s.

Strumenti Acustici di Precisione, the maker of Genio mini-monitors with built-in tube amplifiers, offered an alternative for those even more daring: The Genio Super OTL contains a 5-inch woofer and a compression supertweeter, driven by an in-

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AND THE SONUS FABER
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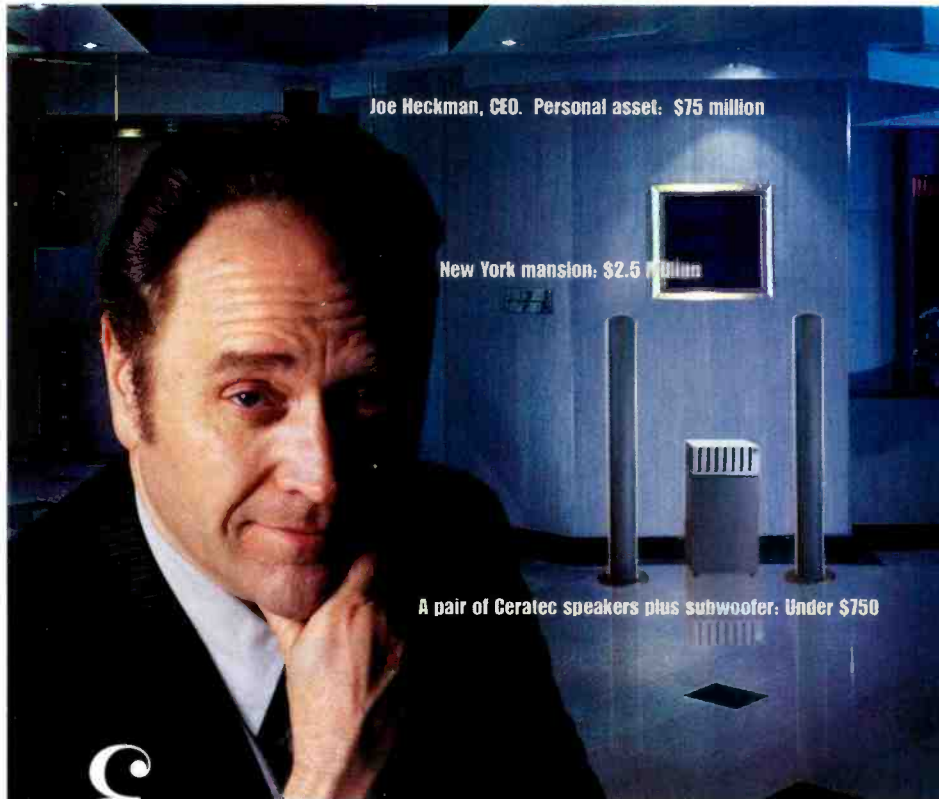
ternal 15-watt output-transformerless tube amp. Also announced at the TOP Audio show in Milan was an OTL integrated amplifier that is said to deliver 20 watts/channel from two Sovtek 6922s, one Philips ECC83, and four GE 6080 double triodes. (It seems that Italy might be the last bastion of output-transformerless tube technology, given GRAAF's and Strumenti Acustici's devotion to it.)

Zingali was one of the most talked-about exhibitors, thanks to its new Omni-ray speaker technology. Its comprehensive

line of striking-looking loudspeakers features wooden horns sculpted from solid poplar. Old hands may note that these speakers are reminiscent of classic JBL studio monitors, but their wooden accents transform them entirely. All of Zingali's models for home use—the Overture 1 and 2 stand-mounted designs and the Overture 3 and 4 floor-standers—have bass reflex enclosures and boast sensitivities of 91 to 94 dB SPL. The various studio monitors offer a similar range of sensitivity, with the Model 95-215 delivering 96 dB SPL for

1 watt. This monster loudspeaker has a 2-inch compression tweeter and two 15-inch woofers in an enclosure measuring 31 x 39 x 16 inches, not counting the 11-inch-tall support.

Should all this talk of equipment unlikely to reach America be getting to you, note that some non-Italians arrived in Milan with cool new goodies, the standout for me being a neat offering from Marantz. In June of last year, I wrote of new all-in-one units containing a CD player and an integrated amp, with some including a tuner. Now Marantz has joined the fray with an addition to its Design Series (which might be



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AUDIOGRAM SHOWED AN ALL-NEW LINE OF SOLID-STATE ELECTRONICS THAT DEFY REASON.

familiar because of the Arch music system). The new kid is the utterly sexy, remote-controllable Layla, which is housed in a sleek chassis that's about 18 inches wide, 4 inches high, and 12 inches deep. The lid, which opens up to expose the CD tray, is fitted with four teensy joysticks that serve as the controls. Also included are an AM/FM tuner section, a timer with alarm, and an internal amplifier that has 25-watt/channel output in case the tiny supplied speakers don't impress you. Layla is available in several colors, at a price so low that I couldn't believe it, so I won't repeat it here in case I misheard.

Wadia Digital arrived in Italy with the 830, a brand-new CD player in a champagne finish. Purists who want to bypass external preamps will appreciate that you can connect the 830 directly to a power amplifier. It also offers ClockLink jitter reduction, DigiMaster 3.1 filtering, Pioneer's Stable Platter transport, and circuitry that is based on Wadia's 850 and 860 CD players. The 830 will be able to accommodate future developments through both software upgrades and modular cards. All of which might be old news to you in the States.

But that's why people outside the U.S. go to hi-fi shows. A

one bell, one whistle,



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EASY AS DSP, ABC, 1-2-3 BABY YOU AND ME

You know something's seriously wrong with the natural order when you walk into Guitar Center (which, by the way, *sucks*) and find far more sophisticated digital signal processing gear on the shelves than in the loftiest hi-fi hut. What the hell's wrong with this picture? Why are slack-jawed, pierced-scrotum'd trogs being served all these wicked-cool processing toys that can do astonishing, almost unimaginable things to an audio signal while the most that Joe Audiophile can look forward to in the way of DSP is a cheesy "Hall" mode on an A/V receiver that roughs up prerecorded music till it sounds like it's playing inside a deserted airplane hangar while BBs rain down on the roof?

It's totally backwards. These mall-rat mullets—whose idea of a great-sounding CD is high-gloss Cheeze Whiz like Joe Satriani's *Surfing with the Alien* and whose wildest dreams of naked gear lust rise no higher than a plywood Day-Glo Ibanez plugged into a high-gain solid-state Peavey amp that's got more crushing distortion on its own than the old route of using a separate fuzzbox plugged into a squealing tubed Marshall—get the most creative digital minds of our generation working overtime to outdo their last brilliant processor that crammed \$5,000 worth of studio-quality effects and ambience replication into a \$250 box. Meanwhile, you and I, music lovers hungry and willing to pay through the nose for the best sound quality possible, have to decide between buying a New Beetle or a new home theater just to get out of "Hall" mode hell. If I were still a 20-year-old guitar twiddler with a Supercuts 'do

and an Ozzy/Randy poster over my bed, I'd be laughing my ass off right now. But I'm not laughing, because

**DSP SHOULD BE PLAYING
A MUCH BIGGER ROLE
IN THE HIGH END
THAN IT IS NOW.**



I'm right there with you. I am in the same hell as you.

Lord, why do you think I started reviewing home studio gear, because I want to be 20 again and it's cheaper than hair plugs? *Wake up.* I am doing this because I am bored out of my @%#\$%& mind with the high end. You people think we hi-fi writers are part of some perpetual fantasy party circuit where platters of

little goat-cheese toast triangles circulate around beautiful, laughing women and the sound just keeps getting better and better because the most brilliant minds of our time are spinning gold out of silicon 'round the clock while we jet off to Rome at 2 a.m. on Sonus Faber's Gulfstream for the next press party, knowing that when we get back—our cummerbunds stained with lipstick and Grande Dame—there will be even more fascinating, groundbreaking products to play with and write about for next month's startling issue. The reality for me is that to feed my jones for audio nirvana and cool

new tech, I've had to look beyond high-end audio to the great things going on in home-based music recording.

What I like, and what I like to write about, are the smart boys and the smart toys. And these days, most of the smart boys and the smart toys are on the *production* side of music, not the reproductive end. I hate to sound like I've given up on the high end, but when I pick up a hi-fi mag and read about some boutique brand whose latest marvel is a \$1,000 phono stage or a \$2,000 stereo line-level preamp, I feel like I'm reading about Civil War buffs who dress up on weekends in period-correct blue and gray and pantomime getting hit with phantom musket balls. Which is to say, I don't read it at all. I'm interested in progress, and right now progress means better DSP for audio.

Digital signal processing should be playing a much bigger role in hi-fi than it is now. Now that all of

our source material is digital in origin (or becomes digital with the transparent and inexpensive 20-bit A/D converters found in more and more A/V gear), we should, by all rights, have much more power to shape and optimize the output from our speakers so that it sounds exactly the way the director, the producer, the artist, or—God forbid—the schlub who paid for it wants it to. DSP should be making good speakers sound insanely great, \$500 amplifiers sound like anything from a tight-as-a-nut Krell to a technicolor single-ended triode job, A/V receivers sound like the smoothest tube line stages feeding the most coveted Class-A amps, and \$300 CD players sound like the best stand-alone D/A converter Theta's ever put out.

But with the exception of the people behind a handful of Fantasy Island rigs like Meridian's \$50k Digital Theatre, the few high-end designers who know enough to be digitally dangerous are either still on the doomed outboard stereo D/A track (a product category that officially died last year), or else they're pissing in the wind trying to perfect the single most unproductive use of DSP the hi-fi hobby has ever seen: DSP room/speaker correction. I cannot be-

lieve I'm still hearing about this sinkhole for, what is it, seven years now? And it's always the same story, "Oh, this is just the prototype. We're still working the bugs out of it." Seven years later? We're not talking about IBM developing atom-wide copper chip traces here or Lew Rothman putting the finishing touches on the next JR Tobacco catalog.

DSP room/speaker correction is just a way for idea-bankrupt digital designers to stay on a payroll a little while longer. Even these guys know the concept is doomed. Using DSP to correct the inherent nonlinearities in a speaker can be stunningly effective, but trying to iron out the acoustics of a room with DSP will never, ever work in a way that's meaningful in the real world. The simple reason is that the more you correct the signal (and the higher the frequency you try to correct), the smaller your effective listening area becomes—to

the point where any kind of significant correction will narrow the listening zone to the width of a single human head. The digital wonderboys know this—learned it the first week, probably—yet they still plug away, egged on, no doubt, by dickweeds in the audio press who think that, even if it could work, which it can't, there's more than five guys in the entire world who would pay more than a hundred bucks for it. C'mon, guys, give it up already. Audio needs you to start working on things that will wind up as products and features that push the state of the art forward. (The irony, of course, is that this plea will undoubtedly have just the opposite effect: Any digital designer still chasing his tail with DSP room/speaker correction will probably show this column to whoever's funding him and declare, "They say it can't be done, but we'll show them!")

This past year I've been amazed at the sophistication of what's become available to musicians in the way of DSP. A guitarist friend of mine recently bought a \$400 studio processor from Roland that does uncanny Rich Littles of miked guitar amps when you feed it the dry signal from an electric guitar. Roland actually went to the

trouble of setting up all of the classic rock guitar recording rigs, measuring the bejesus out of every static and dynamic parameter, and then loosing a monstrous amount of DSP on the trail like a digital bloodhound. You can plug your Strat into this unassuming, rack-mounted box and make it sound like it's plugged into a '60s blackface Fender Twin amp close-miked with a Shure SM57, into a plexi 100-watt Marshall stack miked with a Neumann U47, into a Vox AC30 for early Beatles, or into a blonde piggyback Fender Showman amp for *Revolver*-era Beatles. You name it, this box has got it. I've played through all of these amps in the flesh, and I can tell you that whoever did the DSP modeling really did a hell of a job nailing their sounds. Are they perfect clones? No. Do they come much closer to dead-on than a \$400 box has a right to? Yes, indeed. If Roland can do this for the sounds of guitar amps, high-end audio can do it for hi-fi gear. We should be able to dial in any classic sound we want or pure audio without coloration, and we should have been able to do it yesterday. Why couldn't we? Why can't we?

Sonic Foundry, an audio production software developer, recently sent me a \$250 CD-ROM of its latest program, Acoustic Mirror. Actually, Acoustic Mirror isn't a program; it's a collection of Direct-X plug-ins you can use with any Direct-X-compatible audio recording software, such as Syntrillium's CoolEdit Pro or Sonic Foundry's own Sound Forge. A plug-in is just what the name implies, a little program that adds a new feature or effect to an existing software suite. Similar to downloading new fonts for your word-processing program, Direct-X plug-ins do things for the PC recordist like add reverb algorithms, digital EQ, you name it. But the Acoustic Mirror plug-ins go one step further: Not only do they enable you to take a recording made with a typical home studio microphone and make it sound as if you had used a classic tube or condenser mike, but they also let you send an impulse signal into any room, capture it with a mike, and then model the sound of that room as a reverb setting on any recording you produce. For \$250. I need to experiment with Acoustic Mirror some more, but suffice it to say, this is one smart toy. I wish high-end audio would rise to meet the challenge. A

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OF MIKED GUITAR AMPS.**

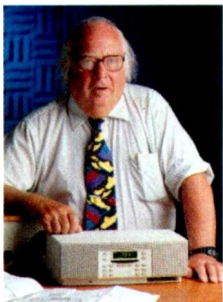
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Eight in 1960. He further refined the concept with the Advent Model 400 FM radio in 1974. Both the KLH and Advent radios became classics. If you'd like to hear the next classic from Henry Kloss, call our toll-free number or visit our website. We invite you to audition it in your own home, listening to your music, for 30 days. If you don't fall in love with it, return it for a full refund.

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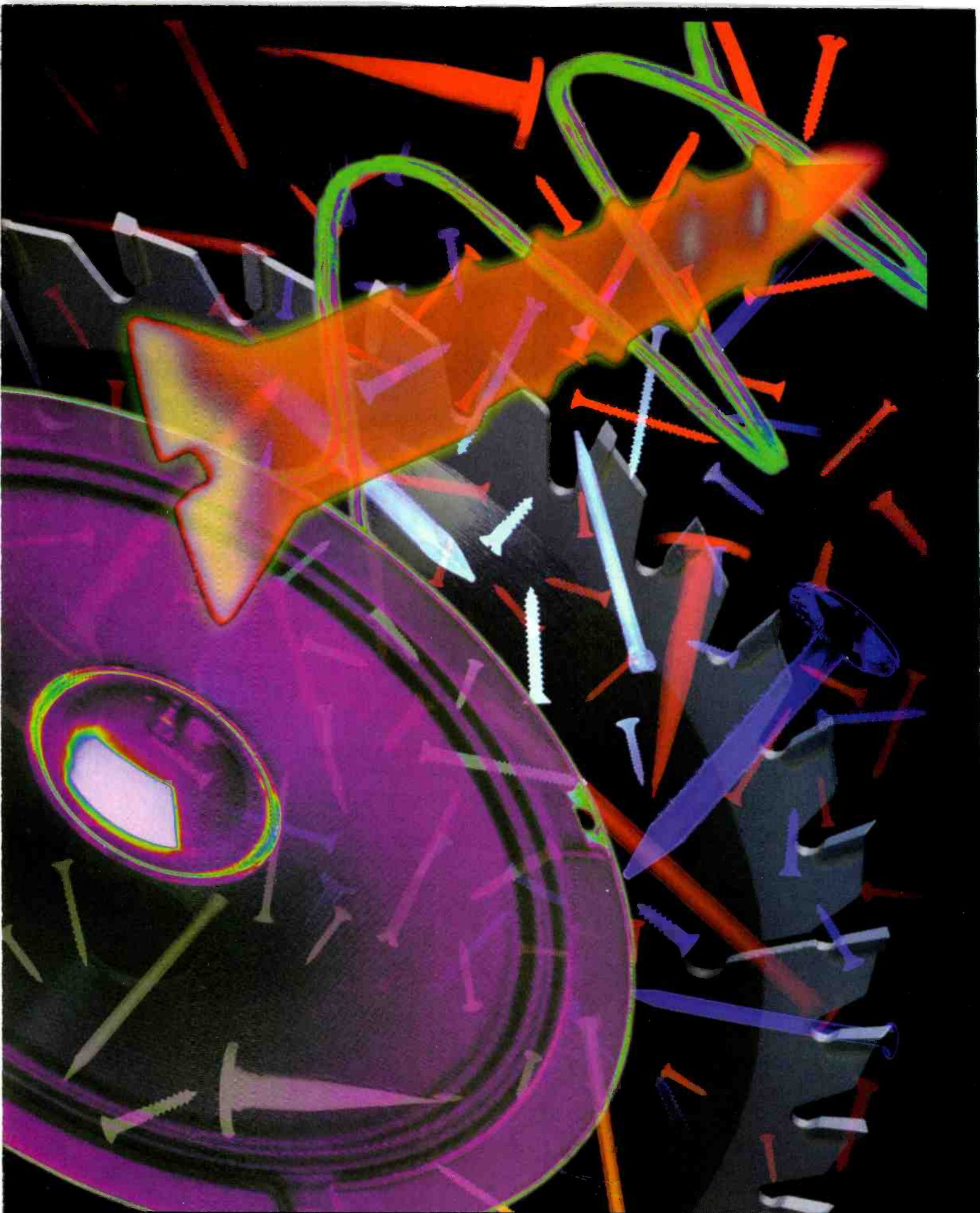
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MONSTER BASS

It's hard to build
better than you can
buy anymore—
except subwoofers.

by TOM NOUSAINE

back in the good old days, construction projects were staples in the lives of most audio enthusiasts. I first became interested in audio when a friend celebrated his wife's promotion by buying himself a \$1,200 stereo system. I was bowled over by its performance, but at the time I didn't have that kind of money to spend on audio equipment.

Like many of my peers, I began indulging myself in the Heathkit catalog, hoping to supply my own labor and save a bundle of bucks on the way to good sound. There

were also the construction articles in *Audio* and other enthusiast magazines and hobbyist clubs, such as SMWTMS (the Southeastern Michigan Woofer and Tweeter Marching Society), where rolling your own was an article of faith. I was an easy convert.

But as time passed, audio manufacturing efficiency and technological progress removed many of the incentives for home constructors. In 1985, the founder of SMWTMS, a medical doctor who had built a complete DIY (do it yourself) system a couple decades earlier, mused in passing that "design and construction just isn't as much fun anymore when anyone with

enough dexterity to plug an NE5534 into a socket can make an essentially perfect pre-amplifier."

Indeed, wave soldering, large-scale integrated circuits (LSIs), surface-mount technology, and digital storage media have made rolling your own less appealing in terms of both dollars and performance. People once built amplifiers all the time. Now it will cost you more to build one than to just buy one, even if you rip the design straight off the schematic.

The last bastion of DIY audio has been speakers. Well into the late '80s, many of us felt we could easily build loudspeakers that

Table 1—Design characteristics of four home-built subwoofers compared with those of a very high-performance commercially available powered subwoofer. (The homemade subwoofers are named according to their builders' initials, the number of drivers, and the diameter of the drivers in inches.)

	RK 4-18	TH 4-15	RP 2-18	TP 8-12	Commercial
Drivers	4 JBL 2245H 18-inch	4 Eminence 15857 15-inch	2 JBL 2245H 18-inch	8 Audio Concepts DV-12 12-inch	1 18-inch
Total Driver Displacement	260 cubic inches	180 cubic inches	130 cubic inches	250 cubic inches	
Loading Technique	Infinite baffle (basement)	Infinite baffle (basement)	Bass reflex	Infinite baffle (attic eave)	Sealed, servo-controlled
Crossover	66 Hz, 24 dB/octave	30 Hz, 24 dB/octave	66 Hz, 24 dB/octave	45 Hz, 12 dB/octave	Variable, 40 to 120 Hz
Amplifier Power	200 watts x 2	150 watts x 2	250 watts x 2	200 watts x 2	600 watts
Cost	\$3,000	\$550	\$2,000	\$1,115	\$2,000
Frequency Response (in-room)	16 to 66 Hz, ±3 dB	8 to 30 Hz, ±5 dB	15 to 66 Hz, ±3 dB	12 to 45 Hz, ±2.5 dB	20 to 70 Hz, ±3 dB

were better-sounding than we could buy. But progress eventually caught up with us there, too.

In the early '90s, the Prairie State Audio Construction Society (PSACS) had a measurement fair for a fall meeting. Tom Breithaupt of Blaupunkt USA invited members to bring their construction projects to his B&K/Audio Precision-equipped facility for performance verification. There were a few amplifiers and other electronic devices, almost all of which performed as expected. Many people brought speakers. Lots of them. One member carted in a three-way system with a poured-concrete, egg-shaped enclosure. No kidding.

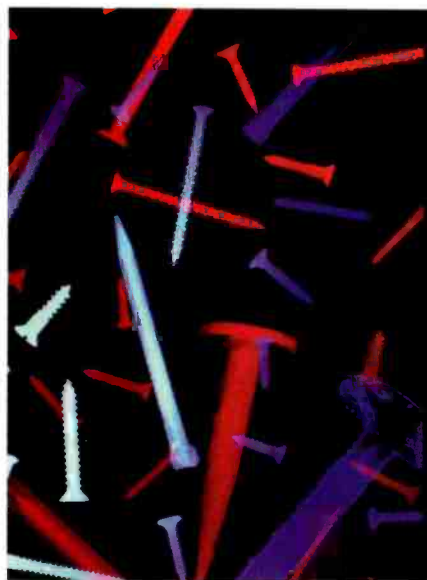
At the end of the day our host dragged out a mid-priced commercial 6½-inch two-way system of English manufacture that he used for bench duty. Above 60 Hz this speaker literally blew the pants off every DIY system examined that day. It was smoother on- and off-axis and sounded better in every respect than any project brought in. I still call speakers like this the DIY enthusiast's nightmare. They are no longer rare. You can make a speaker that looks more interesting than you can buy, but it will be very hard to outdo commercial products in performance, no matter how clever you become.

Of course, those projects were built by folks who, generally speaking, didn't have test equipment to guide them. The main

point remains, however: For electronics and ordinary speakers, DIY just isn't a route to superior performance anymore. Hey! Relax. I didn't say it was impossible—just that you have to be brilliant.

few dollars you can buy some extremely effective models right off the showroom floor.

On the other hand, I have tested more than 300 car and home subwoofers in the



**ALL OF THESE
HOME-GROWN
SUBWOOFERS
HAVE SIGNIFICANT
DISPLACEMENT
CAPABILITY, PROVIDED
BY TWO TO EIGHT
LARGE-DIAMETER
DRIVERS.**

So home construction of audio components has fallen off in recent years. The SMWTMS founder built his own radial-tracking tonearm back in the analog days, but he hasn't made his own CD transport (impossible?) or his own outboard D/A converter (possible but why bother?). So where does that leave construction projects?

How about subwoofers? Heck, there are plenty of relatively inexpensive powered subwoofers available today. If you have a

past decade and found that while producing infrasonics is easy in the car, few home units will do even 20 Hz at a level that matters. True, Velodyne, Paradigm, and some others have products that are impressive. Especially when you consider the SPL, the extension, and the price. But exactly none of them does 10 Hz.

So, who cares? Well, digital storage media, such as CD, can get 10 Hz to the speakers if it's in the recording. We "hear" infra-

sonic sound all the time in real life. Subways, trains, airplanes, and organs all produce ground-shaking infrasonic bass, and there actually are many recordings that contain such sounds.

So if you yearn to build your way to commercially unavailable levels of performance, there is still a world to conquer: subwoofers. As I said, even the best commercial product will not produce a gut-shaking 10 Hz in your home.

I built a subwoofer in 1980 that outperformed every commercial product I have ever used. It would do in excess of 110 dB SPL at any frequency above 16 Hz, with less than 10% distortion. It was relatively inexpensive, but with a 25-cubic-foot cabinet that stood 6 feet tall and consumed nearly 5 square feet of floor space, it was totally impractical in the average home—which is why no commercial subwoofer is that large (or goes that low with appreciable output). Although this system worked fantastically for 16 years, it developed serious cone sag, and I sold it for \$80 a couple years ago (initial cost was less than \$100 excluding electronic crossover and amplifier).

It is not the only such beast out there, however. I'll be describing here four DIY subwoofer systems that generally exceed the performance of anything you can just go out and buy. They range in installed cost from \$550 to \$3,000 but are repeatable and offer a fantastic return for the dollars and effort invested.

THE SYSTEMS

All these subwoofer systems are used with other custom loudspeakers, crossovers, and commercially available amplifiers. However, there is no reason any of them could not be used successfully with commercial speakers and moderately priced outboard electronic crossovers.

Table I outlines specifics of each system. Both infinite baffle and bass reflex enclosures are employed. All of these home-grown subwoofers have significant displacement capability, provided by two to eight large-diameter drivers. And none of them consumes any in-room floor space! Instead, they radiate into the listening room through slots in the floor or wall. (Imagine, for example, a fireplace flush with the wall and with drivers arranged along the sides and rear of its firebox. The drivers radiate

into the room from the mouth of the fireplace and exhaust to the rear, into an adjacent room.)

The infinite baffle systems simply use a basement or attic eave as the enclosure. The bass reflex system has two 40-cubic-foot enclosures located in the builder's basement. Two of the systems have all drivers radiating from a single floor opening located in the right front corner of the room. The others radiate into the room from either side of the left and right front speakers.

Although none of these subwoofers physically occupies any floor space, the ones that radiate through floor slots do effectively take up 2 to 3½ square feet because you can't cover those openings with anything solid. The ones that use wall slots actually consume no room space at all, since all that is required is a small breathing space in front of the opening. In contrast, the best commercially available system I have ever used gobbles up roughly 5 cubic feet of room volume.

And these systems deliver performance that is simply not available over the counter. The best of them has a frequency response of ± 2.5 dB from 12 to 66 Hz, measured at the listening position; the worst measures ± 8 dB from 5 to 70 Hz at a listen-

ing position 3 meters from the speaker opening. However, the latter system's owner uses a 30-Hz crossover, so the room-induced notch at 45 Hz that is responsible for much of the measured response variation doesn't matter to him.

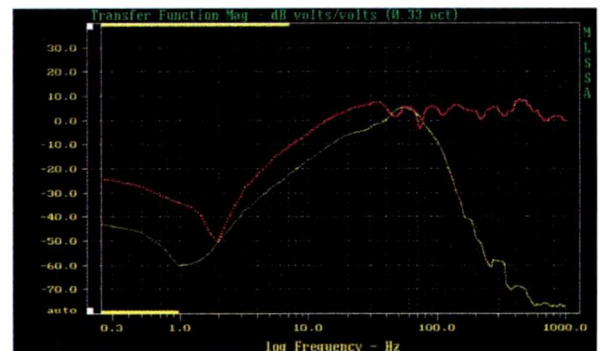


FIG. 1—Response of “RK 4-18” subwoofer, an infinite baffle design with four 18-inch drivers. The heavy curve is a near-field measurement of the subwoofer's output; the faint curve is a 3-meter room-response measurement. The room was rectangular, approximately 2,450 cubic feet in volume, and had three open doorways. Room reinforcement amounts to about 12 dB below ± 0 Hz.



FIG. 2—Response of “TH 4-15” system. This is another infinite baffle design, using four 15-inch drivers, in a rectangular room approximately 2,200 cubic feet in volume and with just one, large open doorway. Heavy curve is near-field, the faint curve room response at 3 meters. Maximum room reinforcement is about 17 dB at 5 Hz.

Table II—Maximum output for 10% total harmonic distortion (THD).

	SPL at 10% THD				
	RK 4-18	TH 4-15	RP 2-18	TP 8-12	Commercial
10 to 80 Hz	121 dB	118 dB	107 dB	119 dB	NA
16 to 80 Hz	125 dB	117 dB	107 dB	123 dB	109 dB
25 to 62 Hz	126 dB	116 dB	107 dB	123 dB	112 dB

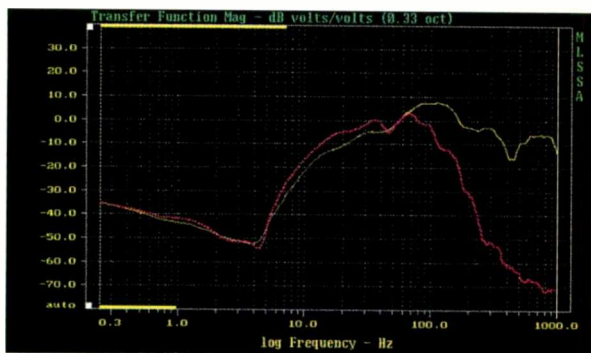


FIG. 3—The “RP 2-18” is actually two subwoofers in separate corners, each using a single 18-inch driver in a 40-cubic-foot bass reflex enclosure. The room is approximately 3,500 cubic feet, opening into another space of approximately 4,000 cubic feet. The heavy curve is a near-field measurement, the faint curve a room-response measurement at 3 meters. Maximum room reinforcement is about 6 dB below 40 Hz.



FIG. 4—The “TP 8-12” is an infinite baffle system with eight 12-inch drivers built into an attic eave. The room is a loft. The main listening area is about 2,450 cubic feet, but the back opens into a two-story space that makes the total volume about 8,000 cubic feet. The heavy curve is a near-field measurement, the faint one a 3-meter room response. Room reinforcement begins at 30 Hz and reaches a maximum of approximately 12 dB.

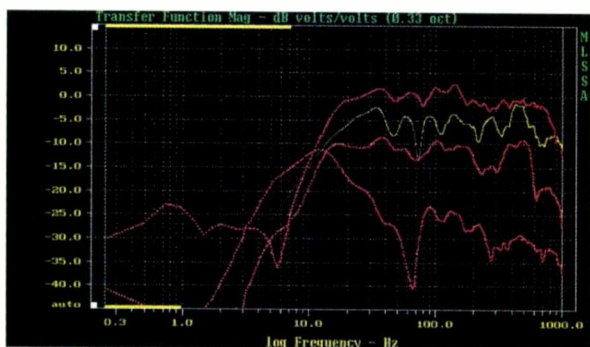


FIG. 5—Room responses of all four home-brew subwoofers. Top to bottom, the “RP 2-18,” “RK 4-18,” “TP 8-12,” and “TH 4-15” (the traces are separated simply for clarity and do not reflect maximum output capability). All but the “TH 4-15” are shown with the main speakers working as well.

Three of the four subwoofers radiate from corner-placed openings. In the fourth case, the owner had me make a room-response map of possible subwoofer positions prior to locating the slots. Optimal placement turned out to be with the openings about 2 feet from each corner. Interestingly, out of nine such room maps I have analyzed, this was the only instance in which corner placement wasn't best.

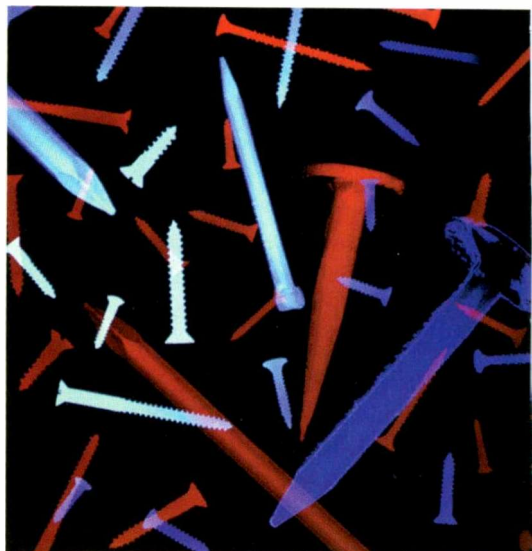
This system is located in a loft where there is no wall behind the listener and the room opens into a large, two-story space. The main listening area is about 2,450 cubic feet, but the system plays into 8,000 cubic feet. The rooms served by the other three subwoofers include a pair of shoeboxes with volumes of less than 2,500 cubic feet each and one with a 3,400-cubic-foot main area that opens to another 4,000 cubic feet.

THE PAYOFF

You can see from the performance graphs for the individual subwoofers (Figs. 1 through 4) how the rooms affect their performance. The heavy traces in these figures represent near-field response, with the measurement microphone placed in the throat of the slot. The faint traces, which are adjusted for distance, show response at listening positions 3 meters from the subwoofer outputs. It is apparent that the smaller rooms with fewer openings (doors, etc.) provide better reinforcement of very low frequencies. The smallest room with

the fewest doorways provides as much as 17 dB of deep-bass reinforcement, whereas one of the larger spaces with subwoofers in two corners delivers a maximum boost of 6 dB. Yeah, I know we all used to think that large rooms made for better bass. But at the lowest frequencies, where adequate output is hardest to attain, a smaller room produces deeper bass. This happens because the drivers pressurize the space at frequencies below the room's modal range, and that starts at a higher frequency in a small room than it does in a large one. So room volume is a major determinant of how much help your room gives you at low frequencies.

It also seems obvious that one key to subwoofer performance is driver displacement. There is no substitute for cubic inches at



bass frequencies. If you want to go low with adequate output, you must have a large-displacement bass engine. The best commercial systems overlap the least substantial of the systems tested here above 16 Hz but simply will not produce useful output at 10 Hz, where displacement and room size are the primary factors. These DIY systems have linear displacements roughly equivalent to that of high-power V-8 automobile engines.

Do we actually need 10 Hz? Well, as noted above, CD and other digital storage media can deliver infrasonic signals. And there are plenty of recordings with infrasonic content if you search them out. It is true that many of them are eccentric sound-effects recordings, but they exist, and some people will want a system that can reproduce them. I know I do.

R E S O U R C E S

What follows is a loosely organized list of resources for the aspiring subwoofer or speaker builder, including reference material, parts suppliers, and audio clubs.

Speaker Builder Magazine (P.O. Box 876, Peterborough, N.H. 03458; 603/924-9464; custserv@audioXpress.com). The May 1996 issue contains an article that describes the "TP 8-12" system in detail.

Useful books from Old Colony Sound Laboratory (P.O. Box 876, Dept. TL, Peterborough, N.H. 03458; 603/924-6371):

The Loudspeaker Design Cookbook, by Vance Dickason
Bullock on Boxes, by Robert Bullock
High Performance Loudspeakers, by Martin Colloms
Designing, Building and Testing Your Own Speaker System, Fourth Edition, by David B. Weems
Testing Speakers, by Joseph D'Appolito
Loudspeaker and Headphone Handbook, by John Borwick
Loudspeaker Handbook, by John Eargle

Books from the Audio Engineering Society (60 East 42nd St., Room 2520, New York, N.Y. 10165-2520; 212/661-8528; www.aes.org):
Loudspeakers: An Anthology, Volumes 1-4

Speaker Design Software

BassBox Pro (\$129 from Harris Technologies, Inc., P.O. Box 622, Edwardsburg, Mich. 49112-0622; 616/641-5924; Harristech@compuserve.com)
WinSpeakerz (\$129 from True Audio, 387 Duncan Lane, Andersonville, Tenn. 37705; 423/494-3388; www.trueaudio.com)

Audio Clubs

Southeastern Michigan Woofer and Tweeter Marching Society (P.O. Box 1464, Berkely, Mich. 48072-0464; www.oakland.edu/~djcarlst/smwmts.htm)
Prairie State Audio Construction Society (2711 Bartlow Rd., Urbana, Ill. 61602; 217/384-2073; sims@prairienet.com)
Boston Audio Society (P.O. Box 211, Boston, Mass. 02126-0002)

Parts

Madisound (P.O. Box 44283, Madison, Wisc. 53744; 608/831-3771; www.madisound.com)
Zalytron Industries Corp. (469 Jericho Turnpike, Mineola, N.Y. 11501; 516/747-3515)
Parts Express (725 Pleasant Valley Dr., Springboro, Ohio 45066-1158; 800/338-0531; www.parts-express.com)
Audic, 41st Annual Equipment Directory, October 1998, "Crossovers" (page 146) and "Company Addresses" (page 286)

Furthermore, a truly high fidelity system *should* be able to reproduce organ recordings with accuracy. On the other hand, if you have no interest in this type of recording, you probably do not need a subwoofer of any kind except possibly for action movie soundtracks.

These homemade systems are truly scary when played close to full throttle. The subwoofer with four 18-inch drivers will reproduce in excess of 130 dB SPL when playing the thunderclap at the opening of Telarc's *Chiller* and 127 dB on the black-powder cannon blasts from Telarc's "1812 Overture." Of course, I used hearing protection when exploring the upper range of this system's capability.

Why would anyone ever play anything that required hearing protection? you

limit at 12.5 Hz, worrying that his garage door might be knocked off the track. On the other hand, no owner reported any structural damage, even over extended use (although the owner of the subwoofer with four 18-inch drivers reported that a water pipe in a nearby bathroom had filled with scale during a spirited playback session).

Some did have great "family bass" stories, however. The best was from the owner of the sub with eight 12-inch drivers, whose mother-in-law appeared from downstairs during a demonstration exclaiming, "That damn airplane almost hit the house."

The best news is that you do not need to remortgage the house or rebuild your listening room to obtain better-than-you-can-buy bass. You need only curiosity, a good pair of reading glasses, and the ability to handle ordinary hand tools. If you are interested in this caliber of low-frequency reproduction, check out the accompanying list of "Resources" to help get you started. The system based on eight 12-inch drivers is completely described in one of the referenced articles.

So all is not lost in the world of audio construction projects. For the bass fanatic, there is still a good reason to build it yourself. Not only do you get the personal satisfaction, but there is a good chance you will save some money (possibly quite a bit of it)—and you can wind up with bass performance that will put anything in any audio showroom to shame. A

YOU NEED ONLY CURIOSITY, A GOOD PAIR OF READING GLASSES, AND THE ABILITY TO HANDLE ORDINARY HAND TOOLS.

might ask. Good question. My primary reason was just to find the system limits. Such high output potential ensures that the sound will remain clean at lower levels with any existing programs.

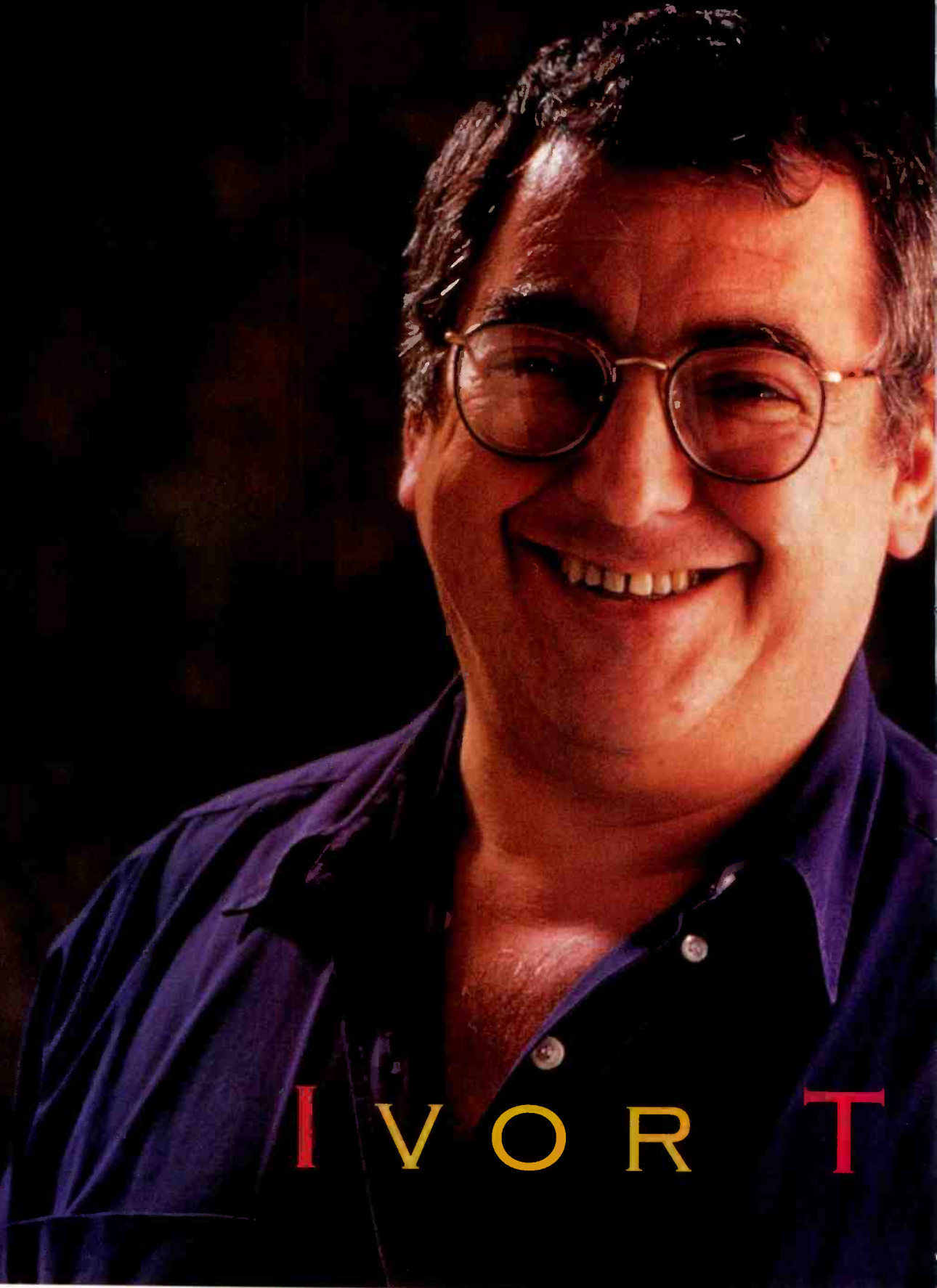
And these DIY subwoofers do just that. Organ recordings are particularly thrilling. The sound swells and swoops around you. Telarc has a good recording of "Wellington's Victory" containing plenty of artillery and gunfire. On ordinary speakers, some parts sound like popcorn popping in the background. With these subwoofers, on the other hand, the true dynamics of musket fire resound through your chest. You can close your eyes and believe you are in the middle of battle. Or in a tornado, if you have the DVD version of *Twister*.

Indeed, the owner of the system with eight 12-inch drivers refused to play it to its



R H A P S O D

G L A S W E G I A N



I V O R T

Y



THE AUDIO INTERVIEW

by Steve Guttenberg



Ivor Tiefenbrun burst onto the scene 25 years ago armed with just a turntable, the Linn Sondek LP12, and an outrageous proposition: The source is the most important component of a hi-fi system. When he was roundly confronted with cries of "How can a turntable have any positive effect on a system's sound? All it does is go round and round," Tiefenbrun's feisty reply was, "Yeah, sure, and all speakers just go in and out."

Ten months after Linn's LP12 was introduced, Tiefenbrun unveiled his wholly unconventional Isobarik speakers; by 1985 the company was offering a full line of program sources, electronics, cables, and speakers. It even started its own record label, Linn Records, whose talent roster now includes Carol Kidd, Tommy Smith, Martin Taylor, Nigel North, and Claire Martin.

Tiefenbrun remembers that when he started Linn, he ran it like "a miniature version of General Motors"—which is to say, inefficiently. But that was then; Linn's remarkable "new" factory is now 13 years old, yet it remains at the cutting edge of efficient industrial design. There's a single automated warehouse for all parts, and automated guided vehicles deliver all of the necessary materials to the person who builds, tests, and packs his or her own product. This Single-Stage Build method is so efficient, it enables Linn to produce any of its 100+ models on the day the order comes in. The company's product range has broadened from the original hi-fi division; it now encompasses home theater, with the AV51 system, and multiroom, with the Knekt system.

The British Institute of Management nominated Linn as one of Britain's most advanced

Linn's factory in Glasgow, Scotland



manufacturers, a select group that also includes IBM, JCB, Black & Decker, Lucas, and Yamazaki. And in 1992 Tiefenbrun was awarded the MBE (Member of the Order of the British Empire) by Queen Elizabeth II for his and Linn's engineering achievements and outstanding service to the electronics industry.

Last summer, I spent several days at Linn's factory in Glasgow, Scotland, to get a feel for the company's way of doing things. I couldn't help but be impressed with the fervor of the people at Linn—the designers, factory personnel, support staff, salespeople, and, of course, the source of it all, Managing Director Ivor Tiefenbrun. S.G.

I E F
of L I

E N B R U N
N N P R O D U C T S

It seems that your company, Linn Products, is inexorably linked to Scottish tradition and culture.

We have the oldest engineering tradition in the world here in Scotland. The first faculty for electrical engineering in the world was in Glasgow University, and the second was 11 years later in Edinburgh. I think people fail to realize the impact of the Scottish engineering tradition and to what extent Linn is a product of that tradition. In Scotland

Ivor Tiefenbrun with the Keltik, Linn's top-of-the-line speaker



we have two or three times as many engineers per capita than the national average. So we can pick and choose our engineers, and we believe that competition is healthy. Audio at the level that Linn operates is as demanding a field as any. It's a supreme challenge.

I'm sure your roots in audio predate Linn.

When I got married, I moved into a house, bought a bed, rented a two-ring cooker from the gas company for £5, and then went out and spent £650 on a hi-fi system. My wife thought I was completely mad, because at that point we didn't even have any chairs to sit on!

Beyond the LP12 turntable, how far ahead did your original plan project?

When I started Linn, I had all the confidence and certainty of youth, and I had a pretty good idea of some of the things I wanted to achieve. I wanted to build a great company. The company was going to be about an unremitting commitment to quality sound. And I wanted to make a complete system. That much I knew.

Those early LP12s had something of a reputation for quirkiness.

not mean a Ferrari and a van are the same kind of device; they're quite different. Although both the Thorens and the AR had triple-point suspensions, the objectives of these suspensions were shock isolation, to decouple the motor from the platter, to reduce rumble, and to avoid the problems associated with turntables driven by idler wheels. The suspension of the Linn had nothing to do with shock isolation; it was designed to remove transient acoustic feedback. The belt was used to couple the motor to the platter in a very broadband way rather than to simply try to isolate one from the other.

Superficially, there were many parallels and resemblances to other designs, and I freely acknowledge the contributions of all the great giants of our industry. But the concept behind the LP12 was one of controlling critical *relative* motion and maintaining the relationship between the

The \$8,500 AV5103 processor was Linn's first A/V product.



It took us about 25 years to fix all these things. So the LP12 is perfect now, but nobody really wants it anymore. [*Quiet chuckles.*] That's not true, but there are very few people who want it now.

But diehard analog-o-philes want to be assured the sun will never set on the LP12.

No, there won't always be an LP12—nothing is forever. And that's a good thing. I used to say my ambition was to make the last turntable, but now it's too close a prospect. I'll assure you of this: We will continue to make it, and improve it, for as long as we can. But if nobody wants it, we won't make it.

Were you aware of Edgar Villchur's AR turntable? Was it the prime inspiration for the LP12?

No, I wasn't actually, but of course it is. I know all cars use four wheels, but that does

cartridge body and the record. It was all about understanding the fundamentals, coupled with an appreciation of the scale of the problem—the realization that the information caught in the groove was so fine that it could not all be retrieved. But it was all relevant, because it was all captured in the groove. All of these perceptions contributed to what became the Linn methodology. The lessons we learned then are still valid today.

Linn methodology also reversed the established hierarchy of the system—to the hi-fi equivalent of "garbage in, garbage out."

Most people thought that since the "noise" came from the loudspeaker, the loudspeaker was the most important thing. Whereas I said, "Put a bad signal into a good loudspeaker, and you'll clearly hear it's bad. Put a good signal into a modest loudspeaker,

Linn's powered sub, the AV5150, uses two 12-inch drivers.



and it's likely to sound pretty good." It was really just a way of ramming home the point, but it caused massive offense because people thought it was unfair to have such an advantage. It's almost like saying that one TV company advocates the use of an antenna and the rest don't.

Linn was entirely hostile to CD throughout the '80s.

CD was launched with a claim, "Perfect Sound Forever," and whilst I had the greatest regard and respect for the Philips people who originally developed the technology, my argument was that the claim was an exaggerated one. CD's sound quality was hailed as being superior to analog/vinyl's. Initially, they didn't even realize the 16-bit standard. It was oversold and slightly premature, but nevertheless the achievement was phenomenal.

We thought Linn had utterly dismissed digital.

Not at all; we were fully familiar with the work the BBC had done on 12-bit nonlinear systems. We developed our own digital recording system, the original Numerik system. We had a background in computing, but we spent a lot of time in research before we released a CD player that exceeded our

minimal level of musical expectations. We were seen as just anti-CD, but the effect of the launch of CD was to put our turntable sales up very substantially. We did question the claims of CD, and we did so in our usual, very youthful, up-front way. [Chuckles.] We would not do that now, I suppose; we would be more circumspect or respectful of the competition.

The irony of it all was that you were using so much advanced digital technology in-house, but to the outside world Linn Products was the most aggressively hard-core analog of all the high-end companies.

You can't say we were against digital technology when we had the world's first microprocessor-controlled preamplifier, the LK-1. Linn is all about a standard; you know, we develop all of our own software. Everything we do is an original design, and that takes tremendous time, effort, and resources.

When we wanted software for Dolby Digital, we wrote it ourselves, sent it off to Dolby Labs, and got their approval. We're not mere implementers. Obviously, other manufacturers can be quicker than us and address more formats 'cause they're doing less original work.

Linn has its own way of doing things.

"Simply Better" is not an assertive statement of superiority—it's a motto. It's something to live up to. We want to simplify and improve. That's what Linn was about from day one. We didn't say, "Here is a design. It's perfect." We saw only its imperfections. Recently, one of my friends said, "You

THE AUDIO
INTERVIEW

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Photograph: Steve Gutterberg

I V O R
T I E F E N B R U N

THE AUDIO
INTERVIEW

EVERYTHING
LINN DOES IS
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DESIGN; WE
EVEN DEVELOP
OUR OWN
SOFTWARE.
AND THAT TAKES
TREMENDOUS
TIME AND
RESOURCES.



Photograph: Steve Guttenberg



I V O R
T I E F E N B R U N

always walked around with a dark cloud over your head." I think that's true. I think I was always absorbed in the shortcomings and weaknesses of our designs. I was looking to identify problems and solve them and then expose the bigger problems that, by definition, hid behind every solution. That's the TQM [total quality manufacturing] method. TQM does not mean absolute perfection; it means all-encompassing attention to quality issues.

So how did your "new" factory make that possible?

In the old factory, all of our products were being built continuously at one, two, or three workstations, and that was just too convenient to be realistic. I realized that we were becoming production-driven. It was all self-fulfilling and self-limiting. It wasn't messy enough, and the best things in life are always messy. I wanted the new factory to be flexible enough to make almost anything. Now we use robotics and automation to serve the people; we don't use the people to serve the robots. Our goal is to elevate the status of the individual. I suppose that has everything to do with my background and my culture, both as a Scotsman and as the son of a Jewish refugee from Kraków. That's what the Age of the Scottish Enlightenment was about: using people at the highest possible level and understanding that wealth is created by people's imagination and skill. When we set out to develop a new product, it's a total company activity.

Highly automated, the Linn warehouse uses AGVs (automated guided vehicles) to load and move materials.

A lot of these ideas came from the late Dr. Pugh, who was a professor at Strathclyde University. He came up with the concept of Integrated

Product Development, the whole notion of concurrent engineering where you take the responsibility away from just the design de-

partment to involve customers, suppliers, and everyone in the company. Someone might ask, "What could Dispatch [the shipping department] possibly add to a new product?" Well, they might want to put more goods on a pallet, reduce transit damage, or keep a shipment within weight limits; there are millions of issues. Everyone is trying to improve the process.

It seems complicated, but it's all about increasing efficiency.

The \$20,000 CD12 represents Linn's assault on the ultra high end.



With computer control, I can reconfigure the factory to make whatever my customers want each day. I can have one, two, three, or twenty positions build a product, or I can change the configuration of the product. We can make one or two of a given model in a day or a month, or we can make many, many thousands in a week. We're the most productive player in our business.

Even with all the troubles in the Asian markets and the general downturn in business in the audio community in particular, Linn seems to be thriving.

We've invested more money, taken more people on, and worked harder. The company is incomparably fitter and better organized than it was even a year ago. One of the most powerful mechanisms for improvement and the generation of good ideas is a challenge. Competition is another one.

I get the feeling that just about every Linn employee is involved with sound quality.

Most of the products are listened to by the guys who build them; they're constantly monitoring sonic performance. Linn is about integrated manufacturing, so we're customer-driven. We start with the customer and end with the customer. I've never forgotten what it was like when I went into a shop to buy my first hi-fi. If you lose

that feeling, it's easy to become distanced from what really matters in the business.

Okay, but how does all that reconcile with a statement of yours: "I often think the object of life is to prove everyone else wrong—but I mean our competitors, not the people I work with"?

It's easy to say, "We're nice and we're doing what people want. . . ." But you're not going to break new ground by doing that. It's hard to combine the external competitiveness and aggression that a team needs to outperform other companies and not have a macho style. I'm a competitive person in many ways, but I'm not unsympathetic, hard, or uncaring. You know, if you want to be original, you've got to be different. And you can't be different without causing disagreements. And you can't be right without prevailing wisdom being wrong. A lot of people don't like that.

Another provocative statement of yours is, "We do not just want to beat our competi-

The Klassik, Linn's CD player/integrated amp, was designed for people who want a simple system.



tors, we want to get them to admit they are beaten. . . ."

That's very Glasgow.

Have any competitors admitted defeat?

Oh, yeah, all of them! [Laughs.] The point is, we're not looking for a small, arguable advantage. We would like our products to be so good, and sound so fantastic, that when people hear a few bars, they will go out and steal the money to buy them!

Your new \$20,000 CD player, the Linn Sondek CD12, just might have your customers considering some extreme action.

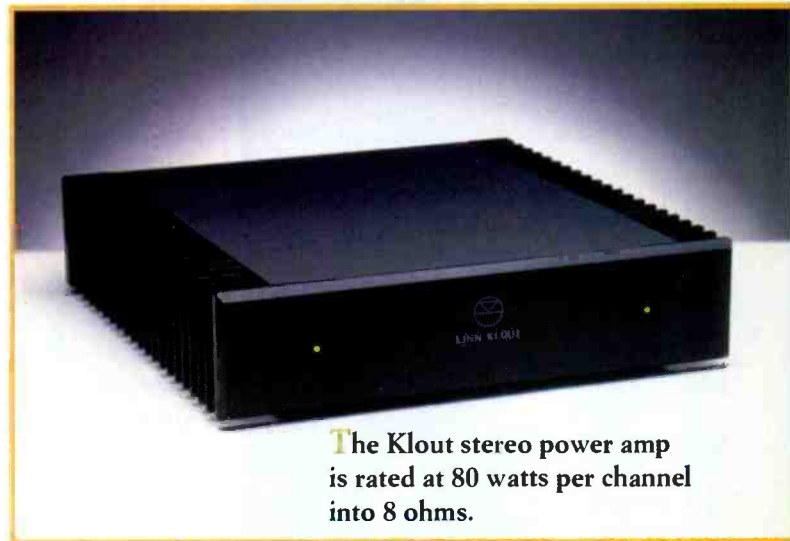
The design team that worked on it didn't want any price limitation, so I said, "No, no, wait a minute," and we set a price ceiling of 25 grand.

We saw in America that there were CD players selling for \$37,000, and we thought we could blow them away with a Mimik [Linn's \$1,595 CD player].

It's interesting that you waited until now to give a Linn CD player the appellation "Sondek."

Alan Clark [the player's chief designer] wanted the CD12 to do for CD what the

LP12 did for LP. I said that if it carries the Sondek name, then I want to take it to Japan first. I've known the guys over there for a quarter of a century, and I have absolute, unreserved respect for them. And they've criticized everything we've ever done! So I went to Japan with an early prototype, and they laughed at it. They said, "You're the guy who taught the world about



The Klout stereo power amp is rated at 80 watts per channel into 8 ohms.

microphony, and now you're making this thing in a tin box?" When I came back from my week in Japan, I told the guys, "This is not good enough." If it was going to have the Sondek name, it needed to be the very best we could do—to hell with everything else. It wouldn't have ended up the way it is without the Japanese critics and press contributions. That put us a year behind sched-



Linn's three-way AV5140 is priced at \$2,595 per pair.

IT'S EASY TO SAY, "WE'RE NICE AND WE'RE DOING WHAT PEOPLE WANT." BUT YOU'RE NOT GOING TO BREAK NEW GROUND BY DOING THAT.



Photograph: Steve Guttenberg



The turntable that launched a company: the Linn Sondek LP12

ule; it costs to learn, you know, but you just have to be prepared sometimes to bleed a little. That's easier said than done, 'cause it's month seven, and that's when you've said the product would be finished. It was a painful experience, but we learned an awful lot from that work.

The LP has celebrated its 50th anniversary, but I doubt the CD will make it to 25.

I think it probably will. For the foreseeable future [the next five years], it will remain the dominant medium, and for another 20 or more years people will want to play CDs. I'd like to be able to predict the future, but I'm not very good at it.

Most Linn speakers offer an upgrade path: They can be bi-wired or passively or actively multi-amped. To me, this is an amazingly flexible approach.

A Linn quality-control technician inspects a row of Sekrit in-wall/on-wall speakers.

because it delivers power so effectively to the drive units rather than squandering it in the crossover. Twenty-five years after we introduced that concept, I find it extraordinary that active systems are still so underappreciated.

You see the speakers as an integral part of your complete system, whereas most other specialist manufacturers sell only specific components.

Whatever product they're trying to sell monopolizes all goodness; it becomes the most important thing in the universe—a personal, physical expression of the deep soulfulness of the designer, and so on. [Laughs.] We're just not like that.

You're pretty deep and soulful.

I couldn't say that with a straight face, even if I felt that. It's just straight engineering.

That sounds so clinical. There's more to it than that.

The reason I got into this business was because I could think of no better way to earn a living than to bring people happiness with accurate music reproduction. And music is so important and so critical for human evolution. All you need to live is bread and water. But for human well-being, you need loads of other things: sex, love, food, shelter, clothing. And you need music, song, and dance. I think that one day they'll discover why we're all killing each other and going crazy in this world. They'll probably find it was because we didn't have enough music, song, and dance.

The 5101 remote comes with the AV5103 preamp/processor or can be purchased separately for \$395.



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EDWARD J. FOSTER

MARANTZ DR700 CD RECORDER

Marantz's DR700 is one of several CD recorders to hit the market recently, and you can expect to see more. Recorder prices have plummeted from the five-figure levels of a few years ago to a comparative pittance today. Prices of write-once recordable CD-R discs have begun falling. And with rewritable CD-RW discs, you can now redo flawed or unsatisfactory recordings.

The DR700 gives you the choice of recording on CD-Rs and CD-RWs. It also gives you a wide choice of input sources. It has an analog input and two digital inputs, one coaxial and one Toslink optical. And a sampling-rate converter lets you make direct digital dubs from sources whose sampling rates are not CD's 44.1 kHz (48-kHz DATs or 32-kHz satellite broadcasts, for example). The Marantz also has coaxial, Toslink, and analog outputs, so you can connect it to analog or digital preamps or any equipment you please. (All RCA jacks are gold-plated, as is the front-panel headphone jack.)

The DR700's two digital inputs are independent, so you can hook up, say, a CD player and a satellite receiver (assuming one has a coaxial and one has a Toslink output). You cycle through the three input sources by pressing the "Input" key on the Marantz's front panel or remote control.

Except for its recording level knob and a few extra buttons, the DR700's front panel is similar to an ordinary CD player's, with the usual "Stop," "Play," "Pause" and track-skip buttons. There are some niceties on the remote, however: track selection via a numerical keypad, double-speed and eight-times search, 20-track programming via the keypad, and buttons for repeating a disc, a single track, or whatever tracks you've programmed.

The controls added for recording are nicely grouped. The good-sized "REC Level" control is to the left of the main transport-control buttons. Just below this knob



are buttons for "REC," "Finalize," "Erase," and "CD Sync." To the left of the knob are buttons labeled "Auto/MANU," "Input," and "Display"; below them is the "Open/Close" button.

By pressing "REC," you prepare the DR700 for recording, as you'd expect, and the dual record level indicators show signal level. Recording begins when you press "Play"; pressing the "Pause" key inserts a blank interval of 3 seconds. The record level indicators (with calibrations at -50, -40, -30, -20, -10, -6, -3, 0, and "Over") are essential when recording via the analog inputs. But they and the recording level knob are merely informative when making digital dubs. As with all digital recorders, when you record from a digital source, there's no need to adjust level;

0 dBFS on the original automatically translates to 0 dBFS on the copy.

The "Auto/MANU" button toggles between automatic and manual track numbering. In automatic mode, the track number goes up when a digital source's track number changes or an analog signal goes silent for 3 seconds. (If the silence lasts more than 20 seconds, the DR700 drops out of record mode.) To add track numbers yourself, you must use manual mode. When recording in this mode, you press the front panel's "REC" button or the remote's "Track INCR" key to write the next track number to the disc. (The minimum track duration is 4 seconds.) Track numbers cannot be added after recording, so you have to get it right to start with.

**THE DR700 GIVES YOU
THE CHOICE
OF RECORDING
ON CD-Rs OR
REWITABLE CD-RWs.**

Dimensions: 17½ in. W x 3½ in. H x 12 in. D (43.5 cm x 8.8 cm x 30.5 cm).

Weight: 9¼ lbs. (4.2 kg).

Price: \$850.

Company Address: 440 Medinah Rd., Roselle, Ill. 60172; 630/307-3100; www.marantzamerica.com.

MEASURED DATA

Channel Balance: Playback, ± 0.03 dB.

Frequency Response: Playback, 20 Hz to 20 kHz, +0.18, -0.13 dB; record/play via analog input, 20 Hz to 20.5 kHz, +0.06, -0.31 dB; record/play via digital input, +0.18, -0.13 dB.

THD + N at 0 dBFS, 20 Hz to 20 kHz: Playback, less than 0.051%; record/play via analog input, less than 0.0235%; record/play via digital input, less than 0.0515%.

THD + N at 1 kHz: Playback, below -85.5 dBFS from 0 to -90 dBFS and below -93.3 dBFS from -30 to -90 dBFS; record/play via analog input, below -80.1 dBFS from 0 to -90 dBFS and below -87.6 dBFS from -30 to -90 dBFS; record/play via digital input, below -85.8 dBFS from 0 to -90 dBFS and below -94.6 dBFS from -30 to -90 dBFS.

Maximum Linearity Error: Playback, 0.65 dB from 0 to -90 dBFS with undithered recording and 0.32 dB from -70 to -100 dBFS with dither; record/play via analog input, 0.84 dB from 0 to -90 dBFS and 1.2 dB from 0 to -100 dBFS; record/play via digital input, 0.18 dB from 0 to -90 dBFS with undithered input and 0.29 dB from -70 to -100 dBFS with dither.

S/N: Playback, 103.7 dB, A-weighted, and 96.6 dB, CCIR-weighted; record/play via analog input, 93.7 dB, A-weighted,

and 85.2 dB, CCIR-weighted; record/play via digital input, 103.2 dB, A-weighted, and 96.5 dB, CCIR-weighted.

Quantization Noise: Playback, -84.8 dBFS; record/play via analog input, -84.1 dBFS; record/play via digital input, -84.8 dBFS.

Dynamic Range: Playback, 94.2 dB unweighted, 98.8 dB A-weighted, and 89.5 dB CCIR-weighted; record/play via analog input, 88.4 dB unweighted, 93.6 dB A-weighted, and 84.7 dB CCIR-weighted; record/play via digital input, 94.3 dB unweighted, 98.8 dB A-weighted, and 89.4 dB CCIR-weighted.

Channel Separation: Playback, greater than 103.7 dB, 125 Hz to 16 kHz; record/play via analog input, greater than 91.7 dB, 100 Hz to 17 kHz; record/play via digital input, greater than 105.1 dB, 125 Hz to 16 kHz.

Analog Input Characteristics: Sensitivity, 0.529 V for 0-dBFS recording level; overload, 7.97 V; impedance, 49.5 kilohms.

Line Output Characteristics: Level, 1.9 V for 0-dBFS recorded signal; impedance, 200 ohms.

Headphone Output Characteristics: Maximum output voltage, 5.82 V at clipping; maximum power, 43.5 mW into 600 or 50 ohms; impedance, 120 ohms.

The "CD Sync" button synchronizes digital dubbing from CD and other sources. Pressing "CD Sync" once readies the DR700 to record the next track of the source; pressing it twice in quick succession sets up the Marantz to record all the source's remaining tracks (but only if you play them in their original order—otherwise, you must transfer tracks one by one, numbering them manually). Recording commences as soon as the DR700 detects the digital track number at the start of the next track and stops if the source pauses for 20 seconds (or if you press "Stop," of course). Whenever you stop recording, the DR700 takes a few seconds to update its temporary table of contents; you're warned of this by the "UPDATE" legend that appears in the display.

It takes the DR700 about 0.4 second to start recording after it senses a new track number. Normally that's of no consequence, because most sources' track numbers precede their audio data by several seconds. However, if you're dubbing a CD in which the music follows hard on the heels of the track info, you're best off not using "CD Sync"; otherwise, you might truncate the track's first note.

While you're recording, the disc's tracks are listed in a temporary table of contents, which only CD recorders can read. Until a permanent table of contents (which regular players *can* read) is written to the disc, you can add more tracks (up to a total of 99) and, if the disc is rewritable, erase the last track or tracks you've recorded. Once a CD-

RW has been finalized, you cannot erase individual tracks, only the full disc (which takes about 90 seconds). These limitations apply to all CD-RW recorders.

When you finish recording, you must press the "Finalize" and "REC" buttons, after which the DR700 writes the disc's permanent table of contents. During this process, which takes 2 minutes or more, the display counts down the time remaining and the Marantz refuses to accept further commands and must not be turned off. When the job is complete, the total number of tracks and the total recorded time appear in the DR700's display, and you have a finished Compact Disc that can be reproduced by most players. Be forewarned, however,

**CD PLAYERS ARE READY
AS SOON AS YOU LOAD
A DISC, BUT RECORDERS
MUST CHECK IF THE
DISC IS RECORDABLE.**

that some players have trouble recognizing CD-Rs or CD-RWs. Most single-laser DVD players will not recognize a CD-R (but may recognize a CD-RW), while most dual-laser DVD players recognize CD-Rs but not CD-RWs. Some CD players balk at reading CD-RWs, but most new models are said to recognize all formats.

The DR700 has to play both types of recordable discs and must distinguish them from each other and from discs it can't record on. When a disc is loaded, the deck takes a few moments to check what kind of disc it is and, if recordable, whether it has been finalized. If it can't recognize the disc, "No Audio" appears in the display. If it's a commercially recorded CD or a finalized recordable disc, the display shows the disc's total time and number of tracks. If the disc is a CD-R or CD-RW that's blank or hasn't yet been finalized, the deck calibrates its laser power for optimum recording on that disc and finds the end of the last recorded track so you can start recording from there; its display reads "OPC" during calibration and tells which type of disc is loaded. Pressing "Display" shows you the recording time remaining on the disc; you can't start a new recording if less than 7 seconds remain.

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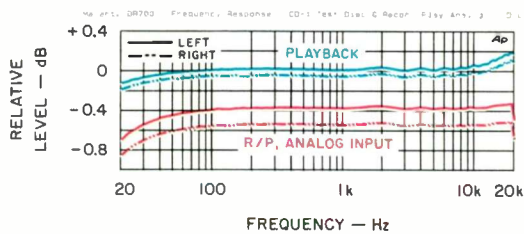


Fig. 1—Frequency response.

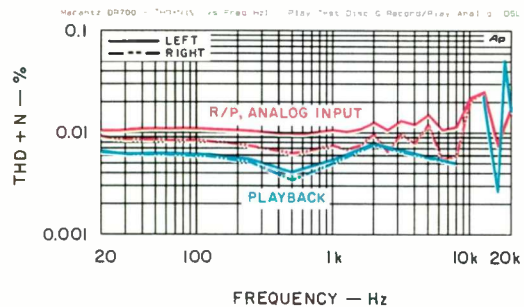


Fig. 2—THD + N vs. frequency.

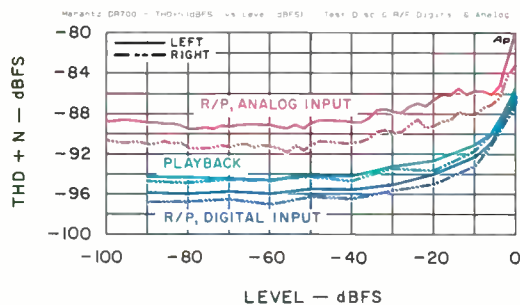


Fig. 3—THD + N vs. level.

Like all home digital audio recorders, the DR700 must comply with restrictions imposed by the Audio Home Recording Act. Therefore, it has been designed to record only on CD-R and CD-RW blanks manufactured and labeled for consumer audio use, on which a copyright fee has been paid, and which are more costly than the near-identical CD-Rs and CD-RWs used for recording computer data. The recorder also incorporates the Serial Copy Management System (SCMS), which limits the number of copy generations you can make digitally. You can make as many digital dubs of a CD as you like, but SCMS prevents your making digital dubs of your dubs; this ensures that a copy you send to a friend won't be cloned from one music lover to another and crop up all over town. Your dubs can, however, be copied freely (if less perfectly) via

analog outputs and inputs. If you try to copy a copy digitally and violate the rules, "Copy Prohibit" appears in the display and the DR700 locks up.

Measurements

I tested the Marantz DR700 as a CD player first, with my CBS CD-1 test disc, which gave me a benchmark to evaluate its digital-to-analog converters and output amplifiers. Then I cloned the CD-1 by copying it from my lab player to the DR700 via a high-quality fiberoptic cable and repeated my playback measurements. Finally, I used my Audio Precision test equipment to generate signals similar to those on the CBS CD-1 and recorded them via the DR700's analog inputs. In doing so, I found that the Marantz's auto track-numbering system interpreted an input level below approximately -60 dBFS as silence and stopped the recording a few seconds later. I therefore completed this recording under manual control.

The test results for the digital dub of the CD-1 were so nearly identical to those for the original CD-1 that I omitted most of the dub's curves from the graphs, to limit clutter. You can see in "Measured Data," however, that the test results I obtained from the copy were actually better in a few respects than those taken on the original disc! I have no ready explanation for this other than that performance was so good both ways that the normal measurement variations over several days occasionally tilted the balance in favor of the clone. It goes without saying that the recordings made using the analog inputs were inferior to those made with a direct digital transfer (though still nothing Marantz need apologize for), so all of the analog curves are presented.

The 0-dBFS levels in the graphs and in "Measured Data" are not precisely the same for digital and analog signals. When I used an analog input level sufficient to get the same output level as I did from 0-dBFS signals on the CD-1, the first red segments ("0") of the recording indicators were on

and there was evidence of peak clipping in the output waveform. This often seems to occur when recording analog signals on a digital recorder, so I dropped the level until the red segment just went out. At that point, a negligible 0.4 dB below true 0 dBFS, the peak clipping disappeared as well. I therefore made this my "0" recording level when using the analog inputs. What this means in practice is that all will be well when you record from analog sources as long as the indicator's "0" and "Over" red segments don't come on.

For all my analog input measurements except sensitivity and overload, I used a 2-volt signal and set the DR700's record level control at approximately 6.2 on its calibration scale to produce my "0" level. The level



**LOW CROSSTALK
TESTIFIES TO
MARANTZ'S
CAREFUL CIRCUIT LAYOUT.**

control affects both channels, with no way to adjust channel balance; with the control set at 6.2, the right channel's output was 0.16 dB less than the left's when recording from the analog inputs. (When playing the CD-1, the right channel's output was 0.06 dB less than the left's.) All things considered, I'd say that the channel balance was pretty good at this setting, despite this deck's lack of balance adjustment for analog signal recording.

Figure 1 depicts the DR-700's frequency response for playback of track 11 on the CBS CD-1 and when recording and reproducing an analog input signal. (The digital dub of the CD-1 had exactly the same frequency response as the original.) I didn't

“normalize” the analog and digital curves this time, so you can see that the left-channel curve for record/play with analog input lies 0.4 dB below the left-channel playback curve. There is also a slight increase in channel imbalance with analog record/play.

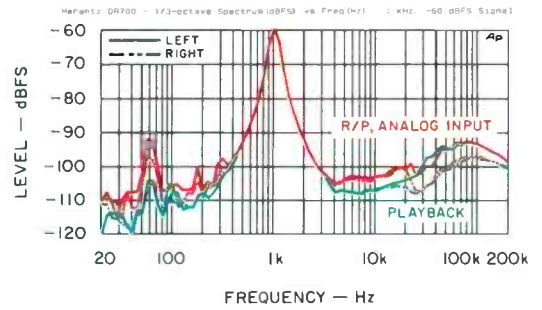
In all other respects, the response curves in Fig. 1 are remarkably similar, considering the extremely sensitive vertical scale that I used. Record/play response using the analog inputs rolls off a bit more in the low

**THE DISPLAY CONVEYS
A LOT OF INFORMATION
CLEARLY, AND THERE'S
A LOT TO CONVEY.**

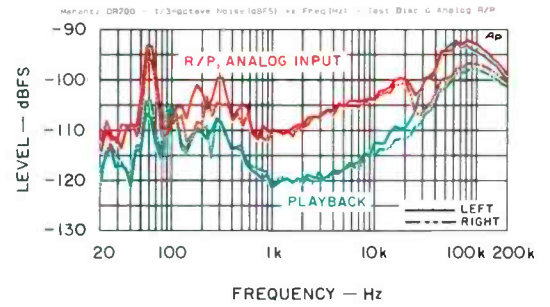
bass (−0.31 dB at 20 Hz compared to −0.13 dB with the CBS CD-1), but there’s no more treble ripple in one than in the other, which speaks volumes about the quality of Marantz’s anti-aliasing filter. That filter does, however, remove the 0.18-dB peak at

20 kHz that appears in the CD-1 “Playback” curve.

Figure 2 compares the DR700’s THD + N versus frequency when playing the CD-1 and when playing a recording made via the analog inputs. From 20 Hz to nearly 10 kHz, the record/play curves lie above the playback curves; that is to be expected, as they include the noise and distortion of the analog input amplifiers and analog-to-digital (A/D) converters. At 10 and 12.5 kHz, distortion is identical for both sets of curves, suggesting that the digital-to-analog (D/A) converter is responsible for it. That’s probably true at higher frequencies, too, even though the curves differ. You see, the peaks and dips in these curves are caused by intermodulation with the carrier rather than by harmonic distortion. As a result, they vary according to the specific test frequencies, which are slightly different for the analog and digital input signals.



A



B

Fig. 4—Noise spectra for −60 dBFS signal at 1 kHz (A) and for digital silence or no-signal condition (B).

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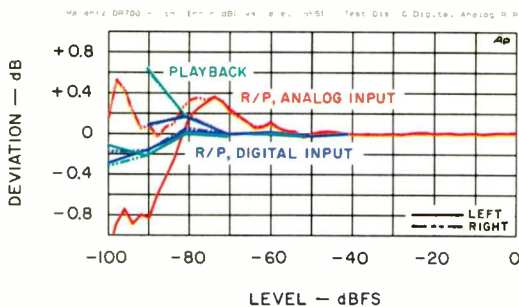


Fig. 5—Deviation from linearity.

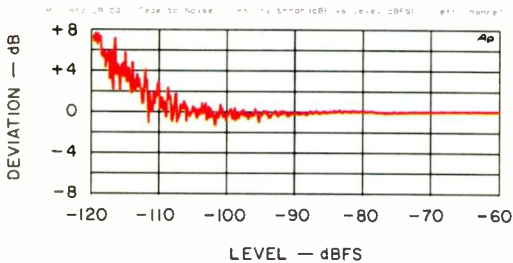


Fig. 6—Fade-to-noise test.

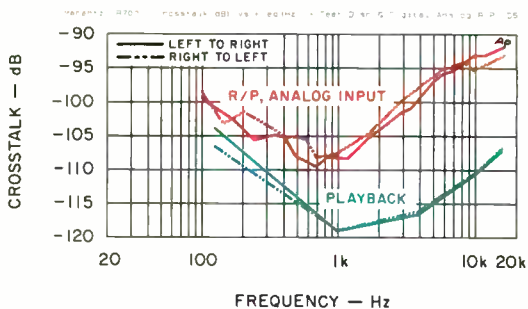


Fig. 7—Interchannel crosstalk.

The Marantz's remote has buttons for double-speed and eight-times search and a keypad for track selection.



I included all three curve sets when I plotted THD + N versus level at 1 kHz (Fig. 3), because the results from the CD-1 and my clone of it did differ in this case. The clone actually had slightly lower distortion below -8 dBFS than the original disc. (Conceivably, the DR700 “de-jittered” the disc it

recorded better than it did the CBS original, but my money’s on test variation.) The record/play curves with analog input lie 4 or 5 dB above those of the direct digital recording because of noise and distortion from the analog input electronics and A/D converters.

You can see the noise contribution of the analog input electronics in the third-octave spectrum analyses of -60 dBFS, 1-kHz recordings (Fig. 4A) and of “digital silence” (Fig. 4B). The playback curves were taken on the CBS CD-1 (the curves taken on the clone were essentially the same); the record/play curves are for the recording made using the analog inputs.

In Fig. 4A, the record/play curves lie about 3 dB above the playback curves in the low- and high-frequency audio regions far removed from the 1-kHz stimulus. There is also substantially more 60-, 180-, and 300-Hz magnetic pickup when recording from the analog inputs (the probable reason for the 1 or 2 dB of added noise seen in Fig. 3) but relatively little difference in 120-Hz power-supply hum.

The curves in Fig. 4B, for playback of the CD-1’s “silent” track and for record/play with no input signal, would seem to suggest that the analog input electronics boost the DR700’s noise floor by about 10 dB, not 3 dB, but that’s misleading. In typical fashion, Marantz’s D/A converter mutes when detecting “digital silence,” leaving only the noise of the output amplifier. Recordings made from an analog input can never result in “digital silence,” so the D/A converter doesn’t mute. “Digital silence” doesn’t exist in the real world, either. The moral of this story: You must be careful when interpreting noise analyses.

Figure 5 compares the linearity error measurements made on the CD-1, on its clone, and on a recording made via the analog inputs. The CD-1 and the clone have two linearity error sequences, one using an undithered signal extending from 0 to -90 dBFS and the other using a dithered signal

that extends from -70 to -100 dBFS. For simplicity, I combined the curves taken with and without dither, but you should be able to distinguish them by referring to the level scale. The analog-generated curves go from 0 to -100 dBFS and include the A/D converters’ nonlinearity as well as the D/A converters’. Again, the Marantz DR700 seems to like the clone of the CD-1 better than the CD-1 itself, but, on both, linearity error is quite low. The deviation from linearity when the DR700 was playing the analog-sourced recording is not as low but, all things considered, not bad at all—the scale used in Fig. 5 is mighty sensitive!

In the fade-to-noise test for linearity error (Fig. 6), the Marantz DR700 exhibited fine performance. The curve shown is for

EVEN FOR ANALOG TRANSFERS, THE DR700 YIELDS RESULTS NO ANALOG RECORDING SYSTEM CAN MATCH.

the left channel during playback of the CBS CD-1 disc; the curve for the clone was quite similar. (This measurement can’t be made using an analog source, so only the curve for the CD-1 is presented.)

Crosstalk (Fig. 7) is shown for playback and for record/play via the analog input jacks. The crosstalk measured for the clone was almost the same as it is for the original CD-1—excellent results in both cases. There’s more high-frequency crosstalk in the recording made from the analog inputs, but it, too, is surprisingly low and can be attributed to careful circuit layout.

As far as signal-to-noise ratio, dynamic range, and quantization noise go (see “Measured Data”), there was essentially no real difference between the CD-1 and its clone. Clearly, the Marantz DR700 can clone a CD perfectly and, although the analog recordings aren’t quite the match of digital cloning, who can argue with an A-weighted S/N ratio and dynamic range approaching 94 dB? I know of no analog recording system that comes close! Overall, the DR700’s performance was fine, even though it establishes no new benchmarks.

The one thing I'd really like to see improved is quantization noise.

Output level was slightly below the quasi-standard 2 volts, but that's okay. Output impedance was a nice, low 200 ohms, and there was more than enough power when feeding high- or low-impedance headphone loads. Analog input sensitivity, input impedance, and input overload were far more than adequate.

Use and Listening Tests

The Marantz DR700 performs one ordinary function unconventionally. It's no big deal, but pressing reverse track skip while playing a disc doesn't return to the start of the current track, as it does on most machines; instead, the laser goes all the way back to the previous track. To restart the track you're playing, you skip back, then skip ahead again. The conventional way has always seemed illogical to me, yet I found this new way rather klutzy because it requires two actions instead of one for a commonplace action.

Compared with an ordinary CD player, the DR700 takes a while to recognize a disc

when it's loaded and to decide how to handle it. This is typical of CD recorders, especially those that must determine not only whether the disc is recordable but also if it's a CD-R or CD-RW. And if the disc



**AS FAR AS I CAN TELL,
THE DR700 MAKES
ABSOLUTELY
PERFECT CLONES
VIA ITS DIGITAL INPUT.**

turns out to be recordable, there are further delays while the system checks whether any recording time remains on it and then calibrates the laser. Fortunately, the DR700 recorder's display is legible and informative enough to show you what's going on as it's happening.

For recording from the analog input, I'd like some means of adjusting channel balance (even two concentric level controls with a clutch between them would do). I'd also like more segments in the recording level indicators; with only nine, the top two of which indicate that you're already in trouble, setting the recording level from an analog source is a bit dicey. (Wishful thinking, I'm afraid—really good level indicators on consumer recorders seem to be as extinct as the dodo.)

These cavils are irrelevant, of course, to recording via the digital inputs, where you don't need level indicators and couldn't adjust level or channel balance if you wanted to. Any copy you make via direct digital connections from a 44.1-kHz source will be a bit-for-bit clone of the original, which is why the recording industry is so hung up about digital recording. But whether the record companies like it or not, it's here, and the Marantz DR700 is a fine exemplar of the breed. It's a good-sounding deck, relatively straightforward and simple to use, and, as far as I can tell by instrument and by ear, it makes absolutely perfect copies. **A**

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D. B. KEELE, JR.

BAG END MM-8H SATELLITES AND INFRASUB-18 POWERED SUBWOOFER

Most speaker companies would kill to have the strong technical story behind their products that Bag End has in ELF and Time Alignment. ELF, an acronym for Extended Low Frequency, is a design technique that enables a woofer's response to reach down into the infrasonic range; it couples a woofer operated below its system resonance with a carefully matched equalizer that compensates for the resulting rolloff. The primary goal of ELF design is to minimize phase and delay errors at low frequencies; deep bass is almost a byproduct. Time Alignment (which is trademarked, despite attempts by other companies to use the term) is a technique for arranging a speaker's midrange and tweeter so that their outputs arrive at the listeners' ears simultaneously. Both ELF and Time Alignment greatly improve a speaker's time and phase response and, Bag End strongly believes, its sound. Time Alignment, which is used in the MM-8H satellites, was developed by Edward M. Long (like me, one of *Audio's* Senior Contributing Editors). He developed ELF (used in the Infrasub-18) with Ronald J. Wickersham. Both technologies are licensed to Modular Sound Systems, Bag End's parent company.

SATELLITES

Rated Frequency Response: 100 Hz to 20 kHz, ± 3 dB.

Rated Sensitivity: 93 dB SPL at 1 meter, 2.83 V rms applied.

Rated Impedance: 8 ohms, nominal.

Dimensions: 17½ in. H x 12½ in. W x 8 in. D (44.5 cm x 31.8 cm x 20.3 cm).

Weight: 31 lbs. (14.1 kg) each.

Price: \$2,264 per pair.

SUBWOOFER

Rated Frequency Response: 8 to 95 Hz, ± 3 dB.

Dimensions: 23½ in. H x 21¼ in. W x 18¼ in. D (59.7 cm x 54 cm x 46.4 cm).

Weight: 90½ lbs. (41.1 kg) each.

Price: In black vinyl, \$1,495; in wood, \$2,395 to \$2,895, depending on type.

Company Address: 22272 North Pepper Rd., Barrington, Ill. 60010; 847/382-4550; www.bagend.com.

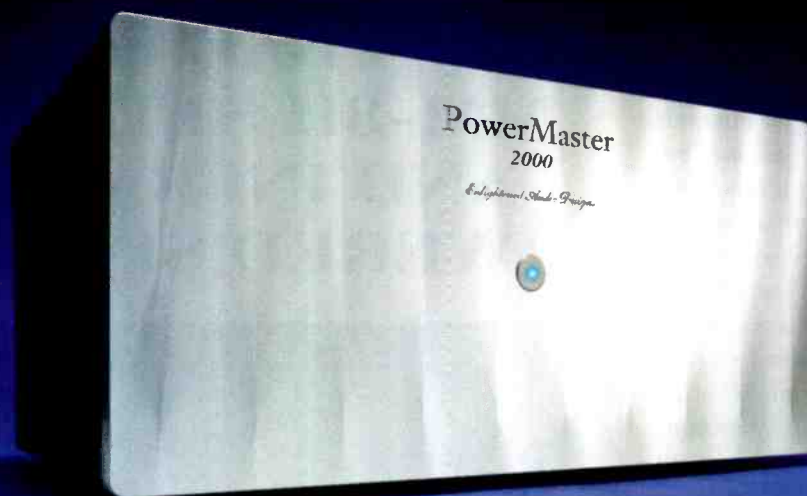


Bag End (the name is a reference to J. R. Tolkien's *The Hobbit*) was founded in 1976 to make speakers for live musical and theatrical performances. Although the company targets the professional market for most of its sales, the speakers under review are home versions of studio models. The MM-8H ("H" for "home") doesn't have the pro version's front-panel EQ switches, and the home Infrasub-18 is available in wood finishes as well as the

pro version's black vinyl. The MM-8H's vented enclosure holds an 8-inch woofer with a coaxially mounted horn tweeter. The Infrasub-18 is a sealed-box subwoofer with an 18-inch driver and a built-in 400-watt amplifier.

The Infrasub-18's rated response extends unusually low, to 8 Hz, thanks to its ELF design and large driver. That driver, a long-throw unit, has a heavy-duty stamped frame and an accordion-pleat surround. Its

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magnet is large, 8½ inches in diameter and just over ¾ inch thick, with a central air vent. The enclosure has an effective internal volume of about 3 cubic feet and is solidly constructed of inch-thick, medium-density fiberboard (MDF).

The Infrasub's power amplifier is in a separate chamber, 3 inches deep, at the rear of the cabinet. Its two circuit boards and large toroidal transformer are attached to an aluminum rear panel. On the outside of the panel are a volume control, polarity switch, power switch, and power-cord socket but no low-pass frequency control. The real panel also holds the summing inputs (line-level RCAs for left, center, and right channels and a pair of speaker-level terminals) and three high-passed RCA outputs.

**BAG END HAS OPTIMIZED
THE MM-8H AND
THE INFRASUB-18 FOR
THE FREQUENCY RANGES
THEY COVER.**

Bag End recommends driving the Infrasub-18 with a full-range signal rather than a low-passed "subwoofer" output, for best response from the Infrasub itself and to ensure correct crossover response to the satellite speakers.

The Infrasub-18 has only line-level, not speaker-level, high-pass outputs. That leaves two options for connecting satellites. You can use the Infrasub's line-level outputs to feed internally or externally powered satellite speakers. Or you can use passive satellites whose bass does not go down much lower than 100 Hz and connect them to your amp in parallel with the Infrasub. It's no coincidence, then, that the rated response of the MM-8H satellite, which Bag End recommends be used with ELF subwoofers, rolls off at 100 Hz.

Like the subwoofer's driver, the MM-8H's 8-inch woofer has an accordion-pleat surround. At first, it seems to be the only driver; a transparent dust cap covers the tweeter horn, whose circular cross-section gives it identical vertical and horizontal radiation patterns. The magnets of the outer and inner drivers are integrated into one concentric assembly.

The MM-8H's cabinet is rigidly constructed of ¾-inch MDF and is well braced. The connection cup at the bottom rear holds a single pair of five-way terminals spaced for double-banana plugs. The crossover is made up of air-core inductors and other high-quality parts.

According to Bag End, the Time Alignment technology in the MM-8H ensures that a complex, transient acoustical signal's fundamental and overtones will have the same relationships at the listener's ear as they did at the loudspeaker's input terminals, arriving "as a tight package of energy, with the same time relationships as the natural sound." Time Alignment takes into account driver placement and the delay characteristics of the drivers and crossover.

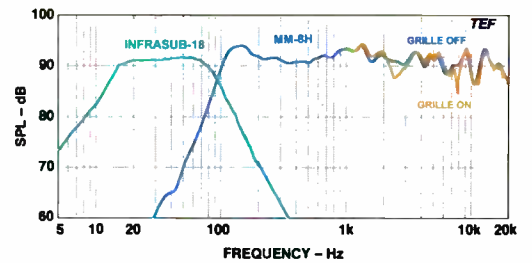
The grilles of the MM-8H and Infrasub-18 have heavy-duty MDF frames covered with black cloth.

Measurements

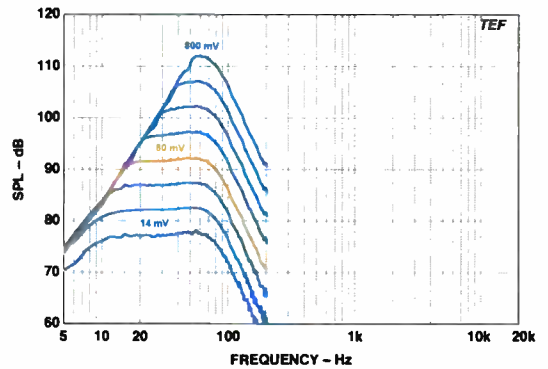
Figure 1A shows the frequency response of the two Bag End speakers. The signal level for the MM-8H was 2.83 volts, equivalent to 1 watt into its rated impedance of 8 ohms. For the Infrasub-18, the signal level was about 0.08 volt (-22 dBV), fed to one of the sub's line inputs.

The MM-8H's response is fairly flat. The rapid rolloff below 100 Hz is caused by the deliberately high, 95-Hz, tuning. The grille has little effect below 2 kHz. Averaged from 250 Hz to 4 kHz, the MM-8H has high sensitivity, 91.6 dB. The right and left speakers matched closely below 1 kHz, though their outputs differed by 0.5 to 1.6 dB between 1 and 3 kHz. At higher frequencies, the two MM-8Hs were better matched, but there were narrow-band deviations of up to ±3 dB.

With an input of 0.08 volt, the Infrasub-18 delivers very clean and flat response from 85 Hz down to about 15 Hz (note that the frequency scales in Fig. 1 begin at 5 Hz). Even at this low level, a pro-



A



B

Fig. 1—Frequency response of Infrasub-18 subwoofer and MM-8H satellite (A) and of subwoofer at varying input levels (B).

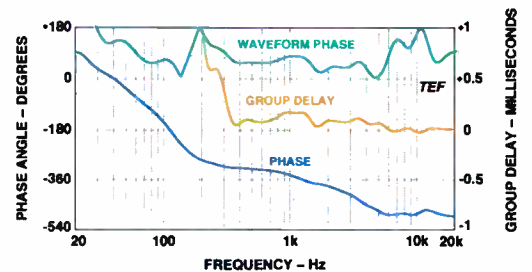


Fig. 2—Phase response, group delay, and waveform phase of MM-8H.

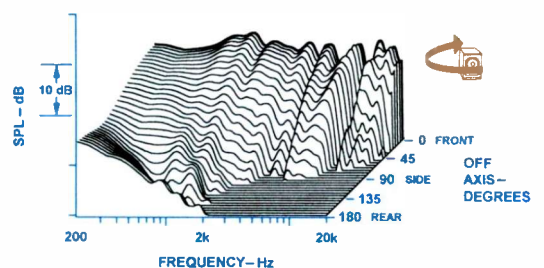


Fig. 3—Horizontal off-axis frequency responses of MM-8H.

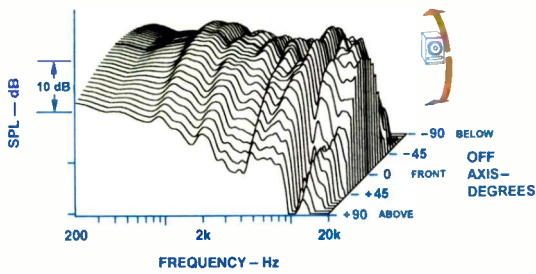
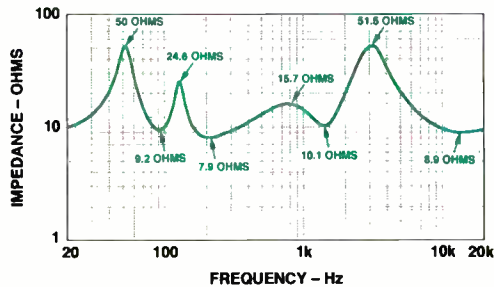
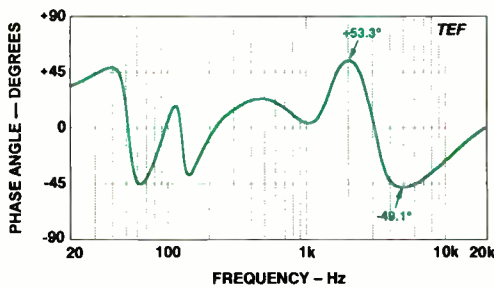


Fig. 4—Vertical off-axis frequency responses of MM-8H.



A



B

Fig. 5—Impedance magnitude (A) and phase (B) of MM-8H.

tective circuit (see “ELF Technology”) is rolling off the low bass; it turns on whenever the input at very low frequencies exceeds 25 millivolts.

The effects of the protective circuit, which Bag End calls Concealment, can be seen more clearly in Fig. 1B, a plot of the Infrasub’s response at input levels from 14 to 800 millivolts rms (–32 to –2 dBV), in 5-dB increments. At the two lowest input levels, the sub’s response is very smooth and is flat—within +0, –3 dB—from 8 to 85 Hz. At the highest drive level, the passband is 48 to 85 Hz—still low enough to handle most musical notes but less impressive than the infrasonic output this subwoofer can deliver at low levels. (The 80-millivolt curve here is the same curve presented for the Infrasub

in Fig. 1A.) The maximum output the sub can generate at each frequency is indicated by the left edge of the curves, where they run together; distortion, by the way, was quite high at these levels.

Figure 2 shows the MM-8H’s phase, group-delay, and waveform-phase responses referenced to the tweeter’s arrival time. The phase response rolls off steeply from 20 to 200 Hz, falls less rapidly from 200 Hz to 5 kHz, and (because the curve is referenced to the tweeter signal’s arrival) is virtually level from 5 to 20 kHz. From 200 Hz to 5 kHz, phase response is linear, a fact disguised by the log frequency scale; even so, waveforms will be distorted in this range because the phase is neither 0° nor a multiple of 360°. The presence of waveform distortion is further validated by the curve of waveform phase. For most speakers, this curve is so irregular that I don’t bother to present it; because of Time Alignment, by contrast, the MM-8H’s waveform phase is fairly flat from about 350 Hz to about 4.5 kHz. But waveforms still won’t be preserved, because there is no region where the waveform phase is 0° or a multiple of 180°. The group delay, on the other hand, is only about 0.09 millisecond between 350 Hz and 3 kHz, the upper end of the range handled by the MM-8H’s woofer.

This is one of the shortest delays I have measured; it is shorter only on pure linear-phase speakers, such as those made by Thiel. Bag End’s Time Alignment paid off here.

The MM-8H’s horizontal off-axis responses (Fig. 3) are all very uniform and demonstrate that high-frequency coverage is very broad. The vertical off-axis responses (Fig. 4) are also unusually uniform. Because of the tweeter’s coaxial mounting, no off-axis peaks or dips are evident in the crossover region (around 3 kHz), and the response is the same above and below the axis. In fact, the response is so symmetrical in both the horizontal and vertical planes that you can place the MM-8H upright or on its side without a qualm.

The Bag End MM-8H should be an easy load for any amp. Its impedance magnitude (Fig. 5A) drops only to 7.9 ohms, although the 50-ohm peaks at 50 Hz and 3.1 kHz raise the average impedance to 15.8 ohms. (The dip at 95 Hz reflects the speaker’s approximate tuning frequency.) Based on the impedance extremes, cable series resistance of 0.11 ohm or less (16-gauge or heavier for a run of 10 feet) should keep cable-drop effects from causing response peaks and dips greater than 0.1 dB. The large impedance phase angles, +53.3° at 2 kHz and –49.1° at 5 kHz (Fig. 5B), are counteracted by the high impedance magnitude, keeping the speaker a benign load. Any competent solid-state amp should be able to drive a pair of MM-8H satellites.

The MM-8H’s and Infrasub-18’s cabinets were quite rigid, and neither of the low-frequency drivers exhibited dynamic offset. The maximum excursion of the MM-8H’s woofer was about 0.3 inch, peak to peak. The Infrasub-18’s maximum peak-to-peak driver excursion was about 0.4 inch at 40 Hz but 0.3 inch at 16 Hz because of the Concealment circuitry. When the sub was overdriven, Concealment limited the

**BAG END’S INFRASUB-18
GOES DOWN TO 8 Hz,
THOUGH BASS EXTENSION
ISN’T REALLY THE POINT.**

Infrasub-18’s cone excursion quite well, but the distortion I heard rose significantly at input levels much above the limiting threshold.

For Fig. 6, raw and smoothed 3-meter room responses, I placed the MM-8H in the right-hand stereo position; the test microphone was at ear height (36 inches), at the listening position. Although a bit rough overall, the smoothed curve is well balanced and has no major peaks or dips. Above 200 Hz, it fits a fairly tight, 13-dB, window, which shrinks to a mere 7 dB or so above 1.7 kHz.

Figure 7 shows how the Infrasub-18’s harmonic distortion varies with output level (including the effects of room gain) for frequencies down to 16 Hz. The distortion



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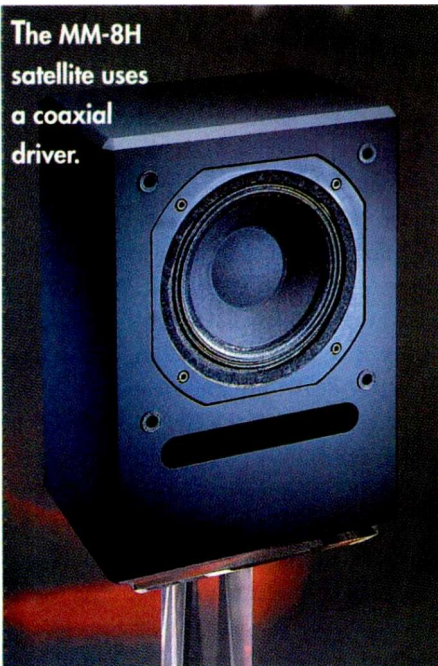
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percentages are the ratios between the power of the fundamental and that of the first 10 harmonics. (This yields essentially the same results as THD, which also involves the 11th and higher harmonics and does not include noise.) I've plotted distortion for output levels up to 110 dB SPL, but the Infrasub-18 exceeded this level at some frequencies. For example, its output reached 116 dB at 63 and 80 Hz, with distortion of only 3% and 4.5%, respectively. At 50 Hz, maximum output was 114 dB with 9% distortion. At very low frequencies, from 32

down to 16 Hz, distortion rose as high as 30% to 35% but did not sound too objectionable because it consisted only of low-order harmonics.

I also measured the MM-8H satellite's harmonic distortion at 110 and 440 Hz (not shown). With an input of 100 watts, distortion at 110 Hz was 6.2% second harmonic and 1.5% third. At 440 Hz, it was even lower: 1.2% second and 0.5% third.

Figure 8 shows the MM-8H's short-term peak input power and the short-term peak output of this satellite and the Infrasub-18.

The MM-8H's maximum input is just 6 watts at 20 Hz, well below its cutoff frequency. Within its rated bandwidth, it can handle 100 watts to 5 kilowatts. Despite its rated bandwidth limits, the MM-8H's output actually goes down to 20 Hz, although it's below the bottom of the graph by that frequency, at 70 dB. But by 84 Hz the output rises to 110 dB, and it ranges from about 120 to 130 dB within the 8H's rated frequency range. Though not the most powerful subwoofer I have tested, the Infrasub-18 still generates fairly respectable output levels below 20 Hz. Its peak output is already a strong 95 dB at 10 Hz, and then it rises fairly quickly. It passes through 100 dB at 18 Hz and reaches a peak of 124 dB SPL at 80 Hz before rolling off again.

Use and Listening Tests

Right from the start, I was impressed with the heft and solidity of the Bag End speakers' enclosures and even by the high quality of their packaging.

The Infrasub-18 is the largest subwoofer I have tested, though not quite the heaviest. With the grille removed, its 18-inch driver looked gigantic. If the Infrasub-18 is not turned on, its cone rings like a large gong when you rap it with your finger; when it is on, it's more like rapping a brick. That's because the driver's voice coil is essentially an open circuit when its amp is off and thus has no electromagnetic damping. But turning on the amp effectively short-circuits the coil, which maximizes damping. About 5 seconds after you turn the Infrasub off, it generates a loud thump. That can be startling, but at least you'll know when to expect it, because you have to turn the Infrasub on and off by hand: There is no voltage-triggered or signal-sensing power switch. (By the way, you can't possibly lose the Infrasub owner's manual because it's printed on the cabinet's rear panel; Bag End supplied no other manual for it, nor did the company include one for the MM-8H.)

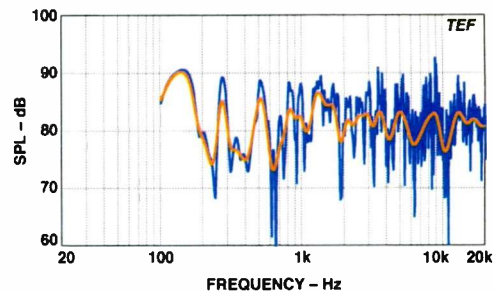


Fig. 6—Three-meter room response of MM-8H.

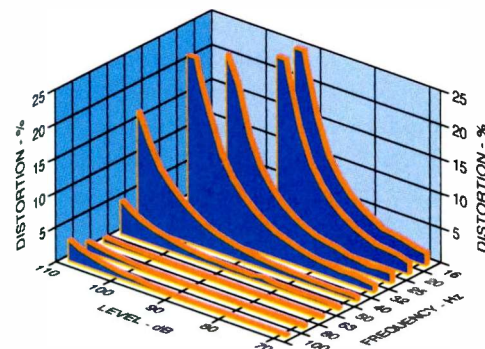


Fig. 7—Harmonic distortion vs. SPL and frequency of Infrasub-18.

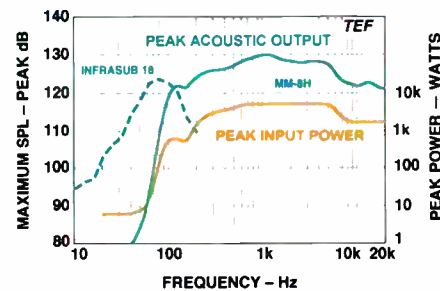


Fig. 8—Maximum peak input power of MM-8H and peak sound output of Infrasub-18 and MM-8H.

The MM-8H comes only in black except on special order. It has a no-nonsense look, although its beveled edges and standoff grille make it quite handsome. For my listening tests, I put the MM-8H satellites on 25-inch stands, which raised the tweeters approximately to ear level. I placed these speakers approximately 3 feet from the wall behind them and 2 feet from the side walls. The terminals were quite accessible, which made hookup easy.

I placed the Infrasub-18 in the right-hand corner of my room, behind one of the

ELF TECHNOLOGY

A woofer's response is usually more or less flat above its system resonance (the resonance of the driver and enclosure together), and most woofers are therefore operated in the frequency region above that point. Below resonance, the woofer's response rolls off steeply, so speaker designers usually try to lower the resonant frequency as far as possible (typically to about 40 Hz) in order to get deep bass response. An ELF (Extended Low Frequency) system, however, is basically a sealed-box woofer operated *below* its resonance, coupled with a closely matched equalizer that counteracts the resulting rolloff. And its resonance is typically rather high (usually about 80 to 100 Hz), as that sets the upper limit of the speaker's passband.

The ELF equalizer is quite simple and straightforward. Woofers in sealed enclosures roll off bass frequencies at a rate of 12 dB per octave, so the equalizer's response must rise at the same rate. This low-frequency boost is cut off at some point—8 Hz in the case of the Bag End Infrastub-18—to ensure stability at very low frequencies.

Why equalize a subwoofer flat to 8 Hz? To improve its phase response and minimize delay at the higher, audible, bass frequencies. A speaker's rolloff below resonance acts as a high-pass filter. And conventional high-pass filters have highly nonlinear phase characteristics, far more so than comparable low-pass filters. Filters also cause group-delay distortion, which can produce slight but audible changes in low-frequency sound quality. These effects, which extend an octave above cutoff, can be inaudible if a speak-

er's low-frequency cutoff is very low. The Bag End Infrastub-18's cutoff was therefore set at 8 Hz; that's an octave below a pipe organ's low C (16 Hz), which is considered to be the lowest musical note.

The circuit that provides the equalization is called a double integrator. (In principle, it is a cascade of two special single-pole low-pass circuits, each consisting of an inverting op-amp with a series capacitor in its feedback path.) Unlike conventional low-pass filters, whose phase shift is frequency-dependent, an integrator's phase shift is uniform at all frequencies, 90° for a single integrator and 180° for a double.

Once you've equalized a speaker flat down to the very low bass, will it have enough air-moving capability to generate usable output there? Bag End says the Infrastub-18 will reproduce 8 Hz, though not at levels you can hear or feel—but then again, reproducing sound at 8 Hz isn't the point.

Loudspeakers that are equalized down to the bottom frequencies risk severe overload if the program signal contains high levels of deep-bass energy. To guard against this without noticeably reducing bass response, Bag End designed a Concealment circuit, to ensure that unexpectedly large signals won't overload the Infrastub-18 enough to cause distortion or damage. Unlike conventional limiter circuits, which reduce the levels of all frequencies fed to a subwoofer when an overload occurs, Bag End's Concealment circuit reduces the lowest frequencies to their maximum safe level without affecting the upper bass. *D.B.K.*

MM-8H satellites. For comparison, I used a Paradigm Reference Servo-15 powered subwoofer (which I reviewed in the April 1998 issue), because it is about the same size, weight, and price as the Infrastub-18. I placed each sub against a wall of the corner with its driver facing the other wall, about 21 inches away, so that the two were symmetrical with respect to the corner. Auxiliary gear included an Onkyo Integra DX-7711 CD player, a Krell KRC preamp, a Crown Macro Reference power amp, B&W

801 Matrix Series 3 speakers, and Straight Wire Maestro cabling.

As was seen in Fig. 1A, the transition between the Infrastub-18 and MM-8H is pretty seamless even without crossover filtering. However, I felt it would be wise to add a high-pass filter to protect the satellite from being overdriven by low bass signals. As in previous subwoofer reviews, I used passive 90-Hz high-pass filters in my preamp's tape loops and a passive network, driven from the satellite's terminals, that summed the

two channels and counteracted the filters' action. The flat, wideband output of this network was fed through an A/B switch to the line-level inputs of the subwoofers I was comparing.

When I first hooked up the MM-8Hs, I listened to them without a subwoofer and was surprised at how good they sounded alone. Aside from their lack of bass, they were quite well balanced. For a given input power, they were also 6 to 7 dB louder than the B&W 801s I use for reference, so I had to attenuate the Bag Ends' input levels to match the B&Ws'. The MM-8H's higher sensitivity is equivalent to a four- or five-fold boost in amplifier power. This is the only satellite speaker I know of that has sensibly traded low-frequency extension for efficiency: Why give deep bass response to speakers specifically meant to be used with a subwoofer?

**ON ROCK KICK DRUM,
BAG END'S INFRASUB-18
WAS VERY CLEAN
AND VERY LOUD.**

When I used the MM-8Hs with the Infrastub-18, the Bag Ends did an excellent job with every kind of music I played. They sounded clean at very loud levels, levels that made the B&Ws sound slightly congested, while the MM-8Hs' high sensitivity had my power amp just loafing along. Their horizontal and vertical coverage was excellent, and they passed the pink-noise stand-up/sit-down test perfectly, slightly surpassing the B&Ws. The Bag End satellites did emphasize vocal sibilance a bit more than the B&Ws, but they did not sound spitty on well-recorded vocals. Octave-to-octave balance on pink noise was quite good, with only minimal tonality. The Bag End system performed equally well on classical chamber music and heavy-metal rock, but its sound was slightly more forward than the 801s'. The MM-8Hs did particularly well on big-band brass, reproducing the characteristic blat of the trombones and trumpets quite realistically.

To evaluate the Infrastub-18 subwoofer, I got out all my best bass-exercising CDs, in-

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cluding those with pipe-organ pedal notes, rock kick drums, and acoustic bass as well as the sounds of jet flyovers and helicopters. The Bag End sub was very articulate and delivered significant output even below 20 Hz. On material with high bass levels at 40 Hz and above, such as kick drums, it was impressively loud and clean, significantly louder than the Paradigm. (At very high levels, the Paradigm flattened out and simply would not get any louder.) With material containing high-level tones below 25 Hz, however, the Infrasub-18 could be overloaded when driven quite hard. The overloading made itself known by a change in bass tone.

When I played the helicopter sequence on track 16 of *The Digital Domain* (Elektra 9 60303), which contains very-high-level bass below 20 Hz, the chopper's blade noise became higher pitched when played loud through the Bag End subwoofer but not through the Paradigm. Presumably the Bag End's higher harmonic distortion was responsible for this pitch change. (Incidentally, the Infrasub's rear panel got quite warm to the touch after this exercise.)

Except at very loud levels, however, it was quite hard to tell any difference between the two subwoofers' bass quality or quantity. I could not discern any difference at all in their low-frequency extension (at low levels the Paradigm is flat down to about 18 Hz, the Bag End to about 8 Hz).

To compare the subs' outputs in narrow frequency bands, I listened to shaped tone bursts at various frequencies. At 40 Hz and above, the Infrasub-18 could play significantly louder and cleaner than the Servo-15; from 32 Hz down, the Servo-15 was the winner. With very low frequencies, 10 to 16 Hz, the Infrasub overloaded easily, generating quite audible distortion; the Paradigm would not sound bad even when it was severely overdriven.

The MM-8Hs and Infrasub-18 are a potent combination. Bag End has done a good job of optimizing each speaker for the frequency range it covers. These high-performance speakers are good-looking, very well built, and embody innovative and significant technology. The MM-8Hs are excellent all-around performers, and the Infrasub-18 provides lots of bass—including very deep bass when played at moderate levels.

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E.A.R. V20 INTEGRATED TUBE AMPLIFIER

Tim de Paravicini, chief designer for E.A.R. (formerly Esoteric Audio Research), comes up with highly sophisticated amplifier circuits that have earned my high regard. I have used and tested several amps from this British company; almost all of them made their rated power at 20 kHz with less than 0.1% total harmonic distortion—rare in tube amplifiers.

The E.A.R. V20 resembles the top of a V-type auto engine, with its tubes arranged in two angled banks, and is said to have been inspired by the V-12 engine in de Paravicini's Jaguar. Each bank contains one channel of the stereo amplifier's circuitry; three transformers (one power and two output) are placed between the banks, where a car's

**THE E.A.R. V20
SOUNDED REALLY SPECIAL,
AND I LIKED IT
FROM THE MOMENT
I TURNED IT ON.**

carburetor or fuel injectors might be. The V20's unusual appearance is also the result of its circuit configuration, which is probably unique: Instead of a few hefty output tubes, it has ten 12AX7 small-signal tubes in each channel's output stage.

An integrated amplifier, the V20 has a five-position signal selector, an illuminated pushbutton power switch, and a volume control. On the rear panel are five pairs of high-quality phono connectors for signal inputs, another pair for the tape output, an IEC power-cord socket, and a fuse holder. The gold-plated five-way binding posts for speaker connections (common, 4-ohm, and 8-ohm terminals for each channel) are at the rear of the top panel; 16-ohm operation requires a small change in the internal wiring, which could be done by a dealer or "by anyone who knows how to use a soldering iron," according to E.A.R.'s distributor in the United States.

Inside the V20's unusual housing, the construction is relatively simple and conventional. Within the one-piece welded chassis are the transformers and a circuit board that holds filter caps and rectifiers for the high-voltage and negative supplies. An-



other board, behind the rear panel, connects the input and output jacks; the selector switch and volume control are connected to it via small daughterboards and are operated by long shafts from the front panel. (The shaft extension of my review sample's volume control was slightly bent, making the associated daughterboard flex when I turned the control.) The audio circuitry and tube sockets are on two large boards, one per channel, mounted on standoffs beneath the tubes.

Measurements

On many tests, the E.A.R. V20's two channels performed almost identically. Data will therefore be presented only for the left channel unless otherwise noted.

The E.A.R. amp's frequency response is shown in Fig. 1 for open-circuit, 8-ohm, and 4-ohm loads and with the NHT dummy speaker load, all on the 8-ohm output taps. The output variation for 4-ohm and open-circuit loads on this tap is within ± 0.7

Rated Output: 24 watts per channel, 20 Hz to 20 kHz.

Rated IM Distortion: Less than 0.5%.

Dimensions: 16½ in. W x 5¾ in. H x 17¾ in. D (42 cm x 13.5 cm x 44 cm).

Weight: 48½ lbs. (22 kg).

Price: \$4,595.

Company Address: 1624 Sunset Ave., Santa Monica, Cal. 90405; 310/396-1919.

ASSOCIATED EQUIPMENT USED

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

CD Equipment: PS Audio Lambda Two Special and Sonic Frontiers Transport 3 CD transports, Sony CDP-707ESD CD player, Panasonic DVD-A310 DVD player, Genesis Technologies Digital Lens anti-jitter device, and Classé Audio DAC-1 and Sonic Frontiers Processor 3 D/A converters

Phono Equipment: Kenwood KD-500 turntable, Infinity Black Widow arm, Win Research SMC-10 moving-coil cartridge, and Vendetta Research SCP2-C phono preamp

Additional Signal Sources: Nakamichi ST-7 FM tuner, Nakamichi 1000 cassette deck, and Technics 1500 open-reel recorder

Preamplifiers: Sonic Frontiers Line-3 and First Sound Reference II passive

Amplifiers: Arnoux Seven-B stereo switching amp, Quicksilver Audio M135 mono tube amps, Manley Labs Stingray stereo tube amp, and deHavilland Electric Company Aries single-ended mono tube amps

Loudspeakers: B&W 801 Matrix Series 3 speakers used as subwoofers with Dunlavy Audio Labs SC-III speakers; Tannoy Churchill speakers

Cables: Digital interconnects, Illuminati DX-50 (AES/EBU balanced); analog interconnects, Vampire Wire CCC/II and Tice Audio IC-1A; speaker cables, Kimber Kable BiFocal-XL and Madrigal Audio Laboratories HF2.5C

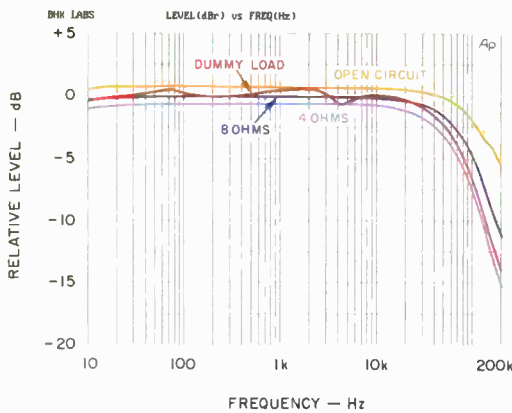


Fig. 1—Frequency response as a function of loading on the 8-ohm tap.

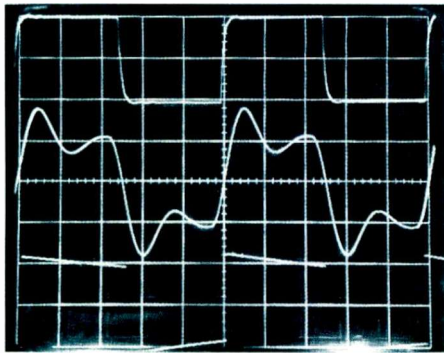


Fig. 2—Square-wave response for 10 kHz into 8-ohm load (top), 10 kHz into 8 ohms paralleled by 2 μ F (middle), and 40 Hz into 8 ohms (bottom).

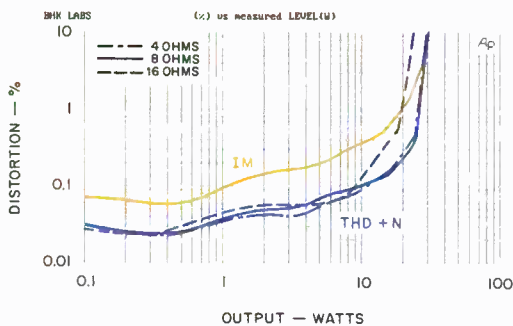


Fig. 3—THD + N at 1 kHz and SMPTE-IM distortion vs. power output, measured at 8-ohm tap.

dB of the 8-ohm load throughout the audio range; for the NHT dummy load, the variation is about +0.5, -0.75 dB. That's quite reasonable for a tube amplifier. The curves for open-circuit, 4-ohm, and 2-ohm loading on the 4-ohm output taps were similar but were farther apart because the relative

output impedance was slightly higher (i.e., the ratio between 4 ohms and the 4-ohm tap's impedance was slightly lower than the ratio between 8 ohms and the impedance on the 8-ohm tap). The variation with the dummy load was about half that for the 8-ohm tap.

Square-wave response at 10 kHz (Fig. 2) is very well behaved with an 8-ohm resistive load on the 8-ohm tap. Adding a 2-microfarad capacitance to the load causes some overshoot and ringing, but it is quickly damped. (With the capacitance added to the load, the frequency response had a slight peak at roughly 33 kHz.) The 40-Hz square wave has a mild tilt, which relates to the V20's rolloff of 0.35 dB at 10 Hz. Rise and fall times were about 4.9 microseconds at ± 5 volts out when driving an 8-ohm load via the 8-ohm tap.

Total harmonic distortion plus noise (THD + N) at various impedances, and SMPTE-IM distortion for 8-ohm loading, are plotted against level in Fig. 3. The amp's THD + N is almost unaffected by load up to about 10 watts. At higher power levels, 8- and 4-ohm loads have similar effects, but there's less power available for 16-ohm loads; this is common in tube amps. At the 4-ohm tap, results with 4- and 8-ohm loads were comparable to those in Fig. 3 for 8- and 16-ohm loading.

How THD + N varies with frequency at several power levels is shown in Fig. 4 for 8-ohm loading on the 8-ohm outputs. Distortion doesn't rise much at high frequencies, which is worth noting, but it does rise somewhat in the bass, particularly at full power.

A spectrum analysis of the harmonic distortion and noise residue for a 1-kHz signal at an output level of 10 watts (Fig. 5) is not so pretty. Despite the output stage's Class-A operation, the harmonic series is quite complex, with high-order products that don't decrease much at higher frequencies. Nevertheless, except for the third harmonic (which has the greatest

magnitude), THD is about 0.023%; that's pretty low. (Including the third harmonic would raise THD to about 0.06% or 0.07%.) It's debatable how easy it would be to hear distortion that has such a harmonic structure and magnitude, and it turned out not to be annoying. At 1 watt (not shown), distortion was lower, less complex, and decreased more rapidly with rising frequency. The main reason for the 10-watt spectrum's complexity is that the designer opted for a circuit topology that requires driving the output tubes into grid current in order to attain the desired output (see "Technical

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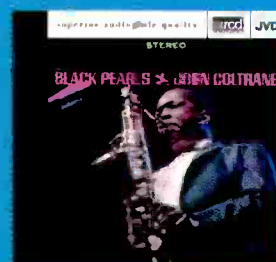
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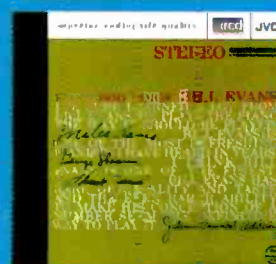
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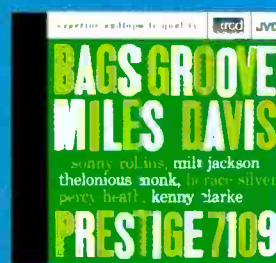
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TECHNICAL HIGHLIGHTS

Like most earlier E.A.R. amps, the V20 is a fully balanced design using a unity-coupled output stage, but it differs from the company's previous amps in the design and coupling of its stages and in the way negative feedback is applied. The V20 has five stages, all but one of which use 12AX7 dual-triode tubes.

From the selector switch, the signal passes through the volume control to a differential-amplifier input stage, which uses one section of a 12AX7 for each signal phase. A triangle of resistors interconnects the two cathodes and a negative supply. The triangle provides a high resistance between each cathode and the negative supply (thereby setting the tube's operating current) and a smaller resistance between the cathodes (which sets this stage's gain). This first stage acts as a phase inverter to provide balanced signals to the following stages. The first and second stages are RC-coupled, with resistors across the coupling capacitors adding a touch of DC coupling to help maintain low-frequency stability after overall loop feedback is applied.

Like the first stage, the second and third stages are configured as differential amplifiers that use half a 12AX7 for each signal phase. The coupling between these stages is the same as that between the first and second stages. All of the voltage swing to drive the output stage comes from the output of the third stage. Its plates are RC-coupled to the input of the fourth stage, with no DC coupling.

The fourth stage is not the output stage, however. It is a cathode-follower driver, with the paralleled elements of a 12AU7 dual triode handling each signal phase. This stage provides additional driving current to the output stage via direct coupling between the cathode follower and the output stage's control grids.

The additional current from the cathode follower is needed because the output stage employs what designer Tim de Paravicini calls "enhanced triode operation." He originally applied that phrase to one of his prior amplifiers, in which signals went to the beam power output tubes' screen grids instead of their control grids. (I suspect the term "enhanced" is by analogy to FET circuits, which are said to operate in enhancement mode if they don't pass current until a positive bias is applied to their control elements and to operate in depletion

mode if they pass current freely until a negative bias is applied. Tubes normally operate in depletion mode, though the term is rarely applied to them.) That prior amp had its control grid grounded so that current would not flow until a positive bias was applied to its screen grid.

To get "enhanced triode operation" from actual triodes, which have no screen grids, you have to make their control grids fairly positive with respect to their cathodes. This takes a lot of drive current, because it lowers the tube's input impedance; in the V20, that current comes from the cathode-follower stage. This helps get the 12AX7s (normally used as voltage amplifiers that deliver only a few milliamperes of current) to produce enough current to drive speaker loads.

Even that high-current operating mode does not, of course, make a single 12AX7 the equivalent of a standard output tube. Therefore, the V20's output stage has ten 12AX7s—twenty triode sections—per channel. Ten triode sections in parallel handle each phase of the output signal, acting like a pair of composite triode output tubes per channel.

The output stage is unity-coupled, like that in McIntosh tube power amplifiers. In such a circuit, half of the load is in the output tubes' plate circuit and the other half is in their cathode circuit. This amounts to quite a bit of local feedback and results in lower distortion in the output stage.

A unity-coupled output stage requires a very large drive voltage at maximum output—more than half the stage's output voltage into the output transformer. To get this high drive voltage with low distortion, the plate circuits of the third and fourth stages are supplied from a dynamic power source that moves with the signal, rather than a steady DC voltage, by means of a technique called bootstrapping.

The output transformer has two identical center-tapped primary windings. One winding connects to the plates of the composite output tubes; its center tap goes to the main high-voltage plate supply. The other primary winding, whose center tap is grounded, is connected to buses that link the cathodes of the output tubes and, via resistor networks, the cathodes of the second, third, and fourth stages. Each signal phase has its own cathode bus; the ten paralleled tube halves handling that phase are connected to the bus via capacitor-

bypassed self-bias cathode resistors. This setup yields two signals of equal amplitude but opposite phase at each end of the two primary windings; the signals in both windings have the same phase and amplitude. In addition, the V20 amplifier couples signals of the same phase and amplitude via capacitors to improve circuit operation at high frequencies, an enhancement to the unity-coupled topology devised by de Paravicini.

The dynamic supply voltages for the third and fourth stages' plate supplies come from the output transformer's plate windings. Each of the third stage's two plates is fed from the end of the winding that carries the same signal phase from the output stage plates. This provides a constant plate-to-cathode voltage for the cathode-follower driver tubes. It also provides a dynamic constant-current load for the third stage's plates, thus enabling that stage to provide the large signal-voltage swing the output stage requires.

The second and third stages' cathodes are also connected to their respective phases' cathode buses via resistors. This provides an inner negative feedback loop back to the third stage and a global loop back to the second stage. The global loop sets the overall gain of stages two through five. The first stage is not included in any multistage loops. No feedback is taken from the output transformer's secondary.

The V20's output stage is said to operate in Class A. However, I feel it should be considered Class A₂, as grid current flows (by design) for a considerable portion of the signal cycle.

In the power supply, the transformer's main high-voltage secondary drives a full-wave voltage doubler circuit that delivers +350 volts to the center taps of the output transformers' plate windings. An auxiliary rectifier circuit supplies -200 volts to two voltage dividers that feed the grid circuits of the cathode-follower stage's driver tubes. These dividers set the operating point (quiescent current) of the cathode-follower tubes and the output stage. The first stage's cathode resistors receive -125 volts derived from the -200-volt supply. Each channel's +350-volt supply is further decoupled and filtered to feed the first and second stages' plates. All tube heaters are AC-powered, via a separate power-transformer secondary winding for each channel.

B.H.K.

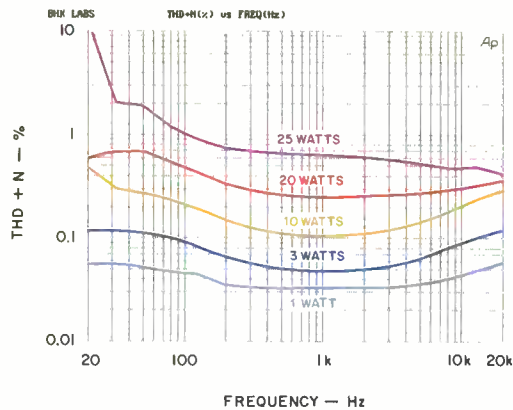


Fig. 4—THD + N vs. frequency.

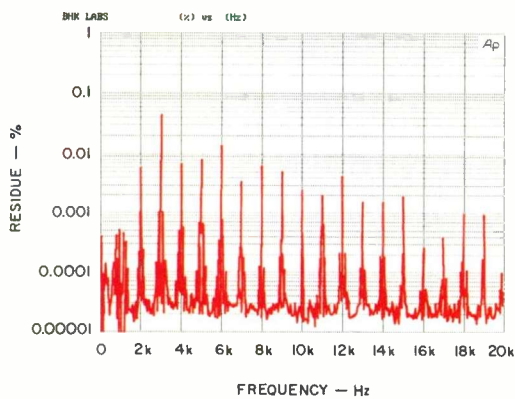


Fig. 5—Spectrum of harmonic-distortion residue for a 1-kHz signal at 10 watts out into 8 ohms.

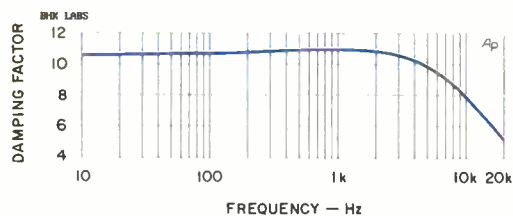


Fig. 6—Damping factor.

Highlights”). You might expect such complex distortion to make an amplifier sound irritating, but, as I said, it did not.

I measured interchannel crosstalk with the volume control in two positions, fully clockwise and 20 dB down from maximum (a setting more typical of normal use). At full volume, crosstalk was -90 dB or less up to about 6 kHz, increasing at 20 kHz to 80 dB from left to right and 87 dB from right to left. With the control turned down 20 dB, where crosstalk typically increases, it was still -90 dB or less until the frequency rose a bit past 1 kHz; it then decreased at about

6 dB per octave until, at 20 kHz, it became 66 dB from left to right and 69 dB from right to left.

Damping factor, shown in Fig. 6 for the 8-ohm output, was slightly lower (9.4 at 1 kHz) on the 4-ohm tap. Dynamic power output for 8-ohm loads on the 8-ohm outputs was about 26.3 watts, which corresponds to dynamic headroom of 0.4 dB. Clipping power (i.e., power at the visual onset of clipping, about 1% distortion) was 25.5 watts, corresponding to clipping headroom of 0.26 dB.

Voltage gain into 8-ohm loads on the 8-ohm outputs measured 31.4 dB for the left channel and 31.3 dB for the right. Corresponding IHF sensitivity (input voltage for 1-watt output into 8 ohms) was 76.5 millivolts for the left channel, 77.2 millivolts for the right. Input resistance was about 38 kilohms for either channel.

Output noise varied somewhat with the volume control’s position, as it will in any amplifier stage that follows a volume control. For the worse (right) channel, wideband noise was 286.6 microvolts with volume full up, 398.4 microvolts with the control at -6 dB (its worst-case setting), and 273.3 microvolts with it turned all the way down. The A-weighted noise for those settings was 74.6, 110, and 72.5 microvolts, respectively. The IHF S/N ratio was 90.5 dB in the left channel, 90 dB in the right.

The V20 draws 1.6 amperes of AC from idle up to 10 or 12 watts of output per channel; it then increases its draw to 1.84 amperes at full rated power. This suggests that the output stage operates in Class A_2 up to about 12 watts and shifts to Class AB_2 above this level. In contrast to the relatively slow current ramp-up of power amplifiers using conventional, large output tubes, the V20 comes up to its full operating current rather smartly.

Use and Listening Tests

I liked the E.A.R. V20 from the moment I hooked it up and started listening to it. As I swapped it in and out of my system, my ap-

preciation of its qualities only increased. This amplifier sounds really special, in spite of (perhaps because of) its complex measured distortion characteristics.

For most of my listening, I used Tannoy Churchill speakers, whose nominal sensitivity is 95 dB; the V20 drove them very robustly. Dunlavy SC-IIIs, whose nominal sensitivity is 91 dB, also sounded exceedingly good with the E.A.R. amp. The V20 conveyed a sense of transparency, delicacy, air, and detail as well as the best amps I’ve heard. Bass definition, detail, and punch were also extremely good. I had moments while listening to this amp that made me exclaim, “God, that sounds so much like real live music in front of me!”

The V20 will not be a good choice if you like your music *loud*. Nor will it be the best possible match for speakers whose sensitivity is 85 dB or so, though its 24



**UNIQUELY, THE V20'S
OUTPUT STAGE USES
TEN SMALL-SIGNAL TUBES
PER CHANNEL.**

watts per channel will suffice for most music played at a reasonable volume.

My review sample worked flawlessly. However, I was a bit concerned that the power transformer and the front panel seemed to get rather hot after the amp had been on for a long time. And I don’t know how long 12AX7s can be used as output tubes before audible deterioration sets in. Replacing all the tubes in the output stage will probably cost about as much as replacing a typical power amp’s fewer but more expensive output tubes. Despite these concerns, I can recommend the E.A.R. V20 with good conscience to anyone whose system and listening tastes don’t make higher power mandatory. I have truly enjoyed having it in my own system. **A**

Why Should Your Ears Have All the Fun?

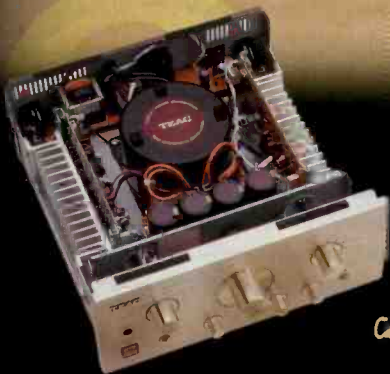


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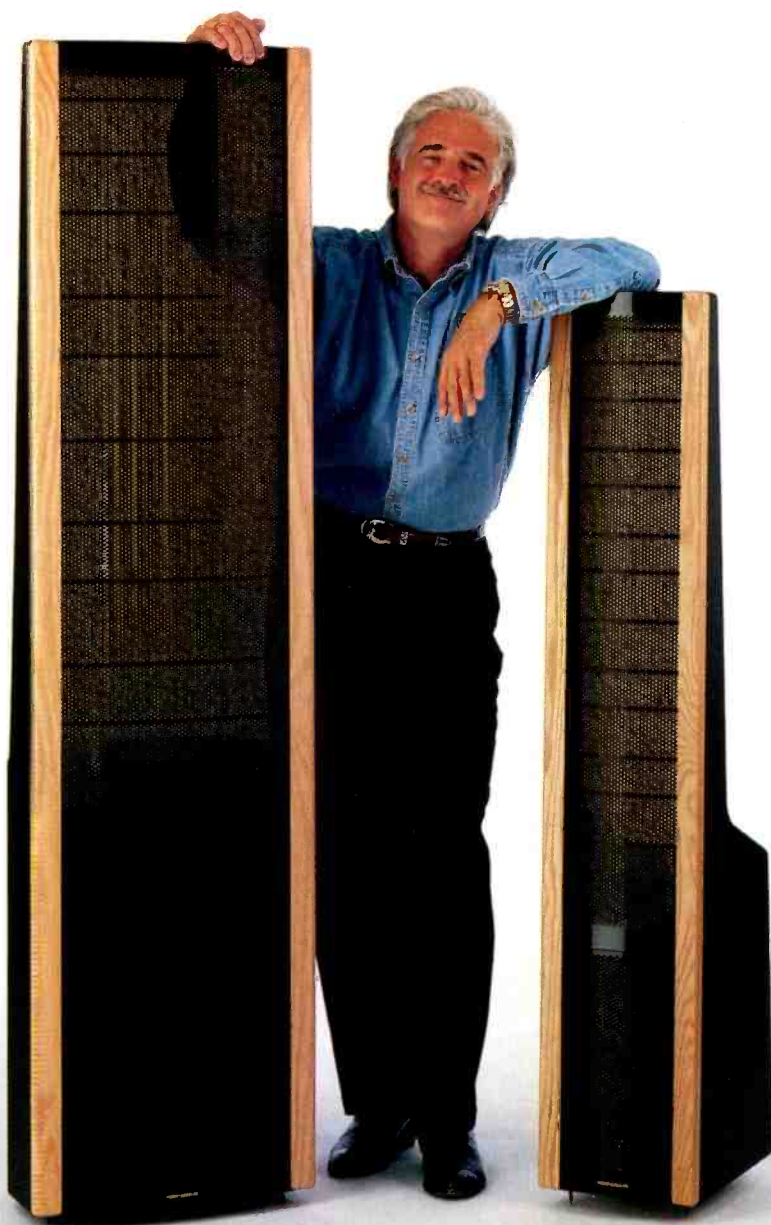
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Krell's KPS 25s "Playback System" demonstrates both vision and courage. The courage comes from bucking the high end's long tradition of separates; the KPS 25s combines Krell's best CD transport, best digital-to-analog converter, and best preamp designs in one box. Making this unified component totally upgradable—to handle any foreseeable CD or DVD audio format—is the visionary part. This should ease the minds of audiophiles contemplating the possibility of CD and DVD-audio format wars and the KPS 25s's \$20,000 price.

At that price, the KPS 25s has to be not just very good, but superb. And, as usual, Krell has succeeded. The sound has all the sweetness, detail, and power that you expect from Krell, while the styling and feel are those of a true luxury product. The features, meanwhile, meet the practical needs of virtually every audiophile without becoming too complex and too gimmicky.

Once you hear the KPS 25s, you realize that it makes a great deal of sense from both an engineering and sonic perspective. As an integrated unit, it enabled Krell not just to optimize but to orchestrate every section. Interface problems between transport, D/A converter, and preamp could be kept to an absolute minimum. There are no level-matching problems. And it all could be consistently voiced, with none of the subtle compromises designers must make in components that will be used with a wide range of other manufacturers' products. Mixing components from different manufacturers can work, but far too often there are conflicts between various designers' choices of nuances. As a result, the designers' intentions often end up masking each others' contributions.

Photo: Michael Groen

Company Address: 45 Connair Rd., Orange, Conn. 06477; 203/799-9954; www.krellonline.com.

AURICLE

ANTHONY H. CORDESMAN

KRELL KPS 25s CD PLAYER/PREAMP



This does not mean that high-end manufacturers reject measurements and specifications. But the best go beyond sheer engineering excellence, listening extensively to determine which component choices and small circuit adjustments yield the finest sound. In practice, the designers of these products are not only superb engineers but also strong subjective reviewers. The more aspects of a system a manufacturer can control, the more consistent the sound quality. And what Krell has accomplished by integrating so much in the KPS 25s is an extraordinary synergy.

Let's start with styling. The KPS 25s is a top-loader, but this is hardly an inconvenience. I really can't see many buyers hiding this unit by burying it under some other compo-

ment. The metal finish is of jewelry quality, and the front-panel displays and controls have the form-follows-function feel and look that you expect from an exhibit at New York's famed Museum of Modern Art. The clear acrylic lid on the transport, the visible CD clamp, and the finish of the top and sides complete the look. Should all this fail to impress your friends, you can always point out that an LCD shutter makes the transport lid opaque when you play a CD, to exclude light intrusion.

Krell's discriminating choice of features helps explain why the KPS 25s—despite enough displays, indicator lights, and controls to merit an article themselves—resembles a small sculpture rather than the bridge of the Starship Enterprise.

Krell gave the KPS 25s an intelligent mix of useful features yet knew when to quit. The preamp, for example, has sensitivity adjustments for each input, so the volume remains the same when you change program sources; combining that feature with the volume control's programmable gain permits customizing of the control range to match the sensitivity of amps and speakers. This may sound unimportant until you try it, but having just the right gain settings for your preamplifier avoids overloading the rest of your system when you turn the level up and enables finer volume adjustments because you can use the control's entire range of travel.

The CD section has all the usual track-access and repeat features (including A/B looping between two points in a single track or a series of several tracks) as well as LEDs that indicate when HDCD decoding is at work and when the transport and D/A converter are in sync.

The KPS 25s comes with two remote controls, a small one (about the size of a cigarette pack) for casual use and a 50-button tabletop controller that enables you to make virtually every adjustment possible. Balance can be set in 0.5-dB steps, which gives you far more precise soundstage control than the 1-dB steps found even on some other Krells. Such small adjustments do help you get the best depth, center fill, and balance between the soundstage's left and right sides. Far from having balance adjustment on their remotes, all too many preamps make the process so difficult that you never explore what it can do or give up using the control altogether. (Some purist preamps eliminate the balance control to get the cleanest possible signal path. This may provide slightly more detail, but there is no way in hell that you can get the best *musical* results out of a really good system without occasionally adjusting balance to suit the recording. Balance differs so much from one recording to another that a balance control's middle setting is almost never the correct one.)

Unlike audio components that have fewer digital outputs than inputs, the KPS 25s has five of each: one AES/EBU, two coaxial,

and two Toslink optical. This should make it easy to connect a digital recorder—more than one of them, in fact.

The KPS 25s's analog connections include five input pairs (one balanced, four unbalanced) and six pairs of outputs. Two output pairs are balanced XLR jacks, three pairs are unbalanced RCA jacks, and the sixth is a pair of Krell's new CAST connectors. (CAST, which stands for Current Audio Signal Transmission, reduces the effects of reactance even in very long connecting cables. The KPS 25s is the first component to use these four-pin bayonet connectors,

but a Krell amp with a CAST input is already in the pipeline.) With a total of 10 inputs and 11 outputs, you're not likely to run short.

In addition to these audio connections, there are terminals for signals to turn Krell's

Full Balanced amplifiers on and off and 12-volt trigger outputs to do the same for Krell's KAV amps and many other amps designed for home theater or multizone systems. The KPS 25s also has an RC-5 input so that it can be operated via whole-house control systems, such as those made by Crestron, AMX, and Niles Audio.

The KPS 25s's specifications are excellent (though it would take a perverse talent to design a transistor preamp with poor specs these days). The circuitry, however, indicates better than the specs what makes the Krell KPS 25s truly outstanding. The transport is built around a high-quality JVC EXU-901A mechanism. It has a high-power neodymium-magnet, direct-drive motor with an oversized drive shaft. A low-mass metal disc clamp isolates and damps the CD, and a belt-driven laser carriage and viscous-damped suspension reduce vibration and help maintain error-free data transfers.

The digital oversampling filter features a Krell-written algorithm that drives dual 80-MHz Motorola DSP engines; this is said to provide a more linear signal to the D/A converter section. A Pacific Microsonics PMD-100 chip enables the KPS 25s to decode HDCD recordings. There are twin dual-converter DAC circuits to increase processing power and eliminate common-mode distortions. The DAC boards,

built by UltraAnalog to Krell specifications, use 16-times oversampling. A master oscillator and clocking system synchronizes all digital circuits and provides accurate, jitter-free timing, which is said to improve resolution and clarity. The high-resolution volume control—though it operates in the analog domain—is digitally controlled and has more than 65,000 adjustment steps.

The analog sections are direct-coupled, complementary circuits that use Krell's patented Current Mode topology. This technique uses paralleled small-signal transistors, rather than comparatively sluggish power transistors, operating in Class A. Current mode is said to improve linearity and lower distortion. As the name implies, these circuits are designed to amplify current, not voltage, resulting in low impedances that further reduce noise and increase bandwidth while requiring only modest feedback to ensure stability. Current Mode also lies behind the KPS 25s's CAST connection system.

The CD section's transport mechanism and its modular input receiver and DAC circuitry are upgradable. The KPS 25s should have no problem, therefore, adapting to tomorrow's music formats, including DVD-Audio or the Sony/Philips Super Audio CD.

There is really just one meaningful test for a subjective review of a component in the KPS 25s's price range: Is the sound superb in every respect? The answer is yes, across the board. It becomes progressively more difficult at this level of excellence to describe clearly the nuances that distinguish the Krell from other top CD players and preamps. But you can hear and understand them by visiting a really good dealer and *listening!*

Consider the reactions of two friends who visited while I was auditioning the KPS 25s. One, a speaker manufacturer, wondered aloud how Krell could get so much detail out of so many CDs and always make it musical. The second, an audiophile, spent a good part of an evening remarking every time he heard a page turned or a musician breathing. I could have done without the interruptions, but I was struck by the fact that he had never before shown this obsession with extraneous details.

My family's reactions were similar. Growing up with a reviewer makes a gaggle of young adults fairly indifferent to tech-

**THE KPS 25s
HOUSES KRELL'S FINEST
D/A CONVERTER,
CD TRANSPORT,
AND PREAMP.**

nology—particularly when one of them has to spend time between classes unpacking equipment and helping me set it up. And because so much high-end gear passes through my house for review, it doesn't turn many heads around here. Even the best equipment gets no more than a grudging acknowledgment: "Yes, I can actually hear a difference," an indifferent family member will say. Krell's KPS 25s, however, garnered true praise, and piles of my sons' CDs mysteriously began to grow around it. Every member of my family has his own system, selected to his own taste, so this crowd votes with its ears.

It was also interesting to get casual reactions from nonaudiophiles. I make it a policy to never demonstrate a system unless someone asks, and I never interrogate listeners about their impressions. Yet the KPS 25s received unsolicited praise from the audio-indifferent, even when I demonstrated another very good CD transport, D/A converter, and preamp. I take the impressions of nonaudiophiles quite seriously. They care only about music, which often makes them very objective about sound.

Every top high-end manufacturer gives its products a distinct and consistent sound; Krell is no exception. It has always done a superb job of extracting and presenting musically convincing details, including the extraneous ones my friend noticed. Krell's sound has become progressively more transparent, without causing irritation or listening fatigue. Bass depth, definition, and power are extraordinary yet realistic.

All this is certainly true of the KPS 25s. I have never before heard any CD-driven front end deliver such bass quality. If your speakers can provide flat, high-power reproduction down to 30 Hz or below, this is a component you really must hear.

I had similar reactions to the KPS 25s's other sonic properties. Its midrange was appropriately neutral, with no hint of euphonic losses or artificially boosted detail in the upper part of the range. The treble is so clean that it may take you some time to realize how much upper-octave data is really there. But the more you know a recording, the more you will be struck by the quality of the overtones and harmonics as well as by the absence of electronic glaze.

The KPS 25s's dynamics were not as "live" as those of the very best tube equipment, but then, neither are the dynamics of most live music. However, it perfectly tracked major changes in the music's energy and—in softer passages—delivered immense amounts of the subtle transient detail that conveys the full interplay of instrumental dynamics.

The Krell's soundstage was balanced and neutral. If the recording was multi-tracked, had artificial reverb, or confined its singer to a separate recording chamber, the KPS 25s's soundstage was just as unreal as the recording's. But when there was depth in the source, it was audible. The same was true of soundstage width and imaging. With the Krell, what's on the recording is what you get.

Although only a few wealthy audiophiles can afford the KPS 25s, all serious audiophiles should hear it. Few of us can afford the very best equipment, but all of us can find the time to listen to that equipment and raise the standards we use in judging equipment that we *can* afford. Wealthy or not, you'll find the Krell KPS 25s is what audio is all about. A

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AURICLE

KEN KESSLER

MUSICAL FIDELITY X-A200 MONO AMP

With the prohibitive cost disparity that normally exists between home-grown products and imports, it's unusual to be able to review an audio component that enjoys price parity. Give or take the couple of percentage points attributable to daily currency fluctuations, the U.S. retail prices of the British-made Musical Fidelity components are identical to those in the U.K.; in fact, one or two U.S. models actually cost *less* than their U.K. counterparts. Surprised? Don't be: You guys pay so much less in the States for imports like Jaguars, Mercedes-Benzes, Range Rovers, and a whole lot more that we on the wrong side of the pond have every right to suffer a persecution complex.

Not that I want you to feel guilty about the bargain that is the Musical Fidelity X-A200 mono amp.

Who knew when Musical Fidelity launched its radical, pocket-money-priced X-Series that this line of accessories would grow to encompass amplification and source components? What began with the small, cylindrical X-10D tube buffer stage is now a family that includes three D/A converters, three preamps, an integrated amp, a CD player, a headphone amp, a phono stage, interconnects, and more. The X-A200 is positioned where the lines blur, between

low-cost doodads and entry-level high end. Just placing this power amp next to any of the 10+ cylinders of the X Series tells you that the

rules have changed. The devices housed in the original X chassis are 8 inches long and 4 inches in diameter, like large beer cans resting on their sides. By comparison, the X-A200 is a small keg: 17 inches long and 7 inches across. It positively oozes a new form of industrial chic, similar to the Canon Elph compact camera, whose



dimpled surfaces make it seem so "heavy-metal." The styling of X-Series modules—with their mix of raw metal, black anodizing, and hex-bolt heads—inescapably suggests props for Fritz Lang's *Metropolis*. As in that

classic film, you will find no wussy touches made for aesthetic purposes alone.

When the product was launched, Musical Fidelity

said that "the X-A200 Monobloc completes the X-Series cylindrical power amplifiers." If that's the case—and what's followed the X-A200 so far are an integrated amp, preamps, and a CD player—then it is a worthy flagship. Each chassis is said to develop 30 amperes peak output and to deliver 200 watts into 8 ohms,

400 watts into 4 ohms, and upwards of 500 watts into 2 ohms.

Musical Fidelity is a company not known for modesty, so a boast that "the X-A200 will drive any loudspeaker with ease" deserves to be challenged. Although I no longer have any below-2-ohm Apogeos (such as the Scintilla) with which to threaten this amp, I did force it to drive the ornery Sonus Faber Extrema. It didn't clip, pop a fuse, or fail; so far, so good.

Company literature further describes the X-A200 as having been conceived "to give no-compromise sound quality." Its monoblock configuration, therefore, was a given,

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mostly because only mono amplifiers can provide total isolation of each channel—at least, that is, from a preamp's outputs onward. Its circuit is related to that of the (non-X-Series) Musical Fidelity A1001 integrated amp, which is housed in a conventional enclosure and is—at least in Europe and Asia—one of the company's all-time, best-received products.

The X-A200 uses power MOS-FETs to drive three pairs of high-current, bipolar output devices; the topology is said to prevent thermal runaway.

Each chassis contains a large power supply, and the cylindrical architecture confers genuine benefits: The aluminum extrusion is both rigid and rugged, and it nicely isolates the innards.

As I said before, "industrial chic" is the only appropriate phrase to describe the amp's appearance, with its ridged, black cylinder capped by a 3/8-inch-thick, machined end piece bolted to the chassis and bearing only the model name, company logo, and a tiny red LED to indicate power-on. The on/off rocker switch is on the other end piece, as are two pairs of multiway binding posts (to facilitate speaker bi-wiring), an IEC power-cord socket, and two phono jacks—one in and one out.

The line-level output, also found on the smaller X-A50 monoblock, is a loop-out facility for those who want to daisy-chain the amplifiers for biamping or triamping or to use them in multiroom or home theater systems. And because all X-Series amplifiers possess identical input sensitivity and impedance characteristics, Musical Fidelity recommends that the cost-conscious should biamp with X-A200s driving the woofers and the 50-watt X-A50s feeding the midrange/tweeters. (Plans for an X-Series active crossover, alas, have been shelved.)

It was only natural that I try the X-A200 with two of its sister preamps, the X-PRE and Nu-Vista. The latter is a limited-edition model reviving the use of the nearly forgotten Nuvistor tube. As expected, the matches were ideal, but I also found the X-A200 sociable enough to work with the all-tube Audio Research LS25 and Talk Electronics' solid-state Hurricane 5LP. Program sources

included Krell's KAV-300cd and a Ken Ishiwata-modified Marantz CD-94. For all hookups of CD players and preamps, I used Kimber Select interconnects.

Because power was never an issue, for speakers I was able to indulge in the aforementioned, hungry-as-hell Sonus Faber Ex-tremas. Although it seemed almost wasteful to use the X-A200s with my less-ravenous standbys—Quad ESL-63s, Apogee Mini Monitors, BBC LS3/5As, and Wilson WATT/Puppys—I did use all of them at

**MUSICAL FIDELITY'S
X-A200 HAS A VAST,
OPEN SOUNDSTAGE
AND A REMARKABLE
TRANSIENT ATTACK.**

some point so that I could uncover any sonic signature the X-A200 might have. For consistency, I stayed with Kimber Select cables—the hybrid copper/silver version, which I found best suits the X-A200. No

other tweaking was entertained beyond the basics of good hi-fi housekeeping.

Although the X-A200s prefer a sensible warm-up period, I didn't have to burn them in from scratch, as my test samples had seen combat with other reviewers. Nevertheless, I suspect that these amps, like most, will benefit from a few weeks of constant use before settling down into normalcy. From ice-cold with a burned-in pair, I suggest 20 to 30 minutes of warm-up before any serious listening. Positioning of the amps wasn't a crucial issue, and I didn't fool with amp platforms, weights, etc. And, truth be told, the X-A200s are not especially fussy about cables, either. On the other hand, they're good enough to reveal differences, as I discovered when I switched from pure-silver Kimbers to the silver/copper mix.

I've auditioned four Musical Fidelity components in the last six months and at least another couple dozen over the previous decade. All the company's products are voiced by head honcho Anthony Michaelson. Michaelson, a highly regarded clarinetist and closet tube fetishist, favors a sound as identifiable as that which marks a Krell, Cello, Naim, or any other amp that comes from a company with an irrepressible personality in charge. In the case of Musical Fidelity components, it appears that the preferred mixture consists of plenty of detail (but not at the expense of listenability), adequate transparency (but not

über alles), an open soundstage, and—above all else—a realistic, nonaggressive, natural midband.

Because Musical Fidelity grew out of the ashes of a tube amp manufacturer and has always had one or two tube products in its catalog, it's no surprise that (in its home market, at least) this company was one of the first to bridge the tube/transistor divide. In a weird way, its solid-state components proved digestible to tube users, while its tube components could be tolerated by the transistorized. This alludes not to schizophrenia but to a nifty juggling act, balancing the virtues of both while ameliorating the weaknesses.

In the X-A200, the juggling goes a stage further. Here is an absolute powerhouse of an amplifier with the delicacy and finesse of a classic 60-watter. While I'm sure that its power limits can be reached, especially by headbangers and bass addicts in massive rooms who are in possession of sub-86-dB-sensitivity speakers, I never felt constrained by its 200 watts. And because I tend to listen to music at a softer level than I believe to be the norm, I was able to focus on its character rather than its muscle. The experience, especially with well-recorded vocals and small acoustic pieces, was warm and embracing. I heard no blatant nasties, but I did hear plenty of refinement and more precision than I would have expected from an amplifier short of twice the X-A200's price.

What differentiates the X-A200 from the run of undistinguished power amps in its class are a vast, open soundstage, a remarkable transient attack (despite an absence of the sharp edges that often accompany this), and that unmistakable midband warmth. The only other solid-state amplifiers I've enjoyed in this price range that would cause me any suffering if I had to choose between them are those from Aragon.

So now, to the matter of price: A pair of X-A200s costs \$1,995 in the United States. Check your newspaper or bank for foreign exchange rates, and then compare the dollar/pound relationship to the British price of £999.95. I think you'll find it a near-perfect match (unless some financial cataclysm occurs before this review appears in print). Perhaps distributor Audio Advisor deserves kudos for exercising restraint and not selling the X-A200s for what they're *really* worth: double the price. A

How Do Your Speakers Measure Up?



Take a look at any speaker manufacturer's lineup. Chances are their "top of the line" offers a lot more piston area than their "starter" models. Why?

With speakers, bigger is better. Unless, of course, you don't care about visceral impact. Or distortion. Or efficiency. Or dynamic contrast.

Now some folks will try to convince you that an 8" woofer is faster than a pair of 12". But moving air is a volume velocity issue.

Relying on an 8" driver to pump up your 2500 cubic foot listening space is like fanning yourself with a guitar pick. Distortion will rise and transient response will be compromised (unless you've recently devised a scheme for miniaturizing a 30-foot wavelength).

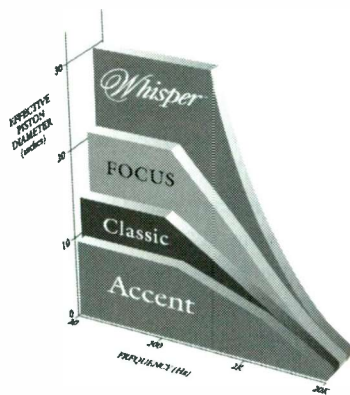
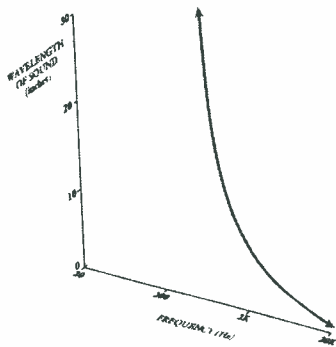
The laws of physics dictate that a loudspeaker's effective radiating diameter should increase proportionally with the wavelength of sound to provide consistently low distortion, broad dynamic range and uniform power distribution.

Study the chart to the side. Note how closely Whisper's effective radiating diameter tracks the wavelength of sound. This provides stable imaging, low distortion and extraordinary dynamic capabilities. This type of chart is very useful in approximating the potential performance level of any loudspeaker design. You may find it helpful to chart the loudspeakers you are currently using on this graph. (We think you'll be in for a surprise!)

Model for model, Legacy offers more piston area than the other guy with one straightforward pricing structure. You'll pay about the same per square inch of piston area for our Whisper as you will for our Classic. None of the exponential markups so typical of high-end audio.



Bill Dudleston,
Chief Designer for
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CINEPRO PROFESSIONAL POWERPRO 20 LINE CONDITIONER

I had mixed feelings when I first received Cinepro's \$1,795 PowerPro 20. Expensive AC line conditioners I'd tried before had done nothing I could recommend, and the claims made for them often seemed to be based more on magic than on physics.

radio-frequency interference (RFI) abounds. I have long used line conditioners and uninterruptible power supplies to protect my computer equipment, and I've taken more elaborate steps to get clean, plentiful power to my audio and home theater systems (see "Waiting for the Electri-



I'm just as skeptical of other AC power accessories. Years of fiddling with exotic line cords has convinced me that they have few, if any, sonic benefits. And such smoke-and-mirrors devices as gold-plated AC-line sockets seem to merge high-end audio with the theater of the absurd.

Don't get me wrong; I have no doubts about the value of high-quality AC power. I live in an area where thunderstorms occur frequently and

(see "Waiting for the Electrician"). But until Cinepro's PowerPro 20 arrived, I found no convincing reasons to protect my A/V equipment with AC line conditioners and no audible benefits from their use. The PowerPro 20 *does* have sonic benefits, however, and it is hardly an exercise in alternative physics.

The PowerPro 20 offers everything you should expect from a good AC conditioner. It provides very good line isolation from a center-tapped

toroidal transformer and a minimum breakdown voltage of 1,500 volts. It monitors voltage via its LED meter and protects against brown-outs, overvoltage, and surges by flashing an alert and shutting off the power when the AC line drops below 80 volts or exceeds 140 volts. It protects against lightning spikes up to 6,500 amperes, and it filters out line-borne RFI.

Access to this clean power is through 12 hospital-grade outlets on the PowerPro 20's rear panel and an outlet pair on its front, all with ground-fault protection (GFI). Four of the rear outlets, designated for use with CD players and other digital components, have extra isolation to keep digital hash from reaching your preamplifier's analog circuitry.

The Cinepro's RFI filter provides approximately 50 dB of attenuation above 1 MHz. But because this filter is placed before the isolation transformer, whose very high inductance blocks signals above 1 kHz, RFI components above 1 MHz are said to be rolled off by more than 60 dB—pretty close to a brick-wall effect.

What sets the Cinepro PowerPro 20 apart from other power conditioners, however, is that it provides *balanced* AC voltages instead of the unbalanced voltages in your house's wiring. The century-old unbalanced system has three leads: a hot wire carrying 120 volts, a ground wire, and a neutral wire tied to ground. The PowerPro 20's balanced system replaces the hot and the ground-referenced neutral wires with two wires in opposite phase, each 60 volts away from ground but in opposite direc-

**CINEPRO'S POWERPRO
PROVED TO ME
THAT AC CONDITIONERS
CAN HAVE
AUDIBLE BENEFITS.**

Company Address: 1030 Vicente, San Francisco, Cal. 94116; 800/395-1222; www.cinepro.com.

WAITING FOR THE ELECTRICIAN

Even if you don't own a conditioner like Cinepro's PowerPro 20, there are steps you can take to reduce noise and hum in your A/V system. I know, because I've taken them.

I have had an electrician run dedicated 20-ampere circuits to my music room and my home theater, all for about the cost of a fancy 6-foot power cord. I keep my systems' AC cords as far from my equipment and audio cables as possible. Using an inexpensive testing device available at most hardware stores, I check polarity and grounding on all three-hole AC outlets to ensure that they meet code. And whenever possible, I have a technician modify any electronic component whose AC grounding produces hum loops in my system. (Do not try to modify the AC power circuits in your electronics; leave that to a professional.) These measures are relatively inexpensive and almost always yield audible benefits.

Yet even these actions' benefits will be limited unless you have obvious problems. Dedicated AC lines cannot affect the basic quality of the AC power going into your house, although they do help isolate switching noises produced by appliances and can ensure that high-power amplifiers get all the AC they need. Surge protectors

can keep power-line spikes from damaging equipment, but those spikes may never occur; even before I started using surge protectors, I never had a piece of audio or video equipment fail because of spikes. And most of my systems' RFI problems have come via interconnects (which I protect with other devices, such as Audio-Quest's RF Stoppers); the RFI protection I've put on my AC lines is just added insurance.

Hum problems in home theaters, which can be made painfully obvious by powered subwoofers, often have nothing to do with AC lines but can frequently be solved with such devices as the Mondial Antenna Ground Isolation Circuit (MAGIC). A lot of the residual hum in audio systems comes from mechanical transformer vibration, which also can't be solved with improved AC power.

Unfortunately, a few VCRs and TVs—and far too many powered subwoofers—seem to have ground-loop problems designed into them. Most of the time, this forces you to use a three-prong to two-prong cheater adaptor to defeat the ground on a three-wire AC connection. Sometimes you can use an individual AC isolation transformer or an audio interconnect isolation transformer. A.H.C.

tions—and therefore 120 volts apart. (This balancing act is the reason the isolation transformer is center-tapped.)

Unbalanced AC presents several problems for audiophiles. Current flowing through the "live" lead can induce hum in nearby wires and metal cabinets through electromagnetic induction. Additional hum is caused by ground currents that stem from the voltage potential between your components' chassis (which most components use as the signal's ground reference) and the AC line's ground. In the PowerPro's balanced setup, the two wires induce equal and opposite voltages that cancel each other out before they can radiate hum to nearby signal cables. Ground currents are all but eliminated by this common-mode cancellation effect. Further, says Cinepro, when most components' power transformers receive bal-

anced AC, they radiate less hum to nearby circuitry.

The PowerPro 20's benefits were really audible. I couldn't tell if hum and noise were reduced by the 12 to 15 dB that Cinepro claims, but I could tell that it reduced even the faint traces of hum in my music system—not to mention the louder hum in my home theater.

Reducing even faint hum brings collateral benefits. Lowering an audio system's noise floor in this (or any other) way can reveal good recordings' harmonic sweetness and integrity and can make soundstage and imaging details more apparent. Lower noise, in other words, enhances the illusion of being at a performance. Perhaps low-level AC-induced noise masks this information, or perhaps it makes us tune out sonic details in order to ignore it; either way, it colors our perceptions.

Cinepro claims a further collateral benefit: improved bass response. The core of the massive, 2.5-kilowatt isolation transformer provides magnetic current storage, becoming a low-impedance source from which an amplifier can draw current freely to meet short-term demands. Cinepro says that an amplifier can draw this current for up to 150 milliseconds without voltage sag—enough to handle, say, a kick drum. The company claims that the low AC source impedance can raise your amplifier's damping factor, which should enhance deep bass response and attack.

With the PowerPro, I was able to perceive an improvement in bass response, but not with every set of components and AC outlet I tried. There was little impact on the sound of a system containing Krell power amplifiers and no significant difference in the sound of a home theater system with powered subwoofers. The PowerPro 20 did improve the bass performance of a system containing Pass Labs' Aleph power amplifiers, particularly on loud orchestral passages having plenty of percussion and on the deep bass of some jazz recordings.

These benefits were audible in my house, where the AC line was already pretty clean, but I believed that the PowerPro 20's effects would be even more pronounced under less benign conditions. To verify this, I simulated worst-case conditions by placing a poorly shielded interconnect near an AC cord; when I balanced the AC with the PowerPro 20, I could hear the hum go down. I expect it will also solve the milder problems caused

**THE POWERPRO 20'S
SECRET IS THAT
IT GIVES YOU
BALANCED POWER FROM
UNBALANCED AC LINES.**

by AC cords or external power supplies placed too close to cables and components.

I took the Cinepro PowerPro 20 on a field trip, trying it in some of my friends' systems and in a small TV production studio. It was apparent that my friends had paid a lot less attention to grounding and hum than I had and that some fairly expensive tube amplifiers could benefit from

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more attention to their AC wiring. (It was also apparent that the PowerPro 20 could stand to have more user-friendly handles and edges.) In one case, the Cinepro helped resolve a turntable/tonerarm incompatibility that apparently was caused by hum from the turntable's motor. In the TV studio, it audibly reduced hum, showing that its benefits may be even more worthwhile in professional applications.

**IF YOU HAVE HUM,
THE POWERPRO 20
MAY BE THE SOLUTION
YOU'VE BEEN SEEKING
FOR YEARS.**

At about \$1,800, the PowerPro 20 is too expensive to be a casual purchase, so its value will depend on what it can do to improve *your* system. Music lovers who suffer from significant AC hum problems or have had their equipment damaged by spikes and voltage problems may find it a worthwhile investment. On the other hand, those who have modest amps (up to 150 watts per channel) or wish to protect only their source components and preamps may opt for Cinepro's 10-ampere version, the PowerPro 10 (\$1,095).

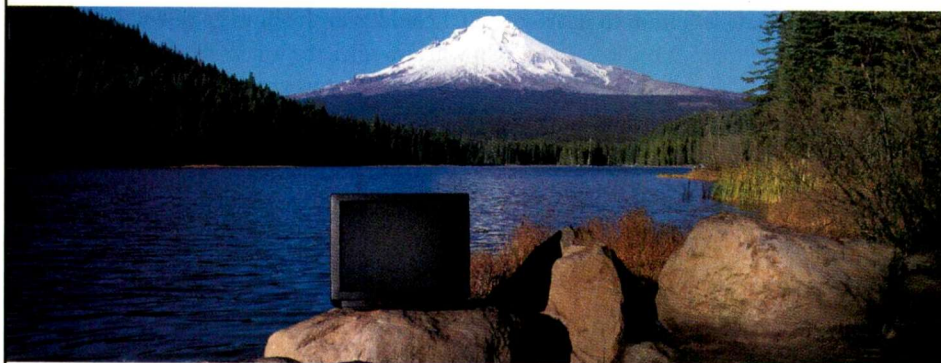
The degree of improvement the PowerPro brings, however, will probably be relatively subtle in many systems—especially if you can't hear hum from your system now, even when it's a quiet time of day and you have everything turned on, no audio signal, and your ear against the woofer. Nor will the PowerPro solve hum problems originating outside your audio system, such as mechanical hum in appliances and fluorescent lights or ground loops in cable-TV connections.

The Cinepro PowerPro 20 is the first serious step forward in AC line conditioning I have ever encountered. But should you make the investment? I suggest borrowing one from a dealer to help you determine its value in your system. Even if you have a very high-quality audio system, there is an excellent chance you'll hear some benefit. And if you have serious hum problems, the Cinepro PowerPro 20 may be the solution you've been seeking for years. **A**

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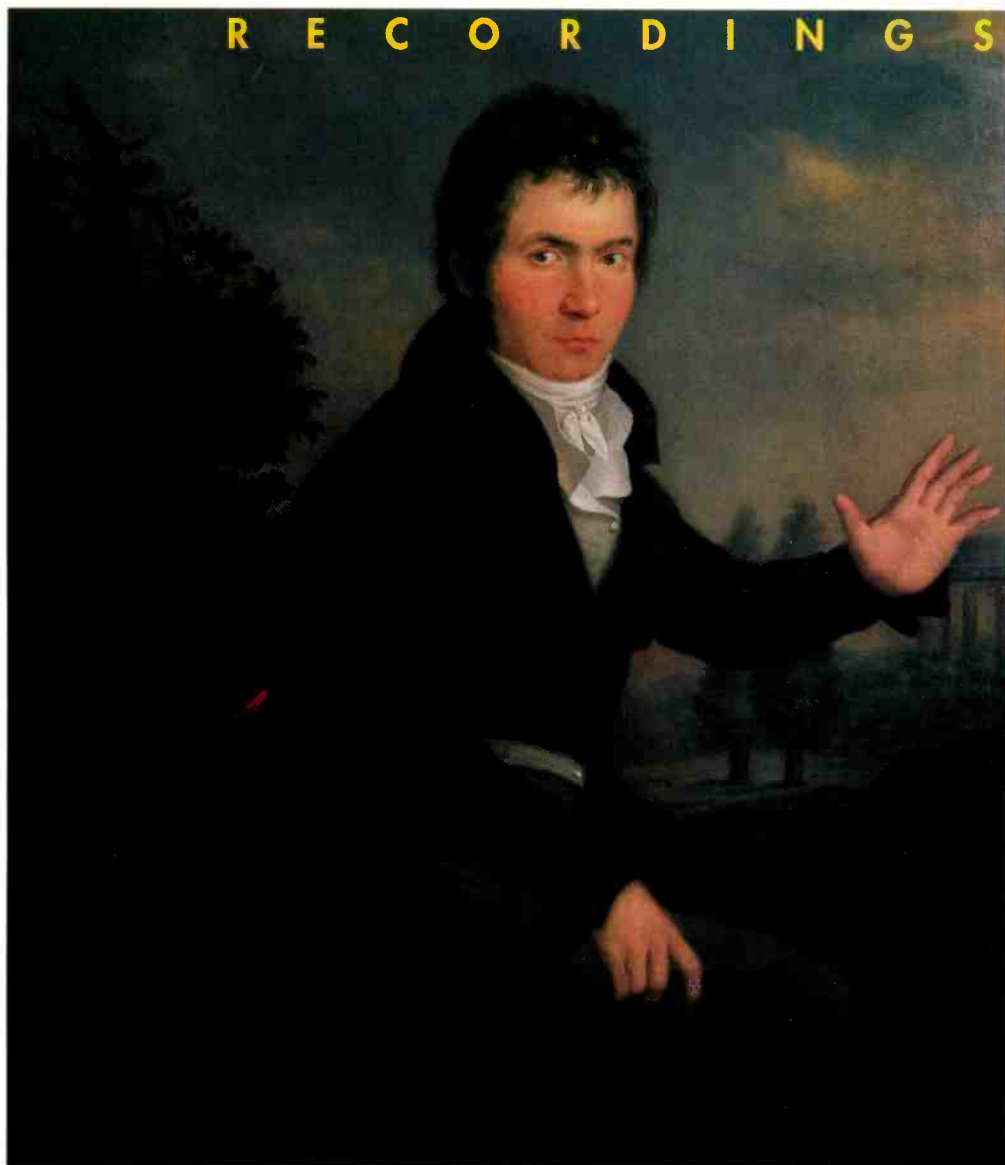
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CLASSICAL RECORDINGS



still to be heard, but based on these first two installments, it will be on my "most eagerly awaited" list.

To call Zinman's brisk, gallant, yet ultimately lyrical and heartfelt interpretations "revelatory" is an understatement. They seem undeniably "right," as if the music should have gone this way all along, a sort of "why didn't we see it this way before" experience. Of course, he's helped by having the new Bärenreiter Urtext score and parts to work with, editions that have sought to resolve most of the age-old problems inherent in transcribing hastily scribbled manuscript to easily read printed page. (This new edition is discussed in some detail in the booklet notes for the Seventh and Eighth symphonies.)

Many differences are immediately audible, such as the extended oboe cadenzas in the first movements of the Fifth and Seventh symphonies or the tempos that are generally brisker than those we're accustomed to. Others are more subtle yet considerably more numerous, having to do largely with phrasing and dynamics. Taken by themselves, these changes might merely sound different, perhaps even odd. But Zinman has let them lead the way to an entirely different yet, in my opinion, irrevocably correct interpretation. Let's take two examples.

In the Scherzo movement of the Seventh Symphony, Zinman adheres to the composer's wish to have the trio played at a fairly rapid clip, without the grandiose, and often ponderous, martial slowdown that completely

shifts the movement's musical gears. The new speed has indicated to Zinman that a different emphasis and weight be given to each beat, so that the whole nature and feeling of the music is changed and fits better with what has gone before. In the Sixth, the "Pastoral," there is a generally *secco* style—one that could result in a choppy feeling—but Zinman and his superb musicians play those staccato notes in a most joyous, agreeable, and natural manner.

Music Museum, Bologna/Italia/ET Archive, London/SuperStock

Beethoven:
Symphony No. 5 and No. 6
 Tonhalle Orchester Zürich,
 David Zinman
 ARTE NOVA 49695; DDD; 73:37
 Performance: A, Sound: A



Beethoven:
Symphony No. 7 and No. 8
 Tonhalle Orchester Zürich,
 David Zinman
 ARTE NOVA 56341; DDD; 60:34
 Performance: A, Sound: A



against which all newcomers must be measured. New recordings in this decade of standard repertory have seldom altered my viewpoint. But it can happen, as it did with the Harp Consort's magnificent realization of Vivaldi's *The Four Seasons* some months ago. And now it has happened again, with David Zinman's recordings of Beethoven symphonies. I don't plan on junking my collection's Ansermet, Monteux, Boult, or Szell cycles, but when I've got time for only one modern instrument reading, from now on it is to Zinman I'll turn, at least for the four symphonies reviewed here. The rest of his cycle is

More often than not, I find myself rejoicing over the reissue of great recordings from the past, those that enshrine standard-setting performances

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There seems to be a delightful surprise at almost every bar, with no missteps. As for balances and general sound, the winds are easily heard and the bass line is solid. The horns are often to the fore but never at the expense of detail elsewhere. This prominence of wind parts is not intrusive at all; rather, the feeling is that of discovering a sound or passage that was always there but often overlooked. The Zürich players are up to the task in both ensemble and solo passages, and the recorded sound is rich, full, and resonant yet chock-full of delicious detail.

And here's the clincher, if one were needed: Available in a budget line, these CDs cost, I'm told, between \$4.98 and \$5.98 each, allowing every collector to expand his Beethoven symphony horizon for very little hard cash.

I'll be eagerly awaiting Zinman and the Tonhalle Orchester's next installment, grateful to know that it's still possible to set new benchmark standards in a market that often seems to churn out entirely too many recordings that are merely good. *Rad Bennett*

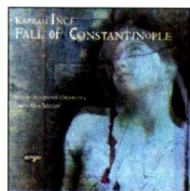
**Ince: Symphony No. 2
(Fall of Constantinople), Arches,
and Remembering Lucia**

Alan Feinberg, piano; Albany Symphony Orchestra, David Alan Miller (Kevin Stalheim, conductor on "Arches")
ARGO 289 455 151; DDD; 73:48
Sound: A, Performance: A

This is the most exciting new concert music I've heard on CD this year. Kamran Ince, a Turkish-American, actually grew up in Turkey, so his music is haunted by that country's long history and culture, much as Hovhanness' music is influenced by his ties to Armenia.

Ince mixes such diverse elements as medieval compositional techniques, Middle Eastern folk music, Bach chorales, wild percussion, tone clusters, and the styles of late Romanticism as well as modern Russia. He also drops nontraditional instruments, such as electric guitar, electric bass, and synthesizer, into the normal symphony orchestra. Yet this very pictorial and striking music could not be called avant-garde; it communicates instantly and clearly in a language quite its own.

Ince not only attempts to depict the sound of pounding waves in one section of his lovely piano concerto "Remembering Lucia," but he also wittily portrays "speeches" by the emperor of Constantinople and the Turkish conqueror in his five-movement symphony about the 15th-century "Fall of Constantinople." After I first heard the opening work, "Arches," I was amazed to read that only five acoustic instruments plus a syn-



thesizer were used; it has the effect of a full orchestra. These works made me think of Ince as a Respighi for the '90s.

Don't miss these world premiere recordings, which show that contemporary orchestral music need not be boring or unpleasant to the ears or the mind! *John Sunier*

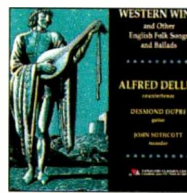
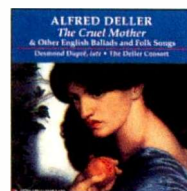
**The Cruel Mother and
Other English Ballads and Folk Songs**

*Alfred Deller, countertenor;
Desmond Dupré, lute;
The Deller Consort*
VANGUARD CLASSICS OVC 8110
ADD; 42:34
Sound: A, Performance: A

**Western Wind and
Other English Folk Songs and Ballads**

*Alfred Deller, countertenor;
Desmond Dupré, guitar;
John Sothcott, recorder*
VANGUARD CLASSICS OVC 8111
ADD; 57:45
Sound: A, Performance: A

In the 1950s, Alfred Deller rediscovered and popularized the countertenor voice. He was also a pioneer in unearthing much of the medieval and Renaissance music that has now become familiar fare.



Deller was one of Vanguard's mainstays, recording over 60 albums for the label, both with and without his excellent consort of equally talented singers. Vanguard Classics is currently involved in remining and reissuing these golden sessions in a series mastered with 20-bit SBM technology.

The titles reviewed here, volumes 10 and 11, are two of Deller's best programs. They find him exceptionally relaxed and comfortable in familiar folk songs and ballads. He uses his pure voice to convey messages and tales with complete ease and simplicity. In programs like these, Deller raised folk music to the highest artistic level imaginable.

My favorite songs are a poignant version of the familiar "Cockles and Mussels" (which is taken way beyond the usual sing-song rendition), a lively "Henry Martin," and a charming, affectionate rendition of "All the Pretty Little Horses" with flute and lute accompaniment. But with so many gems from which to choose, everyone is sure to have his own favorites. The sound scarcely could be better and fully captures this intimate repertory without getting in the way. *Rad Bennett*

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**The Bootleg Series,
Volume 4: Live 1966**

Bob Dylan

COLUMBIA/LEGACY C2K 65759

Two CDs; 1:35:22

Sound: B+/B-, Performance: A+

Look back at 1965, and what do you see? The Beatles were still cuddly, The Stones were still wet behind the ears, The Beach Boys were still surfing, Jimi Hendrix was underground, and the San Francisco scene was known only to the local cognoscenti. And Bob Dylan? He flew past all of them, releasing both *Bringing It All Back Home* and *Highway 61 Revisited*

by the summer of that year. Dylan became the first thinking man's rock star, his angst-ridden song/poems endlessly dissected by the nascent rock subculture. More than that, his genius ignited a revolution by fusing those "flashing chains of images" to an electrically charged metallic sound—a joyously distorted explosion that would resonate for, well, it's still going.

Live 1966 documents Dylan's legendary May 17th concert at Free Trade Hall in Manchester, England. Though never officially released, the material on this album is well known, thanks to countless bootleg

versions (misabeled as the Royal Albert Hall Concert) that have circulated over the decades. Fans who listened through the bootlegs' murky haze will celebrate the clarity of this remastering. The opening solo acoustic set now sounds just beautiful, and the album includes definitive performances of "It's All Over Now, Baby Blue," "Just Like a Woman," and a stunningly euphoric "Mr. Tambourine Man."

The electric Dylan, backed by The Hawks (soon to blossom as The Band), catapults the proceedings to

Photograph: © David Gahr

bap kennedy

Domestic Blues

E SQUARED 1058, 47:53

Sound: A, Performance: A+

Steve Earle liked Bap Kennedy's former band, Energy Orchard, so much that he convinced MCA, his label at the time, to release one of its five albums. Kennedy, a Belfast lad, went to Nashville in 1996 with a suitcase full of songs, and he and Earle cut *Domestic Blues* with the players from Earle's *Train a Comin'*: the late Roy Huskey, Jr., on bass, Peter Rowan on mandolins, guitar, and vocals, and Earle on guitars and vocals. For Dobro and lap steel, Jerry Douglas was the only choice, and he damn near steals the album. When drums were used, Larry Atamanuik was deployed. Nancy Blake adds cello on three cuts, and Nanci Griffith sings on two.

This is a hard record for me not to fall in love with. Bap's songs are so strong and so true, and the picking so compelling (especially by Douglas), that resistance is futile. The grand time everyone must have had making this album clearly shines through in every song. One slight caveat: The running time is deceptive, including as it does about 7 minutes of silence before a terrific unlisted cut, Ewan MacColl's "Dirty Old Town" (sung as a duet with Earle), begins.

Domestic Blues is very ragged but very, very right. Michael Tearson



spiritual heights of ecstasy. Garth Hudson's organ rolls out a supple foundation for the crackling rhythm section driving Robbie Robertson's jagged guitar streaks as Dylan—his raw voice powerful yet vulnerable—tears through the set. The songs run the gamut from "Baby, Let Me Follow You Down" to "Leopard-Skin Pill-Box Hat." On his harrowingly surrealistic rant "Ballad of a Thin Man," Dylan sounds positively unglued, but he then somehow summons up the physical strength to unleash "Like a Rolling Stone," his perverse dismantling of the American dream—or is it an unrequited love song? (Or both?)

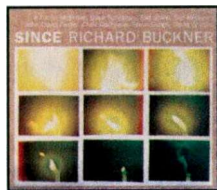
Live 1966 captures Dylan at his creative apogee, casting off the old illusions, searching for new sensations, demanding unrestrained freedom, and forecasting the State of the (dis)Union. It is truly one of the greatest rock 'n' roll records of all time. *Steve Guttenberg*

Since

Richard Buckner

MCA MCAD11780, 37:04
Sound: A, Performance: A

Richard Buckner lives in another time. Like a character from a Jack Kerouac novel, he crisscrosses America playing his songs of hope



and romantic love with abandon. But Buckner performs like a honky-tonk singer: Too tired to focus on the exact note, he prefers to slide around and approximate. His backing band, a revolving door of musicians, creates a desertscape so open and vast that you can hear the tumbleweeds passing through. Together, they make country music that's tied to Hank Williams' vision, not Nashville's Hollywood glitter.

Since is Buckner's third and best album. The 16 tracks melt together and do their damage quickly. "Ariel Ramirez" is gentle and lonely, "Jewelbomb" electrified and driven. "Slept" is the best cut.

Spare acoustic guitars back Buckner as he sings into the night sky. Though sounding like a big kid who's excited about the possibilities of life, his sense of doom roots his songs to the ground. *Rob O'Connor*

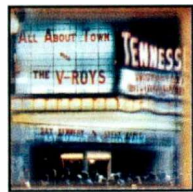
All About Town

The V-roys

E SQUARED 1061, 36:12
Sound: A, Performance: A

You'll be hard pressed to find a more honest alternative country album than *The V-roys'* sophomore set, *All About Town*. Unlike so many young bands whose eagerness to join the twang-rock bandwagon seems more a contrivance than a genuine investment, The

V-roys, having come of age in Knoxville, Tennessee, embrace all aspects of country and rock. They pull together styles from folk music and Buck Owens guitar workouts to garage rock, Motown shuffles, and Beatlesque pop.



The band's sense of adventure pays off on songs like the Everly Brothers-simple "Hold on to Me" and the super-melodic "Ariane," while the chiming "Miss Operator" is scored with a pleasant, Stony harmony. If the rock scent of these tracks doesn't strike, then the Appalachian-flavored "Virginia Way/Shenandoah Breakdown," with a guest appearance by the masterful Del McCoury Band, is sure to set you tappin'.

Produced by the "twangtrust" of Ray Kennedy and Steve Earle, *All About Town* doesn't have a single weak moment, even though it traverses a wide range of styles. The album is held together with honesty, sincerity, and promise, not to mention a nudge-nudge sense of humor—all reflected in Scott Miller's songwriting and the band's raw, charming performance.

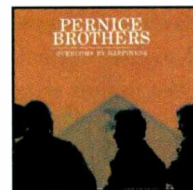
If we can take any positives from the recent stampede of alternative country bands signing major label contracts, it's that we get the opportunity to hear real-deal bands like The V-roys. *Bob Gulla*

Overcome by Happiness

Pernice Brothers

SUB POP RECORDS SPCD427, 39:05
Sound: A-, Performance: A-

There's something undeniably warm about those '70s AM radio hits by the likes of Bread and Gordon Lightfoot. The immediate feel-good quality evokes either instant pleasure or, more likely these days, suspicion. How, in an age of aggression—and of grunge and hip-hop—can we return to something as simple as the stirring melodicism of Jimmy Webb's "Wichita Lineman"?



Since his voice is like butter, Joe Pernice makes music perfect for early '70s radio. As the former leader of Scud Mountain Boys, Massachusetts' exquisite country-folk quartet, he understood paths without resorting to shameless sentimentality. Now, as leader of the Pernice Brothers, he's working on orchestrated pop, draping songs in syrupy strings and lite-FM piano. Underneath this lithe veneer, however, he's telling some grim tales. (There's "Dimmed Star," for example, about a girl who kills herself in the garage.) Yet they're always presented with a seductive, pretty face. *Rob O'Connor*

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JAZZ ~ BLUES

RECORDINGS



Evanescence:
A Tribute to Bill Evans
Fred Hersch
 EVIDENCE 22204, 62:03
 Sound: A, Performance: A

Quiet Moments
Hendrik Meurkens
 EVIDENCE 22214, 45:17
 Sound: A, Performance: B

Jazz buffs have a well-developed scrutiny meter. The seminal musicians have come and gone, having left indelible marks. So, ask these critical listeners, to what degree are those musicians being emulated by today's players, and is creativity being hampered because there seem to be so many copycats?

When pianist Fred Hersch arrived in New York 20 years ago, he was initially "put in a Bill Evans bag," as he states in the CD's liner notes. *Evanescence*, his thoughtfully con-

ceived 1990 recording that until now was available only in Japan, is a candid reply to those critics. Playing primarily Evans originals, Hersch reiterates the obvious—that he has absorbed the lessons of his admitted influence well. But then he proceeds to take the music in a direction that is strictly his own.

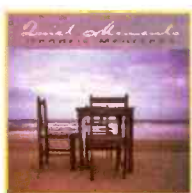
Selections from the Evans repertoire—including "My Bells," "You Must Believe in Spring," and "Alice in Wonderland"—are more highly arranged than the original recordings, with the melodies generally displaced rhythmically. Hersch's prodding of straight eighth notes (without a Latin feel) into swing as a means of development may well be his own idea. The most obvious difference between the two players is Hersch's superior ability to swing. Evans was the absolute king of ballads, but Hersch displays the finesse to take those ballads beyond the realm of gently rolling hills right to the street level. Another great attrac-

tion is Hersch's piano tone, easily identifiable with that of Evans during his early, very best years.

To top things off, vibraphonist Gary Burton and harmonica virtuoso Toots Thielemans join the proceedings on three cuts each. This contributes to an already tasty set that includes bassists Marc Johnson (on four tracks) and Michael Formanek (on six of the remaining seven tracks) plus drummer Jeff Hirshfield.

Once a contradiction in terms, the jazz harmonica has been coming into its own, courtesy of Thielemans and his protégé, Hendrik Meurkens. With a style more heavily dependent on the be-bop vernacular, Meurkens has taken his mentor in another

Illustration: Marina Sagoria



UKULELE

Legends of Ukulele


Various Artists

RHINO R2 75278, 49:03

Sound: C to A-, Performance: C to A

This collection is proof positive that ukuleles are cool, no matter what you think of Tiny Tim. Sure, his greatest hit, "Tip-Toe Thru' the Tulips," is included, but it's the uke's surprising range that makes this disc such a blast. You'll hear why they called Roy Smeck the Wizard of the Strings when he double-times the rhythm on "Uke Said It," and Eddie Kamae demonstrates his chord soloing techniques on the flamenco-tinged "Granada." The uke's four strings soar as the Ukulele Orchestra of Great Britain tears into a rousing "Johnny B. Goode." Radio and TV personality Arthur Godfrey set off a massive ukulele craze in the early '50s, and his "Makin' Love Ukulele Style" amply illustrates his charms. The uke's affinity for jazz goes way back; just check out Johnny Marvin's wild "12th Street Rag" from 1927 and Ohta San's Wes Montgomery-style licks on "Little Grass Shack" (1993).

Rhino's superb mastering brings out the best from the widely varying sonics of *Legends'* 18 tracks, all cherry-picked by ukulele booster extraordinaire Jim Beloff. *Steve Guttenberg*



direction via serpentine lines that might have pricked up Charlie Parker's ears. On *Quiet Moments*, his latest CD, Meurkens winds his way through the great American songbook with resplendent pianist Renato Chicco. Sounding more like a club date than a pre-arranged recording session, this duo is forthright, exploring such standard fare as "Sophisticated Lady" and "A Beautiful Friendship" with subtlety, grace, and playful moments of outright swing. *James Rozzi*

In the World

Olu Dara

ATLANTIC 83077, 47:03

Sound: B, Performance: A-

Do yourself a favor and listen to Olu Dara. He's been playing his horn and guitar for decades on records by other folks, from Art Blakey to Brian Eno to Cassandra Wilson; *In the World* marks his debut as a leader. Dara makes juicy, sensual music grounded in the blues, rooted in African rhythms, and invigorated by world/urban/rural influences. His supporting players are uniformly excellent, but it's the primal sound of Dara's voice and cornet—the way they conjure up the breath of life—that makes deeper connections to and for all of us. *Steve Guttenberg*

Krushevo

Vlatko Stefanovski and Miroslav Tadic

MA RECORDINGS MO44A, 50:35

Sound: A+, Performance: A+

The short rave: *Krushevo* is one of the most beautiful guitar recordings ever made.

The long rave: Guitar virtuosos Vlatko Stefanovski and Miroslav Tadic are joined on this recording by a third—nonhuman—player, a strange and beautiful edifice, the Macedonium Monument. Overlooking the little town of Krushevo, it is a tribute to the Macedonians, who rose up against the Ottoman Empire at the end of the 19th century.

There's no doubt the Macedonium's mystical presence (and sensuously curvaceous interior acoustics) inspired this program of soulful Balkan blues—modern arrangements of Macedonian folk tunes, wedding music, and love songs. Forget the overused "world" music clichés; the range of sounds, passions, and spellbinding rhythmic patterns Stefanovski and Tadic produce are nothing short of astonishing.

Krushevo's convergence of extraordinary musicianship, inspirational setting, superb acoustics, and MA Recordings' minimally intrusive recording style have created a masterpiece that surely belongs in your collection. By the way, *Krushevo's* Technicolor-rich photography is worth the price of admission. (Available direct from MA Recordings; call 888/293-5067.) *Steve Guttenberg*

AUDIO/JANUARY 1999

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DVD REVIEWS

Eve's Bayou

Eve's Bayou 1997; R rating; one-sided (approximately 1.66:1 letterboxed); Dolby Digital 5.1; French and Spanish subtitles; includes theatrical trailer; screen-specific production commentary, short film (Dr. Hugo), and MCA soundtrack promo. TRIMARK HOME VIDEO VM 6741D, 108 minutes, \$24.99
Picture: A-, Sound: A, Content: A

Not since *To Kill a Mockingbird* (1962) has a narrated memory piece about the South struck such a chord. *Eve's Bayou* is the story of the Batistes, an upper-class African-American family in 1960s Louisiana. It is told through the eyes of the youngest daughter, Eve, who is played with incredible depth and nuance by newcomer Jurnee Smollett.

Finely wrought cinematography, an intelligent script, and totally appropriate music create moment after moment of movie magic. In fact, *Eve's Bayou* is so good, I find it hard to believe that it didn't win a handful of Academy Awards for 1997. Surely "A

Child with the Blues," the song Curtis Mayfield composed for the film, is head and shoulders above any of the songs the Academy nominated, and the pungent "Black Americana" orchestral score, by jazz performer/composer Terence Blanchard, is also better than anything considered on Oscar night. Were the power mine, I would have awarded Smollett Best Actress and Debbi Morgan a Best Supporting Actress statuette for her awesome performance as Eve's Aunt Mozelle. I also would

have given Amy Vincent recognition for her masterful, imaginative, and poetic cinematography and perhaps a nod to Kasi Lemmons for her very impressive directorial debut.

This DVD is proof that *Eve's Bayou* deserved such recognition. Outspoken African-Americans in the film and political communities have said that the Academy of Motion Picture Arts and Sciences is biased, and one can sadly only conjecture that *Eve's* slight by the Academy might have been in part be-

cause nearly all of its cast is black and its director and director of photography are women. This beautifully produced DVD gives you the chance to see what you might

CONCERT FILM

Remembering Otis 1998; no rating; color and black-and-white; one-sided; Dolby Digital 5.1. PIONEER ARTISTS PA-98-587-D, 48 minutes, \$24.98
Picture and Sound: See text, Content: A

The Pointer Sisters, Live in Africa 1998; no rating; one-sided; Dolby Digital 5.1. PIONEER ARTISTS PA-98-588-D, 40 minutes, \$24.98
Picture and Sound: See text, Content: B-

These titles are part of Pioneer Artists' Concert Film series, which presents historic footage of classic pop performers. Since the intent seems to be to restore the footage to its original look without any miraculous enhancement, the normal video and audio ratings don't apply.

The Otis Redding DVD is from two performances, one from the 1966 Stax-Volt European Tour in low-contrast, yet clean,

black and white, and the other from the Monterey Pop Festival in 1967 in often blotchy, smeared color. The high-voltage performances shine through the somewhat ordinary video. The Pointer Sisters footage, shot in 1974, is a lot better technically, with good color. But whereas Redding comes across as timeless, The Pointers seem dated.

Neither title's 5.1-channel remix interferes with the original sound very much, which is still the bass-shy, somewhat remote sound of its times. The surround channels just distribute a little reverb and audience noise.

The overall effect on these releases is that of a good, honest documentary: the best available film at the time, reproduced as well as possible in the new DVD medium. Future releases will be devoted to historic footage of The Doors, Little Richard, James Brown, Chuck Berry, B.B. King, Jerry Lee Lewis, Muddy Waters, and others. R.B.

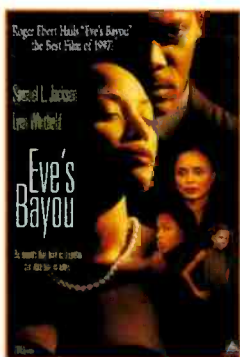


Photo: Trimark Pictures (Courtesy Kobal), ©1997 Chris Helmerman-Benge

have missed so that you don't have to be as shortsighted as those who grant awards.

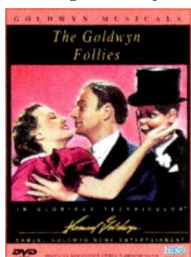
The 5.1-channel sound mix is about as good as it gets in reproducing the film's score and the all-important atmospheric sound effects that seem to place you right in the Louisiana bayou country. The commentary track is a little glossy and naive, though Vincent divulges some good technical information about the filming. The short film *Dr. Hugo*, which was intended as a study piece for *Eve's Bayou*, proves to be a miniature gem in its own right, and the menu design is quite imaginative.

I can find no flaws in the film *Eve's Bayou*, and the only faults I can find in the DVD are a very, very slight orange tint in some scenes and a video transfer that exhibits just slightly too much contrast—a minor defect barely noticeable in some scenes. So settle back and be prepared for a thoroughly mesmerizing experience as you watch this magnificent film in an impressive DVD presentation. *Rad Bennett*

The Goldwyn Follies 1938; no rating; one-sided (1.33:1 aspect ratio); English Dolby Digital two-channel Chace surround stereo; English/French/Spanish/Italian Dolby Digital one-channel mono; English/French/Spanish subtitles. HBO 90746, 115 minutes, \$24.98
Picture: A-, Sound: B+, Content: B-

Overall, *The Goldwyn Follies* is a weak musical in the history of Hollywood. Its plot is merely a skeleton on which to hang an uncomfortable variety of acts and musical numbers. But since the print looks more pristine and colorful than anyone has a right to expect of a 60-year-old movie, it's well worth a look for a definitive glimpse of the entertainers who were popular just prior to World War II. It allows us, for instance, to see Edgar Bergen and Charlie McCarthy, as well as the zany Ritz Brothers, in their prime and to view and hear the popular tenor and handsome matinee idol Kenny Baker, who was a singer on Jack Benny's early radio shows. The audio tracks, carefully reconstructed in Chace stereo, prove that Baker's voice was indeed very special.

As if these star turns weren't enough, there's a lead role for the youthful, voluptuous Vera Zorina, the Ballet Russe star who first married George Balanchine and later Goddard Lieberson, and who became a producer and sometime actor at Columbia Records. (She's the same Zorina who delivers that dynamite narration on Leonard Bernstein's recording of Darius Milhaud's *Les Choéphores*, recently rereleased on Masterworks Heritage CD MHK 62352.)



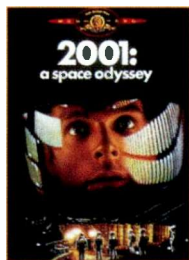
The Goldwyn Follies is a case where the parts are greater than the whole, but thank goodness DVD's rapid search capability allows us to pick and choose quickly. *R.B.*

2001: A Space Odyssey 1968; G rating; one-sided, dual-layer (2.35:1 aspect ratio); English Dolby Digital 5.1; French Dolby Digital two-channel mono; English/French/Spanish subtitles. Includes trailers and interview with Arthur C. Clarke. MGM HOME ENTERTAINMENT 906309, 139 minutes (feature), \$24.98
Picture: A, Sound: B+, Content: B+

The highly regarded special-effects movie that made today's high-tech films possible looks far better on DVD than it did in any of its many laserdisc incarnations. The many scenes bathed in orange or red light emerge with absolute clarity, thanks to the absence of analog video noise, while fully lighted interiors and exterior space vistas are sharply etched and extraordinarily clean and clear.

My only bone to pick is not the one that Kubrick's ape throws up in the air but the director's decision to use medium-fi '60s recordings of romantic classical music instead of the spiffy, colorfully orchestrated score written for the movie by veteran film composer Alex North. (North had written the music for Kubrick's first major big-budget film, *Spartacus*.) Adding insult to injury, MGM's notes don't even mention it. The DVD does include all of Kubrick's choices (including the overture and music for the intermission and the end), but though the sound effects seem dynamically remastered for this DVD, the music sounds just as it always has—like recordings of concert music plopped on the screen with little sense of "cinema sound."

To get the full story on *2001's* music, check out the Varese Sarabande CD (VSD-5400) that contains North's score, recorded after his death by his friend Jerry Goldsmith. Also listen to Rhino's new disc of the Kubrick-approved choices (R2 72562), which includes good transfers of all the originals, some of which exist in two versions—the one used in the film and another that was altered for the original vinyl soundtrack album. It is possible to sync this DVD with the Varese CD (assuming you have separate DVD and CD players). Although the timings are not exact, you'll get an idea of the effect that North's score—recorded in a more forward movie perspective—would have made. DVD technology, with its capacity for multiple soundtracks, might have allowed this, too, but no doubt legal fees would have precluded it. *R.B.*



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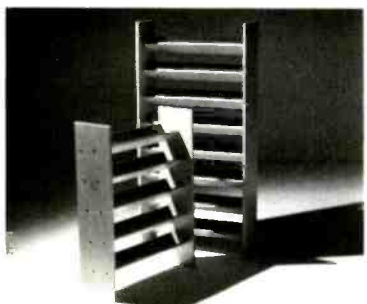
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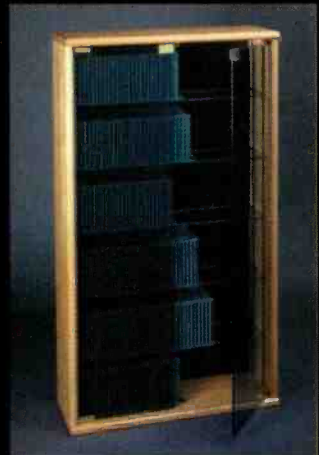
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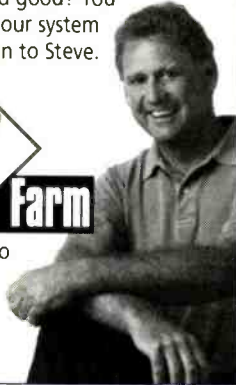
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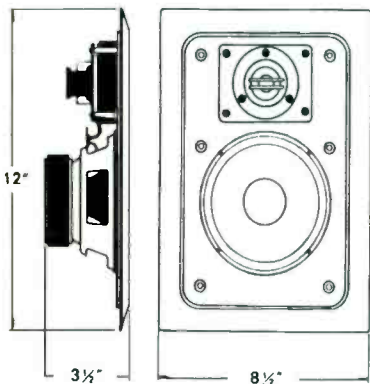
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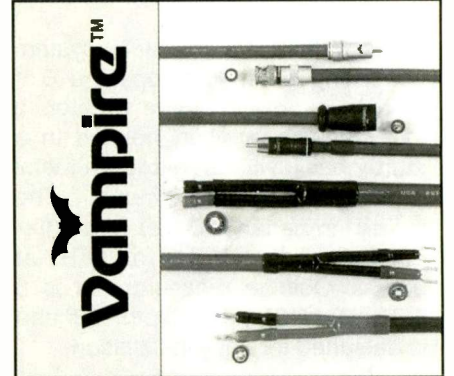


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PlayBack

ROTEL RP-955 BELT-DRIVE TURNTABLE

Remember the days when we could find decent turntables at reasonable prices? In these days of digital gear, there are fewer and fewer good intermediate-priced turntables around. Rotel's RP-955 (\$599) is one of them.

The RP-955 plays 33 $\frac{1}{3}$ - and 45-rpm records. Its aluminum platter is belt-driven by a servo-controlled DC motor, resulting in low rated wow and flutter and a good rumble spec. Speed can be fine-tuned, and a removable strobe disc is provided. The straight, low-mass tonearm, made of aluminum, has anti-skating and comes with an Audio-Technica AT-110E cartridge pre-mounted. The black hardwood base has a hinged dust cover.

Setup was easy; all I had to do was install the dust cover and counterweight and adjust arm balance. Although the arm should easily accommodate almost any cartridge, I tested the Rotel RP-955 with the supplied A-T cartridge, setting tracking force at 1.5 grams. My preamp was a FET Valve EC, from Audio by Van Alstine, which has 12AX7 tubes in its phono stage. The 955 tracked accurately, for the most part, and sounded good. I was impressed by its sound on

Muddy Waters' *Folk Singer*, a limited-edition LP from Mobile Fidelity, and by its sound on well-recorded jazz and pop records. My only peeve was the location of the speed-adjustment control, on the bottom of the base—but the speed was dead-on anyway.

Better snatch up the Rotel RP-955. Who knows how long turntables in this price/performance range will continue to be made? (Rotel: 54 Concord St., North Reading, Mass. 01864; 978/664-3820; www.rotel.com.)

John Gatski

GRADE: A



Sony MDM-X4 Mk II Four-Track MiniDisc Recorder

The Sony MDM-X4 four-track MiniDisc recorder/mixer I reviewed in "PlayBack" in the August 1997 issue is now available in a Mk II version that, at \$895, is more than \$300 cheaper. It uses Sony's latest ATRAC data-reduction system, can perform fancier tasks with MIDI setups, and enables you to enter longer disc and track titles.

Machines like this are mainly for musicians, but other home recordists may appreciate the MDM-X4 Mk II's exceptionally flexible recording and editing capabilities. Besides the mixer, other features you'll rarely find on a consumer audio recorder include the jog/shuttle editing and cueing control and the ability to overdub, bounce audio between tracks, and do automatic punch-ins and punch-outs. In addition to a three-band EQ for each channel, the mixer section has controls for panning and track assignment. Connections include two XLR mike in-



GRADE: A

puts, four mike/line input phone jacks, MIDI in/out jacks, a processor loop with two inputs and two outputs, and a headphone jack. The Sony also has a MIDI time-code function so you can synchronize with another Mk II as a slave recorder or with MIDI signal sources.

The flexibility, convenience, and sound quality of multitrack MD recorders surpass those of four-track analog cassette decks. And the data discs required for four-track recording, which used to cost \$20 each, are now \$10, approaching the prices of music MDs (which either version of the MDM-X4 can record, but only in stereo).

Like the first version, The MDM-X4 Mk II proved to be an excellent performer. I was able to construct a complete four-channel cut in minutes, including pushbutton changes in track assignments. And though ATRAC encoding employs significant data reduction, its sound has gotten better and better with each new iteration. (Sony: 1 Sony Dr., Park Ridge, N.J. 07656; 201/930-1000; www.sel.sony.com.)

John Gatski

Cambridge SoundWorks Model 88 Table Radio

The Model 88 is a blockbuster. At \$199.99, Henry Kloss's fourth hi-fi radio design is also a stunning value.

When mine arrived from Cambridge SoundWorks, I immediately programmed in three local classical stations (which took just seconds) and left it playing. Listening from another room, I was startled by a Beethoven symphony's muscular drumbeats. Radios couldn't produce such impressive bass before Kloss packed this one's brawny, broad-shouldered cabinet (14 inches wide x 4 $\frac{3}{4}$ inches high x 8 inches deep) with a powered woofer, said to occupy two-thirds of the unit. It takes over below 200 Hz from a pair of individually amplified midrange/tweeter drivers.

With its supplied wire antenna, the Model 88's discrete FM tuning section is admirably sensitive in my country location. Plugging in a CD player makes it the better part of a respectable music system. Large forces sound formidable indeed; Cambridge credits this, in part, to adaptive frequency equalization that prevents excessive output



GRADE: A+

in the region from 800 Hz to 2 kHz.

A "Wide" mode allocates out-of-phase information to opposite channels and, on some source material, creates a pleasingly broad soundstage. Other note-

worthy features include a 75-ohm antenna terminal, inputs for two auxiliary program sources, a woofer level control, a headphone output, stereo or mono operation, and an automatic shutoff that's programmable in 10-minute increments up to 1 $\frac{1}{2}$ hours. A palm-sized remote is supplied.

Because this radio should be heard from afar, Cambridge has relegated timekeeping to a separate, companion clock. Suitable for bedside placement, it will control the Model 88 via infrared and make it a two-piece clock radio. The clock should be available about the time you read this and be priced below \$50—possibly \$40 or less.

For me, FM is a very important music medium. I've spent countless hours listening to my Advent Model 400 radio, another Kloss design, since the 1970s, and I'm even more thoroughly delighted with its superb descendant. (Cambridge SoundWorks: 311 Needham St., Newton, Mass. 02164; 800/367-4434; www.hifi.com.)

David Lander

Vienna Acoustics™



The Bridge

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[Home Theater]

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