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JANUARY 1994

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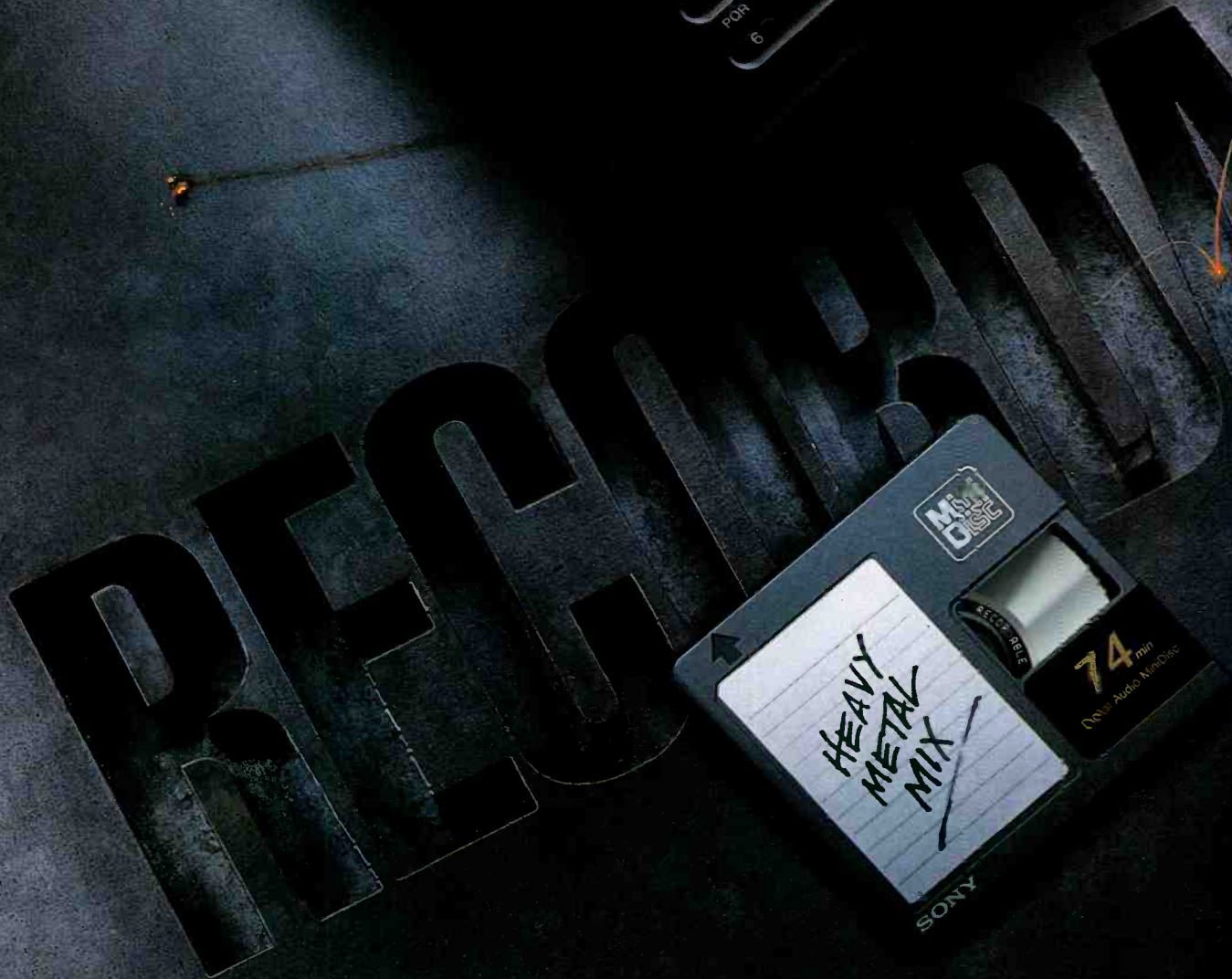
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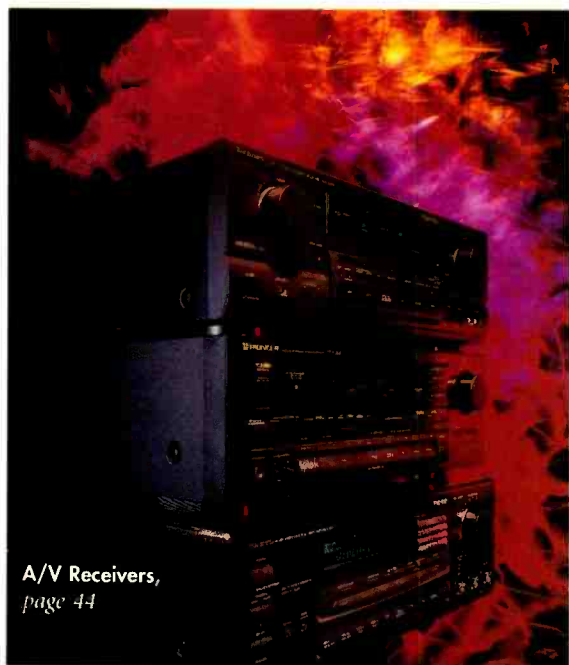
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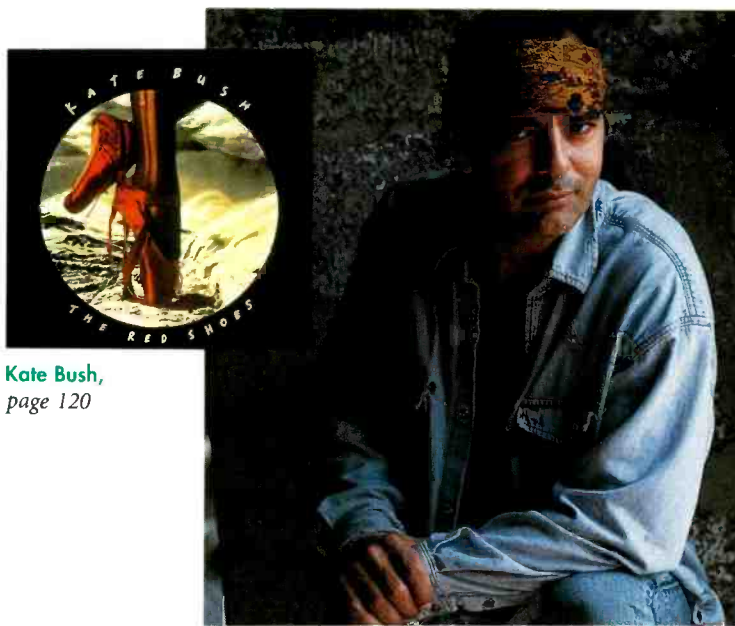
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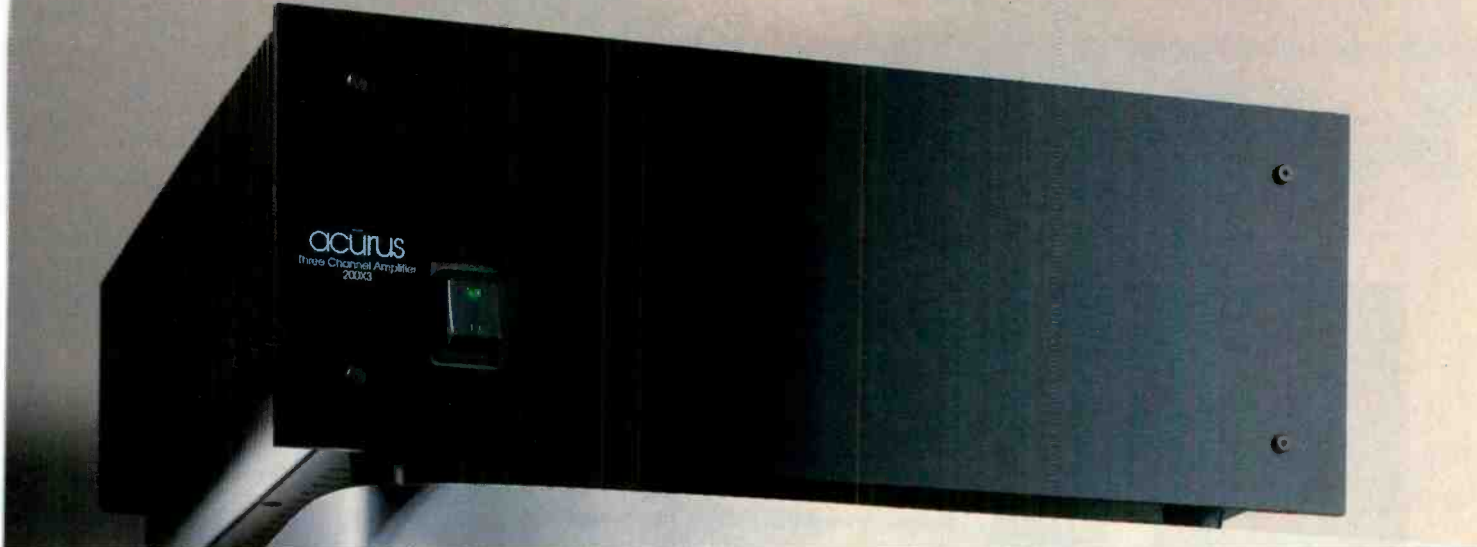
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JVC,
page 78



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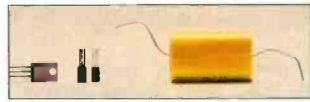
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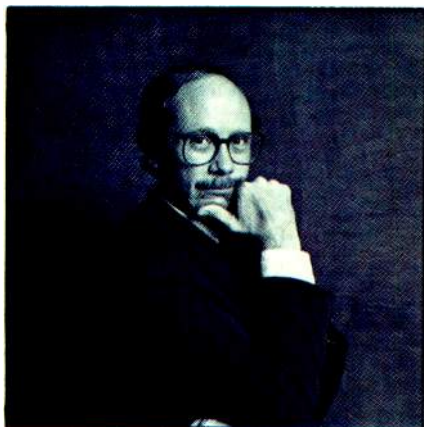
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The monthly publication *Which*, from the British Consumers' Association, is pretty well the British equivalent of the American *Consumer Reports* from Consumers Union. Like *CR*, *Which* does testing of products bought at retail and generally acts as a consumer advocate. They had an interesting item in a recent issue concerning a new tax on blank audio and video tapes proposed for the European Community. Entitled "Unfair EC Tape Tax," the item mentions the magazine's 1991 survey that showed home taping "does not greatly affect sales" and that "People who do record copyrighted works mostly tape things they already own—to listen to in the car, for example." Unlike in the U.S., it isn't legal to tape copyrighted works at home. *Which* is concerned that the proposed tax will add an unacceptably large amount to tape prices, pointing to Denmark, where the tax added about a third to the price of C-90 cassettes.

Loren Shapiro of Chicago, responding to my request in the October issue for ways to improve the Annual Directory, suggests that we add line graphs to equipment reviews "comparing the relative placement of the product being tested vis-à-vis comparable products with regard to one parameter." The graphs would show the measurement for the particular item under test, the average of all other similar items tested, and the

range—both positive and negative—for all items tested. It's a nice idea, and one that our sister publication *Popular Photography* uses. On the downside, we are not as heavily staffed or computerized as *Pop Photo* is, but more importantly, the market they serve has fewer items in it and changes models more slowly than does the hi-fi field. It would not be an easy task to produce such a graph, and that graph still wouldn't be as strongly useful as we'd like; there would be just too many unmeasured units. We've been thinking about making the Directory available on CD-ROM. Since most of the specifications the makers give are pretty accurate, the ROM's search-sort capabilities would allow the user to make graphs like those Mr. Shapiro suggests of any numerical specification.

David Lutley of Womelsdorf, Pa. takes me to task since this year's Annual Directory no longer includes open-reel tape decks, microphones, or hi-fi VCRs. "Surely," he writes, "it should be your aim to make this annual directory better each year, rather than inferior, and this sort of information, which would be useful to the home or amateur recording engineer, should not be abandoned." Well, yeah, that's why we've gone to the DAT, MD, and DCC—digital formats—and dropped the ones poorer in ergonomics and performance. Not including mikes bothers me, but mikes have been gone from the Big D for more than just a year. Mr. Lutley is the first reader to contact me about this, and no mike maker has complained. Further, so very few cassette, DAT, MD, or DCC decks have mike inputs that I contend almost no one does "live" recording anymore. Not that this is necessarily good, but that is the way it is. Moral: Make the best use of space available.

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P.S. from DGX

Dear Editor:

DGX Audio would like to express our gratitude to *Audio* magazine for the cover spot and comprehensive review of our Digital Deconvolution Audio System (DDAS) in the November 1993 issue. Our design objective was to develop the best-sounding system and offer it at a price most people can afford. To make the best speaker—or the best of anything—always takes the experience of “shakedown cruises” and subsequent redesign, adjustment, and fine-tuning. In his complimentary review of our new product, D. B. Keele, Jr. identifies two areas for improvement.

First, he states that the bass, although well controlled, is overemphasized. The bass roll-off compensation of the system was tuned according to the results of recent listener-preference investigations. In fact, we originally provided multiple user-selectable bass roll-off compensation levels. This feature will be included on all systems delivered in the future. We appreciate that bass level is a matter of personal taste—and in this case, allowing listeners to make the choice is the perfect solution.

Second, Mr. Keele points out that the loudspeaker exhibits less than perfect vertical-coverage characteristics. We have since made crossover adjustments that dramatically widened the vertical listening window

We believe that the DDAS is the best-sounding audio system available. Perfection is elusive, but with the feedback of interested and experienced associates such as Mr. Keele, we're getting ever closer.

David Chiang and Gary Brown
DGX Audio
Ronkonkoma, N.Y.

“SuperRadio” Meets Super Antenna

Dear Editor:

I can fully confirm Leonard Feldman's findings—and enthusiasm—about the Denon TU-680NAB “SuperRadio” (“Equipment Profile,” April 1993). A simulcast here in Portland reveals KINK AM sounding even better than KINK FM. Most

people choose the AM when asked to pick the FM in an A/B comparison! The Denon is also by far the most sensitive and selective FM tuner I have ever used.

A postscript on the LF Engineering M-601 AM antenna Mr. Feldman suggests using with the tuner (“Auricle,” July 1993): I installed one and discovered a possible problem for urban dwellers. I live a couple of miles from two AM transmitters and seem to have cross-modulation problems across the entire AM band when the r.f. amplifier in the M-601 antenna is used. However, I find that simply not applying power to the system solves this problem—and I *am* getting *far* superior reception of local and distant AM stations by using this antenna with the r.f. amp off, compared to what I was receiving on the Denon tuner's attached loop antenna. So the LF Engineering antenna still seems worth buying and installing in any location.

Eric Norberg
Portland, Ore.

Editor's Note: Your problem sounds like simple overload to me, but your simple solution works, so use it.—E.P.

Always Use Your Zip Cord?

Dear Editor:

Fred E. Davis' excellent article, “Speaker Cables: Testing for Audibility” (July 1993), concludes that for average systems and short cables, differences between cables (including ordinary zip cord) are “at the threshold of audibility.” This article reminds me of a talk given recently by Edgar Villchur at the 1993 banquet of the Boston Chapter of the Audio Engineering Society. Villchur was describing the “live versus recorded” concerts staged by AR in the late 1960s, at which an immediate comparison was made between live music and its reproduction through AR-3 loudspeakers. (The consensus among critics was that most of the switches were not detectable—and that when a difference was noted, one could not be certain by sound alone which source was live and which recorded.)

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Of all tests, this is the most exacting, and Villchur said: "At these concerts we couldn't afford to use auxiliary equipment that would compromise the quality of reproduction. And so offstage there was a professional Ampex tape recorder, two 60-watt Dynakit amplifiers, and for the 40 or 50 feet between the amplifiers and the speakers, we used #18 zip cord."

The Boston AES audience had laughed at Villchur's occasional quips, but they roared at this remark.

Roy Allison
President, RDL Acoustics
Bellingham, Mass.

Don't Get Wired

Dear Editor:

I always find your articles on speaker cables interesting. As a high-end audio retailer, we rarely sell anyone their first system; we mostly sell improvements to systems, or we sell people their second or third systems. We sell a lot of cables.

We've had all of the major brands of cables in to evaluate. Some improved the sound, some made the sound worse. When people come in and are looking to improve their system, cables are often recommended. A great many people are skeptical (understandably), so we've found it is easiest to let the customer take the cables home and try them. If they make a significant improvement to the sound, buy them. If they don't, don't buy them. It's that easy. We sell a lot of cables (and other equipment) that way. Listen for yourself!

Keith Dowd
Audioport
Overland Park, Kans.

Another Cable on Cables . . .

Dear Editor:

I was so impressed with Fred E. Davis' article on speaker cables that I just signed up for a three-year subscription.

It was refreshing to read (in a consumer-oriented magazine, no less!) a scholarly article that fully explored a subject and offered conclusions based on empirical data rather than opinions only. I am not an engineer, but I want to know *why* equipment works and sounds the way it does, not just *how* it sounds. Davis did an excellent job of explaining key terms and some of the basic physics involved.

I gave up on other "stereo magazines" long ago. Your July issue showed I could gain worthwhile information after all.

C. Richard Sulzer
Doylestown, Pa.

. . . and Another

Dear Editor:

Thank you for the article on speaker cables. Fred E. Davis gets to the heart of the speaker wire controversy. Now if you could have an article that gets to the heart of the CD jitter controversy . . .

Steve Doyle
Kamuela, Hawaii

Editor's Reply: Okay, Mr. Doyle, good suggestion. We'll see what we can do.—E.P.

"Unauthorized Reproduction . . ."

Dear Editor:

For some time I have been curious about what exactly recording companies mean by "Unauthorized reproduction of this recording is prohibited by Federal law and subject to criminal prosecution." Could you summarize what exactly I can and can't copy on tape?

Matt Jurach
Sacramento, Cal.

Jason S. Berman, President of the Recording Industry Association of America, replies: Matt Jurach's letter is a good one. Under U.S. copyright law, a copyright owner of a sound recording ordinarily has the exclusive right to control the reproduction and distribution of that sound recording. The copyright law imposes not only civil liability for those who infringe on a sound recording copyright owner's rights, but also criminal liability where the infringement is willful and for purposes of commercial gain. The warning described in Mr. Jurach's letter thus serves as an enhanced form of copyright notice and hopefully serves to discourage record piracy.

Of course, under the Audio Home Recording Act enacted in October 1992, a consumer may make a copy of a sound recording for the consumer's own non-commercial use without incurring any copyright liability. This limited exception does not, however, negate the importance and value of a broader warning against copyright infringement.

Audio Collection Available

Dear Editor:

For more than two decades I have thoroughly enjoyed reading *Audio*. It is the only magazine of its kind in the United States that I've ever subscribed to.

I now have a large collection of *Audio*, spanning some 25 years, that I must part with for reasons of space. Perhaps some of your readers would be interested.

Freeman H. Matthews
72 Hamilton Pk., B-8
Columbus, Ohio 43203

Dolby S: Surviving

Dear Editor:

In the July 1993 issue, Edward J. Foster expressed regret about the possible fate of Dolby S noise reduction in competition with DCC and MD ("Equipment Profile" of Aiwa XK-S9000 cassette deck). Well, please tell Mr. Foster that he need not shed a tear for Dolby S. Recently, some heavy hitters have stepped up to support it. The Warner/Elektra/Atlantic group has announced that all future titles will be released in the format. Sony now has a line of Dolby S cassette decks starting at less than \$400, a significant price break.

For some reason, though, these stories have been ignored or buried by most U.S. media outlets. There seems to be a general infatuation with things digital, fed by the invalid notion that if something uses computer code it must be better. But, I'm sure you'd agree, the public needs to be disabused of such ideology, for the sake of its pocketbook if nothing else! This is true despite the egg that the expensive digital formats have laid on the market.

One way that *Audio* can make an impact is to run a comparative listening test between Dolby S, DCC, and MD. But unlike the Dolby S versus DAT evaluation conducted by *Stereo Review*, the source should be live music (*not* CDs), which would make for a much more demanding test.

On another front, the Denon TU-680NAB tuner seems to be getting a lot of (probably much-deserved) attention of late ("Equipment Profile," April 1993). However, the abilities of another "super radio" with superb AM stereo specs, the Carver TX-11b, should be brought to light.

Adrian Tatum
Palos Verdes, Cal.

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Minimum Impedance Problems

Q. My receiver delivers 110 watts per channel into 8 ohms. Recently I purchased four new loudspeakers. One pair has an impedance of 8 ohms; the other pair, 6 ohms. I like to run all four speakers simultaneously. The receiver's instruction manual talks about either 12 ohms per speaker minimum or 6 ohms per speaker minimum. I have my speakers connected in parallel. Is that safe? Can I damage any of my components with my present wiring?—Fernando Vazquez, Miami, Fla.

A. It seems to me that you can operate your equipment perfectly just as you now have it wired. If I understand you correctly, your manual says you can operate two pairs of speakers in parallel as long as the minimum impedance per speaker is 6 ohms. One pair of your speakers meets that minimum, and the other has a higher impedance than that.

If, on the other hand, the combined impedance of both speakers per channel must be 6 ohms, you'll have problems with a parallel hookup. In parallel, your loudspeakers will have a combined impedance of less than 4 ohms.

Does your manual's reference to 12 ohms apply to serial connections? If so, I suspect that 12 ohms per channel is the lowest value recommended as the combined series impedance of your two pairs of speakers. In that case, your present loudspeakers can run successfully in a series hookup. If the manual actually says each speaker's impedance must not be lower than 12 ohms (unlikely, as few speakers have impedances above 8 ohms), you have a real problem, as none of your speakers has such a high impedance.

If your manual is confusingly written, check with the service department of your receiver's manufacturer to see which hookups are safe. Assuming both serial and parallel connections are okay, I recommend you operate your speakers in parallel because the damping is better.

If there is any doubt, don't drive your amplifier to maximum. If you run it at half

power or a bit less, chances are you will minimize overheating and damage to the output stages. There is little audible loss of volume between full and half power.

"Pops" from the Power Lines

Q. I hear a "popping" sound from all speakers in my audio/video system. The sound is usually just a quick "pop" every 2 to 15 minutes, and I also hear it when a light switch is turned on. What is causing this sound, and how can I prevent or eliminate it? Will my components be damaged by these "pops"?—Lee F. Winer, Redmond, Wash.

A. The "pop" you hear is caused by transient voltages on the power line. These transient spikes are often produced when a refrigerator or furnace starts and stops operating. As you have noticed, light switches often cause the sound.

I have never heard of such noise spikes being so loud as to damage equipment. But they are annoying, so you need to determine which of your system components is passing these spikes along to its output. Since all your speakers are reproducing the popping sound, look for components that affect all channels. Components that fit this description typically include A/V receivers, preamps, and surround decoders. If all your speakers are fed from the same amplifier, it's also a suspect.

To determine the actual source of the problem, try disconnecting one suspect component and running the system without it. If the "pops" are still heard, reconnect the component and try disconnecting another one. Keep trying, working closer and closer to the power amplifiers, until the noise is gone. If you're left with only the power amps as likely culprits, check by substituting other amps for them.

Once you know which device is causing the problem, write to its manufacturer and ask what remedies he has for the problem. With some components, the solution is to place low-value capacitors across the feedback resistors, to narrow the bandwidth. Before you try that, let the equipment's maker recommend capacitor values.

Sometimes, especially in homes with old and undersized wiring, the problem can be cured by running a separate a.c. line from the fuse or breaker box for use with the audio system only.

You have observed that one or more light switches are sources of these "pops." If you get a noise spike when your furnace or air conditioner switches on, the relay contacts associated with your thermostat may be another source of the problem. For these sources, you may be able to reduce the level of the noise transients by putting RC circuits across the offending contacts. Such circuits consist of a resistor and capacitor wired in series across the contacts. Use half-watt or larger resistors, and capacitors with working voltage of at least 400 V d.c. Try a 100-ohm resistor and a 0.1-mF capacitor for starters, but you may have to experiment to find what values work best.

It's not easy to install an RC network in a refrigerator or freezer, but you should be able to find noise suppressors that can be plugged in between such appliances and the a.c. line. Make sure these suppressors have sufficient power-handling capacity for whatever appliance you use them with.

Audio and A.c. Polarity

Q. Why do some high-end components have switches to change the polarity of the a.c. line? I can't see how changing the polarity of an a.c. signal can improve the sound quality.—F. Luk, Lafayette Hill, Pa.

A. Reversing the polarity of the a.c. power-line voltage entering a sound system will not improve the intrinsic audio quality of that system. On its face, it does seem ridiculous to think that by reversing the polarity of an a.c. voltage, the sound of an audio system can improve or deteriorate. However, there still may be some apparent sonic improvement. The power line has one side grounded, and changing the polarity of the power-line voltage affects the action of the ground in relation to the chassis. This can, in some situations, affect the amount of background hum that emanates

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

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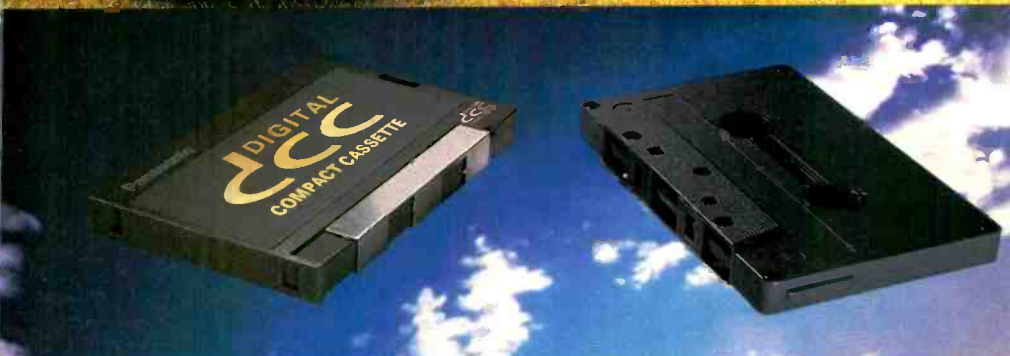
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from the loudspeakers. Even where hum is not apparent, it could be present to an extent where it will mask some nuances of the music. When the hum is reduced or eliminated (as a result of reversing the polarity of the power-line voltage or however it was done), the music will take on a more open quality.

CD Track Lockout

Q. *Why are there presently no CD players that allow the user to "lock out" certain tracks on a particular CD so that they cannot be played? On any given CD, there is likely to be at least one undesired track. Wouldn't it be easier to lock out one or two tracks rather than having to program the player for each CD so that only the desired tracks will be heard?*—Chris Burns, Rockford, Ill.

A. Quite a few current CD players offer such features as Favorite Track Selection, letting you store the track programs for many CDs and automatically repeating those programs when you replay each disc. Check whether any model you're considering has the memory capacity to handle the number of discs and tracks you'll need. Philips and Philips-owned brands, such as Magnavox, were first with this feature, but other makers have it by now (often under a different name).

If all you want to do is lock out tracks on a one-time basis, look for a player with a "program-out" feature. This lets you program the player either to play the tracks you want or to exclude the ones you don't want, whichever makes programming simpler and faster for a given disc.

Line-Voltage Conversion

Q. *Last year, I had my receiver converted from 120-V operation to 220-V operation by an authorized dealer in Paris. Is this in any way likely to degrade the performance of my receiver?*—Roman Krysz, Paris, France

A. Inasmuch as you had the power transformer replaced by an authorized dealer, the correct replacement part was probably used. Therefore, I believe the receiver's performance will not have been degraded by the conversion.

CD Players, Amps, and Level Controls

Q. *Do I really need a preamplifier between my CD player and my power amplifier? Can't I just use a high-quality ganged*

volume control between the player's output jacks and the inputs of my power amplifier?—Alan Fassinger, Rochester Hills, Mich.

A. Using a volume control between the output jacks of your player and the input terminals of your power amplifier will work fine. Just for the sake of completeness, some CD players are equipped with their own volume controls; such players will also work well for your application. However, I personally don't like this arrangement, because there are times when I would like to make tonal adjustments. Your arrangement makes no provision for this. A preamplifier also provides switching facilities and input/output connectors for other equipment in a system; your arrangement doesn't (although you could use a switch box).

Misaligned FM Tuner

Q. *I have an FM tuner connected both to a dipole antenna and, via switching, to the local cable company. The cable system retransmits our local stations and provides a stronger signal than I can obtain using my dipole.*

The tuner is still new, with less than 100 hours of use. I have noticed that the LED center-tuning indicator frequently shows that tuning a little higher in frequency may be required. If I move up 25 kHz, the indicator shows correct center tuning, but the signal-strength meter shows a slightly weaker signal. This occurs whether I use my dipole or cable.

I have heard that atmospheric conditions can sometimes cause stations to drift. I've also heard that tuners can drift. Should I have my tuner serviced?—Brady Patterson, Cowansville, Que., Canada

A. Atmospheric conditions have nothing to do with the frequency accuracy of an FM broadcast station. I cannot even imagine how such conditions would "fool" the tuner into a frequency error. I think the real problem is that the tuner's detector is not aligned properly. Let's say that it is supposed to be centered on 10.7 MHz. If, because of misalignment, it happens to be centered on 10.725 or perhaps 10.675 MHz, then the signal meter and the center-of-tuning meter readings will not agree. Depending on the bandwidth of the i.f. system in your tuner, this misalignment may produce some distortion on highly modulated signals. A

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TAPE GUIDE

HERMAN BURSTEIN

Head Life

From time to time, a number of readers have asked about the life expectancy of cassette deck heads. The question is not easy to answer in precise terms; information on the subject is difficult to obtain. I have heard that cassette deck heads may have a life as short as 1,000 operating hours and as long as 10,000 or even 20,000 hours. Heads for which manufacturers claim very long life may be inferior with respect to saturation and to preservation of a very narrow and very straight gap.

Head wear depends on at least three factors: Material of the head (such as perm-alloy, Sendust, ferrite, etc.); quality of the tape, with respect to smoothness and lubrication of the magnetic coating, and pressure of the tape against the head, which is determined not only by the pressure pad but also by the tension exerted by the take-up and supply reels. (At least one manufacturer, Nakamichi, moves the pressure pad out of the way and depends on tape tension for good tape-to-head contact.) Premium tapes from well-known manufacturers are apt to cause less head wear than other tapes, particularly tapes of unknown origin and quality.

Head wear is not as bad with cassette decks as it used to be with open-reel decks, because the much slower tape speed of cassette decks reduces wear per hour of use. Cassette decks normally operate at the standard speed of 1½ ips, whereas open-reel decks have a standard speed four times as great, namely 7½ ips. While open-reel decks often offer the 3¾-ips speed as an option, best performance from them usually requires the 7½-ips speed, or even 15 ips.

Azimuth By Ear

Q. *Azimuth, that's my problem! I own a good dual-well deck, but have noticed a big difference in treble response with a prerecorded tape on each well. I recorded from a CD onto a tape in well B and played this tape back in both wells A and B; treble suffered in well A. Therefore, I broke the head seals in an attempt to fix the azimuth myself.*

I took a blank tape to an audio store and recorded it on their best cassette deck. The test tape sounded good on this and other decks. Next I used the tape to adjust azimuth of the heads in my deck, judging by ear as to when I achieved correct azimuth. Amazingly, both wells of my deck now sound equal when playing a tape. This attempt to make my own test tape and adjust azimuth by ear took hours and hours. Am I crazy?—Mark D. Mina, Anaheim, Cal.

A. Yes, you are crazy. Like a fox. Just as the proof of the pudding is in the eating, the test of audio is in the listening. Kudos to you. I recall a very respected audio engineer who designed a number of highly regarded audio components; he refused to adjust azimuth by instruments (test tape and meter or oscilloscope). Instead, he set azimuth by ear.

The audio dealer who let you spend considerable time in his shop making a test tape and trying it out deserves a vote of thanks.

What Price More Treble?

Q. *I recently purchased my first cassette deck; its frequency response for Type II tape is rated 2 kHz higher than for Type I. But a test report in a leading consumer magazine indicated that Type I tapes are better than Type II. Is the extra 2 kHz in response worth the degradation in tape performance?—Name withheld*

A. First, I question the general statement that Type I tapes are superior to Type II. At one time, Type II was generally considered better, but then some Type I tapes began to catch up and even surpass some Type IIs. Today, whether Type I or II is better depends on the specific brand and grade of tape you buy.

Now let's consider whether an "extra 2 kHz in response" is worthwhile. This depends on the reference frequency. If you are talking about 2 kHz above 10 kHz, yes, this is probably quite worthwhile. If it's 2 kHz above 12 kHz, it may be worthwhile. Above 14 kHz, the improvement is open to question. The answer depends on your

hearing ability. Most adults hear little above approximately 13 kHz. The same may be true for many young people whose hearing is impaired by frequent exposure to the sound levels prevalent at rock concerts and in clubs.

Hi-Fi VCR Tape Speed and Audio Quality

Q. *I have a Hi-Fi VCR. Someone told me there is little sound degradation between SP (fastest speed) and LP or EP (slower and slowest speeds). Is this true? If not, would reducing VCR speed by half (going from SP to LP) degrade the sound as much as cutting the speed of an open-reel tape deck in half (say, from 7½ to 3¾ ips)?—William Maloney, Rockville Centre, N.Y.*

A. Very good audio recording can be achieved with a Hi-Fi VCR at the LP and EP speeds. Results at these slower speeds are often indistinguishable to the ear from those at SP. To verify this for yourself, tape the same material—for example, a good CD—with your VCR at each of its speeds. Let your own ears determine whether a significant sacrifice results from going to the slower speeds. Sound degradation from reduction in tape speed is probably greater with open-reel (or audio cassette) recording than with Hi-Fi VCR recording.

Data-Compressed Signals and Amps

Q. *I am writing about the Digital Compact Cassette. From what I understand about data compression, the inaudible portions of an audio signal are removed, which permits a lower bit-per-second rate. Does this mean that an amplifier will have an easier job when a DCC is playing than when the same music is being played from a DAT? Will this affect the power produced by the amplifier?—Leon McCalla, Miami, Fla.*

A. The data-compression schemes of DCC and other digital media will not significantly affect the signal presented to an amplifier or the power presented by that amplifier to the speakers. **A**

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



Bob Dylan—The 30th Anniversary Concert. Various artists pay tribute to a rock legend. (Columbia) 465•187/395•186



Billy Joel—River of Dreams. Title cut; *No Man's Land*; *The Great Wall of China*; plus many others. (Columbia) 463•695



Sou'Asylum—Grave Dancers Union. *Runaway Train*; *Somebody To Shove*; etc. (Columbia) 445•510



Sting—Ten Summoner's Tales. *If I Ever Lose My Faith In You*; *Fields Of Gold*; *Shape Of My Heart*; etc. (A&M) 454•561



Mariah Carey—Music Box. Title Cut; *Dreamlover*; *Anytime You Need A Friend*; *Do You Think Of Me*; etc. (Columbia) 465•435

Gin Blossoms—New Miserable Experience (A&M) 463•737

Rage Against The Machine (Epic/Associated) 451•138

Tony Toni Toné—Sons Of Soul (Mercury) 463•679

Fourplay (James, Ritenour, East & Mason)—Between The Sheets (Warner Bros.) 464•578

Dr. Dre—The Chronic (Death Row/Interscope) 461•970

George Howard—When Summer Comes (GRP) 465•534

"Poetic Justice"—Original Soundtrack (Epic Soundtrax/NDM) 461•665

Kool Moe Dee—The Greatest Hits (Jive) 464•610

Tears For Fears—Elemental (Mercury) 460•808

The Cranberries—Everybody Else Is Doing It, So Why Can't We? (Island) 465•559

Pat Metheny Group—The Road To You: Recorded Live In Europe (Geffen) 465•526

The O'Jays—Heartbreaker (EMI) 464•495

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Toni Braxton—(LaFace) 464•362

Babyface—For The Love In You (Epic) 464•222

Robin S—Show Me Love (Big Beat/Anti) 463•992

Boss—Born Gangstaz (Def Jam/Chaos/Columbia) 463•711

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The Steve Miller Band—Wide River (Polydor) 460•758

Michael McDonald—Blink Of An Eye (Reprise) 463•570

Miles Davis & Quincy Jones—Live At Montreux (Warner Bros.) 463•554

B.B. King—Blues Summit (MCA) 463•505

The Rippingtons—Live In L.A. (GRP) 463•471

Mark Chesnutt—Almost Goodbye (MCA) 463•273

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The Black Crowes—Shake Your Money Maker (Def American) 462•184

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Clannad—Banba (Atlantic) 461•749

"Free Willy"—Orig. Sndtrk. (Epic Soundtrax/MJJ) 461•731

Guru—Jazzmatazz (Chrysalis) 461•319

Natalie Cole—Take A Look (Elektra) 460•741

MTV Uptown Unplugged—Various Artists (Uptown/MCA) 460•931

"Jurassic Park"—Original Soundtrack (MCA) 460•915

Johnny Gill—Provocative (Motown) 460•824



Genesis—Live: The Way We Walk, Vol. 1 The Shorts. (Atlantic) 467•373

Genesis—Live: The Way We Walk, Vol. 2 The Longs. (Atlantic) 467•381

Paul McCartney—All The Best (Capitol) 459•776

Kiss—Alive III (Mercury) 459•636

Bette Midler—Experience The Divine: Grt. Hits (Atlantic) 460•386

Columbia House. The Face of Rock.



4 Non Blondes—Bigger, Better, Faster, More! (Interscope) 458•042

Marc Cohn—The Rainy Season (Atlantic) 459•065

Laura Branigan—Over My Heart (Atlantic) 459•057

Robert Plant—Fate Of Nations (Es Paranza) 459•024

Tanya Tucker—Greatest Hits 1990-1992 (Liberty) 458•935

Gloria Estefan—Mi Tierra (Epic) 458•497

Anthrax—Sound Of White Noise (Elektra) 458•489

Dave Grusin—Homage To Duke (GRP) 458•471



"Sleepless In Seattle"—Orig. Sndtrk. (Epic Soundtrax) 458•430

New Order—Republic (Qwest) 458•455

Dire Straits—On The Night (Warner Bros.) 458•448

Jimmy Buffett—Before The Beach (MCA) 458•414

Toby Keith—(Mercury/Nashville) 458•315

Jeff Lorber—Worth Waiting For (Verve) 458•299

Kenny Rogers' Grt. Hits (Liberty) 313•700

Donald Fagen—Kamakiriad (Reprise) 458•463

AC/DC—Back In Black (Atlantic) 305•045

Yanni—In My Time (Private Music) 458•018

Coverdale/Page (Geffen) 457•986

Luther Vandross—Never Let Me Go (Epic/LV Records) 457•176

Michael Franks—Dragonfly Summer (Reprise) 457•028

Chris Isaak—San Francisco Days (Reprise) 456•996

Joe Sample—Invitation (Warner Bros.) 456•905

Depeche Mode—Songs Of Faith And Devotion (Sire/Reprise) 456•780

PM Dawn—The Bliss Album? (Gee Street/Island) 456•772

Tracy Lawrence—Alibis (Atlantic) 456•558

Sammy Kershaw—Haunted Heart (Mercury) 456•541

L.L. Cool J—14 Shots To The Dome (Def Jam/Columbia) 456•525

Lever—For Real Tho' (Atlantic) 455•840

Poison—Native Tongue (Capitol) 454•926

Stereo MC's—Connected (Gee Street/Island) 454•843

Ricky Van Shelton—A Bridge I Didn't Burn (Columbia) 454•611

Van Halen—Live: Right Here, Right Now (Warner Bros.) 454•470/394•478

Dolly Parton—Slow Dancing With The Moon (Columbia) 454•264

Brooks & Dunn—Hard Workin' Man (Arista) 454•025

Willie Nelson—Across The Borderline (Columbia) 453•837

John Michael Montgomery—Life's A Dance (Atlantic) 453•746

Aaron Neville—Grand Tour (A&M) 457•200

Madonna—Erotica (Maverick/Sire/Warner) 453•555

The Best Of The Georgia Satellites—Let It Rock (Elektra) 453•530

House Of Pain (Tommy Boy) (edited) 453•373

Shai—If I Ever Fall In Love (Gasoline Alley/MCA) 453•324

AC/DC—Live (ATCO) 453•217

Club MTV Party To Go Vol. 1 (Tommy Boy) 453•175

Duran Duran (Capitol) 455•550

Sade—Love Deluxe (Epic) 449•439

"Aladdin"—Orig. Sndtrk. (Walt Disney Records) 453•167

Jade—Jade To The Max (Giant/Reprise) 453•068

Bon Jovi—Keep The Faith (Jambco/Mercury) 451•310

Reba McEntire—It's Your Call (MCA) 450•361

Elton John—Greatest Hits 1976-86 (MCA) 450•353

Neil Young—Harvest Moon (Reprise) 450•304

Phil Collins—Serious Hits...Live (Atlantic) 448•944

Garth Brooks—The Chase (Liberty) 448•746

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

10,000 Maniacs—Our Time In Eden (Elektra) 448•530

R.E.M.—Automatic For The People (Warner Bros.) 448•522

"Menace II Society"—Original Soundtrack (Jive) 459•586

Barry Manilow—Grt. Hits (Arista) 288•670



Lenny Kravitz—Are You Gonna Go My Way (Virgin) 455•782

Gloria Estefan—Greatest Hits (Epic) 448•506



The Pretenders—The Singles (Sire) 362•541

Björk—Debut (Elektra) 461•152



Blind Melon (Capitol) 447•995

Wreckx-N-Effect—Hard Or Smooth (MCA) 448•118

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

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Bobby Brown—Bobby (MCA) 445•403

Ugly Kid Joe—America's Least Wanted (Mercury) 445•379

The Police—Synchronicity (A&M) 320•499

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Megadeth—Countdown To Extinction (Capitol) 444•489

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Jon Secada (SBK) 438•184

Arrested Development—3 Years, 5 Months & 2 Days (Chrysalis) 436•204

TLC—Oooooohhh... (LaFace) 434•621

Michael Jackson—Dangerous (Epic) 433•920



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Neil Young—Unplugged (Reprise) **460-972**
Bryan Adams—Waking Up The Neighbours (A&M) **429-779**

SNOW—12 Inches Of Snow (eastwest) **455-311**

Alan Jackson—A Lot About Livin' (And A Little 'Bout Love) (Arista) **447-458**

Mötley Crüe—Decade Of Decadence '81-'91 (Elektra) **429-316**

Stevie Ray Vaughan & Double Trouble—The Sky Is Crying (Epic) **429-258**

Red Hot Chili Peppers—Blood Sugar Sex Magik (Wamer Bros.) **428-367**

Ozzy Osbourne—No More Tears (Epic/Associated) **428-128**

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Patsy Cline—Grt. Hits (MCA) **365-924**

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Spin Doctors—Pocket Full Of Kryptonite (Epic/Assoc.) **428-482**

Guns N' Roses—Appetite For Destruction (Geffen) **359-984**



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Whitesnake (Geffen) **355-362**

Madonna—The Immaculate Collection (Sire/Wamer Bros.) **414-557**

U2—The Joshua Tree (Island) **354-449**

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Peter Gabriel—So (Geffen) **345-777**

Bob Marley & The Wailers—Legend (Tuff Gong/Island) **337-857**

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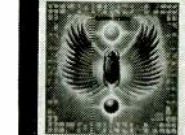
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WHAT'S NEW

Audio Imaging Finishes

Previously available only to manufacturers, installers, and the decorating trade, Audio Imaging's range of 20 custom finishes and colors can be



applied to plastics, metal, wood, cloth, and a variety of other surfaces. In-wall speaker grilles, for example, can be treated to match virtually any wall surface treatment or even the wood stain of a bookcase. Ranging from wood grains—including mahogany, cherry, and teak—to sand and marble, the technique allows a consumer to choose a unique custom finish for speaker or electronics cabinets and cases. Price: \$10 per square foot; \$35 minimum. For literature, circle No. 100

Pref Loudspeaker

Hardly the usual walnut, the Pref 150 is cast from a high-density mixture of Dolomite marble and polymer to reduce resonance. The cabinet's triangular shape is designed to help eliminate internal standing waves. Standing 33 inches high, the 150 has a 1-inch tweeter, 3-inch midrange, and 8-inch woofer. Impedance is 8 ohms, and rated frequency response is 25 Hz to 22 kHz, ± 4 dB. Price: \$1,636 per pair. For literature, circle No. 101



Jensen Car Head Unit

The Jensen JS9335BBE incorporates BBE sound



restoration circuitry, which adjusts the frequency content in three bands for

richer sound. A security LED pulses red when the front panel is detached. In addition to four amp outputs of 15 watts each, the unit has four preamp outputs plus two preamp-level outputs to feed subwoofer amps. Dolby B noise reduction is also included. Price: \$369.95. For literature, circle No. 102

Billy Bags Equipment Rack

Although the I-Beam Steel Component Center is simple enough for assembly by the user, manufacturer Billy Bags Designs says it's tough enough to withstand earthquakes up to 8.7 on the Richter scale. The steel supports have a wrinkled black finish. Price: \$598.50. For literature, circle No. 103





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WHAT'S NEW

Rockford Fosgate Car Amplifiers

The four-channel Punch 4040 DSM and Punch 4080 DSM amplifiers from Rockford Fosgate include electronic crossovers that can be configured for high-pass, low-pass, or full-



range operation of the front or rear channels or of all channels at once. The crossover frequency, normally 100 Hz, can be changed, and slopes are 12 dB/octave. The 4040 is rated at 35 watts/channel into 4 ohms and 55 watts/channel into 2 ohms. For the 4080, the 4-ohm figure is 60 watts/channel, and 2-ohm power is 100 watts/channel. Prices: Punch 4040 DSM, \$530; Punch 4080 DSM, \$650. For literature, circle No. 104

E.A.R. Earplug

Earplugs protect the ear from loud sounds but usually at the cost of sound clarity and frequency balance. The E.A.R. ER-20 hi-fi earplugs are designed to preserve the frequency balance of natural sounds while attenuating them evenly. No custom earmolds or fittings are required. Price: \$25 per pair. For literature, circle No. 106



Kenwood CD Changer

Six discs can be preloaded into a removable magazine for use in the Kenwood DP-M7750, or single discs can be loaded into its drawer. An RS-232 serial port allows control

by a home computer; optional MoodMaker software (which requires Microsoft Windows) can be used to inventory, classify, manage, and control play of CD collections and is limited only by the computer. A



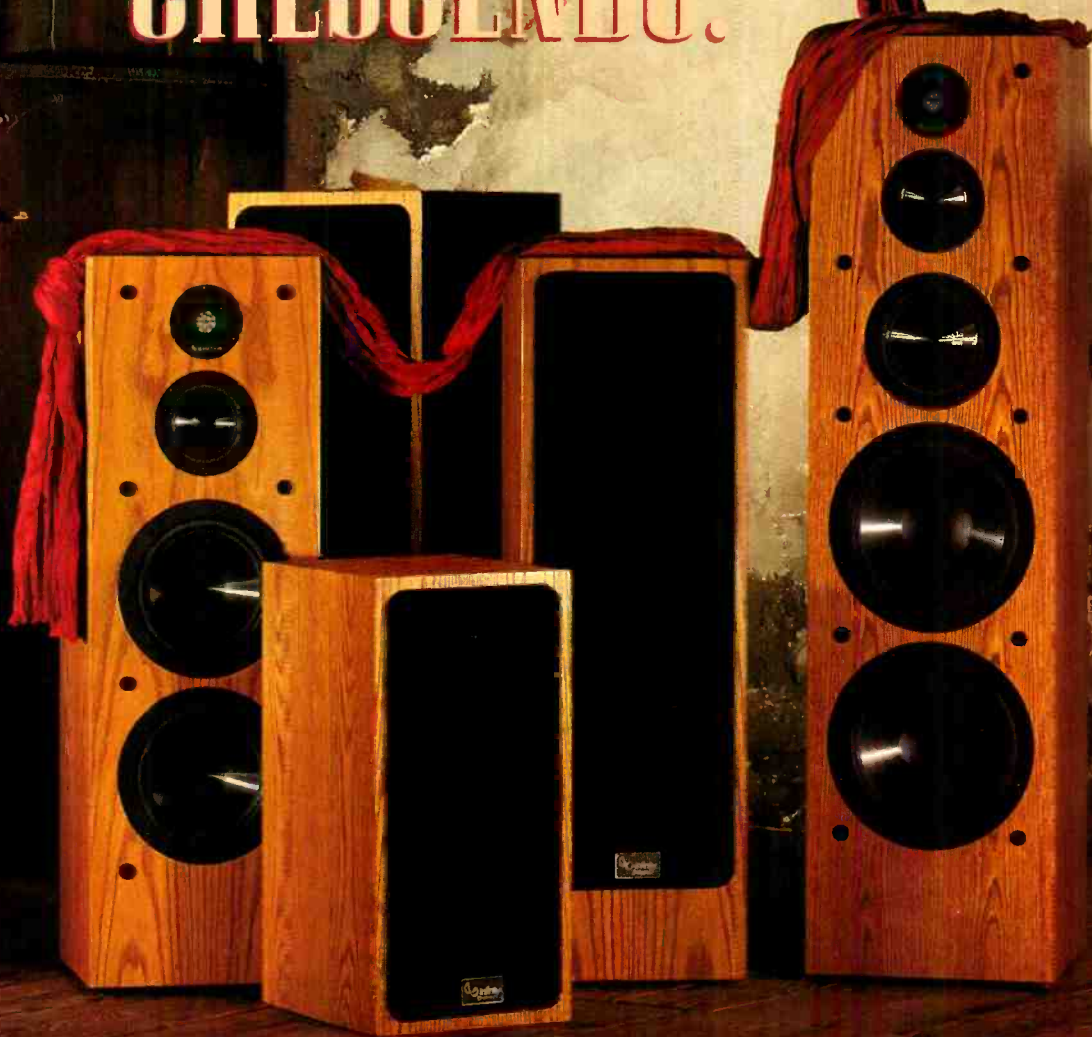
Magazine File system remembers eight-character titles and preferred track order for up to 42 magazines, telling which discs are in a given magazine and which magazine contains a desired disc. The D/A converter is a dual one-bit type designed for precise time-base maintenance. Price: \$379; MoodMaker software, \$49.95. For literature, circle No. 107

Allsop DCC Cleaner

Probably the first cleaner for DCC equipment, the Allsop DCC cleaner is a nonabrasive wet system that cleans the head, capstan, pinch roller, and tape guides. Price: \$29.95. For literature, circle No. 105



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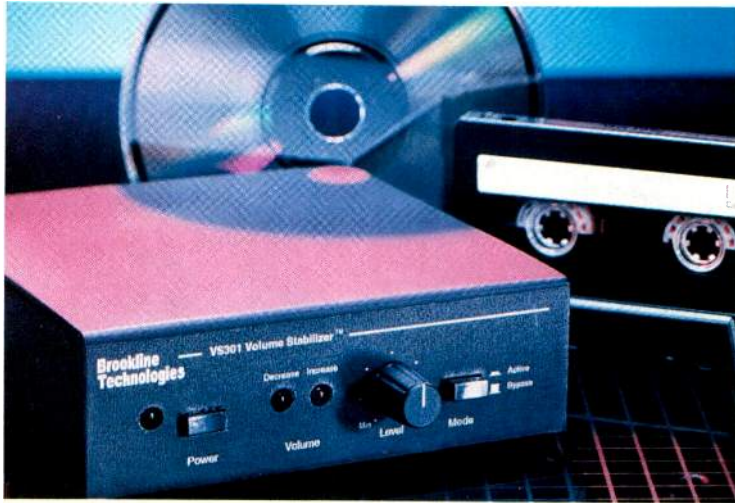
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WHAT'S NEW



Brookline Tech Compressor

The VS301 Volume Stabilizer is designed to compress audio dynamic range benignly, making low-level sounds clearly audible in noisy listening situations. The a.c.-powered unit can be used for home listening (especially to videotapes

whose music drowns out dialog) or for making tapes for car and portable use. Both stereo channels are processed together to avoid image shifts, and the only controls are bypass and power switches and a threshold-level pot. Price: \$149.50.

For literature, circle No. 108



Hifonics Car Stereo Level Controller

The Vesta VIII remote level controller, from Hifonics, can be used to control a trunk-mounted

amplifier from the dashboard. Typical applications include front/rear balancing or adjusting level for a subwoofer amp. Price: \$99.95.

For literature, circle No. 109

Soundstream Car Amp

The Reference Class A 6.0, from Soundstream, delivers 50 watts per channel into 4-ohm loads in its normal, high-power mode and 25 watts per channel in its switch-selectable high-current mode. It is stable with loads down to 1 ohm in high-power mode and to 0.25 ohm in high-current mode. A



proprietary bass equalization circuit can be adjusted for any subwoofer/enclosure combination. Price: \$649. For literature, circle No. 111

Wire Tape Speaker Wire

Only 0.0001 inch thick, Wire Tape can be concealed with paint or wallpaper. The 18-gauge, two-conductor wire has adhesive backing and color-coded conductors. Prices: 16 feet with eight connectors and insulated covers, \$19.95; 25 feet without connectors, \$19.95; 50 feet without connectors, \$39.95; eight connectors and covers, \$5.95.

For literature, circle No. 110



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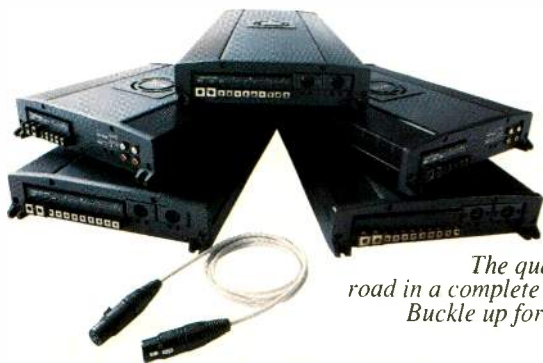
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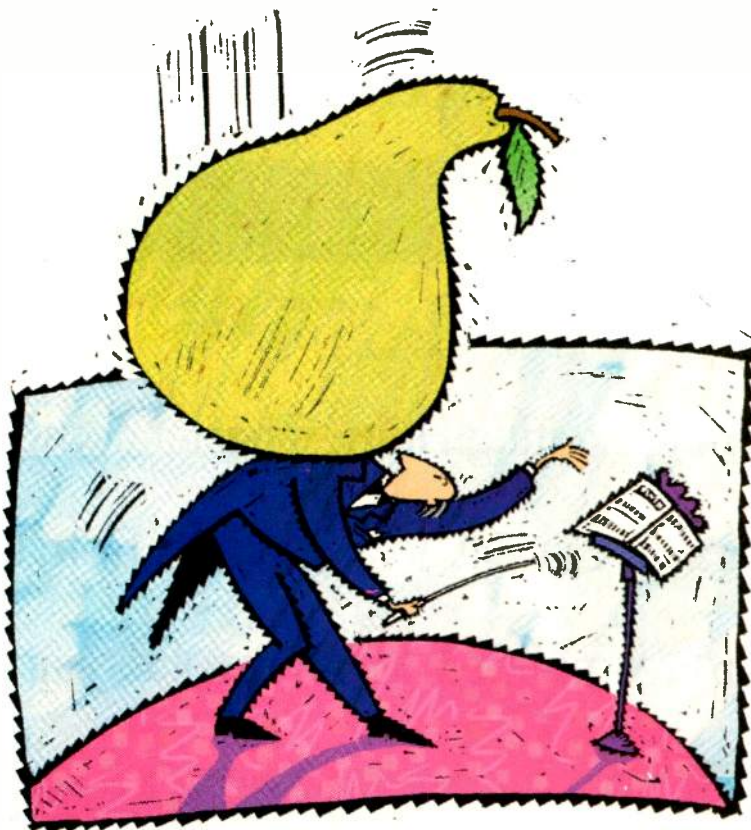
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EDWARD TATNALL CANBY

PEAR PRESSURE



We are tremendously concerned today, when audio communication is merging ever more inextricably with the visual, as to exactly how the human senses work—the ears, the eyes, the mind itself, and especially, all three together. This involves all sorts of ancillary combined perceptions in which it is hard to tell where, so to speak, the eyes and the ears begin; in nature they invariably work *as one* and with them the mind, which infers such things as space, location, distance, size, direction, and even reality itself. (And *now* there is the “virtual” image.) We are working everywhere in the relevant sciences today, but nature is still well ahead of us. We take the complicated scientific way; nature is casual, instan-

taneous, direct. What a contrast! Unbridgeable? Not quite. We are getting places.

A perception that any old normal human body can make in so many seconds without the slightest calculation may take years of study to resolve into some sort of predictable scientific exactitude. Painful! Scientists who deal with perceptions in the human system are even worse off than the medicos who study diseases. Perceptions cannot be seen or heard. Nor even described in easy words that are scientific. *Good!* What does that mean? *Good HOW?* Yet the experience itself is *so*

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HE PRODUCED MUSIC
THE WAY A PEAR TREE
PRODUCES PEARS.**

simple, so direct. We live with our perceptions, and we must marvel at them. Unbelievable, when you think about it. And so effortlessly accomplished! We must really envy our own perfection, a *fait accompli*, laid down a million years ago and still in place, before we can even start our tortuous science. Yet now is the time when it seems we really are getting things together. By which I mean, ever closer, more useful relations between direct human perceptions and measurable engineering parameters that can explain and, more important, predict how those perceptions will work. Selectively and analytically. This is the very essence of scientific method.

You will note that the 95th Convention of the AES, the Audio Engineering Society, which was held in all its enormity this past October in the Big Apple, made all the above essentially its theme, though not in so many words. “Audio in the Age of Multimedia.” That is, how do we bring together sound and sight and more? Together with a reasonable subtheme, audio-only, the newest research into hearing, listening, *auralization*, that being a recent new term that may be ugly but is no doubt useful. (Another I had not seen was *codec*, not related to *codex*. I’m still working on this one, though I do grasp a certain algorithmic slant to it.) An astonishingly large segment of the AES sessions was given over to such matters as psychoacoustics, and others even more “perceptual,” always the relations between what we see and hear and the scientific analysis of the same. Good old familiar AES areas—such as signal processing, recording, and assorted distortions—barely held their own. We have more important things to untangle.

Note too that in Europe the 12th AES Conference was held last June in Copen-

Illustration: Lori Ostecki

*"Relaxed..." "Natural..." "Musical..." "Liquid..."
"Analog-like..." "Unrestrained..." "Realistic..."*

The Critics Have Spoken.

After lending a critical ear, the world's audio press turned to their typewriters to evaluate TEAC's revolutionary CD drive unit. These unbiased evaluations are so compelling there is little we can add.

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hagen, exploring very much the same exciting new areas of basic research, if on a much more intimate scale. Judging by accounts (and pictures), the animated talk in Copenhagen never stopped. It went on day and night over coffee, wine, champagne, and maybe even Coke.

Somehow, you see, the advent of digital audio, though late, opened up such huge, almost infinite new areas for our expansion—like, say, four channels to 1,000 or plenty more—that an intense new wave of research into just how we hear, and see and think, was set off. How we have floundered in the past, particularly in connection with that all-natural art, music! Floundered in concert halls, made progress in stereo, but on the whole without too much successful interrelation between nature and science. Now, we start to go.

Nature is simple—or so it seems. Nature is direct. It is much the same with our most pervasive audio “message,” the art of music. It is indeed all-natural! To a musician, music is not a thing that has to be explained: It *is*. (Or should be if it isn’t.) In its way, music too is simple and direct, no matter how verbose the accompanying publicity. Camille Saint-Saëns, as you will often hear, observed that he produced music the way a pear tree produces pears. Has anyone yet synthesized a pear, via scientific research? Maybe, with gene splicing, you could create a pear for the market out of soybeans? Maybe, but nature does it better. And quicker. As an art, music of any kind shares much with nature and the operations of our perceptions. Music is indeed a product of those very perceptions.

Take rhythm. Some people have it more than others. I have a lot, and as a sometime conductor, it comes out of my hands as well as the rest of me. The other day I took a test for blind spots due to glaucoma. Phew! The engineer who designed that computerized machine was no musician. The machine accurately zeroes in on the blind areas via flashes of light, small bright circles that you either see or don’t see, and maps them out via computer feedback—immensely ingenious. But the damn thing has rhythm! It goes *calunk*, da-dah, *calunk*, da-dah, and you are supposed to press a button when you see a dot. No, I didn’t tap my feet to this beat; I kept pressing the button in time with it—involuntarily. Until I

thought to ask the technician to slow down to half speed. That gave me time to *think*, not merely perceive, and so defeat my own senses. See what I mean?

Many musical experiences are more complicated than that. But though they are often learned, over long periods, they work in the same all-natural way. Instantly, without thought. There is nowhere in the adaptation of music to the current age that has seen more scientific floundering than in the design of new, modern (in style) concert halls, supposedly by scientific calculation for the most desirable acoustics.

We began, after World War II, with the brave but hideously misguided Royal Festival Hall in London, which almost instantly built itself a dreadful reputation among

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TO EXPLAIN HOW THE
HUMAN SENSES WORK,
BUT NATURE IS STILL
AHEAD OF US.**

musicians. What went wrong? Do I need to tell you? Lack of rapport between musical perceptions and scientific analysis of the causes of those perceptions!

Long before that, in the mid-’30s, our own audio engineers and their architect colleagues collectively stuck their heads into an even worse sonic morass. On the nice theory that a dead “studio” would allow a maximum of musical clarity and a minimum of blur and confusion (reverb), they built NBC Studio 8H for Toscanini and the NBC Symphony. Totally dead. And very large. Every detail was thought of (except one); even the programs were printed on sheer silk, so there would be no noise. (What they had to ignore was the human cough. No cough drops.) Was there ever a more total discord between the all-natural art of music and the all-engineering broadcast profession?

Eventually, NBC got the message. Toscanini was moved to Carnegie Hall, not scientifically designed but New York’s best, even so. My children, reverberation—noise—is *a part of music*. By now all audio people know this, and so we progress.

As you may know, the Royal Festival Hall led to the still-young art of synthetic concert hall reverberation. A scurrilous story says that one great German conductor, who was horrified, came back a few years later and pontificated that the building’s surfaces must have weathered and mellowed, to produce such an improved sound. Do you know the rest? It was the surreptitious electronic reverb, the very first. Deliberately, it was kept a dark secret.

Not so with the much heralded Silva Hall acoustics in Eugene, Ore., of a dozen years or so ago, the first building designed deliberately for electronic reverberation. Christopher Jaffe, who improved on the Festival Hall electronics, was the designer of this superb building’s three-way system. Eugene’s multimillionaires love publicity, and pay for it. At first they were ecstatic. But now the place is, acoustically, a wreck. When a few misguided musicians objected (true, they could not hear themselves well enough, an understandable oversight for a first try) and then the local symphony conductor came out adamantly against the whole thing and refused to play unless the electronics were entirely turned off, the local paper printed a scathing attack that I found really agonizing. So much worthy effort gone to naught!

Last I knew, the entire electronic system was turned off, inoperable. Concerts are simply held without it, and listeners don’t like the sound. Why should they? Now, you must go to Alaska (Anchorage) to hear a newer incarnation of the Jaffe system. If it is still working, that is.

You know, engineers and scientists have their perceptions too, their special sorts of instinctive genius. Einstein, the tax collector. Richard Feynman, that prankster and humorist from Brooklyn, one of the century’s real mathematical, scientific geniuses—all-natural, you might say.

I repeat an account of some years ago. I then thought, and still think, that Christopher Jaffe’s huge “portable” outdoor sound system for the New York Philharmonic and Met Opera is an unheralded stroke of genius in our field. By ingenious delay lines, a genuine stereo impact over acres and acres of New York parkland *without any sense of walls or borders*, and evenly wherever you may listen. Who else has produced such a remarkable sound? A

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COMPUTING AUDIO'S FUTURE



When computers and audio both used vacuum tubes, that was about all they had in common. Now the two worlds are converging. Digital technology, whose first major uses were computers and calculators, is now found in almost every audio system: CD players, DSP units, and even tuners with digital displays. Computers have long been used to run MIDI-controlled musical instruments. And technology that started off in audio is hitting the computer field: CD-ROM discs holding data and programs, and multimedia computers with soundboards that follow the audio CD standard of 16-bit encoding and 44.1-kHz sampling rate. The cross-pollination of these fields will affect all future recording media. That's already happened with recordable CD (CD-R) and MiniDisc as well.

So far, the main buyers of CD-R recorders are sound studios (which

use them to make demo discs) and heavy-duty computer users (who use them to make CD-ROMs). High prices (about \$4,000 to \$8,000) keep the user base limited to those for whom the investment will pay off. Also, CD recorders today are write-once devices—fine for audio and computer pros, who are copying finished work from other sources, but not so good for home recordists, who need a chance to rectify their mistakes. The write-once problem may or may not find a solution, but the prices should keep coming down, eventually reaching affordable levels.

The advent of affordable home CD-R may encourage a reflexive fuss from the record industry, even though the fuss they kicked up over DAT has already gained them SCMS and compulsory royalties on digital recorders and recording media—or perhaps *because* that fuss gained them so much. I think they'll be less successful if they try blocking CD-R, because the

computer industry needs this technology and is likely to fight harder for it than the audio industry can.

The MiniDisc should fit even better into the computer. It won't hold as much as a 4¾-inch CD-ROM but will still hold up to 140 megabytes of data, according to the MD-ROM standard that was established in the summer of '93. Home computer users are unlikely to need much more than that for any single application or database, and they will probably be willing to juggle MD-ROM discs as they now juggle floppies (especially as they'll have to do it only about a tenth as often). That juggling could be handled automatically by small inexpensive MD-ROM changers, possibly based on the MiniDisc changer mechanisms already appearing for car stereo.

If more capacity per disc is needed, data-compression schemes can be used to increase each disc's effective capacity by a factor of two to four (though the ATRAC data-reduction system used in audio MDs is probably unsuitable for data use). And there's no reason why MiniDiscs for computer use couldn't use blue lasers or other new technologies to cram more data on the disc. Such technologies would be incompatible with the vast body of CD and CD-ROM equipment already in the field—but that's no problem for MiniDisc, since there's no body of MD-ROM hardware or software in the field yet.

Moreover, MiniDisc drives can probably be made small enough to fit into today's small portable computers, and the discs are exceptionally well protected against accidental damage. Even if DCC should win out over MD as the medium that replaces the cassette, MD will probably be kept alive by data uses.

And future media? They may well originate in the computer field, then migrate over to us.

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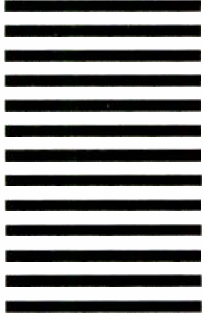
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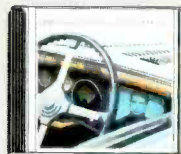
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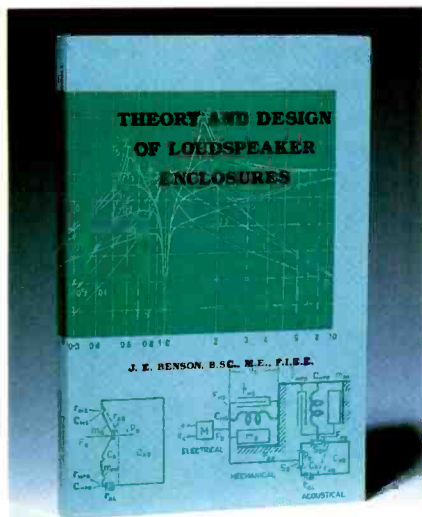
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Benson's Book on Boxes

The publication of *Theory and Design of Loudspeaker Enclosures* (Synergetic Audio Concepts, softcover, 244 pp.) makes available for the first time in the U.S. three speaker papers of the late J. E. Benson. Known as “the Australian Olson” (referring to the American acoustics pioneer Harry F. Olson), Benson was the examiner for the Ph.D. thesis by Richard Small—the same Small of the well-known Thiele-Small parameters. “Much of Dick’s work was done with an analog simulator,” Benson wrote, “whereas all my results were obtained by digital computer from theoretically derived equations.”

Originally published in Australia in 1968, 1971, and 1972 in the *Amalgamated Wireless Australasia Technical Review*, the three papers in the Benson volume are: “Electro-Acoustical Relations and Generalized Analysis,” “Response Relationships for Infinite-Baffle and Closed-Box Systems,” and “Introduction to Synthesis of Vented Systems.”

The book is “a classic,” according to *Audio’s* speaker reviewer D. B. Keele, Jr., “and even more comprehensive and detailed than Thiele and Small’s loudspeaker papers. . . . [Benson’s] papers are very instructive and a must read for anyone seriously interested in low-frequency cabinet design.”

Complete with tables, charts, and graphs, *Theory and Design of Loudspeaker Enclosures* is available for \$25 from Synergetic Audio Concepts (Syn-Aud-Con), 12370 West County Rd. 100 North, Norman, Ind. 47264.

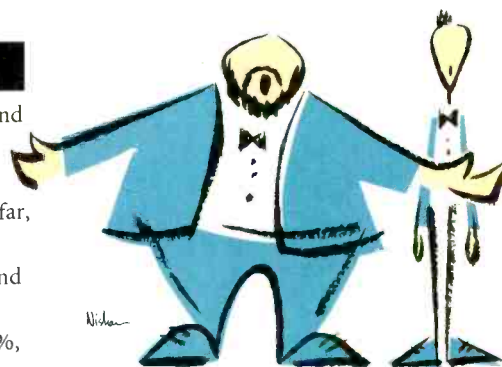
K.R.

Placebo Effect

The *art* of audio is making things sound true and natural. The *science* of audio is learning how to measure what we hear, so we can systematically re-create it. So far, we’ve learned to measure things we can hear (e.g., the difference between 10% and 20% THD) and things we can’t (the difference between 0.0001% and 0.0002%, for instance). That leaves things we can hear but haven’t learned to measure yet.

It also leaves those things we’ll never learn to measure because we only think we hear them. All else being equal, the amp with the elegant faceplate will sound better than the one in the crude case. The sound system we hear while waiting anxiously for lunch will seldom sound as good as the one we hear right after eating. And audio designers tend to feel that the project they’ve just finished is the best-sounding thing of its kind (at least, the night they finish it; their opinion may change later).

Even in live music, expectations can lead perception astray—as I proved when I sang with a Russian chorus in college. I’m



big, I’m bearded, and everyone assumes at first glance that I sing bass—which I do. There were low notes in our arrangements that I couldn’t hit, but we did have a singer who could hit them. When those notes came along, I struck a pose, opened my bearded mouth into a big, round “O,” and sang as hard as a man could who was making no sound whatsoever. The thin, cleanshaven bass at my side sang it beautifully. But because I was the one who looked the part, the listeners would dig each other with their elbows and point straight at me. I was the one they expected to boom out those notes, so I must have been the guy who boomed them—right?

BASIC Instinct

Last April’s “Audioclinic” column contained a Table showing how much wire of a given gauge would add up to 0.1 ohm of resistance, counting the round trip up one leg of the circuit and down the other. To generate that Table, I wrote the following program in BASIC:

```
10 FOR n = 1 TO 9
20 INPUT "Wire Gauge"; ga
30 INPUT "Resistance per 1000"; rrat
40 rft = rrat / 1000
50 max = .1 / rft
60 LPRINT ga, rrat, max
70 NEXT n
80 LPRINT CHR$(12)
```

Feel free to use it, modify it to suit your purposes, or pass it on to friends. (If your impulse is to just ignore it, then you probably haven’t gotten to this paragraph anyway.)

Incidentally, I wrote the program because I couldn’t come up with a formula that would let me derive the needed data with a calculator. Once I’d written the program, though, I was able to derive the needed formula from it:

$$L = 100/r,$$

where L is maximum length for 0.1 ohm and r is resistance per 1,000 feet.

Telephone Tuner

In Vienna, there has long been a number you can dial to hear a 440-Hz tone, or A below middle C, in order to tune your musical instruments. In Sweden, as I learned from *New Scientist* (a British weekly), you don’t even have to dial for this service—they use 440 Hz as their dial tone.



BERT WHITE

DIGITAL UP-MANSHIP



For high-fidelity reproduction of recorded music, it is obvious that two requirements must be met. The first is for audio components capable of low distortion, wide frequency response, and wide dynamic range. The second is for a music storage and retrieval system capable of true high-fidelity performance. Since 1948, an entire industry has developed, based on the pursuit of many technologies devoted to fulfilling these two requirements.

Over the years, audio components reached very high levels of sophistication and refinement. Some would say that the performance capabilities of the very best audio components surpassed those of the various recorded media.

Record labels generally kept pace by constantly upgrading and refining technology in all aspects of record production. Technical one-upmanship was *the* game in selling records. Thus, we had new recording philosophies, with new types of microphones used in new configurations. There were advances in cutting lathes, cutterheads, and amplifiers. Various types of tape machines

were employed in mastering, and some were specially modified. New ideas in plating and pressing technology were introduced, including the use of special vinyl formulations and the adoption of elaborate quality controls. Certain record companies created “audiophile” imprints. We had London/Decca’s ffr (or full frequency range recording), Bob Fine’s “Living Presence” Olympian series at Mercury, RCA’s “Living Stereo,” and my own Everest Recordings (where we pioneered 35-mm magnetic film mastering). Indeed, labels went to extraordinary lengths to convince consumers that their recordings were unique and truly high fidelity. Of course, it wasn’t all hype; there were indeed easily audible differences between the recordings of audiophile labels and those of mainstream labels.

Obviously my foregoing remarks cover the era of analog mastering and the vinyl LP. Although the digi-

tal Compact Disc is now in its second decade as the music storage system of choice, digital tape mastering has been used for a considerably longer time. In fact, well before the arrival of the CD in 1982, you may remember that many LPs had “digital recording” emblazoned on their record jackets. It was considered a

selling point, even though a small group of audiophiles condemned the use of digital tape mastering.

Denon Records was experimenting with a 13-bit, “floating-point” digital tape mastering system as early as 1969, and actually issued some digitally mastered LPs in 1971. And I well remember that Decca demon-

strated its proprietary digital tape mastering system to me in 1976, in London. Even back then, it was capable of both 16- and 18-bit recording and had very sophisticated error cor-

rection, including dropout detection, counting, and correction monitoring. In the U.S., 3M was developing its digital tape mastering recorder, and Tom Stockham already had working units of his Soundstream digital tape recorder. It seems incredible to me that I used Tom’s digital recorder to master my Virgil Fox organ recording for Crystal Clear in 1977 and my Arthur Fiedler/Boston Pops recording in 1978.

**ALTHOUGH THE CD IS
STANDARDIZED, DIGITAL
MASTERS ARE MADE
ON A WIDE VARIETY
OF RECORDERS.**



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When Denon, with the audio industry's longest heritage of digital design and music recording, charged its most talented engineers to create a range of cost-no-object components, clearly the goal was not for immediate sales. Instead, Denon applied the most advanced technologies to improve the resolution, integrity and stability of digital data transmission to achieve accurate, transparent sound reproduction and pure musicality.

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The intensive research and design that has gone into the very limited edition of S-Series components could never be recouped through sales, even at their seemingly lofty prices. Instead, Denon, in keeping with its "Design Integrity" philosophy, will explore ways to incorporate many of these advances in future Denon components. But, for those of you who can afford not to wait...

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BOTTOM: The POA-S1 Monoblocks combine parallel, complementary bipolar power supplies with a full differential power MOS-FET amplifier design to deliver more than 1,400 Watts into a 1 Ohm load. \$20,000 each.

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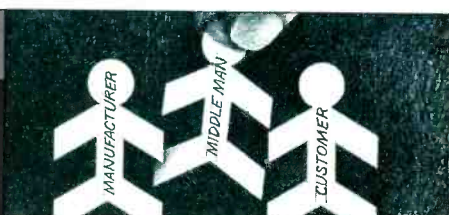
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Today we buy CDs—which could have been made in any of more than 100 CD plants throughout the world—secure in the knowledge that they have been made to Philips/Sony Red Book standards, therefore guaranteeing certain performance parameters with respect to noise, distortion, frequency response, and dynamic range. But though the CD is a highly standardized product, the digital tape masters from which CDs are processed are made on a wide variety of digital recorders. It may be thought that, no matter the type or brand of digital recorder, in terms of performance they all operate on a level playing field. To a certain degree this is true, but it is now apparent that various digital recorders have certain performance differences; although subtle, these differences can influence a recording engineer to prefer a particular digital mastering system.

**IT SEEMS INCREDIBLE
 THAT I WAS USING
 STOCKHAM'S DIGITAL
 RECORDER TO MASTER LPs
 BACK IN '77 AND '78.**

Currently, engineers can choose from a very broad group of digital mastering systems. Probably the most widely used digital recorders are the Sony 1610 and its updated cousin, the 1630. The latter is a two-piece system consisting of a U-Matic VCR (using 3/4-inch tape to store the digital signals) and a 16-bit digital processor. One of the attractions of the Sony 1610 and 1630 recorders is that they are part of a truly complete digital mastering system, including the all-important digital editors. The Sony 1630 is also the interface playback unit in the CD plants, feeding the digital music signals to the photosensitive glass master disc from which each CD will be processed. Whatever the format of digital tape master—R-DAT, S-DAT, DASH, etc.—submitted to a CD plant, it is transferred to a 1630 for processing. (The only time the 1630 is bypassed is if the CD plant accepts CD-R masters for processing.)

Many engineers use professional R-DAT recorders from Sony, Technics, Fostex, and

others. Although some engineers question the archival capabilities of R-DAT tape, it nonetheless is used for a great deal of digital mastering. Sony and Studer have DASH-format open-reel, two-channel digital mastering recorders, mainly for direct stereo recording. For multitrack digital recording, Sony and Studer dominate the market. Perhaps the most ubiquitous units are Sony's 3324 (24 tracks) and 3348 (48 tracks). It is interesting to note that these recorders are 16-bit systems, with no provision for the 20-bit recording now so much in vogue. However, it is reported that a specially modified Sony 3324 provides 12 channels of 20-bit digital recording.

It should also be noted that although the video-based Sony 1630, all R-DAT recorders, and all DASH-format recorders have their own internal A/D converters, it is common practice among recording engineers to bypass these built-in A/D converters and employ external converters from Apogee Electronics, Wadia Digital, and others. This is especially the case if the engineer wants to produce 20-bit masters.

As to the future of digital recording, we can look forward to the Sony 9000, a magneto-optical digital disc recorder that operates at 16- or 20-bit resolution. There is even provision for 24-bit recording if someone will come up with a 24-bit A/D converter! As you might expect, all 20-bit (and above) recorders will require the use of Super Bit Mapping or some other dithering process in order for consumers to truly realize the benefits of these high-bit-rate recording technologies.

Just as there were audiophile labels in the days of analog recording, there are audiophile labels in this digital era. London/Decca consistently turns out superb CDs of the highest fidelity, as it stays on the cutting edge of digital mastering with its updated proprietary recorders capable of 20-bit resolution. Another British label, Chandos, is well known for its audiophile recordings, employing as well a proprietary digital mastering system.

In the U.S., Telarc is certainly an audiophile label, notable for pioneering digital recording with the Soundstream mastering system. Nowadays, chief engineer Jack Renner is busily exploring new digital recording technology and often experiments with different A/D converters. He has a

proprietary Telarc/UltraAnalog digital processor and is doing 20-bit recording using a Mitsubishi PDX-8620 open-reel digital recorder.

Craig Dory, the venturesome head of Dorian Recordings, is experimenting with new digital mastering equipment such as the exotic Nagra D, which records open-reel tape with an R-DAT head! I also un-

**IF ENGINEERS DIDN'T
HAVE A SENSITIVITY
TO MUSIC, THEIR CDs
WOULD MERELY BE
"TECHNICALLY CORRECT."**

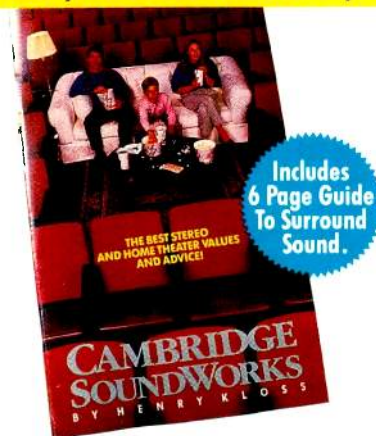
derstand he has been doing direct-to-hard-disk recording on a Sonic Solutions system.

High on the list of audiophile labels is Delos, where colleague John Eargle employs a Fostex D-20 R-DAT digital recorder to produce, in my opinion, the finest classical CDs available. Of course, it is not just the choice of recorder, but the whole of John's recording technique—especially his unerring sense of orchestral balances, hall perspectives, and musical textures—that makes his recordings so outstanding.

The counterpart to John Eargle in the jazz field is Tom Jung and his dmp label. Tom has an incredibly keen ear, and he uses the most advanced equipment: FM Acoustics custom mike preamp, Wadia 4000 A/D converter, and Yamaha DMR8 S-DAT recorder (an eight-channel unit affording 20-bit resolution). His recordings are immaculately clean and have stunning dynamics. Here, too, it is not merely cutting-edge digital recording that matters, but also Tom's musical perceptions and his uncanny ability to achieve just the right instrumental balances.

Engineers of the audiophile labels can point out the best qualities (and the artifacts) in the digital mastering system they have chosen, but if the same engineers didn't have the requisite knowledge of microphone types and how they are deployed, a thorough grasp of hall acoustics, and above all a responsive sensitivity to music, their recordings would merely be "technically correct." A

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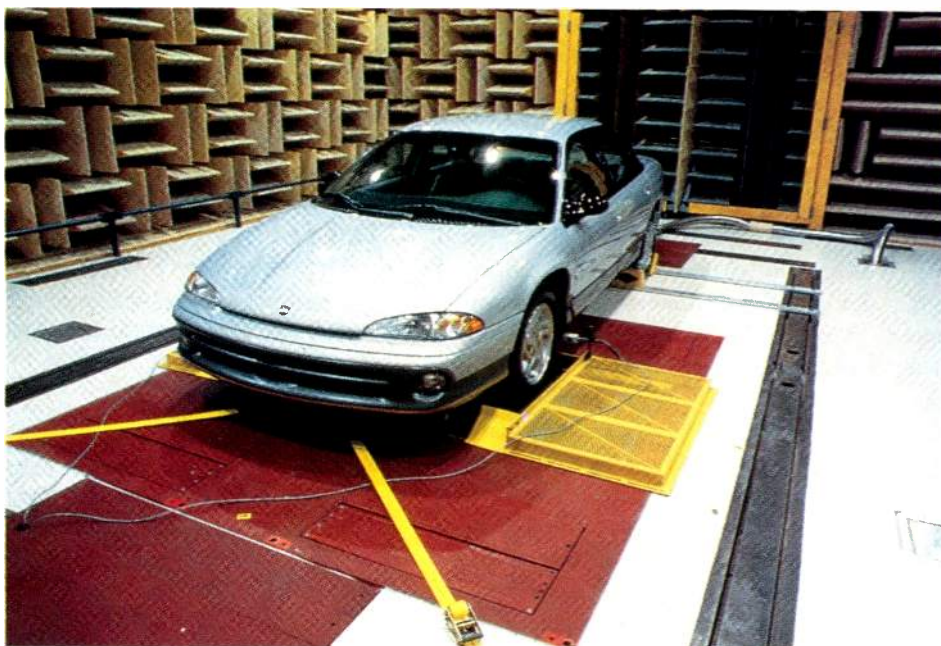
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IVAN BERGER

INTREPID AUDIO

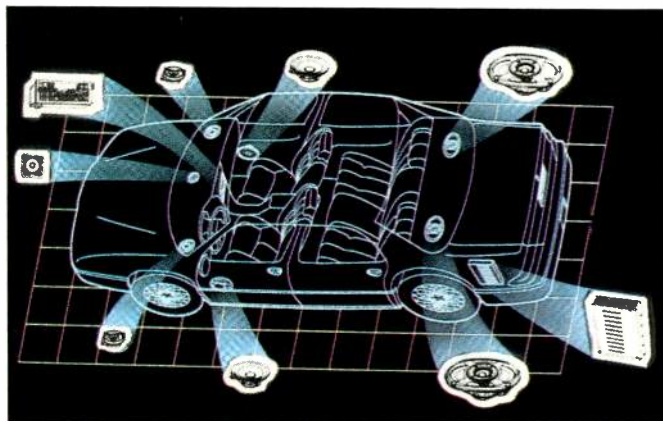


Dodge Intrepid
in the test lab.

Chrysler, having pulled out all the stops to make its new LH car line (the Dodge Intrepid, Chrysler Concorde, and Eagle Vision) impressive, did not forget to offer a fancy sound system for this line. The optional Chrysler/Infinity Spatial Imaging system features an

AM/FM/CD head unit with a five-band graphic equalizer, 11 speakers, and a 120-watt, eight-channel amp with active crossovers.

The front speaker complement includes two 3½-inch coaxial speakers and a 2½-inch center mid/tweeter on top of the dash, plus 5¼-inch woofers in the front



The Chrysler/
Infinity Spatial
Imaging system.

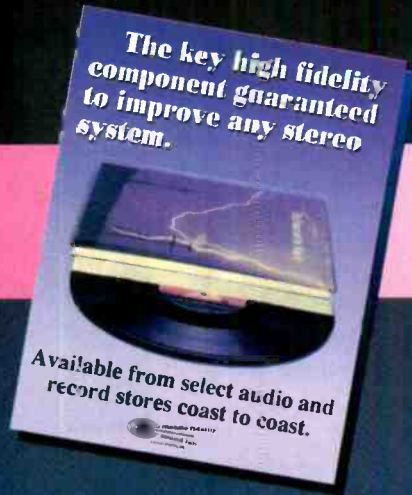
door panels. In the rear, 6 × 9-inch coaxials with 2½-inch midranges are mounted in the package tray. (I didn't bemoan the lack of tweeters back there; I found in my own system that replacing the original speakers with Infinity coaxes having good tweeters just confused the image, until I used an equalizer to roll the rear speakers' treble off again.) When the speakers are driven by 10 watts, their distortion (which I've never before seen listed for a factory sound system) is less than 2% from 250 Hz to 20 kHz for all three dashtop speakers, less than 5% from 100 to 250 Hz for the front woofers, and less than 3% for the rear midrange units. Maximum sound pressure level is rated at 102.5 dB.

The amplifiers have differential (balanced) inputs, to reduce noise, as well as parametric fixed equalization tuned for the car's acoustics and a low-frequency boost that only operates at low volume levels.

In the Detroit tradition, the sound system's control panel is big (about double DIN height), so there's plenty of room for separate controls rather than multipurpose ones. For example, the panel includes a big volume control, a four-way joystick for fading and balance, and a five-band equalizer. The only double-duty buttons are the logical ones. For example, the two-way seek and one-way scan controls work exactly the same way to find CD tracks as they do to find AM and FM stations. In fact, I was surprised to find that separate rocker switches were used for manual tuning and the CD fast-forward/reverse control; it would have been logical to combine the two. The system mutes during fast forward and reverse, so you have to judge where you are on the disc by reading the display.

Each of the five station preset buttons holds two FM and two AM frequencies. Within each band, you access the second station by

What Was True In 1977...



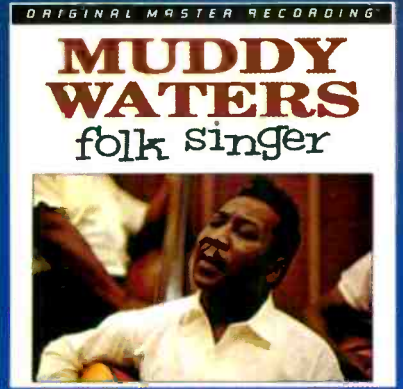
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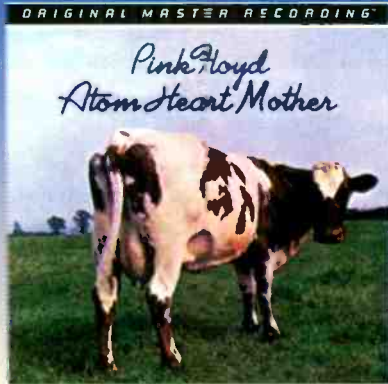


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pressing the button a second time; a separate button switches between AM and FM without making you cycle through several sets of FM memories. The double-push presets were the only feature I had to read the manual to find out about—everything else was crystal clear.

The joystick and equalizer are a bit on the small side for convenient use. If you operate the joystick while you're driving, you can't position it accurately unless you brace your hand on the control panel. And the CD player reswallows the disc pretty quickly after it's ejected. So if you have a long driveway, don't hit "Eject" until you're almost in the garage.

I found the overall sound good but unexciting, chiefly due to treble softness. Pianos sounded dull and flat (you'd never guess they were percussion instruments), and Elisabeth Schwarzkopf's voice darkened to the timbre of Kirsten Flagstad. Raising the top two EQ bands a little helped brighten the sound, but it still wasn't quite right. The bass seemed to go down decently to about 40 Hz, but not much lower, and there seemed to be at

least one notch in the frequency response somewhere between about 40 and 200 Hz. Using the equalizer's lower bands only made the bass seem fatter.

Imaging, on the other hand, was very good, probably due to the center-channel

THE SOUNDSTAGE WAS BROAD, WITH CENTERED SOLOISTS AND EVEN A SENSE OF DEPTH.

speaker (even more of a rarity in factory-installed systems than in custom ones). All stereo sources yielded a broad stage, with soloists placed near the car's center line rather than dead ahead of the listener. There was even a sense of depth on some selections, especially from CD.

The FM section was less sensitive than most. The AM section was more sensitive than most but at the expense of some breakthrough of adjoining stations.

automaker, the Camaro system uses full-range speakers in a cross-firing "stereo everywhere" pattern, plus switching amplifiers using two-state modulation. Also as usual for a Bose upgrade system are custom active equalization to match the acoustics of the particular car model and dynamic equalization to prevent speaker overload by limiting bass output at high levels.

What's unusual here is the use of a single, 6½-inch full-range speaker in the left rear panel of the hatch area (in a 12-liter tuned-port enclosure) instead of a second pair of speakers in the (nonexistent) package shelf. This location was chosen because the corner position makes the most of the speaker's bass and allows the highs to be aimed high and toward the center, where they add ambience without giving the impression that some of the musicians are sitting in the back. (It also helps keep the system affordable: The Delco/Bose option is available for \$275 with cassette, \$550 with CD.)



Coherent Camaro

The 1993½ Chevrolet Camaro debuted a new Delco/Bose sound system, with AM/FM tuning and CD (or optional cassette with Dolby B NR). It just missed being a 10th-anniversary model, since the first Delco/Bose systems appeared in 1983 (no "½") GM cars.

As is usually the case with a Bose system developed in collaboration with an

Cheaters

Unscrupulous amplifier makers have been known to overstate their products' power output in a number of ways. Now, some makers of car amps have models with deliberately understated power ratings. The power ratings in question legitimately tell how the amp will perform into standard loads, but some would consider this, too, unscrupulous.

These "cheater" amps, like most solid-state designs, deliver the same voltage into any load, with the current inversely proportional to the load impedance. Since power is the product of voltage and current, such amps deliver more power into 4-ohm speakers than into 8-ohm types and (if they can take it) still more power into 2 ohms. For most amplifiers, the relationship is linear; each time you halve the impedance you double the power, until you reach the point where the amp either burns out or shuts itself off to keep that from happening. Cheater amps are designed to skew this relationship by lowering supply voltages. A cheater amp that would normally deliver, say, 200 watts into 4 ohms and 400 watts into 2 ohms would now deliver that 200 watts safely into 0.5 ohm—but a mere 50 watts into 4 ohms. A car with four such amplifier channels could compete in the "200-watt" category in car sound contests, while actually delivering 800 watts into its speaker array.

Onward and Update

Two additions to my "Roadsigns" column last May:

Talking of speakers with coincident rather than coaxial tweeters, I mentioned KEF's Uni-Q design and correctly stated that they didn't use it in their car speakers. I'm now informed that they do.

And in discussing books that help you find your favorite kinds of radio program when you travel, I left out the pioneer of them all, Bruce F. Elving's *FM Station Atlas*, now in its 14th edition. The 192-page book includes several articles of interest to radio listeners plus listings of more than 7,200 FM stations by geography and frequency. The book is \$12 from FM Atlas (Box 24, Adolph, Minn. 55701).

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connectors allow unbalanced or balanced operation at the flick of a rear mounted switch. A ground lift switch separates system ground from audio ground to reduce annoying ground loops and system hum. Finally, switchable monaural operation is available if higher power requirements become necessary. **A**lthough the description of circuit innovations can indicate the research and commitment we bring to the design of the finest audio products, only in the listening does the result of that dedication become clear. Bryston's 3B NRB is capable of doing justice to the most refined

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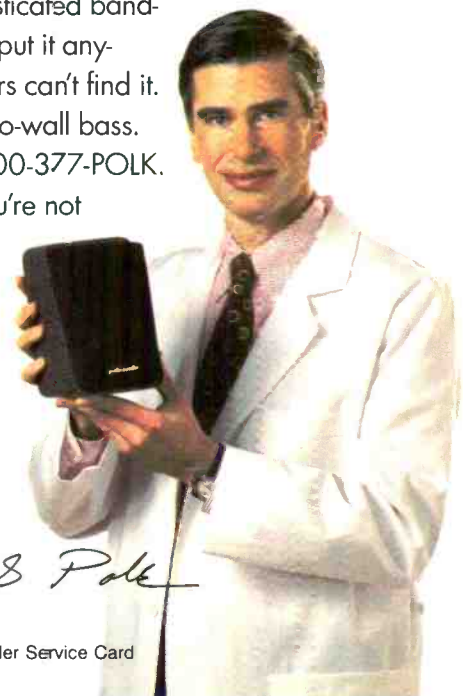


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Explosive Value In Home Theater

These days, you'd have a hard time finding a receiver that is limited to just plain stereo reproduction. The ever-growing popularity of home theaters has prompted every major audio manufacturer to offer audio/video receivers in just about every price category. A year ago, I compared the features and performance of seven fairly expensive, top-of-the-line A/V receivers (*Audio*, December 1992). The least expensive model in that survey had a suggested price of \$770, while the costliest went for nearly \$1,800.

A year later, it's possible to purchase a receiver for around \$500 that can be the central component of a home theater system. To be sure, A/V receivers at this price level may not have all the bells and whistles of their more expensive counterparts, but as I learned from this comparison study, they come mighty close. *Audio* Editor-in-Chief Gene Pitts chose three typical models, all list-priced at around \$500, for this study. He could have chosen several more, but it soon became obvious that the differences in features be-



PHOTOGRAPHS: MICHAEL GROEN

Leonard Feldman

V Receivers



FM TUNER SECTION

Measured Parameter	Onkyo	Pioneer	Technics
50-dB Quieting, dBf			
Mono	18	27	22
Stereo	39	47	42
S/N at 65 dBf, dB			
Mono	76	79	74
Stereo	68	66	64
THD at 1 kHz, %			
Mono	0.16	0.22	0.19
Stereo	0.30	0.64	0.18
Frequency Response from 30 Hz to 15 kHz, dB	+1.7, -0	+0, -0.6	+0.1, -1.3
Alternate-Channel Selectivity, dB	55	65	65
Separation at 1 kHz, dB	45	45	38
Capture Ratio, dB	1.5	1.0	1.0
Tuner Rating (0-10)	8.5	8.5	8.8

AMPLIFIER SECTION

Manufacturer's Spec	Onkyo	Pioneer	Technics
Rated 8-Ohm Power, Watts/Ch.			
Front Channels	55 ¹ /80 ²	70 ¹ /100 ²	100 ¹ /125 ²
Center Channel	55	70	100
Rear Channels	20	20	45
Rated THD, %			
Front Channels ¹	0.08	0.05	0.05
Center Channel	0.08	0.8	0.8
Rear Channels	0.8	0.8	0.8
S/N via Line Inputs, dB, A-Wtd.			
Re: Rated Output	100	97	90
Re: 1-Watt Output, 500-mV Input	81.5	80	75
Measured Parameter			
High-Frequency Limit (-3 dB) for Front Channels, kHz	70	70	87
Amplifier Rating (0-10)	8.2	8.5	9.0

¹Surround mode.

²Stereo mode.

VIDEO SECTION

Feature	Onkyo	Pioneer	Technics
Number of Video Inputs	3	4	2
Number of S-Video Inputs	0	0	0
Number of Video Outputs	3	3	2
Number of S-Video Outputs	0	0	0
Number of VCR In/Out Loops	2	2	1
Front-Panel Video Input	No	No	Yes
Simulcast Ability	No	Yes	No
Video Rating (0-10)	8.5	9.0	9.0

tween receivers at this price level are relatively minor, as will be spelled out in the descriptions of the individual units. The chief difference among these three receivers is their rated amplifier power, which ranges from 55 to 100 watts per front channel in surround mode and from 80 to 125 watts per channel in straight stereo mode.

Before covering the differences between these models' features, let's summarize the similarities. They all have surround sections that include Dolby Pro Logic, Dolby three-channel mode, variable rear delay, and remote control of rear and center-channel levels to match the type of movie, your personal taste, and the size of the room. All three have headphone output jacks and phono inputs.

All of the tuner sections let you enter station frequencies directly on keypads that are on the front panels and the remote controls. Selectable pairs of speaker outputs allow each model to feed music to either or both of two rooms. All have multiple video inputs, but as a concession to the low price of these receivers, S-video connections are not offered; only composite video signals (the most common type) can be handled. All three models come with system remotes that can operate other components, and they have motorized volume controls on their front panels.

As in my earlier study, Tables are included for the receivers' tuner, amplifier, and video sections and for their surround and convenience features. Ratings from 0 to 10 are assigned for each section, and finally, an overall rating is assigned to each receiver. Since the receivers have an MSRP within \$30 of each other, price was not a factor in my ratings—but ease of use was.

ONKYO TX-SV515PRO

This receiver features low-impedance amplifiers capable of delivering 80 watts per channel into 8-ohm loads in stereo mode or 55 watts for each main speaker and for the center speaker when in surround mode. Although rear channels in surround mode are provided with only 20 watts apiece, this power level can be adequate if efficient rear speakers are chosen.

In addition to its ability to feed a pair of speakers in another room, the TX-SV515PRO can play each room's speakers from a different program source. Accessories allow remote-control

use from other rooms. The 40 station presets (10 more than either of the other models reviewed here) have battery-free memory backup. Presets can be classified by up to six categories for access by program type (classical, rock, jazz, etc.) or to provide favorite-station groupings for different members of your family. A Selective Tone Control feature allows low bass and treble frequencies to be emphasized while having minimal impact on the midrange. The receiver has seven audio inputs, three video inputs, a record out selector, a sleep timer, and video dubbing.

Onkyo has always been noted for the excellence of its FM tuner circuitry, so it's not surprising that this receiver's FM tuner section proved to be the most sensitive of all three units tested, both in mono and stereo. However, selectivity and capture ratio could have been a bit higher, as was the case with the two competing models.

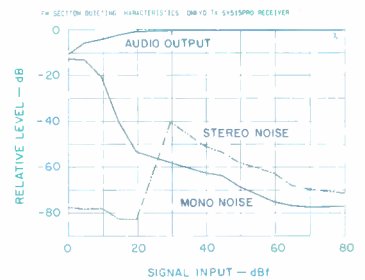
Dolby Pro Logic circuitry performed well, with delay time fully adjustable and with provision for three-channel surround. Narrow-band and wide-band center-channel settings are provided to optimize response for, respectively, a small center speaker that doesn't have much bass capability and a center speaker that matches the main speakers' bass handling.

Both the display and the remote-control functions were easy enough to interpret, but I found the instruction manual a bit on the sparse side, running to only 19 pages. A neophyte may find it a bit difficult to figure out what all the controls and buttons do, unless he is willing to thumb back and forth through the manual several times.

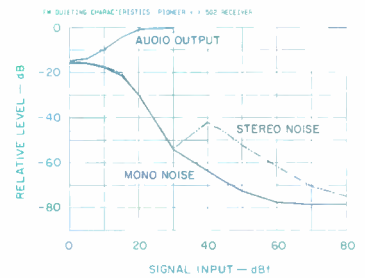
PIONEER VSX-502

When it is operated in surround mode, this Pioneer A/V receiver delivers 70 watts of power to each main front channel and to the center channel. As with the Onkyo, however, power to the rear "effects" channels is limited to 20 watts per channel. In addition to the Dolby Pro Logic and three-channel options, there's a simulated surround mode that is effective with monophonic source material and a "Studio" mode that adds the ambience of a small monitoring room in a recording studio.

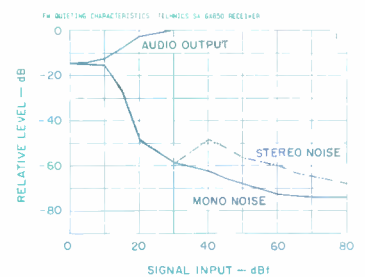
The video signal selector allows free combination of various A/V sources during playback as well as overdubbing. This flexibility makes it easy



FM quieting characteristics, Onkyo TX-SV515PRO.



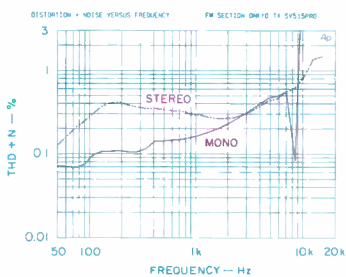
FM quieting characteristics, Pioneer VSX-502.



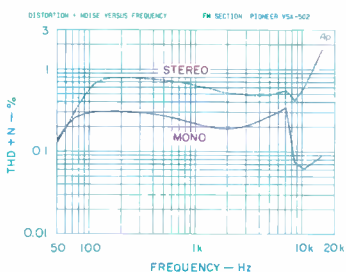
FM quieting characteristics, Technics SA-GX650.



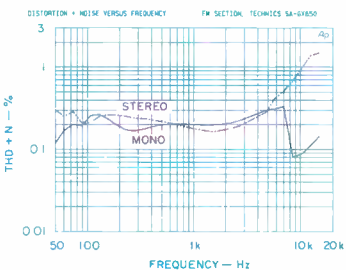
These **three receivers** offer a lot to the **budget-minded** user's home theater.



FM tuner THD + N,
Onkyo TX-SV515PRO.



FM tuner THD + N,
Pioneer VSX-502.



FM tuner THD + N,
Technics SA-GX650.

to enjoy simulcasts (TV programs during which soundtracks are broadcast over local stereo FM stations). Two-way VCR copying and monitoring is possible in either direction (VCR1 to VCR2 or vice versa), and if a laser videodisc player is part of your system, you can simultaneously produce two tape copies from videodiscs.

Five tone-control settings can be preset, as can up to 30 station frequencies. Stations can be preset according to program genre, and the memories can then be scanned by any of five genres. A feature called Auto Source Control (ASC) lets you store level, tone, surround, and other settings for two different sources. When the appropriate ASC button is pressed, the volume is turned down, the input is switched, and volume is turned back up to a new preset level. If the sources are Pioneer components with "SR" (system remote) connections, ASC will also turn them on and start them. The receiver's sleep timer can be set for 30, 60, or 90 minutes. When a second pair of speakers is set up in another room, an optional multiroom remote-control sensor can be set up in that room and connected to a jack on the rear panel of the receiver. This would allow you to use the supplied remote control from that other room. Although the remote does not have a "learn" function, it can operate other Pioneer components bearing the "SR" mark.

While the Pioneer unit I tested exhibited the poorest FM quieting sensitivity of all three receivers, strong-signal quieting capability was very

good indeed, with S/N approaching 80 dB in mono for a 65-dBf signal. At normal settings of the volume control (around "12 o'clock" on the calibrated knob), there was a slight channel imbalance of around 0.7 dB, a minor flaw easily corrected with the balance controls.

As for the Pioneer's amplifier circuitry, the availability of a full 70 watts of power for each of the three front speakers was clearly an advantage. When home theater was first becoming popular a few years ago, conventional wisdom dictated that the center speaker, if used at all, didn't need to be driven by as much amplifier power as the main front speakers. That thinking has now changed almost completely. More and more manufacturers are offering the same power for the center channel as for the main front channels.

Dolby Surround (both in full five-speaker mode and in three-channel mode) was quite effective. Control layout of the front panel was logical and easy to interpret and use. The display was as comprehensive as any I have seen, leaving no status indication to the imagination.

The instruction manual was the most complete and easiest to follow in this study. Separate, easy-to-follow line drawings are provided for connecting basic audio systems, video systems, speakers, and multiroom setups. The 46-page manual also covers Pioneer's Model VSX-512S; the main difference between the two receivers seems to be that the VSX-512S comes with a learning remote.

TECHNICS SA-GX650

One of the most important virtues of this receiver is its amplifier's "New Class A" power output capability. In surround mode, it is rated at 100 watts per channel for the front and center speakers, and a more-than-adequate 45 watts per channel for the rear speakers. In stereo-only mode, maximum power output increases to 125 watts per channel. This makes the SA-GX650 suitable for use with almost any combination of loudspeakers, however low their efficiencies might be. From an acoustic and auditory point of view, however, bear in mind that 100 watts will produce undistorted sound peaks that are not quite 3 dB greater than the sound peaks produced by the 55 watts offered by the Onkyo receiver.

The Technics has a more versatile remote than the other two receivers. It can control just about

You can't lose: The "best" unit ranked only half a point above the "worst" one.

SURROUND AND CONVENIENCE FEATURES

	Onkyo	Pioneer	Technics
<i>Remote-Control Rating (0-10)</i>	8.5	9.0	9.5
<i>Learning Remote</i>	No	No	Yes
<i>Number of Surround Modes</i>	2	2	2
<i>Dolby Pro Logic</i>	Yes	Yes	Yes
<i>Delay-Time Adjustment</i>	Yes	Yes	Yes
<i>Three-Channel Mode</i>	Yes	Yes	Yes
<i>"Wide-Screen" Mode</i>	Yes	No	No
<i>Input Level Adjustment</i>	No	No	No
<i>Subwoofer Output</i>	No	No	Line
<i>Number of Tuner Presets</i>	40	30	30
<i>Display Rating (0-10)</i>	9.0	9.0	9.0
<i>Number of A.C. Outlets</i>	2	3	2
<i>Ease-of-Use Rating (0-10)</i>	8.5	8.8	9.0
Overall Feature Rating	8.3	8.3	8.5
Overall Receiver Rating	8.6	8.5	9.0
<i>Price</i>	\$530	\$520	\$500

any component in your A/V system that has an infrared sensor, either through preprogrammed codes for major-brand TVs and VCRs or by "learning" from other remotes. Although all the models in this survey have remote control of center and rear-channel levels, the Technics is the only one that lets these levels be controlled from the front panel as well.

Besides the four audio and two video inputs on the rear panel, the SA-GX650, alone among these three receivers, has a video input on its front panel for temporarily connecting camcorders and such. This is also the only receiver in this group that has a subwoofer output, a line-level jack designed to feed a powered subwoofer or a passive subwoofer driven by a separate amp.

The tuner section includes not only 30 station presets and direct-access tuning but also a digitally encoded rotary tuning knob. Once a desired frequency is located, the knob setting can be locked in to prevent accidental mistuning.

Measured FM sensitivity was roughly midway between that of the other two models tested. However, FM stereo distortion was the lowest, only 0.18% at 1 kHz.

In addition to step-by-step instructions for basic receiver operations, the 27-page manual provides step-by-step instructions for specific listening modes—such as Dolby Pro Logic and three-channel surround—and for making a recording (including VCR dubbing).

Hookup of the SA-GX650 was fairly easy, as was the "teaching" process for the remote. Using this remote allowed me to clear my coffee table of at least two other remotes that I might otherwise have had to use. (My videodisc player responded to the preprogrammed code for its brand without any additional "learning.")

WINNERS AND RUNNERS-UP

As I did in my previous survey of A/V receivers, I urge you to study the accompanying Tables carefully. You may regard certain features as being more important than others; after referring to the various charts, section ratings, and overall ratings, you therefore may not fully agree with my conclusions. For example, if you already own fairly efficient loudspeakers, the higher power capability of the Technics receiver may not matter all that much to you.

All three receivers have a lot to offer the budget-minded consumer about to enter the world of home theater. Taking into consideration the published specs, my lab measurements, tuner performance, amplifier performance, video performance, and convenience features, I ranked the Technics in first place overall and the Onkyo and Pioneer only slightly lower. (Both would have tied for second place, were it not for the very minor power difference between them.)

All of the units provided excellent Dolby Pro Logic decoding (and the Pioneer's additional soundstage simulation also worked well). In fact, at their price point of around \$500, these receivers generally performed as well as some of the models I tested a year ago. This supports the view of the Electronic Industries Association, which maintains that consumer electronics products continue to offer more value for the dollar each year than do any other consumer goods. So if you're ready for your own home theater, this is a good time to take the plunge. A

COMPANY ADDRESSES

Onkyo, 200 Williams Dr., Ramsey, N.J. 07446. For literature on Model TX-SV515PRO, circle No. 80.

Pioneer, P.O. Box 1540, Long Beach, Cal. 90801. For literature on Model VSX-502, circle No. 81.

Technics, One Panasonic Way, Secaucus, N.J. 07094. For literature on Model SA-GX650, circle No. 82.



The Audio Interview

DANIEL LANOIS

Peter Gabriel's *So* and *Us* (Geffen) and U2's *The Unforgettable Fire*, *The Joshua Tree*, and *Achtung Baby* (Island) are only a few among the sonic successes of Daniel Lanois. They're also among the strangest, most distorted recordings in modern music history to win Grammy awards and top the album charts.

Lanois started with his own recording studio in Hamilton, Ontario, producing Canadian acts from Raffi to Martha and The Muffins. Through a meeting with Brian Eno, he began working on the innovative *Ambient* series and then worked with U2, Gabriel, Bob Dylan, The Neville Brothers, and Robbie Robertson. He's also managed to make two idiosyncratic discs of his own, *Acadie* (Opal/Warner Bros.) and his most recent, *For the Beauty of Wynona* (Warner Bros.).

Speaking with a slow drawl that comes from his French Canadian background, Lanois is a quiet man. Despite having ascended the Grammy awards stage twice, most recently for producing *Achtung Baby*, he seems far removed from the glitz and name-dropping of the rock world.

Just how far removed from that world is Lanois? At the Warner Bros. office in London, our interview was interrupted when a Warner promotion woman asked if he'd take a call from Eddie Van Halen. Lanois looked up and in perfect innocence asked, "He's the guitar player, right?"

I thought that one of the most acclaimed producers of modern rock must be joking.

"I'm not joking. He's the guitar player, isn't he?"

He took the call.

J.D.

ORGANIC TECHNOLOGIST

John Diliberto



When Bono sings with effects on *Achtung Baby*, it gives him a chance to investigate different aspects of his voice.



One of the things that you've done all along—but especially with U2, Dylan, and The Neville Brothers—is recording live in the control room or playing live with monitors right in the studio with a group of musicians sitting around.

There's a funny thing that happens in the studio. You would think that if you isolated the musicians in one room and you had the technical people in another, you would stand a better chance of hearing things clearly and making better decisions. But nine times out of 10 what happens with me is musicians end up in the control room anyhow because it's better for communication, and we'll drag a guitar amp in there and somebody will start singing, and before you know it, we've actually merged the two rooms into one. And in those settings, I've always gotten great guitar sounds. You know, it seems to be less of a labor. Everybody hears what's going on. We don't have to talk about it a lot. And I still can't figure out why that technique works, but it works.

You used that a lot on U2's *The Joshua Tree*.

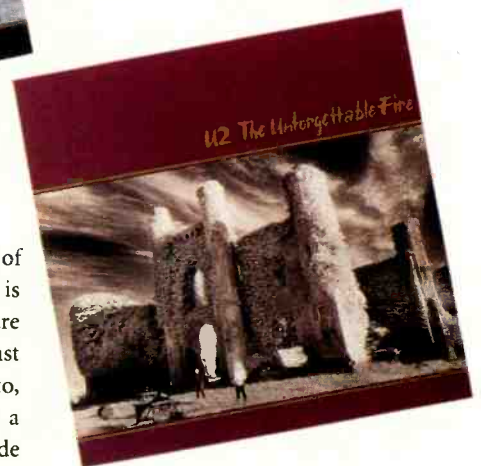
Yeah, the song "Exit" is a good example of a moment captured at a peak. That track is a live performance off the floor. There are very, very few overdubs on that. It's just something that the band had worked up to, and we managed to get it on the tape at a given moment. In fact, that track is made up of two very long performances which just went on for about 20 minutes. And it's made up of these lows and highs and builds, and if we hadn't had the tape rolling or if we hadn't been in that frame of mind at the time, I wouldn't have captured it,

and it really is a fantastic moment. And you can tell.

On a lot of the music that you're involved with, and to a large degree on your album *For the Beauty of Wynona*, the performances sound so removed from an acoustic reality.

Oddly enough, quite a few of those performances are live off the floor. There's one track on there that I love a lot, "Beatrice." I laid that down with my 12-string acoustic and with Daryl Johnson playing the drums. Just the two of us. And it's very, very fiery, and because there weren't a lot of musicians, there was a clear communication and I was able to put a lot of attention to my own guitar playing. I'm very pleased with the guitar performance on that. And then we just put everything else on top of that. The foundation was so strong that we couldn't miss. Another track, "Brother L.A.," has one of those strange beginnings as well, where the track actually came from one of those out-of-control jams. There was even a broken piece of equipment that causes strange psychedelic regeneration, and I thought, "Boy, I never heard this on a record." So I just went with it.

A lot of your references seem to be psychedelic, and that's a running thread in some of the albums you've produced, certainly U2's *Achtung Baby* and Peter Gabriel's *Us*. There's a surreal quality to a lot of the music you are working with lately.



Well, I've been doing spacey stuff all along. But I guess the climate is such that people are a little more open-minded to weirder stuff on records. And that's great for me, 'cause I like to weird up tracks.

The psychedelic thing is really about experimenting, and the more you experiment, the more strange discoveries you make, and it keeps pushing you in a direction. It's a lot of fun, and it adds a journey that Peter really wanted for this record. Yes, he wanted songs for this record, but if something looked like it was going to be an interesting journey, then he was going to jump on it all the way. The tracks "Secret World" and "Fourteen Black Paintings" would be good examples of something that came out of experiment; they were two of those sonic journeys.

Those tracks started with music and melodic jams. And out of these jams come tones that suggest a lyric. When I work with Peter Gabriel, we call it Gabrieleese. That's a lot of fun because it frees you of the pressure of having to come up with a story. So it's pure emotion, and often you can just take the guidelines of those emotional jams and sketch out a lyric from that. *On Peter Gabriel's Us, you find ways of merging sounds from different cultures, with different tonalities and textures, like doudouks, Russian choirs, African drums.*

We invented a few terms for the making of this record. One of them was "future folk." We found quite a bit of the melodies and structure traditional, and yet we discovered these strange futuristic angles, so that's a term we kept coming back to. "Yeah, that's 'future folk.'" That was okay. It's actually something Peter came up with, and it was just his way of rationalizing the use of quite organic tones and instruments but pushing them into the future by applying processing and just taking it all to a new level.

Now, I understand that on Us you just kept recording, tape was rolling all the time, and that ultimate performances were taken from many, many different time periods.

Peter always begins with rhythm, and that's where he gets compositional inspiration. He will run his source rhythm, jam along with it, and out of those jams come melodies, arrangement ideas, chord structures, so it's very much the way that the record gets made with Peter. Even when his band comes in, we'll often like five versions of what we call prints. It's almost like a sketch of the arrangement for the band to play on top of, and we'll have five versions of it. We'll play those five times, and then when

the band is gone we'll often slice an arrangement together from the best bits. A very long process.

The record doesn't sound that way except where there are intentional juxtapositions, but you would never think that it was patched together that way.

In the end I hope that you can't detect any of the seams, but there are more than a couple of edits in there, I can assure you.

You often go for a really grunge sound on almost everything you've done the last few years. Things that aren't really clean, things that have a lot of distortion. When you do these sounds, do you like to start with something clean, or do you just go for the grunge right away?

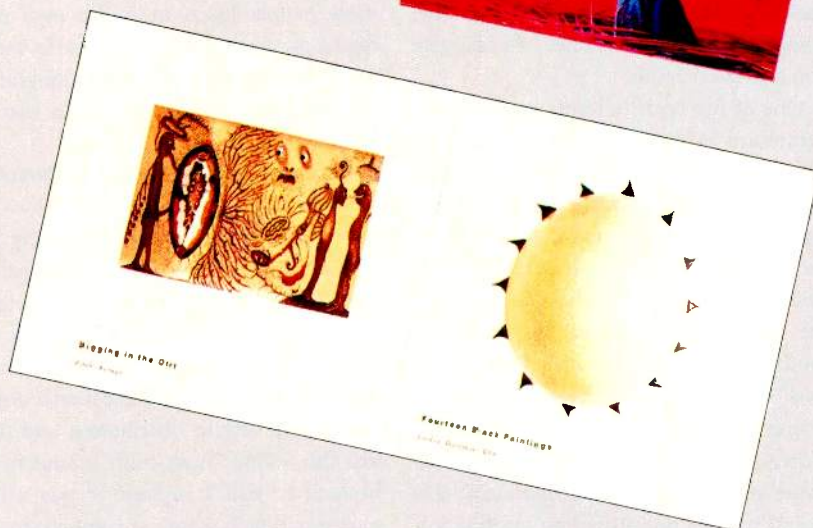
Quite often these dirtier sounds are just sounds that we end up with through recklessness. If you take too much time and polish something, you may end up with too polite a sound and, therefore, not as emotional. In my experience, especially with drums, they sound best when you weird

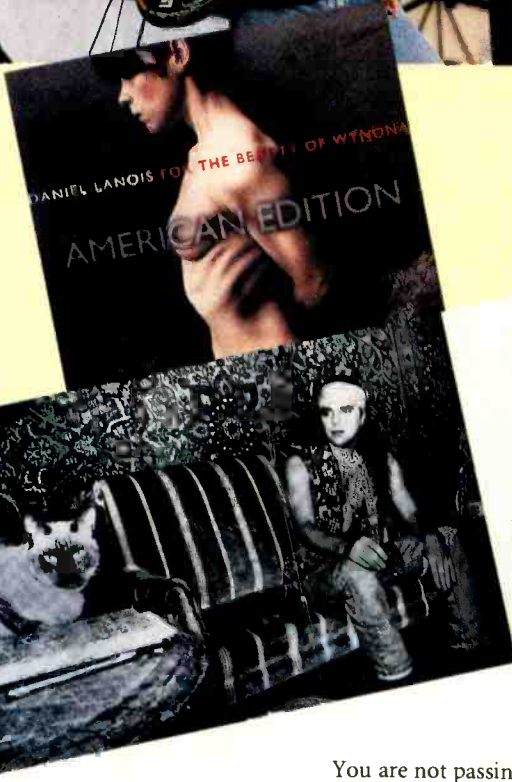
them up, when you overdrive them, or when you do funny miking or crazy EQs. They always seem to sound more interesting that way. And I believe the same thing applies with guitar sounds and synth sounds, for that matter. Synthesizers, to my ears, always sound better when you put them through cheap speakers. 'Cause then they take on more of an organic personality, and in the end I think organic means musical.

Do you use cheap microphones and equipment?

This microphone that you are pointing at me right now is a Shure SM58. It's considered a cheap mike; it costs \$100 or \$125. And most people would think, well, if you are going to go into a studio, of course you are going to pull out your \$5,000 mike. But this cheap mike has got a sound; it's got a curve that's musical. Happens to sound good on drums and electric guitars and sometimes on voices, if you sing real close. And this microphone is part of a toolbox,

On *Us*, if something looked like it was going to be an interesting journey, then Peter Gabriel was going to jump on it.





and all of the tools have a personality. Sometimes the cheaper ones will just give you a musical result.

One of my favorite terms is saturation. Saturation is musical, and that happens when you overload equipment. That's what we love about tube amplifiers; that's what we love about speakers when we crank them up too loud. It gets exciting. The midrange collapses, the bass gets louder, the top end gets sweeter. It's called the loudness curve. They actually have "loudness" buttons on some stereos. And saturation is something that gets discouraged the closer you get to digital technology. Because you are reading information at that point, you are not projecting information.

You are not passing information through a needle that's scraping on vinyl. Given that most people listen to music now on a digital playback system, I choose to use organic saturation during the making of the record to make sure that it gets there in some form or other in the end.

You started your own studio in Canada in '70, '69?

Late '60s is when I started recording in a very small way. What was interesting about those times was you couldn't get recording equipment at the corner music store. Recording was exclusive to the recording club. You had to buy professional equipment from certain distributors and there was this whole "hush-hush" about it, but because of that I suppose it was a little more exciting. It wasn't as common to find

a tape recorder. You wouldn't go to somebody's house and find a four-track in people's bedrooms. So when things are not as common, then everything is a discovery. And in a way, the most exciting, the most important ingredient when you are working is to be excited about something. And just the simple process itself, the recording process, was exciting to me then and was really the thing that drove me.

You just had a two-track Revox?

I had two Revoxes; they were both two-track. You'd record the band on the one Revox and then play that Revox back through the mixture and sing along with it or play along. You had one chance to do overdubs. And that got bounced to the second Revox, and that would become your finished mix, you know, just two passes [laughter].

I had some problems recently with my portable CD player. It wasn't tracking several CDs properly, so I've been shopping for a new one. And one of the CDs that wasn't tracking properly was U2's Achtung Baby. I'm sure that had nothing to do with your production, but I took that along to test these little players to make sure they would play it. But in the process I couldn't get a really good idea of how these players sounded, because of how much distortion and compression there is on that album.

Achtung Baby has got a lot of distortion on it. That's a bit of a contradiction, isn't it, that some of these modern guitar effects processors are real dirty sounding. Any guitar you put in them will come out like *grrrr*. But some of the drums are distorted on the *Achtung Baby* record. Flood, the engineer, liked putting the drums through these Neve modules and overdriving the modules. What happens when you do that, you'll take a fairly flat sound, overdrive it, and then it starts developing this barking-dog quality. It gets a ring to it. And I like it because it develops a personality; it's more organic. But I can see how somebody might read that as a fuzzy sound.

Would you ever see making a record as an audio document? Just recording a performance straight out, that's it? You almost do it on one track on your new album.

I have done recordings that are more like documentations. They are usually instrument records, and those records don't get

talked about a whole lot. I did a record with a group called Farafina, an African percussion group, with a trumpet player named Jon Hassell. It was *Flash of the Spirit* [on the Intuition label]. That was recorded in New York, pretty much live off the floor. Then a few days spent on mixing, and the record went out.

Actually I thought you did quite a bit of processing on that record. I recall hearing that Farafina wasn't exactly pleased.

You gotta talk to Brian Eno about that [laughs]. He's the one that weirded up the record. But I like all that weird stuff. Documentation is one thing, but if you think it's more exciting to weird it up, then you weird it up [laughter].

You're 41 years old, so you grew up with the music of Bob Dylan. Were you in awe when you produced him on Oh Mercy?

Even though I've grown up with Bob Dylan music around me, I was not a fanatical fan. That probably helped me in the end, 'cause you don't want to be drooling all over somebody when you start working with them. But he's written some great songs, and I have to admire him for his vision and his song angles. I gotta tell you, it was a pleasure to just sit by his side for a month and watch it all be crafted.

He's an artist who's not known for creating a sound. You think of a Dylan record, it's pretty much guitars, bass, drums—straight off the floor, as you say. Not much beyond that. What was his response to the processing that you were doing and the treatments that you were giving them?

I think Bob Dylan *has* created a sound on records. And he's probably not been given enough credit for that. I think scene setting has a lot to do with sound—where you make your record, who is going to play with you, and what you are going to sing about. That's all part of sound. And I hear that concentration and personality on some of his records. The thing that I do, and did with him, is not unlike that. We created a setting. We did it in a very small way. We didn't travel the globe trying to hook up with all the best people. We just did it in one room, and I think it was probably the best thing to do with him at that time.

On almost all the records that you work on and on your own record, the voice always

sounds different. It's always in a different space; sometimes it's in your face and dry, sometimes it's distant and filtered. You're always changing that around.

I like to create a mood with the voice the same way that I like to create a mood with music. Sometimes the best thing you can do is put the voice in the foreground and keep it real dry and intimate, and it speaks to a listener. It means that the singer is almost in the room. Other times, manipulation will conjure up a better image.

When you're processing the sound of a musician, are they hearing the processes? When Bono is singing "The Fly" on Achtung Baby where the vocals are really distorted and filtered out—was he singing with that effect?

Yes, he did sing with that effect, and that's one of the things he likes when we weird up his voice. It frees him up and gives him a chance to investigate different aspects of his voice. Different bits of personality. You can imagine that when you've been singing a long time and made a lot of records, you

welcome an opportunity to investigate another part of your voice.

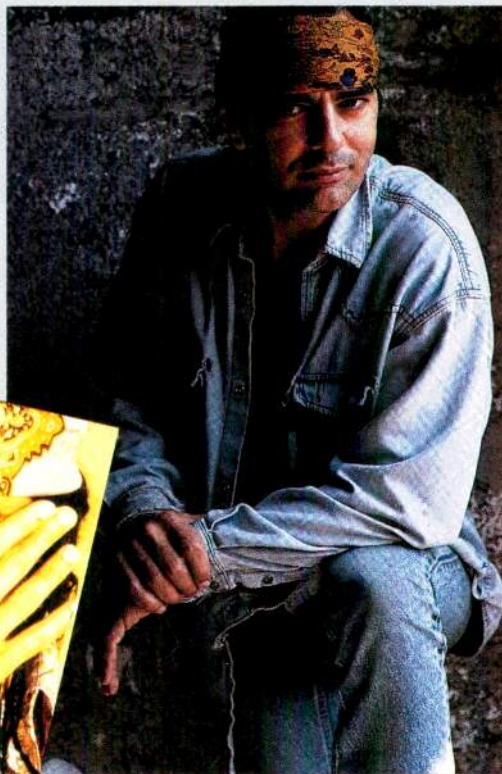
The processing that you do, when did you start doing that?

In the '70s I was doing a lot of sonic manipulation, something I would do late at night, trippy kind of stuff. But I never really had a home for it. It's when I met Brian Eno that I was able to actually connect it with records. So it was great to meet somebody like that who was making a living doing that kind of stuff.

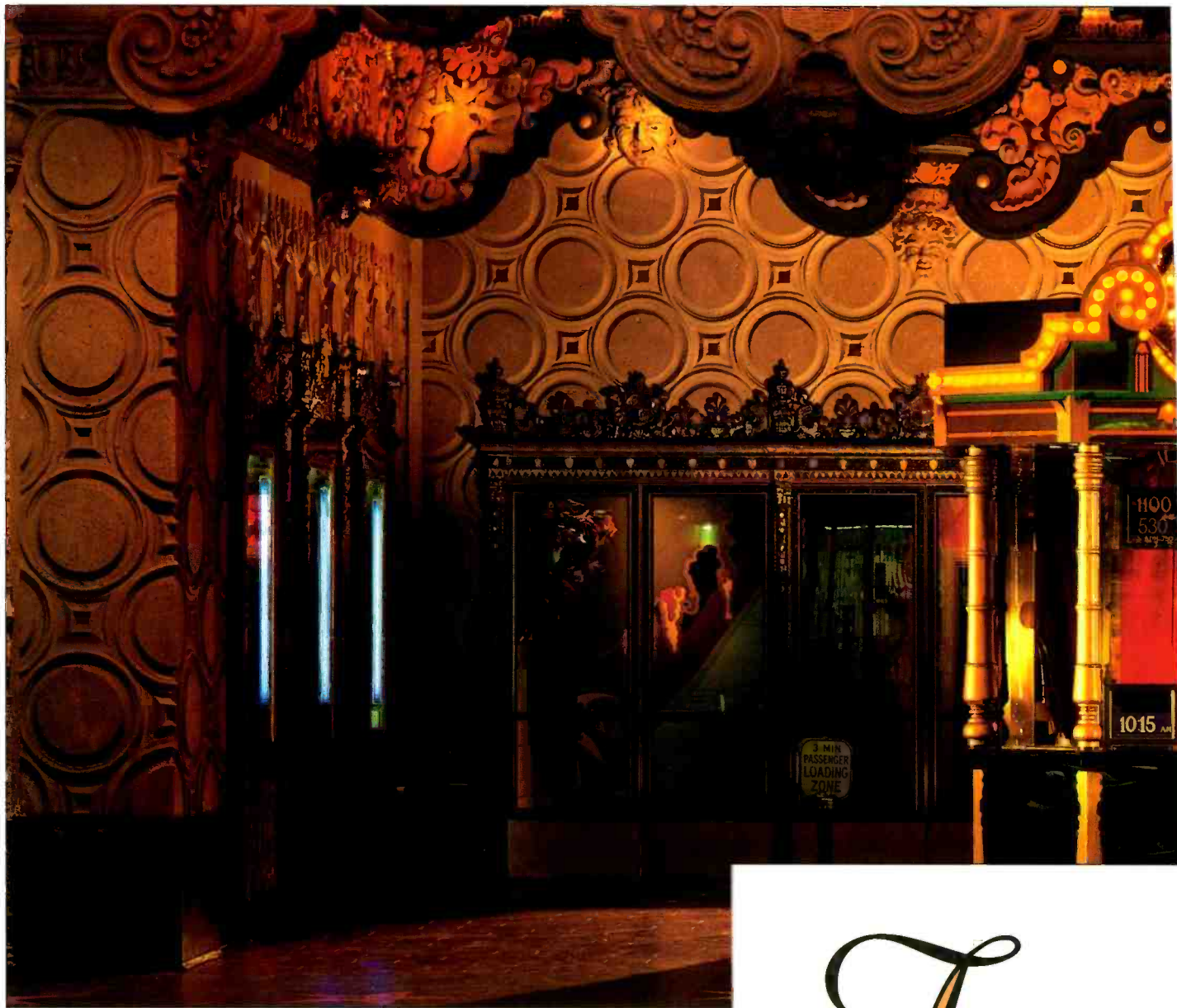
A lot of what you do seems to be involved with mixing up technology and acoustic things.

I mix technology with organics. I hope that technology gets more organic than what we've seen. In fact, I'm hoping that communication becomes even easier with machines. I believe we've gone through the phase of hidden information. Computers and computer screens have used the system, whereby you have to ask for a piece of information before you can see it. But in fact, the human eye, the human mind, can digest a lot of information at once. So I hope that designers come up with gear that allows you to see more than less. A

Documentation is one thing, but if you think it's more exciting to weird it up, then you weird it up!



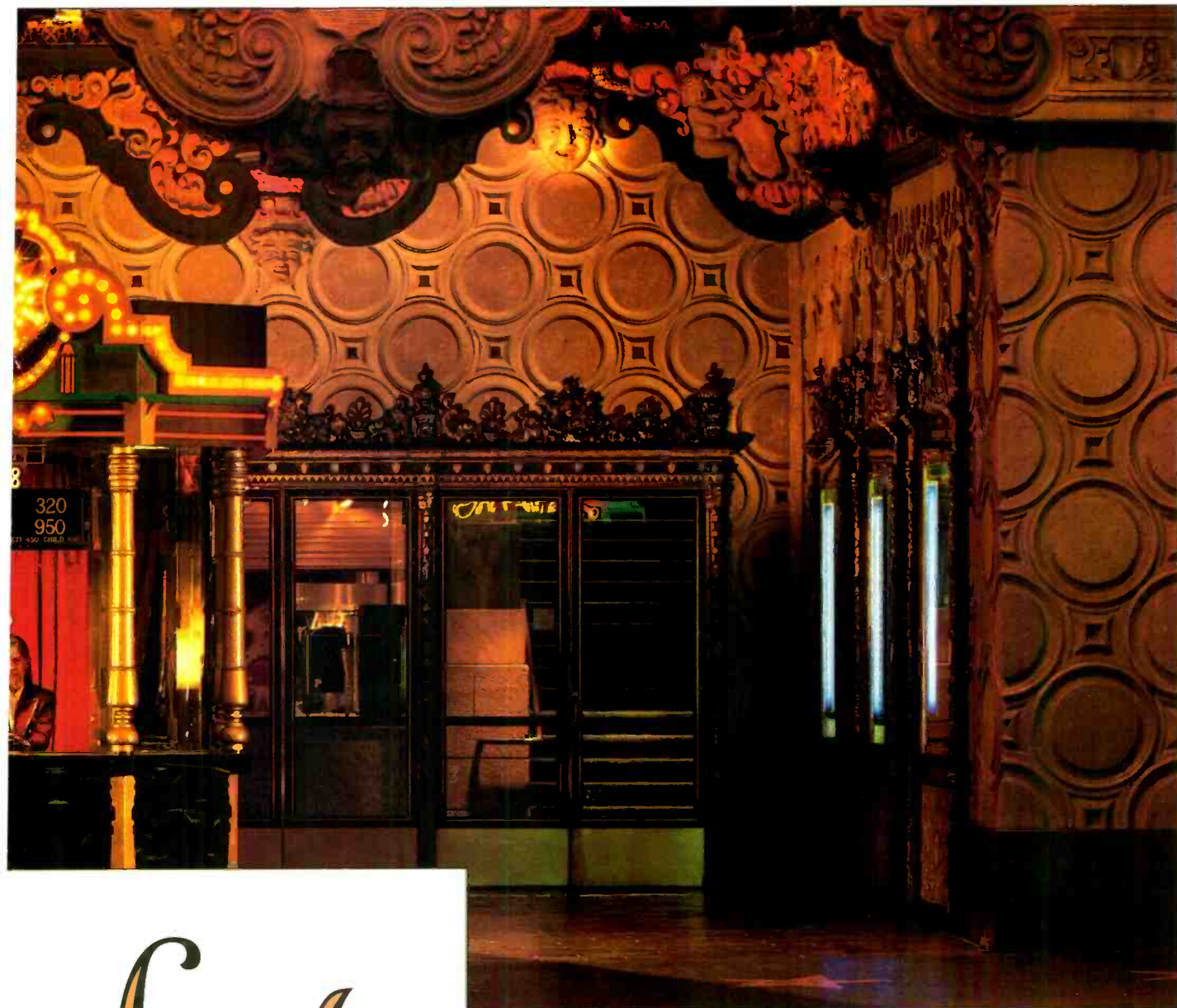
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If you have been to a Consumer Electronics Show lately (in Chicago in the summer and Las Vegas in the winter), perhaps you remember a speaker company that was demonstrating a woofer submerged in a fish tank! The company, New England Audio Resource (NEAR), was illustrating the capabilities of its proprietary techniques for producing loudspeakers with metal cones. Metal-dome tweeters are commonplace now, but mid-

range and woofer drivers with metal cones are not.

Bill Kieltyka, president of NEAR, after working several years for the original Bozak company (whose name and designs have now been licensed to the new company Bozak Audio Laboratories), bought Bozak's tools and technology for manufacturing metal-cone speakers. He founded NEAR in 1988 and, after redesigning and streamlining the production process of making met-

al-cone speakers, brought a line of NEAR systems based on this technology to market. The 50Me is the top of this line.

Kieltyka feels that the metal diaphragm provides superior sonic performance and has real advantages for outdoor speakers subjected to adverse weather. The metal cones are said to minimize cone breakup, which distorts the speaker's output, and the high rigidity provides "a finely detailed sound that permits hours of musical pleasure without listener fatigue."

The 50Me is an update of the earlier 50M that NEAR has marketed for the last 2½ years. The 50Me is a floor-standing tower, with the midrange and tweeter mounted at the top of the cabinet and the woofer mounted on the bottom. The vent is located on the bottom rear of the cabinet. The front panel slopes rearward, making the cabinet depth quite shallow at the top and

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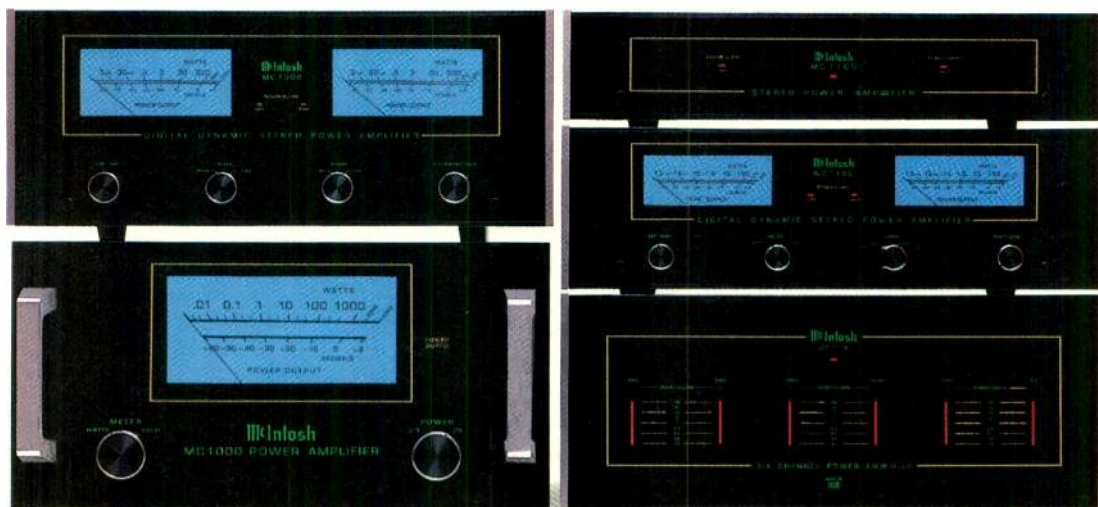
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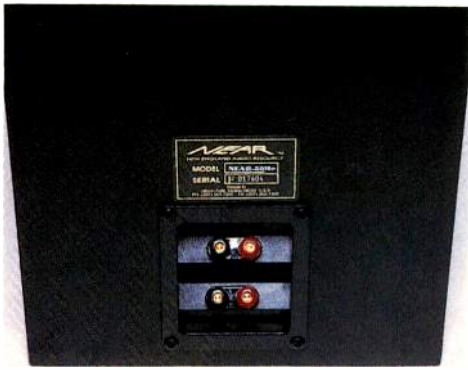
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much wider at the bottom. The cabinet's shallow top, coupled with the narrowness of the cabinet, the top-mounted midrange and tweeter, and low crossover frequency between the woofer and midrange, form a configuration that resembles a small two-way mini-monitor with a separate sub-woofer.

The cabinet is constructed of medium-density fiberboard. The front panel is a beefy, 1 inch thick, while all other panels are 3/4 inch thick. To minimize vibration, the cabinet is braced extensively, with four internal shelves. Three of these have holes cut to allow the free passage of air. The fourth forms a separate enclosure, at the top of the cabinet, for the midrange and tweeter.

NEAR manufactures all of its own drivers. In addition to metal cones and domes, all drivers feature a patented Magnetic Liquid Suspension, a magnetic-fluid centering scheme that eliminates the need for the conventional spider used on virtually all other dynamic drivers. The fluid suspension is said to "keep the voice coil better damped, provide more efficient heat sinking than a traditional air gap, and ensure that the alignment remains ideal at all excursions." The special ferrous magnetic fluid is produced for NEAR by an unnamed company. The fluid has low viscosity and high magnetic energy so that the drivers operate according to NEAR's tight specifications.

The 50Me's 8 1/4-inch woofer is more rigid than Bozak's original design. Its first breakup mode is claimed to be at 4 kHz or higher, which is more than 10 times higher than the 235-Hz crossover between the 50Me's woofer and midrange. The woofer

and midrange cones are made from a composite of metal alloy and ceramic material. With its cast frame and very large magnet, the woofer is quite impressive.

The tweeter features a 1.1-inch, low-mass, very rigid titanium cone (it looks like a concave dome), with a 3/4-inch-diameter single-layer voice-coil and a high-compliance surround. Low-viscosity magnetic fluid is used to damp and cool the voice-coil. According to Kieltyka, the tweeter "offers better off-axis response, a flatter and more extended top octave, and a more musical sound overall."

The crossover is point-to-point constructed on two large Masonite boards, one mounted on the bottom of the box and the other to the side. All parts are large and of good quality. Curiously, all the parts, including the connection terminal strips, are completely wrapped in a clay-like compound (which is a commercial product called Mortite, I believe), presumably to minimize vibration. All internal connections are made with double-stranded, solid-core wire. Separate woofer and upper-frequency binding posts permit bi-wiring. These heavy-duty posts are gold-plated. The crossover contains 17 parts: Four resistors, six inductors, and seven capacitors. Electrically, the woofer is driven by a fourth-order low-pass filter (two Ls and two Cs) with an LCR impedance compensation network. The midrange is driven by second-order high-pass and first-order low-pass filters with a series resonant circuit that sharpens the low-pass roll-off attenuation. The tweeter is driven by a second-order high-pass filter that initially rolls off at 6 dB/octave and then rolls off at 12 dB/octave below 1 kHz. Acoustically, the crossover is said to have linear phase and positive polarity.

Measurements

The tenth-octave-smoothed, on-axis anechoic frequency response of the 50Me is shown in Fig. 1; the effects of the grille are

shown in an unsmoothed curve. Measurements were taken with the grille off, at a point 36 inches from the cabinet's bottom, the height recommended by NEAR. This puts the measuring point slightly below the bottom flange of the midrange driver; the 50Me's tweeter is about 44 1/2 inches from the floor, significantly higher than in typical home speakers. A seated listener's ears, which are usually about 36 to 38 inches

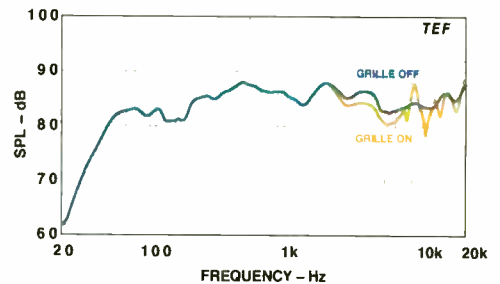


Fig. 1—Anechoic frequency response.

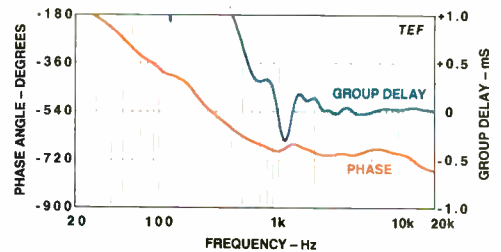


Fig. 2—Phase response and group delay.

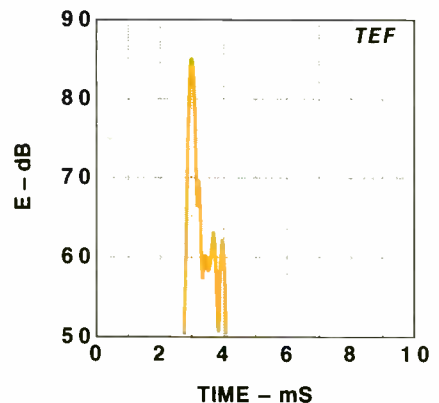
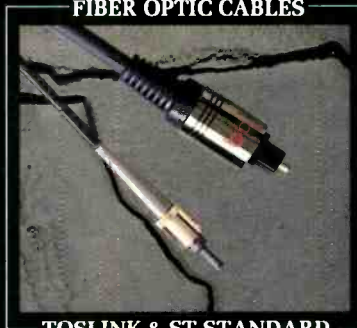


Fig. 3—Energy/time response.

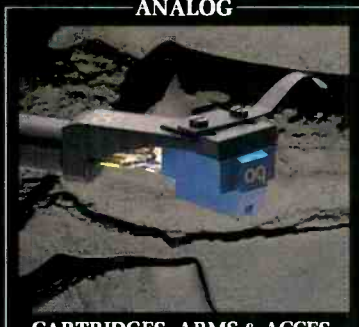
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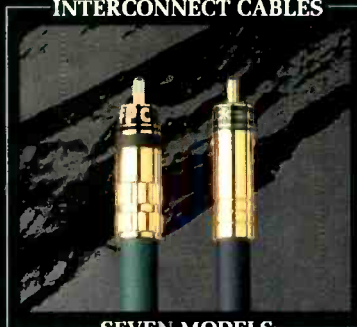
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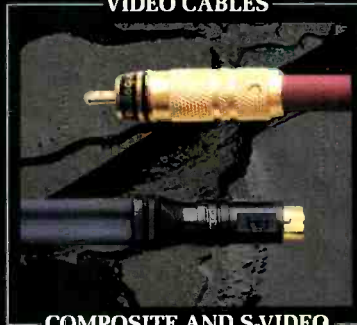
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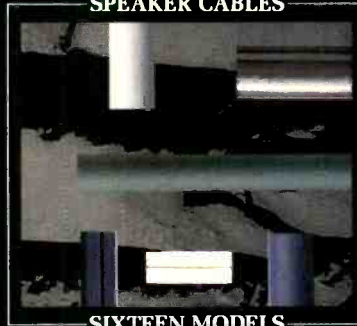
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from the floor, are therefore well below the speaker's axis due to the tweeter's height and the tilt of the 50Me's front panel. This below-axis listener location delays the tweeter's output just enough to synchronize its sound with that from the midrange.

The test microphone was placed 2 meters from the front of the cabinet; a signal of 5.66 V rms was applied, and the measurement was referenced back to 1 meter. (NEAR recommended a 3-meter distance; a trial response test at this distance yielded

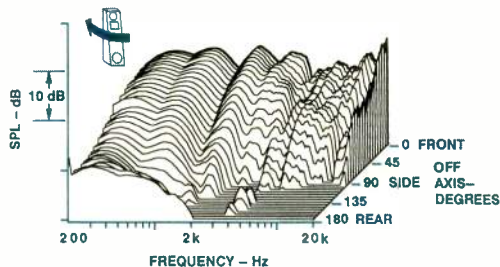


Fig. 4—Horizontal off-axis frequency responses.

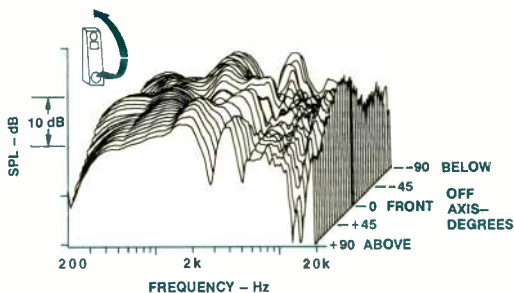


Fig. 5—Vertical off-axis frequency responses.

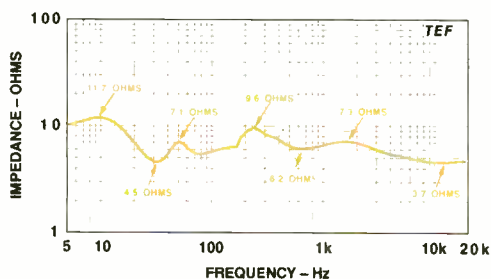


Fig. 6—Impedance.

essentially the same curve seen in Fig. 1.) A combination of ground-plane and elevated free-field measurements was used to derive the curve.

The overall curve in Fig. 1 fits a not-so-tight 7-dB window (+3, -4 dB re: 1 kHz) from 45 Hz to 20 kHz. The curve exhibits a number of moderate peaks and dips, along with a high-frequency depression between 4.5 and 13 kHz. The high-frequency response peaks at 20 kHz and then falls rapidly at higher frequencies (not shown).

Below 40 Hz, the response falls at 12 dB/octave and then falls more rapidly, at a rate of 24 dB/octave, below about 30 Hz. Above 2 kHz, the grille causes significant changes in response of about ± 4 dB; it should be left off for most very serious listening.

Averaged over the range from 250 Hz to 4 kHz, sensitivity measured 86.1 dB, significantly below NEAR's 90-dB rating. The right and left systems were not initially matched very well; there was a deviation of about ± 3 dB in the tweeter's range, primarily above 10 kHz. A set of replacement tweeter and midrange drivers, supplied after I damaged one midrange during my test of peak power handling, yielded a much closer match, with only ± 0.75 dB of difference over the whole range.

The phase and group-delay responses of the 50Me, referenced to the tweeter's arrival time, are shown in Fig. 2. The phase curve is well behaved and changes very little above 1 kHz. The close attention to driver synchronization pays off well here. The group-delay curve indicates essentially zero time offset between the midrange and tweeter. The deviations between 1 and 2 kHz are due to minimum-phase variations in the amplitude response and would disappear if the response were flat through this range.

The 50Me's 1-meter, on-axis, 2.83 V rms energy/time response is shown in Fig. 3. The test parameters accentuate the speaker's response between 1 and 10 kHz,

which includes the upper crossover region. The main arrival, at 3 mS, is quite compact but is followed by minor delayed responses about 22 dB down from the main peak, extending out to 1 mS after the first peak.

Figure 4 exhibits the horizontal "3-D" off-axis responses of the 50Me. The bold curve at the rear of the graph is the on-axis response. The off-axis horizontal response is quite uniform. In the primary $\pm 15^\circ$ listening window, the response is extremely uniform, staying within ± 1 dB of the on-axis response all the way up to 20 kHz.

The vertical off-axis "3-D" curves are revealed in Fig. 5. The bold curve in the center of the graph (front to rear) is on axis. These curves are not very uniform, particularly within an octave above and below the upper crossover frequency of 4 kHz. Significant directivity is also exhibited below 400 Hz due to the separation of the midrange and woofer. Within $\pm 15^\circ$ of the axis, the downward-angle curves are much smooth-

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er and flatter than the upward-angle curves. Although the response is fairly flat on axis, a two-octave-wide dip develops at 4 kHz as the listening position rises. At 15° above axis, the depression is nearly 20 dB deep.

Figure 6 shows the 50Me's impedance magnitude versus frequency, plotted over the extended range of 5 Hz to 20 kHz. A minimum impedance of 3.7 ohms occurs at 12 kHz, and a maximum of about 12 ohms occurs at the subsonic frequency of 10 Hz. Above 20 Hz, the maximum is only 9.6 ohms (at 250 Hz).

Between 20 Hz and 20 kHz, the curve has a max/min variation of about 2.6 to 1 (9.6 divided by 3.7). This max/min variation coupled with the fairly low minimum impedance means that the 50Me will be somewhat sensitive to cable resistance. Cable series resistance should be limited to a maximum of about 0.07 ohm to keep cable-drop effects from causing response peaks and dips greater than 0.1 dB. For a

D R E A M

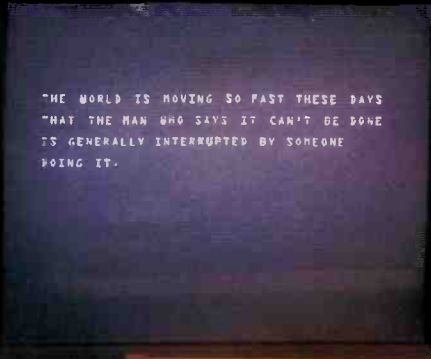
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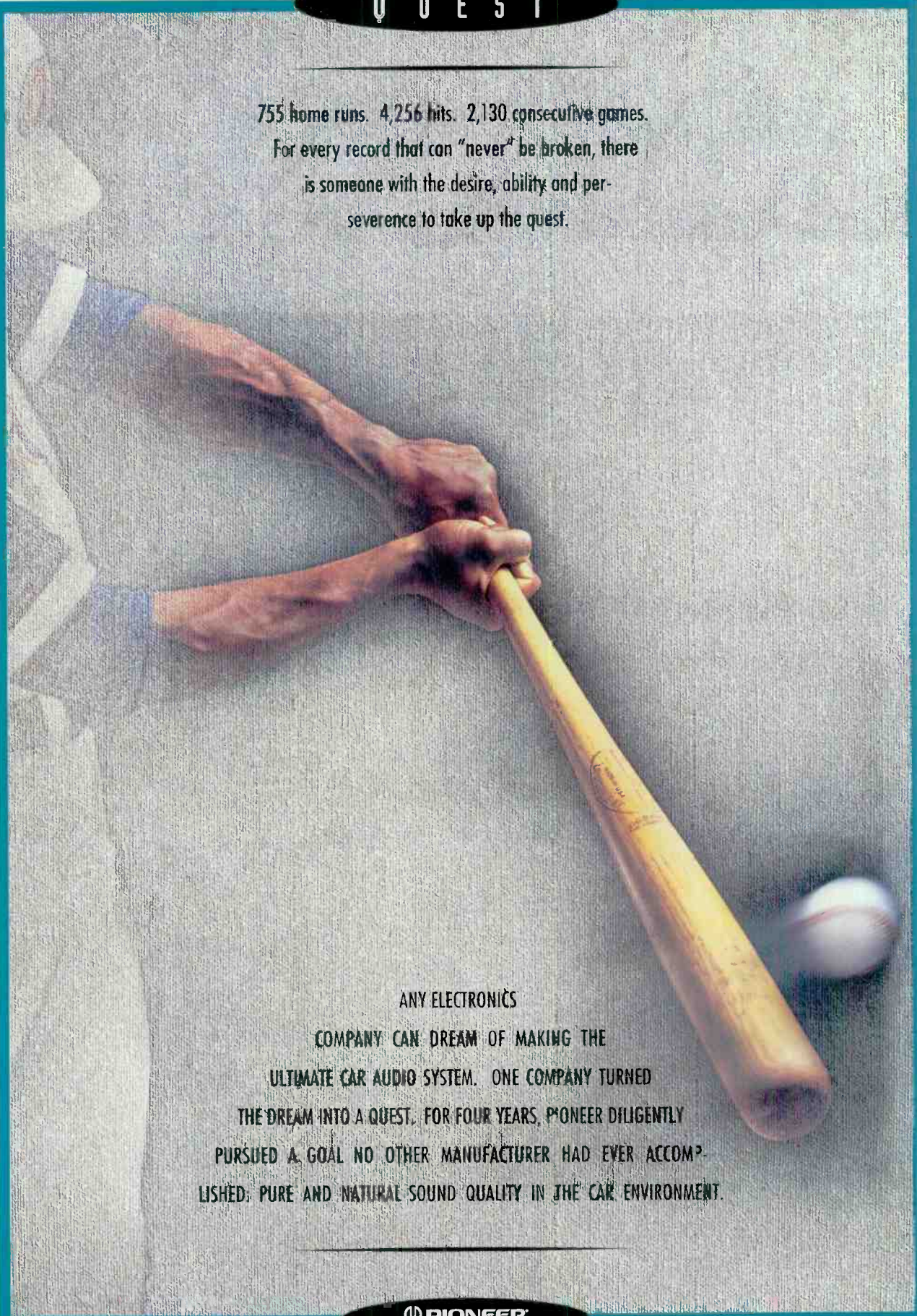
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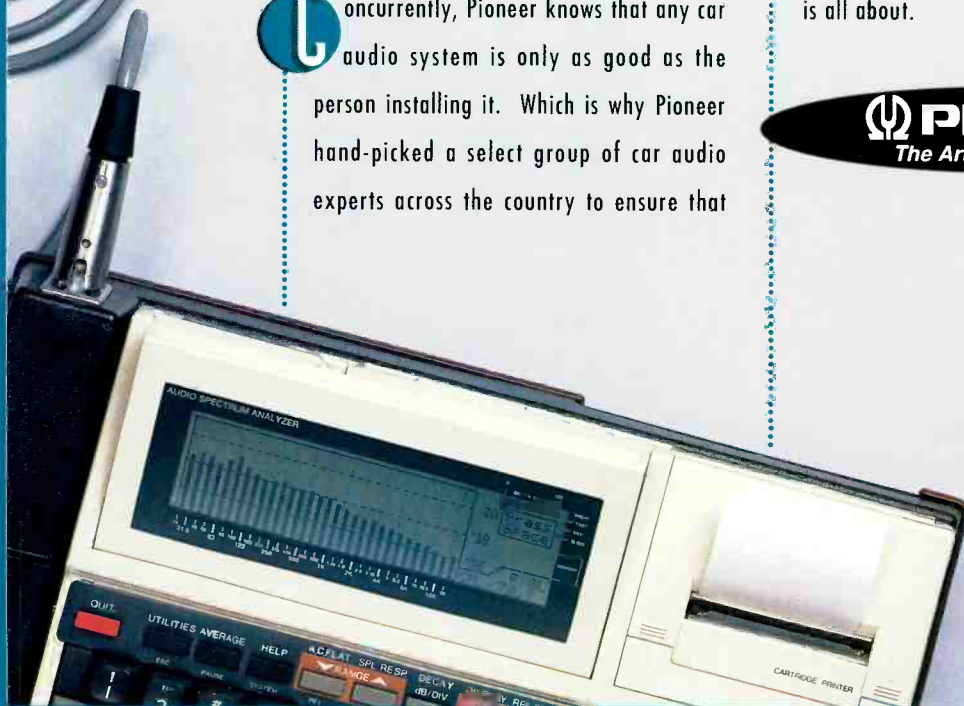
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typical run of about 10 feet, 16-gauge (or heavier) low-inductance cable should be used.

Figure 7 illustrates the complex impedance, plotted on fairly tight 12-ohm scales, over the range from 5 Hz to 30 kHz. No surprises here. The impedance phase (not shown) reached a maximum angle of only +22° (inductive) at 180 Hz and a minimum of only -30° (capacitive) at 20 kHz. With

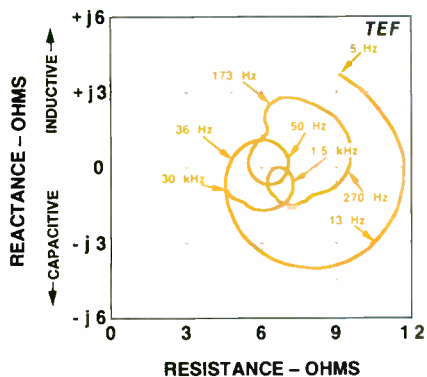


Fig. 7—Complex impedance.

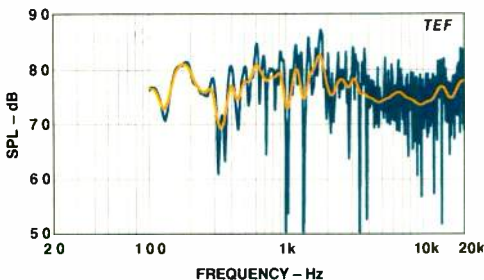


Fig. 8—Three-meter room response.

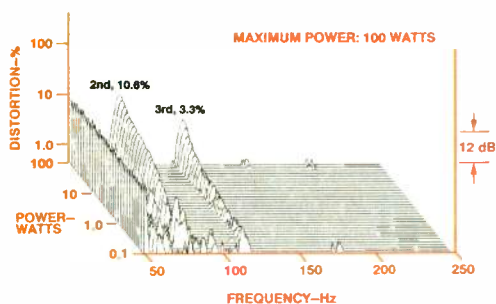


Fig. 9—Harmonic distortion for E₁ (41.2 Hz).

these moderate angles, but significantly low impedance values, the 50Me will not be a problem for most amplifiers if used by itself.

When subjected to a high-level sine-wave sweep, the cabinet of the 50Me was quite inert. The only detectable wall resonance was a slight vibration of the front and rear panels in the range from 260 to 270 Hz. The 8-inch woofer has a very long maximum travel capability, about 1 inch, peak to peak, the highest that I have seen in this size driver. Linear travel with reasonable distortion was significantly less, at about 0.5-inch, peak to peak. The woofer overloaded quite gracefully.

The reduction of cone displacement at the 50Me's vented-box resonance frequency of 40 Hz was very good. Displacement with the port open (the normal condition) was only about 10% as much as with the port covered. A well-performing vented-box system will reduce the woofer's displacement to near zero at box resonance. At this frequency, most of the acoustic energy is coming from the port. Because the acoustic resonator, formed by the stiffness of the air in the cabinet and the mass of the air in the port, is much more linear than the woofer's mechanical moving system, distortion is much reduced.

The woofer did, however, exhibit high values of dynamic offset in the frequency ranges from 55 to 130 Hz (above tuning) and 25 to 36 Hz (below tuning). The cone would drift strongly out of the gap with input voltages above about 10 V rms. Subjectively, the accompanying distortion was not very objectionable because it was primarily second harmonic. Long-throw woofers with very linear suspensions are always prone to exhibit dynamic offset. Additional nonlinear restoring force is required to minimize this effect. Even with the offset distortion, the 50Me's bass output on sine wave was quite impressive. Vent turbulence and wind noise was quite low, even at high input levels at and near box resonance.

Examining the rear of the woofer reveals that, indeed, it has no

spider. All cone-restoring force is provided by the surround only. Although this driver has no spider, I was not able to make the voice-coil rub against the gap by physically trying to rock the cone assembly with my fingers. The total in/out movement capability of the cone was very formidable.

Figure 8 shows the 3-meter room response of the 50Me, with both raw and sixth-octave smoothed data. The speaker was in the right-hand stereo position, aimed toward the main listening position; the test microphone was at ear height (36 inches) at the listener's position on the sofa. The system was driven with a swept sine-wave signal of 2.83 V rms (corresponding to 1 watt into the NEAR 50me's rated 8-ohm impedance). The direct sound and 13 mS of the room's reverberation are included.

Excluding a room-effect dip at 330 Hz, the averaged curve fits a reasonably tight, 10-dB window. Major features include an upper midrange peak at 1.8 kHz and a depressed high end above 3 kHz. In this depressed region, the averaged curve fits a much tighter window, about 4 dB.

Figure 9 shows the E₁ (41.2-Hz) bass harmonic distortion data with input power ranging from 0.1 to 100 watts. The second harmonic reaches only a moderate 10.6%, while the third is only 3.3%. Higher har-

**LISTENERS SIT WELL
BELOW THE 50Me's AXIS,
WHERE THE TWEETER AND
MIDRANGE SIGNALS ARE
SYNCHRONIZED.**

monics are negligible. With an input of 100 watts, the 50Me reaches a quite usable 100 dB SPL at this frequency.

Figure 10 shows the A₂ (110-Hz) bass harmonic distortion data. The predominant harmonics are a moderate 15.5% second and a 4.5% third. Higher harmonics are very low, 0.4% or less.

The A₄ (440-Hz) distortion data (not shown) rose only to the low level of 1.3% second and 1% third, with higher harmonics below the noise floor of my measuring gear.

Figure 11 shows IM versus output, over the range from 0.1 to 100 watts, for 440-Hz (A_4) and 41.2-Hz (E_1) tones of equal power. The IM distortion rises only to the very low level of 1% at 100 watts. The low (235-Hz) crossover between the woofer and midrange of the 50Me contributes to the low level of IM in this test because the test's two frequencies straddle the crossover.

The short-term peak-power input and output capabilities of the 50Me, measured using a 6.5-cycle, third-octave-bandwidth tone burst, are shown in Fig. 12 as a func-

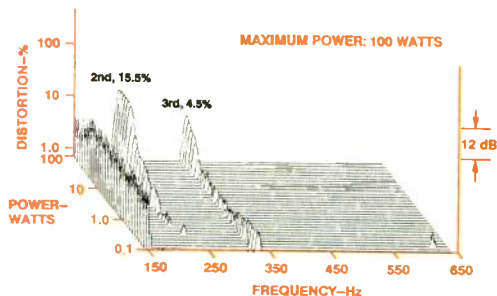


Fig. 10—Harmonic distortion for A_2 (110 Hz).

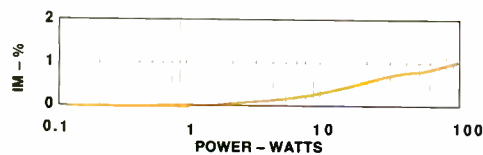


Fig. 11—IM distortion.

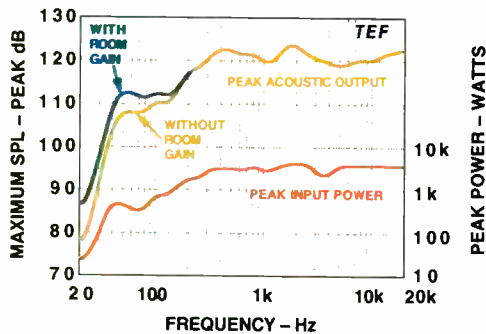


Fig. 12—Maximum peak input power and sound output.

tion of frequency. The peak input power was calculated by assuming that the measured peak voltage was applied across the rated 8-ohm impedance.

The peak input power rises swiftly from 25 watts at 20 Hz to a local maximum of about 500 watts at 42 Hz, which coincides approximately with the tuning frequency of the vented box. After a slight dip, it continues to rise and attains a level of about 4,000 watts above 400 Hz. A slight reduction in input power is noted at 3.5 kHz, at the low end of the tweeter's range.

The woofer exhibited significant dynamic-offset distortion in the octave from 63 to 125 Hz, where the cone's displacement essentially forced the voice-coil out of the gap.

During the test of the peak power handling capacity of one of the speakers, a buzzing problem developed in the midrange. The metal cone separated slightly at the junction of the sloped cone and the flat area where the surround is attached. After this happened, I repeated the test on the opposite unit without mishap. I also experienced a tweeter failure later on with the system that had the buzz; the tweeter's voice-coil exhibited a short (very low resistance). After I received new pairs midranges and tweeters from the factory, the right and left systems performed flawlessly. I conducted listening tests before and after the new drivers were installed.

With room gain, the maximum peak output SPL of the 50Me rises very rapidly, reaching a plateau at an impressive 110 to 112 dB SPL between 40 and 130 Hz. Thereafter, the peak SPL rises rapidly to the loud range of 120 to 123 dB above 300 Hz. A pair of these NEAR speakers operating in unison, in a typical listening room, can attain even higher levels in the important bass range. The bass output of the 50Me exceeds that of every system I have measured that has a single 8-inch woofer. The 50Me, in fact, competes quite well with systems having larger drivers.

Use and Listening Tests

The 50Me is not so large and heavy as to be a problem when unpacking or moving a pair around a room. The speakers come with spiked feet, and NEAR recommends their use. I listened with and without the spikes. As with all spiked loudspeakers, the 50Me systems are more difficult to position with the spikes installed. Fortunately, these speakers can be lifted by one person using the port as a handhold.

NEAR's instruction manual is a well-written, seven-page piece. It has sections on room placement and setup, loudspeaker positioning, connections (including detailed bi-wiring instructions), associated equipment (including cables and interconnects), and a general treatment of speaker power ratings.

My review speakers were supplied in a good-looking walnut finish and had a beveled front panel. The rear panel was satin black. Construction and appearance were top-notch. The 50Me looks quite good even without its grille. The grille assembly's molded plastic frame was somewhat flimsy, and bent quite significantly when I removed it. I broke one side rail when I pulled back on the top while attempting to release the bottom fasteners, which are projections that mate with cavities in the front panel.

After unpacking, one of the first things you notice is the positioning of the drivers. The midrange and tweeter are mounted quite high on the front of the cabinet. The center of the tweeter is about 45 inches

**OFF-AXIS HORIZONTAL
RESPONSE IS QUITE
UNIFORM, ESPECIALLY IN
THE MAIN LISTENING
WINDOW.**

above the cabinet's bottom. Conversely, the woofer is on the bottom of the cabinet, with its frame only about 3 inches above the floor. As mentioned earlier, the elevated midrange/tweeter position and sloping cabinet mean the listener is below axis, but the 50Me's time and frequency response

Continued on page 86

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FOSGATE•AUDIONICS MODEL FOUR SURROUND PROCESSOR

jacks that handle composite video signals. (Stereo pairs of gold-plated phono jacks are provided for each audio hookup.) With composite video, chrominance (color) and luminance (brightness) are multiplexed onto one line; S-video connections carry each separately. As is true of most consumer video switchers, the Model Four switches composite and S-video signals separately. This means that composite video inputs are



Jim Fosgate's involvement with surround sound goes back nearly to the days of "quad." Quadraphonic sound came a cropper in the early 1970s, but it didn't stop Fosgate from believing that more lay hidden in the record groove than was revealed in a simple stereophonic presentation. Now that DSP-based "ambience simulation" and Dolby Stereo movies have vaulted multichannel sound presentation to the forefront, it's interesting to see how Fosgate has remained true to his roots in developing the

Fosgate•Audionics Model Four Digital Servo Logic Surround Processor. As we'll see, the Model Four is no ordinary Dolby Pro Logic box *cum* DSP: It's a product distinguished from the norm.

Control Layout

There are no rotary controls on the Model Four's front panel. All functions are activated by microprocessors and controlled by touchpads on the panel and/or the remote control. Seven pads, starting at the lower left of the panel, command "Power," "Source Select," "Record Select," "Volume" down and up, "Mode Select," and "Noise Sequencer" (for Dolby setup).

The source and record pads choose independently among six audio/video inputs—two S-video inputs plus composite video connections for "VCR," "LV," "AUX 1," and "AUX 2." The two S-video inputs use the usual multipin connectors, while the remaining four use gold-plated phono

routed *only* to the composite video outputs and S-video inputs are routed *only* to the S-video outputs. Pairs of each type of output are provided, one fed via the source selector, the other by the record selector.

**THE MODEL FOUR
DOES A SUPERB JOB
OF KEEPING IMAGES
WHERE THEY BELONG.**

Such a switching arrangement imposes some limitations, although in most modern setups, they're not severe. If you need four or fewer video sources and will settle for composite connections, there are no restrictions whatsoever. If you need more than four inputs, some will have to be S-video. To display S-video *and* composite video sources on the monitor, the monitor

itself needs an S-video input. Those that do usually have a composite video input as well, and both connections to the monitor will be required to view both types of sources. (Most S-video monitors automatically choose the active input.) The same goes for VCRs; if the deck is to record from

SPECS

Frequency Response: Main channels, 5 Hz to 100 kHz, +0.5, -3 dB; center channel, 125 Hz to 100 kHz; surround channels, 5 Hz to 3 kHz or full range, depending on surround mode.

Distortion: Less than 0.05% THD or IM at 6 dB below maximum output.

Maximum Output: 7 V rms into 25 kilohms.

Static Separation: Greater than 35 dB between front and surround channels; typically 40 dB or greater between all channels.

Steering Logic Attack Time: Typically 5 mS in music and movie surround modes; Pro Logic as per Dolby Lab requirements.

Bass EQ: From flat to +12 dB in 4-dB steps.

Subwoofer Output Response: 5 to 80 Hz; 12-dB/octave low-pass.

S/N: Greater than 90 dB below rated output, A-weighted, for all outputs.

Dolby Time Link Delay Range: Pro Logic mode, 15 to 35 mS, in 5-mS increments; selected music and "70mm" surround modes, to 45 mS.

Impedance: Input, 25 kilohms; output, 300 ohms, unbalanced.

Power Requirements: 100 to 240 V, selectable; 50/60 Hz; 25 watts at 120 V.

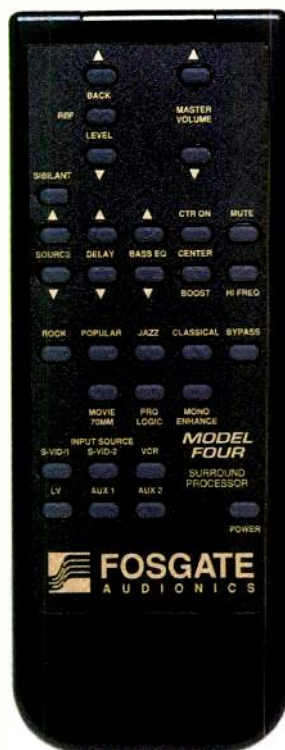
Dimensions: 17.1 in. W × 3.8 in. H × 12 in. D (43.4 cm × 9.6 cm × 30.5 cm).

Weight: 8 lbs. (3.6 kg).

Price: \$999.

Company Address: 80 Crossways Park West, Woodbury, N.Y. 11797.

For literature, circle No. 91



an S-video source, it'll need to have an S-video record input as well as a composite video input, and both connections will be required to cover all bases.

The Fosgate•Audionics Model Four has six main audio outputs (front left, right, and center; rear left and right, and subwoofer). There's one stereo pair of record outputs. All are gold-plated phono jacks. Two multipin connectors lie at the far right of the rear panel. One permits you to connect an optional Fosgate•Audionics remote infrared sensor, so you can tuck the Model Four where it won't be seen and still maintain full remote control. The second, marked "Optional Outputs," provides mode-dependent control voltages that enable the Model Four to raise and lower a projection screen, dim the lights, sequentially power remote amplifiers, etc., depending on your chosen operating mode. Although Fosgate•Audionics does not provide the interface box at present, the company advises that Niles Audio does have a compatible interface available.

The Model Four offers a choice of eight operating modes that determine what (if anything) is sent to the center and rear outputs. "Bypass" provides unadulterated stereo reproduction using only the front left/right outputs and the subwoofer.

"Mono Enhance" generates a synthesized surround field from monaural programs. "Pro Logic" extracts front left, center, and right and the surround channels from Dolby Surround sources; "70mm" is billed as Fosgate's "most advanced motion picture surround mode, [which] features controlled blending of left/right front channel information into the surround channels . . . [to provide] a heightened sense of spaciousness with software which has little or no encoded surround information." In essence, this is an enhanced version of the "Pro Logic" mode.

In addition to the "70mm" and "Pro Logic" movie modes and straight stereo, the Model Four has four ambience modes: "Rock," "Pop," "Jazz," and "Classical." Unlike the current genre of DSP-based processors that *add* artificial ambience to the music, the Model Four *derives* rear-channel information from the music signal itself. "Rock" is designed to give a wrap-around presentation to multitrack recordings with a narrow front soundstage. It puts you "on the stage" with the musicians. "Pop" is similar to "Rock" but has a more frontal presentation and less wraparound. It's claimed to be the most universal of the modes and is appropriate for light rock, Broadway shows, and pop tunes. "Jazz" is best for live jazz and pop recordings; the soundstage is primarily frontal, with ambience coming from the surround speakers. "Classical" uses no processing on the front channels (the others do) and uses the derived natural ambience from the recording to provide mid-hall perspective.

With the exception of "Noise Sequencer" activation and "Record Select," the Model Four's 31-button remote provides access to every panel function and then some. It's the only way to adjust rear-channel level (with a "Ref" pad to return to the original setting) and delay, set "Bass EQ," toggle the center channel on and off and boost its level, activate muting, and switch in the "Hi Freq" and "Sibilant" filters.

The "Hi Freq" filter shelves treble response downwards above 1 kHz and is useful with movies recorded directly from the film soundtrack. These often sound too bright at home because their response was tailored for theaters, whose acoustics cause a natural roll-off in high-end response. The

“Sibilant” pad engages circuitry to minimize crosstalk “splatter” in the front and surround channels caused by speech sibilants in the center.

The remaining touchpads on the remote provide direct access to the eight operating modes and six program sources. “Source” up and down pads permit you to sequence through the input sources. “Master Volume” and “Power” pads complete the remote-control complement. Red, green, and yellow LEDs on the main panel’s display indicate all control settings. Five red LEDs, arrayed in a pentagon, vary their brightness to suggest relative signal levels being sent to the five main outputs.

Measurements

Measurement of a surround sound processor invariably presents problems. Be-

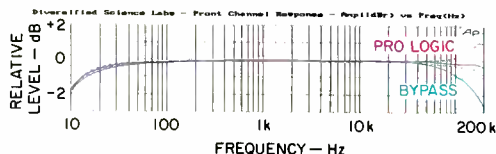


Fig. 1—Frequency response of left (solid curve) and right (dashed curve) front channels.

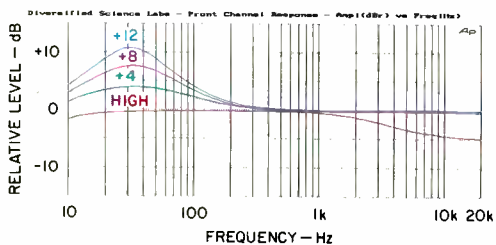


Fig. 2—Effect of “Bass EQ” and “Hi Freq” controls on left front channel (“Bypass” mode).

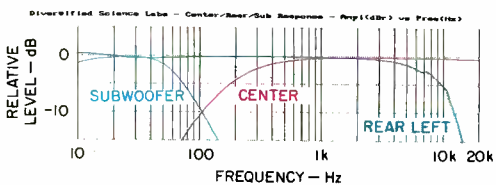


Fig. 3—Frequency response.

cause of the digital delay and the amount of signal processing being performed, distortion and noise figures are usually much worse than we’re accustomed to on a preamp, and in some modes, frequency response is purposely curtailed from what it otherwise might be. Finally, with Dolby Pro Logic, interchannel crosstalk is time-dependent and dynamically varies with signal conditions in a manner that is not readily quantified by steady-state bench measurements.

The final point bears clarification especially as regards the Fosgate•Audionics Model Four, because engineers at the company use a novel and patented approach to Dolby decoding.

Dolby Pro Logic employs a combination of gain riding and signal cancellation to augment channel separation. Left/right and front/back “steering” signals are derived from the matrix-encoded composites by comparing the level of the left total signal (L_t) with that of the right (R_t) and the level of the center channel ($L_t + R_t$) with that of the surround channel ($L_t - R_t$). The steering signals thus derived adjust the gain of a set of voltage-controlled amplifiers (VCAs) that establish the amount of signal transferred between channels to cancel crosstalk. Simultaneously, the gain of the dominant channel is increased to maintain constant sound power in the room.

The time constants associated with the level detectors determine how fast the steering occurs. If the system reacts quickly to small differences in relative level, you’re likely to hear it “work” or “pump.” If the system reacts slowly, it takes too long to correct large differences in relative level, and dynamic separation is diminished. The Dolby Standard calls for two fixed time constants, approximately 22 and 500 mS. When the difference in relative level is large, the system corrects at the faster rate; when the difference is small, the longer time constant is used.

For music listening, however, Fosgate•Audionics decoders use a more sophisticated approach. In-

stead of choosing between two fixed time constants, a continuously variable, 100:1 range of response times is provided—from as short as 5 mS to as long as 500 mS. In the Fosgate approach, the control voltages being fed to the VCAs are compared with the outputs of the level-ratio detectors, and the difference dynamically controls response time. This “servo” approach is meant to provide better apparent channel separation than conventional Dolby Pro Logic without noticeable “pumping.” But the validity of the approach is not easily documented on the test bench; listening tests remain the best evaluation tool.

That being said, I’ll now go on to the lab data. As shown in Fig. 1, front-channel frequency response in stereo (“Bypass”) mode is impeccable, down 0.4 dB at 20 Hz, flat to beyond 20 kHz, and down less than 1 dB at 100 kHz on both the left and right channels. Front-channel response with Dolby Pro Logic is equally good.

Figure 2 depicts “Bass EQ” and “Hi Freq” filter response. “Bass EQ” is pretty much on target, with boosts of 3.8, 7.7, and 10.8 dB at 35 Hz compared with the Model Four’s nominal markings of 4, 8, and 12 dB. The “Hi Freq” filter just departs from flat at 1 kHz, is down 1 dB at 1.9 kHz and 3 dB at 4.6 kHz, and gradually shelves off to -4.7 dB at 20 kHz.

Figure 3 shows response of the subwoofer channel in the “Bypass” mode and that of the center and one rear channel with Dolby Pro Logic engaged. (Center-channel response in the “70mm” mode is the same as with regular Pro Logic.) The crossover to the subwoofer occurs at 61 Hz (-3 dB) with a slope of 12 dB/octave; response is down 1 dB at 10 Hz.

According to Dolby Standards, rear-channel response should roll off above 7 kHz, and, in the “normal” mode, center-channel response should roll off below 100 Hz to avoid overstressing small center speakers. (Some systems also provide a “wide” center mode that does not use the low-end roll-off; the Fosgate•Audionics does not.) The Model Four cuts surround-channel treble response at 8 kHz, reasonably close to the 7-kHz norm, and cuts it off quite rapidly (approximately 20 dB/octave). On my sample, center-channel response rolled off at 12 dB/octave below 240 Hz; Fosgate•Audionics indicated that this

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has been changed to 125 Hz in current production units.

Figure 4 depicts THD + N versus frequency at a 2-V output level. Distortion in the subwoofer and front channels (measured in the "Bypass" mode) is negligible, well under 0.01% over their active bands. (The rising subwoofer "distortion" above about 100 Hz is due to roll-off in the fundamental; ignore it.) The THD + N in the front, center, and rear with Dolby decoding is 0.6% or less across the pertinent band. This might seem high, but as these things go, it's really not.

Measurements of THD + N versus output level (Fig. 5) were, again, made in the "Bypass" mode on the front and subwoofer channels and with Dolby Pro Logic on the center and rear channels. As you can see, clipping doesn't occur in *any* channel until

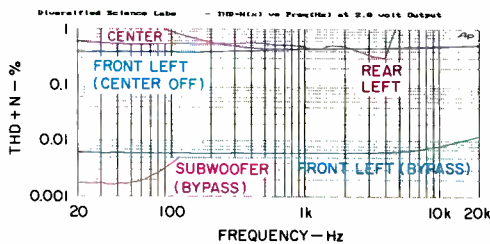


Fig. 4—THD + N vs. frequency.

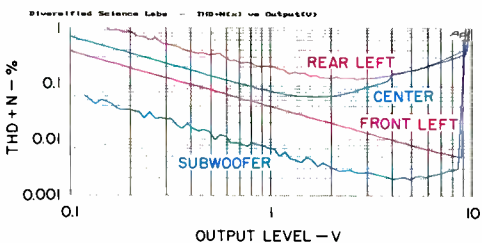


Fig. 5—THD + N vs. output level.

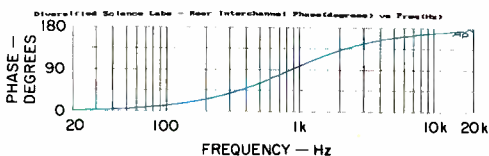


Fig. 6—Phase relationship between rear channels; see text.

the output exceeds 9.3 V (the manufacturer's spec is a conservative 7 V), so the Model Four has more than ample headroom. The increase in apparent distortion at low output levels undoubtedly represents noise more than distortion.

The final graph (Fig. 6) shows the phase relationship between the left and right surround channels, in Dolby Pro Logic mode, as a function of frequency. The gradually changing phase difference helps prevent the formation of a center image between the two rear speakers, which is precisely what's desired for good Dolby Surround performance.

The Model Four's A-weighted noise, referenced to 0.5 V, ranged from -77.6 to -80.2 dB on the three front channels. I would have liked to have seen a higher S/N, but performance like this is not exactly shabby. Noise in the surround channel (with Dolby Pro Logic) was greater (-73.5 dB), reflecting the noise contribution of the digital delay. In the "70mm" mode (which adds some front-channel noise to the rear), the situation degraded by a further 3 dB. Rear-channel noise in the "music" modes approached that of the front. The subwoofer channel's A-weighted noise was -94.6 dB.

Steady-state channel separation with Dolby Pro Logic depended on a precise balance of input signal levels. As with most new Dolby Pro Logic decoders, the Fosgate•Audionics Model Four has automatic input balancing so that you don't have to adjust the system manually when you change program sources. With auto balancing, however, you're at the mercy of the automatic circuitry itself; any mismatch here reduces ultimate separation.

Separation between the two main front channels or between either main channel and the center or rear was superb, ranging from better than 46 to over 55 dB, depending on the channels measured. Separation between the rear channel and the three front channels ranged from 43.6 to 57.0 dB for the various channel combina-

tions—again superb performance. The least impressive figures were for separation between the center and main channels (32.7 dB from center to left front, 32.1 dB from center to right front) and center to rear (38.6 dB). These may stem from a slight imbalance in the automatic circuitry of my sample unit, but the figures are perfectly adequate as they are.

At maximum gain, the Model Four boosted input levels by almost 15 dB, which should be more than you need. Input impedance (28 kilohms) was also more than adequate, and output impedance from all terminals (about 300 ohms) implies no difficulty driving lengthy interconnects to any amp. A check of the composite video circuitry showed it to be absolutely transparent: No gain, no loss, no change in frequency response. Well done!

Use Tests

I auditioned the Model Four with Paradigm loudspeakers in the left, center, right, and surround channels, augmented by a Velodyne powered subwoofer. The Paradigms were driven by a B & K Components amplifier that delivers more than 100 watts per channel; a Philips combi-player handled the videodiscs and CDs, and video was displayed on a 50-inch Pioneer monitor.

Before I tell you how impressed I was with this system (which I was!), let me state my major quibble—the channel-balancing arrangement. Proper balance among the channels is essential for a Dolby Surround presentation. On the Fosgate•Audionics Model Four, this is accomplished via six finger-adjusted trim pots on the rear panel. Adjusting them is a nuisance. Unless you move the Model Four to the viewing position—or use a sound level meter there—you're forced to make a small adjustment, go out and listen to the noise sequence, run back and readjust, etc. Each control has a range of 20 dB—which is *more* than necessary and makes adjustment extra touchy. Fortunately, balancing is required only once during the initial setup (or later if you change speakers or power amplifiers), so it's a nuisance you can put up with (or, as Winston Churchill would have it, up with which you can put). On the positive side, the use of analog trim pots rather than a solid-state attenuator arguably does provide superior performance.

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Once the system is balanced, performance is great! With well-mastered Laser Discs—those in which the producer and director really tried to establish stable off-stage sound images—the Model Four's Pro Logic system does a superb job of keeping the images where they belong despite activity in other channels. Presumably this can be attributed to Fosgate's variable-speed servo logic system. The "70mm" mode widens the apparent front stage. It's not really needed with a well-recorded disc, but you may like it anyway; it does seem to help with more pedestrian fare.

Generally I take the names of ambience modes with a grain of salt. I don't expect "Jazz Club" to be best for jazz or "Disco" to be ideal for rock. So, with the Model Four, I tried every mode with a variety of music programs—classical piano, classical orchestral, pop, jazz, and rock. *Mirabile dictu!* The Model Four's ambience extraction really seems to work as the name tags suggest. One word of caution: I found it best to defeat the center channel for music listening.

In my opinion, the "Classical" mode clearly beats the others on solo and orches-

tral classical music. With the right recording, i.e., one with good natural ambience "hidden" in the stereo like the Antonin Kubalek piano recordings on Dorian or Stravinsky's *The Rite of Spring* on Telarc (CD-80054), the soundstage opens up superbly. You may wish to turn down the surround channels a trifle relative to their setting for proper Dolby presentation (the "Back Level" pads on the remote are handy here), but the results are impressive. Other modes can grab your attention for a while on classical music, but they wear thin. You become more aware of the rear channels, and instruments occasionally pop up there.

On rock—for example, *Tracy Chapman* (Elektra 60774-2)—the "Classical" mode adds depth but not much more, "Jazz" trades that depth for width, and "Pop" seems to split the difference. The album really comes alive in the "Rock" mode, which is very enveloping and seems to generate a lot of surround sound. Some instruments move to the rear (the guitars on the second cut), but the voice stays solidly forward.

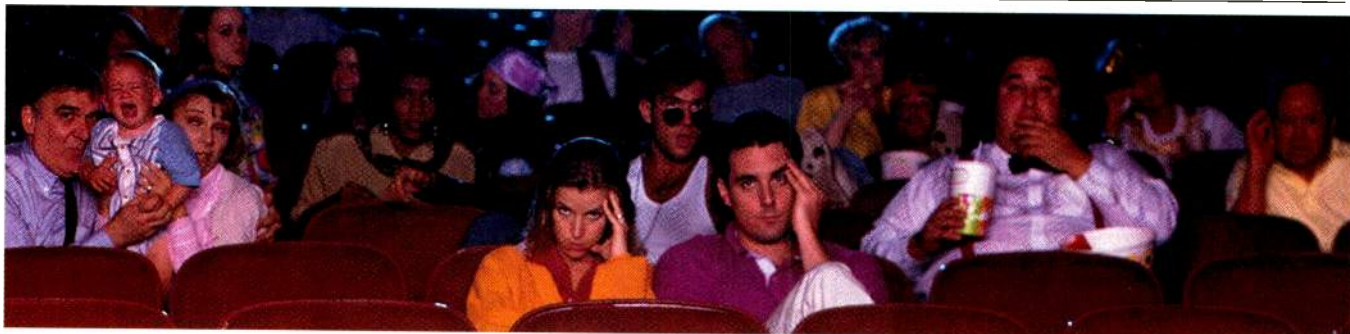
Switch to Barbra Streisand's *The Broadway Album* (Columbia CK 40092) or

Amanda McBroom's *Dreaming* (Gecko), and I'll choose "Pop" processing, although the call is close on Streisand. There seems to be a lot of out-of-phase energy on that disc, which caused images to shift far back and, in the "Jazz" and "Rock" modes, take on a pseudo-reverb quality. Amanda responded very well to the "Pop" mode—bigger all around, wider, deeper, and more enveloping. "Jazz" processing was a close second, but "Classical" and "Rock" seemed to force too much to the rear.

The "Jazz" mode worked best with The Dave Brubeck Quartet's *Time Out* (Columbia CK 40585, a digital remastering of this analog classic). "Jazz" processing added width and a fuller presence without excessive surround sound. If you want more in the rear, try "Rock"; "Pop" produced some strange effects in the back.

With a suggested retail price of \$999, the Fosgate•Audionics Model Four is far from the least expensive non-THX Dolby Pro Logic box you can buy. But in my opinion, it happens to be one of the very finest. And its multimode ambience extraction works wonders on well-recorded music.

Edward J. Foster



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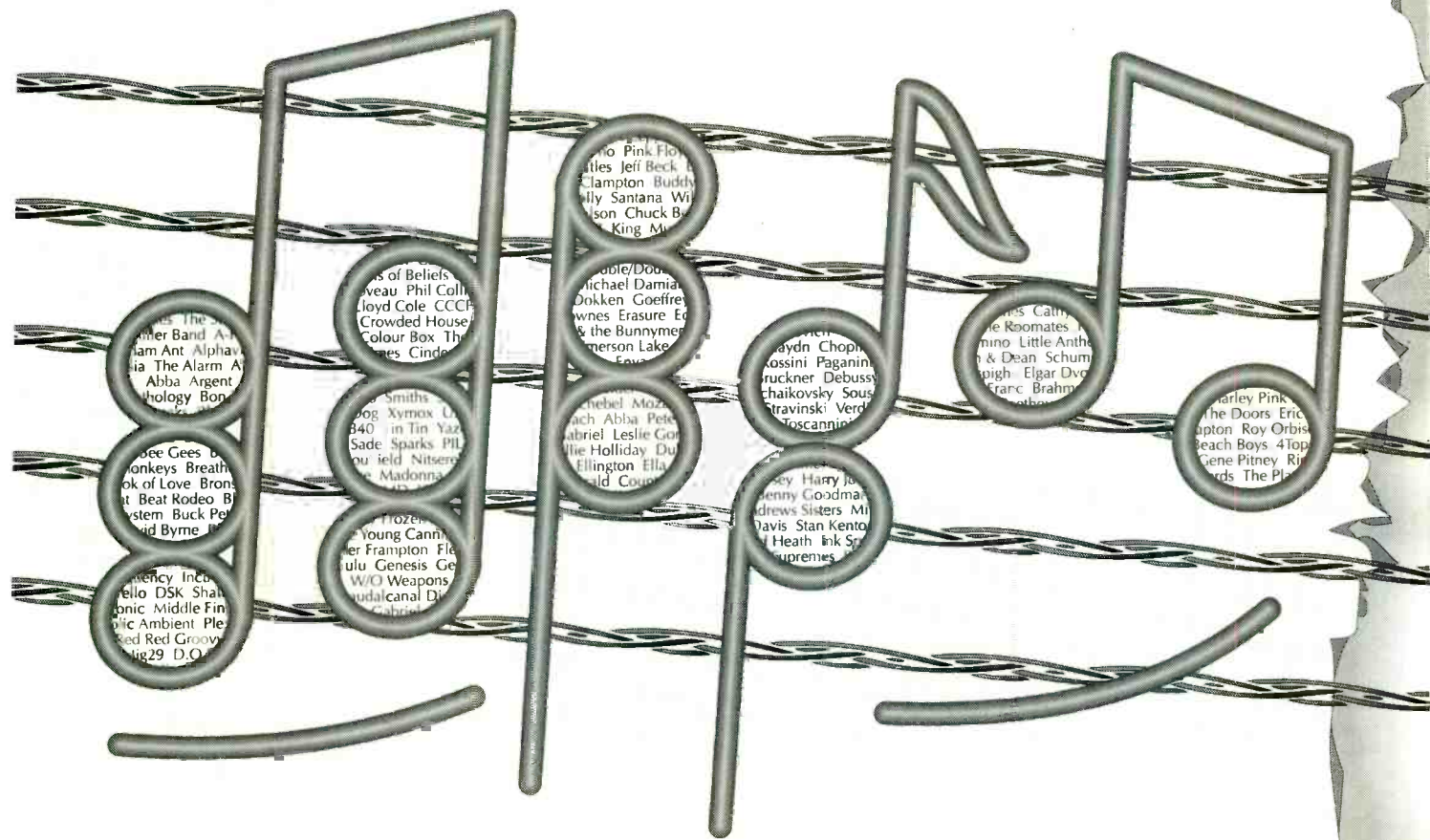
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JVC XL-G3900 CAR CD PLAYER AND RECEIVER

ture list expands to include direct disc selection, disc repeat, and random playback of all tracks on all discs in the currently loaded magazine.

Control Layout

It almost goes without saying that a car stereo as full-featured as this one has quite a few buttons serving multiple functions. To help you keep track of them, JVC's Active-Illuminated Operating System (AOS) changes the button indicators to show you which functions are currently available. For example, in tuner mode, the indicators light for the "PS" (preset scan) and "MO" (mono/stereo) buttons, while those for repeat play, random play, and other CD-only functions don't. Since the "PS" and "MO" functions use the same buttons as station memories 1 and 2, these functions can be selected only after the "Mode" button is pressed; at that point, the "Mode" button turns red and the "PS" and "MO" buttons blink, ready for selection.

At the upper left of the front panel is the sliding release tab for the panel. Just below is a "Power/Att" button marked with a large, illuminated "P." This control turns the unit on and, if pressed for more than a second, turns it off. If pressed and released quickly, however, it attenuates volume level. Touching the button again restores original volume. The CD loading slot occupies most of the front panel's upper section, and to the right is the CD "Eject" button.

Located on the lower left is the now-common arrangement of volume ("+" and "-") buttons, which can be converted to bass, treble, fader, and balance controls by successive presses of a selector button ("Sel"). The current function and station setting are indicated in the well-illuminated display area just to the right.

Further to the right are six numbered buttons normally used to select preset FM or AM stations, CD tracks (in single-play mode), or discs (in changer mode). As mentioned, when the "Mode" button is pressed, these buttons also handle preset scan (AM and FM), mono/stereo FM reception, and random and repeat CD play as well as selection of CD magazines when a multi-magazine changer is used.

Above the numbered buttons is a series of smaller keys. The first of these, "Band," chooses the radio band ("FM1," "FM2,"



As is true of most new premium car stereos, the XL-G3900 has a detachable control panel; removing it renders the unit inoperable and therefore useless to potential thieves. A rigid carrying case for the panel is supplied.

The single-disc CD player has power-assisted disc loading and will accept 3-inch discs. The transport is well protected

The JVC XL-G3900 is full of sophisticated features. In addition to its AM/FM tuner and single-disc CD player, it incorporates a controller for up to six CD changers—handling a total of up to 108 discs if you use JVC XL-MG1800 changers (JVC's most expensive, at \$729.95 each), which hold three six-disc magazines apiece. The XL-G3900 can be set up to automatically mute its volume when cellular phone calls are made or received in the car, whether JVC or other brands of phone are used.

The unit not only includes a digital clock but actually makes use of it. The Special-preset Station Reserve (SSR) feature will automatically tune in a desired station at a programmed time, even if you are then listening to another station, a tape, or a CD. The system will work with any of the PLL tuner's 24 station presets (six AM stations and three bands of six FM stations).

The single-disc CD player has power-assisted disc loading and will accept 3-inch discs. The transport is well protected

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against shock and vibration. A digital filter with eight-times oversampling and dual one-bit D/A converters are used. CD tracks can be accessed directly by using the numbered station buttons. More common CD features include random play, track repeat, track skip, and fast audible search. When the unit is controlling a changer, the fea-

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"FM3," or "AM") and also serves as a "+5" button when you want to access CD tracks beyond the sixth track. The next key, "A-HBS," activates the Active Hyper Bass Sound feature, about which I'll say more when I go over my test results. The "Clk"

SPECS

Tuner Section

FM Usable Sensitivity: 12.1 dBf.

FM 50-dB Quieting Sensitivity: 16.3 dBf.

FM Alternate-Channel Selectivity: 65 dB.

FM Frequency Response: 40 Hz to 15 kHz.

FM Channel Separation: 35 dB.

FM Capture Ratio: 1.5 dB.

AM Sensitivity: 20 μ V.

AM Selectivity: 35 dB.

CD Section

Frequency Response: 5 Hz to 20 kHz.

Dynamic Range: 90 dB.

S/N Ratio: 94 dB.

Amplifier Section

Power Output: Continuous, 8 watts per channel into 4 ohms at 0.8% THD; maximum, 22 watts per channel.

Power Bandwidth: Front channels, 100 Hz to 20 kHz; rear channels, 40 Hz to 20 kHz.

Frequency Response: 40 Hz to 20 kHz.

Tone-Control Range: Bass, ± 10 dB at 100 Hz; treble, ± 10 dB at 10 kHz.

S/N: 70 dB.

Line Output Level: 1.5 V.

General Specifications

Operating Voltage: 14.4 V d.c. (11 to 16 V allowable).

Dimensions: Chassis, 7 $\frac{1}{16}$ in. W \times 2 in. H \times 6 $\frac{1}{4}$ in. D (17.8 cm \times 5 cm \times 15.8 cm); control panel, 7 $\frac{1}{2}$ in. W \times 2 $\frac{5}{16}$ in. H \times 1 $\frac{1}{16}$ in. D (19 cm \times 5.8 cm \times 1.7 cm).

Weight: 4.6 lbs. (2.1 kg).

Price: \$449.95.

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button accesses the time clock in the display. Next in line is "Func," which switches between tuner and CD operation, followed by "Mode," which also selects either automatic or manual tuning. Finally, two arrow buttons serve the multiple functions of track skip, fast search, up/down frequency tuning, and hour/minute clock adjustment.

While the XL-G3900 incorporates both front and rear stereo amplifiers, it also has rear-channel line output jacks for those wishing to employ higher powered amplifiers for their rear-channel speakers. In addition to the usual hot and ground leads emanating from the rear panel, there are leads for controlling a powered antenna, for memory backup, and for audio muting. The latter lead would be integrated with a cellular phone during its installation.

Tuner Measurements

Figure 1 shows FM mono and stereo quieting characteristics. The 50-dB quieting point is reached with input signals of only 15 dBf, exceeding the published specification by a small margin. For strong signals, S/N measures 67.5 dB in mono and 58 dB in stereo. No published specifications of S/N were available from JVC for comparison purposes.

Figure 2 shows how distortion plus noise varies as a function of frequency with output levels adjusted for 5 watts per channel. At 1 kHz, THD + N is just over 0.5% in mono and is 0.7% in stereo. Figure 3 shows how FM mono and stereo THD + N vary as a function of input signal strength. As is true of most car FM tuner sections, blending takes place below about 50 dBf to reduce noise, and the circuit folds down to mono at around 20 dBf. From this graph I derived the mono usable sensitivity, which turned out to be 15 dBf as opposed to the 12.1 dBf claimed. While mono THD + N confirms the reading from Fig. 2, stereo THD + N this time is a bit higher, no doubt

caused by slight mistuning or thermal changes. Nonetheless, stereo THD + N remains below 1% at all measured r.f. input signal levels.

Figure 4 shows how FM signal output and channel separation vary with modulat-

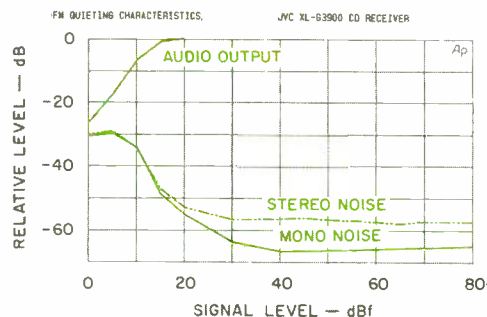


Fig. 1—FM quieting characteristics.

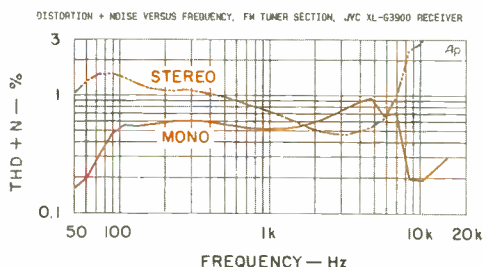


Fig. 2—FM THD + N vs. frequency.

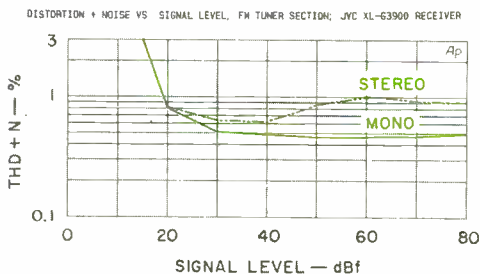


Fig. 3—FM THD + N vs. signal level.

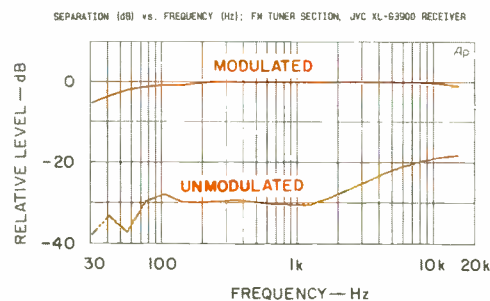


Fig. 4—FM frequency response and channel separation.

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Stereophile, May 1993
Vol. 16, No. 5

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Vol. 16, No. 4

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ing frequency. I did not realize until after my measurements were made that the response of the XL-G3900's front-channel amp was rolled off in the bass, undoubtedly in recognition of the bass limitations of typical car front speakers. As a result, the FM tuner section's frequency response in this graph rolls off about -3 dB by 50 Hz; it is, however, relatively flat at the treble end,

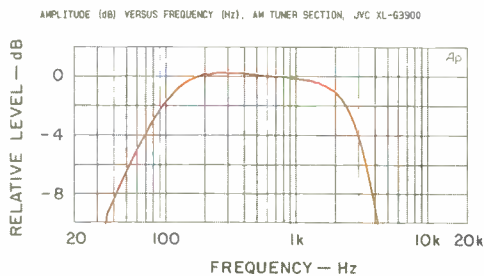


Fig. 5—AM frequency response.

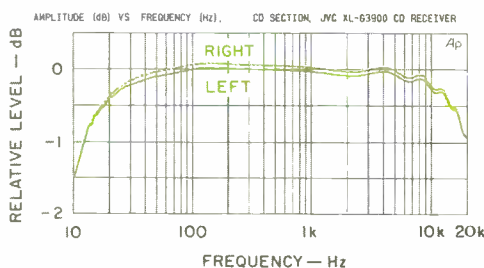


Fig. 6—CD frequency response, through front amp.

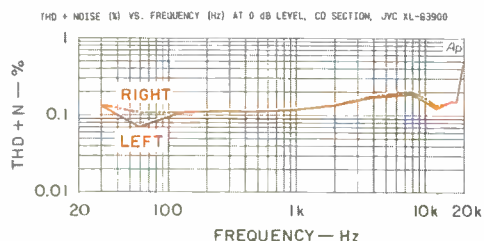


Fig. 7—THD + N vs. frequency, CD section.



albeit with a rise of about 1 dB that is centered at 9 kHz.

A spectrum analysis (not shown) demonstrated that, as is typical of most car FM tuners, JVC makes no attempt to attenuate the residual 19-kHz pilot carrier (which was about 40 dB below the reference output level) or the 38-kHz subcarrier and its sidebands at 33 and 43 kHz.

Turning to the AM tuner section, I measured the frequency response of this circuit. Results are shown in Fig. 5, and while they are somewhat better than average (the -6 dB roll-off points occur at 52 Hz and 3.3 kHz), the AM tuner section doesn't qualify as a "high-fidelity" instrument.

CD Measurements

Although I did not have a JVC CD changer available for checking out the CD controller features of the XL-G3900, I did measure the built-in single-disc player's performance. Using my CBS CD-1 test disc, I plotted frequency response from 10 Hz to 20 kHz (Fig. 6). I should point out that measurements were made at the front speaker outputs, so amplifier response roll-off indicated in the specs is included in the measurement. Response is down less than 0.5 dB at 20 Hz and less than 1.0 dB at 20 kHz.

Figure 7 shows how harmonic distortion plus noise varies as a function of frequency for this CD player section. Again, the amplifier sections were included in the measurements. At 1 kHz, THD + N is just over 0.1%, while for frequencies between 4 and 10 kHz, it increases to around 0.2%. I suspected that the CD player section itself could do much better than this, which was confirmed when I plotted THD + N versus signal amplitude (Fig. 8). Notice that for all output levels below -20 dB (referred to maximum recorded level), THD + N is a full 80 dB below reference level. This corresponds to a reading of only 0.01%. As maximum level is reached, how-

ever, THD + N increases to around -60 dB, corresponding to 0.1%, essentially the reading obtained for a 1-kHz signal at maximum amplitude in Fig. 7. This means that the higher distortion readings are caused by the amplifier circuitry and not by the CD player. I purposely took my readings at or close to rated power output in order to obtain the highest possible measurements of S/N and dynamic range. If CDs are played at normal listening levels, THD + N will be more like 0.01% than the 0.1% shown.

Further confirmation of the 0.1% THD reading with higher power output was obtained when I used FFT spectrum analysis (not shown) to separate the actual harmonic component generated by a 1-kHz signal from any residual noise. The most



significant harmonic (at 2 kHz) was 60 dB below reference level, corresponding once more to a reading of 0.1%.

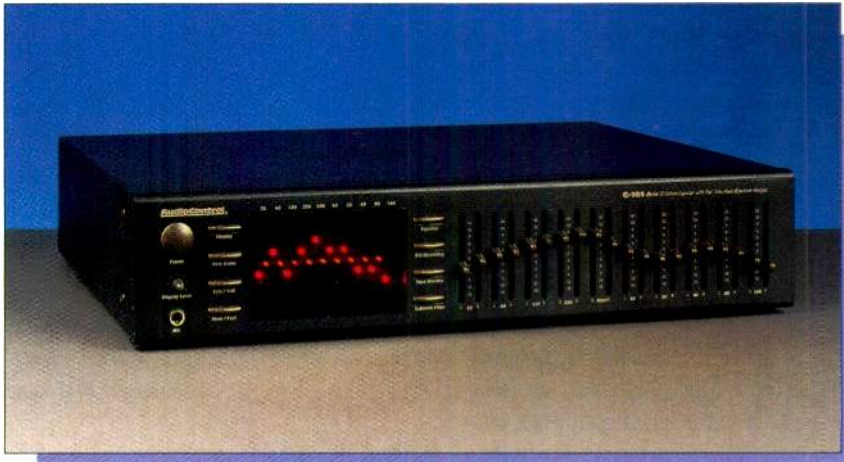
Channel separation for the CD section is approximately 70 dB at 1 kHz, decreasing to around 50 dB at 125 Hz and to between 60 and 65 dB at 16 kHz, depending on which channel is being measured (Fig. 9).

Overall A-weighted S/N for CD playback was 83.8 dB for the left channel and 83.6 dB for the right channel. A third-octave spectrum analysis of residual noise (not shown) revealed that the most prominent noise component was 60 Hz (at about -88 dB). Therefore, some of the noise readings may well have been caused by my d.c. power supply, which derives its power from the a.c. outlet. If I had operated the unit from a pure d.c. source such as a car battery, S/N readings would probably have been even better.

Figure 10 shows the excellent low-level linearity of the CD player, no doubt attributable to the dual one-bit D/A converters. Even at 90 dB below maximum recorded level, deviation from perfect linearity is well under 1.0 dB. Finally, I conducted the

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usual “fade-to-noise” CD player test (Fig. 11), using a dithered test signal that fades from 60 to 120 dB below maximum recorded level. This graph enabled me to calculate the EIA dynamic range of the player as approximately 105 dB. Using the EIAJ

method of measuring dynamic range, I obtained a reading of just under 84 dB.

Master clock accuracy for the CD player was off by +0.0275%. This represents a fairly insignificant alteration of pitch when listening to music.

tures in a single, DIN-sized chassis. To be sure, the multiple functions of the control buttons are a bit easier to fathom thanks to the Active-illuminated Operating System, but I suspect that it will still take a fair amount of time to get comfortable with the controls while driving along at highway speeds. I’ll let Technical Editor Ivan Berger take it from here; I’ll be interested to see if

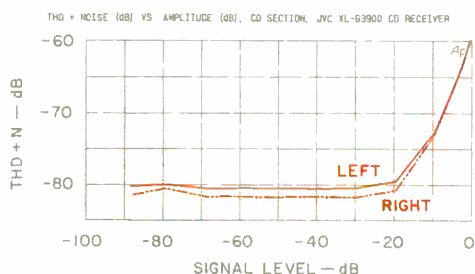


Fig. 8—THD + N vs. recorded signal level, CD section.

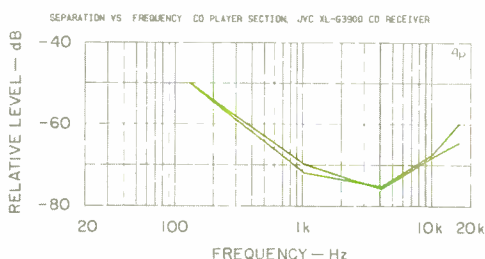


Fig. 9—Channel separation vs. frequency, CD section.

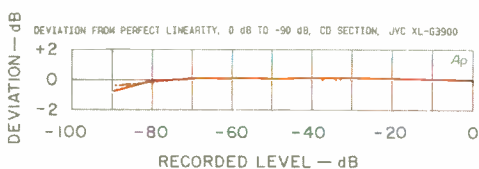


Fig. 10—Deviation from perfect linearity, using undithered signals.

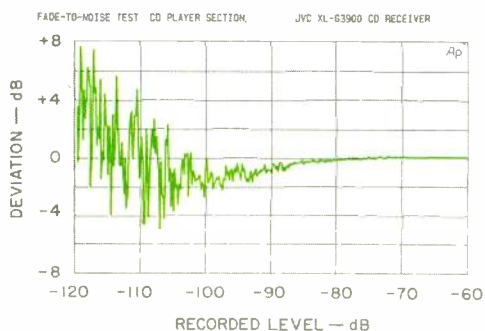


Fig. 11—Fade-to-noise test, using dithered signals.

Amplifier Measurements

The four-channel amplifier section of the JVC XL-G3900, like most other car amp sections, carries both continuous and maximum power ratings. The continuous power of 8 watts per channel is obtained at 0.8% for all four channels; that power is available over a frequency range of 100 Hz to 20 kHz for the front channels and 40 Hz to 20 kHz for the rear channels. This is done to accommodate the larger woofers more typically used in the rear. Distortion at the maximum rating of 22 watts per channel is unspecified but (following the industry’s unstated practice) measured over 10%. I therefore confined my testing to more listenable and realistic power levels of 8 watts or less.

In addition to the usual bass and treble functions, the XL-G3900 has the Active Hyper Bass Sound circuit previously mentioned, which adjusts the amount of bass according to volume level and the bass content of the source material. This active adjustment is designed to prevent overdriving the speakers or the amplifier section. In my tests (not shown), the circuit caused a response dip of 4 dB or less from about 1 kHz to 300 Hz, but then added a 10-dB boost centered on 125 Hz. The boost curve was asymmetrical, with a steeper slope between 125 and 300 Hz than from 125 Hz on down. According to JVC, this asymmetry is designed to minimize the boost’s effect on vocals and midrange tones.

Conclusions

My general reaction to the XL-G3900 is amazement that JVC could incorporate so many fea-

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his conclusions regarding the ergonomics of the XL-G3900 agree with mine.

Leonard Feldman

Behind the Wheel

Learning how to use the JVC XL-G3900 was, with only one minor exception, a piece of cake. I’d feared that I would frequently press the prominent “Sel” button when I was aiming for the “+” and “-” buttons that surround it, but this happened only two or three times in the three months I had the unit. Adjusting bass, treble, fader, or balance with these buttons takes a bit of care while driving, since you have to glance at the display or count carefully to know what function you’ve reached—but more and more head units work the same way. The Active Hyper Bass Sound circuit was useful when listening through road noise. It did affect male voices a bit, but far less than most other units’ bass or loudness controls do.

I was pleased that there was an attenuator button on the panel; too many car stereos offer this function only by remote control. Removing the front panel took just enough more effort than usual to ensure that it wouldn’t pop off by accident. Night illumination was good. With power switched off, the CD slot and three buttons glowed, and there was a dim glow on the display. You can choose whether the display shows the clock or the currently active function; too many other units force the choice for you.

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Tuner controls were easy to use, though I feel that preset scan should be directly accessible without having to press another button first. The scan itself was too fast, allotting only five seconds per station. Setting presets was a simple matter of holding down the preset button for two seconds. Automatic (seek) tuning is standard, for convenience on the road; pressing "Mode" changes this to manual tuning, but it reverts to seek about five seconds after you stop using it. The Strong-station Sequential Memory (SSM) feature, which overwrites the six stations in the current memory with the six strongest signals it can find, is safeguarded against accidental operation, another nicety. I kept forgetting to try the Special-preset Station Reserve (SSR) timer feature, as it's explained only at the very end of the manual, far from the other tuner instructions.

Although the CD slot is illuminated when the XL-G3900 is off, inserting a CD does not turn the unit on. When you do turn it on, however, it will then be in CD mode. You can go straight to any track by pressing the numbered buttons; to get beyond track 6, you press the "Band" button (also marked "+5," less noticeably). For audible fast search, hold the track skip buttons down for a second or so.

As to performance, the JVC's tuner picked up three FM stations out of 31 more clearly, and four stations less clearly, than my reference Alpine. On AM, however, it did better on seven out of 21 stations. The JVC's automatic tuning worked poorly on FM, stopping at every frequency, with or without a signal, from 87.5 to 103.9 MHz. But on AM it was one of the few units whose automatic tuning worked properly, stopping only where there were signals strong enough to justify a stop.

The JVC's sound was a bit less warm than the Alpine's on FM, but a bit warmer on CD. The JVC's CD sound was unexceptionably clear and pleasant. Triangles were silvery, though high piano notes sounded a bit muted.

With the exception of the SSR system, there's nothing sensational about the XL-G3900. Instead, it offers good sound, good performance, a decent mix of features, and good ergonomics—at a price that more sensational car stereos cannot match.

Ivan Berger

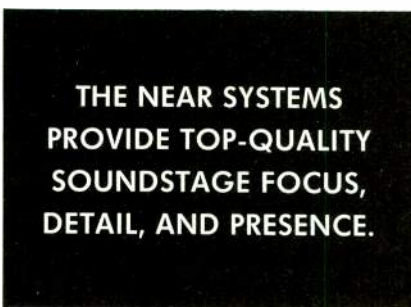
NEAR, continued from page 66

have been optimized for listening at this downward angle.

My equipment lineup consisted of the Krell KRC preamp and KSA-250 power amp driving the 50Me speakers through Straight Wire Maestro cabling. Listening was done with and without bi-wire connections. My reference speakers were the B & W 801 Matrix Series 3 speakers, while Onkyo and Rotel CD players provided source material. Some listening was done using a Sony MDS-101 MiniDisc recorder with material my son recorded.

The NEAR speakers were set up in my usual locations, which placed them significantly away from the rear and side walls of my listening room, 8 feet apart, and aimed in towards my listening position at the couch. These conditions generally followed NEAR's recommendations except that the distance to the rear wall was greater.

First listening was done with a live recording of a marching band my son made using a Crown SASS stereo microphone connected to a Sony MZ-1 MiniDisc portable recorder (and played through the Sony MDS-101). The NEAR speakers reproduced the wide dynamic range, impact, and high peak levels of the marching band extremely well, doing an exceedingly realistic job on the crowd sounds and clapping and creating a "you are there" feeling.



On more sedate material, such as harpist Victoria Drake's *Harping on Bach* (Well-Tempered Productions WTP 5161), the 50Me rose to the challenge and quite convincingly reproduced the delicate string sounds with much air and realism over a wide listening area.

With the proper program material, the NEAR speakers can produce a big, room-filling sound with lots of detailed soundstage information. However, the perceived height of the sound source is significantly higher than that provided by the B & W

speakers, because the NEAR's tweeter and midrange are about 14 inches higher.

On the pink-noise stand-up/sit-down test, the 50Me exhibited a moderate upper-mid suckout when I stood up. Spectral balance on pink noise was fairly good, but in comparison to the B & Ws, the NEAR speakers sounded a bit more forward, were not quite as smooth, and had somewhat less upper bass and very low bass. Sensitivity was fairly close to that of the B & Ws.

With third-octave band-limited pink noise, the 50Me did not have much usable output in the 20- and 25-Hz bands. Significant dynamic offset was evident in the 25-Hz band, where the cone would have a net outward movement with accompanying high second-harmonic generation. The output at 31.5 Hz was clean and quite good but would also exhibit offset at high drive levels. At 40 Hz and above, the NEAR systems could generate lots of clean bass.

On some poorly recorded vocal material, the 50Me did exhibit some slight upper-frequency harshness. However, on well-recorded material this was not a problem. On massed vocals, such as Vaughan Williams' "O Clap Your Hands" (Winchester Cathedral Choir with full orchestra and pipe organ, Argo 436120-2), the 50Me did genuinely well and exhibited no muddiness in the vocals even when accompanied by full-tilt organ pedals. The soprano solos were handled quite cleanly, and these speakers provided good clarity.

On most material, the B & W's bass was a bit fuller than the 50Me's. This was not a significant problem, because the B & W's bass performance in my listening room is somewhat heavy anyway. When called on, the 50Me can produce lots of clean bass, although not in the extremely low range below 28 Hz.

The 50Me offers excellent dynamics on both classical and rock music. These speakers provide top-quality soundstage focus, detail, and presence, much the same as provided by a very good small mini-monitor. Overall smoothness, vertical coverage, and low bass may not be the equal of my \$5,500 reference systems, but then, the NEAR systems cost only \$1,899 per pair. They combine good overall performance, good looks, the latest high-tech materials, and advanced production techniques. They may be the speakers for you. D. B. Keele, Jr.



At one time you understood how this worked.

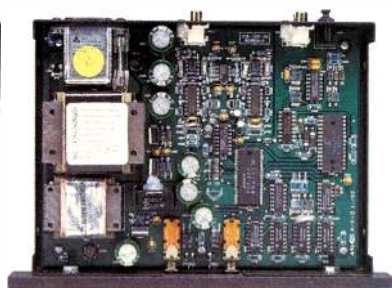
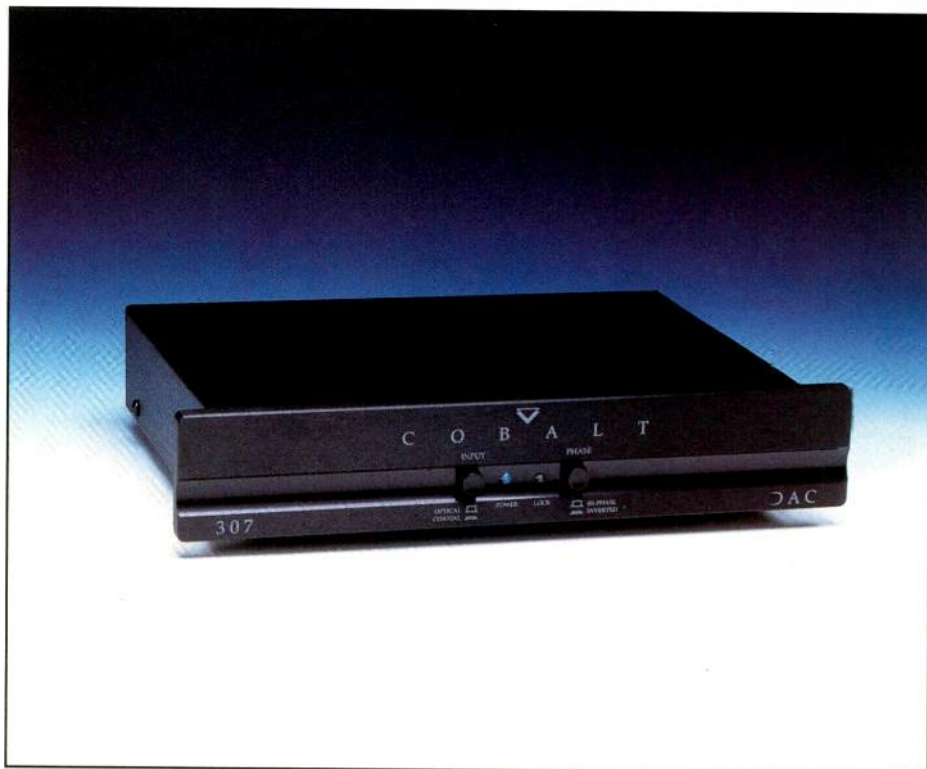


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THETA DIGITAL COBALT 307 D/A CONVERTER



Theta Digital's Cobalt 307 is a small but heavy D/A converter with digital coaxial and Toslink/EIAJ optical inputs, a coaxial digital output, and unbalanced left and right analog outputs. Its front panel holds two cobalt-blue LEDs (to indicate when power is on and when you have digital lock) and two buttons

(to select coaxial or optical input and to select normal or inverted polarity).

Aside from being unusually heavy for its size, there is little to indicate that this \$599 unit is much different from other inexpensive D/A converters until you open it up and really examine it. Then you find a top-of-the-line Burr-Brown hybrid DAC, Vishay foil resistors, polystyrene capacitors, separate power

transformers for the analog and digital sections, and heavy double-sided p.c. boards within the heavy-gauge chassis and front panel.

Theta also claims that it uses the lowest jitter recovery IC available, a fast-settling current-to-voltage converter with buffered outputs, and "what is arguably the world's most advanced digital-filter IC, with a 45-bit accumulator and digital-domain de-emphasis." Each Cobalt 307 is burned in for four days and given both technical and listening tests.

The Cobalt 307 is intended to give audiophiles on a budget a very good taste of what they would get if they could afford a far more expensive unit and to allow them to use virtually any CD player as a deck. My son

**THE COBALT 307
GIVES AUDIOPHILES
ON A BUDGET
A TASTE OF WHAT
THEY CAN'T AFFORD.**

called it the Mazda Miata of D/A converters, and that's not a bad analogy.

How well does the sound of the Cobalt succeed in meeting its goal? Very well, if music, rather than ultimate sonic detail and resolution, is the test. The Cobalt 307 does not produce any dramatic new advances in clarifying the fine harmonics and the transparency of low-level passages. Its transparency and clarity are very good for the money but not truly exceptional at any price. It does avoid the softness or smearing I have heard from virtually all cheap and moderately priced one-bit players and D/A converters so far. This softening of transient edges and harmonics may be better than a hard or irritating sound, but musically it is not totally accurate and it, too, eventually got on my nerves.

The Cobalt 307 provides the kind of harmonic detail, transparency, and low-level resolution that I ex-

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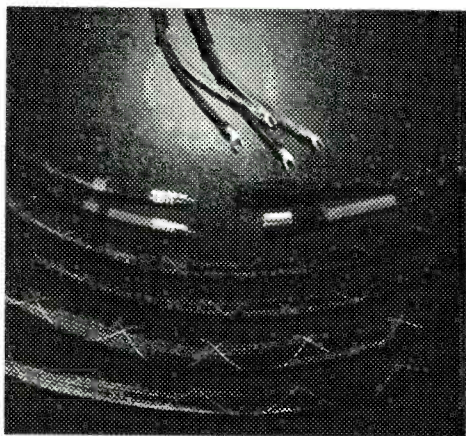


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pect from good separate D/A converters. It is not equal to the resolution of the best UltraAnalog or top-quality D/A chips, but it is very good. More important, it is musical enough to be fun. You get a lot of subtle information without it becoming hard or irritating. There is more such information in any high-quality CD than the Cobalt can extract, but you get enough to push the envelope well into the point of diminishing returns.

Unless your ears are hopelessly better endowed than your wallet, you can enjoy the Cobalt 307. You will not suffer from a constant low-level or subconscious irritation the moment you start listening to natural acoustic recordings of strings, guitar, cymbals, harpsichord, and such (as you will with the vast majority of CD players and moderately priced D/A converters).

As a result, you will have ample opportunity to enjoy the Cobalt's strengths, which are similar in many ways to those of its much higher priced Theta Digital siblings. The bass is rich, full, and dynamic. It does not have all the definition and control of more expensive units, but it is "live" rather than "polite." You get the natural warmth and impact of music, and the slam of percussion. (Far too many low- and mid-priced digital devices either exaggerate all the bass or make it polite and "slow.")

**THE COBALT 307 IS
MUSICAL ENOUGH TO BE
FUN—INFORMATIVE BUT
NOT IRRITATING.**

The Cobalt 307 does just fine in digging the bass excitement out of demanding recordings (such as the Frederick Fennell and Dallas Wind Symphony recording of *Trittico*, Reference Recordings RR-52CD). It has rhythm with both jazz and rock and involves you when listening to either bass viol or cello—instruments that suffer almost as much as the organ from mediocre bass in either a digital device or cartridge.

The mid-bass and upper midrange are not the best defined I have ever heard, particularly when the music gets very soft or very complex. Nothing at this price competes with the highest priced spreads. The

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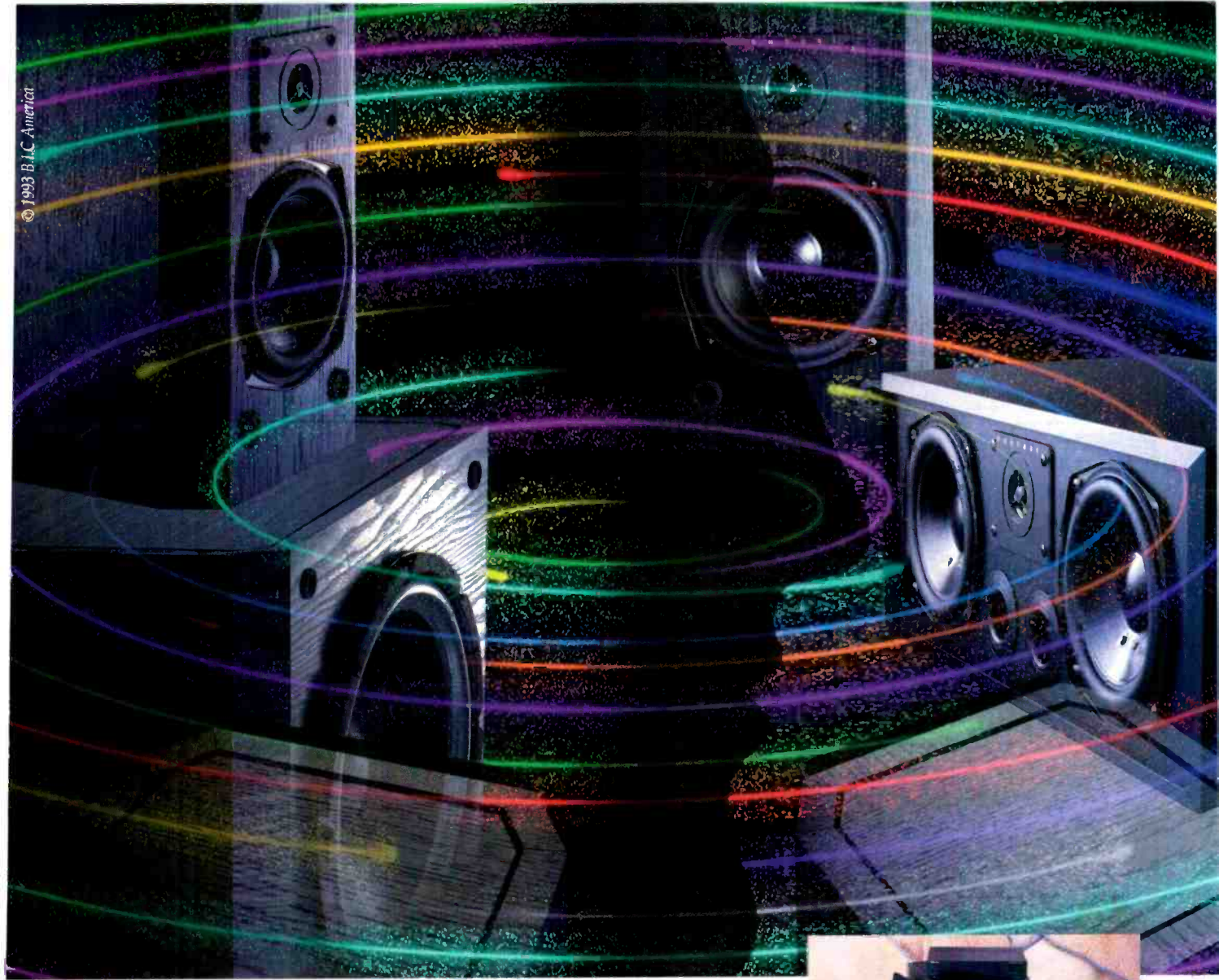
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Cobalt 307 is, however, both slightly warm and slightly dynamic. From the fun viewpoint, this is a saving grace. It reinforces the life and excitement in the music and offsets the lack of ultimate definition of upper midrange detail and harmonics.

The central midrange is not terribly different from that of most well-designed D/A converters. It is smooth and musical, but it lacks the kind of subtle definition and low-level detail you get with much more expensive units. The midrange is also a bit more dynamic than usual, and this touch of

added life tends to compensate for a bit less detail. This kind of midrange is far better than polite and uninvolved.

The Cobalt's ability to refine harmonic detail, transients, and low-level passages is as good in the upper midrange and treble as that of many units that cost far more. Yet after careful listening, you can hear that dynamics are exaggerated just a bit, compensating for a loss of finer detail, and that the slight added energy in the lower midrange masks a loss of sweetness and transparency in the upper midrange.

I should note that I would not describe the Cobalt as the ideal D/A converter for harpsichord or complex upper-octave strings—but then, nothing close to this price range is. It did fine with woodwinds but did only moderately well with cymbals; it gave triangles a bit of added life to compensate for detail, and it did a pleasant job of presenting soprano and tenor voices. (Few of today's overstretched tenors suffer from a touch of added richness at the expense of upper-midrange energy.)

THE MIDRANGE, MORE DYNAMIC THAN USUAL, REINFORCES THE LIFE AND EXCITEMENT IN THE MUSIC.

I have already described the Cobalt's dynamics, transient performance, transparency, and resolution of low-level detail. They are all handled well and in a form that emphasizes strengths over weaknesses. You have to be very demanding—perhaps over-demanding—not to enjoy the synergy that results from the trade-offs the Cobalt makes in these areas.

As for the soundstage, there are no mysteries. Height and width are normal, with no exaggeration or contraction. Left-to-right imaging is very good but lacking in ultimate definition. Depth and front-to-back imaging are good—and better than with most comparably priced competition—though not outstanding. The Cobalt provides a lot of soundstage detail, but more sophisticated units, as well as ones that emphasize detail over musical life, will present more. The net effect is a natural and enjoyable soundstage with sufficient information to suit the components in the Cobalt's price range.

The Theta Cobalt 307 is outstanding value engineering. It will upgrade virtually any system that suits its price range and will upgrade far more expensive systems where the D/A converter is a problem or strips much of the pleasure out of music. It makes no mystical advances in the state of the art, but it does make many aspects of the state of the art much more affordable. It is a best buy for anyone who wonders where the fun went! *Anthony H. Cordesman*

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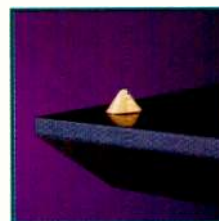
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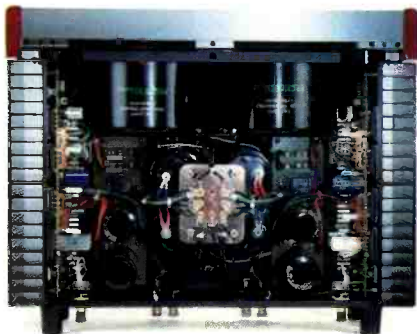


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ROTEL RHB-10 AMP AND RHA-10 PREAMP



Although Rotel may not be a familiar brand name to many American audiophiles, it has long had a solid reputation in Britain for producing good-sounding, moderate-priced equipment. This Japanese company has now introduced a high-end line in the United States; the line includes a tuner, a phono preamp and equalizer, a passive preamp, and the two products under review, the RHB-10 power amplifier and RHA-10 preamplifier. The amp sells for about \$2,700, and the preamp for about \$1,800.

Company Address: P.O. Box 8,
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For literature, circle No. 94

I initially approached these two components with some trepidation. Far too many Japanese companies' attempts at high-end amps and preamps have emphasized features over sound quality. The technical excellence of such units seemed to be the product of a committee of engineers unsupervised by anyone who actually listens. The end result has been products that have outstanding specs and test performance but that fail to provide musicality to match their technical achievements. The RHB-10 and RHA-10, however, combine both technical and musical excellence. Rotel has produced two excellent high-end units and has a design team that can listen!

My first indication of how good the RHB-10 power amplifier is came from my eldest son. He does a great deal of my unpacking and hookup work, and has gotten used to constant changes in my electronics. He normally greets new amplifiers with total indifference, but when he turned on the RHB-10, he reacted immediately by saying, "That sounds really good!"

Extended listening with a wide range of speakers confirmed my son's praise. The RHB-10 is rated at 200 watts into 8 ohms, 330 watts into 4 ohms, and a higher power level into 2 ohms. Such ratings are not uncommon for today's transistor power amplifiers, but the amps often prove disappointing in terms of

**ROTEL'S DESIGN TEAM,
WHICH CAN REALLY
LISTEN, HAS PRODUCED
AN EXCELLENT AMP
AND PREAMP.**

driving difficult loads and are unpredictable in terms of performance with particular speakers. The RHB-10 exhibited neither of these problems. It performed well with my Apogee Divas, Thiel CS-5s, Quad



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I experienced no problems with the amp's power-protection circuitry, even when committing the usual round of "stupid reviewer tricks" during various hook-ups. On the other hand, internal wiring changes allow you to bypass this protection if you are a purist who demands the minimum circuitry possible between amplifier and speakers.

The RHB-10 is superbly built, and its styling is more typical of European components than it is of Japanese. If you open the chassis, you find two mono amplifiers with large individual toroidal power amplifiers. Each channel has a very sophisticated and highly regulated power supply, and the gain stages are laid out in a symmetrical design, with a fully complementary push-pull differential amplifier that feeds two emitter-follower stages. The output stages use a Darlington quadruple parallel circuit that is also completely symmetrical and is mirrored top, bottom, left, and right. The RHB-10 has exceptionally large heat-sinks, a clean circuit layout, and excellent standards of construction. Rotel has used high-quality passive components, such as 1% Vishay resistors, LCR/Wima capacitors, and high-purity copper wiring.

Most important, the Rotel RHB-10 is musical. It has an overall timbre that is just slightly warm, where most Japanese electronics tend to be just a bit lean or analytic. It neither rolls off the highs nor exaggerates the lower midrange and upper bass at the expense of bass depth, control, or power.

The RHB-10 is not an "ultimate" amp in the sense of a Classé Audio M1000 or Krell MDA-300. It cannot deliver the same kind of deep bass extension and dynamics, but its bass is very good indeed. Music that often seems slightly dead in the bass and lower midrange with mid-fi or moderate-quality high-end power amplifiers, such as strong bass lines in jazz and rock, comes alive with the Rotel. At the same time, percussion does not lose detail, and guitar is not altered in overall timbre.

The midrange is exceptionally sweet and does not lose detail or transparency. Many Japanese-made high-end amplifiers have excellent signal-to-noise specifications and performance but limited midrange trans-

parency and life. With the RHB-10, you can really enjoy low-level midrange detail and listen to voice without fear of hearing a change in character or of having voice go hard or flat. Many transistor amplifiers are a bit unkind to female vocalists, particularly untrained soprano voices. The Rotel will not compensate for vocal weaknesses, but it has the kind of midrange that allows you to get the best out of solo voice. The same is true of demanding instruments like the violin and harpsichord.

The upper midrange and treble are equally well defined; no one will ever accuse the RHB-10 of lacking highs. It offers transparency and low-level definition without an apparent brightness or edge. One of

**WITH THE RHB-10,
YOU WON'T HAVE TO
FEAR THAT A VOICE
WILL GO HARD OR FLAT.**

the most critical tests of a power amplifier is whether it provides exceptional upper midrange detail *and* the ability to resolve upper midrange harmonics, low-level detail, and transients in a way that is as musically natural as the source material and front-end components allow. The upper midrange and treble of the Rotel RHB-10, though just a bit short of reference quality, are outstanding for an amplifier in its price range.

The soundstage performance of the RHB-10 is equally good. The amp reproduces virtually all of the soundstage information on a recording without contracting it, expanding it, or altering its apparent location in space. (I have several DAT cassettes of solo instruments that I recorded live. I keep notes with these tapes on the location, apparent size, and sound character of the guitar, drum set, and piano I recorded.) The RHB-10 does an excellent job of handling image size, some very low-level soundstage data, and left-to-right placement. It also does very well in reproducing layers of depth with more complicated music—although I am highly leery of saying that the depth of orchestral or any

other complicated music is ever captured naturally on a recording and that it can ever be reproduced accurately in a home listening room.

The Rotel is scarcely unique in being mechanically and electronically quiet. In fact, I would deem unreviewable, and instantly return, any high-end transistor power amplifier that had fan noise, mechanical hum, or any electronic noise or hum that was audible in the listening position. There are so many top-quality amps without such defects that even minimal noise is totally unacceptable! The RHB-10, however, does deserve high praise for being remarkably free of the kind of low-level noise that nags at the edges of your perception. You can listen further into the music than is common with amplifiers in its price range.

My single reservation about the RHB-10 concerns its ergonomics and is a bit petty. The WBT output terminals for speaker connections do an excellent job of accommodating large bare wires, but they will not fit the standard spade lugs used by many high-end speaker cable manufacturers in the U.S. On the other hand, Rotel does recommend its own "6 nines" copper speaker cable. This cable is not a rival of the best American cables (such as products from AudioQuest, OCOS, Kimber, Tara Labs, and Wireworld), but it is of very high quality.

If I have slightly less praise for the RHA-10 preamp, it is not because it, too, is not an excellent-sounding unit. Like the RHB-10, it is superbly built, uses high-quality and custom-designed components, and has a very attractive European styling. This is the kind of unit that you want to display rather than hide in a cabinet.

The RHA-10 also reflects Rotel's emphasis on actually listening, rather than taking sound for granted as many mid-fi designers do. The preamp uses a specially designed four-gang attenuator as a volume control, Vishay resistors, high-precision switches with gold-plated contacts, and a power supply with a very high-quality toroidal transformer. Circuitry is on a double-sided, high-grade glass-fiber board, with specially formulated extra-thick copper tracks on the bottom and copper shielding on the top. If the extra care taken on this circuit board design seems like gilding the lily, let me note that every high-end electronics de-

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signer I know has found that different types of circuit board really do have a significant impact on the nuances of sound quality.

The circuitry is similar to the symmetrical, push-pull topology used in the rest of the new Rotel line. Rotel feels that it contributes to the preservation of subtle phase differences between the two channels and that it presents a highly detailed soundstage with a great deal of depth.

Features include low-impedance outputs that allow very long interconnects, three regular line-level inputs, and two tape

loops. A tape buffer amplifier is intended to eliminate any possibility that hookup to a tape unit will degrade the signal to the power amplifier, and there is a record output switch with five positions plus a separate control for switching the tape output off. All of the inputs are mechanically switched, and an input is only connected to the ground plane when it is active. This feature may seem unimportant, but it is surprising how many high-end preamps allow trace levels of signal to go from one input to another—particularly when a tape


monitor output is being fed into the preamp. Two sets of RCA outputs allow for biamping or other uses.

These features are typical of today's "minimalist" high-end preamps, where the goal is the least possible coloration of the signal. At the same time, I do have three minor reservations about the features of the RHA-10:

- There are no balanced inputs or outputs. This will be unimportant when the RHA-10 is used with the RHB-10 or in an installation free of hum fields and other sources of noise. Most of today's top preamps do, however, have at least one balanced input and one balanced output.

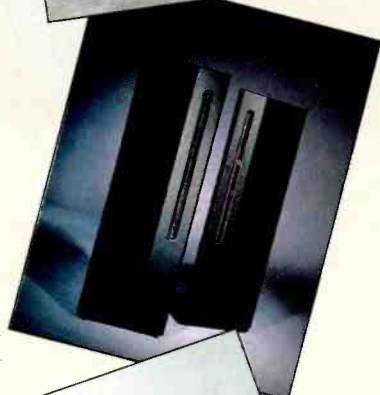
- It may make sense for a manufacturer to assign numbers to the inputs on a unit intended to be exported, rather than assigning them names, but I find names more convenient.

- The RHA-10 does have a remote control that can also be used with the Rotel



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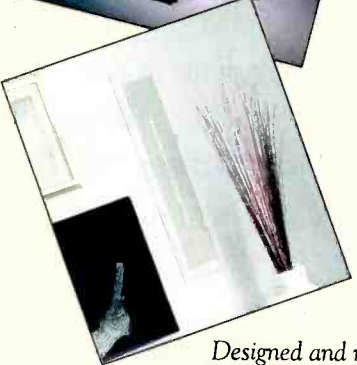


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**THE RHA-10 IS VERY
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TIMBRE AND HAS NO
TOUCH OF TRANSISTOR
LEANNESS.**

RHT-10 tuner, but the remote does not have a balance control. I find the ability to adjust balance via a remote control to be a real advantage. I have a great many CDs and records where a slight adjustment of balance is needed to lock in left-to-right imaging and depth. Perhaps if a balance control was called a soundstage control, its importance might receive more widespread recognition.

What counts most in a high-end product, however, is sound quality, and the RHA-10 is very competitive with other preamps in its price range. Its sound largely duplicates the sound of the RHB-10. It is very neutral in overall timbre and frequency response, with no touch of transistor leanness. It does not alter the highs or bass to reduce or emphasize either frequency extreme.

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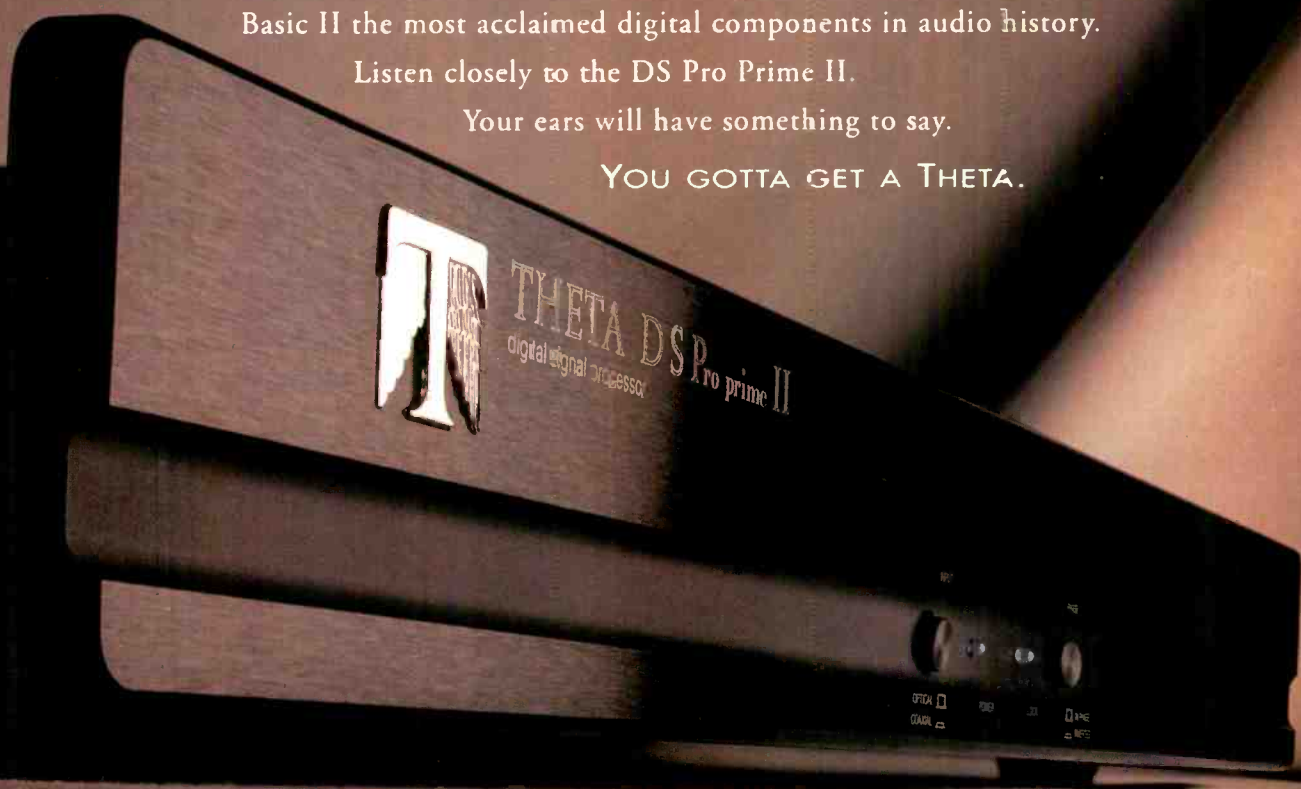
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designs, with a high-quality deep bass that is missing in many imported preamps. Percussion and string bass have excellent transient and harmonic detail.

The midrange is neutral and transparent, although a few U.S.-made high-end line preamps provide slightly more low-level and transient detail. Reproduction of voice and solo instruments is excellent, particularly violin, piano, and guitar. Resolution of complex choral passages and grand opera is very good to excellent, and very musical.

The upper midrange and treble are largely unaffected by the RHA-10 preamp, with the same transparency, low-level definition, and lack of apparent brightness or edge as the RHB-10 amp. The sound of the upper octaves is determined far more by the other active and passive components in the system than by the RHA-10, although there is a minor loss of sweetness and harmonic detail compared to the upper octaves of the best high-end designs.

The soundstage performance of the RHA-10 is very good to excellent—even in

comparison with the top high-end units. Soundstage width and depth are very natural, as is the presentation of left-to-right imaging and layers of depth. Some other units do a slightly better job of reproducing very low-level soundstage detail and musical dynamics, and the RHA-10 does tend to move the apparent listening position just

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slightly forward. At the same time, the RHA-10 matches the RHB-10 in providing an exceptional apparent signal-to-noise ratio and in being electronically quiet.

In broad terms, the RHA-10 provides excellent sound quality and highly musical performance. It is a fact of life, however, that any line-stage preamplifier costing over \$1,000 that does not provide excellent sound quality will simply not be competitive in today's market. The state of the art has advanced to the point where a colored or noisy unit is more an irritating curiosity than a serious product—except for those audiophiles who want a preamp to act as a euphonic equalizer more than they want a neutral preamp. As a result, a line-stage preamp must be judged by its features and the relatively minor sonic nuances of the kind I have just described, or it must provide an extraordinary level of excellence at a given price point. The RHA-10 is fully competitive at its price point, but it does have competition.

My most important criterion in judging high-end equipment is whether it is musically involving rather than sonically interesting. High-end audio has many amps and preamps that have an "interesting" sound character that calls attention to the equipment rather than the performance. The Rotel RHB-10 and RHA-10, particularly the RHB-10, call attention to the performance and involve you deeply in the music. Both are very competitive with other products in the high end and are highly recommended! *Anthony H. Cordesman*

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CAMBRIDGE SOUNDWORKS EXO-1 CROSSOVER



Longtime audiophiles cannot help but recognize the name of Henry Kloss: The “K” of the original “KLH” and founder of Advent and, later, Kloss Video. Kloss’ ingenuity is as legendary as his penchant for developing quality products at affordable prices. Most recently, he has surfaced as the principal designer for Cambridge SoundWorks, a mail-order firm based in (you guessed wrong!) Newton, Mass.

To sample their wares, we selected the EXO-1, a \$299 electronic crossover designed for home theater and music systems. The three inputs—left, center, and right—and their

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corresponding main outputs suggest home theater use, but if you simply ignore the center input and output, the EXO-1 will do quite nicely in conventional stereo applications.

Signals from the three inputs are transferred to their respective main outputs through 18-dB/octave active high-pass filters with Butterworth characteristics (i.e., maximally flat amplitude response). The sum of the three inputs feeds the “Non Filtered” subwoofer output and, after low-pass filtering through an 18-dB/octave Butterworth filter, the “Filtered” subwoofer output.

The choice of crossover points (55, 80, 100, and 140 Hz) and the slope and characteristics of the EXO-1’s filters are matched to those of the input filter in the Cambridge SoundWorks Powered Subwoofer. Thus, when this subwoofer is used,

the unfiltered subwoofer output is employed and the switches on the EXO-1 and the Powered Subwoofer are set to the same positions. The filtered output is provided for use with subwoofers that do not have an input filter. The unfiltered output could also be used to derive a “phantom” center channel from left and right inputs or to feed a monophonic sound system, such as a home intercom.

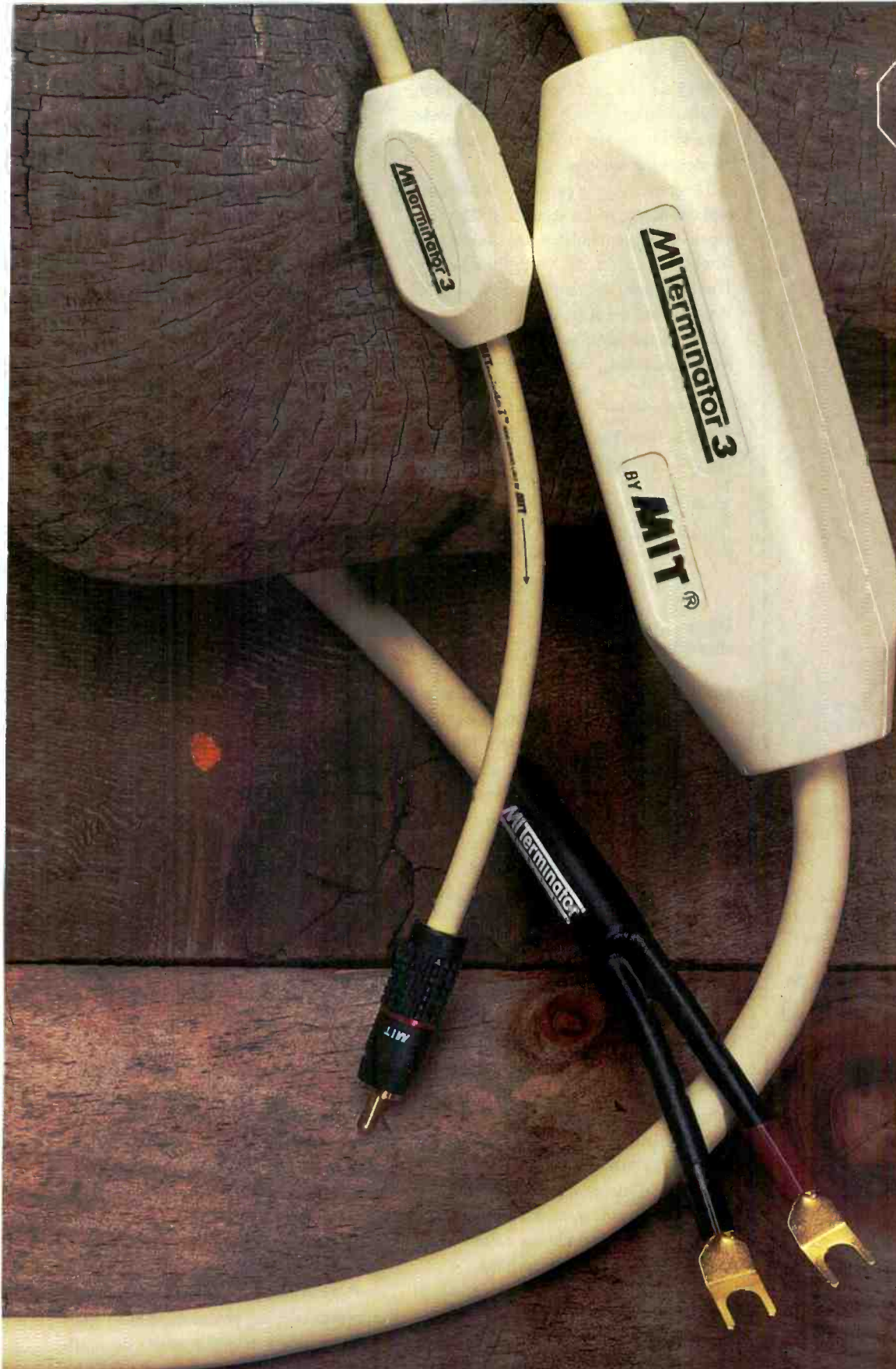
The EXO-1 is designed around five dual op-amps (FET-input OP275s) and nine quad electronic switches (4066s). Three op-amp sections buffer the inputs; another pair sums, buffers, and restores the polarity of the unfiltered subwoofer output. Four of the remaining five sections create the desired high- and low-pass filters. The last op-amp section restores polarity and buffers the filtered subwoofer output.

Crossover frequency is changed by switching resistors in each filter network. Each three-pole (18-dB/octave) filter requires switching three resistors to shift the crossover point, and there are four filters in all (three high-pass filters for the main outputs and one low-pass for the filtered subwoofer output). Therefore, 12 components must be switched simultaneously.

In the old days, this would have meant either a monster switch and

**I'M IMPRESSED WITH
THE EXO-1'S BASIC
PERFORMANCE AND
THE PRECISION OF
ITS FILTERS.**

lots of audio routing or a slew of mechanical relays. In the EXO-1, switching is neatly accomplished by the nine quad electronic switches and a simple single-pole rotary switch on the front panel; depending on this switch’s position, one of three buses is energized, toggling the



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desired set of 12 electronic "relays." In the 55-Hz position, no bus is activated, providing a fourth crossover point from a total of 36 electronic switches.

The power supply consists of an internal transformer, a bridge rectifier, a filter, and a pair of zener-regulated series-pass transistors that deliver ± 12 V to the op-amps. The 12-V lines are zenered down to ± 7.5 V to operate the switches.

On my test sample, which was from an early production run, the main circuitry

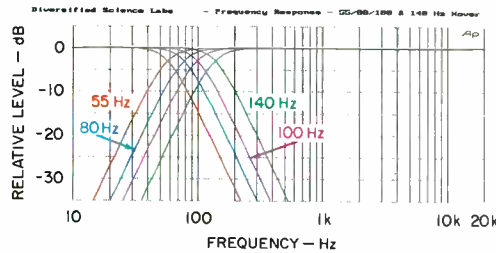


Fig. 1—Crossover filter characteristics.

was mounted on a double-sided p.c. board of good quality that measured $5\frac{3}{8} \times 5\frac{3}{4}$ inches. A small perfboard extension held the three relays which tied the main inputs directly to the main outputs when power was off. I presumed the relays were an afterthought and in the next revision would be mounted on the main board; Cambridge SoundWorks says that this has already been done.

The relays are a good idea in that they ensure the signal will not get lost in the crossover when the EXO-1 is off. They are activated directly by the bridge rectifier and do not provide a turn-on delay. Operated unloaded on the test bench, the EXO-1 produced a turn-on transient of approximately 0.7 V. However, when in the listening room and feeding an Apt power amp, the EXO-1's turn-on transient was almost inaudible. If turn-on transients become bothersome in your system, either leave the EXO-1 on permanently or switch it on prior to powering up the amplifier.


Gold-plated pin jacks are used for all input and output connections. The grounds are daisy-chained together with a light-gauge wire and returned to the circuit board through a jumper. In general, running input and output grounds through the same wire is not a good idea (especially when dealing with active filters), and I



thought this was the reason why I found a potential instability and a rise in response around 90 kHz on the main outputs. (This instability doesn't affect the subwoofer outputs because the unfiltered one is picked off prior to the active high-pass filters, and the low-pass action on the filtered channel would, of course, eliminate the rising response.) According to Henry Kloss, however, the rising response and potential instability were due to circuit design rather than wiring layout; he also said that the circuit had been recently changed to provide response that's 3 dB down at 100 kHz for greater stability.


Input and output hot leads are wired to the board via short unshielded jumpers. A twisted pair of wires that runs most of the length of the board, and rather near some of the audio circuitry, connects the power switch to its tie points on the p.c. board. The close proximity of the power transformer to one of the audio op-amps caused low-level hum (-72 dB in one channel and -78 dB in the other). Apparently, Cambridge is aware of the problem, because an attempt was made to reduce hum by mounting a small copper shield above the op-amp that's near the transformer. Nonetheless, some intruded.

My lab tests suggest that the EXO-1 should interface relatively well with ancillary equipment. Input impedance is relatively low, at 9.6 kilohms, but most preamps should have little problem driving it. The output impedance, 100 ohms, is very low, which means the EXO-1 should have no problem driving a relatively long interconnect to the power amps. Maximum output level was 5.5 V or better—more than adequate to drive any power amp into clipping before the EXO-1 gives up (providing you've not turned down the power amp gain by more than 12 to 15 dB). Gain was close to unity on the main channels; gain to the subwoofer outputs depended on how many main inputs were driven, since the subwoofer outputs con-



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.

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tain the sum of the input signals. (If you're not using the center-channel input, it would be wise to insert a shorting plug to minimize the noise introduced into the two subwoofer outputs.)

The filter characteristics are classic in every respect, and the turnover frequencies are spot on (Fig. 1). On the main channels, response was essentially flat in the audio band from an octave above the crossover point. Main-channel response in my early test sample was up 0.25 dB at 20 kHz and rose to a peak of 1.25 dB at 90 kHz, which

Cambridge SoundWorks says does not occur in current production units. The rise and peak were not present in the unfiltered subwoofer output. Channel separation was good where it counts—better than 80 dB to beyond 3 kHz and almost 73 dB at 10 kHz.

Distortion rose with frequency and level. At 20 kHz, it topped 0.1% for a 1-V output and 0.24% for 2-V out. (This may seem excessive in some audiophile circles, but I, for one, couldn't hear it.) The center-channel distortion rose above the subwoofer output's distortion at levels greater than 1.5 V,

which suggests, not surprisingly, that a primary source of distortion was the filter op-amps themselves rather than the output amps.

The A-weighted noise on the center and right channels was reasonably low at -94.1 dB re: 0.5 V. (Since most power amps reach maximum output with an input of about 1.5 V, maximum dynamic range on an A-weighted noise basis should top 103.5 dB.) The left main output was about 2 dB noisier than the other front channels.

The subwoofer outputs have substantially more noise than the main outputs, because they sum the noise of all three input buffers plus the summing op-amp, the output buffer op-amp, and, in the case of the filtered output, the low-pass filter op-amp. If these outputs are used to drive a sub-

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**LAB TESTS SUGGEST
THAT THE EXO-1 SHOULD
INTERFACE WELL WITH
ANCILLARY EQUIPMENT.**

woofer, there's nothing to worry about, because the subwoofer will not reproduce the noise-frequency range emphasized by "A" weighting. If the unfiltered output is used to derive a phantom center or is otherwise employed in a full-range application, then dynamic range, on an A-weighted basis, will be limited to approximately 88 dB. Of more concern in subwoofer applications were the hum components at 60 and 180 Hz. In my listening room, these were not intrusive, but if I placed my ear close to the speaker, they were audible.

I'm impressed with the precision of the EXO-1's filters and its basic performance in the listening room. On the technical front, there are minor points to quibble with: Component and wiring placements that introduce hum and, under unloaded conditions, a sizable turn-on transient. Perhaps I quibble because these are so easy to solve: A line-cord transformer rather than an internal one and output termination resistors. These might very well make the EXO-1 clear bench tests with as much aplomb as it clears listening hurdles.

Edward J. Foster

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Ever since the first CD players were introduced more than a decade ago, software manufacturers have attempted to produce suitable reference test discs that might be used by both audio equipment testers and serious audio enthusiasts to measure the performance of their CD players or entire audio systems. Philips, the co-developer of the CD format, first offered a set of three test discs that contained both test signals and musical reference signals. There soon followed a spate of test discs from such companies as Technics, Sony,

and CBS, to name just a few. The CBS CD-1 disc became a virtual standard test disc for evaluating CD players, since most of its tracks were created to conform with EIA and EIAJ Standards of Measurement for Compact Disc Players.

DENON'S THREE TEST DISCS ARE THE MOST USEFUL YET.

The CBS CD-1 disc has certainly proved to be extremely useful in testing CD players; it contains 21 tracks, some of which are divided

into as many as 13 index points. However, advances in CD player technology, as well as increased understanding of digital recording techniques and limitations, suggest that CD test discs need to contain many more tests than are now available on the CBS CD-1 disc.

It seems fitting that Denon should rise to the challenge, since that company's parent, Nippon Columbia, developed a digital recorder way back in 1972. The company recently released three discs, collectively called Denon Professional Test CDs (COCO-75084/5/6). The signals contained in these discs surpass those of any earlier test discs in terms of their usefulness.

Disc 1 contains measurement signals intended principally for use with CD players and other types of audio equipment, while Disc 2 contains signals for measuring and checking the acoustics of a performance or recording site. Disc 3 contains samples of musical performances employing a wide variety of instrumental combinations that Denon considers necessary for assessing the sound of audio systems and especially of monitor speakers and control rooms.

One of the most noteworthy features of Discs 1 and 2 is that they permit graphic display on a video monitor of the contents of the disc. This is possible because of the availability on Compact Discs of sub-code areas that are part of the CD Standard. Furthermore, in the case of some of the signals, it is possible to display text in the form of stationary images describing the contents of tracks being played (see Fig. 1). For some tracks, such as frequency-sweep signals, the color changes as the sweep advances from lower to higher frequencies (see Fig. 2).

In order to take advantage of the graphic contents of Discs 1 and 2, it is, of course, necessary to have a CD player that incorporates a video output, a so-called CD + G player. In evaluating the usefulness of these discs, I played them on a Denon

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Model DCG-330 carousel CD changer that provided the required video output. Connection can simply be made from this video output to the video input of any TV set or TV monitor. Then, as the discs are played, text and graphics appear on the TV screen, detailing the contents, track by track, of the two discs.

While space does not permit a full description of each of the tracks contained in these three discs (the manual provided with the discs uses 52 pages for that purpose), a brief description of some of the signals not found on earlier CD test discs should give you some idea of the lengths to which Denon's engineers have gone in creating these CDs.

Disc 1, for example, contains not just one frequency-sweep track but three such tracks. The additional two are recorded at levels of -20 dB, without and with pre-emphasis. Track 36 of this first disc contains a 70-sample cycle repeating signal consisting of one sample of positive full level followed by 69 samples of digital zero. This track is designed for assessing filter properties of CD players, but it is also useful for testing amplifiers and loudspeakers. For those who prefer subjective evaluations of D/A converters, there are music signals recorded at levels of 0, -20 , -40 , -60 , and -80 dB. For the -80 dB musical recording,

**THE NUMEROUS TRACKS
INCLUDE TEST SIGNALS
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average level is actually 20 to 30 dB lower, providing an extremely rigorous audibility test for D/A converters. A wide assortment of dithered test signals at various levels is provided on Disc 1 for extensive linearity checking of D/A converter circuitry.

Track 66 is a 400-Hz, -20 dB phase-sweep signal. The phase between left and right channels begins at 0° and then increases in 6° increments, eventually rotating "full circle" to return to an in-phase condition. This signal can be used for checking phase meters and for other phase measurement purposes.



Fig. 1—CD + G display of track contents.

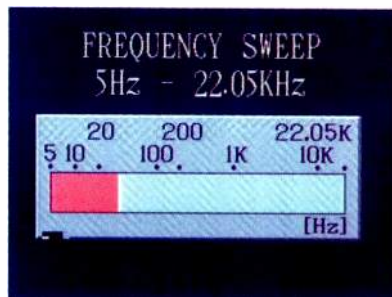


Fig. 2—CD + G display of frequency-sweep track.

Tracks 67 through 89 of Disc 1 are intended more for checking a complete audio system, rather than being limited to CD player testing. In addition to such specific tests as those needed for tape deck alignment, meter level checking, and the like, there are music signals (tracks 79 through 82) for checking recording levels, including orchestral, piano, popular vocal, and rock, all with a maximum level close to 0 dB.

While Disc 2 may not prove as useful to audio enthusiasts as Disc 1, professional recording engineers, acousticians, and even serious amateur recordists will appreciate its contents. There are, for example, tracks recorded using a variety of popular microphone pairs in a wide variety of configurations. Other tracks illustrate the well-known velocity-microphone proximity effect (increase in bass response that occurs when mikes are used in close proximity to the vocalist or instrumentalist), image localization, audibility of high- and low-frequency filtering, and simulations of various reverberation times.

Several years ago, Denon made a series of orchestral recordings in a totally anechoic environment. Selections from these recordings are also included on Disc 2, so the

acoustics of various halls can be judged without imposing recorded reverberation on top of the reverberation provided at the playback site. In addition to tracks containing white, weighted, and pink noise, this disc also contains signals for measuring the clarity of room speech transmission, a low-frequency sweep track, warble frequency sweep, and impulse signals. All in all, there are 93 individual tracks on this disc!

The third disc in this Denon series of Professional Test CDs consists of sound sources taken from actual recorded programs and selected because of their suitability for evaluating sound quality. According to Denon, emphasis has been placed particularly on sources that make it possible to conduct assessments and tests under practical conditions. Programs were carefully selected from Denon's library of digital recordings, with priority having been given to natural sound quality that accurately reflects the features of each instrument and musical genre.

Selections by solo instrument include music for flute, tenor saxophone, trumpet, violin, cello, double bass, piano, harpsichord, organ, harp, guitar, jazz drums, and African folk drums. There are also examples of chamber music, period-instrument performances, instrument recordings, orchestral works, jazz-ensemble selections, big band, rock, and traditional Japanese music.

The material on Disc 3 is intended to be used as sound sources for checking tone quality, size of sound image, localization, stereo perception, band range balance, distortion, etc. It can also be used to provide sound sources for conducting assessments of sound quality and performing a wide range of listening tests.

The set of Denon Professional Test CDs, which, incidentally, utilizes an evaporated gold reflecting layer rather than the usual aluminum layer, sells for around \$150. That may seem like a pretty steep price for three CDs, but for those of us who want to be able to test CD players and other audio equipment and systems using the latest and most comprehensive test signals, price is rarely a prime consideration. Bear in mind, too, that test discs such as these are not produced in the mass quantities associated with standard musical CDs.

Leonard Feldman

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MOZART

PIANO CONCERTOS



Mozart: Piano Concerto No. 5 (K. 175) and No. 6 (K. 238); Rondo K. 382

András Schiff, piano; Camerata Academica des Mozarteums Salzburg, Sándor Végh
LONDON 430 517-2, CD; 52:19

Mozart: Piano Concerto No. 15 (K. 450) and No. 16 (K. 451)

András Schiff, piano; Camerata Academica des Mozarteums Salzburg, Sándor Végh
LONDON 433 374-2, CD; 48:25

Mozart: Piano Concerto No. 17 (K. 453) and No. 24 (K. 491)

John O'Connor, piano; Scottish Chamber Orchestra, Sir Charles Mackerras
TELARC CD-80306, CD; 57:45



Mozart's popularity in the classical field is not exactly waning. It is astonishing to see and hear the "competition," from the world over, in what was once a fairly esoteric area—the piano concertos—in the works of a very esoteric composer. A reviewer can listen only so far. I absorbed András Schiff and Sándor Végh, out of Austria (and Hungary), one evening, John O'Connor from Ireland and his conductor Sir Charles (from Scotland) another, thus sampling two major series. Both are top-drawer but interestingly different.

Since my own "Mozart year"—the time when this composer hit me first—was a long time ago in Mozart history, circa 1932, I can best simply describe the differences, though my preference is for Schiff, by a modest margin. Both of these series belong on the side of instrumental conventionality, "modern" instruments as a matter of course, both the pianos and the orchestral music. In many places, still, the thought of "period" instruments never occurs. On the other

hand, the areas of intense "period" activity now often include Mozart and even Beethoven and Schubert, but not here. No judgmental ideas! Just a listening fact.

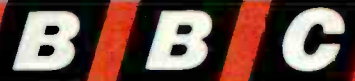
The Schiff-Végh team is out of the Mozart homeland, musically still the Austrian empire, and sounds it. True, the present Austrians are notably conservative (the Hungarian branch less so), but in their own music they do preserve a gentle, highly expressive quality that takes good musicianship for granted—careful phrasing and shaping, a desire to let each part of the music have its say, so to speak, in peace, which always makes good listening. That is what we hear to perfection in the

Salzburg Mozarteum tradition. You will note especially how well the orchestra and the pianist work together, neither dragging the other unwillingly. Only one very mi-

nor distraction: The Bösendorfer piano. Not the best for any Mozart, a sort of Steinway, only more so. But Schiff manages the big beast admirably, and only an occasional anachronistic walrus-rumble in the bass gives it away.

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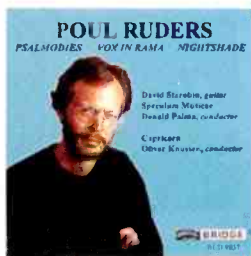
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John O'Connor is bigger international stuff, and so is his nominally Scottish orchestra with Sir Charles at the helm. This is prime Telarc. If I am right, an unfaltering aim of that company is discovering some remarkable "international" orchestras among our minor-league outfits in the U.S. If you like the somewhat glitzy, hard, big sound of this big-time way of music making, this is an excellent example of it. Yes, O'Connor is a bit mannered and self-conscious, as compared to the selfless Schiff. And Sir Charles does drag his strings into some not very handsome fast notes, slurred and hasty as they should not be. Minor, almost inaudible faults.

Curiously, O'Connor uses the modern piano best suited to Mozart, the Hamburg Steinway, a spiritual descendant of the *fortepiano*, in contrast to the big Bösendorfer sound. No walrus bass here! It is a gentler sound, and so is the woody midrange, not unlike Mozart's own pianos.

Edward Tatnall Canby



Poul Ruders: Psalmodies; Vox in Rama; Nightshade

David Starobin, guitar; Speculum Musicae, Donald Palma (in "Psalmodies"); Capricorn, Oliver Knussen (other works)
BRIDGE BCD 9037

"Psalmodies" has spiralling, slightly dissonant "modern" harmonies that rapidly and darkly spin out of control, like the "Sorcerer's Apprentice," only to glide, with swooping strings, to an uneasy repose. Peeking from between the strident strings and woodwinds of New York's Speculum Musicae are the delicate, harplike strains of David Starobin's featured guitar. In "Vox in Rama" an electrified violin dances like a distracted wood nymph over a military plain laid out by gloomy piano chords and a contrary clarinet. "Nightshade" displays the brooding, funereal, *poisonous* colors of despair. This piece for 10 instruments is performed by London's Capricorn ensemble.



Piano Works for the Left Hand (Works by Takács, Saint-Saëns, Saxton, Bach-Brahms, Blumenfeld, Scriabin, and Strauss-Godowsky)

Leon Fleisher, piano
SONY CLASSICAL SK 48081
CD; DDD; 73:28

The very existence of a catalog of classical piano works for the left hand alone is remarkable. Perhaps the most famous piece is the piano concerto written by Ravel especially for Paul Wittgenstein, a concert artist who lost his right arm in World War I. Most of the pieces were written for pianists who had injured or lost their right hand, though some appear to have been created primarily as virtuoso show-off vehicles.

Two short pieces by Scriabin came about because the composer, through overpracticing early in his concert career, had injured his right hand and feared he might have to

abandon performing before he had really begun. He refused to accept the dire diagnosis of his doctor and out of indomitable will created this Prelude and Nocturne. Leon Fleisher's story is not that different from Scriabin's. A condition with his right hand brought his successful international concert career to a sudden halt, but through his own courage he has returned to the stage with programs entirely devoted to works for the left hand.

In many of these works, you must remind yourself that all sounds are in fact created by just a single hand. You fall into the special language required; the experience is similar to listening to Bach's unaccompanied violin partitas or cello suites, where the artistic genius soon makes one forget anything is missing. This is even truer of the Bach Chaconne included here. Brahms arranged this as a self-test without knowing that Clara Schumann had just strained her right hand while opening a drawer and needed a left-hand work to perform. Fleisher's treatment may make you think of a harpsichord (or at least of Glenn Gould), but he somehow still retains a singing line throughout. The piano sonics are beyond reproach. *John Sunier*

Here, you must remind yourself that all sounds are created by one hand.

ble. New music by the young Danish composer Poul Ruders reminds us—with brilliant all-digital clarity—of our unsettling new world order. *Michael Wright*

Lift Off

Robert Hohner Percussion Ensemble
dmp CD-498



Tom Jung's label, dmp, ventures away from straight jazz in this sonic-spectacular encore to Robert Hohner's first CD. Boasting many tuneful moments, this isn't just drums and cymbals, but 13 percussionists assaulting a studio full of different instruments, plus two string and electric bassists, a pianist, and saxophonist Bob Mintzer. Barber's Adagio for Strings, arranged for

nine marimbas, is not what you would expect; it's as mellow a treatment as the string quartet original. A major track is the 15-minute "Marimba Spiritual," Japanese percussion composer Minoru Miki's fantasy of soulful and churchy black music. The title tune by Russell Peck focuses strictly on the rhythmic aspects of percussion, with an unbroken eight minutes of aggressive

drumming that's sure to become a demo hit at the next CES high-end exhibits.

John Sunier

**Haydn: String Quartets Op. 55,
Nos. 1, 2, and 3**

Kodály Quartet
NAXOS 8.550397, CD; 58:27

The best! That is, quartet performance of the highest expressiveness and understanding, out of Hungary. These three late middle-period quartets were composed, casually enough, for one of Haydn's immediate colleagues at the Esterházy court, a violinist named Johann Tost who seems to have been also a persuasive and somewhat shady musical businessman, working deals with composers by which their music would be played at the houses of rich aristocrats, for mutual profit. He took Haydn's music to Paris, where he sold the stuff, not necessarily for Haydn's benefit.

Haydn did his part—the quartets are splendid works, full of vitality, even if Herr Tost was pretty close to being what we would call a con man. All Haydn's works are splendid. That is the astonishment of his long composing life. Over more than 40 years and an enormous volume of music, inspiration, expressiveness, and informed experiment never seemed to fail him. The well-known puckish Haydn humor, so misunderstood by the serious 19th century, was invariably a cover for his most intense expression, and was so understood in his own time. The second of these quartets is called "The Razor" because Haydn swapped it for a pair of English razors.

Excellent engineering here, too, all-Hungarian, the music recorded in the Hungariton Studios at Budapest.

Edward Tatnall Canby

Satie: Piano Works

Michel Legrand, piano
ERATO 4509-92857-2, CD; DDD; 54:08

While at first glance a surprise, with thoughts of recordings by Bob James of Rameau or Bud Shank of Villa-Lobos, some rumination puts this confluence of two quite different French composer/pianists in a positive light. Michel Legrand is the creator of many film scores and other lighter music. He is also a superb jazz pianist who,



like Keith Jarrett, has become active in classical music performance. Legrand was much taken by the idea of a Satie piano album when Erato asked him to do it. He rushed out, bought all the scores, studied them, and "entered a world that I found altogether fascinating." Legrand's stated purpose was clarity and transparency; he decided on a brilliant Steinway piano and used very little pedal to avoid blurring, as is done in the Debussy style.

What Legrand achieves is not only clarity but a flow and a sort of lilt that make many other recorded versions of these little pieces sound stiff and often pedantic. Legrand's facility with handling melodic lines—whether in his own music or in performance of others' music—comes to the fore in these 49 short tracks.

The program mixes earlier pieces of a rather austere classical style, such as the three "Gymnopédies," with later witty gems such as the "Flabby Preludes for a Dog." The 11-minute "Sports et Divertissements" is the longest work on the disc. Legrand gives us an altogether fresh and engaging view of the eccentric composer who was addicted to velvet suits and umbrellas.

John Sunier

The German Album

**Wagner: Tannhäuser Overture;
Schumann:
Symphony No. 3 in E Flat, "Rhenish,"
and Manfred Overture;**

Liszt: Mephisto Waltz
Royal Philharmonic Orchestra;
The International Symphony Orchestra
(in the Liszt); René Leibowitz, conductor
CHESKY CD 96

The connecting link in these recordings by two orchestras in the early 1960s is René Leibowitz, a solidly professional workhorse conductor who could do a splendid job on virtually any standard orchestral music handed out to him. Plenty was. As we

know, this was a fabulous time for the burgeoning two-channel recording technique, spurred to new heights by the stereo LP and a new mass market. Equally significant, I think, it was the last era when the old Romantic traditions of performance were still completely understood and familiar, to conductors like Leibowitz and, especially, to symphonic players. Only a tendency to fast tempos gives Leibowitz away as of the '60s. I am sure that virtually any listener will at once notice the arresting musical conviction, the confidence, the easy fluency, directness, and even economy with which all these works are performed. Very rare today! So on musical grounds as well as engineering, these restorations are absolutely priceless. (Chesky's engineering is indeed admirably high-level, but perhaps even higher "oversampling" would have helped in proofreading and would have caught the listing of composer "Richard" Schumann.)

Edward Tatnall Canby



Evening in Granada
Los Angeles Guitar Quartet
DELOS DE 3144

Guitar quartets do not have a long history, but they are already beginning to compete with string quartets for audience favor. Pepe Romero founded the Los Angeles Guitar Quartet, and its members are his former students.

While the L.A. Guitar Quartet's repertoire covers a wide range, a Spanish flavor is paramount in this program. Ian Krouse's "Folias"—a recording premiere—quotes Corelli and Sanz while hinting at flamenco-style playing. A quite amazing transcription of the complete "El amor brujo" of Falla is an album highlight, and equally rousing is Rimsky-Korsakov's "Capriccio Espagnol" in spite of its diminution from full symphony orchestra down to four guitars. John Eargle's engineering places the four guitars right in front of the listener, with breathtaking realism.

John Sunier

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**Brahms: Serenade No. 1 in D, Op. 11;
first version, reconstructed for nonet**

*American Symphony Orchestra,
Leon Botstein;
Chelsea Chamber Ensemble
VANGUARD CLASSICS OVC 8049
CD; 76:25*

Eureka! In the 1930s, when I was first collecting 78s, mostly singles, a recording of a minuet and scherzo from this work was my passionate favorite music, almost played to extinction. I've looked it up:



Victor V 11458, the London Symphony under Leo Blech. Such a poignant, deeply felt performance; I can hear almost every

note of it to this day. That record disappeared. There have been surprisingly few recordings since then, though the Serenade No. 2, Op. 16, is often played. I had not heard the Serenade No. 1 music in decades. Here it is. And with an interesting bonus: The first version, for nonet, lost but quite easily reconstructed, only four movements out of the six in the 1860 orchestral version. In the nonet, the music is entirely for solos. The later version is for the standard orchestra of that time, but contains more

Sympathy for the Devil

*The Hampton String Quartet
EASTWORLD TOCP 7640, CD; 56:27
(Japanese release, \$20, from Hampton
String Quartet, P.O. Box 527,
Oxford, N.J. 07863.)*

If beauty is in the eye of the beholder, is it in the ear of the listener? Who can say what is good and bad? Nobody, in this case. Here you have a strictly classical string quartet—black tie, funeral tuxedo and all—playing their own arrangements of long-familiar popular songs, mostly out of '60s rock and from such artists as The Beach Boys, The Beatles, The Rolling Stones, and Jimi Hendrix. What most audiences hear, in concerts and on disc (these players are already very big-time), are *the tunes*. Coming incongruously out of what seems to be very classical music in a somewhat modern vein. Judging from about a pound of publicity, they really love the idea. More power to them.

Am I thinking of the three blind men and the proverbial elephant? That is, what you hear depends on who you are. And I'm a classical reviewer! So what do I hear?

Yes, I know and respect quite a few songs from '60s rock; the group names are as familiar to me as to anyone else. Turns out, though, that I did not recognize a single one of these particular tunes, even including several from The Beatles. Guess my rock ear is out of practice. But I heard a lot else. My piece of the elephant.

The Hampton is strictly classical in its background, no faked-up quartet. All the players are products of the Juilliard School, most celebrated of our professional music schools. They play "regular" classical right along, many of the standard quartets, old



The Hampton's classical training comes through in this CD of '60s rock.

and new, including the difficult Beethoven Grosse Fuge. They mix their arrangements in with these. As individuals, indeed, they have performed in some very high-level classical groups along the way. But by some undeniable quirk (as with the King's Singers!) they have led themselves afield into these arrangements—a sort of deadpan pop, sometimes not so deadpan, as when they sing along while they are playing! This is what slays their audiences, in concert and via, already, three earlier CDs from no less than RCA.

Well, then, what *did* I hear? Guess what.

I hear these guys' musical background clear as a bell. Or a string quartet. In these arrangements they have not moved two inches from the professional way of musical life they learned (along with impeccable performing expertise) at the Juilliard. Their compositions (arrangements) are precisely what might be expected: Neoclassic. Remarkably like the stuff that still comes out of a hundred music schools the country over, even though generally we are now far

removed from the neoclassic style. This was the new music of the '20s on into the '50s, the main new music. Dry, sardonic, "jazzy" (with plenty of tight syncopation), complex, dissonant, and hard—you can easily spot it. I hear, too, a strong touch of the old "modern jazz" idiom. Close relative.

And more. There are spasms, shall I say, of just about every big composer and movement of the early 20th century, some quite startling. Simon and Garfunkel's old-English "Scarborough Fair/Canticle" is taken up again, and suddenly we are in the Vaughan Williams Fantasia on a Theme of Thomas Tallis, dating back to 1910, a work that set the solemn religious style for "ancient" melodies, picked up by S. & G. and now picked up by the Hampton, as if nothing had ever changed. A lot has.

All this, of course, out of the four players' experience in study and performance a good many years ago. Indeed, give or take a bit, they themselves are "1960s" characters. That could explain a lot.

Edward Tatnall Canby



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than the usual number of solos within the orchestra, notably the horn, bassoon, and clarinet.

I played the chamber, or solo, version first. Odd. So close and sharp and immediate. Also in a way somehow rather bumpy, not smooth. But this is inevitable in a solo group heard close-up. The Chelsea Chamber Ensemble is okay, very good in the slow movement, one of Brahms' finest, while on the other hand not perceptive of all the Romantic expression I knew in the earlier recording from the 1930s. Who is, these days?

I played a few seconds of the orchestral version that follows. Stop! Instead, back to the beginning for a better understanding of the nonet. Why? A classic audio problem: The two versions are *at the same volume* on the disc. Inevitably, this makes for a spurious and unpleasant contrast, the orchestra sounding—at least at first—thin, distant, ineffective! Better to play that version later on. Which I did.

When I got to my favorite minuet—the first section for winds only, the second for strings only, the first repeated—I could only be disappointed. Gone are the eloquent contrast between the ominous and subdued winds, their almost creepy chromatic harmony, and then the flying, exultant surge of the strings. Simply not there. The tempo was *much* faster, too fast—this was not a lightweight little interlude, as this conductor seems to think. So much of the immediate Romantic tradition, still vibrant in the 1930s and even the 1960s, is now faded away, though the new styles are surely interesting and workable for our time. Similarly, the scherzo, on my old record's back side, loses much of its rhythmic bounce here—springing off the triumphant sound of the horn! It was wonderful; now it is routine, just notes. The printed notes are the same, now and then. The interpretation, the tradition, is gone.

Not really a poor set of performances, just a three-quarters try, earnest, expertly played, sincere, but with too much unrealized. It still is a splendid piece, and you will enjoy both the nonet version and the full six-movement Serenade. Note that though the nonet ostensibly has no conductor, the two performances are much alike in detail, implying the presence of Leon Botstein in both.

Edward Tatnall Canby



**Busoni: Indianische Fantasie;
Indianisches Tagebuch; Konzertstück;
Berceuse Élégiacque**
Jeffrey Swann, piano;
Montpellier Philharmonic Orchestra,
Gianfranco Masini
ARKADIA-AKADEMIA CDKAK 126.1
CD; DDD; 65:06

During a visit to the U.S. early this century, the Italian-German composer/pianist Ferruccio Busoni became fascinated with the music of the “Red Indians” via an ethnomusicologist who wrote a pioneering text about their songs. Busoni's interest was similar to that of Dvořák on his American visit in the 1890s, but not as far-reaching.

In writing his piano concerto (actually more of a suite) on Indian themes, Busoni was marked by doubts and struggle, and in the end he wrote to his wife, “The Indian themes neither concede nor yield much; I shall have to introduce much of myself . . .,” and he did. The Fantasy even adheres to the classical three-part concerto structure, but it is an interesting early example of the composer's use of exotic scales and even microtones, which later became part of his musical teaching and philosophy, influencing such students as Kurt Weill and Edgar Varèse.

“Indian Diary” is another of Busoni's works inspired by native American music, this time for solo piano and with more easily identified themes. The other two selections bear no Native Americanisms, authentic or bogus.

Brahms' First Piano Concerto, Wagner, and Bach are evoked in Busoni's early Concert Piece for piano and orchestra. This lovely work could drive music students crazy on a snap identification quiz. The Berceuse is a harmonically adventurous lullaby and was composed in memory of Busoni's mother.

The piano sound is occasionally a trifle clanging in climaxes, but the balance with the orchestra is excellent, as is hall ambience.

John Sunier



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THE RED SHOES



KATE BUSH



The Red Shoes

Kate Bush
COLUMBIA CK 53737-2
CD; 55:27
Sound: A-, Performance: B+

Since her debut 15 years ago, *The Kick Inside*, Kate Bush has been a surveyor of the soul, exploring the inner dimensions with a metaphoric arsenal drawn from technology, fantasy, and classic literature. On *The Red Shoes*, she takes a page from soulmate Peter Gabriel, trying to balance bouncy pop songs with introspective and sometimes troubled reflections. However, while Gabriel manages to work "Sledgehammer" into his gestalt, as if revealing another hidden pocket of his psyche, Bush seems to be truly reaching, aping the pop veneer of dance divas like Madonna and bringing in Prince to tart up "Why Should I Love You" with his funk stylings. It even appears that on "Constellation" there's space left in the arrangement for sound effects for a videoclip.

But that's not the case with most of *The Red Shoes*. Here, the soul-searching is centered around the title track, which gives a new spin on "Gotta Dance!" With a dervish of balalaikas and penny-whistles, Bush spins out her tale of magic dancing shoes, exploring the paradoxes and repercussions of following your bliss.

Several guests appear on the album. Eric Clapton does a wonderful blues turn on "And So Is Love," though Jeff Beck gives a perfunctory performance on "You're the One." Gary Brooker from Procol Harum lays in some Hammond B-3 swirls—reminiscent of "Whiter Shade of Pale"—on a couple of

tour for her last album, *The Sensual World*.

Despite its flaws, *The Red Shoes* sits comfortably with Bush's best. From the industrial grunge of "Big Stripe Lie" to her sentimental reminiscence of "Moments of Pleasure," Kate Bush probes themes of sexuality, spirituality, and loss, using rich sonic detail to populate her narratives.

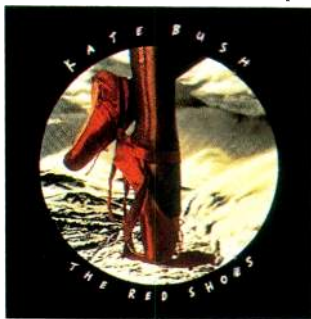
John Diliberto

Heroes

Mark O'Connor
WARNER BROS. 9 45257-2

Heroes is an album of duets with the fiddlers whom Nashville fiddle ace Mark O'Connor most admires. Included are country greats Johnny Gimble, Byron Berline, Vassar Clements, Buddy Spicher, Kenny Baker, and Cajun madman Doug Kershaw—and that's not all. O'Connor also duets with the legendary Stephane Grappelli, jazz-fusionist Jean-Luc Ponty, classical great Pinchas Zukerman (on a gorgeous take of "Ashokan Farewell"), and L. Shankar for a raga-like piece. A collaboration with Charlie Daniels delivers a spiffy sequel to "The Devil Went Down to Georgia," with Johnny Cash, Marty Stuart, and Travis Tritt on vocals. Performances throughout are fabulous and quite varied, but the sonics are disappointingly mushy, lacking the scrape-of-the-bow presence and immediacy that Nashville recordings usually have these days.

Michael Tearson



tracks. Bush even quotes a line from that hoary chestnut.

These songs seem to reveal little of Bush, and in fact her ambivalence about them can be heard on the much more compelling "Top of the City," a piece set in New York, where an isolated Bush casts her eyes out on this alien landscape and asks to be "put on the angel's shoulders." As Bush is notorious for her unwillingness to travel, I suspect this song was written during the press

Photographs: Anthony Crickmay

a celebration is in order!



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Acid Eaters

The Ramones
 RADIOACTIVE RARD-10913
 CD; 32:00
 Sound: B, Performance: B+

As '60s children bored to death in Queens, The Ramones lived and breathed rock 'n' roll radio: Beatles, Stones, Phil Spector, bubblegum pop, '60s punk like Syndicate of Sound. And in 1974, when the music and the hapless four morphed into The Ramones, the combination became one of rock 'n' roll's most influential bands—but unfortunately one that, to this day, is without any gold or platinum wall-hangings to show for it. This has everything to

do with a perennially unreceptive response from the medium known as rock 'n' roll radio.

Weird irony aside, when Joey Ramone queried 13 years ago “Do you remember rock 'n' roll radio?” on the Spector-produced *End of the Century* album, was this the same nostalgic musing that now drives *Acid Eaters*, an album of covers? Probably, but it's sentiment tempered with practicality. In covering music made famous by others, the biggest challenge for The Ramones, whose M.O. is loud and fast bubblegum-inspired tales of dementia and psycho women, was properly honoring the material with at least a serviceable reading. Their other chal-

lenge was choosing appropriate tunes. **Not only have The Ramones changed the landscape of pop music, they've also made the world a little less boring.**

Updates of The Who's “Substitute” (with Pete Townshend contributing harmonies) and The Troggs' “I Can't Control Myself” reek of youthful Ramones angst, but nowhere is the age factor more apparent than on The Animals' “When I Was Young,” which comes off like an ode to midlife crisis. A small downer, perhaps, but one that opens the door for a Ramones-style counterattack featuring send-ups of The Byrds' “My Back Pages,” Love's “Seven & Seven Is,” and Creedence Clearwater Revival's “Have You Ever Seen the Rain”—songs that lend themselves to breakneck tempos.

So as The Ramones gabba-gabbahey their way through 12 of their favorites, it stands to reason that golden oldies never die, they just get louder and faster. Two other messages within the music: There is no correlation between age and attitude, and The Ramones—as left-back in their Rock 'n' Roll High School as they may appear—are fortysomething baby boomers whose peers are home in the 'burbs watching Peter Noone on VH1. As societal misfits, however, they've changed the pop music landscape while making Queens—and the world—less boring.

Mike Bieber

Waiting for Herb

The Pogues
 CHAMELEON 61598-2

Shane McGowan is a man who took the slurring of words to new musical heights. And as frontman/stooge for The Pogues, it was Shane who gave this North London amalgam of Irish traditionalism and British punk most of its irrefutable charm. But Shane is gone, currently drying out and contemplating life without teeth. In his place is Spider Stacey, doing his darndest to maintain the attitude of McGowan-era Pogues, with mixed results. Stacey's not a “strong” singer; his voice gets diffused by producer Michael Brook's all-over-the-place mix, and except for “Big City” and



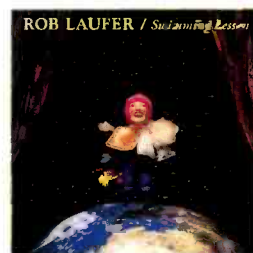
“Modern World,” the punkism takes a back seat to traditionalism, leaving The Pogues' gestalt indefinitely on hold. But then there are songs good enough to want to hear again—“Once Upon a Time,” “Pachinko,” and especially “Modern World”—and you realize this mess ain't bad at all. But The Pogues still need Shane.

Mike Bieber

Swimming Lesson

Rob Lauffer
 EYE E2201

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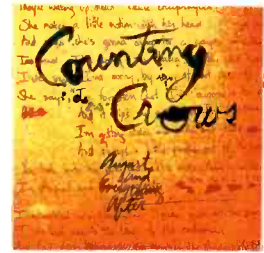
based Rob Laufer and his debut album, *Swimming Lesson*, are a perfect example. Guitar rock with a nod to Richard Thompson, The Beatles, and The Band, *Swimming Lesson* is a home recording in which Laufer plays and sings nearly everything, yet the result sounds like a lavishly produced studio job. His songs, from the opening epigram "Summer Bloom" to the anthemic "This Is Our Life" and on throughout the set, are thoughtful as well as smartly executed. Laufer's got the goods. (Eye Records, 8391 Beverly Blvd., #263, Los Angeles, Cal. 90048.)

Michael Tearson

August and Everything Else

Counting Crows
DGC DGCD-24528

Anytime I see T-Bone Burnett credited as producer, the disc leaps to the top of the pile. He always works with artists who have something genuine and fresh in them, artists with terrific song skills. This time, San Francisco's Counting Crows fit the bill perfectly. Their songs, mostly written by vocalist Adam Duritz, have involving melody lines and lyrics that tell stories well and paint vivid characters. "Mr.



Jones" is a dialog with Bob Dylan's character from "Ballad of a Thin Man," and so helps point where Counting Crows come from musically. A strong album, end to end.

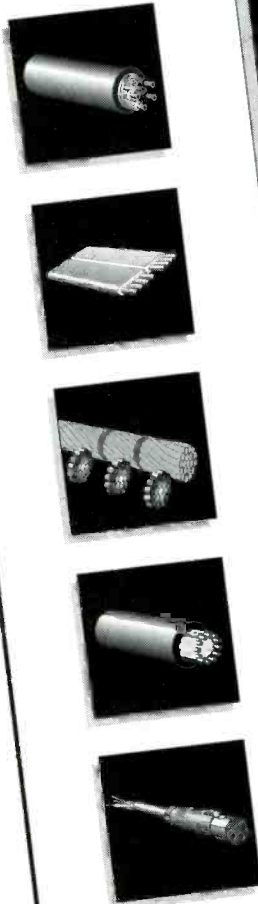
Michael Tearson

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Bohemia

Mae Moore
TRI-STAR/EPIC WK 57373

The gamesque Mae Moore has not been easy for me to pin down. Her album has been enchanting me for a month while slipping like mercury away from my words. *Bohemia*, produced by Steve Kilbey of The Church, is an album of shimmering, somehow exotic, and surely adult pop music. Moore's sultry, smoky voice animates her songs and their rich vocabulary. Kilbey's settings and Moore's vocals cast the songs somewhere out in Rickie Lee Jones/Joni Mitchell country. Very definitely an album of real substance.

Michael Tearson



Mezzal Head

Swervedriver
A&M 31454 0129 2

The Swervedriver dream-pop sound carries a vibe of nocturnal studio riffing, as heard in sprawling tracks like "Duess" and "Never Lose

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"That Feeling/Never Learn," both of which last around 10 minutes. Adam Franklin and Jimmy Hartridge, the band's nucleus, create a dizzying pileup of droning guitars and stream-of-consciousness vocals. And somehow, this sonic cauldron yields imagery of diesel engines, dust, and guns, all of which surface in a song like "Last Train to Satansville." If these Brits can avoid occasional self-indulgent prog-rock tendencies (remember Hawkwind?), Swervedriver could lead the pack of sonic guitar bands for the '90s.

Tom Ferguson

FAST TRACKS

Bat Out of Hell, II—Back Into Hell: *Meat Loaf* (MCA MCAD-10699). If you combined Mr. Loaf's bombast with an Andy Lloyd Webber musical, would you get dinner theater? When Mr. Loaf sweats, does it come out as gravy? Will Phil Rizzuto make an appearance on *Bat III*? **M.B.**

Perfectly Good Guitar: *John Hiatt* (A&M 31454 0135 2). As if to say "the honeymoon's over," Hiatt leaves the family home this time out and turns the guitars up, while not neglecting his rootsy and soulful sentimentalizing. A raucous, perhaps grittier side of Hiatt, but one that remains true to his superb sense of melody and emotion. **M.B.**

The Hits/The B-Sides: *Prince* (Paisley Park/Warner Bros. 9 45440-2). Three discs spanning 15 years in the musical life of an ingeniously warped and horny pony called Prince—the same guy whose wardrobe is inspired by Victoria's Secret, who licks his guitar, who plays mind games on whom-ever he can, and who grabs the big bucks at contract renewal time and then declares "I'm retiring." The kid's got chutzpah. **M.B.**

Rumble Doll: *Patti Scialfa* (Columbia CK 44223). Mrs. Springsteen's long-delayed solo album is finally out, a pleasant but very lightweight effort with decent but not very memorable songs. There are clues about personal life here and there, but *Rumble Doll's* *People* magazine mentality is a bore. **M.T.**

Blink of an Eye: *Michael McDonald* (Reprise 9 45293-2). A slickly crafted pop album, but one by a guy blessed with an incredibly soulful voice and a knack for writing excellent songs. It's always refreshing to hear McDonald, and thankfully he isn't obscured by the album's somewhat glitzy L.A. production values. If anything, this is glitzy in a way similar to Donald Fagen's *Nightly*, and that's good glitz. **M.B.**

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JAZZ ~ B L U E S

R E C O R D I N G S

BLACK BUTTERFLY

RUSSELL MALONE

.....

SPIRIT TALK

KEVIN EUBANKS

Black Butterfly

Russell Malone

COLUMBIA CK 53912

CD; 63:41

Sound: A, Performance: A+

Spirit Talk

Kevin Eubanks

BLUE NOTE CDP 0777 7 89286 2

CD; 53:00

Sound: B+, Performance: A

Long ignored by mainstream jazz, the creamy, melted-but-ter smoothness of the archtop guitar and the prancing tingle of fingerstyle acoustic guitar have only recently been rediscovered, as jazz artists return to the allure of good melody and clever

arrangement. While much of this neotraditionalism consists of derivative reworkings of standards, two new releases by Russell Malone and Kevin Eubanks offer fresh visions of the old ways.

Malone's debut, *Black Butterfly*, is an ebullient display of classic technique subtly updated for a faster-paced era. The full-throated sound of this young (31) Georgia guitarist stretches back through time to grab the rich, bassy sound of the masters on a set of original and cover tunes which, except for a swinging, up-tempo "I Say a Little Prayer," have the virtue of underexposure. Malone takes command immediately with

an aggressive tribute to Wes Montgomery, highlighted by nimble, hell-bent lines; next comes a salute to Kenny Burrell, loaded with surprising and delightful intervallic skips that wind up the tension and get you in the mood for more electric improvisations. Whether it's bluesy bends and rapid jumping between fast, angular scales and glissando chords or the gentle, rippling arpeggios of a lullaby, Malone is remarkably precise and expressive. Add the svelte uptown counterpoint of pianist Gary Motley, bassist Paul Keller, and drummer Peter Siers, and you have the makings for as good a trad-jazz guitar record as has ever been cut.

In contrast, Eubanks' *Spirit Talk* shows a more collective approach and finds the pick-less guitarist straying ever further from his familiar fusion voice into realms of acoustic jazz, like Charlie Byrd or Jim Hall. Joined by brother Robin on trombone, alto flutist Kent Jordan, bassist Dave Holland, and drummers Marvin "Smitty" Smith and Mark Mondesir, Eubanks is more an adhesive than a leader, weaving and bobbing in and out of his compositions with busy, jangly acoustic guitar rhythms that hold things on



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Crowes Losing My Religion/R.E.M.



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**The Complete
Blue Note Recordings
of Don Cherry**

MOSAIC MD2-145
Two CDs, 2:01:33

Sound: B-, Performance: A

Thirty years ago, Don Cherry was a musician stuck between avant-garde disciplines of the day, but he ultimately bridged the gap between Ornette Coleman's strident intellectualism and John Coltrane's stormy spiritualism. In the years since re-

leasing his mid-'60s Blue Note recordings, Cherry has reached out across cultures and generations. He has recorded both pure electronic music and meditative invocations and led the way into the world fusion that's now in full bloom, not to mention influencing his stepdaughter, the pop singer/rapper Neneh Cherry.

This remarkable box set gathers Don Cherry's three Blue Note albums, *Complete Communion*, *Symphony for Improvisors*, and *Where's Brooklyn?* These sprawling works shift tempo and mood in Cherry's brilliantly wrought structures for some of the up-and-coming improvisors of the time. The team of bassist Henry Grimes and drummer Ed Blackwell may have been the most unsung unit in jazz; they maintain a

crisp pulse while pushing and probing like dervish surgeons of rhythm. A young Gato Barbieri was making his first thrusts from Argentina, using vocal cries and murmurs, while Pharoah Sanders was in full-throated wail. And then there's Cherry himself, a trumpeter with as distinctive a voice as that of Miles Davis—a brilliant blues-edged clarion call.

In his liner notes, A. B. Spellman makes the accurate observation that Cherry was one of the first recording artists to make albums that suited the LP format, featuring side-long suites with a structured flow. Despite some flutter in the cymbals and distortion on the saxophone, I'd say these three albums have made the transition to CD just as eloquently. (Mosaic, 35 Melrose Pl., Stamford, Conn. 06902.) *John Diliberto*

Don Cherry's three Blue Note albums are gathered on this remarkable set.

course. At times, he carries on a Latin-tinged, syncopated conversation with the cymbals. At others, he steps out for lively interplay with his brother and Jordan, risking bold improvs that threaten to veer into chaos before settling back into the groove. Eubanks, however, neither disguises his impressive technique nor diminishes the verve of the inspiration; significantly, this entire set was recorded direct to two-track.

In a time when exploring roots often appears to be a substitute for original thinking, Malone and Eubanks demonstrate that playing traditional jazz doesn't have to be archeology. *Michael Wright*

Joe Lovano is in the eye of the storm. A journeyman for many years, Lovano is suddenly emerging as one of the more distinctive saxophone voices of the day, and *Universal Language* points to his growth as a composer as well.

Universal Language is an adventurous disc that follows the signposts of '60s jazz experimentation but is tempered with bop and big-band authority. Heading up an ensemble that has two bass players on every

belong together. And it's not just his cogent statements on saxophones and flutes that can scorch and smolder. It's Lovano's conception and his unifying themes that provide his soloists with the space to be free yet the guidance to interact as a unit. *John Diliberto*



Universal Language

Joe Lovano
BLUE NOTE CDP 7 99830-2

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tune, usually the acoustic of Charlie Haden and the electric of Steve Swallow, it's no surprise that this recording has a dark tone. But that's not to say it's somber.

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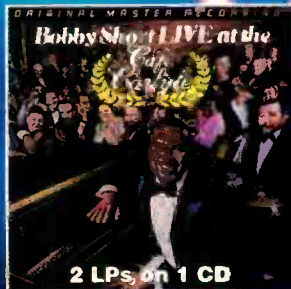
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The Cortège: *Mike Westbrook Orchestra* (Enja ENJ-700722). Mike Westbrook is one of the few composers who could set to music texts from the likes of Federico García Lorca and William Blake without sounding arch. Between the Kurt Weill-inflected vocals of Phil Minton and Kate Westbrook, Mike Westbrook creates integrated arrangements with lots of room for improvisation. **J.D.**

Late: *Alvin Batiste* (Columbia CK 53314). Clarinetist-modernist Batiste offers a startlingly strong session that draws stylistically from his native New Orleans, the blues, bebop, and beyond. With a small-group setting that includes Kenny Barron and Rufus Reid, Batiste delivers "Body and Soul," "When the Saints," a tribute to Ray Charles ("Ray's Segue"), and five other originals. **J.W.P.**

The Duke Recordings, Vol. 1: *Bobby Bland* (Duke/MCA MCAD2-10665). There's no finer blues singer than Bobby Bland, a man who never crossed over to mass popularity, as did Memphis friend B.B. King. This is the first of a chronological reissue of his Duke sides, where producer Joe Scott framed Bland's vocals with the best horn charts outside of Southern soul bands. Future volumes will no doubt be even better, but the magic was there from the beginning. **R.G.**

A Blue Deeper than the Blue: *Garrison Fewell* (Accurate AC-4700). The debut of a Berkeley School of Music jazz guitar professor whose mature lines are unhurried yet spontaneous, gently swinging, and deeply felt. The first-rate trio—including Fred Hersch's luscious piano—is so well recorded you won't know this album is a live club session until you hear the well-deserved applause. (Accurate, P.O. Box 390115, Cambridge, Mass. 02139.) **H.M.**

Dance with the Ancestors: *The Ethnic Heritage Ensemble* (Chameleon 61494-2). Ed Wilkerson's deliberate if gruff tenor sax, Joseph Bowie's throaty trombone, and Kahil El'Zabar's delicate but emphatic hand percussion merge compositionally to prove that jazz tradition is open to reinterpretation. **H.M.**

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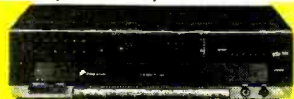
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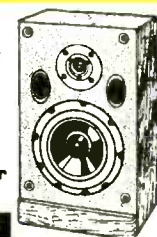
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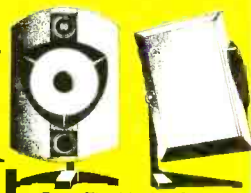
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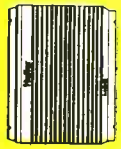
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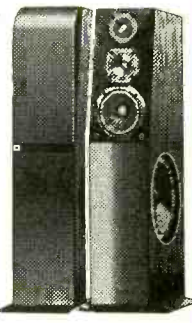
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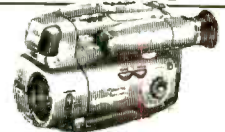
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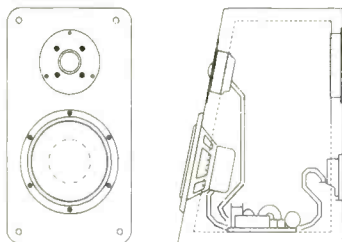
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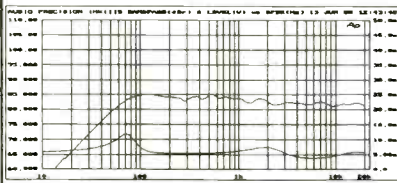
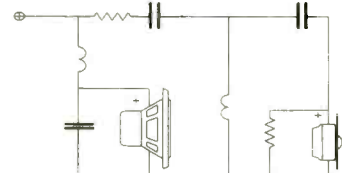
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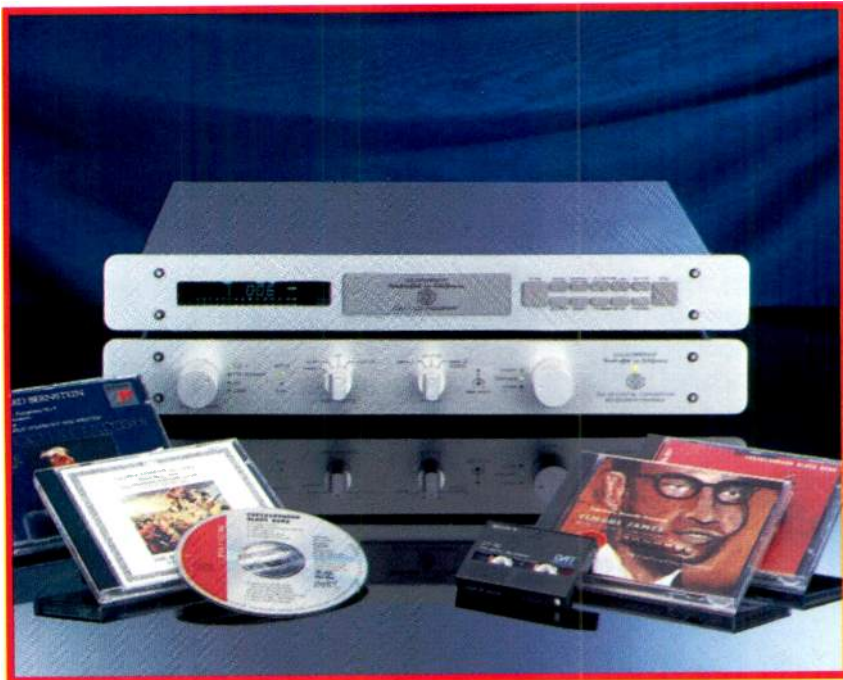
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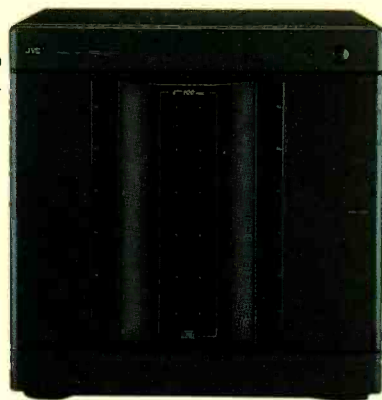
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