

AUDIO

INSIDE THE STUDIO

HOW HIT RECORDS ARE MADE

THE EQUIPMENT AUTHORITY

SEPTEMBER 1996

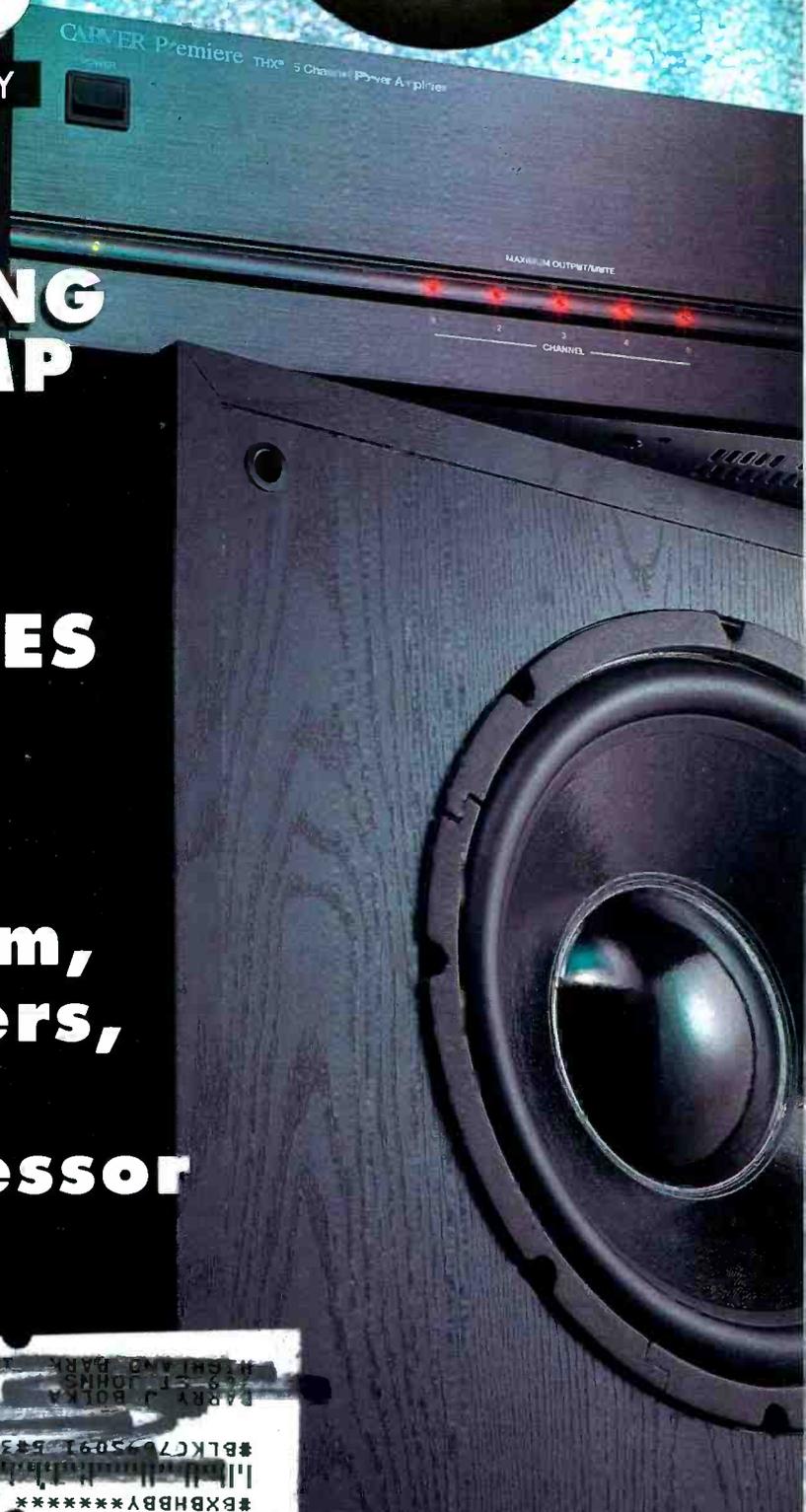
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ALSO TESTED

Polk SRT System, Mirage Speakers, Meridian AC-3 Surround Processor



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3,000 FEET

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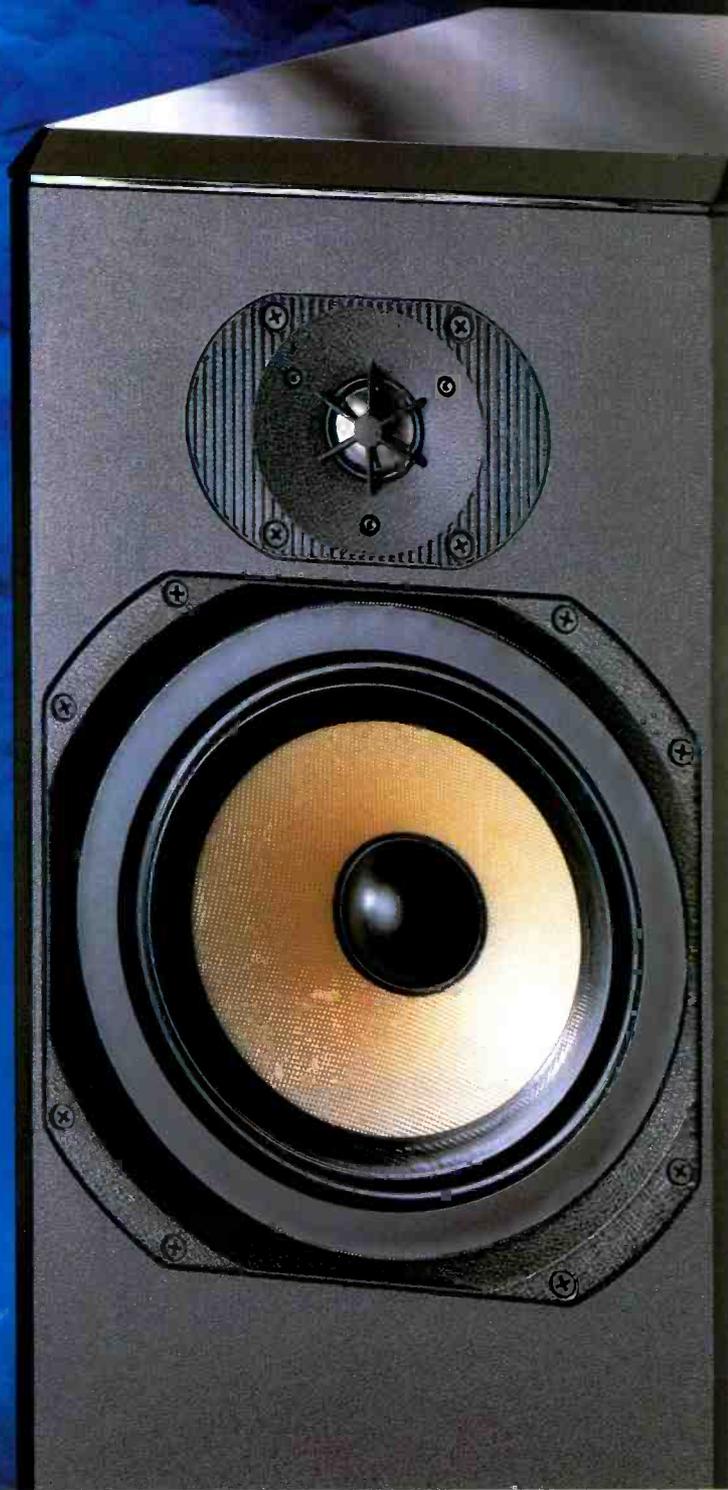
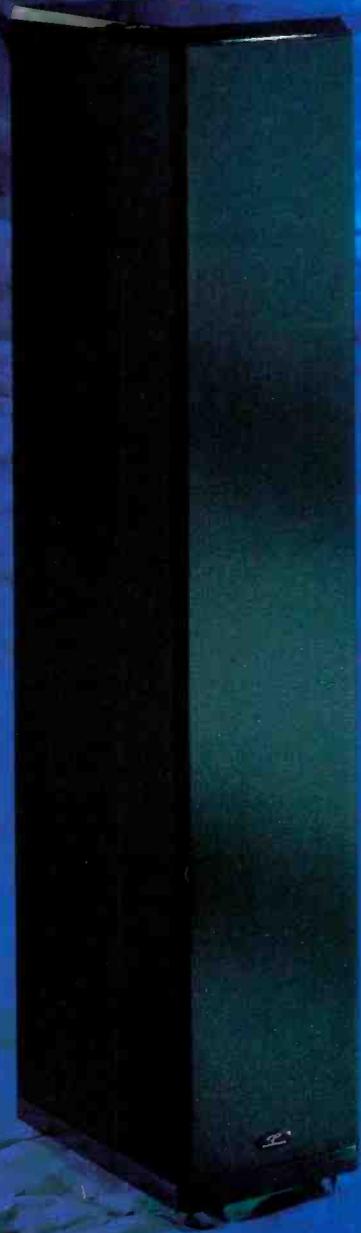
– D.B. Keele, Jr., on the Studio/100
Audio Magazine/July '96

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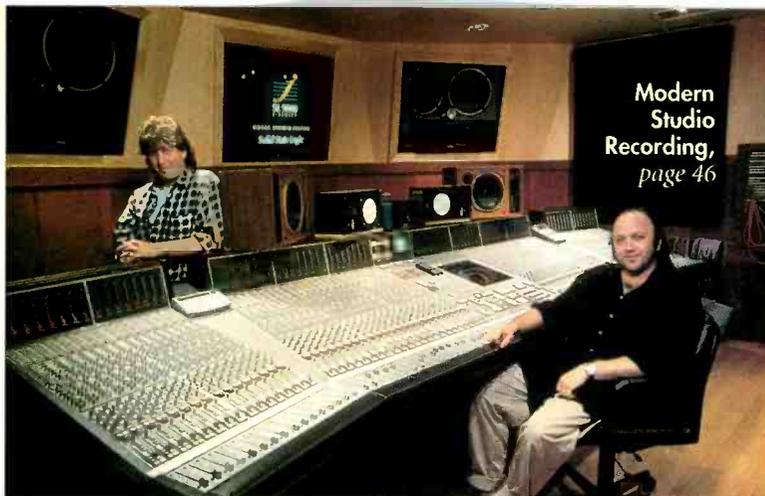
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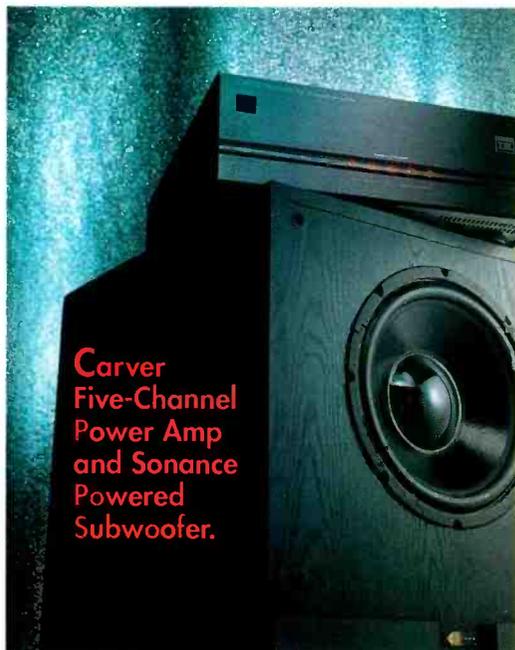
CIRCLE NO. 18 ON READER SERVICE CARD

AUDIO

THE EQUIPMENT AUTHORITY



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Carver Five-Channel Power Amp and Sonance Powered Subwoofer.

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Rotel Report

5



Rotel's RSP-980 provides Dolby® Pro Logic® and THX® certified surround-sound decoding, video switching, and audiophile quality preamp functions for two independent zones.

SYSTEM BUILDING

Building Blocks for Home Entertainment

Are you a bit daunted by the choices involved in putting together a high performance yet affordable home entertainment system? We have a suggestion for you — Rotel.

Since 1963, we've concentrated on one thing: Building the finest, most cost-effective audio and audio/video components available. Judging from the praise we've received from reviewers and magazines around the world, we've done fairly well at it.

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The RCC-945 — convenience and performance in a six disc CD changer

RSP-980 Processor/Preamp

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In the Rotel tradition, the RSP-980 is built around a multi-segment power supply that provides ripple-free operating voltages thanks to high capacity rectifier and regulator ICs. Careful circuit board layout assures that filter capacitor banks are located near associated active circuitry. Analog stages benefit from precision metal film resistors, low ESR capacitors, and high current operational amplifiers.

System flexibility? Seven source inputs and an independently controlled Zone 2 output allow you to choose one source for your main system and another for remote rooms!

The Rotel RSP-980 is an ideal choice for future system expansion. With Dolby Pro Logic decoding, THX certification, video switching for composite and S-video sources, and an on-screen display, the RSP-980 is fully equipped to effortlessly take you into the world of total home entertainment. How's that for painless transition?

RCC-945 6-disc CD Changer

And, lest you forget that convenience and quality extends throughout the Rotel product line, take a look at our new RCC-945 Compact Disc changer.

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Technically, the RCC-945 is a standout, too. Advanced digital processing includes the same Delta Sigma converters and second order noise shaping digital filter that's earned high praise in our single disc models. The dual D/A converters feed a "no compromise" analog

section featuring the acclaimed Burr-Brown 2604 operational amplifiers. And, of course, the entire audio circuit has been optimized through extensive listening tests.

The sound? Well, let's just

say that it's musically balanced, detailed, and unusually transparent. Not what you might expect from a CD changer. But, quite in keeping for Rotel. After all, we've been building on that tradition for over thirty years.



*"The Rotel RMB-100s deserve serious consideration."
Dayna B., The Audio Adventure,
Vol. 2, Issue 2, Dec. 1995*

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CIRCLE NO. 20 ON READER SERVICE CARD

This month's feature by Dan Levitin describes the methods used to make almost all the recordings available today in stores or heard on the radio. Recently, however, I attended a very different sort of recording session—different in almost every possible way.

Sitting in the control room, listening to the mike feed, I could easily believe I was hearing a great pianist at work. In a sense, I was: Ferruccio Busoni, born 1866, died 1924!

The engineer for the session was Jerry Bruck (*not* Shirley MacLaine), and that the performer was a dead man is only half the story. The recordings themselves were going down in a variety of formats, including two-channel, 1-inch, half-track analog and four-channel, nominally 24-bit digital, the latter at 44.1 kHz on a single Nagra D and at 96 kHz on a pair of Nagra Ds slaved together to handle the extended bandwidth. (I say nominally because the analog-to-digital converters used, even though they generate samples 24 bits long, have a true dynamic range of "only" about 19 bits. That is, however, state-of-the-art A/D performance, especially for the 96-kHz sampling rate, which required some hot-out-of-the-lab converters from England to achieve.) All the recordings were derived from the same microphone setup, a modified version of the Schoeps sphere developed by Bruck himself. It consists of Schoeps omni microphone capsules embedded on either side of a 7-inch wooden ball, with Schoeps bidirectional mikes mounted externally just below them. The sphere is set up with the omnis facing to the sides and the bidirectionals aiming fore and aft.

The sound from this setup, especially in full four-channel, was remarkably like that in the hall where the piano was playing. In fact, with all four channels going, walking around within the perimeter of the speaker layout gave an excellent illusion of walking around within the actual hall. Perspectives changed, but very naturally, and the sound field never collapsed toward the nearest speaker—the Achilles' heel of most traditional quad. It was by far the most convincing four-channel reproduction I've ever heard.

But back to the ghost at the piano. The secret? The instrument being recorded was a painstakingly restored Steinway D reproducing piano. Only 10 of these were ever made, of which a handful remain in existence.

These pneumatically operated pianos read punched paper rolls created by a performer playing a special recording piano. Although many people have heard player pianos, true reproducing pianos are much more sophisticated and exceedingly rare. The only clues that this beautiful Steinway was not being played in the usual manner were occasional, very soft intrusions of sounds produced by the mechanism or by the paper unrolling through the reader. In all but that respect, the sound was better than one normally gets from a modern recording played through a home audio system.

This would really be nothing more than a fascinating curiosity, however, were it not for the performances themselves. The few I heard that night were thrilling. This piano, and the recordings being made of it, open a door into the 19th century. Master performers whose work is poorly, if at all, preserved in conventional recordings—Hofmann, Paderewski, Stravinsky, Saint-Saëns, Ravel, and others—will become accessible to everyone in recordings that represent the best that can be done with the most advanced current technology. Based on the little bit I heard, I think that has the potential to knock some dust off modern performance practice. I don't think anyone's heard anything like Busoni's style lately!

The recordings are for a broadcast series conceived and produced by *Audio* contributing editor D. W. Fostle and underwritten by Madrigal Audio Laboratories. Called "Earwitness," the one-hour programs will be hosted by noted piano authority Harold Schonberg, critic emeritus of *The New York Times*. They will air over a period of 13 weeks, from October through December, on the WFMT Fine Arts Network. I encourage you to tune in.



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Subwoofer Angles

Dear Editor:

I have subscribed to *Audio* for a long time and I want to congratulate the staff for such a terrific magazine. When *Audio* arrives, it gets top priority.

The article, "Placing the Bass" (June), by Tom Nousaine, was very timely for me and extremely interesting. I have several questions:

1. How were the two subwoofers in the same corner positioned? Were they both placed in the corner at a 45° angle to the walls, or parallel to one wall, and if so, which wall? If parallel, what would be the effect if one subwoofer were parallel to one wall and the other parallel to the other corner wall?

2. Instead of two subwoofers in the same corner, would there be some advantage with one subwoofer in the front right corner and one subwoofer in the left front corner? What about front and back diagonal corners, or same side front and back corners? I would appreciate the author's comments on whether he thinks these arrangements would be detrimental, the same, or offer some improvement compared to both subwoofers in the same corner. Has Mr. Nousaine tried any of these arrangements and concluded that two subwoofers in the same corner are best?

3. In Fig. 4 of the article, the response curves of two subwoofers in the same corner show a 5-dB increase at 8 Hz, 3 dB above 16 Hz (roughly), 0 dB just below 63 Hz, and 1 dB or less boost above 63 Hz. Why shouldn't all the frequencies show the same increase from adding a second subwoofer?

I think the author's work is remarkable and clearly shows the significant effect the room has on music reproduction in relation to loudspeaker placement. I want to thank him for all the information he has

given us and will greatly appreciate his comments on the above questions, especially on how the subwoofers were positioned.

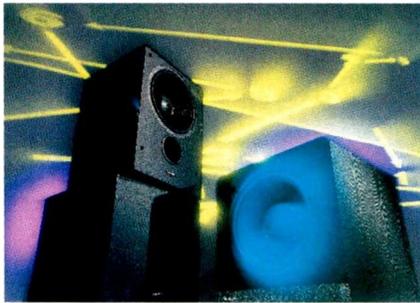
Charles R. Smith
Dousman, Wisc.

Author's Reply: Thanks for your interest in subwoofer placement. In regard to your questions:

1. The subwoofers were simply stacked in the corner one atop the other. The orientation of the cones and ports is irrelevant at these very low frequencies because of the long wavelengths involved. In other words it doesn't matter how you orient the faces of the speakers. You need not "aim" a subwoofer.

2. Likewise, there is no advantage to using other corners. At these frequencies drivers placed next to each other behave like a single larger speaker, so placing identical powered subwoofers adjacent to each other in any orientation yields a 6-dB increase in maximum output resulting from twice the piston area and twice the input power (subjectively, a 6-dB increase is "significantly louder"). Placing the subwoofers in different corners means the combined outputs will only produce between 3 and 4 dB more SPL (sound pressure level).

3. The graphs for the story were redrawn, so perhaps the actual output differences were obscured somewhat. Given the physics involved, two subwoofers in the same corner will produce 6 dB more SPL between 25 and 50 Hz, where there is a relative sparsity of room modes. Above those frequencies the apparent output gain falls because the speakers approach the low-pass filter limits. Below 25 Hz, the lowest axial mode, the output is limited by speaker displacement and amplifier power, and speaker placement becomes irrelevant. In these graphs the subwoofers themselves have limited output below 25 Hz.



In sum, put a single subwoofer in a corner to obtain the smoothest, deepest, and loudest acoustical output. Placing more subwoofers in the same corner maximizes SPL in the modal area.—Tom Nousaine

Polarity Response

Dear Editor:

Edward M. Long's article "Upside-Down Sound" (July) on the audibility of acoustic polarity issue tackles a tough subject. I say "tough" because it has defied traditional objective definition. More work deserves to be done in this neglected area of audio.

I must disagree with Mr. Long's statement that an AM (amplitude modulation) broadcast station is a good source for checking the effects of acoustic polarity reversal on a speech signal. Actually, AM broadcast signal processing seeks to reduce the asymmetry of the audio signals, so polarity reversal would be much less audible (if at all).

Speech waveforms are highly asymmetric, i.e., their positive and negative waveforms are not the same. It has long been known that having the "correct" polarity of a speech signal fed to an AM transmitter can result in a louder signal. It's best to have the largest peak modulation of the transmitter in the positive direction.

Asymmetry in an audio modulating signal tends to reduce the energy radiated by an AM transmitter. This effect is due to the use of the usual compressors and peak limiters. They reduce gain on modulation peaks. Asymmetry will therefore reduce average modulation levels. Also, negative (but not positive) modulation needs to be strictly limited to 100% to prevent interference with other broadcast signals.

Complex processors are used to instantaneously reverse the polarity of the audio waveform to minimize its asymmetry. Other techniques that have similar effects are also used to reduce peak-to-average ratios.

FM (frequency modulation) transmitters do not have these kinds of limitations. Waveform asymmetry can therefore be preserved.

John Sehring
Baker, Mont.

Author's Reply: I thank Mr. Sehring for the additional information about AM broadcast signal processing. I didn't expand on

the topic in my article because of space limitations. I am aware that AM signal processing deals with the asymmetry of signals to produce the maximum modulation of the transmitter in the positive direction while never exceeding 100% modulation in the negative direction. Perhaps this is why I find it easy to hear the polarity of such vocal sounds as Ts, Ps, and so forth. These sounds have an initial overpressure that is positive, which causes a positive transmitter



modulation. Mr. Sehring disagrees with my contention that AM radio is a good source for checking acoustical polarity and presents reasons why he believes that I must be wrong. All I can say is that I and others can hear a difference when we switch the polarity back and forth while listening to voices on AM radio. Try it and find out if you can hear it; that's what the article was about.—*Edward M. Long*

Recordable and Rentable DVD

Dear Editor:

Corey Greenberg's column supporting DVD ("Front Row," June) is a bit misleading. I agree completely that DVD will find immediate success in replacing the CD-ROM. I also think that DVD will eventually replace the venerable laserdisc, especially if current owners of laserdisc buy the Pioneer machines that will play both media.

I disagree with Greenberg when it comes to the average person's acceptance of DVD, especially as it applies to video. He says the superior quality of DSS is the reason that people have forked over good money and accepted this medium, hence they have shown they are willing to pay for higher quality. There is more to it than that. As a DSS owner myself, I factored in quality as well as the cost of service as compared to cable. The comparable service my local cable company would have had to provide to match DirecTV would have cost me \$17 more per month! Also, price increases with the cable company are now a yearly occur-

rence. Higher quality for lower operating cost sold me.

I believe DVD will succeed if it is geared towards replacing the VCR as opposed to being just another high-quality video source. The first response most people have towards DVD is "that's great, but can I time-shift?". If DVD is a recordable medium, with rentals readily available from Blockbuster plus low-priced software, then I believe it will be a major success. Look at laserdisc. It's not recordable, and rentals are scarce. Only about 2% of U.S. households have bothered. In fact, a friend of mine just bought a laserdisc player only because he found a rental place. Rentals and time-shifting will play a major roll in the success or failure of DVD.

I recently saw a Sony DVD demo and was impressed by the picture quality. However, it is not leaps and bounds better than laserdisc. I could not differentiate sound quality between it and CD. I was, however, smitten by the ability to switch between pan-and-scan and wide-screen modes at the touch of a button—that was neat!

Anyway, the jury is still out on DVD's consumer video success. I wish it the best of luck as it struggles to make it.

*Claude Whiting
Centreville, Va.*

Author's Reply: Mr. Whiting claims to disagree with my opinion that DSS won wide consumer acceptance because of its higher picture and sound quality versus broadcast and cable TV, but his own reasons for switching to DSS—"Higher quality for lower operating cost"—mirror what I originally wrote. Nice to have you aboard, sir.

As far as time-shifting goes, I could cite any number of statistics that show the vast majority of VCR owners rarely if ever use the recording capabilities of their decks—most people who own VCRs use them to play pre-recorded tapes, period. In any event, high-resolution digital VCRs will be here soon for those who want DVD/DSS-grade time-shifting, and we can further expect to see a recordable DVD format in a few years, so your 1,000th viewing of "The Olsen Twins—Live From Red Rocks" will be just as crisp as when you taped it off DSS pay-per-view. My palms sweat just thinking about a future, nay, nirvana, such as this.—*Corey Greenberg*

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A Good Word for "Fast Fore-Word"

Dear Editor:

While waiting in a doctor's office the other day, I picked up the June issue of *Audio*, the first I've seen in some time though I was a subscriber for more than 25 years. I read your "Fast Fore-Word" first. It is just great!

I've been with a small professional tape duplicating business since the late '50s, so I've had plenty of opportunity to see first hand the silliness of some of the "leaders" in the industry. You made your point extremely well. I really enjoyed the piece.

*Hugh S. Bell, Jr.
Address not given*

Sound-Field Sound-Off

Dear Editor:

As an audio enthusiast not interested in Dolby Pro Logic systems (when I first tested one at home, my neighbor showed up im-



mediately, and was obviously very interested in borrowing it, at least once in a while, to put it in his closet), I turned my attention to stereo-image processors to improve my two-channel audio system. At that time (February 1996), I was aware of only one model, the NuReality Vivid 3D Theatre VHT-200, which I bought and which gives me satisfactory performance.

Three months later, I read John Sunier's "Auricle" on the Spatializer HTMS-2510 (June 1996). Highly interested by his comments on the Spatializer compared to the NuReality SRS technology, I jumped on my phone and ordered the Spatializer 3D Stereo demo CD.

The Spatializer 3D Stereo CD demonstrates the benefit of the technology by playing different recordings, alternating from "normal stereo" to "Spatializer 3D Sound turned on." With this demo CD, I ran two tests on my present stereo system. My system consists of a Yamaha RX-385 stereo receiver and a pair of Bose 501 Series V, which, by the way, already produce an

outstanding sense of spaciousness and realism.

In the first test, I listened to the Spatializer demo CD just as it was intended. My first observation was that the Spatializer really does a good job at creating a 3D stereo sound field. Unfortunately, it also does a really bad job of respecting what the performers intended the recording to sound like.

Astonished, I began wondering if my NuReality VHT-200 was that bad. So in my second test, I listened to the same recordings, but this time alternating from "Spatializer 3D Sound" to "NuReality 3D Sound" instead of normal stereo (during the Demo CD audition, I simply turned on my SRS processor when the recordings were played in normal stereo). The results appeared to be very clear to me:

1. SRS technology delivers a much more accurate 3D sound field.

2. SRS technology does not alter the natural frequency balance as much as the Spatializer does.

In addition, for the same price, I think that the controls of the VHT-200, used to adjust the amount of space and center processing, are much more useful than the three settings available on the Spatializer. Moreover, SRS is able to process mono recordings; not the Spatializer.

To briefly conclude my comparison of these two stereo-image processors, I say that:

1. Both systems represent an absolute advance over standard stereo when listening to live recordings (in Vegas, classical, jazz bands) but produce absurd effects with studio recordings.

2. It would be great if NuReality could develop an advanced unit, featuring memories enabling the user to store several space/center settings adapted to individual tastes and different recording characteristics.

3. The Spatializer is intended to be an economical product; it appears to me way overpriced compared to the VHT-200.

And finally, instead of giving away my NuReality unit, as the Spatializer salesman suggested on the phone, I gave my neighbor the Spatializer Demo CD (so he can put it in his closet), even though the original recordings sounded good in "normal stereo."

*Christophe Remy
Charlotte, N.C.*

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CO- Listen Up; Denver; Boulder, Colorado Springs; Soundtrak; Denver & Suburbs; Boulder; Ft. Collins, Colorado Springs.
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GA- Audio Warehouse; Savannah; Kent's Stereo; J&L; Macon; Essex; Dixie Electronics; Atlanta; Marietta; Columbus; Stereo Connections; Valdosta; Stereo Festival; Atlanta.
HI- Audio Center; Honolulu; Waipahu.
IA- Audio King; Cedar Rapids; Des Moines; Archer Audio Video; Ft. Dodge; Audio Video Logic; Des Moines; Audio Visions; Sioux City; Camera Corner; Davenport; Hawkeye A/V; Iowa City; Waterloo.
ID- Ultimate Electronics; Boise; Wise Buy; Idaho Falls.
IL- United Audio Centers; Chicago & Suburbs; Camera Corner; Bloomington; Cars & Stereo; Rockford; Good Vibes; Champaign; Jon's Home Ctr.; Quincy; Sound Forum; Crystal Lake; Select Sound; Naperville; Sundown A/V; Springfield.
IN- Classic Stereo; Ft. Wayne; Mishawaka; Good Vibes; Lafayette; Kings Great Buys; Evansville; Ovation Audio; Clarksville; Indianapolis.
KS- Accent Sound; Overland Park; Advance Audio; Wichita; Audio Junction; Junction City, Manhattan.
KY- Ovation Audio; Lexington, Louisville.
LA- Alterman Audio; New Orleans; Metairie; Lake Charles Music; Lake Charles; Sound Advice; Baton Rouge; Wright's Sound Gallery; Shreveport.
MA- Cookin'; Chestnut Hill; Saugus; Goodwins Audio; Boston; Shrewsbury; Nantucket Sound; Hyannis; Pittsfield Radio; Pittsfield.
MD- Gramophone; Baltimore; Ellicott City; Myer-Emco; Gaithersburg; Beltsville; Rockville; Soundscape; Baltimore.
ME- Cookin'; Portland.
MI- Pecar's; Detroit; Troy; Classical Jazz Holland; Classic Stereo; Kalamazoo; Grand Rapids; Stereo Center; FRAV; Flint; Court St.; Listening Room; Marquette; Saginaw.
MN- Audio King; Minneapolis & Suburbs; Rochester; St. Cloud; Audio Designs; Winona.
MO- Independence A/V; Independence; Reference Audio; Sedalia; Sound Central; St. Louis.
MS- Ideal Acoustics; Starkville; McLelland TV; Hattiesburg; Players A/V; Ridgeland.
MT- Aspen Sound; Missoula; Avital; Bozeman; Car & Home Stereo Ctr.; Billings; Rocky Mt. Hi Fi; Great Falls.
NC- Audio Video Systems; Charlotte; Video Images; Wilmington; Now Audio Video; Durham; Greensboro; Raleigh; Winston Salem; Audio Lab; Wilmington; Tri City Elect.; Conover.
NE- Custom Electronics; Omaha, Lincoln.
NH- Cookin'; Nashua; Manchester; Newington; Salem, S. Nashua.
NJ- Hal's Stereo; Trenton; Moonmouth Stereo; Shrewsbury; Sound Waves; Northfield; Woodbridge Stereo; West Caldwell; Woodbridge.
NM- Ultimate Elect.; Albuquerque; Sound Ideas; Albuquerque.
NV- Ultimate Elect.; Las Vegas; Upper Ear; Las Vegas.
NY- Audio Breakthroughs; Manhasset; Audio Den; Lake Grove; Audio Expressions; Newburgh; Audio Junction; Watertown; Clark Music; Albany; Syracuse; Stereo Exchange; Manhattan; Nanuet; Hart Elect.; Vestal; Innovative Audio; Brooklyn; Listening Room; Scarsdale; Rowe Camera; Rochester; Sound Mill; Mt. Kisco; Speaker Shop; Arnhem; Buffalo.
OH- Audio Ctr.; Akron, Cleveland, Mayfield Hts., Westlake; Audio Etc.; Dayton; Classic Stereo; Lima; Paragon Sound; Toledo; Threshold Audio; Heath.
OK- Ultimate Electronics; Tulsa; K Labs Premium Audio; Tulsa; Photo World; Bartlesville.
OR- Bradlord's; HiFi; Eugene; Chelsea A/V; Portland; Beaverton; Kelly's Home Ctr.; Salem; Larson's; Medford; Roseburg; Stereo Plant; Bend.
PA- Audio Junction; Pittsburgh; Gary's Elect.; State College; GNT Stereo; Lancaster; Hart Elect.; Blokey; Kingston; Hi Fi House; Abington; Broomall; Camp Hill; Harrisburg; Listening Post; Pittsburgh; Palmer Audio; Allentown; Pro Audio; Bloomsburg; Stereo Shoppe; Selinsgrove; Williamsport; Stereoland; Natrona Heights; The Stereo Shop; Greensburg; Studio One; Erie.
RI- Stereo Discount Ctr.; Providence.
SC- A/V Design; Charleston; Custom Theater & Audio; Myrtle Beach; 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; Piano Audio Tech; Temple; Waco; Audio Video; College Station; Brock A/V; Beaumont; Bunkley's Sound Systems; Abilene; Bjorn's; San Antonio; High Fidelity; Austin; Krystal Clear; Dallas; Marvin Electronics; Ft. Worth; Sound Quest; El Paso; Sound Systems; Amarillo; Sound Towers; Texarkana.
UT- Alpine Elec.; Provo; Audio Works; Salt Lake City; Crazy Bob's; St. George; Stokes Bros.; Logan; Ultimate Elect.; Layton, Murray, Orem; Salt Lake City.
VA- Myer-Emco; Falls Church; Tyson's Corner; Fairfax; Audio Connection; Virginia Beach; Audiotechnics; Roanoke; Home Media Store; Richmond; Stereo Type; Charlottesville.
VT- Audio Video Authority; S. Burlington.
WA- Aspen Sound; Spokane; Definitive Audio; Bellevue; Seattle; Evergreen; Audio; Silverdale; Pacific Sight & Sound; Wenatchee; Tin Ear; Kennewick.
W.VA- Sound Post; Princeton.
WI- Audio Emporium; Milwaukee; Absolute Sound & Vision; Sheboygan; Hi-Fi Heaven; Appleton; Green Bay; Sound World; Wausau.
Puerto Rico- Precision Audio; Rio Piedras.
Canada- A & B Sound; Calgary, Edmonton, Kelowna, Vancouver & Suburbs; Victoria; Advance Electronics; Winnipeg; Bay Bloor Radio; Toronto; Centre Audio Charest; Trois Rivières; CORA; Quebec City; Digital Dynamics; Clearbrook; Great West Audio; London; Kebecson; Montreal; Lipton's; New Market Ontario; Peak Audio; Halifax.

A Breakthrough! “Definitive’s New BP2002 Achieves An Impossible Dream.”

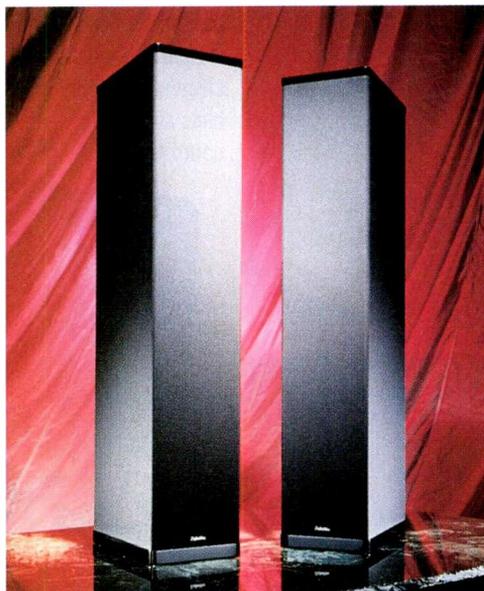
—Peter Moncrieff, *International Audio Review*

At \$999 ea., the bipolar BP2002 with dual built-in 125-watt powered 12" subwoofers approaches the ultimate performance of Definitive’s reference flagship BP2000.

Your Dream Comes True

When *Stereo Review’s* Julian Hirsch wrote of the BP2000, “...I would choose these speakers for myself,” we were thrilled and honored by this highest of compliments. In fact, since its introduction last year, Definitive’s top-of-the-line BP2000 has clearly established itself as the most award-winning and highly reviewed speaker of all time.

Now, our newest breakthrough, the BP2002, incorporates similar cutting-edge technologies in order to achieve mind-boggling sonic performance which closely approaches that of our flagship BP2000. And most importantly, the BP2002’s significantly lower price and more compact size will allow many more lucky listeners like yourself to own speakers of this ultimate quality level.



Experience sonic ecstasy! Hear for yourself why top high-end guru Peter Moncrieff raved the “BP2002 achieves an impossible dream.”

Music & Movie Perfection

The extraordinary BP2002s incorporate bipolar technology, which turns your whole room into a sweet spot with three-dimensional depth and a huge sonic image ideal for music and movie perfection. Truly a unique combination of delicately detailed musicality and totally controlled brute force for your ultimate listening pleasure!

Whether incorporated in a super audiophile stereo music system or combined with matching CLR2002 Center Channel (\$499 ea.) and our bipolar rears for a truly remarkable AC-3* ready home theater system, Definitive’s magnificent BP2002 will achieve your impossible dream, too.

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WHAT'S NEW



Soundolier Subwoofer and Center Speaker

Designed to support a large TV, the SubCenter also holds a subwoofer and a center-channel speaker. The subwoofer section has four downward-firing, 8-inch drivers; the center-channel section has two 6½-inch drivers and a 1-inch tweeter in a vertical array. The SUB-40 (shown) is 40 inches wide, can hold direct-view sets with up to 40-inch screens or table-top projection units up to 45 inches, and is available in cherry veneer (SUB-40V) or black laminate (SUB-40B); a 36-inch version supports up to 35-inch TVs. Prices: SUB-40V, \$1,340; SUB-40B, \$1,140; SUB-36V, \$1,170; SUB-36B, \$990.

For literature, circle No. 100

FULTRON CAR SUBWOOFER



The BP10 is a bandpass subwoofer with a 10-inch driver. Its rated frequency range is 40 to 125 Hz, and minimum suggested power is 50 watts.

▲ A recessed plexiglass window showcases the driver. The cabinet measures 22½ x 12½ x 13 inches. Price: \$199. For literature, circle No. 101

BIC SPEAKER

Joining the trend to bipolar speakers, the Model V-604 has both front- and rear-firing 6½-inch woofers and ¾-inch tweeters. The woofer enclosures use BIC's Venturi venting system. The cabinet, which stands 38 inches high, has a mitered front panel to minimize edge diffraction. Rated frequency range is 34 Hz to 20 kHz, and response is 6 dB down at



30 Hz. Sensitivity is 90 dB, and the V-604 ▲ can be used with amps that produce 20 to 300 watts per channel. Price: \$699 per pair. For literature, circle No. 102

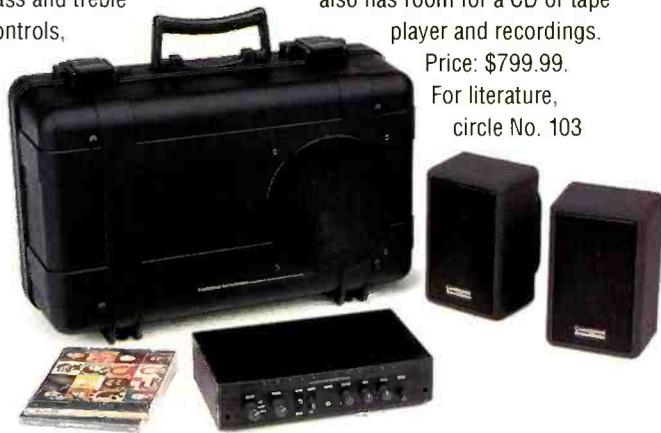
Cambridge SoundWorks Transportable Speaker System

Unpack the Model Twelve's amplifier and satellite speakers, and the suitcase that held them becomes a subwoofer for the satellites. The amplifier has three inputs plus a tape monitor, a headphone jack, a stereo/mono switch for cleaning up noisy recordings, bass and treble controls,

and a subwoofer level adjustment. It runs on 12 volts DC and has a DC power outlet to drive portable players that require 1.5 to 9 volts DC. The detachable AC adaptor can be left at home for 12-volt operation or replaced with power supplies that run on overseas AC voltages. The case also has room for a CD or tape player and recordings.

Price: \$799.99.

For literature, circle No. 103



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WHAT'S NEW

Koss Headphones



Koss promises "large-as-life 3-D sound" from its Phase II headsets, controlled from a small box on the signal cord. The box has a switch to turn on ambience expansion, a switch for quick comparisons between processed and unprocessed sound, and two crossfeed controls. The Pro/405 Phase II 'phones (shown) have closed, leatherette earcushions and a padded headband. Rated frequency range is 20 Hz to 17 kHz; sensitivity is 101 dB SPL for a 1-milliwatt input, at less than 1% distortion. Price: \$59.99. For literature, circle No. 106

Pioneer A/V Receiver

Besides Dolby Pro Logic surround decoding, the VSX-505S offers simulated stereo for surround from mono programs and a three-mode sound-field control for use with stereo sources. The AM/FM section has jog-dial tuning and 30 station presets. Rated power output is 150 watts per

channel in stereo mode or 135 watts x 4 in surround; a line-level subwoofer output is provided. The remote control can operate equipment from Pioneer and other makers, including DSS satellite systems and videodisc players. Price: \$465. For literature, circle No. 104



Signature Technologies Power Amp

A hybrid design, the SRa-4 uses FET input devices to drive two 6550 or KT88 tubes per channel. Rated power output is 70 watts per channel, from 30 Hz to 21 kHz, at less than 0.3% harmonic or IM distortion;

in mono mode, power is 135 watts under the same conditions. The S/N is greater than 100 dB. Both 110- and 220-volt versions are available. Price: \$2,795. For literature, circle No. 105



Aiwa Cassette Deck

Aiwa's second cassette deck with Dolby S noise reduction, the AD-S750, also offers Dolby B and C NR, plus Dolby HX Professional headroom-extension circuitry.

The deck automatically sets recording bias and sensitivity to match the tape. A remote control is included. Price: \$325. For literature, circle No. 107



AudioControl MultiRoom Controller

The Director Model 46, from AudioControl, routes four different stereo sources to six different stereo zones or rooms. The Director and its program sources can be operated by infrared remote controls, through serial data connections, or through up to

16 Lutron or LiteTouch wall stations. Programming can be entered from a PC; program data can be copied to other Directors and saved for reuse. Price: Less than \$3,000, not including wall stations and installation. For literature, circle No. 108



Adcom would like to make this perfectly clear.



Regardless of how sophisticated your stereo and video system is, it may never achieve its full performance if plugged directly into an AC outlet. Raw and unprocessed AC power can severely diminish the clarity of audio signals and reduce the resolution of your video picture.

ADCOM's ACE-515 AC Enhancer significantly improves the performance capabilities of your system by filtering and processing raw AC power, unveiling a pure, noise-free power source.

Listen To The Critics

"...the effective suppression of AC 'RF' hash' by the ACE-515 improved clarity and lowered noise in all three CD players. . . .the significant improvements in instrumental and vocal harmonic retrieval and hall ambience are superb. . . . it simply appears to allow musical information to be passed through to the listener with less veil and electronic 'haze.'"

—Lewis Lipnick, *Stereophile*, Vol. 11 No. 4, April 1988.

Recommended accessory in *Stereophile*, Vol. 12 No. 4, April 1989.

Line Protection: It Pays For Itself

The ACE-515 also protects your valuable equipment from harmful high-voltage spikes and surges. And, its sequential turn-on/turn-off control circuit guards your speakers from disturbing, damaging thumps.

Again, The Critics Agree

"Electronic equipment (especially digital audio gear) is vulnerable to both annoying and catastrophic power-line problems. Your stereo gear should have line spike and surge protection, with hash filters thrown in too. Line protection—you can pay a little for it now, or you can pay a lot for it later."

—Ken Pohlman, *AUDIO*, November 1987.

For a modest investment, the ADCOM ACE-515 enhances both audio and video clarity while protecting your equipment from damaging line voltage disturbances. Once again, ADCOM lives up to its reputation of offering superior performance at a reasonable cost. For complete technical data, please visit your Adcom dealer. You'll discover the ACE-515 is more than an accessory. It's a necessity.



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"Selling Direct Allows Camb Speakers Hundreds Of Doll

Cambridge SoundWorks manufactures critically acclaimed speakers and music systems designed by Audio Hall of Fame member Henry Kloss (founder of AR, KLH and Advent). We sell them – along with components from Harman Kardon, Pioneer, Sony and others – factory-direct, so you can save hundreds of dollars. *Audio* magazine says we may have "the best value in the world." *Home Theater Technology* says our speakers "sound much better than other systems – at half the price."

Ensemble®

Ensemble is our best speaker system. We think it competes with audiophile tower speakers selling for over \$1,000 a pair. Yet its unique four-piece design literally disappears in your room.

Ensemble consists of two compact, two-way satellite speakers

Our dual-subwoofer Ensemble outperforms expensive tower speakers because of its great room placement flexibility.
\$599.99

and two slim-line (4 1/2" thick) subwoofer cabinets enclosing 8" woofers.

Because the bass produced by the subwoofers is non-directional, you can put them in out-of-the-way places...even behind or under furniture. Then place the satellite speakers to create a realistic stereo image. *High Performance Review* describes *Ensemble* by saying "...stereo imaging is phenomenally sharp...the dynamics are stunning...some of the speakers I'm comparing it to cost \$1900 to \$2800." White or charcoal grey. \$599.99

Ensemble II

Ensemble II is our best value high-performance speaker system. It uses the same satellites as *Ensemble*, but with a single subwoofer cabinet that holds two 6 1/2" woofers in an acoustic suspension enclosure.



Ensemble II is our best value in a high-performance speaker system. Its satellite speakers are identical to Ensemble's. \$499.99

Because 90% of the music is reproduced by the satellites, *Ensemble II* sounds much like *Ensemble*. *Stereo Review* says "Ensemble II can be compared only with much larger speakers at substantially higher prices." White or charcoal grey. \$499.99

Ensemble III

Ensemble III was designed to bring big sound into smaller rooms. It has two small, two-way satellites and a subwoofer cabinet that encloses a single 6 1/2" woofer with two voice coils.

Ensemble III maintains the smooth, natural tonal balance of our more expensive systems, but without the same deep bass extension. *Stereo Review* says it "sounds first rate in every respect." \$349.99

Ensemble III brings high-performance sound into even very small rooms.
\$349.99



Ensemble IV

Our most compact and affordable subwoofer/satellite speaker system is *Ensemble IV*. It consists of two "cube" satellites containing wide-range 3" speaker drivers and a shoebox-sized subwoofer with a 5 3/4" woofer. It doesn't have the same deep bass extension as our more expensive speakers – but it sounds terrific.



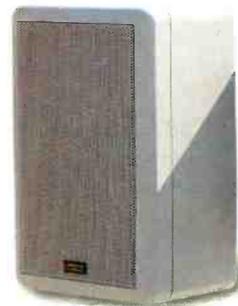
Ensemble IV is our most affordable subwoofer/satellite speaker system. \$249.99

Home Theater Technology says "Ensemble IV produces a level of sound quality that is so much bigger and better than you'd expect from an inexpensive system that it's almost ridiculous." \$249.99

The Outdoor

Our all-weather speaker is called *The Outdoor*. It has the natural, accurate, wide-range sound that Henry Kloss designs are known for.

We don't know of any all-weather speaker that sounds better. Free-standing (shown), \$299.99pr. In-wall version, \$349.99pr.



Center Channel Speakers

Cambridge SoundWorks manufactures two speakers specifically for use as center channel speakers in Dolby® Pro Logic® home theater systems. Both are magnetically shielded so they can be placed near a TV or computer

Cambridge SoundWorks To Price Yours Below The Competition."

Inc. Magazine



Center Channel

Center Channel Plus



monitor. *Center Channel* is identical to an *Ensemble* satellite (but

with magnetic shielding). **\$159.99.** *Center Channel Plus* uses an ultra-low, ultra-wide design that is ideal for placement above (or, with optional support stand, below) a TV monitor. It is, we believe, the finest center channel speaker available. **\$229.99**

Surround Speakers

Cambridge SoundWorks makes two "dipole radiator" surround sound speakers. Dolby Laboratories recommends dipole radiator speakers for use as surround speakers. *The Surround* has high power handling capacity and is often selected for "high end" surround sound systems. **\$399.99 pr.** The smaller *The Surround II* is arguably the country's best value in a dipole radiator speaker. **\$249.99 pr.**



Powered Subwoofer

Slave Subwoofer

Powered Subwoofer II

in conjunction with the *Powered Subwoofer*. **\$299.99** The new *Powered Subwoofer II* uses a 120-watt amplifier with a custom designed 8" woofer. **\$399.99**

The Surround II



The Surround

Powered Subwoofers

The *Powered Subwoofer* by Cambridge SoundWorks uses a heavy-duty 12" woofer housed in an acoustic suspension cabinet

SoundWorks Amplified Speakers

SoundWorks is a compact, amplified, subwoofer/satellite speaker system. Never before has so much "big" sound come from



SoundWorks

something so small. Connect it to a portable CD/tape player, boombox, TV or computer – anything with an earphone jack – for beautiful, room-filling sound. *Audio* called it "really amazing...exceptionally good." *PC Computing* named *SoundWorks* "the best multimedia sound system costing

over \$100." Available in black or computer-beige. **\$219.99**

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Our speakers are available only directly from Cambridge SoundWorks, and through cost-efficient Best Buy stores.* Order them, then listen in your own home. If you aren't satisfied, return them within 30

days for a full refund.

*Actual prices may vary by store.



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Folded-Dipole FM Antennas

Q *I am interested in receiving only one FM station; I understand that it radiates a circularly polarized signal. Which way should I point my folded-dipole antenna? And does it matter whether I orient it vertically or horizontally?—Name withheld*

A First, aim one of the dipole's broad sides, where its sensitivity is greatest, at the station. If that doesn't get you a clean, strong signal, experiment with other angles; reflections from buildings or hills can corrupt the signal coming from the "proper" direction. And since it's equally sensitive on both sides, a dipole aimed directly at the station might also be aimed at a signal reflector in the opposite direction.

Stations use circular polarization to ensure good pickup by horizontal antennas, the most common home type, as well as by the vertical antennas used in many cars. So your antenna's orientation shouldn't matter much; still, it never hurts to experiment. As you try different antenna positions, don't just watch your tuner's signal-strength meter. You should also listen for the cleanest sound.

Suburban Antennas in Urban Use

Q *I live in an apartment in New York City, and my FM reception stinks. I got permission from my landlord to put an antenna on the building's roof. I checked Radio Shack's catalog and was bewildered by the variety of antenna types: crossed dipoles with 360° coverage, dipoles with built-in amplifiers, and high-gain, directional models. Which type should I get?—D. Smith, New York, N.Y.*

A In the city, you do have signals coming from all directions. But you also have reflections coming from all over, which is probably why you have bad reception. You don't need an antenna to strengthen signals but to help you sort out the desired signals from the undesired ones. Paradoxically, that makes a high-gain antenna your best choice—not for its gain, but for its directionality. If you mount the an-

tenna on a rotor, you'll be able to home in on the best possible signal for each station. I suggest getting a rotor whose control box will indicate where your antenna is aimed. By noting which direction works best with each station, you'll be able to re-aim the antenna faster. I know someone who used to have your problem, and this type of antenna worked perfectly. Some stations even came in best when the antenna was pointed almost dead away from them, because he was getting one clean signal echo instead of the direct signal jumbled with a million echoes.

Secure the antenna so that it won't blow down into the street, and make sure that its mounting won't make the roof leak. If you're not sure you can manage that, hire a professional installer.

Using Dual Subwoofers

Q *How can I achieve a stereo effect with two subwoofers in a home theater system?—Timothy T. Anzalone, Streamwood, Ill.*

A Bass tends to be nondirectional, which is why home theater systems can get away with having only one subwoofer. What a second subwoofer can provide is somewhat extended bass and greater overall bass output. The stereo effect, however, will not be enhanced. For more on the effects of subwoofer number and placement, see Tom Nousaine's article, "Placing the Bass: Two Subs in a Corner Beats Five in the Round," in the June issue.

Connections to D/A Converters

Q *I've heard that the sound you get when using an outboard D/A converter with a CD player or transport depends on the data link used and that a coaxial digital cable is better than an optical one. Is this true?—Benjamin Chiaro, New York, N.Y.*

A The answer to this question is, as I am sure you know, very subjective. I have not been able to hear any difference between these cable types (and I doubt this is because I've used digital links only between DAT recorders, not between a CD

player and D/A converter). Still, this does not mean that there are no differences, just that I cannot hear any.

You have read that coaxial cables are supposed to sound better, yet I've read the opposite. In any case, which type works better could depend on the input and output circuits of the components involved.

I can, however, say that optical cables can be microphonic. I don't know if they pick up or are affected by audio signals in the air, but if you slam one against a table while it's carrying a signal, you'll usually hear a noise in the decoded analog output signal.

Getting Around an Input Shortage

Q *My receiver's one line input is not enough for me. I'm using my integrated amplifier as a phono preamp (it accepts my moving-coil cartridge, whereas the receiver doesn't). I'm using a karaoke amp as a sound field processor. And I might someday want to add a CD player. For now, I'm daisy-chaining amps, with the integrated amp's tape output feeding the karaoke amp's auxiliary input and the karaoke amp's tape output feeding my receiver's CD input. The receiver then drives the speakers and controls the volume. Is this setup safe?—Emmanuel A. Cristobal, Calgary, Alberta, Canada*

A Your setup is safe, but it's also complex and inflexible, and you're probably picking up extra noise and distortion as signals run through all those amps. There are alternatives.

First, I'd suggest connecting the karaoke amp's auxiliary input and tape output to your receiver's tape out and monitor input. This puts the karaoke amp on a side chain, where it won't affect the signal unless you switch it in with your receiver's tape monitor switch. It also lets you add this amp's sound-field effects to music from any source, including the tuner in your receiver. You can then feed your integrated amp's tape output directly to your receiver's CD

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

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input, running your turntable (and any line-level sources you add later) through the integrated amp.

If your receiver has a moving-magnet phono input, a step-up transformer or preamp would adapt it to accept your moving-coil cartridge and would still leave the receiver's CD input free. That's an elegant, but costly, way to go.

For the utmost in flexibility, you might also add an external switcher. I'm familiar with the Russound TMS-10 (which can handle 10 tape decks and a couple of processors), but there are others on the market.

High-Pitched Sound from TVs

Q *In the early days of TV (1949-50), I could hear a high-pitched tone whenever I went near a TV set. (I could even hear that tone when walking past a house with an open window and the TV on.) This sound was not affected by the setting of the TV's volume control, and I think it came from a component or a tube in the unit rather than from its loudspeaker. A lot of time has passed, and at age 65 I no longer can hear that high-pitched tone. Can younger folks hear it?—Joseph C. Damery, Bedford, Mass.*

A The sound you describe comes from vibrations in a TV's flyback transformer, at the horizontal sweep frequency of 15.75 kHz. As you imply, aging reduces our ability to hear high frequencies, but today's TVs also produce less of this noise, so younger folks are less likely to hear it, too.

Mono Playback of Stereo LPs

Q *I have a monophonic system on which I wish to play both stereo and mono LPs. Should I connect my stereo phono cartridge in series or in parallel?—Name withheld*

A Whether you wish to play mono or stereo recordings, you should wire the cartridge's two channels in parallel. This will cancel out-of-phase signals, including stereo difference information (which you're not set up to hear) and some older discs' vertical rumble (which you don't want to hear). It will also cancel distortion caused by a stereo-LP phenomenon called pinch effect.

Depending on your cartridge's impedance characteristics and the load im-

pedance it feeds, you may find the highs are a bit depressed. If so, you'll probably need to add some capacitance across the preamp input, or perhaps experiment with different load resistors. You should, if possible, use a test record to check that you're actually making the response flatter this way. Alas, I don't know where you can find such discs today.

Transformers Don't Sing, But They Sure Can Hum

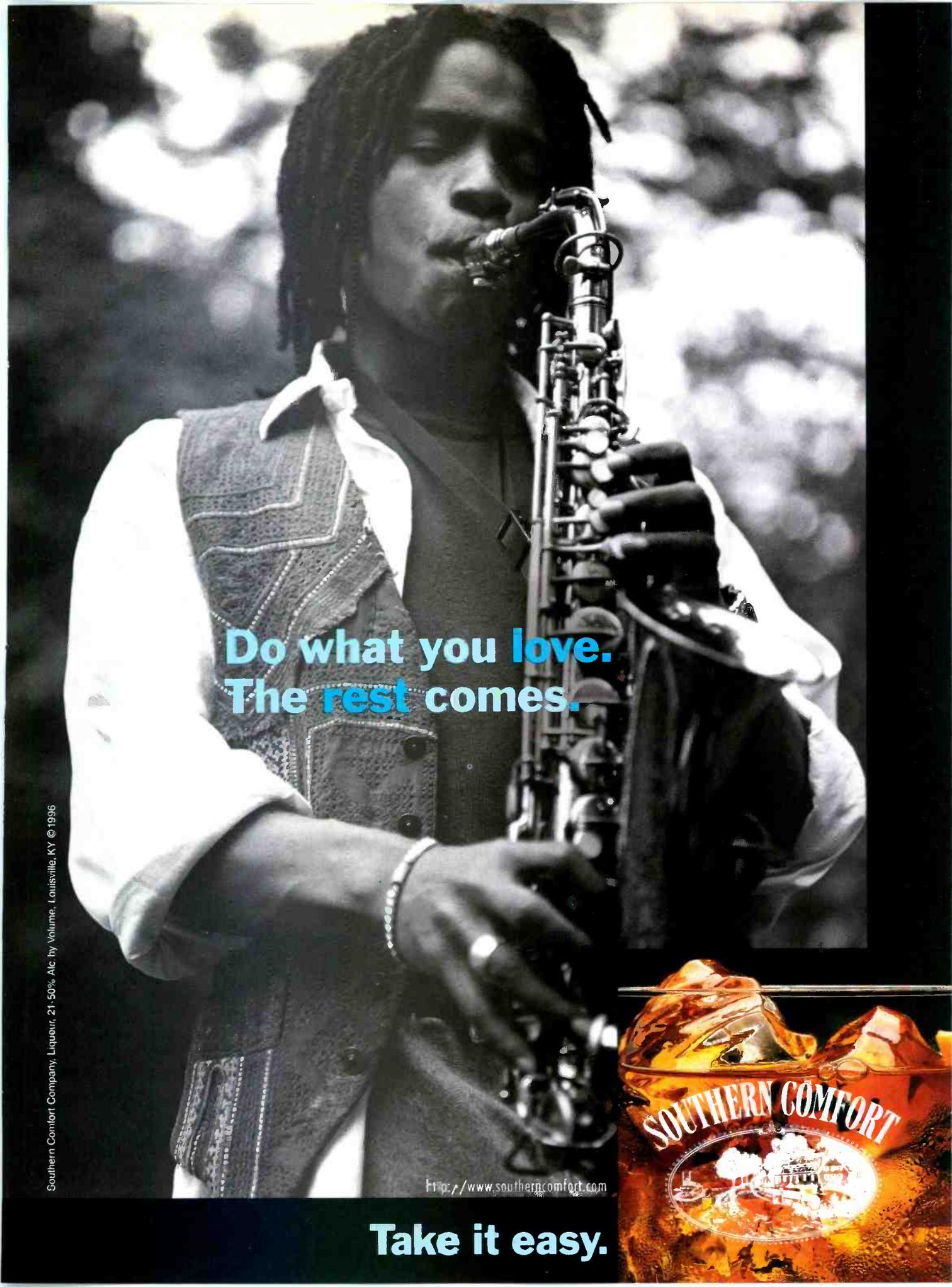
Q *I hear a hum from my amplifier—not through the speakers but from the amp itself. My previous amp, which did not hum, used a toroidal power transformer; my present one uses the more standard type.—Name withheld.*

A Conventional power transformers can do a fine job and, when properly made, don't vibrate too much. As you obviously realize, the hum you hear is caused by vibration of the transformer's laminations and windings, with the amplifier's chassis and the shelf it rests on probably acting as diaphragms to broadcast the humming into your room. It is often possible to reduce or eliminate this mechanical vibration by tightening the bolts that hold the transformer together. You might also try isolating the amplifier from the shelf it stands on. (Try packing a block of foam under each corner of the chassis; make the blocks just big enough so that they compress very slightly under the amplifier's weight.) If these measures fail, ask your amplifier's manufacturer to suggest some remedies.

Old Recordings, New Format

Q *I'm looking forward to the DVD format, but I am wondering if old quadraphonic recordings can be re-released in the 5.1-channel format that DVD supports, complete with center channel information.—Jonathan Countiss, Bristol, Va.*

A If those recordings were originally made with just four channels, they could easily be reproduced that way via the new format, but adding a center channel would be a problem. You can sometimes rearrange the information on a recording, but you can't add information that isn't there. This is why pseudostereo releases from mono masters don't sound like real stereo and why CDs made from Tommy Dorsey 78s don't go all the way out to 20 kHz. **A**



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EUROSTYLE AUDIO



You can't tell from the photo whether the speaker at the left sounds good or not. (Since the Blue Room Minipod shown is from B&W, it probably does.) What you *can* tell is that it's almost certainly not American. I'll admit that rectangular components dressed in simple black and rectangular, wood-finished speakers are the rule on every continent. But there are exceptions—and all too few of them are made in the U.S. (most come from Europe) or wind up on U.S. dealer's shelves.

There's a marketing perception that Americans won't buy equipment that looks really different, and this perception goes back many years. I remember Philips executives in Holland showing drawings of their upcoming, ultramodernistic audio line—for Europe only. For the States, that equipment was finished in standard black, with flat front panels. Its quality was good (for many years I used a Philips amp and

tuner), but it didn't sell. On the other hand, it might have sold worse in its European dress: I know a Japanese company that took a bath selling equipment with polished metal faceplates for six months; sales picked up when it went to standard, basic black.

Back in the '50s and '60s, every U.S. audio company's styling was

distinctive—not just that of high-end companies like McIntosh and Fairchild, but makers of more affordable gear such as Scott, Fisher, Sherwood, Dynaco, and Harman Kardon. Even after audio fashion fell into a black hole, some high-end products, such as Infinity's IRS loudspeaker and the components René Besné designed at Threshold, broke new ground. A number of U.S. high-end companies make very distinctive gear, even today—for example, Jeff Rowland Design, Boulder, Madrigal Krell, and Altis. (Is it coincidence that all five products are from states whose names begin with "Co"?)

Yet most of the really interesting (or, in Blue Room's case, wild) looking audio gear now comes from Europe. The most consistently slick, interesting styling I have seen is on components and speakers from Italy, from companies like Unison Research, Sonus Faber, Galactron, and Monrio. I've also seen excellent but unusual styling in equipment from Revox (Switzerland), Micromega and Jadis (France), and Denmark's Primare and Bang & Olufsen. But Revox is no longer sold here; and except for B&O, the other brands have very limited distribution, if any. (More to do with price than style, however.) And the amps that accompany Sennheiser's Orpheus and HE 60 headphones are jewels of Eurostyling in their own small ways. I'd love to see more such visually excit-



They came from Eurospace: Sennheiser Orpheus (top) and B&W's Blue Room Minipod (above).

Another slick Sennheiser design, the HE 60.





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ONLY THE NAMES HAVE BEEN CHANGED. . .

A year ago, everyone was talking about two surround systems using discrete digital signals for 5.1 channels: Dolby's AC-3 and Digital Theater Systems' DTS. A year from now, they'll be talking about Dolby Digital and Coherent Acoustics.

New systems? Nope—new names. Luckily, few people outside the audio and audiophile community have heard of either, yet, so it's possible to switch names without confusing everyone—except the “everyone” who's been discussing both systems for the past year or two.

ing audio gear. Granted, looks and sound are presumably independent variables. But while equipment can only sound good while you're using it, it can look good all the time.

WESTREX REDUX

Once upon a time, big American corporations were prominent on the audio scene. Some of the first good phono cartridges came from GE. Stromberg-Carlson made audio components as well as TV sets, before disappearing into defense electronics. Microphones and broadcast consoles were made by RCA. And AT&T's Western Electric division made speakers, microphones, cutting heads for record mastering, and tubes.

Now, Western Electric's 300B triode tubes, at least, are coming back. However, AT&T will not be making them. According to *The Economist*, Lucent Technologies, one of three companies emerging from AT&T's recent breakup, has sold production rights to Westrex, a new Atlanta firm bearing an old Western Electric trademark. The tube, first sold in 1938, is now highly prized in hi-fi circles, and the company hopes to sell 30,000 a year, at \$350 each. If they succeed, they'll begin making other tubes.

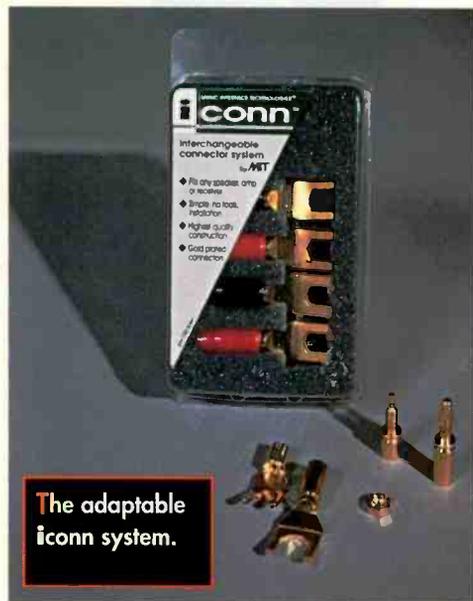
A TIP OR TWO FROM MIT

Each of the four speakers I currently have on hand has a different type of input con-

nectector: spring clips, multi-way binding posts with double-banana sockets, multi-way binding posts without the sockets, and multi-way posts with sockets that can take single bananas but not double ones (the spacing's wrong). That's a bother, not a crisis: If I left my speaker cables' ends bare, they'd fit any of these speakers; but since my Kimber Kables' multi-strand construction makes bare ends unwieldy, I have Kimber's spring-clip spade lugs on the cables's ends, which fit large binding posts; for terminals that accept banana plugs, I attach Vampire Wire banana-plug adaptors.

Now, Musical Interface Technologies has a neater solution, the Interchangeable Connector System—iconn, for short. The MITerminator speaker cables now come with special pin connectors at each end. The pin connectors will fit spring-clip terminals and, I suspect, the holes drilled through multi-way terminals (at least, on speakers that leave these holes accessible). What's special about these connectors is a threaded section that accepts iconn

banana plugs and two sizes of spade connector. For folks like you and me, it means the ability to adapt cables whenever we swap speakers. For retailers, it means the ability to have whatever cables we audiophiles need, without needing an entire stockroom for all the different lengths, gauges, and connector types. A



The adaptable iconn system.

A CHANGE FOR CHANGERS?

The more CDs a changer holds, the harder it gets to tell what discs are loaded and which disc is where. Adam Wolff, of Metuchen, N.J., has a patent approved on a gadget that solves that problem and gives you some place for your empty jewel boxes, too. His CD

Select system uses those jewel boxes as index tabs and selector buttons. The boxes fit into a special rack, with their spines facing outward. To select a disc,



you browse the disc spines until you find something you'd like to hear, then press the jewel box. This depresses a button behind that box, sending a signal to the changer. There's reverse

communication, too: Use the changer's controls to program several discs, and signals from the changer tell the rack to light an LED next to the slots containing the jewel boxes for those discs. When you replace discs in your changer with new ones, the rack puts the jewel

boxes for the old discs right at your fingertips. Wolff estimates that a 100-CD changer designed to use his system would cost about 20% more than one using conventional controls. It would be possible to retrofit CD Select to an existing changer, but the retrofit would only let you select CDs for play, not see what discs had been programmed.

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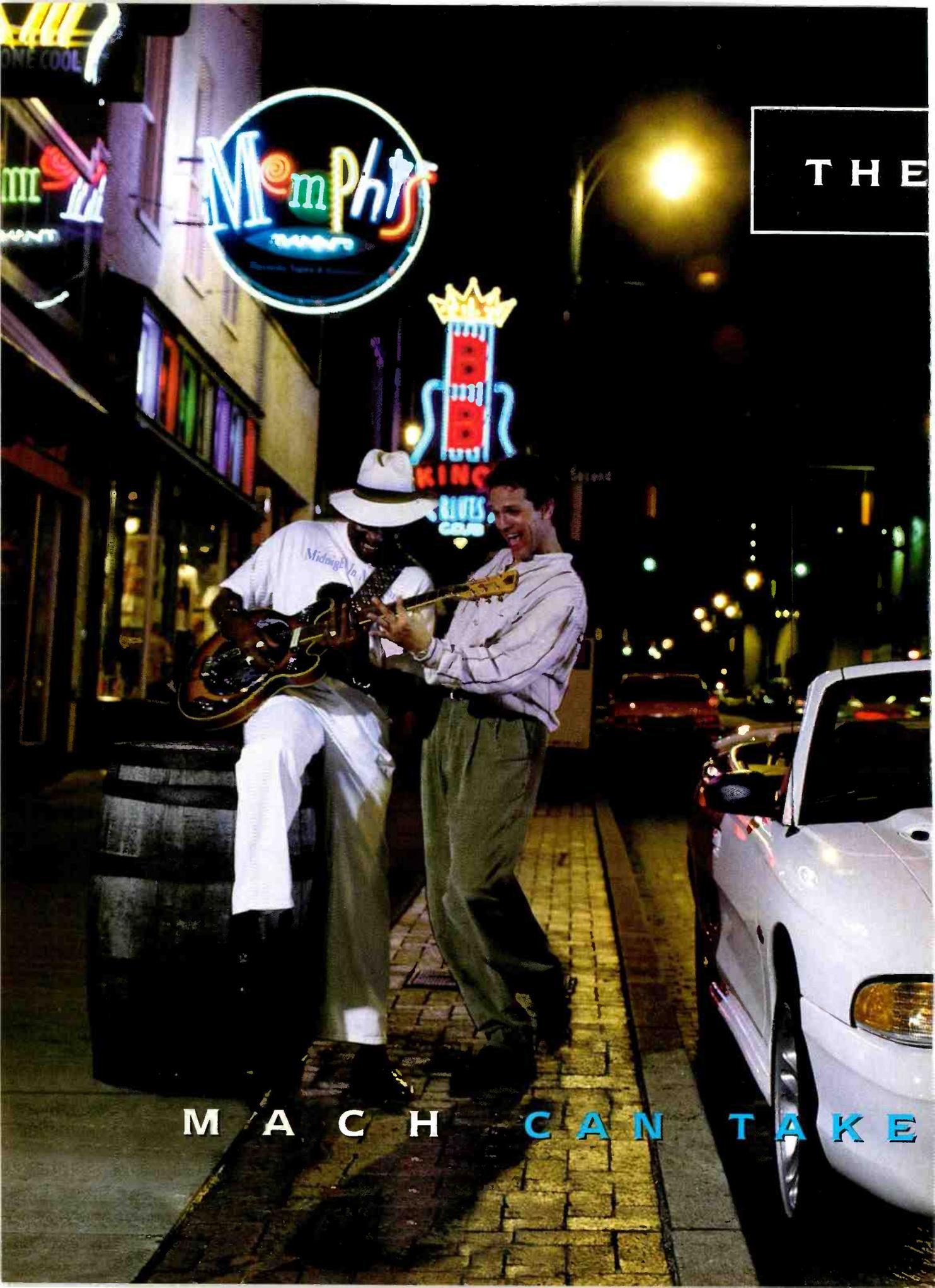
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WHITHER (AND WHEN) DVD?



Once seemingly on a clear path for late 1996 introduction, DVD now appears to be stalled until sometime next year. What has happened can be understood from a cursory review of its short history.

When Sony and Philips showed their version of DVD (Digital Video Disc) for the first time, in January 1995, they called it MMCD (Multimedia Compact Disc), and the agenda was relatively simple. The proposed single-sided, single- or dual-layer disc was a fairly straightforward evolutionary step up from the CD in manufacturing complexity. It could hold up to 135 minutes of MPEG-2 compressed video per layer, plus multiple compressed digital soundtracks, subtitles, and other information. The disc was, of course, non-recordable, but it offered a giant step forward in viewing quality compared with mass-duplicated prere-

corded VHS videotape, and, in theory, could cost considerably less at retail. There appeared to be no obstacles in its way.

Barely a month later, Toshiba and Time Warner announced and demonstrated their take on DVD, called the SD (Super Density) disc. SD boasted greater data capacity and the possibility of discs recorded on both sides, which complicated the manufacturing process by requiring that each disc consist of two half thicknesses bonded together (much the way laserdiscs are constructed). Most other specifications were similar to those for MMCD, though the SD group explicitly endorsed Dolby Digital (AC-3) audio coding. Besides its originators, SD had the support of such heavyweights as Thomson, Matsushita, and Pioneer as well as several major studios. And for a time it appeared that we were on our way to a replay of the Beta/VHS VCR format war.

By the end of 1995, however, a truce between the MMCD and SD groups was reached, following some forceful prodding from the computer industry. In passing, the erstwhile combatants settled on DVD, standing for nothing in particular, as the name for the joint system. (Although often said to mean "Digital Versatile Disc," that expansion has no official

standing.) And the disc was more explicitly a multipurpose storage medium expected to have a strong role in computer applications as a DVD-ROM, where its superior video performance and high capacity would be great assets. It is primarily these multiple roles with their differing requirements that have created the current impasse.

Last May's joint SMPTE/USC (Society of Motion Picture and Television Engineers and University of Southern California) one-day conference, held in Los Angeles, addressed the many current technical and esthetic aspects of DVD, with emphasis on copy protection issues, manufacturing challenges, and artistic quality control. Here are some of the highlights of that meeting that will help you appreciate the present state of the DVD and its ultimate promise.

The attractiveness of DVD as a basis for ROM video content of all kinds lies in its uncompromised video quality. Those who recall interactive CD-ROM efforts of 10 years ago may be quick to observe that things today have improved only marginally. Video quality is probably the limiting factor in the general acceptance of interactive multimedia software, and DVD promises to remove these limitations.

But even in its intended home video application, DVD has borrowed a great deal from its ROM associations. For example, the options available to the home theater enthusiast include:

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David Ranada, Stereo Review, January, 1996

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What Hi-Fi?, Great Britain. February, 1996

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Co-founder, Polk Audio

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CIRCLE NO. 19 ON READER SERVICE CARD

1. Multiple branching. A given motion picture may be available in several versions, including the standard release version, a director's cut, and a censored version for children. There may be soundtracks in multiple languages (there is already sufficient capacity for discrete 5.1-channel Dolby Digital soundtracks in three languages), or subtitles in many more, as well as a version for the hearing-impaired, with expanded legends on screen.

2. Format options. Some movies may be offered in the standard (4:3) aspect ratio, a "letterboxed" format, with black bars at the top and bottom to preserve wide-screen ratios for display on standard 4:3 sets, and a "scoped" (anamorphic) version that will play back on large wide-screen sets, in which the scoping is undone and a 16:9 aspect ratio presented. Each screen format could be toggled from the remote, with the 4:3 pan-and-scan display controlled by a disc-embedded code that tells the player what portion of the full frame to display.

3. On some programs, such as sports, music performance, or documentary coverage where multiple cameras are normally used, it may be possible to replay a given segment as seen from different camera views or angles.

4. Language options. For what it is worth, you may be able to watch a movie in French with English titles—or in English with French titles—or in French with French titles, to brush up on your language skills.

It is no trivial matter to program a disc to do all of these things smoothly and in an intuitively obvious way for the non-technical user. Clear menu structures and commands must show on the screen when needed, and the programming must be completely fool-proof. It is one thing to have a new software program for your computer that has a few bugs that won't get worked out until the next version of the program. We have all had to contend with that situation, and perhaps it is okay in the environment of ongoing, rapid development of both computer software and hardware, where users are fairly savvy. But this is anathema to entertainment-based hardware and software in-

terests, whose products must appeal to the lowest levels of technical competence.

Imagine a situation with DVD where these two cultures are in conflict. Both hardware and software standards are being hammered out simultaneously, and there may yet be significant changes not anticipated at present. For example, Hollywood and Silicon Valley have quite different views of copy management and protection. The computer manufacturers gave up on it years ago with the realization that a determined hacker could break almost any scheme. Furthermore, there have always been rapid technological changes in the computer world, which means that the

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PROPOSED STANDARDS
FOR A SUPER CD.**

turnover in both hardware and software is more rapid than in the movie and music businesses, where formats tend to stay around for a fairly long time. And Hollywood is particularly spooked by the potential of DVDs to serve as high-quality masters for pirates. But quality has never been an issue with pirates, especially in those parts of the world where piracy is rampant. The fact is they'll copy whatever source they can get, be it on VHS or in a digital format.

In order to accommodate the widest range of programming needs, the DVD standard allows for use of both disc sides, with up to two layers per side. A single-layer side provides data capacity of 4.7 gigabytes, sufficient to handle the bare necessities of a 135-minute movie (long enough to accommodate 97% of all Hollywood films) together with a single 5.1-channel Dolby Digital surround soundtrack. A second layer almost doubles a side's capacity, so the potential exists for dual-layer, dual-sided discs with capacities of around 18 gigabytes.

As you can see, there are numerous possibilities here. For example, if two layers are needed for a given program, the choice is between two single layers, one per side, or a double set of layers on a single side. The single layer per side is perhaps more straightforward from the manufacturing point of view, but it does not allow any substantial space for printed graphics on the disc. (Remember how the back side of the audio CD gradually made the transition

from being merely a label to serving as an extension of the front cover artwork?)

On the other hand, two layers on a single side will provide the added space for graphics on the reverse side, but will complicate the manufacturing process. At this time, many of the manufacturing processes required are in their developmental stages. As in the early days of CD, few manufacturers are willing to talk openly about plant production yields and unit costs. So no-one really knows at present what the typical list price of a DVD will actually be.

One thing is safe to state, that early production will likely stick with single or double-sided discs, at least until the dual-layer process has been thoroughly perfected.

Product quality issues came up for many discussions at the conference. These have to do not with mechanical or technical quality in making the discs themselves, but with the decisions regarding sources used for mastering them. Most of us remember the early troubles with CD, when discs made from inferior late-generation copies of master tapes flooded the market. There was a lot of critical damnation, much of it misdirected at the digital process itself, and the problems went away only when the record companies went back to their earliest studio master tapes and carefully transferred them to digital using the best methods available. The film industry wants to avoid such mistakes, and in many cases, early sources are pretty much mandated if the language options are to be fully accommodated in the DVD product.

There may, in fact, be a handful of DVD video players and discs on the market before year's end, although it is difficult to see how this can happen without all the legalities of copy management in place. In any event, it promises to be a slow introduction. I know that I'll be standing in line early.

As audio enthusiasts, we also await developments in the area of the super CD, one based on the high information capacity of the basic DVD. (A British-based group, Acoustic Renaissance for Audio, chaired by Bob Stuart of Meridian, has already proposed standards for what it would like to call the High Quality Audio Disc.) However, it's likely that no universal standard will be promulgated in that field until the basic DVD has been launched. That will be another "Currents" column. **A**

Digital Satellite TV?

Should I own or not?

What does it really cost?

Can I get my local stations?

Will it work on my set?

Can I use it with two TVs?

Do I still need an antenna?

What else do I need?

Can I block channels?

What if I need help?

What does the red button do?

What about surround sound?

Should I disconnect my cable?

How big is it?



Any more questions?

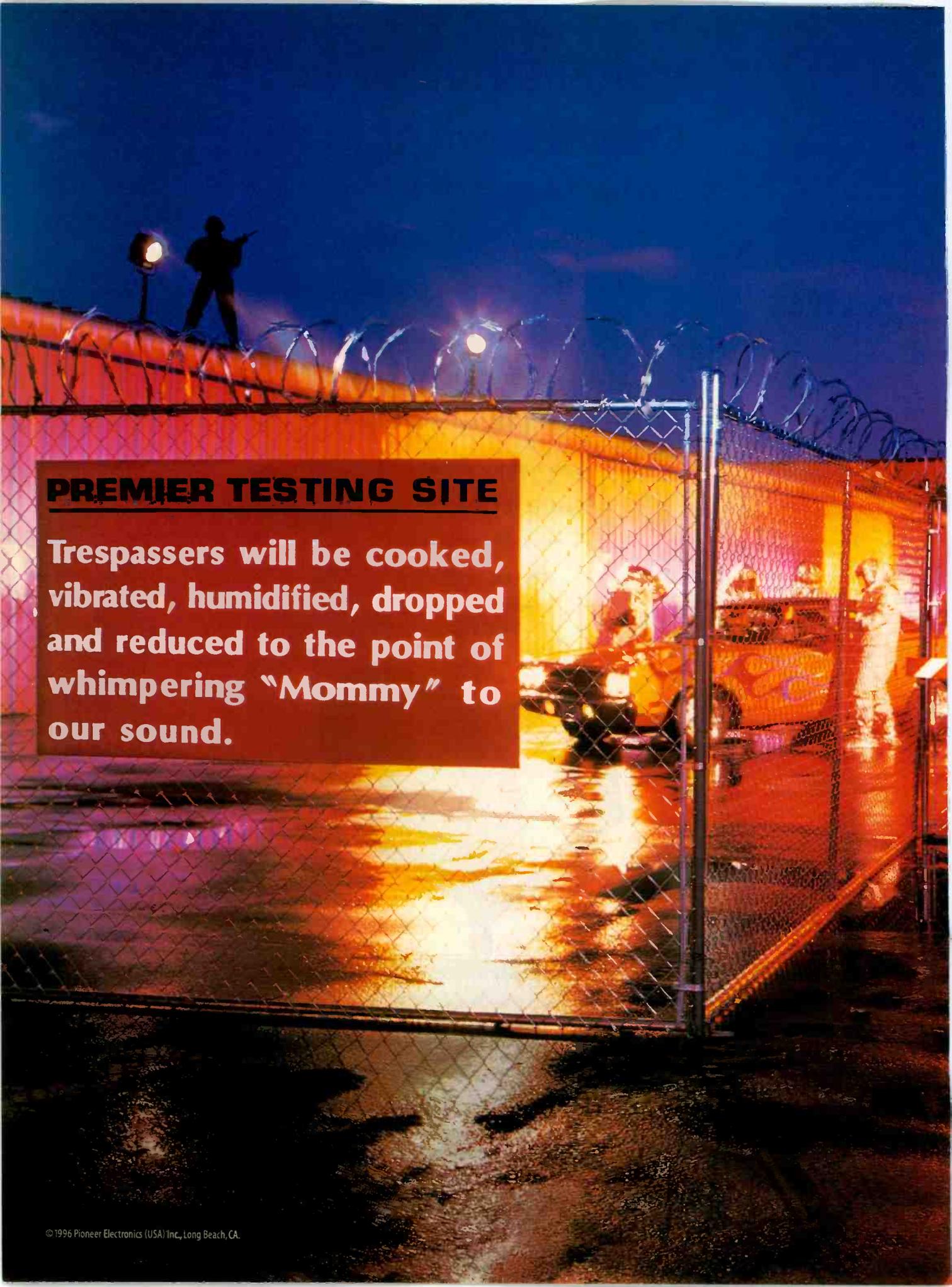
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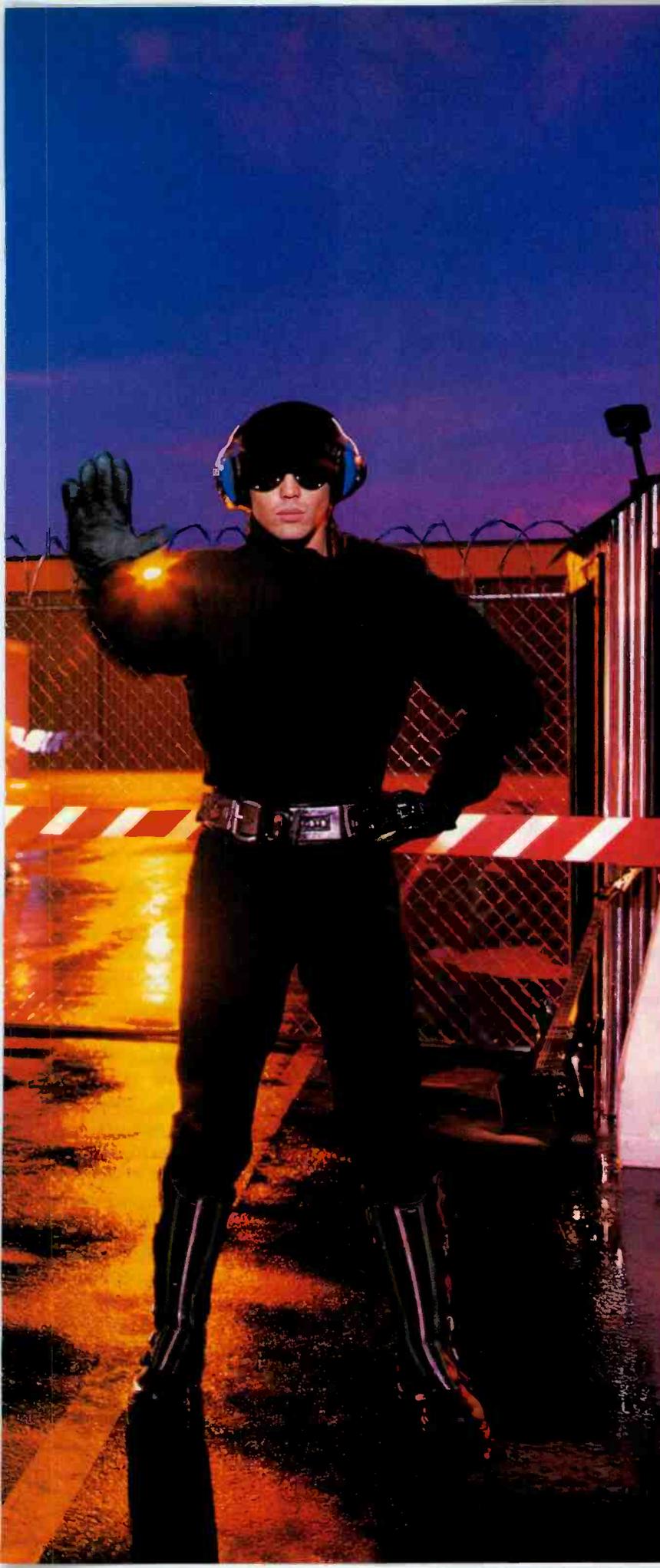
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You've got questions.
We've got answers.®

A night scene of a prison with a sign on a fence. The scene is illuminated by warm, yellow lights, possibly from a street lamp or a guard tower. A guard is visible on the roof of the building, silhouetted against the dark sky. The fence is topped with barbed wire. The sign is a dark rectangle with white text. The overall mood is somber and menacing.

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**Trespassers will be cooked,
vibrated, humidified, dropped
and reduced to the point of
whimpering "Mommy" to
our sound.**



Premier is the car stereo that pain built. If the sound gets aggressive at times, it's because our merciless testing hammers something called *stereo angst* into the soul of each unit. Most of you have heard this condition referred to as *high-quality sound*. It answers to either one.

After the headunits are shaken like they're out of their minds, operated in 95 percent humidity, subjected to temperatures from -40 to 176 degrees and dropped from nail-biting heights, they're able to arm wrestle your car and win.

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Their hell consists of acoustical analysis tests, strength tests, ultraviolet radiation tests, more extreme temperature tests and weatherability irradiation tests, which force them to belt out an obscene amount of volume for 150 head-kicking hours.

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Hopefully the headunits inherit some of our approach-me-and-get-racked attitude. But we felt the fools lurking. So Premier invented Detachable Face Security™ and then added a car alarm, built into the unit itself, that blasts its warning inside the car to terrorize the thieving rodents into scampering away without your beloved stereo.

These premises, these conditions, these posture-perfect engineers exist solely to bodyguard the reliability and ultimate sound performance of your Premier system. But if you're able to create a more unlikely condition in your own car than our tests simulate (good luck), and the stereo starts to cower, our warranty will be idling for two long years, anxiously awaiting the chance to participate.

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High Voltage output sends improved dynamic range input to amplifiers with less noise-floor and distortion.



Assembled with high-quality components by bare hands, these amplifiers have a built-in crossover and come dressed in purple.

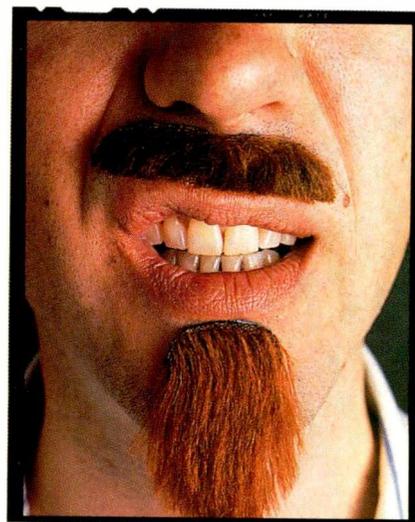
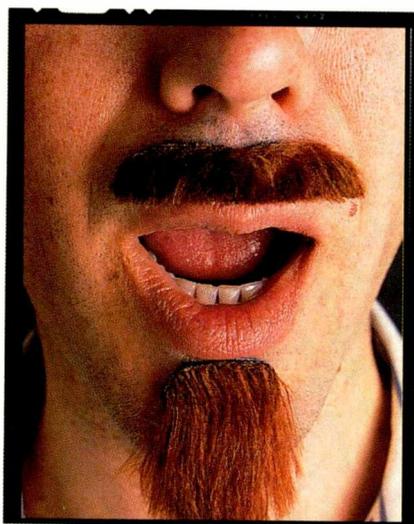
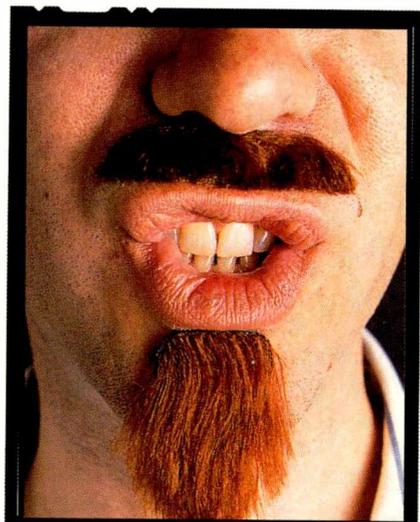


Depending on the speaker's frequency demands, RigiLite™ Composite Cones contain the perfect tailor-blended mix of maximum-performance materials in order to be both rigid and light.



PREMIER

SHUT THE HELL UP, GEEKS!



want to delete Bill's head?", and the "OK" box is greyed out for some reason so I can't finish him off. I hit "Cancel," but it's too late—the computer geeks tackle me to the ground and Crazy Glue a fake alterna-goatee on my face while Gates screws up his face and shrieks, "Convergence!" like a savage coyote howl that bounces off the buildings and gets louder and

As a self-proclaimed audio geek, I like to venture out and explore other geek colonies to see if there might be some cool overlap. Of course, the audio geek colony itself can be broken down into subsets of its own, such as the tube geeks, who can then be further broken down into sub-subsets (like the "retro" tube geeks, the "We're not retro, you are!" tube geeks, and the "Are not! No backs!" tube geeks). But it's the non-audio geek colonies that I like checking out the most, because, quite frankly, I'm always looking for a new group of geeks that will make us audio geeks look less, well, geeky.

For a great ego boost, check out the flame-bait geeks on the internet newsgroup alt.shut.the.hell.up.geek. The sole purpose of this newsgroup is to lure new message posters and flame them with "Shut the hell up, geek!" no matter what they post. Once you get the joke, you join the regulars in flaming the next newcomer unmercifully. Actually, now

that I think about it, it's kind of like a sped-up version of growing up, except without the Cheech and Chong records.

But you know who could really use a good "Shut the hell up, geek!" these days? The computer industry.

Lately, all my nightmares start with the word "CONVERGENCE" in big, flashing marquee letters eight stories high with those lights that look like they're rolling around the letters. I'm running down the street under the giant letters, chased by Bill Gates and an army of computer geeks, all of them moaning, "Convergence, convergence, convergence. . ." and trimming their alterna-goatees with buzzing Brauns. I whirl around and shoot Gates' head off with an Elmer Fudd varmint rifle, but a window pops up that says "Do you really

louder and eerier and eerier the farther it travels.

"Convergence" is the new war cry of the consumer electronics industry, too. As with airplane glue, I liked it just fine the first few times, but all I got after that was a bone-splintering

headache. The consumer electronics industry keeps lunging at the ankles of the PC boom like some diseased tick, eager to attach itself to the host

beast as it darts into the headlights on the information highway. The idea is that "PCTV," the marriage of personal computers to home theater, will let us watch movies, work on spreadsheets, surf the Web, and play *Duke Nukem*, all from the comfort of our living-room in full surround-sound and high-definition video.

But what everyone hypnotized by the PCTV scenario fails to address is

**"CONVERGENCE!"
IS THE NEW WAR CRY
OF THE CONSUMER
ELECTRONICS INDUSTRY.**

One Great Idea on Top of Another: Introducing the Marantz SR-96 THX Receiver and DP-870 Dolby Digital Decoder

DP-870 DOLBY DIGITAL AC-3

DEMODULATOR/DECODER:

- discrete 5.1-channel decoding for Dolby Digital AC-3 soundtracks • DSP decoder with Zoran AC-3 chip • AC-3 RF input for LD • digital AC-3 inputs for future sources with digital AC-3 output (DVD, DSS) • channel level and balance controls
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• SR-96 THX AUDIO/VIDEO

- RECEIVER:** premium dual DSP decoder features all-digital Dolby Pro Logic and THX Home Cinema processing • 5 high-current power amps • 110 W x 3 front, 90 W x 2 surrounds (into 8 ohms) • discrete 6-channel input connects to Marantz DP-870 Dolby Digital decoder

- AM/FM tuner with station

- naming • 5 pre-out/main-in loops

- 4 audio inputs, 5 video

- Inputs with A/V copy features

- composite and S-video

- switching • advanced multi-room

- mode provides two independent

- sources • headphone jack with

- auto stereo switching • auto

- power-on sensing on TV input

- on-screen display • banana-jack

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- grouped functions • LCD displays

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- each component • label naming

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- popular DSS equipment • built-in

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Start with the Marantz SR-96 THX Audio/Video Receiver, a perfect blend of powerful technology and thoughtful design. Premium dual DSPs provide all-digital Dolby decoding and THX Home Cinema processing. Five high-current power amps deliver 110 W continuous to the fronts and 90 W to the surrounds (into 8 ohms). A versatile complement of A/V inputs manages even the largest theater systems. And should you ever actually leave your theater, the SR-96 offers an advanced multi-room mode that can play two sources independently. The SR-96 is the ideal centerpiece for any entertainment system.

Top it off with the Marantz DP-870 Dolby Digital AC-3 Demodulator/Decoder. The DP-870 connects directly to the SR-96 to deliver the most advanced surround sound ever. The DP-870 can even be connected to many existing surround sound systems that use separate surround processor and power amps, and other A/V receivers that feature 5 pre-out/main-in/subwoofer connections. Featuring the high precision Zoran DSP Dolby Digital AC-3 decoder chip, the DP-870 is prepared for the future with additional inputs for other digital AC-3 sources, such as DSS and DVD components.



Now that you have the best in home-theater sound, check out the remarkable Marantz RC-2000 Learning Remote. Designed with input from leading custom A/V installation experts, it's the only remote you'll need for complete and convenient control of your entire entertainment system.

All You Need is One



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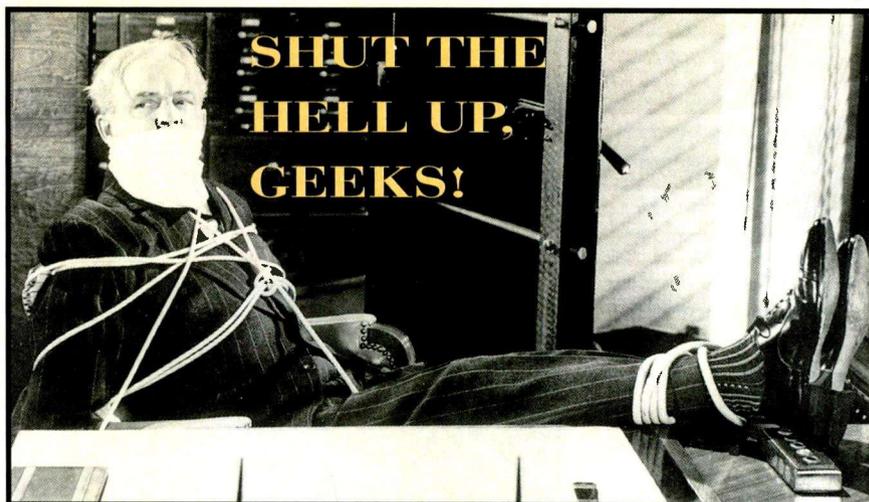
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the incredibly screwed-up state of affairs that is the reality of the home PC market. You've got CD-ROMs that won't run, operating systems that won't load properly and then take down important files when they crash, and peripherals that just flat don't work, right out of the box. I've spent the last decade-plus in a constant state of frustration when it comes to the various computers I've owned, and everyone I know who has a PC feels the same way. We use them, we rely on them, we even have fun with them. But the computer industry is decades behind the consumer electronics industry when it comes to delivering competently designed, reliable, and easy to operate products. If the A/V business is going to hand over the keys to its future to a zit-covered prom date named Bill, we may as well spray the roads with foam now and hope they can cut us out of the wreckage with torches before the gas tank blows.

I'm sorry, but when it comes to hi-fi, computer geeks haven't got a clue. By far, the dumbest and most obtuse messages posted on the rec.audio.high-end newsgroup come from people with computer-industry domain addresses. It escapes me why computer geeks who think a '70s receiver is as good as it gets waste their time arguing about cables in an audiophile forum, especially when they could be grooving on postage-stamp-sized video files and CDs played on their CD-ROM drives through \$20 plastic multimedia speakers.

The computer geeks are just way too uppity, that's the problem right now. I mean, you'd think they'd be a docile breed of geek, kind of like Smurfs except with paler skin and alterna-goatees, but that's not the case. The PC boom is going through the roof, and the geeks are high on the fumes. They don't want to let us handle the audio and video side of the Great Convergence while they handle the computing side—they want to do it all themselves. Not a day goes by that I don't hear about some faction of the computer industry poking its waxy fingers into pies better off baked by the consumer electronics industry alone.

DVD's a perfect example. In the strained midst of a shoving match last year between rival hardware camps led by Sony and Philips on one side and Toshiba and Time/Warner on the other, the computer geeks suddenly entered the fray, crying over



the "Digital Video Disc" name. Sony and Toshiba almost melted down the whole planet in a format war to end all format wars, and the computer geeks were whining about the name because they felt left out!

Ultimately, the DVD alliance caved to the computer geeks by formally announcing that DVD didn't officially stand for "Digital Video Disc"—it could be "Digital Versatile Disc," "Digital Veal-cutlet Disc," or anything anyone wanted. Man, if I'd been in charge, I would've set up a live mike feed into a 100-foot wall of Cerwin-Vega speakers and Carver muscle amps and announced, "Fine, you guys want to make trouble at this crucial juncture? DVD now officially stands for 'Die Virgin Dorks.'" Now go back to your \$20 plastic multimedia speakers and Jenny McCarthy .JPGs and your sub-AM-quality RealAudio feeds and SHUT THE HELL UP, GEEKS!"

And it doesn't stop there. Now we've got Bill Gates hassling FCC honcho Reed Hundt over HDTV. It took AT&T, Thomson, Zenith, Philips, and the rest of the Grand Alliance years of testing and haggling to reach a commonly agreed-upon standard for digital HDTV broadcasting, and now Gates wants the standard changed so the images will look better on PC monitors. As if HDTV's slow crawl to the marketplace hasn't been frustrating enough for consumers, now we face even longer delays because the biggest computer geek of 'em all wants to change the standard. Maybe the

Grand Alliance should just change the name to High Versatility Television. Hey, it never hurts to grease the host beast.

Don't get me wrong. I think the PCTV concept has the potential for mass acceptance, and I'm heartened by the efforts of Thomson, with its RCA Genius Theater PCTV prototype, and Gateway, with its new Destination PCTV system. Even though both systems currently feature monitors that don't offer the same level of picture quality in both PC and TV modes, I expect to see a new wave of monitors in the coming year that do equal justice to NTSC television video and RGB computer video. And while I still question whether the PC and the TV will ever truly be one and the same, the possibilities for home entertainment are certainly intriguing to say the least. I

know I've personally got some .AVI files on my drive featuring remarkably talented young actresses that I'd love to see on the big-screen and hear in surround sound.

But if this convergence between the PC and home theater is going to succeed, the computer geeks need to concentrate on what they do best and leave the audio and video standards to a consumer electronics industry that's busted its ass, year in and year out, to achieve a much higher level of relative quality across the board than the PC industry ever dreamed of. I'm all for the convergence of computers and hi-fi—as long as the hi-fi rig of tomorrow isn't built like the home PC of today. A

**I'M SORRY, BUT WHEN
IT COMES TO HI-FI,
COMPUTER GEEKS
HAVEN'T GOT A CLUE.**

"Madness"

It falls apart, destroys amplifiers, there's no bass and no volume, only one person at a time can listen, it takes up too much

space and it's dangerous. But its clarity is beyond any other loudspeaker known to man. *~* The year was 1978, and

everyone said I was mad. Back then, their fears of electrostatic loudspeaker technology were well-founded. But I was

obsessed with the clarity, and determined to create a loudspeaker the like of which this world had never known. *~*

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and overcome every fear. *~* All that remained was the incredible clarity. *~* When you become disenchanted

by the ordinary, we invite you to experience Martin-Logan technology. One of our chosen specialists will show you

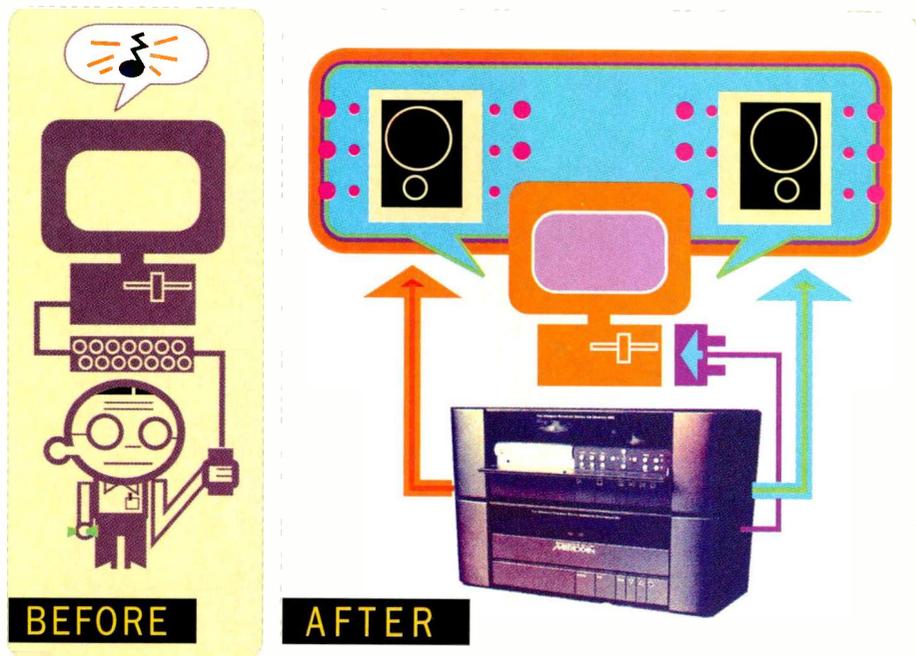
what it is to touch space, feel an image, relish a sublime madness.

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SOUND BYTES



With everyone braying about our “multimedia future,” it’s amusing to note that it’s already here, only we seem afraid to admit it. The computer community apparently has realized that the world isn’t waiting for its 1990s vision of multimedia—with every white-collar worker with a notebook computer running around making sound ‘n’ vision presentations—and has finally admitted that multimedia’s main appeal is for no-brainer entertainment.

How so? Given the choice between browsing through Microsoft’s *Encarta* or blasting away with *Duke Nukem 3D*, the latter usually wins.

Alas, multimedia via computer also brings sound quality decidedly worse than execrable. Computer nerds are even more tight-fisted than audiophiles when it comes to sound-per-dollar, so they think that \$99 for a pair of “self-powered speakers” is

more than enough to extract the maximum sonic pleasure available from a CD-ROM, an audio CD played in the computer’s CD-ROM drive, or even from the PC’s own programs (e.g., games). How do I arrive at this image of meaner-than-Scrooge computer dorks? Simple: Ask a Las Vegas cabbie to name the lowest-paying conventions, and he’ll tell you Comdex, followed closely by CES. In a town where conventions are more common than bookshops, they know all too well who’s tight-fisted and who’s not. And the city likes neither community, computer or consumer electronics, because both are known for being, well, cheap. Or too smart to gamble. But that’s another story.

ALAS, MULTIMEDIA VIA
COMPUTER ALSO BRINGS
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THAN EXECRABLE.

Anyway, this manifests itself in the peculiar scenario where a PC enthusiast will spend \$400 to \$600 for a killer video card, which will be driving the finest monitor that the geek’s available money can buy. But when it comes to the audio, PC users freak out if the sound card costs more than \$150. And I’ve already told you what they consider to be a fair price for adequate speakers. All of which confirms what Meridian’s Bob Stuart says to me every time I beg him—or someone else in the audio community—to produce an audiophile-grade sound card.

Without wishing to court a lawsuit, the best sound cards I’ve heard are so truly vile in sonic terms that I can only marvel at the sheer chutzpah of the manufacturers when they boast about “CD sound quality.” Hell, if you do play an audio CD through your computer, it has to travel through the sound card, which has an analog output stage slightly worse than a \$79 boombox’s. (Mind you, some CD-ROM drives can—with difficulty—yield a digital signal to feed to an outboard DAC.) But Stuart also pointed out to me that, even if you were to engineer a “high end” sound card, the environment within a PC simply isn’t conducive to good sound. All that RF interference, the proximity of the disk drives, the crappy switch-mode power supplies; you’d need outboard stand-alone units, just like internal versus stand-alone modems. And who among us needs more boxes?

But what it really gets back to is cost. If Krell or Meridian or Theta or Wadia were to come up with a stupendous sound card, with MIDI

(Musical Instrument Digital Interface) features and 20-bit pure audio capability and SoundBlaster compatibility, it would stiff the instant its \$1,500-plus price were announced.

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Well, perhaps not totally, because there *are* a few hi-fi crazies out there with PCs who'd leap at the opportunity to add killer sound to their computing, but probably not enough of us to justify the board's existence. The tragedy is that there's plenty of material already available, software you're only ever likely to "play" through your PC, that justifies an audiophile-grade sound card. And I don't mean *Quake* or *Wing Commander IV*.

CD-ROMs with substantial music content have been around for years—the CD-ROM editions of *A Hard Day's Night* and

This Is Spinal Tap, for example. But, being CD-ROMs, they cannot be enjoyed for their sound-only content via a normal, audio-only CD player. So, when you slip MTV's *Unplugged* CD-ROM into your PC, the best you'll ever hear is what the sound card will let through. And heaven knows some of us have tried to optimize what's available.

Unnaturally, I use the "line out" facility on my crummy sound card, plugged into a "real" hi-fi system. Okay, so I'm no longer running my PC through a Krell KRS into a pair of 300-watt Krell monoblocks driving Apogee Divas, but that's because my "office" is no longer in my listening room. At present, the output from my PC feeds a second-hand Quad 33/303 combination driving a pair of Bolero Kompakts—total (audio) system cost, given the modern equivalent of the old Quad gear, running close to \$3,000, or as much as a decent PC. This, of course, would be judged as lunacy, but I "justify" it by listening to audio CDs through my PC while I'm working. And I've just learned from a friendly hacker-type that my CD-ROM has a digital output, which, though hard to access, will soon be feeding a stand-alone DAC into the Quad electronics, thus bypassing the sound card entirely when I play audio-only CDs.

But I still have to suffer the sound card when I play *Hexen*, use CD-ROMs, or watch my "Beavis and Butt-head" screen saver.

But onto the heartbreakers: "CD Extras," or "Enhanced CDs," or whatever the industry wants to call those audio CDs that just happen to have additional video material embedded in the pits. Okay, so the nomen-

clature has changed more often than Roseanne's last name, but I'm hooked on the new generation of audio CDs that come "free" with multimedia segments. The first I tried was last year's Rolling Stones album, *Stripped*, and I found its video/info/interview extras even more enjoyable than the full-blown *Voodoo Lounge* CD-ROM, which

THERE'S PLENTY
OF MATERIAL AVAILABLE
THAT JUSTIFIES
AN AUDIOHILE-GRADE
SOUND CARD.

came out around the same time. Since then, there have been a number of CD Extras from Todd Rundgren, Yoko Ono, and others, but their non-audio material seemed perfect for the PC platform and demanded nothing more. Then I came across James Taylor's *Best Live*, the CD Extra edition.

Admittedly, I'm a lapsed Taylor fan, as I left behind introspection, college, solitude, and tortured artistry a couple of decades back. His music depresses me almost as much as Leonard Cohen's, though not quite to suicidal levels. Anyway, I was in Lechmere's in South Portland, Maine, during a few days of R & R at my folks' home, stocking up on discs unavailable in the UK. New to me was a separate section for CD Extras/Enhanced CDs, so I grabbed the Taylor title (Columbia CXR 68096) just out of sheer curiosity and maybe a dab of nostalgia. I expected it to be filled, like Rundgren's or Yoko's CD Extras, with view-once novelties, after which it would be treated as an audio-only CD. Boy, was I wrong.

Taylor—rustic, down-homey, low-key singer-songwriter or not—has delivered one of the most satisfying and slick CD Extras yet, one that begs for the audio and video signals to be fed to the hi-fi/home theater system rather than through a PC's cut-price signal path to a computer monitor. Yes, the disc features "infotainment" stuff, such as a partial discography, press releases, a biography, wacky graphics, and other CD-ROM-iana, but the bulk of the set is concert sound and footage, eminently re-watchable in the manner of a laserdisc. You know: audio-only when you don't feel like watching the visuals or sound and vision when you want the whole shebang.

So there I was, lamenting a situation where I could have either/or but not both at once. I played the CD in my reference sys-

tem to hear the music at its best but still had to return to the PC to see the footage. Then I remembered the hit product from the Hi-Fi '96 show, just a few days earlier. And Bob Stuart's vision fell into place.

Meridian's new 800 Series features the first high-end audio components to follow genuine "computer architecture" practices. The 800 Reference CD Machine contains (and here's how the PC versus hi-fi face-off will be resolved) two front-panel-accessible CD-ROM drives rather than audio-only CD transports. Either or both can be configured to read CD-ROMs as well as audio titles, act as a CD library or recorder, and write to a hard-drive ad infinitum. And you can connect up to six external units. The 800 can also accept a tuner "card" or be used as a full-function preamplifier, and it accepts as many as 10 analog and 10 digital sources, has analog and digital tape loops, and can provide up to eight digital and eight analog outputs.

Its sister, the matching 861 Reference Surround Processor, can handle eight channels of information, with modifications beefing that up to 64. Broadcast-grade video switching; dozens of inputs for digital, analog, and video; controls for 14 speaker layouts; numerous subwoofer options; more than a dozen modes from mono to Dolby Digital THX; and a facility to adjust sound synchronization by up to one video frame for greater accuracy. There seems to be no end to the options: a flash memory for easy software updates, room for up to 16 cards, every possible form of digital input and output, and—to return to the theme of this month's Mondo Audio—an RS-232 input for simple connection to a PC. Which is why I'm so happy.

Maybe it's a bit too early to celebrate. Maybe we should wait and see what happens with DVD and all of its myriad forms. Who knows? They just might set the audio standards high enough to ensure that the *son* is as good as the *lumière*. Whatever next year holds, as you read this column, music and video have reached a stage in their interactivity that requires only one more detail to be addressed: the move out of the PC and into the hi-fi (or home theater) system. If Meridian's 800 series is the first to achieve it in practical terms, then bless 'em.

And shame on the entire PC industry for being so damned cloth-eared. A



As virtually every speaker manufacturer rushes to deliver "home theater" speakers to the marketplace, M&K amasses nearly twenty years of experience in the field—dating back to Hollywood screening-room installations in the 1970s.

M&K engineers have

spent well over a decade studying the varied aspects of surround

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M&K speakers *excel* in the reproduction of *all* source material. Accuracy, low coloration, pinpoint imaging, wide dynamic range, and deep-bass reproduction are all critical for music as well as film soundtracks. M&K Satellites and Subwoofers have been acclaimed for these attributes since the '70s.

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M&K Home Theater Systems

Conventional speakers make the music and effects on film soundtracks compressed and dull. But M&K's exciting dynamics and "quick" transients give you precise 3-D imaging and a lifelike presence.

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ble timbre-match with your existing speakers—even if they are not M&Ks.

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THE MODERN ART OF STUDIO RECORDING

TODAY'S MOVIE-GOERS AND TELEVISION WATCHERS ARE AWARE OF THE VARIOUS FORMS OF "TRICKERY" INVOLVED IN BRINGING SCENES TO CINEMATIC LIFE. WE TAKE FOR GRANTED THAT THERE WERE PROBABLY MULTIPLE TAKES; THAT THE DIALOG MIGHT HAVE BEEN DUBBED IN LATER TO FIX POOR LOCATION RECORDING; THAT THE SOUND OF A BLENDER MIXING UP A SMOOTHIE, OR A PISTOL BEING FIRED, WERE ADDED LATER IN A SOUND EFFECTS SUITE. WHAT MOST PEOPLE DON'T REALIZE IS THAT THIS SAME LEVEL OF SOPHISTICATED PRODUCTION IS FOUND IN A GREAT MANY MODERN AUDIO RECORDINGS.

THE TECHNIQUES USED IN MUSIC RECORDING ARE FASCINATING IN THEIR OWN RIGHT, AND THE KNOWLEDGE OF HOW ENGINEERS APPLY THEM TO CREATE CERTAIN EFFECTS CAN ENHANCE ANY LISTENER'S APPRECIATION OF THE FINAL PRODUCT.

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MIXING

BY DANIEL J. LEVITIN

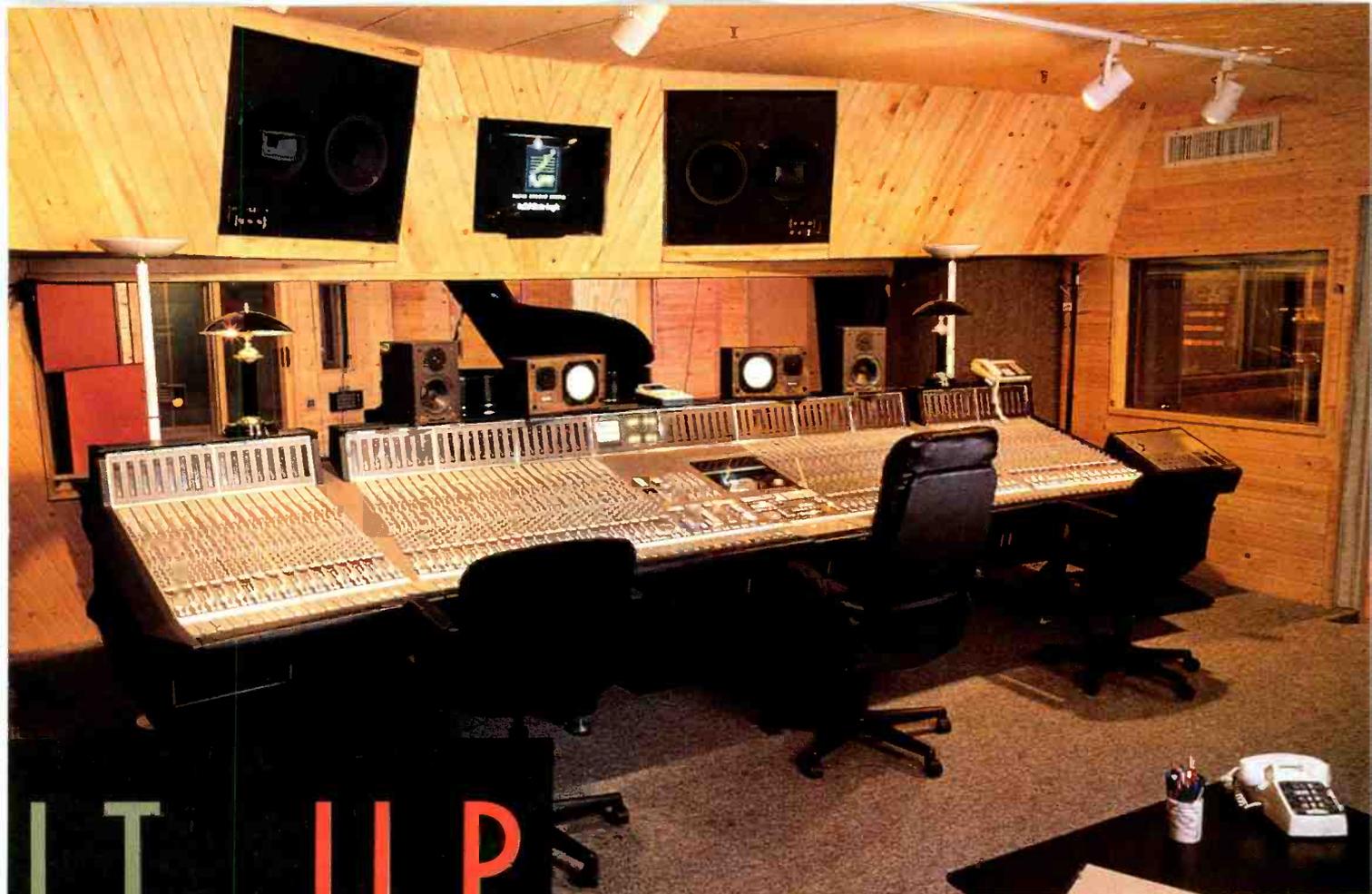
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TOP RIGHT: QUAD RECORDING STUDIO IN NEW YORK CITY.

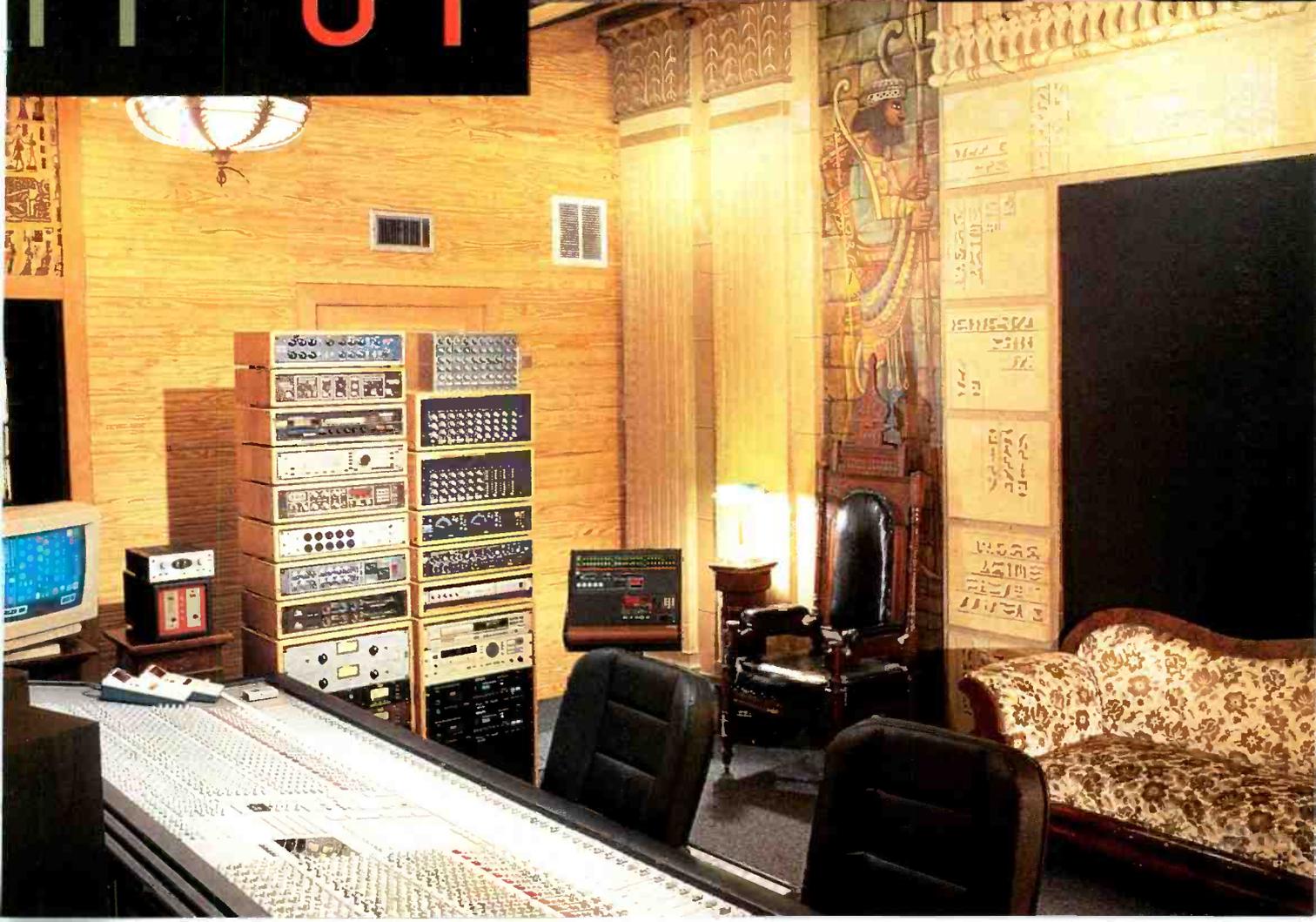
PHOTOGRAPH/JULIAN JAIME

BOTTOM RIGHT: THE AMERICAN SECTOR RECORDING STUDIO IN NEW ORLEANS, LOUISIANA.

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IT UP



Most popular music CDs (rock, country, alternative) use multitrack recording, in which different instruments (or different parts of an instrument) are recorded on distinct, separate regions, or tracks, of recording media (digital or analog tape or hard disk). The most common tape-based systems use 24-track machines, and several of these can be linked together to create 48-track and 72-track recorders. Hard disk-based multitrack recording is common in home and project studios and in large, leading-edge operations. But mainstream studios still rely on tape

time or in any combination without interfering with each other. This simple fact enables a number of interesting recording techniques.

First, the musicians don't all have to play at the same time or, for that matter, be in the same place. Using digital technology and data-reduction codecs, tracks can be relayed via satellite links and telephone lines to studios across the country or around the world. If a band decides to add a saxophone solo after recording a song, the sax player just records his part to an empty track, and it doesn't disturb the other tracks that have already been recorded. Conversely, if the group decides they don't want to use a guitar solo or a backup vocal recorded earlier, they simply don't turn that track on (they can even erase it), and the rest of the instrumental and vocal tracks remain undisturbed.

Many groups exploit this feature of multitrack recording by adding different instruments just to see how they sound—background vocals, horns, strings, and so on. They'll let the producer or mixing engineer decide later what to keep and what to throw out. (The mixing engineer is the person who blends all the tracks into a two-channel "mix" and decides where to allocate or position the various instruments across the left-to-right stereo panorama.)

A second advantage is that a musician can play more than one instrument (called "overdubbing" in session musician parlance) and listen to his or her previously recorded instrumental tracks to provide a reference while recording the new track. The guitarist and inventor Les Paul was the first to employ this

technique in the 1950s (with his singing partner, Mary Ford) on such early hits as "How High the Moon," and Stevie Wonder, Prince, and The Beatles have all used it to great effect.

A third advantage of separate, multiple tracks is that each track can be modified or processed individually without affecting the other tracks. Signal-processing devices such as compressors, expanders, equalizers, noise gates, digital reverberation simulators, and digital delays can be applied to any one or multiple tracks, and they can be applied *after* the sound was recorded. Most high-end recording consoles have built-in parametric equalizers (EQ) on every channel, allowing the engineer a wide range of tonal control over every track. For example, suppose that an electric guitar, electric bass, and acoustic guitar are recorded on three separate tracks. Perhaps the electric guitar sounds too shrill, the bass sounds too muddy, and the acoustic guitar sounds too dark. At any time during the recording process, the engineer can modify these sounds by applying EQ to them individually. Multiple signal-processing devices can be chained as well, so, in this case, the engineer might EQ the bass to make it less muddy, run it through a noise gate to get rid of hum that was present in the background of the studio that day, then run it through a compressor (to even out the overall volume of the performances) and, finally, through another stage of EQ. This scenario is not all that uncommon.



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because of human factors (many engineers are more familiar with tape) and financial considerations (the higher cost of disk storage and the need to continually invest in rapidly changing technology). The techniques I discuss here apply to both disk and tape, so when I refer to tape, that's because it's still the dominant medium.

In a multitrack installation the output from each track feeds a separate preamplifier built into the mixing console in the studio. Instead of a stereo balance control that adjusts the relative output of two tracks (the left and right channels), a recording engineer can adjust 48 individual volume controls—one for each track—or turn each track on or off with a switch (usually called the "mute" button). It is important to understand that these tracks are both time-locked and distinct. They can be recorded and played back one at a

The typical way that rock and country albums are produced is to record the rhythm section first, usually the drums, bass, lead guitar, and perhaps a rhythm guitar. At this time the vocalist records a “scratch” vocal, a temporary vocal track to help the rhythm players keep tabs on where they are in the song. The vocalist typically doesn’t give it his all at this stage, and the engineer doesn’t always bother to set up a particularly good microphone, because the plan is to replace this vocal (overdub it) later with a better performance. You can often find a lot of joking around on these scratch vocal tracks.

If you’d like to hear a scratch vocal, at least one set is available on a commercial release. John Lennon was working on a new album in 1980, which eventually became *Milk and Honey* (Polydor 817160). He had recorded scratch vocals to accompany the musicians’ basic tracks, but he was killed before any final vocals were recorded. The vocals on the finished album were what Lennon intended only as temporaries, so they exhibit a certain degree of casualness—and an absence of full-voice singing—that would not normally be found on a final vocal track.

The various instruments used in the rest of a recording are often added one instrument or section (i.e., backing vocals, strings, and horns) at a time. Musicians adding a new part can listen to any combination of the instruments already recorded, at any volume, in any mix they choose. A rhythm guitarist might want to hear lots of bass and drums so he can keep time, while a lead guitarist may want lots of keyboards so he can hear the chord changes better.

Other techniques are making it easier for the musician to work at a remote location or home studio and add tracks to the recording. A musician can have a copy of the master or a rough mix sent to his location, where he can record his part to the master or a digital source (DAT, hard disk), then have the part sent back to the studio and time-locked with a computer. And many musicians are preparing basic tracks in a MIDI (Musical Instrument Digital Interface) studio and bringing the parts on a floppy disk to a larger studio, where a computer records and integrates the tracks.

Classical, bluegrass, folk, and traditional jazz have followed a different approach. In those genres, the musical communication between players is considered an essential part of the performance, and they would never consider playing separately from one another. Neil Young is an example of a rock artist who tends to favor “live” recordings with minimal overdubs, but he is an exception in the rock world. One of the problems is purely technical: To create a clean rock recording with loud electric guitars is difficult when the guitar amps, the drums, and the vocalist are all going at the same

time in the same room. Because the sound of the instruments leaks into the microphones of the other instruments, a muddy sound is the result. Listen to the difference between *Led Zeppelin III* (Atlantic 82678) and *Houses of the Holy* (Atlantic 19130) to hear the radical difference in recording quality as the group moved from live recording to an overdub approach.

At the vanguard of audio engineering there is also a movement to use as little audio processing as possible. These engineers often boast on album covers that they have used no EQ and no digital reverberation or other signal processors. The result can sound stunningly lifelike, but pulling this off requires a great sounding musician to begin with, and a great deal of skill on the part of the engineer. To record an entire album without any outboard effects is a challenge, and it does not guarantee a superior product. Some of the best engineers in the world—Roger Nichols, Bruce Swedien, and George Massenburg, for example—use signal processors judiciously to create beautiful recordings, and in many cases to create interesting “hyperrealities.”

One of the most interesting aspects of cinematography is that we are able to see on the movie screen things we could never see in real life. A classic example of this is the movie chase scene. In the theater, we can see the pavement speeding by from a camera mounted

on the door of the car or the road ahead from a camera mounted on the front bumper. In a sense, these are very unrealistic vantage points; we rarely are able to put ourselves in those positions. An even more startling example is when the director cuts from one camera to another, enabling you to see two different perspectives in rapid suc-

cession. What the director and cinematographer are conveying is an unrealistic view of the world; they are providing a set of impossible perspectives to provide excitement and a sort of hyperrealism.

Of course, chase scenes aren’t the only use of techniques that create unreal perspectives. Even simple “head shots” produce the illusion that your eye is only three inches from the person’s face, revealing pores and details most of us would never see. Modern recording can also use technology to create hyperrealities.

One common technique for creating hyperrealities is based on a simple concept: microphone placement. When recording an acoustic guitar, the engineer might, for example, use two microphones, one at each end of the guitar, and record these onto two separate tracks. During mixing, one of these tracks is as-

WITH COMPUTER-BASED RECORDING, INDIVIDUAL NOTES CAN BE PITCH-SHIFTED OR TIME-EXPANDED.

signed to the left stereo field, the other to the right stereo field. If you listen to this at home and the speakers are eight feet apart, it sounds like the guitar is eight feet wide! (It also sounds as though your head is in the middle of the guitar, which of course it couldn't really be or the guitarist would be strumming your face.) Listening on headphones, the illusion of your head being inside the guitar is even more compelling because there is virtually no air between the transducers and the ear drum. The guitarist Alex deGrassi records his acoustic guitars this way; it's especially evident on his albums *The World's Getting Loud* and *Slow Circle*.

Any instrument can be recorded with this technique, which is known as "stereo mikes split-panned." With one mike only, the instrument can be assigned to one speaker or the other or to any arbitrary point between them (in the early days of multitracking, purist audiophiles labeled such miking "multiple mono" because it created an unrealistic rendering). Only by rendering the signal with two mikes, however, can the sound break free of "point-source localization" and begin to take up more space in the stereo image, at its ultimate creating the illusion that the instrument is surrounding the listener. In popular, jazz, and classical music, grand pianos are often recorded in this manner to give the listener a sense of being enveloped in sound.

Other instruments lend themselves to less radical effects. A drum set is often recorded with as few as three mikes. But an often used technique might employ one microphone on each individual drum, with the mikes panned in a semicircular arc, emulating the sound that a drummer would hear sitting at the drums: the high-hat just to the left, the ride cymbal on the right, the snare and kick drums in the middle, and the tom-toms sweeping around the arc of a semicircle. The sound we hear through our speakers and headphones, however, is typically much better than the drummer actually hears, because the mikes are placed adjacent to each sound source. That way, each percussive component conveys the sound it would if your ear were right next to it! Stevie Wonder was one of the first recording artists to do this, working with engineers Malcolm Cecil and Bob Margouleff, on his album *Music of My Mind* (Motown 37463-314).

The same is true with vocals. The engineer typically places a very sensitive microphone an inch or two in front of the singer. This makes it sound as though your ear were in front of the singer's mouth. On ballads, this adds intimacy to the performance, especially when heard over headphones; with heavy metal, it adds a great deal of power and gives the vocals a presence that keeps them from being submerged by the other instruments in the mix. In real life, of course, our ears are never just two inches from a singer's mouth, but through recordings we can experience this illusion. For

years, my favorite example was Paul McCartney's vocal on "Honey Pie," from *The Beatles* ("The White Album"). On this recording, the mike, probably a Telefunken M49, is so close to McCartney's mouth that you can actually hear his lips part just before he pronounces the "p" in the word "pie"; when he sings the word "crazy," you can hear the air moving as he sets his mouth to pronounce the "c." Recently I found a recording that conveys this effect even better—Aimee Mann's vocals on "Jacob Marley's Chain," from her album *Whatever* (Imago 72787-21017). Using Neumann's version of the M49, a U49 mike, she artfully uses vocal dynamics to create the illusion that she is practically whispering the song in your ear. Mixing engineer Bob Clearmountain (one of the best in the business) added a great deal of compression to the vocal to even out the dynamics, so that loud

and soft passages appear to be at the same volume even as Mann goes from very soft to very loud.

Now imagine listening to a group where *all* the instruments have been recorded with the microphones positioned in this manner. This is called "close miking," and it is how most rock records are made. The listener experiences the ultimate in hyperreal perspective, hearing each instrument as if it were located right next to the ear, all at the same time! This is equivalent to the rapid edits in a movie, except with albums, you, the listener, get to decide when to switch your attention from one instrument to another, or whether to take in the whole sonic panorama.

Because visual information is spread out across space, whereas auditory information is spread out across time, the two sensory experiences are fundamentally different. When we shift attention from one visual stimulus to another, we have to move our eyes; to shift attention from one auditory stimulus to another, we don't move our ears; instead, our ear/brain system focuses on a different aspect of the sounds impinging on our eardrums. In a musical performance, we can concentrate on an individual instrument or on the whole (the "gestalt"). In a visual performance, such as a movie, we can gain the equivalent degree of control only if we are provided with multiple views, when the director splits the image up into several parts, or shots.

REVERBERATION REVERBERATION

In the old days, engineers would take Elvis Presley's vocal and play it through a speaker in the corner of a small, tiled room, picking up the sound of the room reverberations with a microphone suspended from the ceiling. In recent years, the acoustic echo chamber has been replaced by digital reverberation simulators. Whereas the live echo chamber provided only one sound (ad-

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justing parameters like reverb time required moving the mike around in the tiled room), the modern devices simulate dozens of spaces, from a small tiled room to a recital hall to a large cathedral. Because each instrument can be run through special effects separately, you can hear something else on albums that you'd never hear in the real world: a band in which the snare drum sounds as though it were inside a 50-gallon oil drum or a guitar that sounds like it's underwater or a lead vocal that seems to be coming from the far end of the concert hall.

The various microphone techniques described earlier define the location of a sound in the left-to-right plane; reverberation defines a sound's location in depth. The three-dimensionality of recordings comes from the listener's impression that the various instruments occupy different positions front to back as well as in the left-to-right stereo field. By applying different reverb programs to different instruments, the depth of a recording is greatly increased, giving the sense that each instrument occupies its own place in the sonic landscape. With clever manipulation of phasing, engineers can even make it seem as if sound is coming from beyond the stereo speakers (not just between them) or that sound is coming from in front of the speakers (not just behind them). Engineer Bruce Swedien experimented with such placements on Michael Jackson's album *Bad* (Epic OE-40600) and on *Dangerous* (Epic EK-45400).

Of course, if used indiscriminately, all these techniques can produce cheap, gimmicky sound, but if used properly, they can create excitement. Performers such as Pink Floyd, The Beatles, and Laurie Anderson pioneered the use of the recording studio as another musical instrument to enrich their artistry, and this has now become commonplace.

EDITING

TRACKS

Multitrack recording brings with it another virtue, the ability to edit individual tracks. Remember that a rock band might record the "basic tracks" of their song first—the drums, bass guitar, and rhythm guitar. Because each instrument can be recorded on its own track, it is a simple matter to repair any mistakes on a given track without altering the other tracks. If the producer and the band decide that a particular take has the right "feel," they might decide to use it even if it contains mistakes. If the bass player played some wrong notes, or his or her timing was off a bit, it's easy to go back and fix just those notes. The engineer plays back the recording, and the bass player plays along. When the tape gets to the part where the mistake occurred, the engineer hits the "record" button for the bass player's track only. At that instant, the bass player's new performance is put on tape, erasing the old one. The engineer can then hit the "stop" button any time to stop recording and return to the portion of the bass track that was formerly recorded.

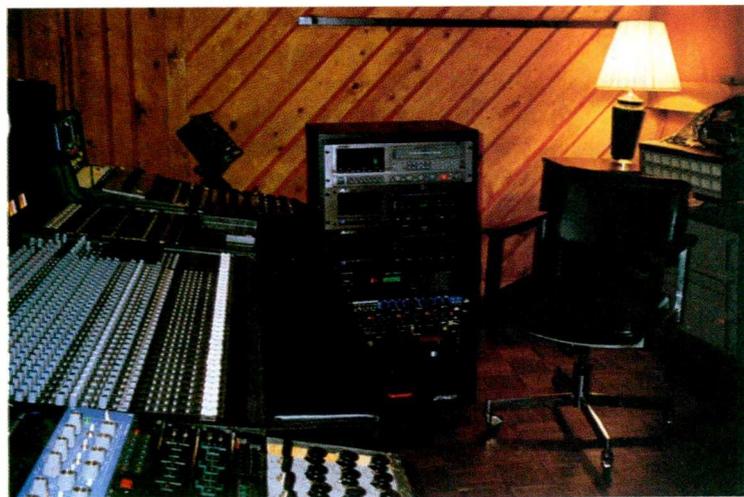
This technique is called "punching in." It's simple to punch in and out of very tight spots, especially with digitally-based systems that enable the engineer to program the "in" and "out" spots. It's not unusual, for example, for a musician to try to repair a passage with as little as a sixteenth-note space on either side of it. As long as an instrument was recorded on its own track, and was properly isolated from the sound of other instruments during recording, it's

difficult to tell a repair from the original. After spending 3½ minutes recording basic tracks, a group might spend several hours making repairs to those basics.

FIXING

FLUBS

Soloists and vocalists also routinely punch into a track. With new computer-based recording and processing, individual notes or groups of notes can be pitch-shifted or time expanded (or compressed in time) far beyond the limit of the singer's performance skills in real time. A cynic might view this as a way to "manufacture" an instrumental or vocal performance. But it gives artists a greater range of creative control to match sounds they hear in their heads even if they can't produce them physically. If you listen carefully, you can actually hear the "punches" in Michael Jackson's vocals on *Thriller* (Epic QE-38112) and on the Crosby, Stills



TWO VIEWS OF TIN PAN ALLEY RECORDING STUDIO
IN NEW YORK CITY.

PHOTOGRAPHS/PATRICK KLEIN.

and Nash song “Helplessly Hoping” from their album *Crosby, Stills and Nash* (Atlantic 82654). You can hear the punches because they occurred while the singers were taking a breath, and the punch interrupts the sound of them breathing in.

Interestingly, a musician with only marginal technique can use punching in to make himself sound better than he really is, creating flawless performances that he would never be able to deliver in real time. (I am a marginal guitarist, but on tape I border on good, only because I, like many of my friends, spend as much as six hours recording one eight-bar solo.)

Conceptually, punching in is equivalent to editing tape with a razor blade and splicing the tape. The difference is that punching in affects only one or a few tracks at a time, and editing usually involves cutting the entire piece of tape and splicing it to a new one. Symphony orchestras typically record an entire performance and then go back and replay any sections that contained mistakes. Later, an editing engineer, using digital technology, “cuts and pastes” in the fixes from the various takes. In traditional jazz, the combo might play several versions of the same song, but it would be an artistic scandal if two different takes were edited together, because jazz is primarily an improvisational form and each take is considered a complete and inviolable work.

Because jazz and classical sessions are recorded without overdubs, you might think they don’t require a plethora of tracks, but they are still commonly recorded multitrack so that mixing engineers can balance the relative levels of instruments after the session. In the case of classical works, many people believe this should be the conductor’s job and that engineers should not presume to change the balances that the conductor and orchestra have so carefully achieved.

COMPOSITE

PERFORMANCES

The practice of punching in fixes can be further extended by the technique of “compositing” performances. The ability of an artist to punch in and out of a track to make fixes eventually gave rise to the practice of creating composite tracks. Originally, an artist might have recorded two or three vocal takes, and then, along with the producer, picked the best take and systematically fixed any problems by punching in. Some time ago, a clever engineer figured out that he could mix and match the various parts of the three vocal takes, choosing the best parts from each and dubbing them onto an empty track on the tape.

Nowadays, some vocalists sing their part many times over several days, compiling perhaps 20 different takes of the same song. Then the singer, engineer, and producer will sit down with a lyric sheet and listen carefully to every take, indicating which contains the best version of any particular musical line. The engineer then creates a composite vocal track that combines all these distinct performances. Truly compulsive vocalists (who shall remain nameless) sometimes even edit to the level of replacing syllables. I’ve observed several compositing sessions in which the poor engineer had to extract a “th” from one track and an “e” from another, to create the perfect “the.” In this perhaps ultimate application of punching in, the result is a recorded performance superior to anything the artist has actually delivered, a genuinely “master” performance.

Once a composite master has been compiled, the artist, whether a singer or instrumentalist, studies and practices this master so he or she can duplicate it in concert. An example of a composite guitar solo is Jimmy Page’s solo on “Stairway to Heaven,” from Led Zepelin’s untitled fourth album. The solo was pieced together from several different takes to create the unified piece that appears on the album.

AUDITORY

IMPRESSIONISM

For several hundred years, beginning in the Renaissance, painters strived to bring increasing realism into their works. The discovery of the use of perspective, which had eluded earlier artists, laid the groundwork for fantastic advances in rendering scenes in oil with lifelike qualities. Around the middle of the 19th century, a popular movement overshadowed the realists; the impressionists endeavored to create scenes that didn’t rely on realistic depiction to convey their emotional message. What caused this sudden change in style?

One explanation offered by art historians is that the invention of the camera around 1840 meant that anyone, without any special training, could suddenly capture scenes realistically. Impressionism and cubism, in that view, were styles adopted to create engaging artistic works as a reaction to the ease with which realism could now be achieved.

Similarly, in audio, recording engineers sought for many years to create ever more realistic recordings, to recreate the sound of a musical group on stage in the listener’s living room. In classical, folk, and traditional jazz, this is still the norm. Naturalistic microphone techniques and a minimum of processing are used to attain this highly desirable goal.

One notable exception is the cycle of Beethoven symphonies recorded by Herbert von Karajan and the Berlin Philharmonic in the early 1980s. Karajan insisted that the instruments be close-miked. The result was a complete loss of the normal sense of acoustic depth in the sound field of the orchestra. Instead of the French horns sounding distant, at the rear of the orchestra, they and all the other instruments sounded up front, as though they were in your face. Many critics and the public found the recordings so disorienting as to be unlistenable. The Maestro was unabashedly pleased with the result, commenting that for the first time in his life, he could hear the orchestra as he had always heard it in his head.

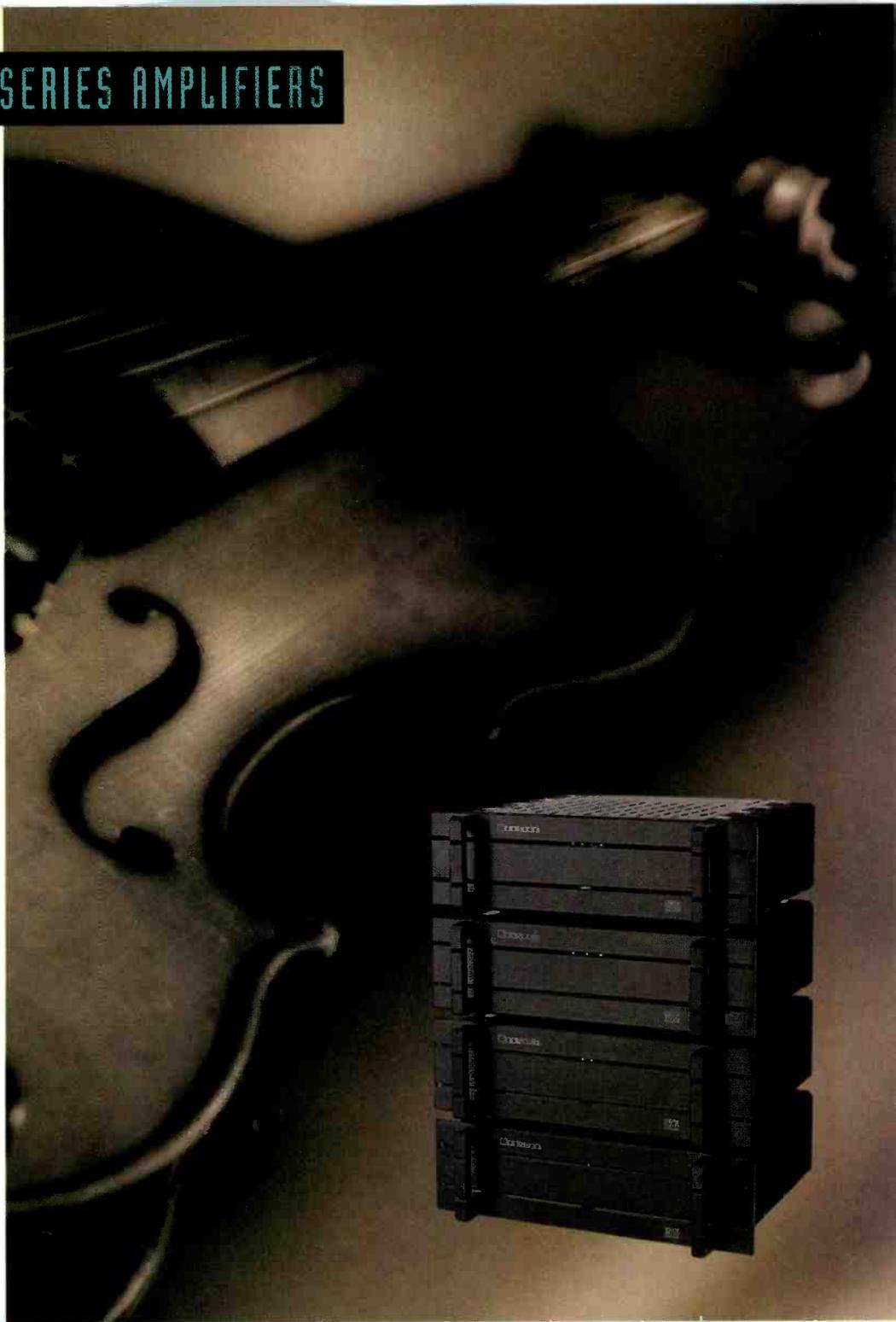
In the 1970s, recording technology reached the point where it succeeded in recreating the sound of a live band with great fidelity. The cutting edge of audio production since then has been to create something more than reality—to sculpt sound pictures that evoke feelings and thoughts unconstrained by reality, soundscapes that push the envelope of the technology available to create a sort of auditory impressionism. The ease of digital editing, of saving ephemeral sounds in a sampler and playing them back at any pitch, and of MIDI control of samplers, synthesizers, and effects processors, all contribute to the palette of tools the musician has available. Artists, producers and engineers are now able to create all the sounds they hear in their heads, not just sounds that could be produced in a live performance.

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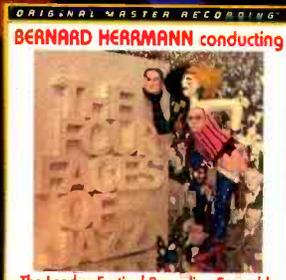
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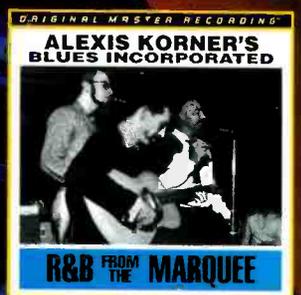
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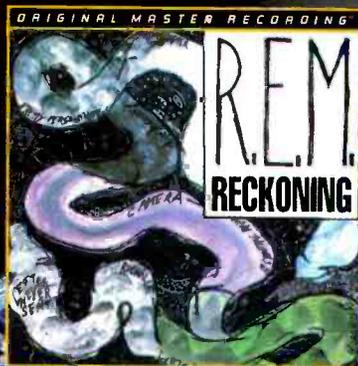
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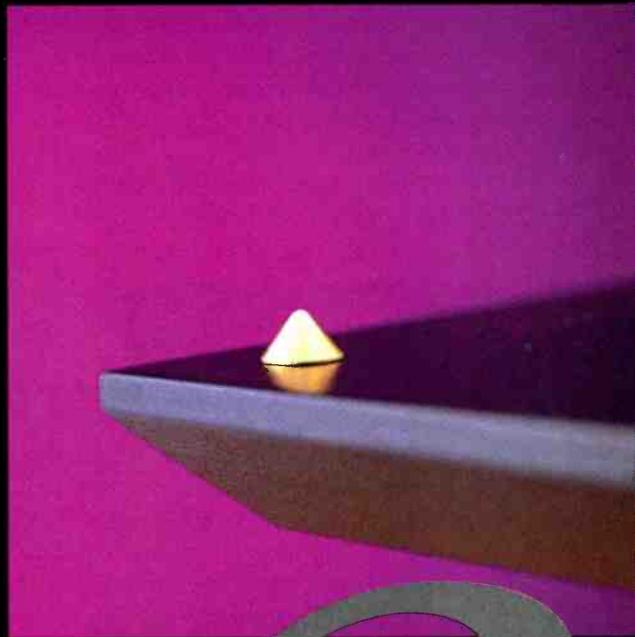
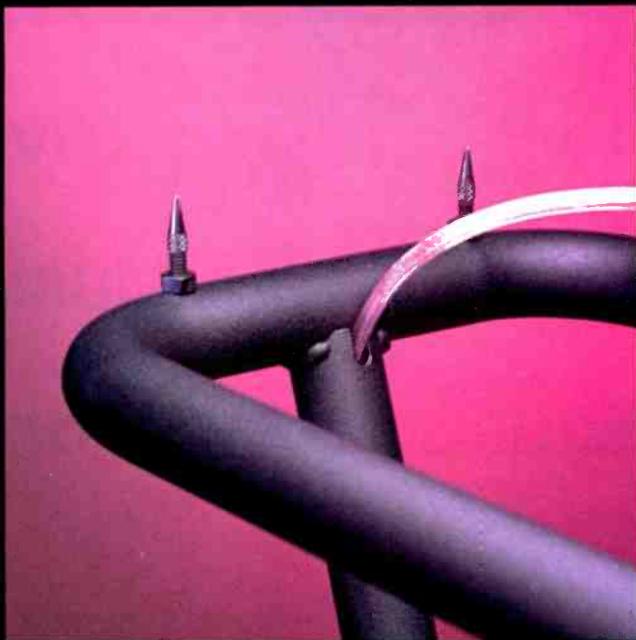
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The Euro Sat features a unique adjustment knob that allows speaker height and angle to be varied to perfectly match the requirements of your listening room.



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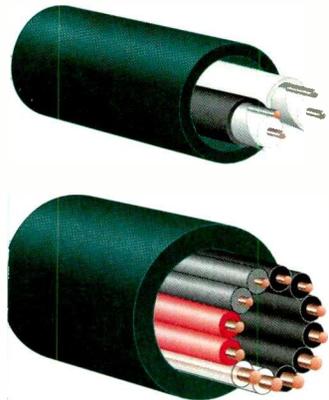
Euro Twenty Four

Euro Sat

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CIRCLE NO. 22 ON READER SERVICE CARD

The World of Accessories



Cutaway of cable construction. AudioQuest's Video S-Two (top) and AudioTruth (Forest).

Connections 3

"So many enthusiasts consider interconnects and loudspeaker cables an afterthought," said Jim Hassi, marketing manager of MIT. "They are integral components of any world-class system—whether for audio or Home Theater. This is one detail that demands your undivided attention, just like your CD player or television."

MIT, which stands for Music Interface Technologies, designs interconnects and speaker cables for a wide range of systems and tastes. "Although we have the MH-850 Reference



AudioQuest interconnects (top) and speaker cables are available for a wide variety of applications.



high performance at a more reasonable cost," Hassi noted. The new MITerminator 5 Series is based on proprietary technology for improving signal transfer efficiency between components and between amps and speakers. The new cables offer sonic benefits of increased

bass weight and resolution for enhanced imaging and soundstage. The new MITerminator 5 Speaker Interface Cables feature their new *iconn* Interchangeable Connector System so you can easily change the cable's connectors. This is great news for aficionados who constantly swap out components to build better systems.

The *iconn* system consists of an MITerminator cable with a basic Pin Base connector at each end. Pin Base connectors work with all "push-type" spring-loaded terminals found on receivers and bookshelf speakers. The



MIT's MITerminator 5 interconnect and *iconn* connector system.

base has a threaded section for other *iconn* connectors including regular banana, economy spade and large spade. According to Hassi, these four types fit the vast majority of terminals available today.

Naturally the connectors are gold plated for low resistance and contamination-free connections. Prices range from \$9.95 to \$24.95 per pair. Speaker cables featuring the breakthrough *iconn* system start at \$79 per 8-foot pair.

These new additions join the award-winning ranks of their predecessors. The MITerminator 2 Bi-Wire (at \$399 an 8-foot pair) won an Innovations '95 Award at the Winter Consumer Electronics Show. Another award winner is the RES-LinQ video cable, which restores film-like detail and depth.

Almost 20 years ago Ray Kimber started experimenting with cables. His goal? Simply the best sound possible. Today highly respected Kimber Kable

offers cables and interconnects ranging from the new Silver Streak to the legendary Model 88, The Black Pearl Reference Loudspeaker Cable (\$15,000 per 8-foot pair).

"The Silver Streak is the ideal interconnect for all upscale audio and video applications," Ray Kimber said. They have many of the company's most advanced technologies, including tri-braid VariStrand cable geometry, custom Teflon dielectrics and advanced metallurgical techniques. As its name implies, the Silver Streak features an AG VariStrand conductor made from hyper-pure silver. The ground plane consists of TCSS conductors with Teflon dielectrics. The Silver Streak is available with RCA or

XLR connectors, single ended or balanced. Prices start at \$120 for a .5 meter pair. Mr. Kimber added that for fans who longed for the benefits of The Black Pearl Model 88, the more affordable Model 33 and Model 38 will be introduced at the Winter Consumer Electronics Show this January. They use many of the patented technologies of

interconnects

the Model 88 with prices starting at \$1,920 per 8-foot pair for the Model 33. A new bi-wire cable will be introduced this Fall as well.

All quality cable and interconnect designers research the signal-carrying

GREAT
details
3
cables

You Need More Than Just Cable.

Any cable can transmit electrical signals from one component to another, or from an amplifier to the speakers. But, transmitting music takes more than just cable. The shapes of musical waveforms are incredibly complex and critical signal timings are measured in microseconds. Ordinary interconnecting cables or speaker cables cannot faithfully preserve these complex musical relationships across the full musical spectrum.

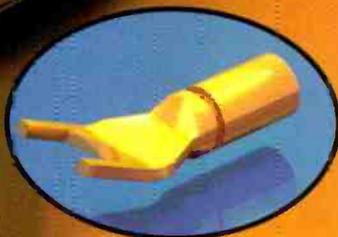
That's why MIT's founder literally invented high-performance interconnects and speaker cables. MIT® holds several basic patents in high-performance cable and interface design. These fundamental technology patents mean that only MIT can bring you interconnects and speaker cables scientifically designed to eliminate the nonlinearities and distortions caused by other cables, no matter whether the others cost tens of dollars or thousands.

If you choose your system components with care, listening for the subtleties of music that distinguish great components, then you need MITerminator™ interconnects and speaker cables. The hard science behind MITerminators reveals the full musical potential of your high fidelity stereo system. Until you use MITerminators, you'll never know how good your system can sound.

Patented MIT® Terminator Network

MIT's patented Terminator Networks are the heart of MIT's sonic superiority. These unique networks enable MITerminator interconnects and speaker cables to deliver better bass, clearer midrange and smoother treble sound, and to enhance the image, focus and soundstaging of every recording you listen to.

MIT's fundamental technology patents are your assurance that only MIT interconnects and speaker cables can transmit all of the sound quality that your program sources and stereo system components are able to deliver.



iconn™ interchangeable connector system

MIT's exclusive iconn™ system for speaker cable connections is so innovative, it has 3 patent pending, and every MITerminator speaker cable has it. Thanks to iconn's five interchangeable connector types, you'll always have the right connector to fit the terminals on your amplifier and speakers. iconn's gold-plated connectors assure ultra-low contact resistance and contamination-free connections for best sound quality.

New RCA connector

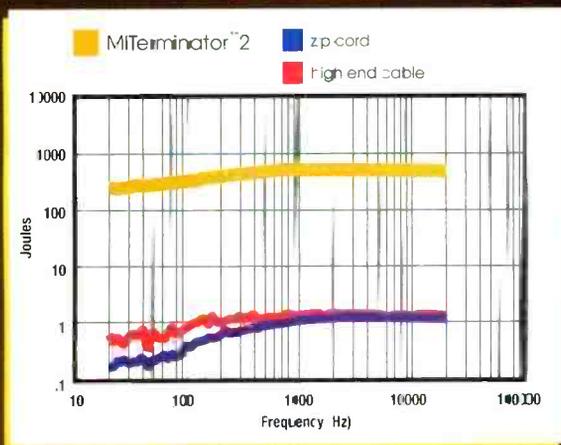
MITerminator interconnects now have new high-performance RCA-type connectors. These machined, gold-plated connectors feature bifurcated center-contact pins and multi-contact shield connections for unimpeachable signal integrity. They properly match the cable for highly efficient energy transfer and outstanding sound quality.

With MITerminator interfaces starting at just \$39.95 interconnect and \$79.95 speaker (MITerminator 5, not shown), MIT performance is truly affordable for any system.

More Than Just Cable!™



Why MITerminators sound better



Superior Final Energy Component

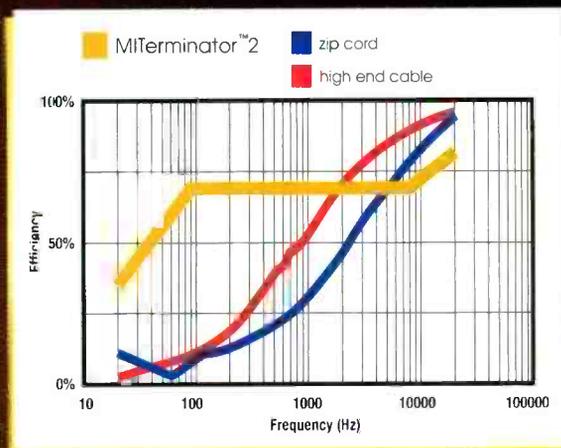
In transmitting electrical energy cables store and release energy. MIT® calls the amount of energy that is stored and released the Final Energy Component. Unfortunately, as shown in the plot, the Final Energy Component in ordinary 12-gauge "zip cord" and a typical high-end cable is non-linear — it changes value with signal frequency. This non-linearity inevitably causes distortion and the loss of both tonality and image integrity.

MIT discovered that increasing the Final Energy Component of cables already having outstanding electrical characteristics dramatically improves the overall sound quality. By employing the patented MIT Terminator Networks to store and release energy at the correct levels and times, nonlinearities are greatly reduced or eliminated. This superior Final Energy Component is a major factor in the superb sound quality of MITerminators.

Superior Efficiency

MIT quantifies how well cables maintain correct phase relationships between audio signals' voltages and currents as Efficiency. When cables maintain correct phase relationships, all of the signals' energy transfers to the next component or to the speaker with 100% efficiency. Ordinary cables' non-linearities make them much less efficient at low frequencies than at high frequencies, as the plot shows for "zip cord" and for an ordinary high-end speaker cable. The sonic results are noise, distortion, loss of image quality, and excessively "bright" treble sound.

As you can see from the plot, MIT's patented Terminator Networks give MITerminator cables a huge advantage over ordinary cables, raising low-frequency efficiency and "flattening" the overall curve. This means that MITerminator cables deliver far more accurate tonality and imaging, with lower noise than ordinary cables can. Although the plot shows speaker cables, the results also apply to interconnects.



Superior Imaging

In the accompanying graphics, you can see a three dimensional representation of the sonic image created by the audio system. The blue, red and yellow areas represent the image size while the musical note represents the image focus.

In the first room, using ordinary 12 gauge cable we can see that the image size (the blue ball) is very small and defocused—the note is blurry and undefined. In the second room, using conventional "high end" cable the image has become slightly larger and has moved forward between the speakers, but still lacks lifelike size and absolute focus (the note is still blurry). In the third room, the system is wired with MITerminator 2.

The superior Final Energy Component and superior Efficiency provided by the MIT Terminator technology provides a lifelike, focused, three-dimensional image. Only MIT's patented Terminator technology can achieve this level of performance in your system.



Experience the sonic improvements of MITerminators in your system!

Most MIT retailers offer a no-risk home trial program.
Call 916-888-0394 or Fax 916-888-0783 for the location of your nearest authorized MITerminator dealer.

Our components make your components sound their best.™

Music Interface Technologies™ MIT products are manufactured and sold by CVTL, Inc., Auburn, CA, USA
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CIRCLE NO. 16 ON READER SERVICE CARD

Closeup of Kimber Kable's Silver Streak interconnects made of hyper-pure silver.



Single Ended
AGSS positive
TCSS grounds

Balanced
AGSS signal positive
AGSS signal inverted
TCSS ground

GREAT details 3 cables

properties of a variety of materials—whether it's the purest copper or silver. Pure music—with little discoloration—is the Holy Grail.

"Using multiple solid conductors in multiple sizes is a very effective technique for reducing distortion. Several years ago, AudioQuest Crystal speaker cable was the first model to use different sizes for multiple conductors. Now every model from Type 4 on up has been refined and improved using very carefully selected varieties of conductor size," reported Bill Low, president of AudioQuest. He laughed when he said multiple sizes weren't used because "the highs go down the little wires and the bass goes down the big ones. Since our speaker cables use multiple conductors we have the opportunity to minimize sonic signatures by using multiple strand sizes. Instead of a single character there are two or three different but related characters that work together to defocus the presence of any character." Low said there is no such thing as the perfect wire, simply those that minimize coloration and distortion. "Ten years ago we made a speaker cable called Type 12. The stranded conductors in this cable look pretty crude to us today but one of the reasons this cable was so superior in its day was the use of 26, 28 and 30 American Wire Gauge

(AWG) strands. So long as we can continually refine the basic ingredients, we'll never stop trying."

Along with a wide variety of speaker cables, audio interconnects and video cables AudioQuest also offers ways to clean up your AC power. No detail ever gets overlooked in the quest for the best audio and video experience. According to Mr. Low, all AudioQuest AC power cables include a large ferrite bead to reduce Radio Frequency Interference (RFI). RF Stoppers' "beads" filter the magnetic field at RFI frequencies so they can't travel inside the wire. They're available integrated into power cords or as clamp-ons (RF Stoppers Jr. and Sr.). "AudioQuest AC power cables are about preventing distortion, period," Mr. Low noted. The same holds true for the company's newly designed RCA connectors which are so critical for video applications.

Methods, materials and approaches may change from company to company. However, they all share one thing in common...no detail is too small for the best home entertainment experience.

Form and Function

"We all know the joy of bringing home a new component. Inside the carton is a state-of-the-art power amplifier, loudspeaker...even a television," said Jim Wohlford of Sanus Systems. "Then it's the classic dilemma: Where do I put it? We've been solving that riddle for years with some of the most attractive and affordable audio/video furniture furnishings available." Sanus Systems is, in fact, the largest manufacturer of speaker stands and component racks. The experts continually rave about the quality, the fit and finish. *Audio* magazine gave the Ultimate Foundations speaker stands a Grade A+ and said: "What difference can good stands make? Lots."

The Ultimate Foundations are designed to be the finest speaker supports available, offering complete stability, minimal diffraction, freedom from resonance and, of course, attractive design. The stands can be easily filled with sand or shot. The top plate damping system, coupled with an attractive Fountainhead base plate, ensures a very quiet design. Fountainhead material

looks and feels like marble but has excellent acoustic properties. Wohlford said the company's speaker stands are available in the new Series Two Reference and Steel styles ranging from 16- to 28-inches high.

One of their newest designs are the Euro Foundations loudspeaker supports, a new styling without the utilitarian feel of many others on the market. Like all Sanus Systems stands, they are rigid and quiet. They have models specifically designed for bolt-mounted satellite and surround speakers, adding a designer's touch to your Home Theater system. They can be filled with sand or shot and have adjustable floor spikes. Depending on your decor, there are also Natural and Basic

stands

Foundations with black lacquer, oak and walnut finishes. "We constantly look at the details," Mr. Wohlford said. "Our Natural Foundations have concealed speaker wire path to keep everything tidy and not detract from the stands themselves." Natural Foundations range from 7- to 28-inches high and the Basics are available in heights from 5 to 31 inches.

While speaker stands are integral to any music system, what happens when your list of components expands? "We



Sanus Systems has an extensive array of speaker stands and design options.



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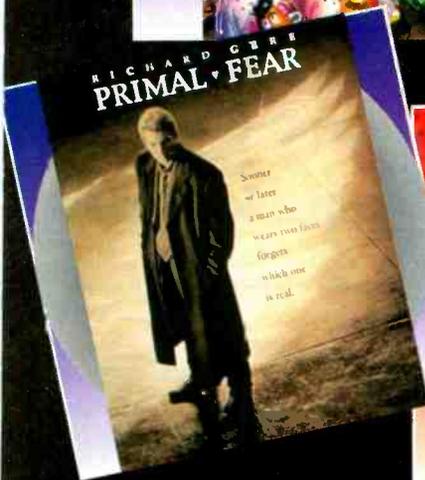
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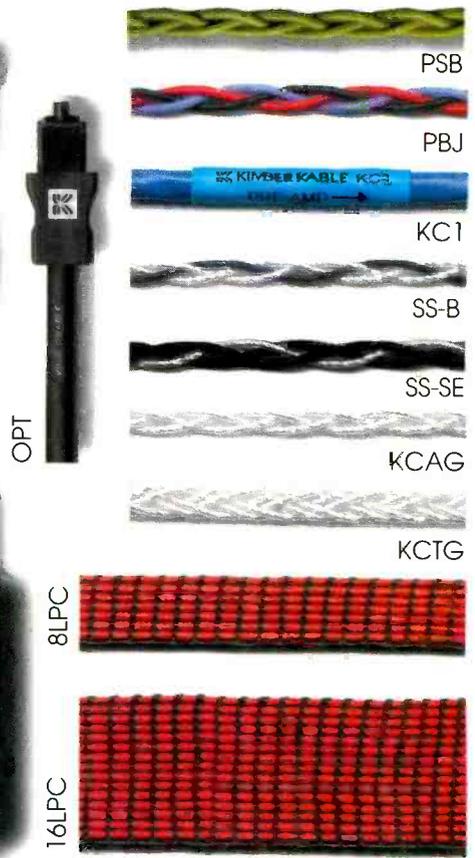
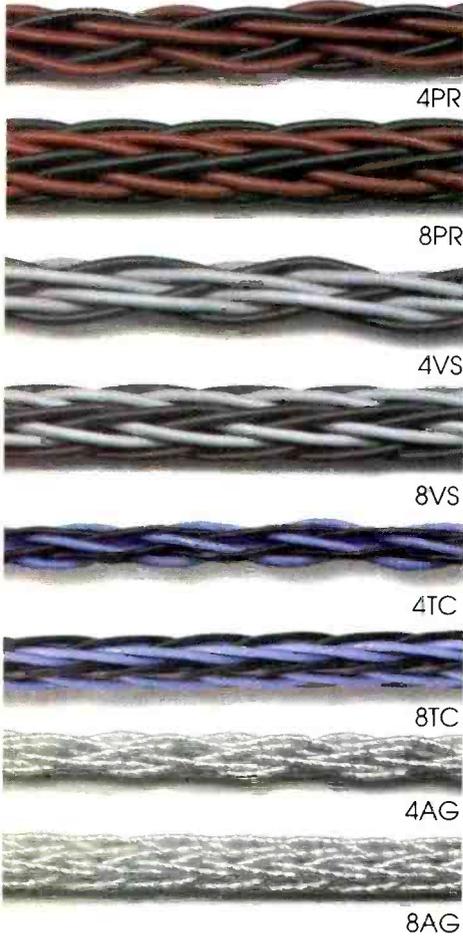
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You don't want these! ☹️

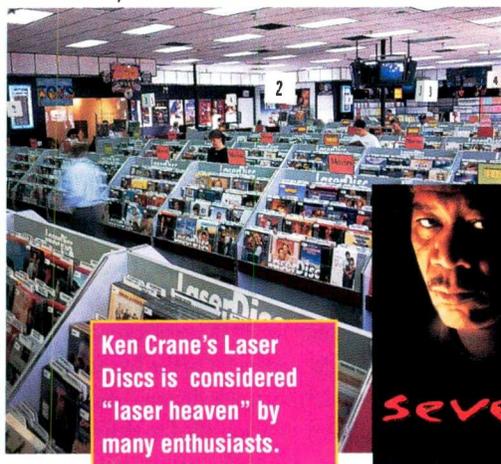


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 you will need them! 😊
 CIRCLE NO. 11 ON READER SERVICE CARD

find enthusiasts constantly rework their systems. What happens when they want to buy a new D/A converter? With many shelf systems they're locked in to a specific amount of gear. Our versatile Component Foundation systems can grow with you. You simply buy another modular shelf. And they're unbelievably rigid," Mr. Wohlford noted. Trim kits are available to blend with Sanus Foundation speaker stands for a truly seamless design.

As more people combine their music and video systems for Home Theaters, Sanus Systems developed complementary video furniture. There are new Euro



Ken Crane's Laser Discs is considered "laser heaven" by many enthusiasts.



GREAT details 3

software

there's no need to compromise on style or acoustics," Mr. Wohlford said.

Incomparable Software

As more enthusiasts re-create the movie theater experience in their homes, they meticulously add cutting-edge components to their systems. And for Home Theater sound, nothing matches the impact of Dolby Digital (AC-3). The new 5.1 multichannel digital surround sound provides six discrete channels, including front left, center, right, left surround, right surround and the "point one" output for low frequencies. "Once properly set up in your home, the impact is tremendous," said Pam Crane of Ken Crane's Laser Discs. "And there is still only one form of

video software with Dolby Digital encoding—the laser disc." Ms. Crane pointed out that although the Digital Video Disc (when introduced) will feature Dolby Digital, it will be "many years before the library of titles is anywhere near the 9,000 on laser disc. There are over 50 discs featuring Dolby Digital so consumers can enjoy it now—not sometime in the future."

She pointed to the recent winners of the Optical Video Disc Association's Fifth Annual Discs of the Year balloting as just a sample of some of the great entertainment on laser disc. "Almost all were widescreen versions so you see everything the director intended. They were mastered using the THX benchmarks for the best audio and video quality. And many winners had Dolby Digital soundtracks." She noted that the newly remastered *Amadeus* won the

award as the Best Special Edition and was placed in the Hall of Fame as Best Overall Disc. "The combination of Mozart's music and the lush sets makes this one a customer favorite," Ms. Crane said. Other Dolby Digital award winners included *Lion King*, *True Lies*

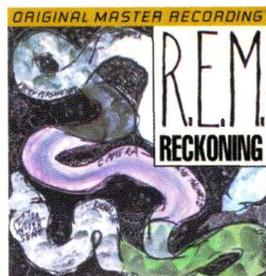
and *Dr. Zhivago*.

"To give you idea of the depth and breadth of the laser library, look at the music winners," Ms. Crane said. *U2: Rattle and Hum* won for Best Popular Music, *Pavarotti & Friends 2* was Best Classical while *Swing, Swing, Swing*, a compilation of classic movie shorts, was the Best Jazz winner. "There's still no question about it. If you want the best prerecorded video with advanced audio soundtracks, the only answer is the laser disc." Ken Crane's Laser Discs in Westminster, CA is the largest laser disc store (software only) in the U.S.

As we all know, movies are just one part of the home entertainment experience. There's this little detail called music, the reason enthusiasts worry about all their components, including cables and furniture. Mobile Fidelity Sound Lab has a passion for music at its best, whether it's on vinyl or compact disc.

Mobile Fidelity was one of the first companies to produce reference-level CDs, the Ultradisc series, the original limited edition 24-karat CD. Some of their latest releases include classics ranging from *Bing Crosby Sings Whilst*

Bregman Swings to Goo from Sonic Youth and artists as disparate as REM, Nirvana, The Moody Blues



and Eric Clapton. Mobile Fidelity, like the Moody Blues searching for the lost chord, constantly improves their mastering and manufacturing techniques. They're most proud of the GAIN System, a new mastering technology introduced three years ago. GAIN (Greater Ambient Information Network) was a complete upgrade of analog and digital components. Translation: GAIN delivers more detail and stable imaging. The GAIN system is used for Ultradisc II compact discs and their latest Anadisc 200 vinyl LPs. The classic albums are half-speed mastered, super 200 gram vinyl, numbered limited-edition discs. ●

Buyers' Guide

For more information, please write, call or contact the manufacturers below.

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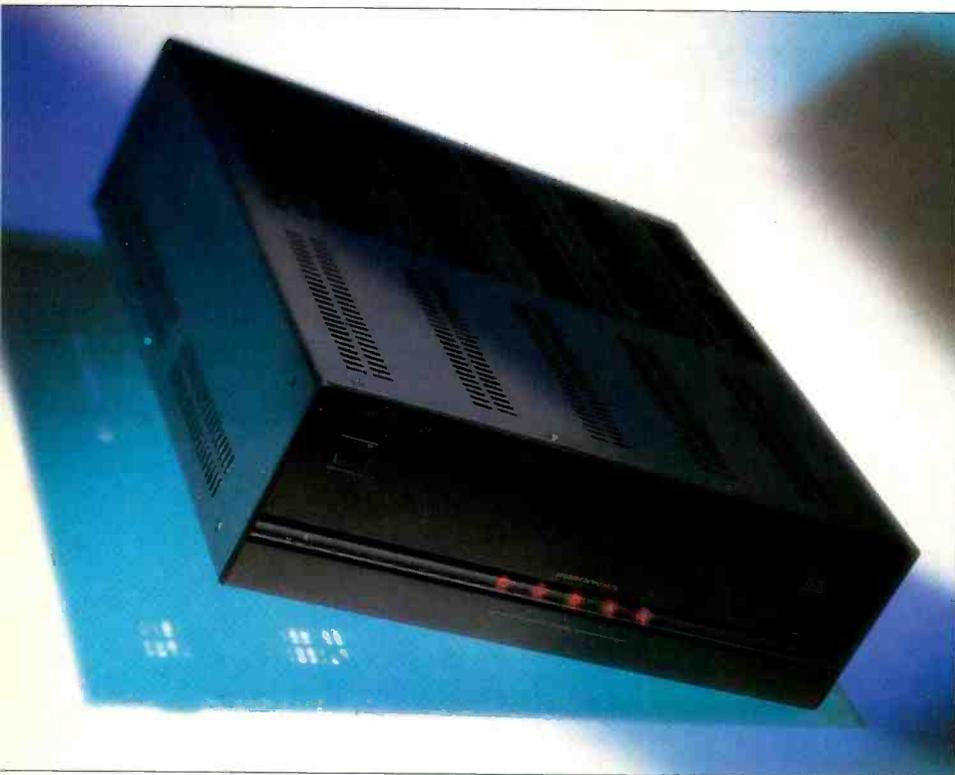
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This special advertising section was specially prepared for the publisher of *Audio* magazine. None of the magazine's editorial personnel were involved.

EDWARD J. FOSTER

CARVER AV-705X FIVE-CHANNEL AMPLIFIER



Mid-power home theater power amps—by which I mean those of the 100-watt-per-channel ilk—come increasingly in five-channel format, and for a simple reason: Most people who buy a

subwoofer these days opt for the powered variety, so there's no need for a sixth amp channel to drive it. If you want more than 100 watts/channel or so, however, going to a single-chassis amp can be a problem. It's

pretty difficult to shoehorn five 200-watt channels of power into a box that won't run hotter than a \$2 pistol or require Godzilla to move it. Leave it to Carver Corporation

to come up with a neat solution, dubbed Power Steering and introduced in the company's new Premiere AV-705x five-channel power amplifier.

The benefits of Power Steering in a home theater product are so obvious, it's surprising the idea didn't surface sooner. But it always takes someone to be first, and the Carver people seem to have a knack for not missing the forest for the trees—or does that go the other way around? No matter. I

expect it comes from living in the Northwest woods; all that fresh air must encourage Carver engineers to take a fresh look at problems.

**POWER STEERING
DIVERTS POWER FROM
CHANNELS THAT DON'T
NEED IT AT THE MOMENT
TO ONES THAT DO.**

Heretofore, multichannel home theater power amps were built like stereo amps, only with more channels. Yet the demands on them are likely to be quite different. In a stereo system, it's possible—indeed, probable—that both channels will be required to deliver equal power simultaneously (a mono signal demands that, for example). But the relative power demands of the various channels in a Dolby Pro Logic system are very unlikely to be the same at any given time, in part because the decoder dynamically detects the channel with predominant energy and steers a substantial portion of the signal there. Actually, energy is canceled out of the opposing channels, but the net result is the same: All channels needn't deliver maximum power simultaneously.

Power Steering capitalizes on this fact by adapting to signal conditions and, in effect, diverting power from channels that don't need it at the moment to ones that do, enabling the latter to deliver substantially more than “maximum” power as rated with all five channels driven equally. To clear FTC rules and qualify for THX certification (which the AV-705x carries), Carver has to rate the amp with all channels driven—under which conditions it is specified to deliver 125 watts per channel into 8-ohm loads—but the power supply and output stages are actually designed to deliver 200 watts into 8 ohms when the energy is predominantly in a single channel. It's kind of neat: something like dynamic headroom, but not exactly. Dynamic headroom describes an amplifier's ability to deliver extra *short-term* power, whereas the AV-705x will deliver upwards of 200 watts into any one channel all day and all night if you ask it to.

Rated Power Output into 8 Ohms, 20 Hz to 20 kHz, with 0.08% THD:
Stereo mode, 180 watts/channel; five-channel mode, 125 watts/channel.

Dimensions, with Handles and Feet:
5¾ in. H x 19 in. W x 18¾ in. D (14.6 cm x 48.3 cm x 47.5 cm).

Weight: 42 lbs. (19.1 kg).

Price: \$1,199.

Company Address: P.O. Box 1237,
Lynnwood, Wash. 98046-1237;
206/775-1202;

<http://www.carver.com>.

For literature, circle No. 90

The AV-705x is fully modular; each amplifier channel occupies its own glass-epoxy circuit board, has its own heat sink, is individually fused, and has its own DC-offset, shorted-load, and high-temperature sensing circuits. Each also has its own power-on delay, and when all five relays come on at once, the amplifier announces the fact with a mighty thwack.

Modular construction not only makes a component easier to build and service, but also offers certain technical advantages, not least of which is a short signal path. On the Carver AV-705x, input and output connectors (and the input-level control) are soldered right to the circuit board and protrude through openings in the back panel, so there's no internal wiring in the signal path. The input RCA jacks are gold plated, the output connectors, base-metal binding posts that accept up to 10-gauge bare wire or single banana plugs. (Although I'm not a fan of these binding posts, they do meet international safety requirements, which is important to a company like Carver that sells the same products worldwide.)

Except for a coupling capacitor between the level control and the Texas Instruments Excalibur operating-point controller IC, the amplifier is direct-coupled, fully balanced, and discrete throughout. There are only two gain stages, each running true Class A. The output stage is a triple-Darlington, complementary-symmetry emitter follower with parallel-connected pairs of triple-diffused planar transistors. These boast a 60-ampere output capability and a safe operating area large enough for them to handle 600 watts per channel.

The output devices drive the loudspeaker directly without the usual series inductor. Eliminating the inductor helps prevent output impedance from rising with frequency. In fact, Carver's schematic suggests that low, uniform source impedance was a primary design goal for the amplifier (the protection relay is inside the feedback loop,

for example, which helps reduce the impedance of the relay contacts). This type of design promises sonic benefits, but to be stable such a circuit must have exceptionally wide open-loop bandwidth, excellent performance prior to the application of feedback, and superior circuit layout.

Key to the last point (in Carver's view) is a double-stage ground-management system that isolates the amplifier's input from the nearby output connectors. In fact, Carver claims that the ground system offers an absolute solution to the problems of ground loops, separation loss, and parasitic oscillation and that the AV-705x will operate cleanly with no negative feedback at all while showing no signs of oscillation or input-to-output crosstalk or interference.

The AV-705x is constructed on a seemingly sturdy sheet metal chassis with an extruded aluminum front panel. Although the panel sprouts wings and handles, Carver does not suggest that the AV-705x be rack-mounted from the wings but rather that it be placed on a shelf. The wings are removable, enabling the amp to slip into a 17-inch opening. It needs at least 3 inches above and an inch of clearance on each side for cooling.

The front panel has a power rocker at the upper left and a green power LED beneath. Red LEDs for each channel light up when the amplifier is turned on (before the power-delay relays click in) and then are quenched. Once the amp is in normal operation, these LEDs serve as clipping indicators for their respective channels. A channel's LED will also come on and stay on if the channel mutes (that is, if a protection circuit has detected a problem and opened the output relay).



THE AV-705X'S FREQUENCY RESPONSE IS SUPERB AND TESTIFIES TO A VERY WIDEBAND DESIGN.

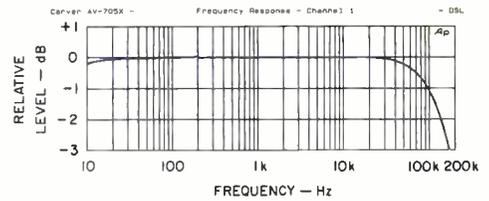


Fig. 1—Frequency Response.

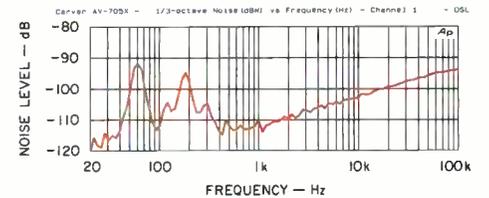


Fig. 2—Noise Analysis.

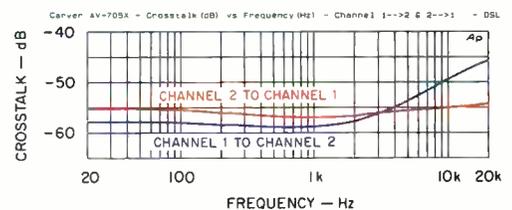
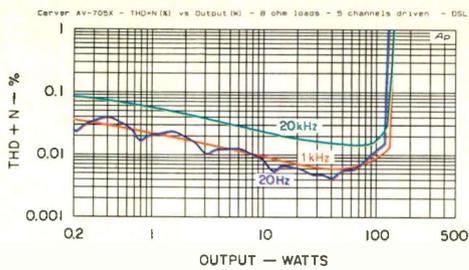


Fig. 3—Crosstalk.

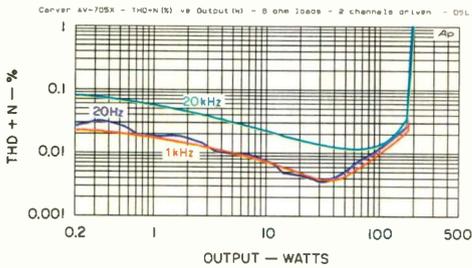
Measurements

I expanded my normal power-amplifier test sequence to evaluate Carver's Power Steering system. First, however, I made the usual basic measurements with all channels driving 8-ohm loads simultaneously. Frequency response (Fig. 1) is superb and testifies to a very wideband design, just as Carver claims. The third-octave noise spectrum analysis (Fig. 2) suggests some magnetically coupled hum at 60, 180, and 300 Hz but remarkably low power-supply ripple at 120 Hz. On an A-weighted basis, total noise came in at an excellent -94.4 dBW. Channel 1 input sensitivity was almost spot on the THX standard, and the gain of all channels was matched within a tight ± 0.06 dB. Input impedance was a solid 46 kilohms. Channel separation, measured between physically adjacent circuit boards (Fig. 3), is adequate but not so outstanding as this amp's other characteristics.

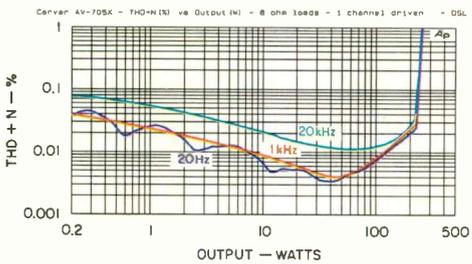
The three graphs of Fig. 4, which show the Carver's total harmonic distortion plus



A

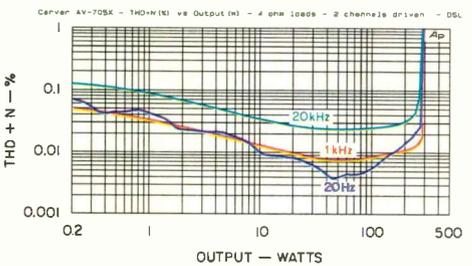


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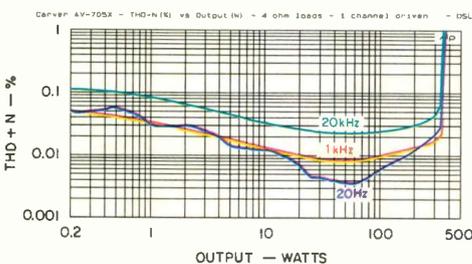


C

Fig. 4—THD + N vs. output into 8-ohm loads with five channels driven (A), two channels driven (B), and one channel driven (C).



A



B

Fig. 5—THD + N vs. output into 4-ohm loads with two channels driven (A) and one channel driven (B).

noise (THD + N) versus output level into 8 ohms at my three standard test frequencies (20 Hz, 1 kHz, and 20 kHz), were plotted under different conditions to evaluate the Power Steering system. For Fig. 4a, all five channels were driven; for Fig. 4b, only two channels were driven; and for Fig. 4c, just one channel was driven.

The Power Steering action is clearly evident. Based on the 1-kHz data, the Carver AV-705x delivered 145 watts per channel at 1% THD + N with all channels driven, 200 watts per channel with two channels driven, and 255 watts when only one was driven. On a decibel scale, which is more meaningful for power measurements, the maximum output rose from 21.6 dBW (five channels driven) to 23.0 dBW (two channels driven) to 24.1 dBW (one channel driven). Those are significant differences! (The bumpy appearance of the 20 Hz curves is unusual, but neither the amplifier nor the Audio Precision System One test equipment showed any signs of misbehavior; since the distortion is very low in any event, I'm not concerned.)

Note that the data in Fig. 4 represent measurements made on a continuous-power basis. I also used the IHF tone burst to measure dynamic power into 8 ohms with one, two, and five channels driven. With only one channel driven, the dynamic power and continuous power were the same, suggesting that the limiting factor under these conditions is the unloaded power-supply voltage. When additional channels are driven, more power is available dynamically than continuously, as one would expect. The dynamic-headroom rating (referenced to Carver's 21.0 dBW output specification) ranges from 1.8 dB to 3.1 dB, depending on the number of channels driven. All these figures are far better than the 1.1 dB Carver claims.

The two graphs of Fig. 5 show THD + N versus output with 4-

ohm loads. Figure 5a shows the situation with two channels driven, Fig. 5b with one channel driven. At 1 kHz, the AV-705x delivers more than 300 watts per channel with two channels driven and 390 watts with one channel driven before clipping, which I define as 1% THD. Not bad for a 125-watt amplifier. Carver does not specify power into 4-ohm loads, so I can't calculate dynamic headroom under those conditions, but I could and did measure dynamic power. It came out at 370 watts per channel with two channels driven and 415 watts into one 4-ohm load.



**THE BENEFITS OF CARVER'S
POWER STEERING
APPEAR TO COME
WITHOUT ANY OFFSETTING
DRAWBACKS.**

Figures 6a and 6b show THD + N versus frequency with 8- and 4-ohm loads. The 8-ohm curves were taken at 10 watts and at rated power (125 watts per channel) with two channels driven and, separately, with all five channels driven. Although more power is available into two channels than into five, as demonstrated by Figures 4a and 4b, the curves for distortion at rated power in Fig. 6a are virtually identical—the benefits of Carver's Power Steering system appear to come without any offsetting drawbacks.

I took the 4-ohm curves of Fig. 6b at 10 watts, 100 watts, and 200 watts with two channels driven. Lacking an official 4-ohm rating from Carver, I took 200 watts as the benchmark, because a Home THX power

amp is supposed to be able to deliver 28.2 volts rms into loads at least as low as 4 ohms and 28.2 volts is equivalent to 200 watts into a 4-ohm load. With either load, distortion is quite low. Figures 6a and 6b have a fairly expanded scale (0.001% to 0.1% THD), and distortion at rated output never tops 0.022% with 8-ohm loads or 0.030% with 4-ohm loads.

**POWER RESERVES SEEMED
ENDLESS, AND ON MUSIC,
THE SOUND WAS CLEAN,
SILKY SMOOTH, AND
EXTENDED.**

Clearly, Carver has met its targets of wide bandwidth, low distortion, and a maximum output capability that increases as fewer channels demand full output simultaneously. The final desideratum was low, uniform output impedance. I'd say the company met this goal, too.

I should point out that there are several ways to measure output impedance and the related specification, damping factor, and the results do not necessarily come

out the same. I usually follow the procedure spelled out in the EIA/IHF amplifier standard, which is to force a 0.3536-ampere current (equivalent to 1 watt into 8 ohms) into the amplifier's output, measure the voltage at the output terminals, and calculate output impedance and damping factor from that.

Measured by that procedure, the IHF damping factor (taken at 50 Hz) is an excellent 415, implying an output impedance of just under 20 milliohms. As shown in "Measured Data," output impedance rises negligibly across the frequency spectrum. At 1 kHz it is only 21.1 milliohms, and at 20 kHz, 31.4 milliohms. In my book, that's first-rate performance.

Use and Listening Tests

The Carver AV-705x performed exceptionally well in my home theater. On Sturm-und-Drang shoot-em-ups, the reserves seemed endless, and on music, the sound was clean, silky smooth, and extended. To me, that's important, because it makes the AV-705x as useful

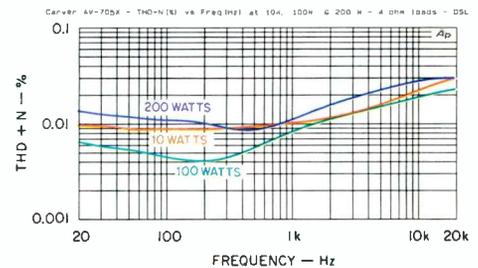
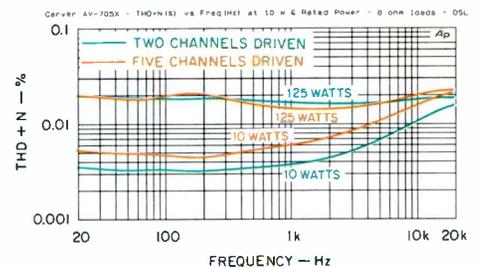


Fig. 6—THD + N vs. frequency with 8-ohm loading (A) and with 4-ohm loading (B).

in the surround-sound music systems that will ultimately arrive with DVD-Audio as it is in today's home theater.

That brings up the question of whether Power Steering will be as worthwhile with discrete multichannel recordings, such as Dolby Digital (AC-3) soundtracks, as it is with steered Pro Logic decoding of conventional matrixed surround. Only time will tell, but I've got a hunch it will be. Except for disaster sound effects, like the world blowing up or the ground splitting open under me (in which case, I don't think I'll be able to tell if my amp has run out of steam), I expect that movie sound will remain unbalanced in its moment-to-moment channel power requirements. The same is likely to be true of surround-sound music. Indeed, the very concept of sound localization implies an unequal power distribution among channels on a moment-by-moment basis. So, I think design techniques such as Carver's Power Steering will continue to be useful as surround technology moves beyond Pro Logic. But if I'm wrong, so what? Even if you factor out the benefits of its Power Steering feature, the Carver AV-705x is a great amplifier. And, with a suggested retail price under \$1,200, it's a terrific bargain.

MEASURED DATA

Output Power at Clipping (1 kHz, 1% THD): Five channels driven, 145 watts/channel (21.6 dBW) into 8-ohm loads; two channels driven, 200 watts/channel (23.0 dBW) into 8-ohm loads, 305 watts/channel (24.8 dBW) into 4-ohm loads; bridged (one channel driven), 255 watts (24.1 dBW) into 8-ohm load, 390 watts (25.9 dBW) into 4-ohm load.

Dynamic Output Power: Five channels driven, 190 watts/channel (22.8 dBW) into 8-ohm loads; two channels driven, 215 watts/channel (23.3 dBW) into 8-ohm loads, 370 watts/channel (25.7 dBW) into 4-ohm loads; bridged, 255 watts (24.1 dBW) into 8-ohm load, 415 watts (26.2 dBW) into 4-ohm load.

Damping Factor re 8 Ohms: 415 at 50 Hz.

Dynamic Headroom: +1.8 to +3.1 dB re rated five-channel continuous output into 8 ohms.

THD + N, 20 Hz to 20 kHz Five Channels Driven: 8-ohm loads, less than 0.022%; 4-ohm loads, less than 0.030% at rated power and at 10 watts out.

Output Impedance: 21.1 milliohms at 1 kHz, 23.4 milliohms at 5 kHz, 27.2 milliohms at 10 kHz, and 31.4 milliohms at 20 kHz.

Frequency Response: 20 Hz to 20 kHz, +0, -0.05 dB; -3 dB below 10 Hz and above 169 kHz.

Sensitivity: 98.2 mV for 0 dBW (1 watt) out.

A-Weighted Noise: -94.4 dBW.

Input Impedance: 46 kilohms.

Channel Separation: Greater than 49.5 dB, 100 Hz to 10 kHz.

Channel Balance: ±0.06 dB.

When you've got questions about Audio and Video,

see a specialist

Q

How much do I need to spend to have a really good home theater?

A

How much have you got? "Home Theater" is a loose term used to describe a mixture of different audio/video components; from the simple hookup of an inexpensive 20 inch TV and a modest stereo system, to an extravagant commercial quality AC3/THX sound system with a loft screen data-grade projector, line doubler and elegant theater decor, costing six or even seven figures. The answer is a balance between budget and expectations. If you are currently watching a 20 or 27 inch TV and listening to it in monaural through the internal four inch speaker, a simple hookup to an inexpensive stereo receiver and two speakers can be very exciting. If you are already enjoying TV in stereo or surround-sound, you'll need to spend a lot more to get your heart pumping. In short, a home theater can cost as little or as much as you want it to. My recommendation is to audition home theater systems at several different price levels. If your expectations don't exceed the limits of your budget, you can decide at that point how much to invest in upgrading your system to create your own "mini-movie palace".



—Bill Behrens
Behrens Audio Video
Jacksonville, FL

 **Behrens**
AUDIO • VIDEO

Q

Is there a way to have both a high quality music system and a good home theater system. If so how should I set the system up?

A

Yes. Our experience has found that any high quality music speaker also works well for home theater. Most small high quality bookshelf speakers may not be able to reproduce the bass levels required for home theater, we highly recommend using a powered subwoofer. To avoid system obsolescence, choose separate audio components which offer superior performance and flexibility over all in one receiver. Keep the main speakers equal distance left and right of the television approximately 6-10 feet apart for best imaging. The closer you get the main speakers to any boundaries (walls, cabinets, etc.) the more this will change the sound of the speakers. The center speaker should be placed as close to the center of the left and right speakers as possible. Bipolar speakers can be used as the rear speakers in Dolby Pro-logic systems, set up left and right but to the rear of the listening area approximately 6 feet above the floor. THX systems sound best with Dipolar speakers placed left and right but to the sides of the (AC-3) systems sound best with full range speakers placed left and right but to the rear, facing toward the listening area approximately 6-7 feet above the floor.



—Robert Haasch
Absolute Sound & Vision
Sheboygan, WI

 **ABSOLUTE**
SOUND & VISION

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

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

Q Why not buy my equipment "mail order" and "save lots of money"?

A When you're shopping for audio/video equipment it's tough to ignore the seemingly terrific deals offered by mail order companies. However, there is something you may not be aware of! Most of the "better" audio and video manufacturers carefully select distribution through specialist retailers. Each retailer has a limited territory which he is allowed to do business in, and cannot sell via the mail. What this means is the mail order company may not be an authorized dealer for the products they sell. Since they are essentially "reselling" to you, the item will not have a manufacturer's warranty because you are now the second owner. If you are thinking of making a purchase from a mail order company, call the equipment manufacturer first and ask if the company is an authorized dealer. If they're not, you may be in for a surprise if the equipment needs service. Buyer beware! See your specialist retailer.

—Jerry Heeson
GNT Stereo
Lancaster, PA



**GNT
STEREO**

Q Will the new DSS 18" satellite systems allow different channels to be viewed in different rooms?

A Yes! The basic DSS systems offered by most manufacturers limits you to one DSS channel per household at any given time. The deluxe DSS systems gives you the option of adding extra receivers in other rooms allowing a different DSS channel to be viewed in another room. By using the existing cable in the home or by running new cable, DSS channels, local antenna and/or cable can be supplied to any room in the house. There are many options available to any room in the new DSS systems. Talking to a qualified audio/video dealer will insure the correct option be chosen for your needs.

—David Sherman
Modern Music Audio/Video
Memphis, TN



D. B. KEELE, JR.

MIRAGE

MBS-2 SATELLITES, BPSS-210 SUBWOOFER, AND LFX-2 CROSSOVER

Mirage speakers are made by Audio Products International (API), which also makes Energy and Sound Dynamics speakers. The company manufactures its own drivers, crossovers, cabinets, and electronics.

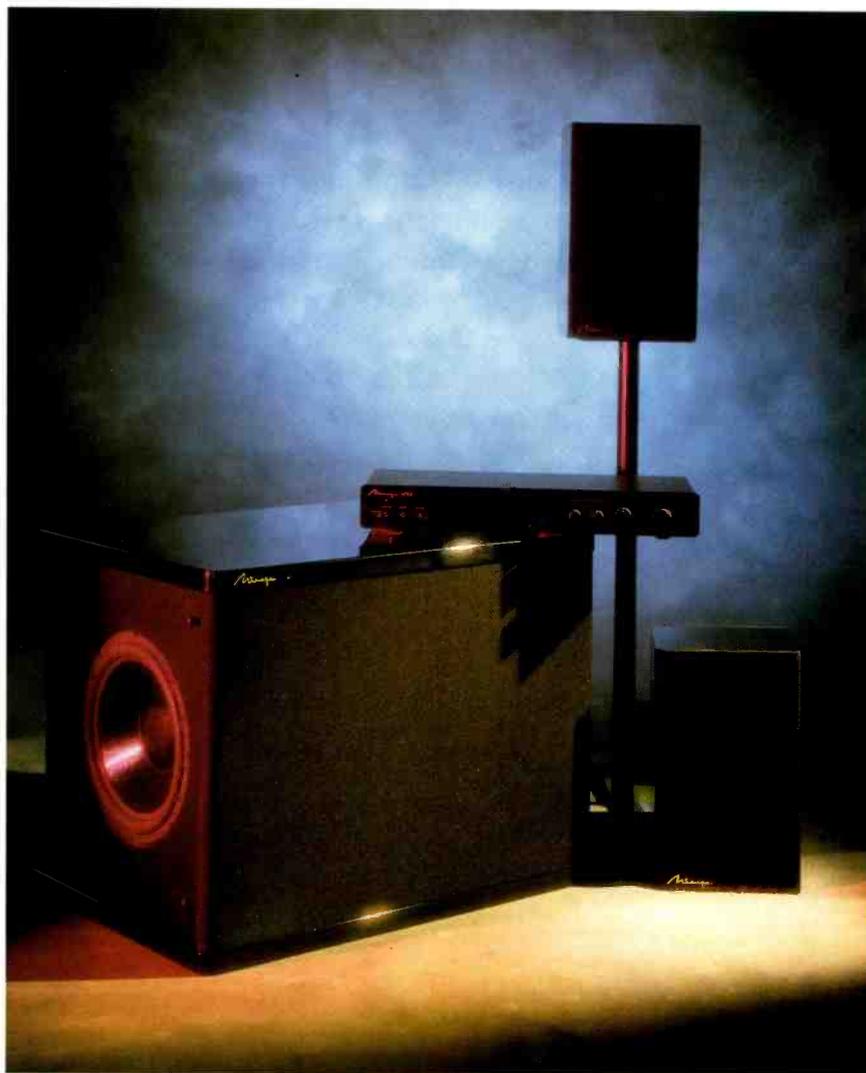
Mirage is best known for bipolar loudspeakers, which have identical sets of front and rear drivers that radiate in phase over the whole audio band. (This is different from dipolar loudspeakers, whose front and rear outputs are in opposite phase to one another.) To the best of my knowledge, Mirage introduced the bipolar concept, back in 1987, with its M1 loudspeaker. Currently, Mirage offers 26 speaker systems, both bipolar and front-radiating, at prices from \$200 to \$6,000 per pair. The line includes

**BOTH THE MIRAGE MBS-2
SATELLITES AND
BPSS-210 SUBWOOFER
ARE BIPOLAR DESIGNS.**

stereo, home theater, and in-wall speakers, as well as electronic crossovers.

Both the MBS-2 satellites and the BPSS-210 (Mirage's top subwoofer) are bipolar systems and are included in Mirage's high-end home theater line. But I used them, together with the Mirage LFX-2 electronic crossover, as a two-channel subwoofer/satellite speaker system.

The MBS-2 bipolar speakers have very compact, sealed enclosures, each holding two 5½-inch woofers and two 1-inch titanium-dome tweeters. One woofer and tweeter are mounted in a vertical line on the



front of the enclosure, while the other set of drivers is similarly arrayed on the back, and the two sets are connected in phase. However, the tweeter on the front of the enclosure is above the woofer, whereas the rear woofer is above its tweeter. When the MBS-2s are used as main-channel or stereo speakers, their fronts should face the listening area; when they're used for surround,

the speakers should be placed high on the side walls and facing sideways to the listening area (that is, with the drivers aiming to the front and back of the room). Wall-mounting hardware is supplied with the MBS-2, but I did all my listening with the speakers on stands.

A wall-mounted speaker gets more low-frequency assistance from room boundaries than a stand-mounted speaker away from the walls does. So the MBS-2's internal crossover has different settings for stand and wall mounting. With the wall-mount

setting, the speaker's bass output is decreased by about 6 dB below 200 Hz and the high-frequency response is raised slightly above about 10 kHz. The setting is selected by jumpers in the connection-terminal cup at the bottom of the cabinet. The crossover contains nine components (two resistors, two inductors, and five capacitors), forming a first-order low-pass filter on the woofer

Photos: Michael Groen

and a second-order high-pass on the tweeter. To protect the speaker against high-level bass signals, one or two of the crossover's capacitors (depending on the configuration) are in series with the speaker.

Identical grilles are supplied for front and rear. The grilles and cabinet form smooth, low-diffraction surfaces when the grilles are in place, and the MBS-2 should be used with both grilles on.

The BPSS-210 powered subwoofer's two 10-inch drivers have very high excursion. One driver is mounted at each end of a relatively large sealed enclosure. Since they op-

erate in phase, they move in opposite directions, so their inertial forces cancel; this has no acoustical effect, but does keep the cabinet from "walking" around the room when delivering high-amplitude signals. The enclosure is said to be extremely rigid and to incorporate a system to decouple low-frequency vibrations from the floor. Grilles mount on the sides and front of the cabinet, even though there are no drivers on the front.

The BPSS-210's built-in amplifier delivers 250 watts and uses servo feedback (from an accelerometer mounted in the center of each voice coil) to linearize the drivers' motions. Mirage says the servo system has a wide bandwidth of 3 to 300 Hz; it is equalized with pole/zero cancellation techniques that are said to reduce distortion by a factor of 270 (about 48 dB). The amplifier has feedforward internal error correction and circuits to protect against overload and driver overexcursion; it is a current-source (rather than the more common voltage-source) design, which means it has a relatively high output impedance. The subwoofer turns on automatically when presented with a signal at its single, gold-plated phono-style input jack. The input jack, power and "Stand-by/Operate" switches, as well as a large, finned heat sink, are on the amplifier's back panel at the rear of the enclosure. The subwoofer amp has built-in bandpass filtering, using a fourth-order Butterworth high-pass filter that is 3 dB down at 18 Hz and a second-order Linkwitz-Reilly low-pass filter that's 6 dB down at 100 Hz.

The LFX-2 active electronic crossover is a two-channel unit for use in a stereo setup with one subwoofer or a stereo pair of subs. (A three-channel version, the LFX-3, is also available.) The LFX-2 is quite versatile, with controls for selecting crossover frequencies between 50 and 100 Hz (in four one-third-octave steps) as well as "Shape" con-

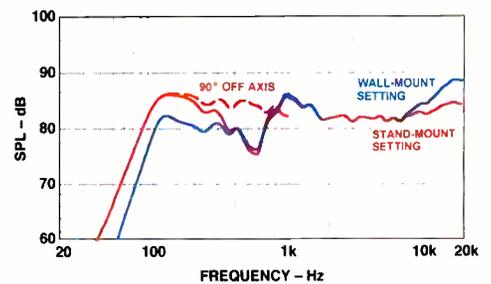


Fig. 1—On-axis frequency response of MBS-2 satellite.

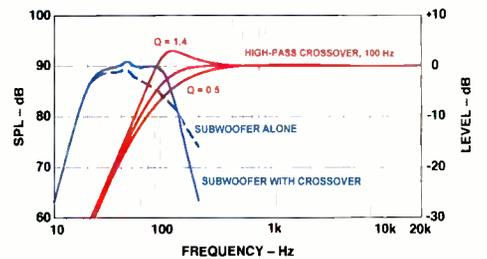


Fig. 2—Frequency responses of BPSS-210 subwoofer and LFX-2 crossover's high-pass filter.

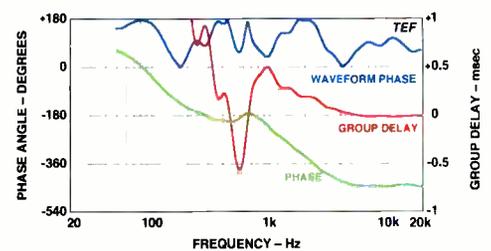


Fig. 3—On-axis phase response, group delay, and waveform phase of MBS-2.

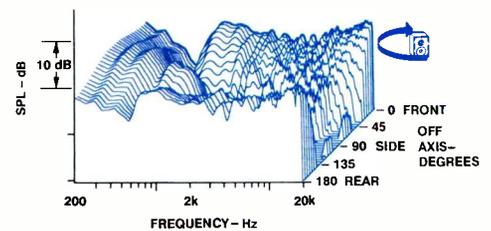
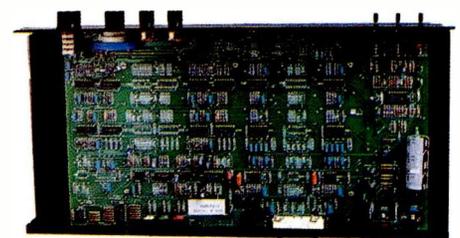


Fig. 4—Horizontal off-axis frequency responses of MBS-2.



Interior of LFX-2 crossover.

SATELLITES:

Rated Frequency Response: 80 Hz to 20 kHz, ± 3 dB.

Rated Sensitivity: 86 dB at 1 meter, 2.83 V rms applied.

Rated Impedance: 8 ohms, nominal.

Recommended Amplifier Power: 15 to 125 watts per channel.

Dimensions: 12½ in. H x 7¾ in. W x 7¼ in. D (30.8 cm x 18.7 cm x 18.4 cm).

Weight: 12 lbs. (5.5 kg) each.

Price: \$600 per pair; available in high-gloss black or white.

SUBWOOFER:

Rated Frequency Response: 18 Hz to 100 Hz, +0, -3 dB.

Rated Input Sensitivity and Impedance: 500 mV, 47 kilohms.

Dimensions: 24 in. H x 18 in. W x 18 in. D (61 cm x 45.7 cm x 45.7 cm).

Weight: 94 lbs. (42.7 kg) each.

Price: \$1,700 each; available in high-gloss black.

ELECTRONIC CROSSOVER:

Crossover Frequencies: 50, 63, 80, and 100 Hz, switch selectable.

Filter Slopes: Low-pass, 24 dB/octave; high-pass, 12 dB/octave.

Rated Input Impedance: 100 kilohms

Minimum Load Impedance: 10 kilohms

Price: \$500 each.

Company Address: c/o Audio Products International, 3641 McNicoll Ave., Scarborough, Ont., Canada M1X 1G5; 416/321-1800.

For literature, circle No. 91

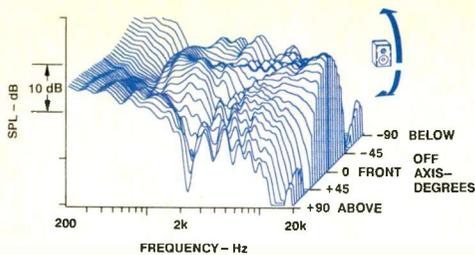
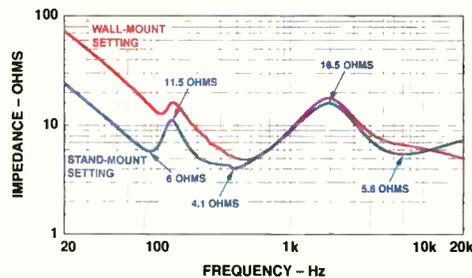
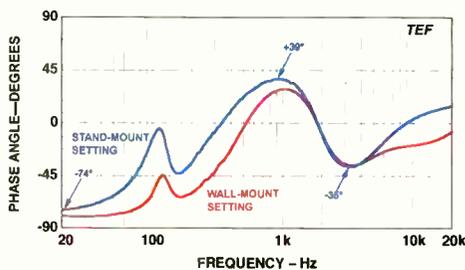


Fig. 5—Vertical off-axis frequency responses of MBS-2.



A



B

Fig. 6—Impedance magnitude (A) and phase (B) of MBS-2.

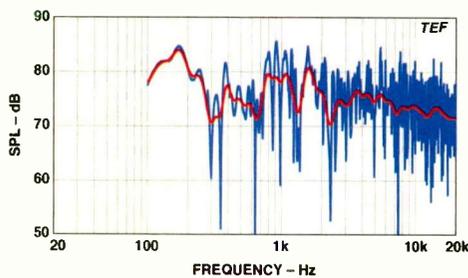


Fig. 7—Three-meter room response of MBS-2.



Rear panel of LFX-2 crossover.

trols for changing the Qs of the high- and low-pass filters and thus the shapes of their knees. The crossover also has a subwoofer level adjustment and a polarity-reversal switch, to optimize the blend between the sub and the main speakers. The power switch has a position that completely bypasses the crossover. Input and output jacks are on the rear panel and are gold-plated.

Measurements

Measurements were taken in a large anechoic chamber, and I smoothed the curves with a one-tenth-octave filter. The MBS-2's on-axis anechoic frequency response, with grilles on, is shown in Fig. 1 for both the stand-mount and wall-mount settings of the crossover. Also shown is an anechoic response with the system oriented sideways, which put the test microphone 90° off the axis and equidistant from both sets of the MSB-2's drivers.

With the crossover at its wall-mount setting, output below 400 Hz is noticeably reduced, averaging about 4 dB lower between 100 and 250 Hz. Above about 7 kHz, the curves for both settings rise, but the wall-mount curve rises more sharply, becoming about 4 dB higher than the stand-mount curve by 20 kHz. As mentioned earlier, the wall-mount setting's reduced bass roughly compensates for the low-frequency gain that occurs when a speaker is placed near room boundaries. The reason for this setting's treble boost is that the recommended placement for surround-channel reproduction will place listeners far off-axis.

With either setting, there's an octave-wide dip, about 6 to 8 dB deep, centered at about 560 Hz. The dip is caused by interference between the outputs from the front and rear drivers: The difference in path length from the front and rear woofers to your ears puts their outputs out of phase in that range,

causing cancellation. This is a common problem with bipolar speakers. With a larger model, the cancellation dip will occur at a lower frequency; for example, in the Paradigm Eclipse/BP (reviewed in the August 1995 issue), it occurred at 250 Hz. Orienting the system sideways eliminates the path-length difference and enables the outputs of the front and rear woofers to add constructively instead of destructively, as shown by the dashed curve of Fig. 1; for the MBS-2, this constructive addition occurs at points 90° off the vertical as well as the horizontal axis.

Overall, the response with the stand-mount setting is fairly well behaved except for the previously mentioned 560-Hz dip and a peak of about 4 dB centered at 1 kHz. That's about an octave above the dip, where the front and rear are essentially in phase again. Excluding the 560-Hz dip, the curve fits a fairly tight, 7 dB, window between 80 Hz and 20 kHz. With the dip, the window is a much looser 11 dB or so between 70 Hz and 20 kHz. Above 1.2 kHz, the curve fits a quite tight window just 3 dB wide, with the primary deviation being a slight rise in the response above 7 kHz. Response is significantly smoother with the grille on than off: Removing it caused a 2.5-dB peak at 4 kHz and a 4-dB dip 5.7 kHz (not shown).

Averaged from 250 Hz to 4 kHz, the speaker's axial sensitivity was a low 81.5 dB. To assess right/left matching, I measured four individual response curves from 200 Hz to 20 kHz on the right and left speakers, including both the front and rear responses. These four curves matched within 1 dB above 1 kHz and 1.5 dB below 1 kHz.

Figure 2 shows response curves for the BPSS-210 subwoofer and the LFX-2 active crossover. The curve for the subwoofer alone was taken at 1 meter in front of the cabinet, equidistant from the two side-mounted woofers, with an input signal of 50 millivolts rms; at 40 Hz, a 50-millivolt input generates about 89 dB SPL at 1 meter. The curve is quite smooth and exhibits a gentle rolloff above 40 Hz and a more rapid rolloff below 20 Hz. The LFX-2 electronic crossover can be used to extend this response, as shown: With the crossover, the response becomes much flatter, with -3 dB points at 20 and 100 Hz. For the curve shown, the crossover frequency was set at 100 Hz and the low-pass (LP) "Shape" con-

trol was turned fully clockwise, providing a boost of about 4.5 dB at the crossover point. The resultant response rolls off at 24 dB per octave below 20 Hz and above the 100-Hz cutoff.

Also shown in Fig. 2 is the effect of the "Shape" control on the LFX-2's high-pass response with the crossover frequency set to 100 Hz. Note the changes at the corner frequency with the high-pass "Shape" control fully counterclockwise ($Q = 0.5$), at its mid position, and fully clockwise ($Q = 1.4$). All the responses roll off at 18 dB per octave below 100 Hz and are ruler-flat from 400 Hz to 20 kHz. The response at higher frequencies continued very flat up to 100 kHz, the limit of my measuring equipment.

Figure 3 shows the phase and group delay responses of the MBS-2 satellite system, referenced to the tweeter's arrival time, as well as waveform phase. The phase decreases over most of the frequency range, except from 400 to 700 Hz. In that range, the phase dips at 500 Hz, then rises to a slight peak at 680 Hz; these phase undulations, which coincide with the range where the MBS-2 is subject to the bipole cancellation mentioned earlier, are due directly to the frequency-response dip in this band—they'd disappear if the axial response were flat through this range. Once past these ripples, the phase falls to 450° at 5 kHz and above. The group-delay curve exhibits a large dip in the cancellation band. The wiggles in the waveform-phase curve indicate that wave-shapes will not be preserved over any appreciable frequency range—a normal result for conventionally designed loudspeakers.

Figure 4 shows the MBS-2's horizontal off-axis responses. The bold curve at the rear of the graph is the on-axis response. Note that the response to the rear of the speaker is essentially the same as the response in front of it. Note also that, above 1 kHz, the off-axis high-frequency response decreases only until 90° (the side), then rises again until the response at the rear almost matches that at the front. In the range from 500 to 600 Hz, where the bipole's two woofers are in phase at the sides but out of phase in the front and

rear, you can see the 90° response standing out from the cancellation dips in the front and rear responses.

The MBS-2's vertical off-axis curves are shown in Fig. 5. The bold curve in the middle of the graph is on the front tweeter's axis. The curves are quite uniform except in the range from 1.5 to 6 kHz, which includes the speaker's crossover. Here, the off-axis response narrows and roughens. However, the response in this range is fairly uniform and smooth over the first 10° above the axis.

The MBS-2's impedance magnitude versus frequency is shown in Fig. 6a for both the stand- and wall-mount crossover settings. Unusually, the low-frequency impedance continues to rise as frequency decreases, because of the series protection capacitors in the crossover. Below 300 Hz, the impedance is significantly lower with the stand-mount setting than with the wall-mount setting. (Because I tested the MBS-2 only as a stand-mounted front speaker, I have annotated only the curve for the stand-mount setting, which also minimizes clutter on the graph.) This lower impedance draws greater power from the amplifier and hence yields greater acoustic output. Above 80 Hz, a maximum impedance of 16.5 ohms is reached at 2 kHz, the nominal crossover point. The speaker's minimum impedance is 4.1 ohms, at 370 Hz. Consequently, if you wish to keep response variations from cable-drop effects within ± 0.1 dB, cable series resistance should be limited to a maximum of about 0.063 ohm. For a typical run of about 10 feet, that would mean 14-gauge or heavier low-inductance wire.

The MSB-2's impedance phase versus frequency is shown in Fig. 6b. The phase approaches -90° at low frequencies because of the series protection capacitors. The wall-mount configuration's impedance phase approaches -90° faster than the stand-mount configuration's as frequency

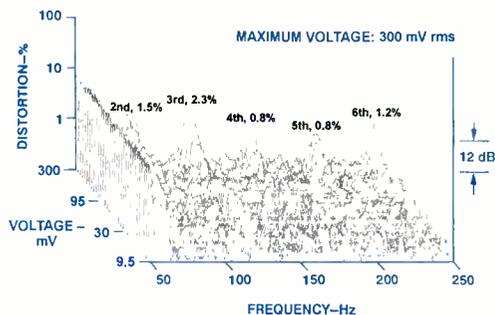


Fig. 8—Harmonic distortion of BPSS-210 for E_1 (41.2 Hz).

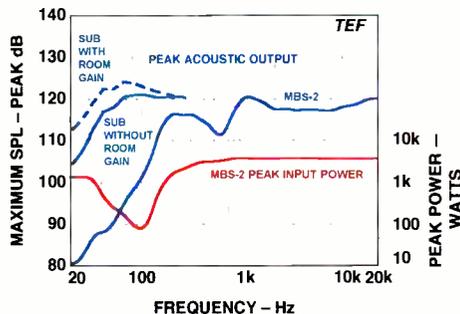


Fig. 9—Peak input power for MBS-2 satellite and maximum sound output for MBS-2 and BPSS-210 subwoofer.

decreases. Above 80 Hz, the phase with the stand-mount setting reaches a minimum of -42° at 150 Hz and a maximum of $+39^\circ$ at 900 Hz. An MBS-2 should not be a difficult load for any competent power amplifier.

Sweeping the MBS-2 satellite with high-level sine waves, I noted some vibrations at 210 and 280 Hz in the side-wall and top. The MBS-2's woofer reached its maximum excursion, a generous 0.35 inch peak to peak, at 95 Hz. Below that point, the cone's excursion actually decreases as the frequency goes down. The speaker's series capacitors work very well, here, to minimize low-frequency overload. No dynamic offset was evident. At higher levels the woofers overload gracefully.

When I swept the BPSS-210 subwoofer with a high input, the cabinet was quite inert and produced no detectable wall vibrations. The subwoofer's maximum excursion was a very generous 0.8 inch peak to peak, and it exhibited no dynamic offset.

Figure 7 shows the MBS-2's 3-meter room response, with both raw and smoothed data. The speaker was upright in

THE LFX-2 CROSSOVER LETS YOU CONTROL THE SHAPE AS WELL AS THE CUTOFF OF THE FILTER CURVES.

the right-hand stereo position, and the test microphone was at ear height (36 inches), at the main listening position on my sofa. The speaker was on a 27-inch stand, so the tweeter was also 36 inches high. The smoothed response goes up and down several times between 100 Hz and 2 kHz, but the overall curve still fits within a moderately tight, 10 dB, window above 200 Hz. The dip in the bipolar cancellation range, centered at 550 Hz, is no more significant than the dips at other frequencies. The room response does not show the strong cancellation effects seen in the anechoic on-axis response (Fig. 1), because the room's side-wall and ceiling reflections help to fill in the dip. Above 3 kHz, the averaged response is quite smooth and extended, all the way to 20 kHz.

Figure 8 shows the BPSS-210 subwoofer's E_1 (41.2-Hz) harmonic distortion. The major distortion component is the third harmonic, and even it reaches only 2.3% at the highest input level. The second harmonic reaches 1.5%, and all other harmonics are 1.2% or less. With signal inputs of 150 millivolts or less, the distortion was very low, barely above the noise floor of my test setup. At 41.2 Hz, a 300-mV input made the woofers move about 0.75 inch peak to peak and generated a robust output level of about 105 dB SPL at 1 meter in free space. Operation in a reflective room will yield significantly higher levels.

The MBS-2's distortion performance is not graphed here, but it also proved good, particularly for such a small speaker. With an A_2 (110-Hz) input at 50 watts, the second harmonic reached a moderate 5.8% and the third 9.7%, with higher harmonics less than 1.6%. At A_4 (440 Hz), a 50-watt input yield-

ed predominantly second-harmonic distortion, at 5.5%, with 1.2% third harmonic and higher harmonics below 0.5%.

Figure 9 shows the short-term peak-power input and output capabilities of the MBS-2 satellite and the BPSS-210 subwoofer. The peak input power for the MBS-2 starts very high, at about 1 kilowatt, drops gradually to a low of about 90 watts at 100 Hz, and then rises rapidly and smoothly to about 4 kilowatts above 1 kHz. The corresponding 1 meter peak output starts at 80 dB SPL at 20 Hz and rises rapidly to a high 115 dB at 250 Hz. After falling to about 111 dB at 550 Hz, the peak output rises briefly to 120 dB at 1 kHz and then stays within 3 dB of that level at all higher frequencies. Although the MBS-2's sensitivity is low, it can achieve high outputs if driven with a large amplifier.

The BPSS-210 subwoofer's peak output is also shown in Fig. 9. With room gain, the peak SPL starts very high, at 112 dB, then



**THE SUBWOOFER'S
ROBUST PEAK OUTPUT
HAS BEEN MATCHED
BY VERY FEW SPEAKERS
OR SUBS I'VE TESTED.**

quickly reaches a very loud 120 to 123 dB above 30 Hz. Such robust output capability has been matched by only a few of the speakers—or subwoofers—I have tested. At 50 Hz and below, however, the BPSS-210 did not overload very gracefully; with input levels higher than those shown in Fig. 9, distortion increased rapidly as the level rose and the output sounded quite stressed. Above 50 Hz, fortunately, the subwoofer's overload-protection circuits limited the signal just enough that the distortion did not increase at higher input levels.

The BPSS-210's maximum output exceeds the satellite's over the subwoofer's entire operating range. This suggests that the LFX-2 crossover should be set to its highest frequency, 100 Hz, to take maxi-

imum advantage of the sub's high output capability.

Use and Listening Tests

The Mirage MBS-2, BPSS-210, and LFX-2 comprise the first subwoofer/satellite system I have tested for *Audio*. The combination is somewhat unusual in that it couples a pair of relatively small and inexpensive satellite speakers with a top-of-the-line, high-output subwoofer. They all looked first-rate and well-matched, however, thanks to their high-gloss, piano-black finishes and excellent workmanship.

Between the three speaker boxes, the crossover, and the crossover's many controls, wiring and adjusting the system took me *much* longer than usual. (What's more, the satellites, subwoofer, and crossover each had a different manual; if these components are to be marketed as a system, a unified manual would be better.) The result was definitely worth the effort, however, as the Mirage system proved itself the equal of a pair of high-performance, full-range speakers, but with greater flexibility in optimizing the bass response to room conditions—and all for a relatively moderate price.

Despite the system's complexity, hooking it up was relatively straightforward. The only complications were deciding where the subwoofer was to be placed, adjusting the crossover's "Shape" controls, and setting the subwoofer operating level.

I mounted the MBS-2 satellites on a pair of Audio Products International's SST-27 stands, which are designed specifically for these speakers. These sturdy stands elevate the speakers 27 inches, which puts the front tweeters 36 inches above the floor. Four bolts attach each satellite solidly to its stand. Since the MBS-2s have drivers both front and rear, the only inconspicuous place left for connections is the bottom of the enclosure; since these connections are covered when the speaker is bolted to the stand, you must remember to attach the cables before you mount each speaker.

I set the controls on the LFX-2 crossover to flatten the subwoofer's response and smooth the transition to the satellite; I did this primarily by ear but also used some of the knowledge I'd gained from my measurements. I ended up with the low-pass "Shape" control fully clockwise and the

high-pass "Shape" control slightly above its minimum position.

Most of my listening was done with the LFX-2's subwoofer-level control set about 40% above its minimum. On pop, rock, and jazz, this gave me approximately the same level of bass as provided by the B&W Matrix 801 Series 3 speakers I used for comparison; on very low bass (20 to 40 Hz), the Mirage setup actually put out more bass than the B&Ws. Occasionally, when listening to pop/rock, I raised the bass level to "7" on the dial. This provided a concert-like backing that I found very satisfying. And don't bother telling me the bass was too high—it was, but it sure was fun! A subwoofer-level control (found on most powered subwoofers, though Mirage puts it on the outboard crossover) is very worthwhile: It lets you turn the bass up high without boosting the lower midrange as typical tone controls do.

I moved recently, so I'm breaking in a new listening room. It's somewhat smaller than my previous room, 12 feet wide by 20 feet deep, and has a lower, 7½-foot ceiling. I placed the MBS-2s about 7 feet apart in this room, 2½ feet from the side walls and 4 feet from the wall behind them. After some experimentation, I ended up placing the subwoofer directly between the satellites and at the same distance from the wall behind them. Moving it closer to that wall gave me a woolly, one-note bass.

I listened from a couch about 7 feet from the speakers. For this review I used the powerful Crown Macro Reference amplifier, a Krell KRC preamp, and Straight Wire cabling.

The first disc I listened to was *Harry James & His Big Band* (Sheffield Lab 10057-2 G, a favorite of mine). The horns were very realistic, retaining their live bite and aggressiveness, while the bass was smooth, extended, and well balanced. The Mirage system sounded more spacious and open than the B&Ws, but its imaging was a bit less distinct. I had to attenuate the level of the B&Ws about 3 dB to match the sensitivity of the MBS-2s. When played loud on the high-level trumpet peaks starting at 1:26 into track 3, the lower sensitivity of the MBS-2s was evident from the amplifier's 0-dB LED lighting occasionally on peaks. Even at this high peak input level, the MBS-2s' output was quite clean.

Even after much adjustment and experimentation with the crossover controls, I was not completely satisfied with the Mirage system's reproduction of male speaking voices. The MBS-2s sounded slightly hollow and chesty in comparison with the B&Ws. On female singing voice, however, the MBS-2s really shined, yielding a smooth, clean, and clear response. The MBS-2s quite faithfully reproduced Amanda McBrook's voice on her CD *Amanda* (Sheffield Lab 10066-2 G); especially good were track 2, "Dorothy," and track 6, "The Rose." On the latter, however, analog tape hiss seemed more noticeable than through the B&Ws.

On much more aggressive material, such as loud rock 'n' roll and modern country music, the system handled most everything I could throw at it, playing loud and clean. With the bass turned up, the system should please any teenager in your household: It can play heavy metal, alternative rock, or rap at near-concert goosebump levels (though in a large room that will require driving the satellites from an amp the size of the Crown Macro Reference). The only time the system wimped out was when I played the title track from AC/DC's *Highway to Hell* CD (ATCO 92419) at high level with the bass turned up. The woofer self-protected and shut down after playing only two kick-drum whacks at the beginning of track 1. After a few seconds, the system recovered and turned back on without any apparent harm.

I listened carefully for any spectral problems in the bipolar-cancellation range but could hear very few anomalies. Not until I moved within 3 or 4 feet of the speakers could I hear any significant differences between the Mirages and B&Ws in this range.



HORNS HAD REALISTIC BITE, WHILE THE BASS WAS SMOOTH, EXTENDED, AND WELL BALANCED.

On most classical symphonic and live-recorded pop/jazz material, the additional spaciousness provided by the Mirages was very welcome and heightened the sense of realism in the presentation. On more intimately recorded material, the effect was less desirable. The MBS-2s' bipolar radiation tended to soften, diffuse, and widen images,

which worked well on some recordings and not so well on others. The effect was most evident when listening to pink noise from a single speaker: With the B&Ws, the sound appeared to come solidly from the

direction of the speaker; with the Mirages, the sound was significantly more diffuse both in width and in depth and seemed to come only from the general direction of the speaker. The Mirages did

not reproduce pink noise quite as smoothly as the B&Ws and added some tonality to the noise. I also heard some tonal changes in the upper midrange when I stood up during the pink-noise tests.

On third-octave, band-limited pink noise, the Mirage system's output was clean and robust in all the low-frequency bands. Its clean output equaled or exceeded that of any other speaker system I have put to this test. There was even significant usable output in the 16-Hz band; very few speakers manage that! The BPSS-210 performed just about flawlessly on all the low-bass material I listened to, including pipe-organ pedal notes, synthesizers, and special effects.

The Mirage subwoofer/satellite system represents an extremely good combination of extended, low-distortion bass response and topnotch performance at higher frequencies. Its good looks, spacious sound, and moderate price are very welcome, too. It would be a very wise choice for someone contemplating an expansion of his stereo setup to a full home theater system. **A**

EDWARD M. LONG

SONANCE DL1200 POWERED SUBWOOFER



The Sonance DL1200 DualLevel powered subwoofer gets its name from its ability to switch between two output levels—a substantial, but not overpowering or boomy, level for music listening and a more thunderous bass level for blockbuster movies.

The two levels are independently set by a pair of level controls, which share a metal

plate at the rear of the DL1200 with its built-in amplifier's heat sinks and the input and output connectors. Normally, output is set by level control 1, which you'd set for music listening. But when 12 volts DC is applied to a pair of screw terminals, the DL1200's output rises to a level set by level control 2. You can build a remote trigger, using a 12-volt source and a switch, or you

can get Sonance's optional VT1 video trigger box (\$50), which applies 12 volts to the terminals whenever it senses a composite video signal from a TV (or other component) with a video output.

The DL1200 has a 12-inch dynamic woofer firing front and a 15-inch passive radiator firing downward. The bottom of the enclosure is raised from the floor by an integral sculptured base,

which provides acoustical loading for the passive radiator and allows a path for the lowest frequencies. The passive radiator is similar to the 12-inch driver, but without a magnet and voice coil; it consists of a thick paper cone with a rubber surround, built on a metal loudspeaker frame. The frame enables the passive radiator to be replaced easily, if that's ever necessary (manufacturers that save money by omitting the metal frame and attaching the surround directly to the enclosure make replacement very difficult).

The DL1200 enclosure is finished in black, wood-grain vinyl with a removable, black-cloth grille. The internal power amplifier is rated at 200 watts maximum output; it does not have an on-off switch, but, since it draws only 18 watts of AC power when there's no signal input, it can be left on continuously. There is a moderately loud pop when the amplifier is switched on or off, so Sonance suggests that you plug the DL1200 into an unswitched output on your receiver or directly to an AC outlet. The DL1200's amplifier is mounted directly to the large metal plate on the rear of the cabinet and has its own internal enclosure to separate it from the air-tight main enclosure. Push-type loudspeaker input terminals on the plate accept speaker-level signals from your amplifier or receiver and feed them to the DL1200 amplifier; this pair of signals is also sent through first-order (6-dB/octave) high-pass filters to push-type output terminals. If you connect your main loudspeakers to these terminals, the filter will roll off the bass fed to those speakers, enabling you to operate them at higher lev-



The rear panel holds the usual jacks and heat sink, plus the unique DualLevel controls and terminals.

Rated Frequency Response: 25 to 140 Hz, ± 3 dB.

Crossover: Low-pass, 40 to 150 Hz, variable; high-pass, 125 Hz at 6 dB/octave.

Infrasonic Filter: 20 Hz, 18 dB/octave.

Power Consumption: 18 watts at idle.

Dimensions: 21 in. H x 20 in. W x 20 in. D (53.3 cm x 50.8 cm x 50.8 cm).

Weight: 60 lbs. (27.3 kg).

Price: \$999.

Company Address: 961 Calle Negocio, San Clemente, Cal. 92673; 800/582-7777.

For literature, circle No. 92

els without distortion. If you don't need this high-pass feature, you can use either the speaker-level inputs or a pair of gold-plated phono input jacks that accept line-level signals from a preamplifier or the subwoofer output from an A/V receiver or surround processor. When the line inputs are used, no signals will be present at the DL1200's speaker-output terminals.

The DL1200 amplifier has a soft limiter circuit. This increases the subwoofer's dynamic range for instantaneous signals while keeping it from producing nasty sounds when driven to sustained high levels.

The owner's manual is very good; it includes diagrams, specifications, and all the information you need to connect the subwoofer to a variety of audio/video systems. Sonance also provides a toll-free phone number in case you run into difficulties.

Measurements

Figure 1 shows the output of the Sonance DL1200 subwoofer for different settings of the low-pass filter control. The sub's natural low-frequency rolloff below 50 Hz is at a rate of about 24 dB per octave, characteristic of a bass-reflex or passive-radiator

**I GOT EXCELLENT SOUND
AND A VERY SMOOTH
CROSSOVER WHEN I USED
THE DL1200S WITH
SMALL SATELLITES.**

system, while the filter's adjustable high-frequency rolloff approaches the specified 18 dB per octave rate at the lower settings and is steeper for the 150-Hz setting. The 9 o'clock setting is the best when using the DL1200 with loudspeakers that operate down to 70 Hz, while the 12 o'clock setting should work well with small satellites that operate down to about 100 Hz. The DL1200's output is down only 6 dB at 38 Hz, which is very good.

Figure 2 is the energy/time response of the DL1200 with its low-pass filter set at 150 Hz; the test signal's energy is in the range from 20 to 200 Hz. Subtracting the normal signal delay caused by the microphone's 1-meter distance from the speaker gives a signal delay of 7 to 8 milliseconds for

the DL1200 driver and crossover. I also verified this by measuring the group delay (not shown).

Figure 3 shows the frequency and phase responses of the DL1200 with its crossover set to 150 Hz. The phase is very linear all the way down to the lowest frequencies and finally reaches 180° at about 31 Hz. If you set the DL1200's crossover to lower frequencies the signal delay will increase, reaching a maximum at the 40-Hz setting. Your stereo loudspeakers will also have a signal delay, which can be as low as 1 millisecond for small satellite systems and as high as 3 milliseconds for larger systems whose response goes down to 60 Hz. You can adjust the spacing between your main speakers and the DL1200 to ensure that the sounds from the subwoofer and the satellites arrive simultaneously at your listening position. (I realize that this is sometimes difficult to do, but if you can, you will find that the total sound will be very homogeneous.) I did this with some small stereo loudspeakers, by placing the Sonance near a side wall and closer to my listening position; the sound was excellent, with very smooth response in the crossover region. The DL1200's low-pass filter response is steep enough to reject any high frequencies that would provide localization clues and draw attention to this off-center location. I verified this by playing vocal recordings; the DL1200 rolled off the singer's voice until it was practically inaudible.

The subwoofer's impulse response for a 300-Hz cosine input pulse is shown in Fig. 4. The initial output of the DL1200 is inverted; however, I contend that this is the correct polarity because the strongest initial output is positive and the phase response, as was shown in Fig. 3, is around 0° for most of the subwoofer's operating range. As I mentioned, I was able to achieve an excellent blend between the DL1200 and the small satellite loudspeakers with this polarity.

Figure 5 shows the speaker's output and main distortion products with the DL1200's level control fully up and an in-

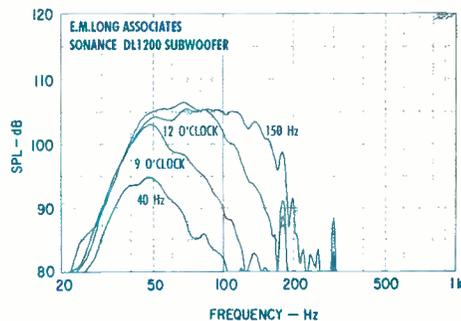


Fig. 1—Frequency response for various settings of low-pass crossover control.

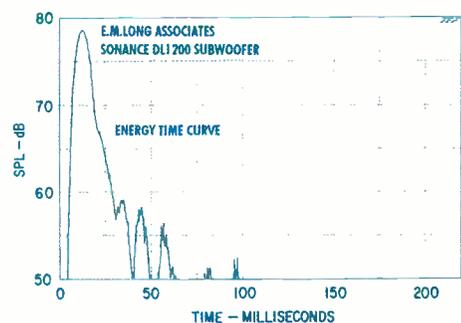


Fig. 2—Energy/time response.

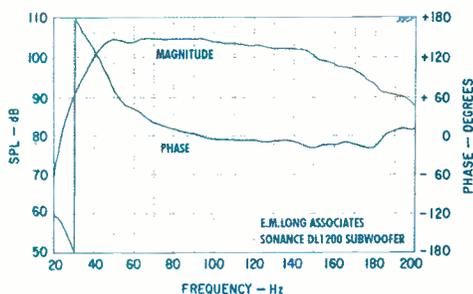


Fig. 3—Frequency response ("Magnitude") and phase response; note linear scale.

put of 1 volt rms into its input terminals. The highest measured distortion was a 5.2% second harmonic at 74 Hz at a very loud sound-pressure level of 103.9 dB. The highest level of third harmonic was 2.5%, at 58 Hz and 102.4 dB SPL. These are very low distortion figures for such high SPLs. The DL1200 sounds excellent at high sound levels and is even cleaner at moderate levels.

I also tested the effect of the DL1200's soft limiter (not shown). Starting with an

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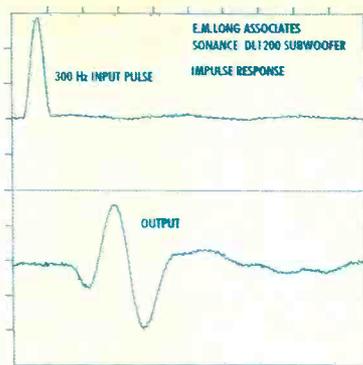


Fig. 4—Impulse response.

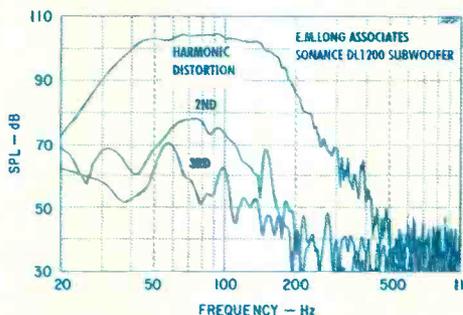


Fig. 5—Output and principal harmonic distortion components.

input signal that produced an output of about 96 dB SPL, I raised the input level 20 dB, in two equal steps. The first 10-dB increase produced an output of about 105 dB. The second increase would have produced an output near 115 dB without limiting, but the limiter held the output to a level around 108 or 109 dB SPL. This keeps the DL1200 from being overloaded, which would cause audible distortion. The limiter is well designed and keeps the DL1200 sounding good even when it is severely overdriven.

Use and Listening Tests

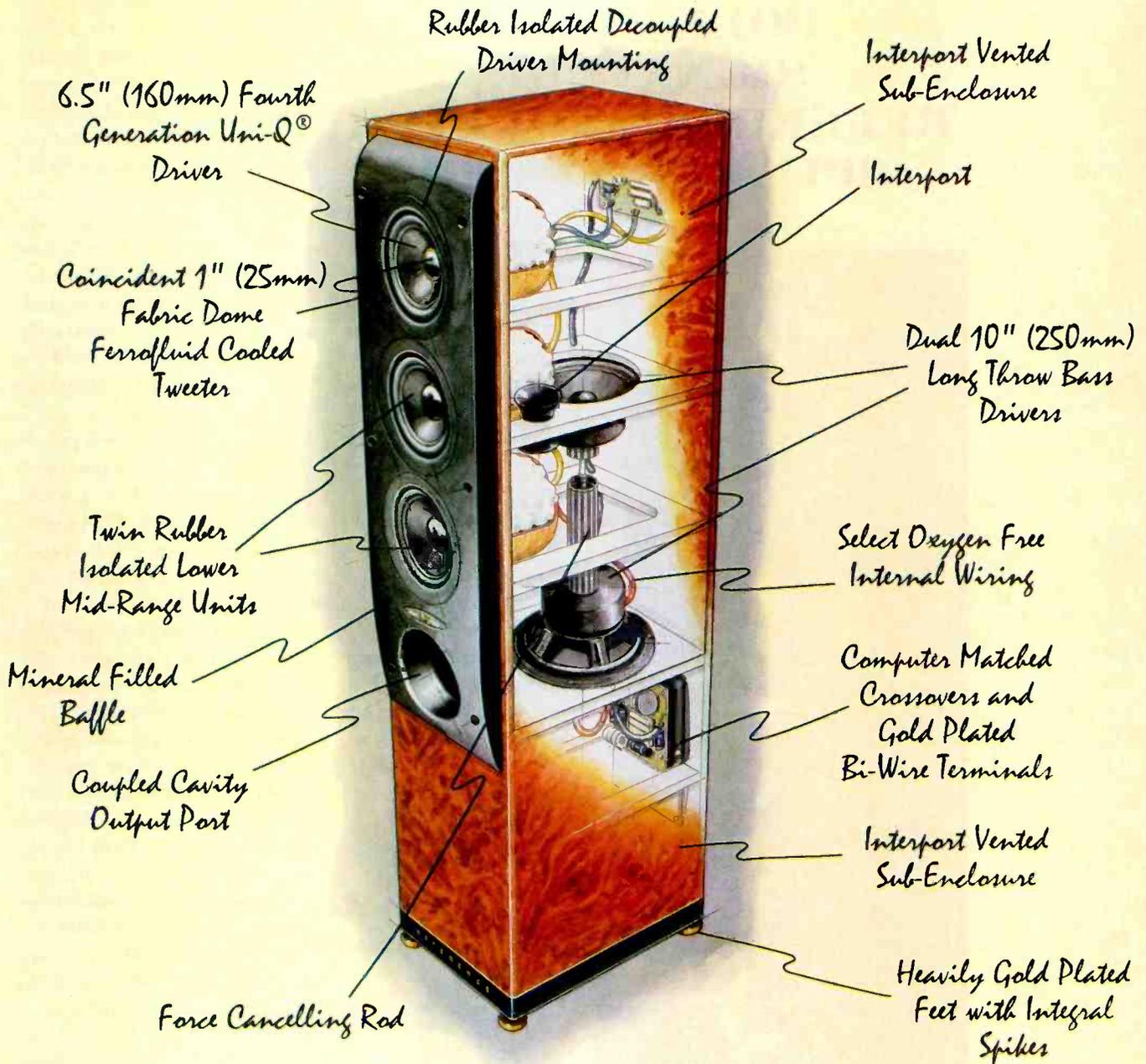
Although I used small satellite loudspeakers with the Sonance DL1200 for most of my listening evaluations, I also used a pair of high-output speakers to see whether the subwoofer could deliver enough volume to match them. The DL1200 blended well with these speakers, which had a sensitivity of 97 dB SPL at 1 meter with a 1 watt input.

For the sound quality evaluations, I had members of my listening panel audition the DL1200 subwoofer with the small satellite loudspeaker systems. For reference, I used a closed-box subwoofer with an 18-inch driver and special electronics that let it operate below resonance; the reference sub's output was uniform within ± 1 dB from 100 down to 30 Hz. The panel members' comments when listening to the Tchaikovsky "1812 Overture" with Andrew Litton conducting the Dallas Symphony and Chorus (Delos DE 3169) were: "double bass and drums warm and powerful," "slightly more bass fundamentals from reference," and "very close to reference." For "The Higher You Rise" from *The Sheffield Drum & Track Disc* (Sheffield Lab CD-11420), the comments were: "excellent bass guitar and drums," "slightly less tight and deep bass than reference," and "bass and guitar full and strong." Comments made when listening to "Wishing Well" by Schoenherz and Scott from *One Night in Vienna* (Windham Hill WD-1060) were: "bass sounds are very strong and warm," "low frequencies not as deep as reference," and "low sounds are good but not as tight as reference."

For the jazz recording of "Arthur Street," featuring a group of excellent musicians on Angelo Di Pippo's album *Arthur Street* (Stash Records ST-CD-557) the comments were: "bass is powerful and drums are solid," "bass very close to reference," and "bass and drums very close to reference." These comments correlate well with my measurements. The Sonance DL1200 is excellent for recordings with bass that goes down to about 40 Hz, which covers most. My reference system, which is substantially higher priced than the DL1200, surpasses it only from about 50 down to 30 Hz. The DL1200's tight, well-controlled response is hard on the heels of the reference system's. The DL1200 performed best with rock and jazz recordings and very well with classical recordings. It is well engineered, well built, and offers excellent value. If you need a good subwoofer, give the Sonance DL1200 a listen.

KEF REFERENCE SERIES MODEL FOUR

The Inside Story



Look inside the new KEF Reference Series Model Four and you'll understand why it has been hailed as one of the finest loudspeakers in the world. You'll find brilliantly innovative design and advanced features found on no other speaker. No wonder it has met with such critical acclaim.

"...In the end, I was delighted with the performance of the KEF Reference Four..."

"...you won't be disappointed with the result..."
Tom Norton, Stereophile

"...This speaker has a degree of slam and overall dynamic range associated with the best at two or three times the price..."
Martin Colloms, Hi-Fi News

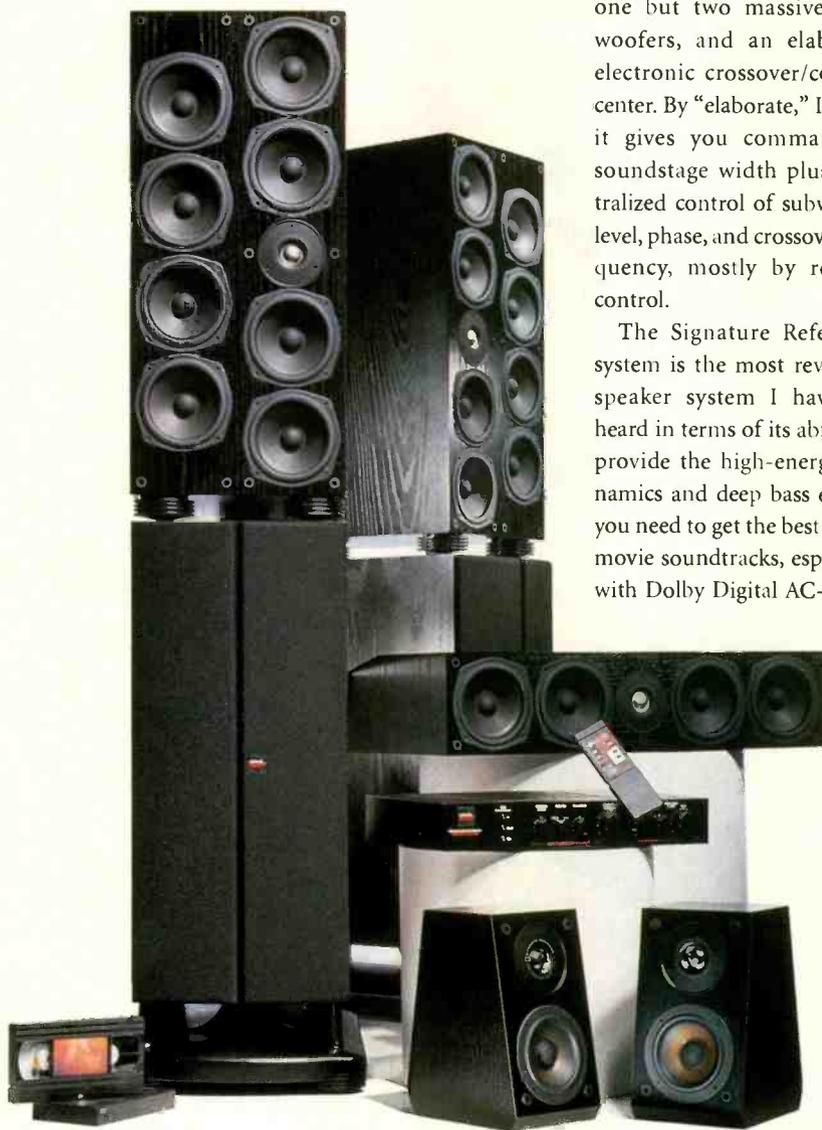
"...The Model Four's response within 30 degrees of the axis is extremely uniform in both the horizontal and vertical planes; KEF's Uni-Q® speaker systems are easily the best I've measured in this respect..."

"...be prepared to enjoy yourself a lot..."
D. B. Keele, Audio magazine



The experience of sound

POLK AUDIO SIGNATURE REFERENCE THEATER SPEAKER SYSTEM



The Signature Reference Theater (SRT) speaker system is intended as a high-end statement. It's a \$9,000 system that includes two satellites for the main front channels, a center speaker, two surround speakers, not

one but two massive subwoofers, and an elaborate electronic crossover/control center. By "elaborate," I mean it gives you command of soundstage width plus centralized control of subwoofer level, phase, and crossover frequency, mostly by remote control.

The Signature Reference system is the most revealing speaker system I have yet heard in terms of its ability to provide the high-energy dynamics and deep bass energy you need to get the best out of movie soundtracks, especially with Dolby Digital AC-3. Yet,

tempting as it is to focus only on the Signature Reference's performance as a home theater system, I also found it intensely musical on material ranging from stereo chamber music to symphonies encoded for Ambisonic surround. The system does

just as well with Mozart string quartets as with action movies.

The SRT system's bass response and dynamic range are breathtaking. Its rated response is 26 Hz to 20 kHz, ± 2 dB, with a -6 dB point at 16 Hz. It is also rated to deliver more than 120 dB SPL at 3 meters with wideband stereo program material. I cannot check these measurements, but I can state that the Polk Signature Reference provided clean, deep bass equal to that of the most expensive subwoofers and stereo speakers I know of. Its low-frequency response extended well below 20 Hz at very high power levels and was remarkably clean on peaks of over 115 dB SPL—levels I have measured on many Dolby Digital soundtracks.

That bass comes from a pair of High-Velocity Compression Drive (HVCD) subwoofers, which Matthew Polk described in *Audio* recently ("More Bass in Less Space," May 1996). This isn't just old technology with a fancy new name: HVCD coaxes very low, loud bass from comparatively compact cabinets by using extra-heavy drivers with extremely powerful magnet structures in a bandpass enclosure. To further conserve floor space, the subwoofer cabinets are tall, rather than wide, which lets them double as stands for the main-channel speakers. Sound emerges from the bottoms of the enclosures, which stand a few inches above their bases. Between the base and cabinet, you can see a structure somewhat resembling a valve from an automobile engine; this is part of the HVCD system's new "Power Port" venting system, designed to enable the extremely high-velocity air flow out of the port tube to emerge into the room with low turbulence, noise, and loss.

Each enclosure has a built-in, 300-watt amplifier driving two 10-inch

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For literature, circle No. 93

HVCD woofers with stiff polymer and graphite cones. The subwoofer systems are extremely fast and detailed, and their damping ("Q") is very carefully matched to that of the woofers in the main speakers, for a more seamless blend. Blending is further assisted by the Control Center, which contains not only the usual 180° polarity-reversal switch but a phase control that's continuously variable over a 180° range.

The drivers in the HVCD subwoofers and in the other parts of the Polk SRT system use Polk's Dynamic Balance technology, a mix of advanced cone, surround, and magnet designs resulting from a three-year laser-interferometry research project performed in cooperation with Johns Hopkins University. Polk says Dynamic Balance reduces diaphragm breakup and resonances and gives all the SRT's speakers the same sonic signature.

I suspect the SRT's speakers would share one sonic signature in any case, as they have so many drivers in common. The main, center, and surround speakers all use the same tweeters, the main and center speakers use the same woofers (and crossovers), and the woofers in the surround speakers are a close match for the ones in the main and center units.

It's a good thing the drivers are so well matched, since there are so many of them: seven SL6500 Tri-Laminate dome tweeters, 20 5¼-inch woofers, four 4½-inch woofers, and the four 10-inch HVCD subwoofer drivers. It's also a good thing that these drivers are of such high quality. I have listened to the SL6500 Tri-Laminate dome tweeters in other Polk speakers and have found them to be among the cleanest dynamic tweeters around, rivaling or surpassing their best European counterparts. And the SRT's 5¼-inch Dynamic Balance woofers demonstrate that a clean midrange is critical to musical realism as well as to the imaging and soundstaging of both music and home theater.

The left and right main satellites each have eight of these woofers. In each satellite, two pairs of these drivers flank the tweeter, exactly as they do in the center-channel

speaker, except vertically. The other four woofers support Polk's "Stereo Dimensional Array" (SDA) technology, designed to cancel interaural crosstalk. This makes imaging more precise and expands the apparent soundstage. Polk developed SDA more than a decade ago, but I find the version in the Signature Reference is far more realistic than its previous incarnations. You may or may not like SDA with everything, but it very definitely benefits many recordings—particularly those old performances that were cursed (and still are, in reissue)

with a flat, uninteresting soundstage. What's more, you can select "Normal" or "Wide" SDA, or turn it off, with the remote control.

The center-channel speaker has the usual low-slung cabinet, to fit above or under a TV screen, but can also be mounted on the ceiling, with an optional bracket. The F/X surround speakers, which have keyhole slots for wall mounting and accept an optional swivel bracket, give you a switch-selected choice of dipole or bipole radiation; this aids in both speaker placement and adjusting to different styles of recording.

Although it also controls SDA, the control center is basically devoted to bass control. It enables you to adjust subwoofer phase over a 360° range, set the subwoofer crossover's low-pass frequency anywhere from 45 to 120 Hz, set the subwoofers' output level anywhere from 20 dB above to 20 dB below that of the other speakers, and set up and select "Music" and "Video" output modes to give you louder bass for home theater than for music. That last feature is a necessity for getting the best out of both music and movies. Except for the bass phase and coarse subwoofer-level adjustments, all of the control center's features can be selected with the remote control.

In short, the Polk Signature Reference Theater speaker system has more technology than I can describe in a review of reasonable length. It's also complex enough that Polk requires its SRT dealers to customize the system to each buyer's needs and listening room and to help in setup—a sine qua non with *any* true high-end home theater

speaker system. Even the most experienced audiophile is going to need extensive dealer help, particularly if the system is intended to provide high-end performance with both music and movies.

Complex as the Polk Signature Reference Theater system is, I consider it a basic system that you might wish to augment with additional speakers. If, for example, you have a state-of-the-art surround processor that can serve separate rear and side surround speakers (or, in some cases, two pairs of side surrounds), you could add more of the SRT f/x surround speakers (\$599 per pair); I have heard installations with two sets of surround speakers, and yes, it definitely does help.

Although I consider the Polk SRT a high-end system, it embodies trade-offs that some purists may not choose to make. I have yet to hear any surround processor or surround speaker system that can match the best "purist" stereo systems' transparency and ability to retrieve musical information from the very best recordings. Transparency and musical information, however, are only part of the story. Many, if not most, purist systems have significant limits in their ability to handle massive musical transients and dynamic changes; most also have limitations in the mid and deep bass. Further, many purist systems produce an artificial soundstage with a narrow listening area, and their imaging locates instruments and voices with a precision that never occurs in live music. The fact that most audiophiles learn to live with, if not prefer, systems that have such limitations and that create an artificially detailed soundstage does not make them realistic or right.

This means that a system like the Polk Signature Reference has to be judged for what it is. If you favor sheer transparency and listen largely to the limited number of audiophile recordings that really deserve the name, you should probably stick with a more conventional stereo speaker system. If, however, you are open-minded about the merits of full frequency response and natural dynamics, you may well find the Polk Signature Reference to be a good choice—especially as, when teamed with the right surround processor, it offers a number of advantages unobtainable with purist stereo systems.

**THE POLK SRT
IS INTENSELY MUSICAL
AND DOES JUST AS WELL
ON MOZART
AS ON MOVIES.**

I've already mentioned one of those advantages, SDA; it's not always necessary, but it's nice to have it on tap to give life and a more natural soundstage to the many recordings that need it. Another advantage is in soundstaging: With the right surround processor and adjustments, the SRT's center and surround speakers can deliver a remarkably natural soundstage over a wide listening area. The SRT system can provide excellent depth and soundstage width and imaging that is very natural, with no sudden changes when you move your head. In fact, I would invite you to go to a live performance and then compare a properly set up Polk Signature Reference against a high-quality stereo speaker system. Yes, you give up some detail, but live music simply does not have the directional high-frequency information and etched imaging detail that many audiophiles seem willing to bankrupt themselves for.

For that matter, compare the sound of a live performance with that of a high-quality surround recording reproduced through a properly set up Polk Signature Reference system and through a classic stereo system and see which you prefer. True, there are only a few high-quality recordings using Dolby Surround, Ambisonics, or other matrix encoding (try the better ones from Delos or Nimbus). Nevertheless, using an advanced surround processor with the Polk SRT system showed that such recordings can provide a feeling of space and a natural soundstage available from only a handful of stereo recordings. Music recordings using discrete surround, whether from four-channel tapes or Dolby Digital, can offer a significant improvement over even the best Dolby Surround and Ambisonic recordings. And surround sound is almost certain to get better with time.

My listening to the Polk Signature Reference was scarcely the first time I had heard discrete surround outperform Dolby Pro Logic. I was still a bit stunned, however, to hear just how much better Dolby Digital soundtracks can sound with one of the few speaker systems that can really handle the dynamics and transients it delivers.

In spite of the almost uniformly clumsy way AC-3's sonic potential has been handled on the laserdiscs I have heard, it simply

blows Dolby Pro Logic and any other matrix recording/decoding system into oblivion. The best Ambisonic recordings of chamber music with limited dynamics may come close in terms of pure ambience, but you have never really crashed a starship, fought a small war, or watched Arnold "be back" in your own home until you have seen and heard it in Dolby Digital.

With the right speaker system, Dolby Digital has the bass and dramatic energy you always dreamed of getting from Dolby Pro Logic and never really got. It has the natural directional information that Dolby Pro Logic lacks, and the precise, clean detail that Dolby Pro Logic blurs. Dolby Digital is open and dynamic, while Dolby Pro Logic sounds compressed.

These differences were so obvious that my audio/video room threatened to become a permanent demonstration center. My sons (aged 17 and 20) kept bringing in friends to hear AC-3, and for once, a new



**THE POLK SIGNATURE
REFERENCE THEATER
SYSTEM'S DYNAMICS
AND DEEP BASS ENERGY
ARE UNSURPASSED.**

technology met with uniform acceptance. My own friends also approved—and not just the men. Women, while too smart to focus on the joys of explosions and car crashes, uniformly spotted AC-3's improvement in clarity and detail, and many found intense dynamic peaks in Dolby Digital to be much less irritating than the lower level peaks of the same soundtracks' Dolby Surround versions.

But Dolby Digital ruthlessly reveals the limits of most surround speaker systems. Even some of the most expensive speakers

simply cannot handle its bass and dynamics. It takes a speaker system like the Polk Signature Reference to make Dolby Digital come fully alive.

To sum up, I found the Polk easily qualified as a true, high-quality reference system for musical listening, one that can get the best out of a wide range of recordings. It also demonstrates that surround sound can make a major contribution to musical listening with the right recording and surround processor. (A growing number of processors from manufacturers such as Citation and Meridian provide excellent center-channel performance and realistic surround-channel sound.)

Such processing may not contribute much to the best possible stereo recordings—but there are very few "best possible" recordings. With the right processor, the surround features of the Polk SRT system did as much to make ordinary recordings come alive as its SDA did.

As for home theater, the Polk Signature Reference outperformed the available media. It was all too clear, from soundtrack after soundtrack, that the Polk SRT system was capable of doing far more than any Dolby Surround soundtrack demanded. Dolby Digital soundtracks were far more live, exciting, and detailed, but it was obvious that sound engineers are just beginning to figure out how best to use the system; even the best AC-3 laserdiscs I could find rarely took advantage of the process's technical potential for more than a few moments. Even so, the SRT system showed that many—if not most—other home theater speakers are going to be rendered obsolete by Dolby Digital's ability to deliver sudden, massive dynamic contrasts and deep bass energy.

The issue is not loudness, but life. If anything, many competing speaker systems sound "louder" because they distort on peaks, have trouble resolving the low-level detail in sudden transients, and blur bass transients. The Polk Signature Reference has a resolving power that I have heard only in the best theater systems. Its sound is also far better integrated than that of most speakers designed for high-end music. If you are really serious about home theater, you really need to audition the SRT before you buy speakers. A

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MERIDIAN 565 DIGITAL SURROUND PROCESSOR



The Meridian 565 is a sophisticated surround processor that provides Dolby Pro Logic and Ambisonic decoding, Home THX post-processing for Pro Logic, a number of multichannel enhancement modes for ordinary two-channel stereo recordings, and, optionally, Dolby Digital (AC-3) decoding and Home THX 5.1 processing. The 565 performs these functions entirely by means of digital signal processing (DSP), and though it may not qualify as a supercomputer, it comes damn close. It crams about as much

sheer computing power per square inch into a small black box as any component I know of. It uses twin Motorola DSP chips running at 60 MHz, plus an additional Motorola digital signal processor running at 100 MHz for 5.1-channel Dolby Digital decoding. And it can process up to 22-bit digital signals, maintaining necessary internal precision by means of 24- and 48-bit arithmetic.

Although designed primarily for digital sources, the 565 does have an analog input feeding a delta-sigma ("1-bit") analog-to-digital (A/D) converter that generates 44.1-kHz,

16-bit digital signals suitable for further processing. It has two digital inputs—one 75-ohm coax and one Toslink optical—plus a digital bypass input, and it automatically synchronizes to the sampling frequency of the selected digital input signal. There are eight, individually variable analog outputs—front left and right, center, two pairs of surround channels, and subwoofer—each fed from an 18-bit-precision delta-sigma digital-to-analog (D/A) converter. Rated distortion is well below 0.1% from input to output, and noise and hum are specified as below -90 dB. To simplify operation in audio/video systems, the processor has a set of standard 75-ohm composite-video inputs and outputs suitable for use with NTSC, PAL, or SECAM signals. There is also an RS-232 port to facilitate connection to a computer, plus two proprietary interfaces for communication with other Meridian components. All of this is contained in a single box measuring 12.7 by 3.5 by 13.1 inches and weighing just 10 pounds.

The Meridian 565 sells for \$4,495 with Dolby Digital decoding and \$3,795 without it, although it is a little difficult to imagine anyone buying such a component these days without the AC-3 option. You can use the Meridian 565 alone if you have adequate switching capability elsewhere in your system (it is not a

**THE MERIDIAN 565
OPERATES ENTIRELY BY
MEANS OF DIGITAL
SIGNAL PROCESSING.**

full-blown A/V preamp), but you will need an additional switching unit like the Meridian 562V (\$1,995) for complex installations.

Although all future Dolby Digital sources will deliver their encoded audio signals via standard digital outputs, current laserdisc players supporting such soundtracks do so by way of RF outputs that require demodulation to extract the AC-3 signal. That means that to play Dolby

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Digital laserdisc soundtracks through the 565 you will also need the companion Meridian 519 AC-3 demodulator (\$695). Such outboard demodulators are relatively common adjuncts to today's high-end Dolby Digital decoders, but the Meridian 519 adds a number of important features. A particularly appealing one is automatic switching between Dolby Digital, when the 519 detects its presence on the RF input, and conventional laserdisc digital soundtracks from a coax or Toslink input.

The Meridian 519 uses a proprietary discrete analog filter to extract the Dolby Digital signal coming from a laserdisc and smooths the selected incoming signal with a very high precision phase-locked-loop (PLL). This circuitry helps compensate for the fact that laserdisc players often have relatively high output jitter, enabling the 519 to deliver a digital output much closer to the standard set by the best CD transports. It also means that you can get very good results playing CDs on CD/laserdisc players, particularly with the laserdisc transports that have separate CD loading drawers.

If all of this sounds extremely complicated, it is! This complexity also applies to the many setup and operating features of the 565 and related Meridian components. This is not technology you casually unbox and throw into a system, and that is reflected in Meridian's provision of separate manuals for installation and use and a number of cheat sheets to help you with key features until you memorize them.

The Meridian 565 has a host of setup adjustments that enable you to tailor its sound to your room and system. The sheer number and complexity of these adjustments can be intimidating, but they give the 565 an outstanding ability to adapt to different room sizes and speaker layouts, to accommodate different numbers and types of surround speakers, to time-compensate the system, to select subwoofer options, to vary output delay, to provide speaker protection, and to calibrate the system. No other processor I have encountered allows an installer to do more in getting the best out of virtually any mixture of speakers under so

wide a variety of real-world listening room conditions.

The Meridian 565 is also the only surround processor I know of that enables adjustment of the total delay through the decoder from 2 to 30 milliseconds (almost the length of a full video frame) to ensure that the sound arrives at relatively close-in home listening positions in perfect synchronization with the picture. This locks in the illusion that the speaker of the dialog is actually where he or she appears to be. The Dolby Digital option includes software that enables you to control the level of the LFE (low-frequency effects) signal the 565 passes; the software also continuously monitors the level of each output, comparing it to user-set power-handling statistics and applying gentle, momentary limiting when necessary to prevent overload.

If you want to install this processor yourself, count on at least the same learning curve you have with a new computer, and all the same frustrations brought on by mediocre manuals. At the same time, there are two compensating factors. First, the 565 is designed for dealer setup, and a good dealer can do in an hour what a new user might take a day to accomplish. Second, once the processor is set up, the settings can easily be "locked" to prevent casual users from changing the adjustments, and it is then dead easy to operate. If you can survive shaving, or use a microwave oven, you will master the Meridian 565's control features in about 15 minutes.

Further, I am afraid much of this complication is the entry price to the world of high-end A/V. Like the Ångström 200 (reviewed in the February 1996 issue), the Meridian 565 is the forerunner of a new generation of components designed to get the very best out of digital music recordings and home theater while enabling modular growth to new delivery systems, such as DVD, digital television, and new, higher-resolution systems for CD. Similar processing units are on the way from such worthies as Krell and Theta, and many more are certain to follow.

The Meridian 565 is one of a whole series of Meridian digital components that range from CD players to self-powered speakers and subwoofers with built-in D/A converters. These Meridian digital components can be added to Meridian analog components or integrated into at least three different music systems. They can then be expanded to include the components for three digital home theater systems, providing a wide range of audio and home theater options for even the most demanding users.

Such digital components and systems may be the ultimate nightmare for audiophiles who believe technology should have stopped with the tube and LP and who are still uneasy about the conversion from mono to stereo (or acoustic to electrical recording). Meridian products are not likely to draw awards from the Flat Earth Society, the Federation of Neo-Luddites, or the Daughters of the Carleton Weavers. For those of us who care about the future, however, the Meridian 565 is a real blessing. It is one of the few surround processors to give as much emphasis to music as to video soundtracks and that can deliver superb sound from both two-channel and surround recordings.

Many surround processors are optimized for home theater use. Some reflect this in a subtle loss of transparency and detail. Others do a mediocre job of filtering deep bass to the subwoofer or do not provide a signal to the subwoofer output when in two-channel mode. Most fail to make optimal use of the center channel in reproducing music, fail to provide Ambisonic decoding for surround music, and provide ambience enhancement for two-channel recordings that sounds like an echo chamber.

The Meridian 565, by contrast, has a proprietary "Music" setting in which the processing adds a well-judged touch of surround to stereo recordings, to yield a musically natural sense of space rather than the sound of instruments playing in a bathroom. The 565's "Trifield" setting is the best effort to integrate a center speaker into stereo music reproduction that I have heard to date. There is also a somewhat less successful "SuperStereo" setting that adds wide-area surround effects for casual or background listening, a "Music Logic" setting with adjustable steering that can add musical excitement to recordings with flat

**THE 565'S PROCESSING
CAN OPEN UP MANY
STEREO RECORDINGS
TO GIVE THEM A MORE
REALISTIC PERSPECTIVE.**

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or collapsed soundstages, and the best Ambisonic processor I have heard to date.

I am not going to argue for a moment that the Meridian 565 provides the kind of ultimate purity that you can get from the best analog or digital electronics reproducing really excellent stereo recordings with lots of natural ambience. Simplicity is still the best approach to reproducing great stereo recordings. But we're talking here about less than 5% of the world's recordings, and most of the best musical performances are in the other 95%.

With that in mind, I'd invite even members of the Flat Earth Society, the Federation of Neo-Luddites, and the Daughters of the Carleton Weavers to listen carefully to just how good the Meridian 565 sounds with most recordings, using its "Trifield" setting and a high-quality surround system properly set up for music. Once the Meridian 565 is properly adjusted to get the best out of a high-end system with top-quality, full-range left and right front speakers, the "Trifield" mode creates a realistic feeling of acoustic space, a more natural soundstage with less left-right spotlighting, solid center fill, and more lifelike imaging. I would far rather listen in a concert hall than in a recording booth, and the Meridian opens up many recordings to give them a much more convincing perspective.

Even with the best CDs, the Meridian goes a long way towards offsetting the minor loss of harmonic purity and transparency that even the best digital surround processors seem to introduce. In fact, only a few top-quality stereo D/A converters can provide finer harmonic and transient detail, better bass extension and definition, and more realistic dynamics, usually at a price far higher than the Meridian 565's.

I was also deeply impressed by how much better Nimbus and other recordings with Ambisonic encoding sounded through the Meridian 565. Many Ambisonic CDs and LPs sound quite good in stereo, but playing them back through an Ambisonic system gave them new realism and life. Only John Eargle's work for Delos has even begun to give Dolby Surround-encoded

musical recordings as natural an acoustic perspective as is common on Ambisonic recordings. In fact, the Meridian 565's Ambisonic setting provided the best surround music I have heard apart from discrete multichannel master tapes.

With video soundtracks, the Meridian 565 provided some of the best sound I have yet heard. Depending on your taste, the Ångström may sound better in reproducing Dolby Pro Logic—its dynamics seem a shade more lifelike to me, as do its deep bass energy and transients. The 565, however, rivals it in terms of superior surround retrieval and detail and avoids the kind of excessive and ill-defined surround energy that colors the Dolby Pro Logic outputs of some otherwise excellent processors.

**ON VIDEO
SOUNDTRACKS,
THE 565 PROVIDED SOME
OF THE BEST SOUND
I HAVE YET HEARD.**

The 565 also offers a wide range of different sound processing settings for movie and TV sound. It has the best execution of Home THX processing I have heard, which can yield quite convincing results indeed with the right soundtrack (although the Proceed PAV also does it very well). The Meridian also does a truly outstanding job of dealing with the sound of regular television, cable, and satellite. Its "Academy," "Cinema 57," and "TV" settings all can invigorate regular TV sound, old mono movies (and some new mono movies cleverly claiming to be stereo or Dolby Surround), and the strange sound engineering found on far too many made-for-TV movies or mini-series. If you find most TV sound as flat as I do, these settings offer a menu of worthwhile alternatives.

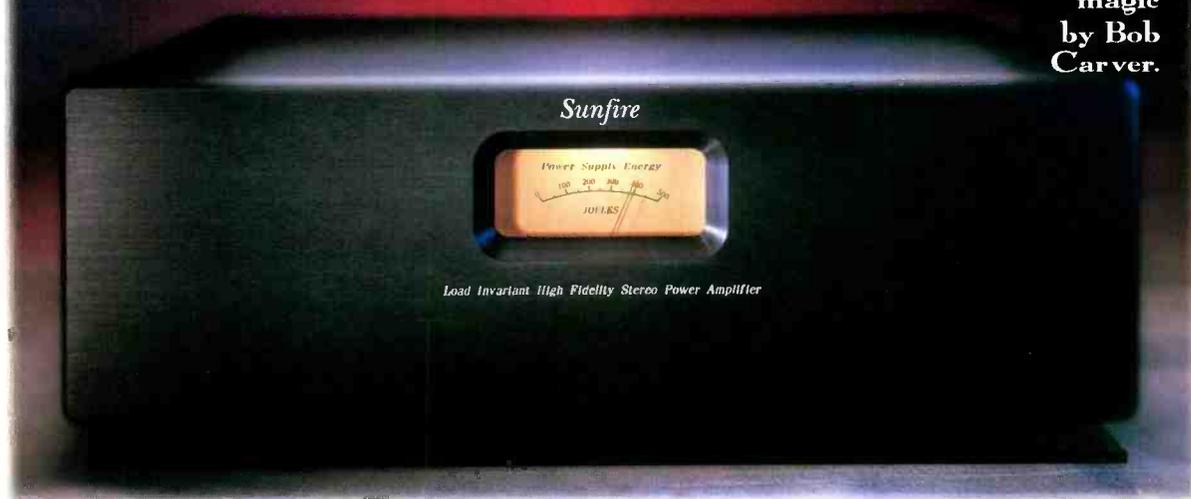
And the Meridian 565 really shines with Dolby Digital movie soundtracks. Bass, dynamics, and directional information are superb. The soundstage locks together, and the end result is better than the theater sound I have heard in any but the very best DTS- and SDDS-equipped cinemas. Dolby Digital may not provide all the clarity, dynamic detail, bass detail, and harmonic integrity of the best CDs, but it is vastly superior to Dolby Pro Logic and seems to be just as exciting as today's soundtracks permit. This enables the Meridian 565 to be both musical and theatrical, and one hell of a lot of fun!

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The Sensible Sound

Issue Number 54

SPRING 1995

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CLASSICAL RECORDINGS



Ravel: L'Enfant et les Sortilèges
French National Radio Chorus and Orchestra, Ernest Bour
 TESTAMENT SBT 1044
 CD; ADD; 43:25
 Sound: A+, Performance: A+

In my mind, this may well be among the 10 greatest recordings ever, by any standard I can imagine, it should rate among the 100 best. It represents a rare confluence of a unique work and forces uniquely qualified to perform it. Moreover, it is a fine example of a lost art: that of creating sonic space and atmosphere without the use of stereo. And here it is in a superb CD transfer.

The *L'Enfant et les Sortilèges* opera itself is a wonderfully creative fantasy about the discovery of responsibility and caring by an erstwhile bad boy—the ultimate hedonistic little beast, indeed. Colette's text and Ravel's music both contain prodigies of imagination. The out-of-control grandfather clock (because the child

has copped its pendulum), the scolding figure of Arithmetic (with its chorus of yes-men ciphers), the ethereal fairy princess (who is forced to leave because the child has torn the book that holds her story), the cockney teapot and Chinese cup (who talk in whatever vernacular scraps came to the mind of Colette, who evidently knew neither English nor Chinese)—I haven't space for all the piece's delights.

Ravel outdid himself in the coloristic precision with which he realized these characters. The episode that will grab most first-time listeners is the parody of his own *La Valse*, as sung by a pair of randy cats. Priceless! But the characterizations of the lumbering motion of the armchair or the erratic flitting of the dragonfly, for example, are equally deft.

This is one of those operas or quasi-operas (like the Berlioz *Damnation of Faust*) that are far better imagined than staged: "theater of the mind." Though the score includes

stage directions for live performance, its authors imagined that Disney-style animation was the only medium in which it might be realized adequately. Radio in 1925, when the piece was written, had not achieved the maturity of 1947, when it was first recorded (brief excerpts aside).

At that time, the French Radio (Radiodiffusion Française) had launched a project to broadcast all the neglected masterpieces of French music. To that end, it assembled what amounted to a resident company capable of doing justice to everything from Lully and Couperin to Messiaen and Dutilleux. Many of its members had contributed to the early "old music" recordings on now-forgotten 78-rpm labels like L'Anthologie Sonore, Lumen, and Boite à Musique; all were among the best Paris had to offer. And in Bour, the

Illustrator: Teresa Berasi

Dowland: Complete Lute Works, Vol. 2

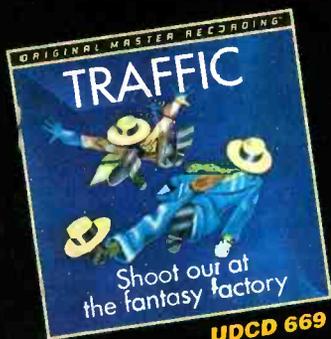
Paul O'Dette, lute
 HARMONIA MUNDI FRANCE
 907161, CD, 66:38
 Sound: A-, Performance A+

The words "lute" and "Dowland" have become invariably intertwined, as John Dowland was the foremost lutenist of his day and perhaps the greatest lute composer of all time. Today we often hear the hundred or so surviving pieces transcribed for classical guitar, and high-quality recordings of Dowland's work performed on the lute are rare. But this collection by Paul O'Dette is destined to be the definitive example of the lute as it might have been in Dowland's own hands. From the exhilaration of "My Lady Hunnison's Puffe" to the dulcet strains of "Lachrimae" (which was so popular in his time that it made Dowland's name a household word throughout Europe), O'Dette's superb playing is to the lute as Segovia's was to the guitar. How O'Dette can play his 6-string and 8-string lutes with such dexterity and cleanliness is a marvel, and certainly a marvel every Dowland fan will want to hear.

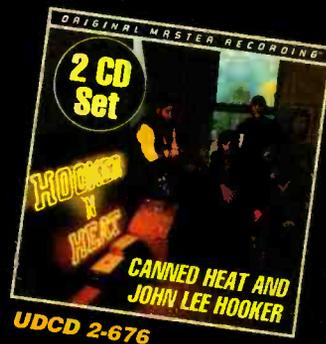
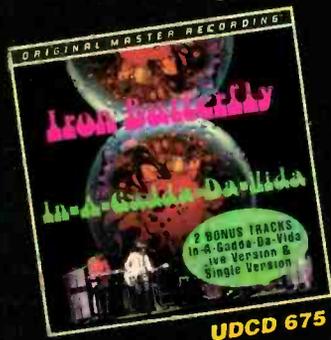
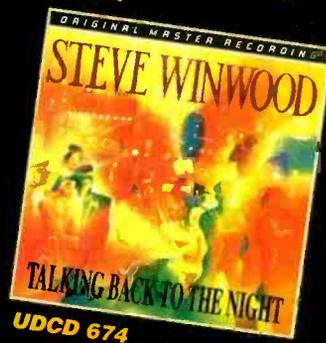
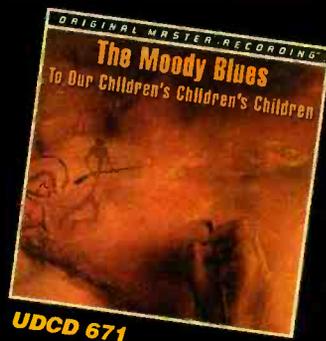


Patrick Kavanaugh

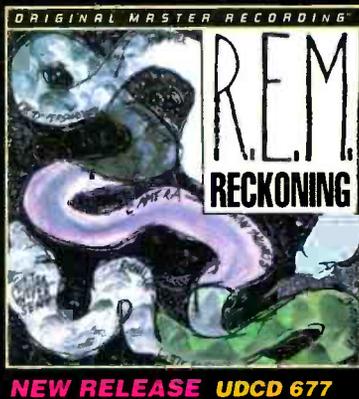
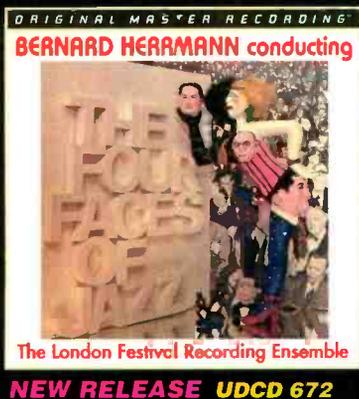
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radio service had a conductor with a sense of mission comparable to its own.

Of the performance's singers, baritone Yvon le Marc'Hadour (the clock and one of the cats) was particularly distinguished, thanks to his solid technique and adventurous repertoire. He and the fine Corsican lyric soprano Martha Angelici (the fairy princess) were both sadly under-recorded, though the latter did star in an Opéra-Comique recording of Bizet's *The Pearl Fishers*. Solange Michel, who here sings a shepherdess from the nursery wallpaper and the squirrel whose mate the naughty boy had caged, was in the same class. Nadine Sautereau, the excellent soprano who sings the boy, was perhaps the best known of all, but there's not a mediocre performance in the lot. All have a childlike earnestness of approach that makes the piece utterly convincing and deeply moving.

A few years later, Decca/London recorded Ernest Ansermet conducting *L'Enfant*—a version of which I have no concrete recollection. A stereo version with the French Radio under Lorin Maazel, now transferred to CD (DG 423 718), was slicker and more knowing than the Bour—and therefore less affecting. London recorded a Montreal performance under Charles Dutoit in 1992; it is unissued here, but I have obtained a Canadian CD of it (London

440 333). I have not heard the recent Valois recording, conducted by Alain Lombard.

The Dutoit recording does have some advantages over the Bour. It includes the song cycle *Shéhérazade* and an early *Shéhérazade* Overture, for more than an hour of music. The sound, being more modern, has a wider dynamic range and is totally free of the inconsequential background noise that you can just hear in Bour's silences. And London's stereo, which only occasionally is used for dramatic effect, allows you to hear Ravel's miraculous sonorities in delicious detail. Dutoit seems obsessed with those sonorities, in fact; the drama as such is not nearly as compelling, either orchestrally or vocally, as it is under Bour. The Montreal cast is more than respectable, but it is no match for Bour's.

The Testament transfer is cleaner and a little brighter than that on a Columbia LP around 1950. As a result, the sense of almost tactile immediacy is increased, though it does emphasize strain in an occasional high note. Above all, however, it retains the feel of the original; it moves through the nursery and out into the garden with a sonic sensibility redolent of the golden age of radio. Full text in both French and English is supplied—a big plus over the LP version.

Robert Long

Concertos From the New World

Yo-Yo Ma, cello;

New York Philharmonic, Kurt Masur

SONY CLASSICAL SK 67 173

CD; DDD; 61:26

Sound: A, Performance: A+

This CD includes the first two great cello concertos written on this side of the Atlantic. Neither composer was born in America—Antonín Dvorák was Czech and Victor Herbert was Irish—but they worked together at the

National Conservatory of Music in New York City. Dvorák is best known for his powerful symphonies and chamber music, Herbert for such operettas as *Babes in Toyland*. Despite their different musical output, they became fast friends and greatly encouraged each other in their compositional endeavors.

Dvorák's Concerto is sacred to any cellist, having quickly become the instrument's pre-eminent work. Yet the composition owes much to Herbert's earlier (by a year!) Cello Concerto No. 2, which premiered in March 1894 with the composer as soloist. Dvorák was ecstatic, calling the work, "Splendid! Absolutely splendid!" Its performance naturally inspired Dvorák, who finished his own concerto within the year, though it was not premiered until March of 1896. Concerning this piece, yet another of Dvorák's friends, Johannes Brahms, would one day comment, "Why on earth didn't I know that one could write a violoncello concerto like this? If I had only known, I would have written one long ago!"

Yo-Yo Ma's Dvorák is outstanding. Every passage is carefully thought through, and tone quality is altered to match the contrasting themes of each movement. The famous opening is as strong as a cannon, yet that movement's secondary theme soars with Ma's celebrated lyric quality. The cadenza of the second movement is played very delicately, while the trills and double-stops of the finale are attacked with gusto. The soloist's great love for Dvorák's music is evident in every phrase.

The Herbert concerto is less acclaimed, but equally well performed. Ma's playing is sensitively measured with the orchestra, creating a true unity rather than the feeling of soloist accompanied by a less important group of musicians. Kurt Masur leads the New York Philharmonic with great enthusiasm, and the playing is well balanced and precise.

This CD was recorded at New York's Avery Fisher Hall, and the sound is impressive. Some listeners may, however, wish that the soloist had been recorded more prominently, especially in a few bombastic sections of the Herbert. But the caliber of musicianship is so high in these performances that this disc is a must-have for any cello lover.

Patrick Kavanaugh



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14 CDs; DDD; 16:05:08

Recording: A, Performance: A

The "everything-by-everyone" concept was well covered during the LP era by Vox and other labels, but recent CD activity has eclipsed anything from the previous format's time in the sun. Naxos, the upstart budget label, has won acclaim for excellent sound and performances, albeit by unknown performers. These bargain-priced CDs are more likely to induce collectors to invest in a complete set, such as this enormous 14-volume project, that might be out of the question at full price.

Edvard Grieg turned out a large amount of keyboard music, including pieces for organ and harmonium, all included here. Some compositions run less than a minute, and others (such as the *Peer Gynt* Suites on Vol. 11) are major stage pieces complete with a chorus and narrators. There are dif-

ferent versions of some of the music, such as *Peer Gynt* and the *Holberg Suite*, and transcriptions of popular pieces by Halvorsen, as well as transcriptions of Grieg's own songs.

Three volumes are devoted to Grieg's small character pieces, which he called *Lyric Pieces*, and another three to his arrangements of folk themes. To add variety and interest in the latter, Steen-Nøkleberg used variously a small house organ, a clavichord that he felt sounded similar to a certain Norwegian folk instrument, and an early Graf piano that seemed to fit the more orchestral-sounding pieces.

Most of this music can be easily played with great enjoyment by intermediate piano students; yet it all bears unique humanity and warmth that are Grieg's own style. Steen-Nøkleberg superbly handles both this vulnerable side and more virtuoso passages such as the closing fragment from the now-forgotten Piano Concerto in B Minor that ends the 14th volume. All recordings were made in the same hall in Oslo; reproduction is clean and transparent throughout.

John Sumier



ROCK ~ POP

RECORDINGS

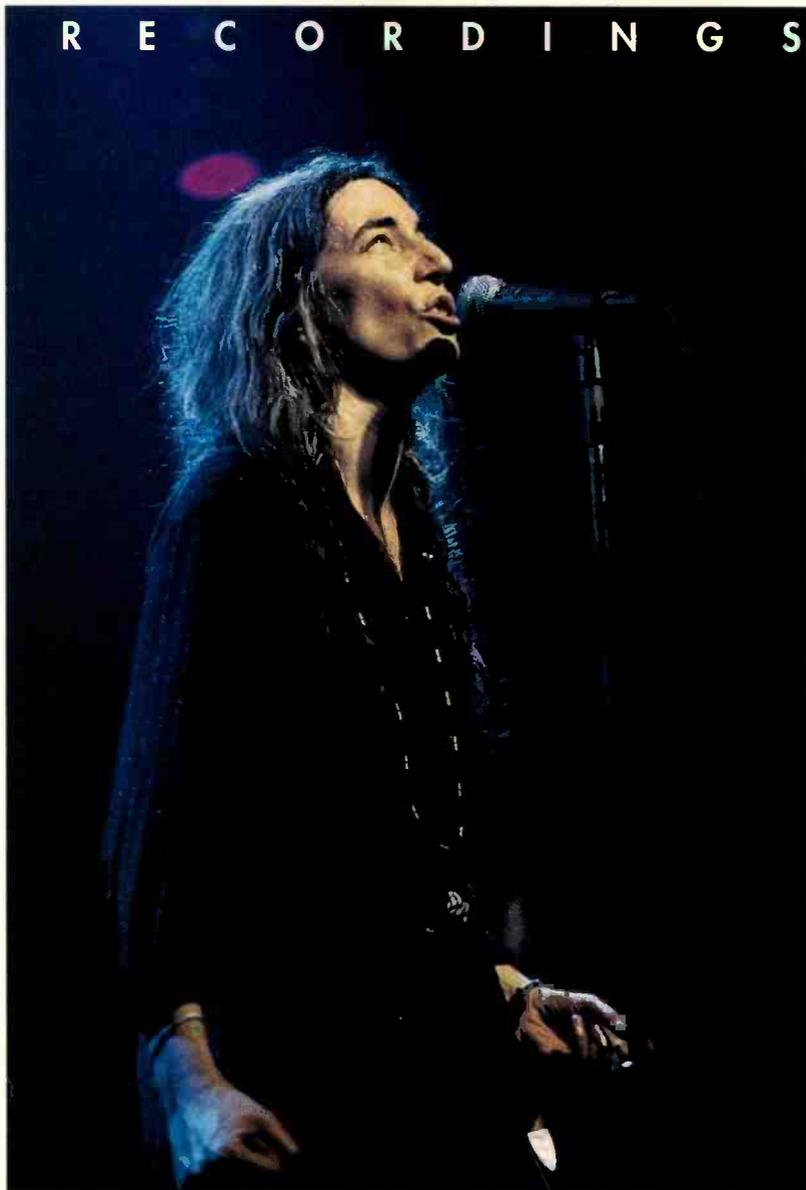


Photo: ©Ebet Roberis



Gone Again

Patti Smith

ARISTA 07822-18747, 55:58

Sound: A-, Performance: A-

In the mid '70s, Patti Smith's visceral mosh of spiritual discovery, vivid abstractions, urban poetry, and venomous punk rock helped her to become the musical decade's most explosive and influential woman. Not only did she compose and record what many consider to be the first punk single of the '70s ("Hey Joe" backed with "Piss Factory"), her first three records—*Horses*, *Radio Ethi-*

opia, and *Easter*—have become archetypes of literate vitriol and excellent vehicles for bringing the primal adrenaline rush of hardcore punk to a sophisticated audience. On songs like "Rock 'n' Roll Nigger" and "Horses," Smith was inflamed with inspiration, a musical harridan with the poetic sensibility of e. e. cummings.

After she married former MC5 guitarist Fred "Sonic" Smith and moved to Detroit in 1980, Smith dropped out of the music business almost entirely, save for her enervated but blissful 1988 reemergence, *Dream of Life*. Unfortunately for her fans, she had (with two children and

a placid suburban lifestyle) become quite content.

But when her husband died late in 1994 (and her brother nearly one month later), that contentment shattered, and Smith again found herself in need of artistic communication. *Gone Again*, her sixth album and her first in eight years, is a striking rebirth and the first cornerstone of her renaissance.

On *Gone Again*, traces of Smith as a primal performer arise like a phoenix from the figurative ashes of her husband. She's bitter and despondent, frustrated, awash in poetic futility. With its heavy doses of God-fearing grief and its promises of afterlife, *Gone Again* is as haunting as a collection of Appalachian folk ballads. To add to that chill, Fred's presence—hovering over the record like a skyward bunch of helium balloons—is deeply and frequently felt. He wrote the only two all-out rock

Bill Nelson

After the Satellite Sings

GYROSCOPE GYR 6616, 62:02

Sound: A, Performance: B

Composed, performed, and produced by former Be-bop Deluxe guitarist Bill Nelson, *After the Satellite Sings* falls somewhere between Brian Eno's and Prince's self-contained opuses. A pulse-conscious technodance offering with precious few gratuitous guitar-hero turns, *Satellite* focuses on groove and Nelson's enigmatic, hushed vocals. Though he builds up layers of imposing guitar textures on dense pieces like "Skull Baby Cluster" and "Ordinary Idiots," his guitar playing on the slick funk of "Streamliner" is warm and wonderful in the tradition of Ron Wood's economic, soulful guitar solo on Rod Stewart's classic "Maggie May." Nelson's atmospheric E-bow work is particularly effective on "Memory Babe," and he creates a New-Age vibe on the sparse piano-loop piece, "V-Ghost."

After the Satellite Sings is crafty, intelligent Brit-pop with a nod to Bowie, Eno, and Roxy Music. *Bill Milkowski*



songs on the record ("Summer Cannibals" and "Gone Again"), he receives a spoken dedication on the closing track, and he can be heard chanting near the end of the title song, a spine-tingling, respectful touch.

But though this record is moving as a spiritual tribute, and though Smith is accompanied by a stellar cast—John Cale, Jeff Buckley, Tom Verlaine, and former bandmates Lenny Kaye and Jay Dee Daugherty, among others—it is the power of her poetry that strikes an emotional target most often. On "My Madrigal," she turns the wedding vow phrase " 'til death do us part" into an eerie mantra. On the ghostly, acoustic "Farewell Reel" that ends the record, she sings with clenched frustration: "I don't know why, but when it rains it rains on me." On the tender "Fireflies," she sings to her husband: "Don't avert your eyes, don't turn away. . . I'm coming to you." Throughout, the record echoes the visceral tone—if not the outright polemic—of her best work.

Like the still before a storm, so dark, so quietly intense, *Gone Again* looms heavy with Smith's expressions of grief. Ironically, though, this record becomes our celebration, as it marks the physical and emotional return of a truly iconic performer. *Bob Gulla*

To the Faithful Departed

The Cranberries

ISLAND 314-524 234, 52:26

Sound: B+, Performance: B

A lot has happened since Irish pop phenomenon The Cranberries released their last record, *No Need to Argue*; they've grown from collegiate idols to international celebrities, and in the process discovered a world of personal and political upheaval right outside their front doors. Secondly, they've experienced the type of anguish and loss they've been writing about since 1991.

To the Faithful Departed, The Cranberries' new record, was largely influenced by the deaths of several friends and family members, including that of Dolores O'Riordan's grandfather (which the song "Joe" is about). Such stabs of reality have knocked the band out of its zombie-like trance and injected its music with a welcome sense of urgency. The Cranberries featured shimmering melodies on older hits like "Linger" and "Ode to my Family," but the new songs dig deeper under the skin, whether in lighter-raising ballads such as "I'm Still Remembering" or head-bobbing rockers like "Free to Decide" and the disc's first single, "Salvation."

From "Hollywood," the ominous opening track about disillusionment (played on crashing guitars, with a half-cooled, half-yelped



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chorus), to "Bosnia," the marching, political closer with strings, horns, and music-box chimes, the album is adventurous and musically diverse. Instead of gently plucking the heartstrings, as on past discs, The Cranberries alternately caress and prod their listeners into emotional ambivalence.

To the *Faithful Departed* doesn't cure all of The Cranberries' past ills. O'Riordan still resorts to yodeling too often, many of the lyrics are still heavy-handed, and, when The Cranberries aren't on an adrenaline high, some of their rhythms remain in that lifeless jangle zone. But the growth the band displays on the disc is praiseworthy, and in most cases the spirit and immediacy of the songs outshine any of the group's flaws. *Jon Wiederhorn*

Arise Therefore

Palace Music

Drag City 88, 43:58

Sound: B-, Performance: A-

Will Oldham, the enigmatic force behind Palace Music (he also records as Palace, Palace Brothers, and Palace Songs), is a songsmith of the highest caliber. And his desolate hillbilly take on Neil Young-style soul searching is eminently engaging. The only hitch is that the beauty in his music is often upstaged by oblique lyrics and plain old weirdness.

MAGNAPOP

Rubbing Doesn't Help

Magnapop

PRIORITY 53992, 50:08

Sound: B, Performance: B+

Georgia quartet Magnapop doesn't make it easy on itself. The turf it mines—jagged, punky guitar coupled with the fluid, disaffected vocals of chirpy Linda Hopper—has already been tapped by other schematically similar artists such as Belly, Juliana Hatfield, and even Lush on its latest. The differences that set *Rubbing Doesn't Help* apart from the other drone-pop pack efforts are subtle, but they do hold your interest for most of the disc's duration. Take, for instance, Hopper's cheeky ripoff of "Knocking on Heaven's Door," a sound-alike number called "My Best Friend," about a pal who "cries at the movies even when the story's old and bad." In addition to a staccato, grungey bridge tacked on for curiosity's sake, there's a weird Gen-X



phraseology to Hopper's singing and angst-plagued wordplay that creeps up on you, in the same sneaky way those unassuming episodes of Clare Danes' "My So-Called Life" once did.

Hopper has an "everywoman" sort of voice that weasels into the heart of each man-but-life-sure-sucks track, even when Ruthie Morris's guitar is growling against her. Sometimes the group is too snippy for its own good, as on the petulant riffer "Firebrand," but much of this material comes dangerously close to apothecic brilliance. Check out "Radio Waves," the Ramones sounding "I Don't Care," and a metallic-chorused "Hold You Down," in which heroine Hopper turns dominatrix and runs down a list of wicked tortures she might try out on her hapless significant other. Magnapop may not win the girl-group sweepstakes (sorry, Elastica's already holding that prize), but *Rubbing Doesn't Help* definitely puts it in the running. *Tom Lanham*

Arise Therefore may well change that. Not only is it Oldham's strongest album to date, but surprisingly, he's given credit to the players and producer (something he hasn't done in the past) and come up with an unmistakable title. While this may not seem that shocking in the grand scheme of things, if you've ever tried to surmise anything beyond song titles on previous Will Oldham releases, you'll certainly appreciate this. Thus, the listener will know that Steve Albini is responsible for the delicately crisp sound of the album, David Grubbs (*Gastr del Sol*) provides the piano and organ accompaniments, track and Oldham's brother Ned plays bass. The three truly help these songs sound like fully formed melodic entities.



The 11 tracks on *Arise* are far from orchestrated and remain true to Oldham's stripped-down vision of poetic Appalachian sorrow. The simple, spacious mourning of the near jazz chordings on "Give Me Children," the extremely "Powderfinger"-sounding quietude on "A Sucker's Evening," and the very nearly upbeat "No Gold Digger" paint *Arise Therefore* as an album that is more hushed and heartwrenching than the Palace efforts before it. It's also more accomplished. Works like Oldham's reaffirm the right of an artist to be as evasive and opaque as he wishes. Yes, it's that good. *Jason Ferguson*

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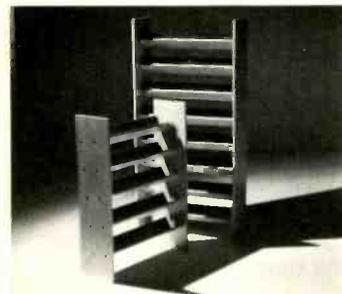
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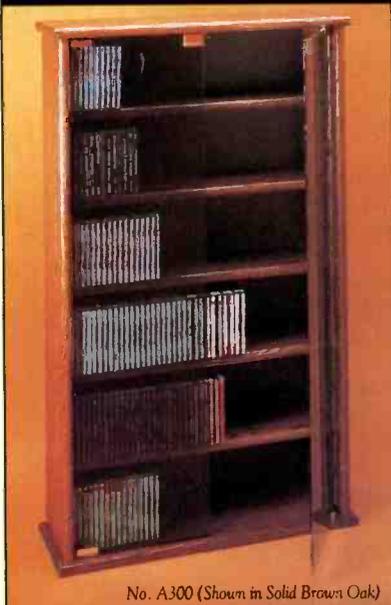
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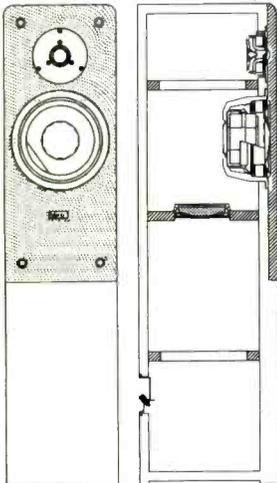
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The Aries crossover is a 6dB network, created and perfected by Dynaudio factory engineers. The tweeter has an all pass filter integrated for a flat phase response. The impedance is constant at 4Ω, through the use of RC and RCL filters. The construction makes use of premium parts: metalized polypropylene capacitors, Lynk non-inductive resistors, and premium coils as specified by Dynaudio for quality and wire gauge.

The Aries system comes with prefinished oak veneered cabinets, in either a clear or black stained finish. The cabinets come with quarter round solid oak corners. Grills are included and attached with fastex fasteners; the black grill covers the drivers, leaving the wood visible on the lower third of the cabinet face. The dimensions of the cabinets we provide are: 9" wide x 37.75" tall x 11.25" deep.

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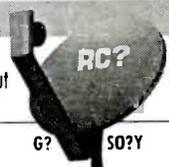
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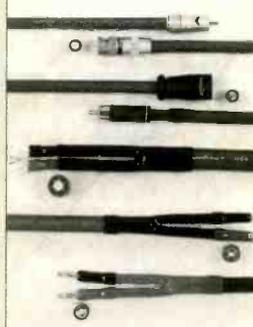
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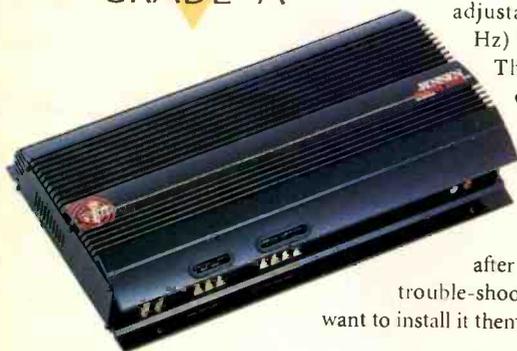


PlayBack

JENSEN RA 2040CLX CAR AMPLIFIER

I think this \$469.95 amp from Jensen's premium Nitro series may have a slightly softer high end than the older, \$1,000 amp I normally use; but I couldn't absolutely swear to it. And I can swear to a difference I hadn't expected to hear: I'd thought my system was so quiet I wouldn't hear a difference from Jensen's use of Crystal Line noise elimination, said to "block amplification of noises picked up by audio input cables." But I'd forgotten an intermittent noise the system recently acquired—I still hear it, but at a *much* lower level than I did before. The amp is rated at 50 watts per channel into 4 ohms in four-channel mode, but you can bridge either or both pairs of channels to deliver 150 watts into 4 ohms per bridged pair. Its crossover includes a 150-Hz high-pass filter as well as an adjustable (40 to 140 Hz) low-pass filter.

GRADE: A



The amp never overheated in the summer heat, even when my trunk was jam-packed. And the manual has page after page of installation and trouble-shooting tips for those who want to install it themselves.

Ivan Berger

for literature circle no. 120

Apollo CKD Speaker Stands

There are hundreds of audiophile speaker stands out there, in a variety of sizes, styles and prices, and most of them are very good. When I needed stands, the British-made Apollos caught my eye, and I bought a couple of pairs of the Model CKD 6.

The stands, which come in six different sizes, aren't really fancy. Their bottom and top plates and dual-column supports are of sturdy steel; the supports can be filled with sand or other damping material, and removable spikes are included. Prices range from \$169 to \$269 per pair, depending on height; my CKD 6s (\$179) are 24 inches high, and other models range from 14 to 44 inches in height. (The 39½-inch CKD 10, \$249, and the 43½-inch CKD 11, \$269, are shown.)

These stands are extra-easy to assemble: Mine took me 15 minutes for the pair, using the supplied wrench and hex-head bolts. Stick-on cushions are supplied to keep the stands from scratching the bottoms of speaker cabinets, a nice touch. The stands were a perfect match for my Apogee Acoustics Ribbon Monitors and several other bookshelf speakers I tried. I like the Apollo stands; they're useful, and they're not extravagantly expensive.

GRADE: A

John Gatski

for literature circle no. 121

SRD Speakerworks VM-1 Center-Channel Speaker

SRD Speakerworks is a small manufacturer based in Texas. Its line ranges from small surrounds to large stand-mounted speakers and powered subwoofers.

The \$375 VM-1 is a center-channel speaker, with two 5-inch polycone woofers and a 1-inch titanium dome tweeter in a ported, hardwood cabinet 18 inches wide. The drivers are video-shielded, and the cabinets are available in several finishes. Maximum power handling is given as 150 watts.

Setting the VM-1 on my Toshiba monitor, I found that it had a nice, transparent sound that wasn't colored by room interaction—no need for EQ. The bass was good, rated to 45 Hz, but not subwoofer-low. The



tweeter sounded accurate without being sibilant or crisp in the vocal region (which can lead to listener fatigue over a long movie

GRADE: B+

session). Male voices were not boomy in normal conversation as they are with some other center speakers I have heard.

The manufacturer says that the VM-1 can also be used as a main or surround speaker. When I tried a pair at the front left and right, they sounded very dynamic. So the SRD Speakerworks VM-1 is a pretty good all-around speaker for the money.

John Gatski

for literature circle no. 122



"...Possibly the most speaker
that can be had
for the money."

- KWN, Editor
The Sensible Sound, Issue #54

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CIRCLE NO. 12 ON READER SERVICE CARD

SYNERGY? LOCKING-IN? ENHANCEMENT? COMPENSATION?

Someone try to "sell" you one of these? They are just a few of the misguided and ineffective solutions bandied about as sure to "fix" your audio system.

Sorry to be so negative, but the truth can be brutal. Understanding how to improve a system requires first acknowledging that nothing positive ever happens. Sure, it's fabulously positive to get music out the other end, but the signal only gets a little worse each step along the way.

Inserting a superior piece of equipment anywhere in the signal path will improve the quality of the final sound. However, the signal will not have been improved ... it will have simply suffered less damage. Believing claims that a component can improve the signal can lead to expensive frustration.

When a better component is substituted for a lesser piece, we expect a positive improvement, something like $1 + 1 = 2$. However, when the improvement seems unexplainably large, somewhat like $1 + 1 = 3$, then terms like "synergy" and "locking-in" are often used to describe this apparently magical change. Whatever the terminology, the actual improvement will be better understood when viewed as a change from a minus three to a minus one. The same two points change, but on the other side of zero.

Just because a change is greater than expected or understood, that doesn't make it magical or incomprehensible ... logic has not been compromised. For example, if something is too far away to see, that doesn't mean the distance in-between is infinite.

The logic of a good system is very simple: Every component matters! The electronics, the speakers, the cables ... even every solder joint, they all cause damage. Each component is like one of the dirty panes of glass in this illustration, each one blocks a bit of the view. The quality of the final performance, or the clarity of the view, is the original minus the damage done by all the pieces in-between. Improving any one of the components will improve the sound. Cleaning any one of the glass panes will allow a clearer view.

Recognizing the negative nature of our challenge makes it much easier to understand "unexplainable" improvements. If the panes of glass were not only dirty, but also had a red tint, then as each pane was cleaned and Murined (get the red out), the view of the music would improve as expected. However, it would only be after the last pane was de-tinted that the red would be completely gone.

De-tinting this last pane would seem to make more of a difference than de-tinting the others. We would be more impressed by the elimination of the red tint than by the previous changes in the density ... we are more sensitive to the presence of a phenomenon (the red) than to the quantity.

The "synergistic" aspect of this improvement would have been the same no matter which pane of glass happened to be the last one de-tinted. What was special about it was simply that it was last ... not much magic in that.

Assembling or upgrading a system to be sonically effective and cost-effective requires a broad perspective and a trustworthy evaluation methodology. Combined productively, these ingredients make the process predictable and enjoyable.

For more information about developing an effective evaluation methodology, please write/fax/call us to request our "Methodology" paper. Or you can borrow a "Get To Know Us" kit from one of our Center dealers ... the methodology discussion is included along with lots of different cables and accessories, and some great jazz and blues from AudioQuest Music.

