

The Audio Critic®

Retail price: \$7

In this issue:

We immerse ourselves totally in the digital scene, with further probing of CD players (including unexpected double-blind listening results), plus our first DAT test.

We review a \$4500-a-pair loudspeaker system, which is paradoxically an engineering masterpiece and at the same time a slightly disappointing listening experience.

For the first time since our resurgence, we make some tentative reference system recommendations.

In the belief that multimedia installations are the wave of future, we broach the subject of (surprise!) video equipment with the review a costly projection monitor.

Plus other reviews, articles, and features—and our new column on hot air, bull, and hype in the audio press.

The Audio Critic

Issue No. 12

Summer/Fall 1988

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Consulting engineers and other technical advisers are engaged on a project basis, some contributing under their by-lines, others working anonymously.

The Audio Critic® is an advisory service and technical review for consumers of sophisticated audio equipment. It is published at approximately quarterly intervals by The Audio Critic, Inc. Any conclusion, rating, recommendation, criticism or caveat published by **The Audio Critic** represents the personal findings and judgments of the Editor and the Staff, based only on the equipment available to their scrutiny and on their knowledge of the subject, and is therefore not offered to the reader as an infallible truth nor as an irreversible opinion applying to all extant and forthcoming samples of a particular product. Address all editorial correspondence to The Editor, The Audio Critic, P.O. Box 978, Quakertown, PA 18951. (Note new address.)

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For subscription information and rates, see inside back cover.

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Note: All unsigned articles and reviews in this issue were written by Peter Aczel, Editor and Publisher.

From the Editor/Publisher to Our Subscribers:

This time we are seriously late, and about the only positive thing we can say about it is that the reasons for it are singular and nonrecurrent. The unbelievable heat wave of August, which broke all records in the Northeast, was the least of our problems, but it did slow us down considerably just when maximum effort was needed. More consequential was our move from Westchester County, New York, to Bucks County, Pennsylvania (see also below), which took up a great deal of our time, partly in real-estate negotiations, partly in packing and other mundane but time-consuming maneuvers. The primary slow-down factor, however, was the continuing shortage of acceptable contributors and of suitable everyday help. This was supposed to be the issue your Editor would no longer have to start and finish single-handed from upper left to lower right, but the planned and expected assistance was woefully delayed, although the next issue will in all likelihood show some evidence of it.

Here, then, is where we stand. To remain in touch with reality, we have to call this issue Summer/Fall 1988. Issue No. 13 will be called Winter 1988-89 and should be in your hands by midwinter. At that point we are still going to be one issue (and a fraction) behind schedule, and it will have to remain that way for some time. A regular quarterly schedule in 1989 should be feasible; our projected bimonthly schedule will have to wait a year until 1990. Quality before quantity seems to be our destiny, not just our option.

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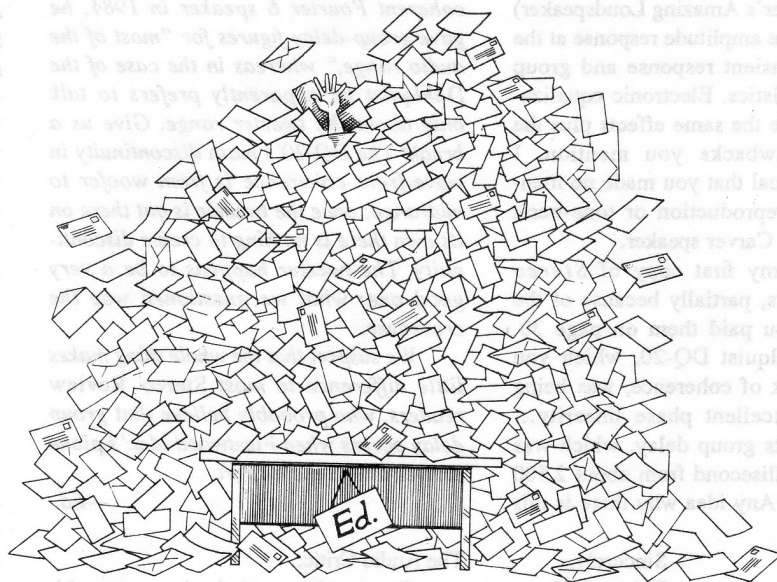
As for our change of headquarters, it was time to move. The Greater New York area is not getting any more enchanting; real estate values are peaking; our house was much too big, old, and highly taxed. With the children grown and gone, we longed for something smaller, newer, and more practical, with a bit more acreage for our big dogs. We found the perfect place just on the edge of Quakertown, Pennsylvania; even our sound room promises to be superior, once it is finished, to our pretty nifty old one. Please try to remember that we have a new address; it appears on the opposite page just before the letters, as well as on our masthead and on the inside back cover right after the subscription information.

* * *

*We have settled on a word we intend to use from now on to describe the difference between our kind of equipment reviewing and what is standard in the other "alternative" audio journals. The word is accountability. That is the ingredient so glaringly missing from assertions to the effect that component A has a much better midrange than B, with no other documentation than the exquisite hearing of the reviewer. You think B has the better midrange? Then you are deaf, sir, and the golden-eared pundit owes you no explanation. Were A and B available side by side and played at the same level? No information on such trifles. Was the comparison blind or double blind? Fat chance. Any measurements or other technical data offering a clue as to the difference in midrange quality? Go to Julian Hirsch for hack stuff like that. The message is that accountability is for accountants, not for audio critics. It is, however, absolutely the most important thing for *The Audio Critic*. What we say is what we believe we can account for.*

Box 978

Letters to the Editor
(Please note new address!)

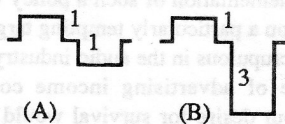


We have been getting exactly the kind of mail we want for this column, so we must conclude that our ground rules for publishing letters as set forth in No. 10 and No. 11 have sunk in. Let us reiterate that any communication of serious editorial interest coming from a reasonably credible source is likely to be published. Letters may or may not be excerpted, at the discretion of the Editor. Ellipsis (...) indicates omission. Address your letter to The Editor, The Audio Critic, P.O. Box 978, Quakertown, PA 18951.

The Audio Critic:

Referring to some of your comments in Issue No. 11 regarding the audible significance of D/A errors of the order of a few LSB's, I thought that you might be interested in our findings. (Namely the paper presented at the 84th Convention of the Audio Engineering Society in Paris, March 1988, "Are D/A Converters Getting Worse?" by Stanley P. Lipshitz and John Vanderkooy, a preprint of which was enclosed with the letter.—Ed.) As you will see, many current CD players (even expensive ones) have errors of 4 bits or more. As you'll see on p. 35, we believe these to be audible on suitable music at normal levels, and thus too large. We would like to see D/A errors at low levels held to under 1 LSB.

By the way, I disagree with your statements in the 2nd paragraph of the 2nd column on p. 34 of Issue No. 11 that on the -90.31 dB dithered signal a 3 dB level error amounts to a 1/2-bit error, 6 dB to a 1-bit error and 12 dB to a 2-bit error.



The -90.31 dB signal is 2 LSB's high, (A) ideally. A 2-bit monotonic error on this

results in (B), which to first order is twice as large and will have a fundamental component about 6 dB (not 12 dB) too large. This is, of course, approximate, as this is a severely distorted reconstruction. See, for example, Fig. 38 of our preprint. A 16-LSB monotonic error results in a level error of about 20 dB due to the peak-to-peak signal amplitude being increased from 2 LSB's to 18 LSB's. You're thinking of 6 dB per bit—but this is number of bits in binary word, not number of LSB's in signal.

I'd like to suggest that you try to duplicate some of our experiments and see what you think is acceptable in terms of low-level ("crossover-type") linearity errors. I'd be interested to hear what you find.

Good luck with the resurrected publication. Some sanity is all too rare in this field of popular publishing.

Yours sincerely,
Stanley P. Lipshitz
Audio Research Group
University of Waterloo
Waterloo, Ontario, Canada

Thank you for the paper; its reputation had already reached us by the time we received your preprint. It is without doubt the best, most complete and most interesting investigation so far of the key issues in

digital-to-analog conversion; CD player testing will never be quite the same again, at least not in our laboratory. (Our readers are directed to the digital article in this issue for further details and comments.)

It is most kind of you, as a professor of mathematics and distinguished audio theoretician, merely to "disagree" with our sloppy digital arithmetic when you could have subjected us to a withering put-down, such as we have occasionally deemed fair play under comparable circumstances. We stand corrected, of course, and our only excuse is the pressure of time, the parenthetical bit numbers having been inserted into the paragraph in question as a last-minute editorial afterthought just before an already delayed issue went to press. Our overall conclusions, however, remain unaffected by these computational lapses. (Again, see the digital article in this issue for emendations.)

Needless to say, we are proud and happy to have you among our well-wishers for whatever reason, but we think the main polarization in "popular" audio journalism is not sanity vs. craziness but accountability vs. irresponsible self-indulgence.

—Ed.

The Audio Critic:

I would think that raising the Q of the drivers to compensate for dipole cancella-

tion (as in Carver's Amazing Loudspeaker) would flatten the amplitude response at the expense of transient response and group delay characteristics. Electronic equalization would have the same effects plus the additional drawbacks you mention. I thought it unusual that you made no mention of pulse reproduction or tone-burst testing with the Carver speaker.

I bought my first copy of *Stereo Review* in years, partially because of the compliment you paid them on page 30. There the Dahlquist DQ-20, which you blasted for lack of coherence, was being lauded for "excellent phase linearity... confirmed by its group delay, which was within ± 0.2 millisecond from about 2,500 to 28,000 Hz." Any idea why there is this discrepancy?

Sincerely,
Robert S. Green
Palatine, IL

You appear to have missed the main point of the Carver bass design. The open baffle is, in effect, equivalent to a very low-Q enclosure for the high-Q drivers. The resulting system Q comes out in the right place, analogously to the more familiar case of a low-Q driver in a conventional high-Q box. Since it depends on the self-cancellation of opposite-phase wave launches, the desired system Q of the Amazing comes together only at some distance past the nearfield, but that is where you sit, and there the transient response of the bass system has the appropriate lower-Q characteristics. Electronic equalization, as in the Enigma or Celestion 6000, is the brute-force way to achieve the same end result in an open-baffle system when starting with low-Q drivers.

The Carver speaker has a single crossover at 100 Hz, low enough to make pulse coherence a moot point, as we explained. At higher frequencies the monolithic ribbon is of course coherent, being driven in phase over its entire surface. Its tone-burst response is fine.

As for Stereo Review, you must understand that Julian Hirsch is a bit uncomfortable with loudspeaker testing because some loudspeakers are devastatingly superior to others and that goes against the editorial grain of the magazine. He uses some kind of personal-computer software with FFT capability and gets an automatic readout of group delay, which he then reports only for the range of frequencies in which the figures are acceptable. For example, when he reviewed our own highly

coherent Fourier 6 speaker in 1984, he gave group-delay figures for "most of the audio range," whereas in the case of the Dahlquist he apparently prefers to talk only about the tweeter range. Give us a break! The DQ-20's main discontinuity in wave-front coherence is from woofer to midrange; once the tweeter is out there on its own there is nothing to create discontinuity. The tweeter happens to be a very good one; what we questioned was the crossover.

We suspect that the whole thing makes little difference to most Stereo Review readers, who probably believe that group delay occurs when Fleetwood Mac's plane arrives late at the airport.

—Ed.

The Audio Critic:

Great to have you back at your old, enlightened, technical, acerbic self. Stay nasty!

But—how dare you print the cartoon on page 15 of Issue No. 11 and still have the audacity to print the warning on the inside front cover that reads, "Reproduction in whole or in part [of the contents] is prohibited... The Audio Critic will use *all* [emphasis mine] available means to prevent or prosecute any such unauthorized use of its material or its name." Does "all" include the FBI? Are your "talents" more worthy of protection than Emmylou Harris's? May I copy The Audio Critic for my indigent relatives for significant holidays? Or is it only OK for "mom"?

Sincerely,
Alex Zonn
Los Angeles, CA

P.S. Tom's cartooning abilities have certainly improved. Will we be seeing his work in the Los Angeles Times soon? Will they (his abilities/talents) be worthy of protection then or are they now?

First of all, we are unaware of being nasty, but it is possible that in Southern California any civilized individual is perceived as having a streak of nastiness.

Secondly, your ellipsis slyly eliminates from our masthead the key words, "without the prior written permission of the Publisher." Such permission has always been granted in the case of articles and reviews reproduced in their entirety and of short quotations without obvious out-of-context falsifications of meaning. As for bootleg Xeroxes, we believe that in the long run they bring in more new subscriptions than they circumvent, a business

philosophy shared by the publishers of personal-computer software without copy protection, to name just one enlightened example. The original uptight Emmylou Harris of underground audio publishers was actually J. Peter Moncrieff, who in 1980 and 1981 had his IAR Hotline! printed on Xeroxproof red paper in green ink, until he realized that his subscribers were going blind trying to read his reviews and that pirating the latter was not exactly a top priority of the underworld.

Lastly, Tom was only 15 years old when we stopped publishing; now he is 22 and about to graduate from the School of Visual Arts in New York, so it behooves him to show an improvement. It so happens that Sci-Tech Information, a bulletin of the National Bureau of Standards, requested and was given permission to reprint the comic strip in question free of charge, and Tom did not throw an Emmylou tantrum.

Thank you for your concern about these matters.

—Ed.

The Audio Critic:

Having recently completed reading [Issue No. 11] of The Audio Critic, it occurred to me that you may have overlooked another, and perhaps more potent, argument than that you have already advanced in support of your new advertising policy.

As I understand the position, your "old" policy was based upon the potential conflict of interest between your ethical responsibilities as a journalist on the one hand, and your desire to run a profitable and financially viable enterprise on the other.

As you have conceded that the lack of advertising revenue may have been a significant factor in the demise of the original Audio Critic, and given that you presumably do not wish to repeat that failure, there would exist a real risk that you may now be deflected, consciously or otherwise, from your obligations as a journalist in accepting paid advertising.

However, it could be argued that a continuation of the old policy carried just as great a risk of corruption, in that the special reputation you may develop through the implementation of such a policy would make you a particularly tempting target for the unscrupulous in the audio industry. The absence of advertising income coupled with your desire for survival would place you in a different, but equally insidious, conflict of interest.

In the final analysis, we are wholly dependent on the ethical standards of you and your staff.

It is therefore of some considerable concern to me to note what appears to be a significant breach of faith on the part of The Audio Critic, ironically as a result of advertisements in magazines such as *Stereophile*, apparently placed by, or on behalf of, The Audio Critic.

Specifically, I am referring to the series of advertisements informing readers of the imminent resurrection of your publication. Such advertisements clearly stated that the same "editorial format" would be followed in the new magazine as the old.

I take it that you would not dispute that advertising policy falls within the ambit of "editorial format." I also take it that you would not dispute that such was a fundamental plank of same.

As these advertisements ran for a lengthy period of time without any correction or disclaimer, it is difficult to accept that you had been unaware of their content. Indeed, your recent comments in [Issue No. 11] show that it was a matter to which you had adverted your mind, and anticipated criticism.

Even when viewed in the most favorable light, the advertisements were misleading. It was to be "just like the (good) old days," or so we thought!

In the absence of any indication that the change in advertising policy took place after the placement of those advertisements, the inference that you knowingly allowed the publication of false or misleading material is almost irresistible.

This is a matter of real concern to me, and no doubt to many of your readers—it goes directly to that most vital of issues: your credibility. If you are able to provide a benign explanation, I would be most grateful to hear it.

Yours faith fully,
Clive P. Locke
Sydney, Australia

Our comprehension of Australian manners and mores extending very little beyond Crocodile Dundee, we are not sure whether you are serious or just pulling our leg. Are you just parodying the exquisite fraternity of hairsplitting ethics buffs (high-end audio subchapter), or are you a down-under blood brother of Marc Richman (see Issue No. 11, p. 6), fiercely guarding our morals, always hoping to catch a bishop in the whorehouse?

Well, we have news for you, mate. Not

one of our readers, other than yourself, has written or spoken to us so far regarding this "matter of real concern." To us, the words "editorial format" denote the physical appearance (size, layout, typography, etc.) and general approach to writing (style, features, columns, recurrent subjects, etc.) of a publication, not its business policies or sources of revenue. Had we felt that our decision to accept manufacturers' advertising would be a red-flag issue to potential subscribers (as it turned out not to be, not even marginally), we would certainly have announced it, even though no pages had been sold yet when our original classified ads were written.

We love your implicit suggestion that taking bribes was as great a danger under our old policy as becoming a lackey to the advertiser is now. You have a wonderfully dirty mind, and it has been said that a dirty mind is a perpetual feast. The conspiracy theory of audio reviewing, paranoiac and tiresome as it is, will never die because outsiders have no idea how little money there is in being dishonest in this business.

Of course, it is possible that all we have here is a bit of semantic confusion. Maybe "editorial format" has a totally different meaning to an Aussie. We have no idea what "Waltzing Matilda" means, either. G' day, mate.

—Ed.

The Audio Critic:

...Your reentry into the world of publishing promises many an interesting and controversial discussion.

I note with interest, for instance, your latest position statement on amplifier (and preamplifier) "sound," perhaps prompted by your experience with Bob Carver's massaging of one of his amplifiers to sound "exactly like" another. Based on this, and other experiences with ABX comparison, you now conclude that in the absence of level or frequency-response differences beyond 0.15 dB, or gross distortion mechanisms, any and all amplification is provably indistinguishable from any other of the same variety (i.e., power amp compared to power amp).

(Not quite. What we suspect, rather than conclude, is that any claim of audible differences under said conditions will remain unprovable. Slight difference.—Ed.)

...I cannot disagree in principle with your conclusions, as far as they go. I have long since grown weary of the fatuous statements of the "measurements are meaningless" variety, ascribing Olympian feats

of imaging, depth, stage width, etc. to the poorest-performing products, in language more suited to an Elizabethan suitor than a reviewer of electronic hardware. I have long believed that a better-measuring product will tend to sound better, and vice versa. In short, accuracy is the goal we have pursued, and accuracy can be demonstrated empirically.

It is, as you have found, relatively easy to set up a so-called double-blind test, carefully matching levels, and to conclude on the basis of statistics that no reasonably accurate amplifier is able to be sonically trounced by another. To conclude, in fact, that audible differences, if they exist at all, are so trivial as to beggar description or concern. We, in our own double-blind listening test, can prove nothing else. This is among the reasons we have always said that products of this type should be selected on the basis of demonstrated reliability, proven customer-oriented service policies, observable quality of componentry, rational pricing structure, intelligent engineering, projected resale value and company integrity, as much as sound quality. But we do include sound quality in our list of purchase decision criteria, careful not to make grandiose claims for our own gear, or to denigrate any other, merely admonishing the prospective customer to listen carefully, at leisure. Observe how one reacts to the music, not necessarily trying to "hear" the electronics.

Why? Because we have been, as manufacturers, privy to information which an audio reviewer, professional or otherwise, would have no way of duplicating.

A little background is in order here. We have long held to the belief that "new, improved" model designations for every minor tweak in the construction of a product are a cynical, shortsighted marketing strategy. Thus, we have always merely included improvements in our products in the normal manufacturing process, with no announcements or model-number changes. This has given us some unique opportunities to observe unsolicited reactions to the same products, but with improved (measurable) performance. The results have been instructive. In one very early example, we discovered that a resistor in the feedback loop of our amplifiers had a temperature coefficient which showed up in the THD measurements at low frequencies because of the relatively long heating and cooling times, actually changing the gain minutely twice for each cycle, thus showing up as a harmonic component. The heating/cooling

cycles integrated over the waveform at higher frequencies, thus the measurable effect disappeared above about 100 Hz. Keep in mind that we are talking about a mechanism which was rather subtle in its action, generating a worst-case increase in THD of less than 0.005% at 20 Hz, full power, and proportionately less at lower output or higher frequencies. We had not been in production very long at this point, over 10 years ago, and we were a bit embarrassed that this phenomenon had escaped our attention even as long as it had. We substituted a low-temperature-coefficient metal film resistor in this spot in production, with no announcement, naturally, of any kind. Over the next month, we had at least one call per day, sometimes two or three, from our dealers all over North America asking, "What did you guys do to the bass? It sounds tighter somehow, better defined." My initial reaction was to dismiss this as coincidence; *nobody*, I thought, could possibly *hear* a change that minute, especially with no reason to suspect there was a change in the first place. But as I continued to field the calls from dealers, I finally started wondering if it was possible, provable or not.

The concept was intriguing enough that we decided to test it on a more or less formalized basis. If and when improved technology made it possible to measurably advance the performance of our products, we deliberately made no mention of it to anyone, but just shipped it in place of the older circuitry as production continued. In each case, we had a flurry of contact, by phone and letter, asking about or mentioning the "smoother top end," or the "overall increase in transparency," depending on where the actual specs had changed.

It almost became an in joke at the factory. "Don't make that change in the circuitry until next month; we're too busy and we haven't got time for the phone calls right now."

A couple of years ago, in an extreme case, we revamped the entire output section of our amplifiers, to a configuration we call "quad-complementary," whereby we use complementary pairs of output devices on *each* side of the power supply, with each complementary pair fed from a single driver transistor. This negates the minor but measurable differences in overall characteristics between NPN and PNP transistors, and very much linearizes the transfer function, especially around zero crossing. It reduced the THD and IM numbers across the band by about 6 dB, or a factor of 2,

while tilting the distribution of the remaining distortion downward to reduce the contribution of the upper harmonics much more than just THD numbers would suggest. Needless to say, we expected a reaction, and we got it. It was not mild.

One dealer's reaction was typical. "I just got a new 4B amp in and decided to hook it up in my demo system and cycle out the one I've been using the last few months. I want to return the older one because now I believe it's defective." One dealer got in an example of the new production and phoned immediately to order a replacement for it. He was going to take it home and never sell it because he was afraid it was a fluke we could never duplicate!

Obviously, all the above boils down to anecdotal evidence and is by its nature unprovable. Yet we cannot deny that it happens, time and again. It is maddening that we could probably set that same dealer, who was going to take the "fluke amplifier" home, in front of an ABX-box system and derive nothing but guesswork statistical results. Yet he didn't call us the week before, or the month before, when there were no changes. He called us the minute he first hooked up the new circuit, with no advance notice it was even there, practically shouting at us over the phone, along with literally dozens of others. We have had to resign ourselves to existing in what I have come to call "a Zen world of dual realities." We don't express an opinion on this; we merely improve our product wherever and whenever we can, observe the results, and wish we could "prove" that it makes an audible difference.

As an aside, if this second reality has any pertinence to your tests with amplifier nulling, such as the original Carver vs. Levinson setup, whereby you were able to obtain a momentary null as deep as 74 dB, it would be this: Keep it in mind that the best amplifiers have distortion spectra 95 to 100 dB below the music, and a null of 70 to 75 dB still allows for differences of considerably more than an order of magnitude in distortion mechanisms. A null of 70 to 75 dB consists of equalizing out frequency-response and phase-shift differences, and as you pointed out, it is in essence a one-way street. A reasonably good product can be brought down to the level of a relatively poorer one, at least within the rather broad limits a 70+ dB null constitutes. Going in the other direction is obviously quite a different story. No amplifier with a -75 dB distortion spectrum (about 0.02%, well

within the realm of the big true-class-A amps) can ever "null" better than that against a product with -95 dB broadband spuriæ, no matter how much tweaking is done. If people are even unconsciously responding to that last 20 to 25 dB, no amount of observable, provable, empirical data is going to convince them it all sounds the same and to look elsewhere for the real answers to their questions about sound quality.

Sincerely,
Christopher W. Russell
Vice-President, Engineering
Bryston Ltd.
Rexdale, Ontario, Canada

Those of our readers who still have a copy of Vol. 1, No. 4 stashed away somewhere may find it amusing to go back to your 11-year old letter on p. 42, Chris, and note your Faustian evolution from high-tech quest to spiritual enlightenment.

Since you do not disagree with us in principle, we might as well accept your "anecdotal evidence" at face value. Of course, anecdotal evidence also exists in support of extraterrestrial visitors, faith healing and levitation, all of which would be almost as nice to believe in as the audible superiority of amplifiers with "-95 dB broadband spuriæ."

We have an article in this very issue on the subject of conventional/traditional audiophile wisdom vs. double-blind listening tests, so it would be redundant for us to put forth the same thoughts here. Let us merely observe in passing that your "Zen world of dual realities" is far too good for the high-end audio business to be entirely above suspicion, although we do believe that your excellent products are also viable in a Cartesian world of certitudes.

—Ed.

The Audio Critic:

It's wonderful to have you back. A major difference between The Audio Critic and most other alternative audio publications is that you are more often able to give reasons why one item sounds different from another, rather than merely observing that there is a difference. Your voice has been sorely missed.

... Why isn't the output of a vent misaligned in the time domain with the driver's output. Surely it must take *some* amount of time, no matter how minute, for the sound waves to travel from the back of the driver to the vent outlet. How then can this sound possibly be properly synchro-

nized with that driver's direct radiation?...

Sincerely,
Douglas Weinfield
Silver Spring, MD

Vive la difference between us and the undisciplined subjectivists.

At very low frequencies, where the vent is active and where the wavelength is incomparably greater than any of the various dimensions and spacings of the system, the driver and vent can be regarded as a single coincident source with an output equal to the vector sum of their individual outputs. This has been explained more precisely and in greater detail by both Beranek and Small. Your fear of nonsynchroneity stems from popular caveats applicable only to considerably higher frequencies with shorter wavelengths.

—Ed.

The Audio Critic:

I was pleased to note in your review of the Hafler XL-280 that you found it to be a fine amplifier. I was disappointed, however, to note that you tried to disparage our concept of trying to make the amplifier indistinguishable from a straight wire. This is inconsistent with your previous writings on this topic.

When Bob Carver doctored his amplifier to make its sound identical with a Mark Levinson model, you praised this technique. Now, when we have made our amplifier indistinguishable from a straight wire, using an identical concept, you condemn it.

Of course, "straight wire" is a figure of speech. What we are really saying is that the output of the amplifier should linearly follow its input at all frequencies and at all dynamic levels. That would be the ideal amplifier—a goal which is impossible to achieve. Fortunately, in practice we need only achieve this for the audible frequency range, and this is possible as demonstrated with the XL-280.

With the XL-280, the difference signal between amplifier and "straight wire" is down better than 70 dB and is inaudible when listening to "normal" signals such as music or white noise. I concede that with wider-band, more dynamic signals, and with better-quality transducers and ancillary equipment, plus sharper ears, the difference signal *might* be audible. That is a problem for the future. For the present the XL-280 can be demonstrated to be a very accurate amplifier—more accurate than any which we have tested to date.

You have criticized the XL-280 as not having a flat response *outside the audio range*. This was done, of course, to make a better amplifier *within* the audio spectrum. The trimmer which modifies the ultrasonic response adjusts the phase shift in the upper audio range and compensates for the change in phase shift which occurs with different loudspeaker loading. We have found that changing the high-frequency load, as happens with loudspeakers, causes small response variations in the audio range. These variations are one of the causes of sonic differences between amplifiers which are affected differently by different loudspeakers. Our trimmer permits reduction of this amplitude distortion so that the amplifier's performance is closer to that of a straight wire and can be optimized for a specific loudspeaker.

The effects of this trimmer capacitor are audible with some program sources and some loudspeakers, so the adjustment is meaningful.

The small rise in frequency response above the audio band brings the phase shift close to zero within the audio spectrum. There is a question as to whether phase shift is audible, but minimizing it certainly cannot be detrimental.

You refer to "scientific truth" calling for a "perfect" amplifier to be a low-pass filter having flat response up to a certain high frequency (unspecified) and rolling off with a controlled slope (unspecified) above that point. What authority has pontificated this "scientific truth"? Who can say whether a roll-off is better or worse than a rise in response? Does a spike on the leading edge of the square wave sound better, worse, or the same as a rounded corner due to a roll-off?

Fortunately, we do not have to answer these questions. The Straight-Wire Differential Test bypasses them. If the sound output from the differential comparison between amplifier and straight wire is inaudible, the amplifier is accurate regardless of whether its ultrasonic response is flat. The logic is irrefutable—an inaudible null means the amplifier sound cannot be differentiated from that of the straight wire, and that is as good a reference standard as can be found.

If you yourself believe what you have written about the Carver comparisons with various amplifiers, then you must accept the validity of the straight-wire comparison. Of course, some fine amplifiers might fail the test strictly on the basis of some relatively unimportant phase shift. Howev-

er, the amplifiers which pass it, such as the XL-280, should be praised for their design achievement.

Sincerely,
David Hafler
The David Hafler Company
Pennsauken, NJ

Let us not forget, first of all, that what we are disputing here is a very narrow strip of purely conceptual territory. The disagreement between us is for the most part academic, rather than the typical reviewer vs. manufacturer hassle about hardware, so there is really no reason for tempers to rise. "Pontificate" seems to us a bit ill-tempered (although we are not familiar with it as a transitive verb), so we want to make it quite clear, Dave, that we are on your side on nearly every issue in audio and have been so inclined ever since our original audio mentor, Stew Hegeman, told us in the mid-1950's that "when Dave Hafler tells me something about an amplifier, I know it's a fact without having to check it myself." You have no cause to regard us as an adversary.

That said, we are just about as uncomfortable with the concept of your SWDT after your letter as we were before, despite the almost irresistible chutzpah of your suggestion of a resonant condition as no less valid than a nonresonant one when modeling the ideal transfer function. Why not, indeed? On what marble tablet is it engraved that our theoretical low-pass filter must have a low Q ? But wait a minute, a straight wire does not have a resonance at 365 kHz with a Q of 2, does it? It does not impose a leading-edge spike on a square wave, does it? What you are really saying, at least as we hear it, is that the amplifier should be like a straight wire within the audio range and, by necessity, like a very kinky wire above the audio range. That is a most inelegant model to our mind, and we cannot buy it. What we discern here is a kind of self-fulfilling prophecy: you structured a specific test which your amplifier then passed with flying colors.

The true bone of contention here is the audibility of those small phase shifts at the highest frequencies of the audio spectrum, or more simply and precisely the audibility of the small but inevitable signal delay through the amplifier. You are a bit schizoid about this, going to unprecedented extremes to wash out the delay while obviously doubting its audibility in actual performance. We say, leave it alone. It is as

natural a part of an amplifier's attributes as your shadow is a part of yours—and just as harmless. That, incidentally, was the basic position we took regarding Bob Carver's input/output null test (his "other" test—see Issue No. 10, p. 36, 2nd column, and p. 37, Fig. 2). There is absolutely no inconsistency in our views here; the "praise" you remember had to do with his main null test, the one we were primarily focusing on, which proved that two totally different amplifier circuits could have exactly the same transfer function. That had an important demythologizing effect. Being critical of your trimmer does not mean we are against null tests all of a sudden.

To repeat, this Lilliputian controversy does not change our generally favorable opinion of Hafler engineering and Hafler products; we still believe, however, that the SWDT is essentially a marketing concept.

—Ed.

The Audio Critic:

Thank you very much for the review of the Win FET-10 cartridge and your kind words about me and my work in general. I am flattered, and perhaps a little embarrassed, by your characterization of me as "the most sophisticated of phono technologists." I must confess in all honesty that considering the amateurish design work which prevails in cartridge and turntable technology today, sophistication within this realm is quite relative.

I was also a little surprised by your discussion of the decline of the phonograph. I think the decline most worth discussing is in the general quality of recorded music brought on by the widespread adoption of imperfect digital systems by the recording industry. I am certainly not against digital, and I do not propose to freeze the technology, but I truly believe that a strong case can be made for analog by some fundamental rethinking of the basic design of playback systems.

On the basis of my fundamental research, the vinyl disc still has the ability to store a signal and redeliver it on playback equipment with a level of quality surpassing that of all other systems currently available or projected...

...While it is true that the phono equalization sections of all preamplifiers have tremendous amounts of phase shift between 20 Hz and 20 kHz, this phase shift exactly complements the phase shift of the pre-equalization circuits used in cutting records. So with a well-recorded vinyl disc

and a well-designed preamplifier, the system phase response is nearly perfect. In a system like the Win FET-10 cartridge, which is an amplitude sensor, and with the RIAA preemphasis characteristic not far from constant amplitude, this phase shift is almost nonexistent, thanks to the absence of the violent equalization networks necessary with most moving-coil and magnetic cartridges.

In regard to the frequency response and channel separation which you perceived in the FET-10, our research has shown that test records suffer from inaccuracies within this spectrum. Most cartridge manufacturers use the Brüel & Kjær equipment with their test records QR 2009 or QR 2010. Although B&K is the dominant equipment, there are other test records based on the General Radio recorder, viz. the CBS STR series.

We used our B&K equipment with the following test records to substantiate your findings in the review of the FET-10: Denon 7001, JVC TRS-1007, AT-6005, B&K QR 2010. As a further check on our measurements, we had data run on the same cartridge using the General Radio recorder and the CBS STR-100, 170 and 112 test records. The chart of the channel separation data is provided. It can be seen that the Japanese test records yield higher separation figures, in general, than the CBS test records, outstripping them by 6 to 10 dB at 1 kHz. Only the JVC TRS-1007 test record provided a channel separation figure that is close to our exciter measurements.

...An oscilloscope trace of the test cartridge from the CBS STR-112 square-wave test record [shows] the characteristic ringing that many magazine reviewers attributed to resonances in cartridges that they have tested over the past two decades. To examine this hypothesis, the disc was played at different speeds from the standard 33.33 RPM. If the ringing was indeed the artifact of our test cartridge, its frequency would remain fixed. If recorded onto the disc, its frequency would change

in proportion to the difference in speed; the frequency did change, and we therefore concluded that the ringing was cut into the disc. Subsequent examination of the groove walls with an electron microscope confirmed our findings. This ringing is characteristic of the Westrex lathe system used in the production of CBS STR test records... The square-wave signal produced by the same cartridge using our Neumann SX 74 bidirectional exciter measuring system... shows no such ringing.

Also, in view of the construction quality, component selection and the sheer number of research hours in the development of the FET-10, the pricing does not begin to reflect the kind of profit margins which unfortunately typify esoteric audio products today. Considering that some moving coils cost \$1000 to \$1500, and adding to it the cost of a preamplifier up to \$3000, we consider the price of the FET-10 and its accompanying source module with its own gain control to be a bargain, with sound quality superior to that of any front end on the market today.

Lastly, I wish to congratulate you on the comeback of your blunt and honest publication, and I would like to wish you every success.

Yours sincerely,
Dr. Sao Zaw Win
Win Research Group, Inc.
Goleta, CA

All our applicable comments are in the brief Win FET-10 follow-up under "Analog Miscellany" in this issue, except those relating to the analog vs. digital controversy, which come up in nearly every one of our articles and columns. To be "blunt and honest," we believe you are wrong about the superiority of analog phono technology to the best implementations of CD and DAT, although we admit that not very long ago you would have been right. See also our opening remarks in the current "Records&Recording" column.

—Ed.

Win FET-10 Channel Separation, Left/Right, in dB
Measured with Seven Different Test Records and the Neumann SX 74 Bidirectional Exciter

	1 kHz	10 kHz	15 kHz	20 kHz	30 kHz	Recorder
CBS STR-100	15/18	14/12	15/18	15.5/16		General Radio
CBS STR-170	18/16.5	19/21.5	20/20	22/19		General Radio
Denon 7001	23/23	21/20	20/20	27/27		Brüel & Kjær
JVC TRS-1007	34/34	33/32	27/28	26/26		Brüel & Kjær
AT-6005	29/28.5	26/28	20/20	25/24	26/30	Brüel & Kjær
B&K QR 2009	22/22	21/23	16/16	17/18		Brüel & Kjær
B&K QR 2010	22/22	20/21	17/16	17/17		Brüel & Kjær
Neumann SX 74	34/34	34/34	30/30	26/26	26/26	

Analog Miscellany: A Roundup of Not Necessarily Related Equipment

We have a number of different categories here with only one or two items in each, so we are sparing you our usual educational overviews. The KEF speaker review is, nonetheless, a bit of an education.

We were hoping to get as many speakers together for this issue as we did for the last one, but they did not arrive in time and will now have to stay on deck until we can test them. So, instead of another speaker survey, we bring you this potpourri of analog goodies, including our first video equipment review.

Preamplifier **Boulder MS** (temporary follow-up)

Boulder Amplifiers, a division of Silver Lake Research, 4850 Sterling Drive, Boulder, CO 80301. MS11 Phonograph Preamplifier, MS21 Selector Switch, MS32 Output Controller, MS01 Power Supply, \$3144.00 the system. Tested samples on loan from manufacturer.

We finally received the MS11 module with the active MC pre-preamp option, but not in time to allow us to test it for a complete review in this issue, which of course would have to include a meaningful comparison against the earlier version with transformer input. Boulder products appear to be scarce—probably because they are in demand among professionals and the company is fairly small—and review samples are slow to materialize but invariably worth the wait. This is beautiful equipment, and the price is merely steep without breaking through the high-end cuckoo barrier.

The immediate reason for this brief follow-up is that we have started to use the balanced outputs on the MS32 to drive the balanced inputs of a pair of Boulder 500 power amps (see Issue No. 10) bridged for mono operation. We have always had a philosophical aversion to the use of the ground as a signal return path; it is a primitive solution which goes back to the stone age of audio but has somehow gained respectability in a slow and haphazard historical process unresisted even by the high end. We therefore hail the new trend to include the option of balanced-line inter-

connection in audio equipment above a certain price level (such as the Denon DAP-5500 reviewed in Issue No. 11) and want you to know how much we enjoy using the full Boulder system in this mode.

The ultimate luxury in equipment of this sort is to have nothing bad, or even mildly anxiety-producing, ever happen—no hum, hiss, clicks, pops, crackles or other unmannerly noises, no RFI (unless introduced by the phono source) or other interference of any kind, no devices suddenly going intermittent, no ground loops appearing out of nowhere—and the Boulder components operate with exactly such reassuring uneventfulness. Some of the credit for all that has to go to the balanced-output-to-balanced-input connection because it maximizes common-mode rejection and gives the signal complete independence from the ground reference. That, at least, is the theory. In practice, you cannot switch quickly between the unbalanced and balanced modes, so you have to make up your mind about audible differences from (ugh!) memory. We did, and voted enthusiastically for the extra clean balanced mode. We now have long balanced lines between the MS32 and the 500's, and just a few feet of wire between each 500 and the loudspeaker. (Almost any kind of wire will do, freaks, when the leads are that short.)

Of course, the bridged mono operation of the 500's may have something to do with our enthusiasm. More about that in the article on reference systems.

Preamplifier **Citation 25**

Harman/Kardon Incorporated, a Harman International Company, 240 Crossways Park West, Woodbury, Long Island, NY 11797. Citation 25 Remote Control Preamplifier, \$849.00. Tested sample on loan from manufacturer.

Remote control has become a way of life in more viewing/listening rooms than we would ever have imagined.

Not having to get up from the couch or armchair is a very small selling point to your Editor, who is a compulsive pacer and ne'er-sit-still. Occasionally it is convenient to be able to control the volume, muting, etc., from a distance, and TV channel browsing by remote control is of course the quintessential expression of late-twentieth-century ennui, but to the serious audiophile who likes to fuss with all the controls and adjustments, front and rear, all the time, the ability to command the basic functions by infrared beam is not all that exciting. In this particular case, what we have is a preamplifier quite obviously addressed to those who put a high priority on remote control, but at the same time it is a great deal more than that.

We do not hesitate to call the Citation 25 the most complete and most versatile control center for a residential audio/video system we have ever laid hands on. Up to nine components may be connected to it, selected for sound and picture via the front panel or remotely, and manipulated in just about every conceivable manner. It would be difficult to put together a home entertainment system, no matter how complex, that could not be plugged into it in its entirety, without any additional junctions, selectors, switches, etc., and controlled as a single centralized network. If that is what you are looking for, we can tell you that the Citation 25 does it all, in spades, and you can stop reading right here. If you are a purist looking for the cleanest possible signal path, read on and decide for yourself.

The basic "architecture" of the preamp is very similar to that of the Citation 21, and all the good things we said about the latter in Issue No. 11 could be repeated here almost verbatim. We say almost, instead of exactly, because the signal routing in a remote-control design is of necessity more convoluted and therefore not quite as "pure" as the best solution obtainable in a directly controlled unit. Thus the 25 cannot possibly be superior to the 21 in signal-path quality; it has to be slightly inferior; but surprisingly the difference is very slight, indicating excellent engineering. When we inserted the entire preamp, from line-level input to main output, into the tape loop of our reference system and switched from the source to the tape loop at matched levels, the added veiling and diminished openness were quite perceptible, more so than in the case of the 21, but far from disturbing. Remember, there is no more brutal test for transparency than this A vs. A+B comparison.

Another small difference between the 21 and the 25 is in RIAA equalization accuracy. The 21 astonished us with its ± 0.0 dB error; the 25 has a 0.2 dB saddle in the lower midrange of its preemphasized/equalized response. A very minor quibble, but it makes us wonder whether the same highly touted active/passive equalization circuitry is used in the 25 as in the 21 (we have no schematics). On the other hand, the 25 offers a variable input capacitance trimmer for MM cartridges and a variable load resistance trimmer for MC cartridges, both highly desirable and missing from the 21. The trimmers have four positions each, with values we would have chosen a little differently, but that again is a

relatively small matter. So is the fact, this time on the credit side, that there is no polarity inversion from phono input to main output.

Cosmetically, the Citation 25 matches the restrained style of the other models in the line, black with tiny white lettering and tiny green LED's. The less frequently used controls are concealed under a flip-down panel; these are not duplicated on the hand-held remote control.

We want to make sure that by characterizing the exact niche this rather special preamplifier fits into we have not disparaged it in the eyes of the serious audiophile. Let us state for the record, therefore, that if no other preamp were available to us, the Citation 25 would keep us quite happy with its sound quality and of course more than happy with its switching and control facilities. It is definitely a winner in its own specific class, and its price is not excessive.

Video Projection Monitor **Harman/Kardon VPM 600**

*Harman/Kardon Incorporated, a Harman International Company,
240 Crossways Park West, Woodbury, Long Island, NY 11797.
VPM 600 Video Projection Monitor, \$5990.00. Tested sample on
loan from manufacturer.*

Sound without sight looks to us like an obsolescent basis for a home entertainment center. There is no doubt in our mind that domestic multimedia installations—complete with big screens, surround sound, digital processors, and other high-tech goodies—are the wave of the future, and the real estate people had better start talking about media rooms instead of family rooms and finished basements. The future is already here in a small way and in scattered instances; the time is not far away when just plain stereo, without video and signal processing, will be as rare as mono is today.

We do not believe that such a trend is necessarily at the expense of music (the boob tube triumphant over art, etc.); an opera on video/audio laser disc, for example, can be far superior as a total artistic experience to an audio-only CD or LP. Nor do we feel that optional and controllable signal processing is an impure audio influence; for your Bach partita you switch it out of the signal path and listen to your super clean stereo channels straight through. Even in such a case, however, we would not be averse to seeing the soloist in front of us on the big screen for added you-are-there realism. In that spirit, we welcomed the opportunity to review the new and obviously high-quality VPM 600 as our first foray into video territory. Eventually we hope to have video equipment reports in every issue, our chastity in audio matters remaining nonetheless unsoiled.

The VPM 600 is a video monitor without receiver, capable of projecting an image generated by three cathode-ray tubes on screens up to 16 by 12 feet in size (20 feet diagonally). Harman/Kardon is the marketing organization behind the video products bearing their logo, not the manu-

facturer; the VPM 600 is made in Germany by ITT and is the new updated version of the very similar VPM 500, so new in fact that the manuals we received with it had not been changed yet from the VPM 500. The discontinued Kloss projection monitor was also very similar.

The relatively rare breed of front-projection TV's raises the basic issue of image size vs. picture quality. No question about it, something like the Zenith 35-inch direct-view set with its single giant tube will give you a more nearly perfect picture than the Harman/Kardon. Even the biggest of the rear-projection sets with three cathode-ray tubes, the Mitsubishi 60-inch model, provides somewhat greater clarity and detail. On the other hand, there is something about a really large image, 7 feet or more diagonally, that creates an impression of greater realism than a sharper but much smaller picture. We relate more immediately to life-size people, animals, footballs, chairs, etc. We see more when the scale is that of the real world. For example, on the VPM 600 with a large screen, your Editor's dog-show videotapes revealed much more clearly why certain dogs were winning or losing than on a high-resolution 19-inch set. Ball games and other sports action are easier to follow on the big screen, regardless of resolution, and lavishly produced color movies with crowd scenes, etc., are simply more enjoyable. Even so, when it comes to an actual buying decision, the trade-offs of front-projection TV must be carefully weighed. We are definitely in favor of it.

Once it is decided to go with front projection, the VPM 600 looks like an outstanding choice, mainly because of its uniquely sophisticated installation and setup features. Other designs might give you equal or better performance under one specific set of conditions, but no other projection TV known to us permits any screen size between 6 and 20 feet diagonally, and certainly no other set offers comparable precision, ease, flexibility and repeatability in focusing, geometric alignment and color convergence. The controls and test patterns for these adjustments are most impressive; our only regret is that the somewhat cumbersome cover of the unit must be skillfully removed to gain access to them—why not a concealed control panel of some sort? Is the consumer that untrustworthy? A small point; more important to remember is that performance is irrelevant unless it can be optimized under any and all circumstances, and the VPM 600's design assures just that.

In terms of video performance the Harman/Kardon sets no records; nearly all of its competitors are equal to or ahead of it in brightness and resolution, but we do not feel that the user will be even marginally deprived of picture quality as result because his start-up alignment will be so much more precise. Not that the performance figures are in any way unsatisfactory. The video bandwidth is 4.0 MHz, resulting in 320 lines of horizontal resolution. That is good enough to take almost (not quite) full advantage of state-of-the-art signal sources such as S-VHS video cassette recorders (the special input socket for these is provided) and laser disc players. The RGB (red, green, blue display) bandwidth

is 6.5 MHz, which translates into 520 lines. Brightness (light output) is 300 lumens, about average for front-projection TV's. Black level retention (the ability to hold solid blacks) is also average.

Performance figures give no indication of how nice it is to use this set, how well the remote control works (it even provides a quick test and touch-up adjustments for color convergence), and how reliably and repeatably every part of the unit functions. Each time we had a minor problem, it turned out to come from the VCR, not the monitor. All that can be expected to add up to long-term satisfaction.

We would recommend a flat screen to all users of the VPM 600 who can darken the room before viewing. Start-up alignment is easier, more precise and more repeatable on a flat screen. Where the ambient light is relatively strong, a curved screen is indicated, but even that works best in a darkened room, and some people will never be happy with the slight optical weirdnesses caused by the curvature. We would also recommend mounting the VPM 600 on the ceiling wherever possible because it is large enough to be a traffic hazard on the floor or even on a table. Sooner or later somebody will kick it or bump into it, and the six-thousand-dollar incision in your bank account will begin to ache, not to mention the possibility of having to align everything all over again.

Loudspeaker System

KEF Model 107

KEF Electronics of America, Inc., 14120-K Sullyfield Circle, Chantilly, VA 22021. Reference Series Model 107 floor-standing 3-way loudspeaker system, \$4500.00 the pair. Tested samples on loan from distributor.

This is possibly the most difficult review we ever had to write because of the conflict between our awed respect for the engineering of the product and our disappointment in its sound. Let us try to sort out the complexities of this baffling situation.

The English firm of KEF Electronics has been one of the heroes in our audio pantheon for many years; on the subject of loudspeaker technology, they stand for just about everything we believe in and are opposed to everything we dislike. Laurie Fincham, as Technical Director of KEF, was among the earliest advocates of computer-aided loudspeaker design; KEF was the original sponsor of Siegfried Linkwitz in the development of computer-optimized fourth-order crossover networks for commercial speaker systems; and KEF was the only speaker company smart enough to entice Richard Small (*the* Richard Small) to leave academia and join their staff. We are certain that Dr. Small was in some way involved in the design of the Reference Series Model 107, the company's new flagship speaker, and that alone is enough to intimidate us in our attempt at a fair and rational critique.

As if to make things still harder for us, another of our

heroes, Don Keele (who signs his outstanding engineering papers as D.B. Keele, Jr. and has been cited by us before), made his debut as an equipment reviewer in the February 1988 issue of *Audio* with a devastatingly thorough and scholarly test report on the KEF 107, in which he proves that it is an amazingly accurate small- and large-signal transducer and says absolutely nothing negative about the perceived sound of the speaker. We recommend this 8-page "Equipment Profile" to all of our readers who want to see how a real pro goes about testing such a device. Our own measurements revealed nothing to contradict any of his findings—he works for Techron/Crown and used the Techron TEF System 12 analyzer, which is undoubtedly more sophisticated than our not-so-new instrumentation—so we shall treat his published data here as facts (and his favorable subjective observations as opinions).

The Model 107 is a floor-standing 3-way design with a very interesting bass system incorporating two 10" woofers, a separate swiveling "head assembly" housing a 5" midrange driver and a 1" cloth dome tweeter, plus an active line-level equalizer known as KUBE (proprietary alphabet soup), which goes into the tape loop or between the preamp and the power amp. The two woofers exhaust from separate sealed enclosures into a shared ducted cavity, with their magnets linked together by a metal rod for resonance cancellation, a configuration familiar from the Model 104/2. Front-loading a closed-box woofer with a Helmholtz resonator is not a new idea (John Marovskis, uncredited by Don Keele, has been doing it since the mid-1970's in his Janis subwoofers); it combines some of the advantages of both closed-box and vented-box systems but allows only low frequencies to emerge from the duct, so that the woofer-to-midrange crossover frequency has to be much lower than in a more conventional 3-way system, thereby potentially stressing the bottom end of the midrange driver. Neither the type of crossover network nor the crossover frequencies are specified by KEF for the Model 107; logic, combined with our explorations of the sound field by B&K microphone, would suggest a Linkwitz-Riley fourth-order network with one crossover point between, say, 130 Hz and 160 Hz, and the other around 3 kHz. That division (confirmed by Don Keele's estimates) assigns more than four octaves to the little plastic midrange cone with butyl rubber surround, raising some issues to be addressed below. The ferrofluid-cooled dome tweeter with its short quasi-horn operates very happily between 3 kHz and 23 kHz.

The frequency response of the speaker is almost spookily flat with the optimal settings of the KUBE. The unequalized response rolls off at 12 dB per octave below 35 Hz (typical closed-box profile) and it shows a very slight elevation of the two octaves from 1 kHz to 4 kHz, but the flattest obtainable equalized response on axis is contained within a 4 dB strip (i.e., ± 2 dB) from 20 Hz to 20 kHz. Unbelievable, yes, but verifiable by ear: this baby goes down really low and up really high, with impeccable balance and no spectral signature of any kind, at all levels, soft

and loud. The 23 dB of available equalization at infrasonic frequencies necessitates a damn good power amplifier, though; on the other hand, we found the KUBE to be quite forgiving of very high-amplitude inputs, even if its integrated op amps may not reassure the purist. You should read the Keele review for all kinds of data on the speaker's single-frequency distortion, power handling, and so forth, all of them pretty amazing. This is a high-tech loudspeaker system if there ever was one.

In the time domain, the Model 107 is equally impressive. All drivers are in phase, moving forward in response to a positive pulse; square pulse replication is not quite as perfect as we have seen in some 2-way systems, but we have never seen better in a 3-way. Don Keele's energy-time response curve is probably a more revealing test, and it is beautiful, as are his phase and group-delay curves, which we did not find necessary to verify. Tone burst response, not shown in the Keele review but sometimes the easiest way to see various kinds of ringing, looked very good too.

So—this is the perfect electrodynamic loudspeaker, and yet... How should we put it as fairly and temperately as possible? We did not fall in love with the sound, accurate and well-balanced as it was. We heard a certain degree of veiling, or let us call it nontransparency, in comparison with speakers such as our old, discontinued Fourier 8e, which the KEF beats in so many other ways, and at high levels we even heard some ugliness, especially on piano music. As we kept listening, the pleasure diminished with familiarity instead of growing. We realize that we are beginning to sound here like the self-indulgent subjectivists whom we detest, such is the intellectual/emotional frustration the KEF came to represent to us, but unlike those worthies we shall at least try to rationalize our feelings.

We can think of no more than three possible causes of our disappointment, and the first two are not terribly convincing. There is the so-called conjugate load matching (CLM) network of KEF, which introduces various complex impedances complementing each driver, so that the overall impedance of the speaker system is a purely resistive 4 ohms from 20 Hz (yes!) to 20 kHz. We have never dealt with such a network, which theoretically should be easier on the power amplifier than any other, but who knows what the actual transient interface conditions are? Okay, pretty lame, that one. Next, we have a rather obvious 3 kHz dip in the vertical (but not the horizontal) off-axis response of the 107, shown in the Keele review and confirmed by our own measurements. We believe we have nailed the cause of it, which is certainly not the nondiffractively contoured head assembly but probably the fact that the "naked" midrange driver begins to roll off naturally at 3 kHz, right at the crossover point, instead of providing the overlap necessary for this kind of network. Vertical lobing, however, is not associated with the kind of sonic deficiencies we heard, so that too is a lame explanation. Here is our best shot. Even Don Keele, who liked everything about the sound of the

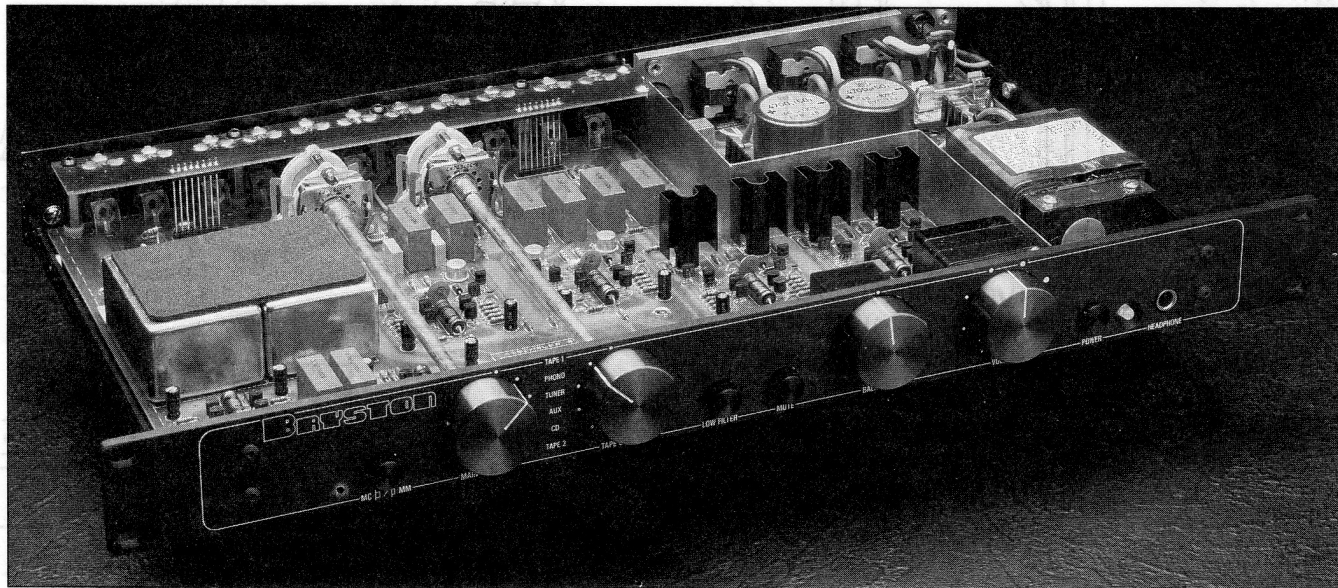
(continued on page 39)

In Your Ear



BRYSTON

Continues to define state-of-the art...



Bryston 12B preamplifier

The Bryston Magic

BRYSTON believes the purpose of an audio system is to create the three dimensional illusion of a live musical event in your own home.

The **sound stage** involves the placement of instruments, in space, around, behind and in front of the speaker system.

The audio system should present the instruments' harmonic structure, image, tonal balance, depth, clarity and dynamic range should all sound believable.

In order to accomplish this three

dimensional sound stage a significant amount of effort is required in both theory and practice when designing an audio product.

TO this end, Bryston has originated and optimized the circuitry used in all its products to a degree of linearity which approaches theoretical perfection. From steady-state signals, to high, low and mid frequency transients we understand the mechanisms and criteria

necessary for musical accuracy over the full spectrum.

We have devoted years of research to the elimination of audible problems due to phase shift, differential temperature effects, transient compression, envelope modulation, and the subtle effects group delay can have on **depth** information.

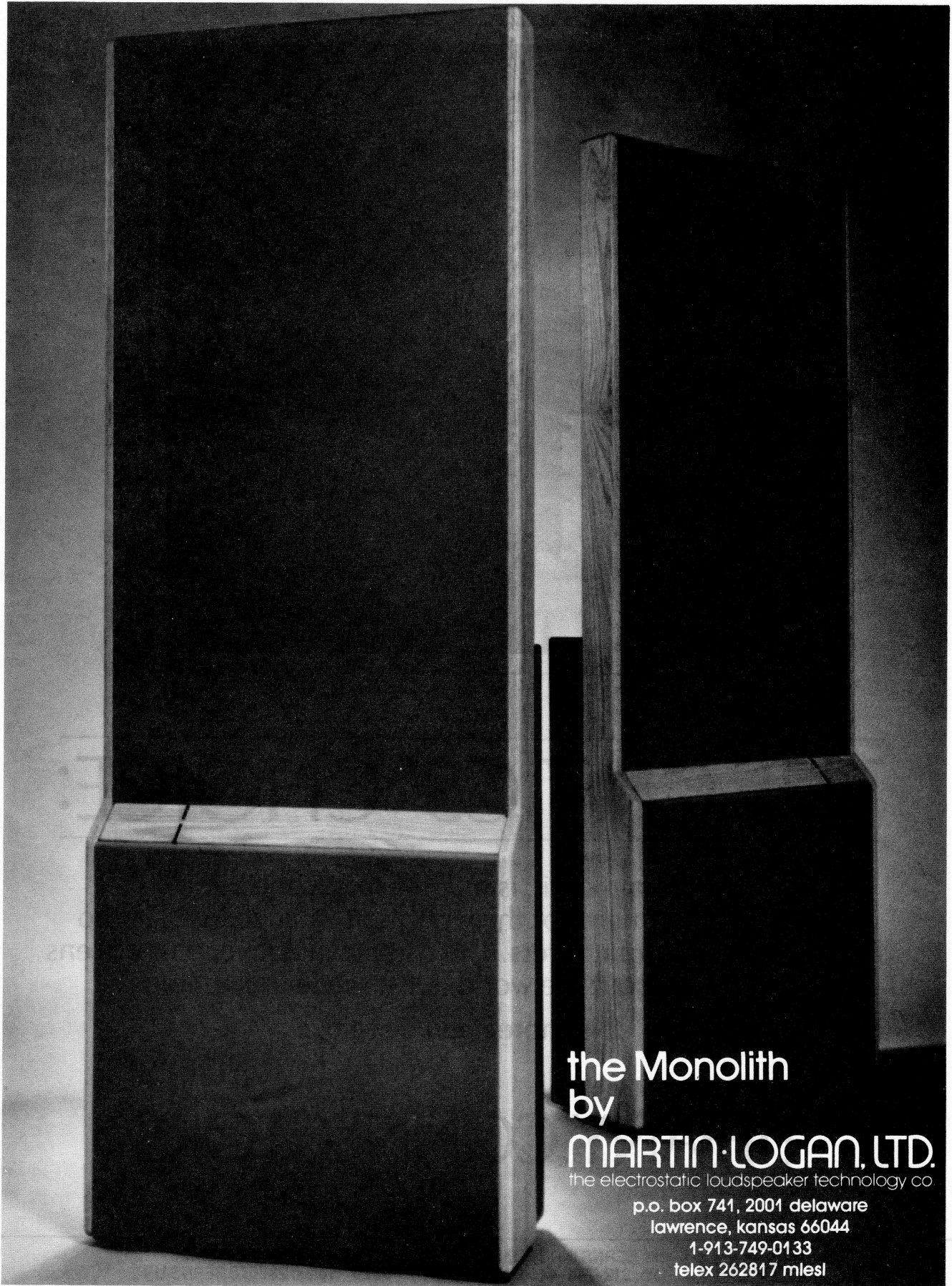
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the Monolith
by

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the electrostatic loudspeaker technology co.

p.o. box 741, 2001 delaware

lawrence, kansas 66044

1-913-749-0133

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THE CRITICS' CHOICE:

The ultimate critic is not in a magazine but in the R&D departments of the world's most acclaimed audio designers and manufacturers. The six shown above, plus dozens more throughout the world, have made their choice.

No more need be said.

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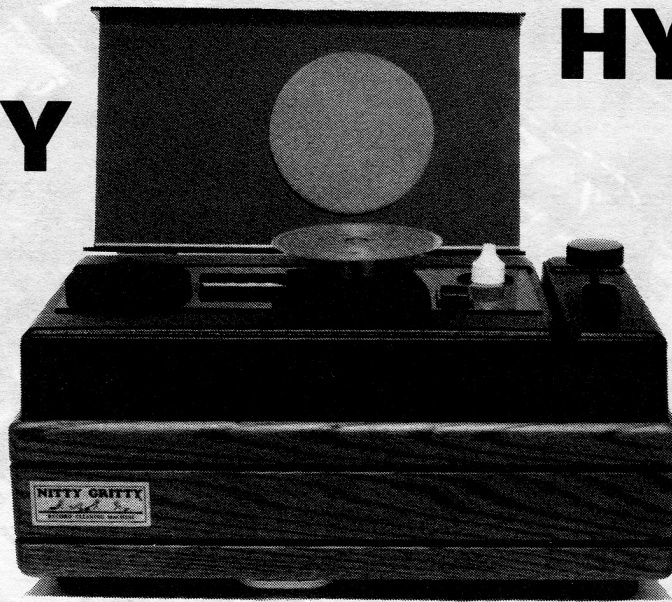
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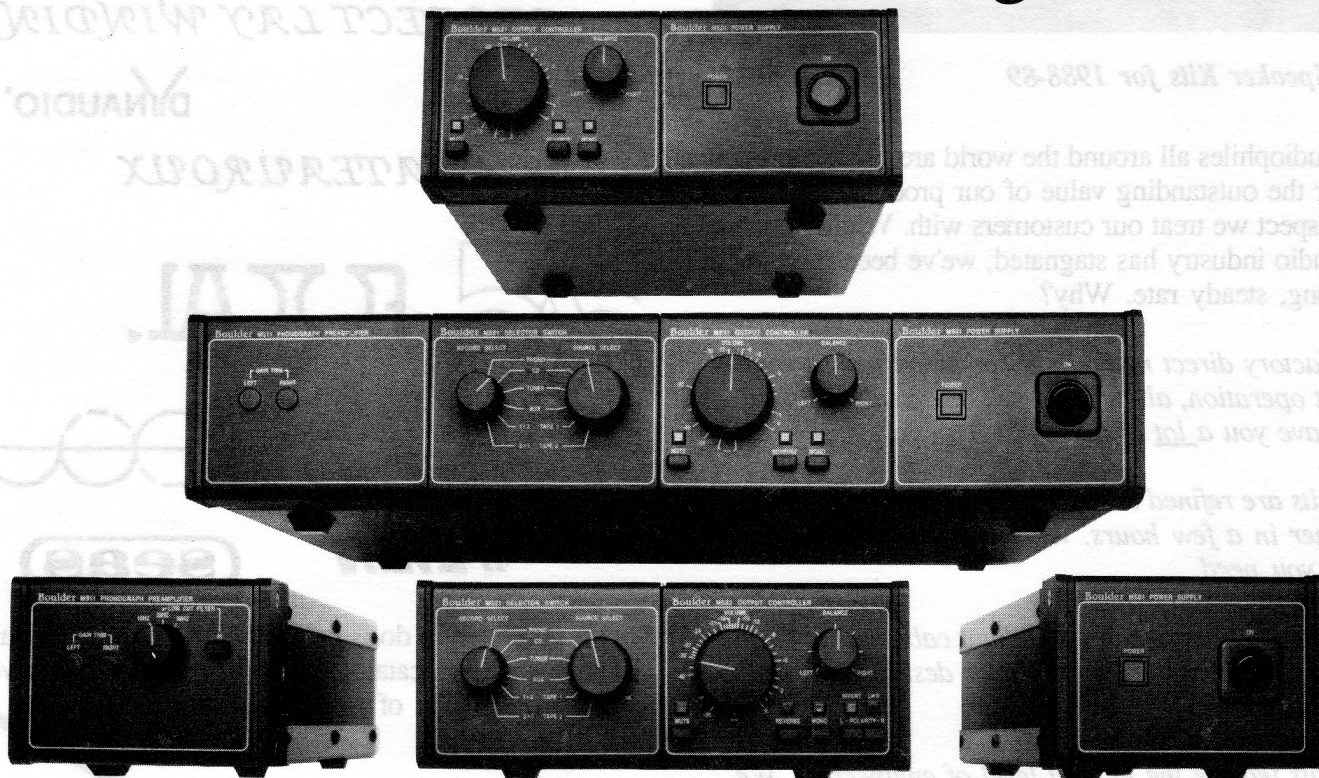
NITTY GRITTY

Record Care Products
4650 Arrow Highway
Unit #F4
Montclair, CA 91763
714/625-5525

RECORD & CD CLEANING MACHINES

OPTIONAL ACCESSORY KEY														NOTES
A - soft dust cover B - acrylic dust cover C - 45/78 adapter														
Manufacturer	Model	Vacuum	Operation	Motorized Rotation	Fluid Injection	Sides per Cleaning	Clean Time per Disc	Cleaning Fluid Included	Quantity of Fluid	Cabinet Material	Dimensions L x H x D	Weight in lbs	Price	
NITTY GRITTY	1.0	Yes	Manual	No	No	1	2 min	Pure 2	4 oz	Vinyl Veneer	14" x 10" x 10"	13	\$259	A, B, C
	2.0	Yes	Manual	No	No	1	2 min	Pure 2	4 oz	Solid Oak	14" x 10" x 10"	13	329	A, B, C
	1.5	Yes	Semi Manual	Yes	No	1	1½ min	Pure 2	4 oz	Vinyl Veneer	14" x 10" x 10"	15	359	A, B, C
	2.5	Yes	Semi Manual	Yes	No	1	1½ min	Pure 2	4 oz	Solid Oak	14" x 10" x 10"	15	429	A, B, C
	1.5Fi	Yes	Semi Auto	Yes	Yes	1	1½ min	Pure 2	16 oz	Vinyl Veneer	17" x 10" x 10"	19	429	B, C
	2.5Fi	Yes	Semi Auto	Yes	Yes	1	1½ min	Pure 2	16 oz	Solid Oak	17" x 10" x 10"	19	499	B, C
	Mini Pro 1	Yes	Automatic	Yes	Yes	2	½ min	Pure 2	16 oz	Vinyl Veneer	17" x 10" x 10"	21	629	B
	Mini Pro 2	Yes	Automatic	Yes	Yes	2	½ min	Pure 2	16 oz	Solid Oak	17" x 10" x 10"	21	699	B
	Hybrid 1	Yes	Semi Auto	Yes	Yes	1	1½ min	Pure 2	16 oz	Vinyl Veneer	17" x 10" x 10"	22	529	B, C, D
	Hybrid 2	Yes	Semi Auto	Yes	Yes	1	1½ min	Pure 2	16 oz	Solid Oak	17" x 10" x 10"	22	599	B, C, D
CD-1	No	Semi Manual	Yes	No	1	½ min	Pure CD	2 oz	Vinyl Veneer	10" x 5" x 6"	8	169	E	
CD-2	No	Semi Manual	Yes	No	1	½ min	Pure CD	2 oz	Solid Oak	10" x 5" x 6"	8	239	E	

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One-size-fits-all preamplifiers are often too big or too small. Because people have different listening needs, our preamplifiers come in different sizes.

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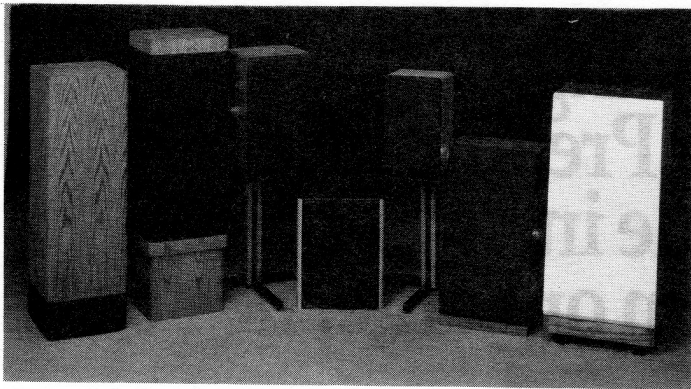
A complete Boulder Modular Preamplifier is typically \$2,800. The Boulder 500 Power Amplifier lists for \$3,295.

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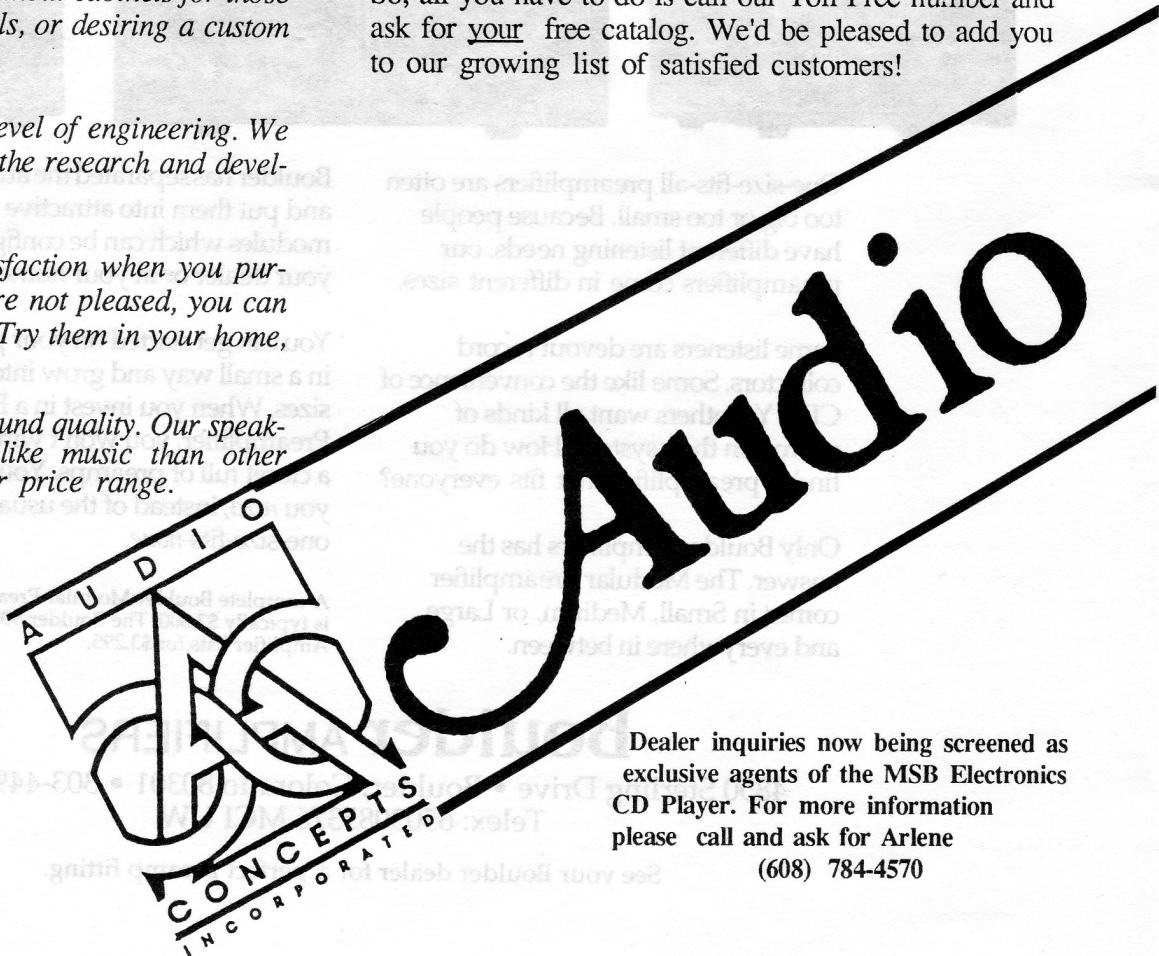
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The MSB CD Player is a high quality unit that employs the very latest analog and digital technology. It is a direct coupled, DC Servo design that uses a newly released, (early 88) opamp for the first gain stage. This device has a very high slew rate, 330 v/us and fast settling (120 Ns to .1%).

The same family of opamps, that are used for the gain stage, are also used in the power supply regulator circuit, in fact these are even faster than the signal path devices and higher gain. The circuit is more stable with the higher frequency devices in the power supply possibly due to being able to react faster to any changes in load demand from the signal path opamp. The speed and low output impedance of this power supply configuration is truly remarkable.

The circuit board is single sided to prevent any high frequency coupling between the top and bottom traces. The traces are wider and more direct than with most boards. Also close attention was paid to the way the ground traces, and power feed traces, were routed. This type of circuit layout is normally only needed in very high frequency applications but this was done in order to allow each circuit to run at the highest frequency possible, without oscillation, and thus reduce the phase shift in the feedback loops of each stage.

The output filter circuit has been changed to make it have less impact on the audio passband. This circuit also uses a discrete amplifier that decreases the effect of phase shifts normally associated with active filters.

Development of this unit has taken over two years, but 14 years of experience in the field of analog control systems has gone into it. It is a relatively simple, but elegant circuit using parts of much higher quality and cost than the original. Polyprop 2.5% caps in signal path, 10%

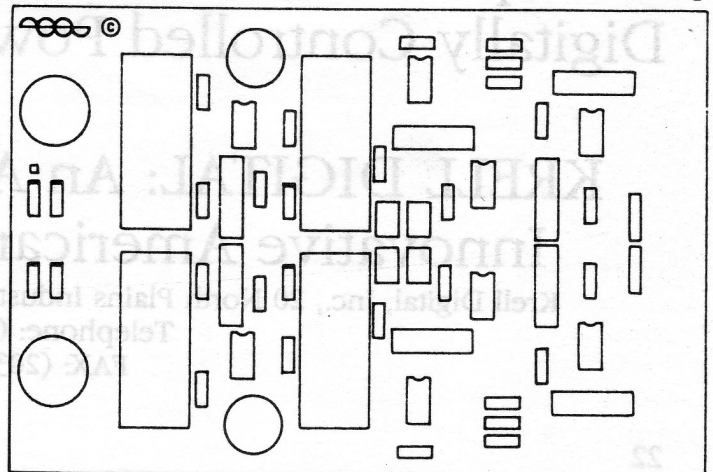
polyprop in most other places. Resistors are 1% metal film, the board is FR-4 material.

Over the last several years, many hundreds of hours of testing and listening have gone into the final version. In fact, every unit is carefully evaluated and listened to before it leaves the factory.

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Circuit Board Drawing





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have in common?



aragon

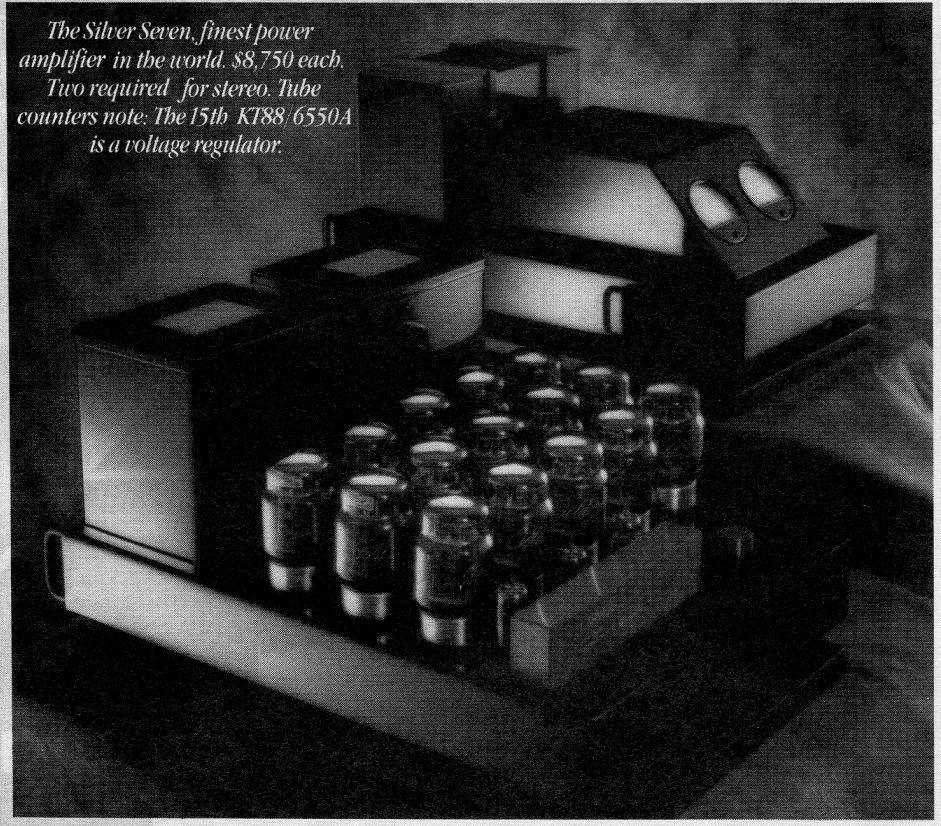
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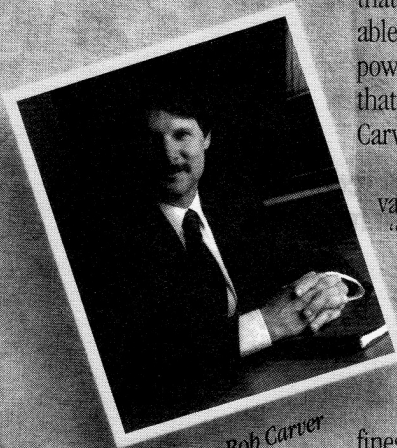
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The Silver Seven, finest power amplifier in the world. \$8,750 each. Two required for stereo. Tube counters note: The 15th KT88/6550A is a voltage regulator.



Before you meet the new M-4.0t, Bob Carver wants you to meet its inspiration, the money-is-no-object Silver Seven.



Bob Carver

“One of my important design precepts is that power amplifiers should be easily affordable but last year, when I began designing a powerful new amplifier, I temporarily set aside that precept of affordability. The result is the Carver Silver Seven Mono Power Amplifier.”

Destined to redefine ultra-high-end values forever, the Silver Seven is truly a “money-is-no-object” design. In fact, just a single pair of its fourteen KT88/6550A Beam Power output tubes cost more than some budget amplifiers.

The Silver Seven employs classic, fully balanced circuit topology and the finest components in existence.

A-450 Ultra Linear output transformers with oxygen-free primary leads and pure silver secondaries.

- *Wonder Cap capacitors throughout.*
- *Interconnects are Van den Hul Silver.*
- *Internal wiring is pure silver.*
- *Wonder Solder throughout.*
- *Gold input connectors and high current gold output connectors.*

The Silver Seven’s polished granite anti-vibration base floats on four Simm’s vibration dampers. The separate power supply’s power transformer end-bells are machined from a solid block of high-density aluminum.

Capable of an astonishing 390 joules energy storage, the Silver Seven delivers *a conservatively rated 375 watts into 8 ohms from 20Hz to 20kHz with no more than 0.5% distortion.* On the 1-ohm tap, peak current is in excess of 35 amps!

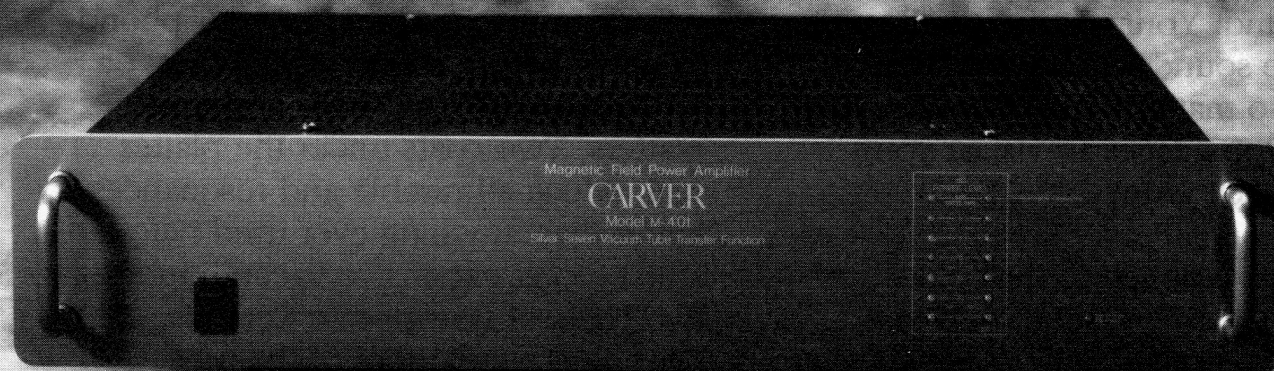
Sonically, a pair (for stereo) of the flawless Silver Sevens almost defies description.

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"Because I wanted to share its magnificent sound with you we built the new Carver M-4.0t."

The M-4.0t, identical transfer function and 375 watts rms/cb. at 8 ohms 20-20kHz with no more than 0.5% thd. Total maximum output current is 60 amperes.



Superlatives are insufficient.

What does this have to do with the new M-4.0t?

Everything. Because the M-4.0t precisely duplicates the transfer function of the Silver Seven.

Ever wondered why two amplifiers of identical wattage can sound different? Or why two designs with different output ratings can sound much the same? In many cases, it's because each power amplifier exhibits a unique relationship between its input and output signals. Like human fingerprints, this *transfer function* is subtly distinct, defining much of the sonic character of the design. Bob has not only perfected the art of measuring an amplifier's transfer function, but is able to duplicate it in a completely dissimilar amplifier design! That's how he invested his solid state M-1.0t with the

transfer function of a set of \$5000 esoteric tube amps several years ago.

This time he's gone one better. Or two.

He's used this powerful scientific method to duplicate the transfer function of the Silver Seven in the new M-4.0t (now you know what the "t" signifies). Mind you, we are not saying the M-4.0t is *identical* to a pair of Silver Sevens. An M-4.0t weighs 23 pounds versus the Silver Seven at 300 pounds a pair. The Silver Seven stores 390 joules of energy while the M-4.0t stores none. As a Magnetic Field Power Amplifier the M-4.0t instantly draws the power it needs directly from the AC line.

Though in choosing the M-4.0t you may miss the warm glow of the Silver Seven's silver tipped vacuum tubes reflecting in polished black lacquer, be assured both amplifiers are the most musical, effortless, and open sounding you have

ever heard. Bass is full and tight, midrange is detailed, treble is pure and transparent.

Each can float a full symphony orchestra across the hemisphere of your living room with striking realism.

Bob Carver developed this incredible design for one reason: to bring you the best the world has to offer and the best amplifier value ever, and he has succeeded handsomely.

Listen to the new, incredibly affordable M-4.0t at your nearest Carver dealer. Or write us for more information. We'll even send you data on the Silver Seven. After all, if you ever want to move up from the M-4.0t, there's only one possible alternative.

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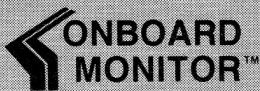


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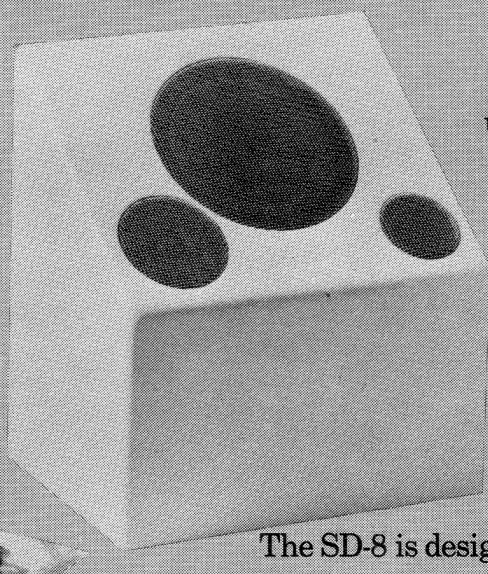
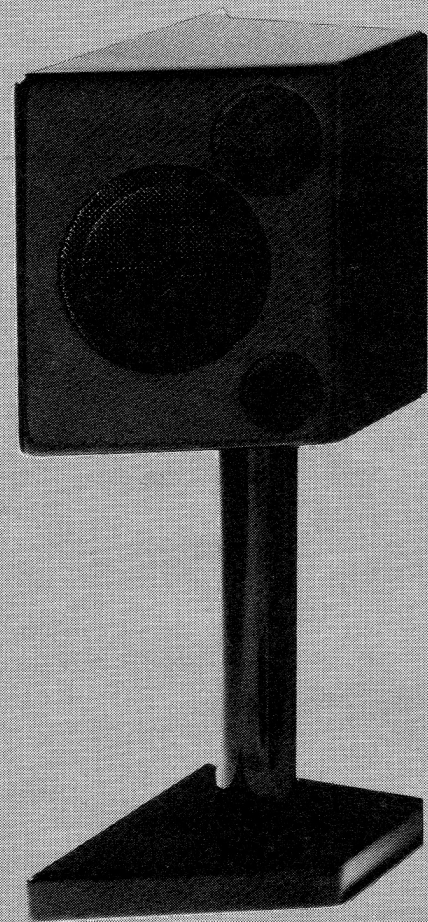


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And, with 91 dB/1 W/1 m efficiency, the SD-8 fits any system.

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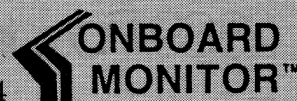
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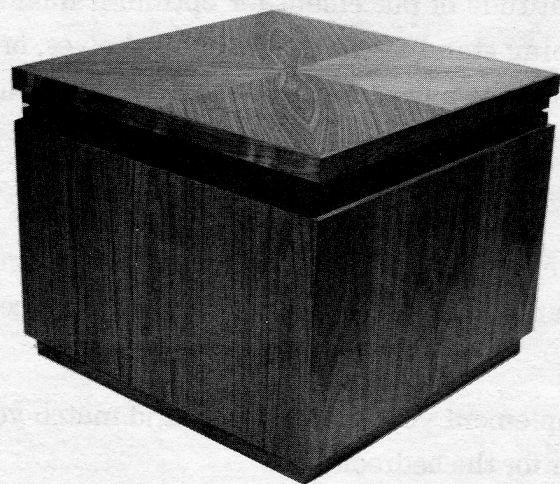


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Further Thoughts on Double-Blind Listening Comparisons at Matched Levels

Reluctant as we may be to give up the habit of casual audio-salon-type A/B comparisons followed by instant expertizing, a more disciplined approach nearly always results in different conclusions.

We keep coming back to this subject because it is so absolutely essential to valid equipment reviewing. There is, of course, no proselytizer as fervent as a convert, and it is a matter of record that once—long ago, we would like to think—we were heathens ourselves when it came to our listening practices. Today we have little tolerance for what we have come to call the restaurant-reviewer type of audio journalist, whose dogmatic assertions about the sound of A vs. B are based either on memory or on casual dipping into both plates, as it were (“my companion had the trout, which I also tasted”), with nothing but his exquisite taste as documentation. That kind of opinion is worthless and a waste of everybody’s time, except occasionally in the case of loudspeakers with vastly different sonic signatures.

The conversion from conventional/traditional audiophile wisdom and comfortably vague listening criteria to the world of the unforgiving ABX comparison is a painful process for many and unbearable for some. The very idea that the sound of a \$6000 and of a \$600 amplifier may be indistinguishable from each other—as long as neither one is clipping, and the volume levels are matched within 0.1 or at least 0.15 dB—will be treated with stubborn and nonnegotiable denial by many otherwise reasonable aficionados. You might as well ask a Mennonite to join the Marines; it is simply unthinkable in terms of the prevailing belief system. The designer and manufacturer of the \$6000 amplifier will, needless to say, defend their vested interest in the high-end mystique with their last breath, and the owner of such an amplifier has no choice but to defend his buying decision, but why are all, or nearly all, the high-end audio pundits so upset by ABX testing? No one so far has suggested that *all* \$6000 amplifiers sound exactly like *all* \$600 amplifiers; our own ABX comparisons of CD players as reported in this issue have revealed tiny differences where none were even expected; so why all the defensiveness and denial even in the ostensibly impartial segments of the audio community?

It almost seems as if The High End were some kind of fraternal order or secret society requiring each member to protect and defend the credibility of all other members regardless of merit or even elementary truthfulness. We have in fact been told on several occasions by various well-

wishers that we would put ourselves out of business by flying in the face of this brotherhood with our bad-news ABX findings, in other words by telling the high-end audio industry and its audiophile customers what they do not want to hear. What nonsense! The facts are more exciting than fiction, or at least more gratifying in the long run, and there will always be a demand for a reliable source of facts. Even the purveyors of fiction will consult it—maybe only behind closed doors—from time to time. Pandering to fantasies and preconceived notions is a provenly successful business, as we all know, but that does not make “telling it like it is” a losing business, does it?

Arguments, good and bad, against ABX-ing.

Since our initial remarks on double-blind listening tests in Issue No. 10 and our reviews in No. 11 reporting a few somewhat tentative ABX comparisons, we have been exposed to just about every argument, pro and con, about the validity of such testing and have added sundry tidbits to our previous insights. Happily, the lamest, most pathetic objection to the ABX method, namely that the switching system is not transparent and therefore covers up the differences, has not resurfaced lately, otherwise we would have to go into the boring subject of how the ABX RM-2 relay module passes square waves (surprise—perfectly), how the results with laborious plugging and unplugging by hand correspond to those obtained with the automated comparator (surprise—they are the same), and so forth. We would much rather address some of the more sophisticated criticisms to come our way.

One of the latter is that an ABX listening test is a tense and anxiety-producing “final exam” type of situation, possibly more so to certain individuals than others but always with an element of pressure and competition, especially where a peer group compares scores afterwards. It is easy to choke in such circumstances, so the argument goes, and to be less perceptive about small differences in sound than under more relaxed conditions. We are fairly sympathetic to that line of reasoning, but the rebuttal is obvious: take all the time in the world, do it alone without anyone watching you—the ABX comparator is perfectly designed

for one-man self-testing—and see if the results are significantly different. In our own experience they are not. What we find to be a greater danger, as we have previously stated, is that intense concentration on small differences produces fatigue, which in turn tends to generate resentment (why am I doing this?), which in turn leads to wild guessing to speed up the test and end it. Valid ABX testing requires sincerity and dedication because it is hard work and sometimes downright unpleasant.

Then there is the familiar song and dance to the effect that you have to *live* with a piece of equipment before you are able to recognize its specific sonic characteristics and tell it apart from others. Everybody has heard that one, and there is an element of plausibility there, but the rebuttal is again easy: go ahead and live with both A and B, as long as you like, provided you listen to them at exactly matched levels. There is no official time limit to an ABX test; it is entirely permissible to let it go on for months. Bob Carver tells the story of an interesting long-term listening test involving an esoteric, cult-brand tube amplifier. After he had duplicated the transfer function of this amplifier in one of his moderately priced transistor amplifiers by means of his “t-mod” technique, he physically disguised both units in such a way that their inputs and outputs were available but their identities concealed (unless of course a spoilsport made a serious effort to peek). He then left the disguised amplifiers with the skeptical owner of the tube job and asked him to keep a notebook on his listening impressions. This was in effect a double-blind comparison without an ABX switcher (double because the one man who knew the identities of A and B was not even on the premises). Many months later Bob examined the notebook and determined that the owner had not been able to distinguish his own tube amplifier from the t-mod with higher reliability than is obtainable with sheer guessing. So much for long-term living with the equipment—when they sound the same, they sound the same, and when they sound different, the best way to hear it is still the good old quick-switching A/B method.

To state our reaction to the conventional/traditional audiophile point of view in very general terms, we are very suspicious of strong opinions about the differences between two pieces of equipment when such opinions vanish into thin air as soon as the brand identities are concealed and only the sounds can be compared. We are likewise suspicious of strong opinions about new vs. old equipment when the old equipment is no longer available as a point of reference. On the other hand, we are perfectly willing to admit that a genuine difference exists between A and B even when only one listener out of a hundred can reliably tell them apart in an ABX test. Fair enough?

But then why, oh why...

There remains the nagging question of why so many honest and highly competent audio practitioners—as dis-

tinct from the phonies, mystics, creeps and crazies—also believe, on the basis of long experience, in certain equipment superiorities which then turn out to be unprovable in ABX or similar listening tests. We have only very tentative answers to that one.

Undoubtedly, preferences having to do with circuit design philosophy, construction details and even cosmetics enter into the picture, but that is a cop-out explanation. Another is subconscious rooting for and against various brands for various emotional reasons. The \$64 question, however, is whether or not these people actually hear in the sound of A something unique or distinctive that disappears in an A/B comparison at matched levels. Well, we have a theory of sorts—and it will have to remain just a theory.

A possible though far-out explanation.

When an ABX test is being set up and the levels have not been perfectly matched yet—say there is still a 0.4 dB difference—it is ridiculously easy to tell A and B apart and to ascribe sonic personalities to each, even in cases where subsequent level matching within 0.1 dB erases all audible differences. Furthermore, that 0.4 dB mismatch is often interpreted as a quality difference rather than as a volume difference.

Now, different individuals listen to their stereo systems at different levels (even if the difference is only 1 or 2 dB), and when they change a piece of equipment they do not necessarily reestablish the exact same level within 0.1 dB. That could be a source of strong opinions about all sorts of level-related (i.e., not intrinsic or design-related) sonic characteristics. Our theory is that the same audio component A, played at two slightly different levels such as 88 dB and 89 dB, becomes in effect two different components A and B as far as subjective *Gestalt* is concerned. This is a psychological insight, not a scientific determination, and as such can be punched full of holes, but it does offer some sort of clue to why the same piece of equipment might be described as a little hard-sounding by the 89 dB listener and as velvety smooth by the 88 dB listener.

A/B threshold estimates.

One more thing. We are sometimes asked under what conditions we would expect two fairly similar pieces of equipment to be clearly distinguishable in a correctly set up ABX test; in other words, what the thresholds might be. Bob Carver claims that, in his bridge nulling test, the null must be -38 dB or deeper for the two amplifiers to sound exactly the same. Dave Clark, another expert whom we trust, believes that events below the -34 dB level with respect to the signal are likely to be inaudible. Thus both of these authorities put the threshold of audible anomalies in the 1.25% to 2% range. Purists will howl; high-end audio salon owners will blanch; but remember, we are only the messengers! ◇

The Digital Scene: More Theory, More Facts, More Hardware

We continue our ongoing, open-ended discussion of the glories and pitfalls of digital audio and check out various recent implementations, including R-DAT. We also add a new wrinkle to our test procedures.

It occurs to us that a "tree-worshipping analog druid" (latest CES epithet for the bigoted digitophobe) could have misconstrued the sweeping endorsement of current digital technology in our last issue (No. 11), qualified only by the phrase, "barring vulgar hardware and software foul-ups, of course." If we somehow left the impression that such foul-ups are very rare and that smooth sailing can thus be taken for granted in the digital domain, the TWAD might have a plausible case against us. Let us hasten to point out, therefore, that today's commercial hardware (D/A converter chips, digital filter chips, etc.) and software (digital master tapes, CD's, etc.) are often quite flawed and not at all indicative of the current potential of the technology. Our feeling was that these things were rapidly improving, but now we are not so sure. Stanley P. Lipshitz and John Vanderkooy presented an excellent but somewhat upsetting paper at the March 1988 convention of the Audio Engineering Society in Paris under the self-explanatory title, "Are D/A Converters Getting Worse?" (see also the letter from Dr. Lipshitz in the "Box 392" column in this issue), and it seems that the DAC is the bad guy more often than we thought.

The DAC situation: not so good.

The two Canadians measured and analyzed 20 different CD players (17 documented in the preprint of the paper, 3 more in supplements thereto) strictly from the standpoint of digital-to-analog conversion. The players ranged from first-generation models (1982-83) to the latest-and-greatest, Philips-based as well as Japanese, moderately priced to ultrahigh-end. The results were quite dismal on the whole, although the commercial feasibility of accurate D/A conversion was at the same time clearly substantiated. Only about one third of the units tested appeared to be free from objectionable conversion errors, and the majority of these dated back to 1982-85. For example, the most nearly faultless player, DAC-wise, was the JVC XL-V400, a relatively inexpensive 1985 model with a Yamaha 2-times interpolating ("oversampling") digital filter and a single time-shared

Burr-Brown converter for both channels. The earliest Sony models, with analog low-pass reconstruction filters and no oversampling, tested almost as satisfactorily. One of the most dramatically flawed players was the \$1700 Denon DCD-3300, introduced in 1987 and until very recently the flagship of the line, loaded with ostensibly state-of-the-art features. (It is possible that inadequate factory adjustment was the problem.)

In general, the paper takes a rather dim view of "new and improved" digital circuitry for CD playback, concluding that "there is a downward trend in the accuracy of the D/A converter systems appearing in consumer CD players" and that this decline "is partially attributable to the drive for ever greater 'oversampling' ratios, without clear apparent benefits, but largely due to the use of inferior-quality D/A converter chips, even in expensive machines." It should be added, on the one hand, that the tests documenting these conclusions were quite a bit more detailed and analytical than those seen in consumer audio publications and, on the other hand, that our own tests of even more recent CD players paint a somewhat more hopeful though still not entirely reassuring picture (see the reviews below). Needless to say, D/A conversion accuracy is not the only criterion of CD player performance—the analog signal path, the power supply, mechanical design, etc., are all very important—but without accurate encoding/decoding the *raison d'être* of digital sound reproduction ceases to exist, and therefore as the paper succinctly states, "it is ill-considered to skimp on performance in this one item [the DAC], especially in mid- and high-priced machines."

Lipshitz and Vanderkooy make a special point of straightening out the audio community on certain erroneous beliefs relating to DAC performance. To wit: test tones without added dither are totally useless, at any level significantly below 0 dB, for displaying distortion spectra or making THD-plus-noise measurements and, below -70 dB, for assessing level errors. (Offending reviewers please note.) Another thing: a correctly designed analog recon-

struction filter has headroom for overshoot on transient waveforms, whereas a digital filter does not (except at the unacceptable expense of a raised noise floor); furthermore, 2-times and 4-times interpolating digital filters introduce a noise/distortion penalty as an inevitable result of the filter arithmetic (unless digitally dithered rounding is used—but it never is); therefore, the superiority of digital filters to good old-fashioned analog filters is not so clear-cut, despite the widely publicized advantages. "It is our belief," the paper states, "that, properly designed, either kind of filter can be audibly innocuous, and that neither is better per se." (Simplistic advertisers please note.) Still another tidbit: the "18-bit" Yamaha bit-shifting quasi-floating-point converter system has some inherent drawbacks and is no more accurate than some of the better conventional solutions. (Please note, also, our own review below.)

Department of corrections.

We were a bit sloppy in Issue No. 11 on the subject of low-level DAC errors as expressed in dB's and LSB's (least significant bits). Nobody caught us but Stanley Lipshitz (naturally); his letter and our answer (excuse?) appear on page 3 of this issue. Let us set the record straight.

Track 19 of the CBS CD-1 test disc provides a series of computer-generated 997 Hz test tones with added dither, at -70.31 dB, -80.77 dB, -90.31 dB and -100 dB. The first three of these levels represent 21 codes, 7 codes and 3 codes, respectively. Thus, in terms of LSB's, they exercise the range from -10 to +10, -3 to +3 and -1 to +1, respectively (the extra code value in each case being 0). The -100 dB level is a special case (also synthesized with 3 codes but with many more 0 samples than -1's and +1's), included on the test disc as a demonstration of dithered signal reproduction below the least significant bit. Now, a -6 dB error at the -90 dB level means halving the signal amplitude and is therefore a 1-LSB error; a +6 dB error at the same level means doubling the signal amplitude and is therefore a 2-LSB error. At the -80 dB level, a +3 dB error (not uncommon) results in a signal amplitude of 8.5 LSB's and is therefore a 2.5-LSB error. And so on. If we have lost you by now, all you need to remember is that respectable DAC performance at these low levels means keeping the errors to 1 LSB or less.

Having rechecked our laboratory notes on the equipment reviewed in Issue No.11, we can now correctly report that the maximum low-level DAC error found in each unit was as follows: **Denon DCD-1500 II**, 1.5 LSB; **Denon DAP-5500**, 2.5 LSB; **Euphonic Technology ET650PX**, 1 LSB; **Philips CD960**, 0.5 LSB; **Tandberg TCP 3015A**, 1.5 LSB. Thus, in our comments, we were too kind to Denon's DAC's and a little unfair (but just a little) to Tandberg's. The Denon models have trimmer potentiometers on the circuit boards for making DAC linearity adjustments; we made no attempt to experiment with the factory settings, and it is possible that there was room for improvement. The Philips and Philips-based units have no such adjustments.

A test for asymmetrical transient clipping.

Most equipment reviewers tend to treat the square wave response of CD players a bit cavalierly; unless there is severe ringing or gross asymmetry, they call the waveform typical for the particular type of filter used. We have tried to be more precise by spectrum-analyzing the output of each player when reproducing the 1002.27 Hz square wave encoded at 0 dB on the CD-1. Since this test signal is computer-generated without distortion, its spectrum consists exclusively of the Fourier components of a perfect square wave, viz. the 1002.27 Hz fundamental and its odd harmonics—3006.81 Hz, 5011.35 Hz, 7015.89 Hz, etc.—at exponentially declining amplitudes. There should be no even harmonics in the output of the device under test, and indeed there are none produced by any of the Japanese CD players we have tested. To our surprise, however, we found that some (not all) Philips-based players exhibit this defect, specifically the CDB650 types and the lower-priced but more up-to-date CDB471/472 series. The higher-priced CD880, CD960 and DAC960, on the other hand, are absolutely clean in this respect.

We are reasonably certain—although we reserve the right to be wrong, this being our first stab at a rather slippery phenomenon—that what we are dealing with here is a special case of digital filter overload as mentioned above. The inevitable overshoot of the full-scale square wave constitutes a worst-case scenario (very rare in music) resulting in filter clipping, but that alone would not generate even harmonics. Only some kind of asymmetrical condition, such as a DC offset, would cause the even harmonics to appear. Now, every one of the anomalous Philips players uses the older SAA7220P/A digital filter chip, and every one of the unaffected units uses the newer SAA7220P/B chip. The A chip has a negative offset, intended or not, whereas the B chip operates symmetrically. It is interesting that the oscilloscope display of the square wave gives little or no hint of the A chip's asymmetrical clipping; the spectrum analyzer, on the other hand, makes it loud and clear. The amplitude of the even harmonics is of the order of 3% of the odd harmonics preceding them (i.e., 30 dB down, typically), and that is not a negligible distortion figure. We admit the possibility that the test is a mere exercise, since musical transients punching through the 0 dB ceiling will be rarely encountered, but we must still downgrade audio equipment that spontaneously outputs at -30 dB what is not inputted. What still remains to be explained is why the 100 Hz square wave encoded at -10 dB on the Denon Audio Technical CD (38C39-7147, Track 71) also causes even harmonic generation in the same players, but only higher up in the kilohertz region, not in the hundreds—that could not be a transient overload level, even with a sizable negative offset, now could it? Let Philips worry about that one...

Incidentally, the SAA7220P/B filter is the mandatory complement to the TDA1541A converter with the S1 marking in the higher-priced Philips models. (Quite confusingly, the A suffix in this last case stands for selected quality and

the S1 for *crème de la crème* in the Philips system of grading for DAC linearity.) In our opinion, this top-of-the-line Philips chip set—the 4-times interpolating digital filter in combination with the highly linearized nonadjustable 16-bit DAC, plus the sophisticated Philips error-correction chip up front—represents the current state of the art in digital playback, notwithstanding the new wave of players with linear 18-bit conversion and 8-times oversampling, which according to the earliest test reports have only equal accuracy to show for their much greater complexity. Yes, those multi-kilobuck computerized “algorithmic” playback systems are also coming, but they will have to be rather extraordinary to convince us that the best Philips chip set’s 15.75-bit resolution of 16-bit encoding needed to be improved upon. It should be added that the Lipshitz-Vanderkooy paper did not cover these latest Philips DAC’s and filters, which are 1988 developments; if it had, its conclusions might have been a little more upbeat.

About our double-blind listening tests...

Our latest thoughts on double-blind listening comparisons at matched levels are noted elsewhere in this issue. Here we just want to state that in this particular series of tests we were occasionally able to hear marginal differences in sound quality through our ABX setup—and, believe us, they were marginal. The incompetence and irresponsibility of reviewers who report night-and-day differences in the sound of CD players are beginning to get to us. We repeat, guys: you cannot do it from memory and even side by side you cannot do it without matching volume levels within 0.1 dB or at least 0.15 dB. Again, we did not ABX everything against everything, as the procedure is extremely time-consuming, but we did suffer—yes, unrelenting concentration on minutiae is a form of suffering—through a sufficient number of valid comparisons to be able to conclude with some degree of confidence what we are concluding below.

Harman/Kardon HD800

Harman/Kardon Incorporated, a Harman International Company, 240 Crossways Park West, Woodbury, Long Island, NY 11797. HD800 compact disc player, \$529.00. Tested sample on loan from manufacturer.

Our genuine respect for Harman/Kardon’s audiophile-oriented, premium-quality Citation line probably had the effect of raising our expectations too high when it came to testing this top model in their regular, bread-and-butter line of CD players (there is no Citation CD model so far). The HD800, rather than being some kind of plain-vanilla Citation, is a fancy version of the lower-priced HD400 and HD200 models, differing from these mainly in sampling frequency (176.4 instead of 88.2 kHz) and DAC’s (two of the cheap, unselected Burr-Brown PCM56P’s in the 800). The front panel and controls of all three HD’s are the same and rather Spartan, with very minor extras thrown in with the 800. Even the rock-bottom-priced Philips/Magnavoxes

have more sophisticated control facilities in some important respects, such as separate up and down buttons for index as well as track, and are a bit more solidly built to boot.

The special attraction of Harman/Kardon components is usually the engineering of the audio circuits, where the Matti Ojala influence is generally apparent even when the parts are not the best. The analog section of the HD800 does indeed evidence some good thinking and care, but all is negated by the substandard digital performance of the unit. This is one of the few current-generation CD players known to us with easily measurable nonlinearities at not only the lowest quantization levels but the middle levels as well. That is quite unjustifiable at any price point; furthermore our findings are corroborated by those of Diversified Science Laboratories as reported by Robert Long in his *High Fidelity* review of the HD800 (September 1988 issue, published in August). Exactly how much the sound of the player’s output suffers, if at all, as a result of these digital anomalies did not particularly interest us after our disenchantment at the lab bench, but our nonblind A/B quickie at matched levels against the Precision-Audio-modified Sony CDP-910 seemed to reveal a trace of coloration and an overall lack of sonic refinement in the Harman/Kardon, above and beyond the microscopic differences we have come to regard as plausible. That was enough for us to move on to the next item.

Onkyo Integra DT-7700

Onkyo U.S.A. Corporation, 200 Williams Drive, Ramsey, NJ 07446. Integra DT-7700 digital audio tape deck (price not announced). Tested sample on loan from manufacturer.

Half a year after the heartwarming collapse of the idiotic Copycode, DAT decks are still rather scarce, indeed underground, items in the U.S.A. The political convolutions and ramifications of this state of affairs are beyond the scope of our review here, but obviously something has got to give; in its home country, Japan, the DAT technology is already old hat, and the talk is turning to newer, if not better, things. Of course, any American audiophile with a few connections here and there plus the necessary cash can obtain some kind of DAT deck if he really wants one, but there is no possibility of a solid market in hardware, accessories, blank tape and prerecorded tape under the present circumstances.

We were able to borrow this deluxe Onkyo model only for a relatively short time, during which we had no opportunity to make a live stereo recording with it. We did put it through a good many laboratory and listening tests, however, and were most impressed. The quality of construction is very high; the tape transport mechanism is Swiss-watchlike in its intricate precision; the cosmetic details are also beautiful, we would say a small cut above top-of-the-line Sony or Yamaha in style and finish. The whole process of operating the cassette tray, inserting the miraculously small DAT cassette, hearing the reassuring

little whirs and clicks of automatic threading, watching the control panel take charge, handling the smoothly functioning controls, etc., gives considerable æsthetic satisfaction.

On the lab bench, we found every measurable specification of the DT-7700 fully met or exceeded. As there is no DAT equivalent of the CBS CD-1 test disc, we had no way to measure playback-only performance characteristics. (Digital-to-digital copies of CD's cannot be made on unmodified DAT decks, and an analog-to-analog copy of the CD-1 is not an accurate digital reference.) We can report, however, that the record/playback frequency response is ruler flat over the entire audio range, much flatter than we have seen in any professional open-reel analog recorder, and that wow and flutter are literally nonexistent—the expanded spectral display of the recorded test tone shows no sidebands whatsoever, not even tiny blips. In general, the analog output of the recorder appears to be identical to its line input, except of course on square waves, which show the typical sampled and quantized profile, in this case overshooting just a little at the leading but not the trailing edge—the early CD player look, probably due to an analog low-pass filter at the input. No even harmonics, though, not even at 0 dB. We did not get as much as a block diagram, let alone a schematic, with the machine, so our cause-and-effect insights are limited. All we know is that the DAT standard specifies 16-bit quantization with 48-kHz sampling (although 44.1 kHz and 32 kHz are also provided, but only for playback); for encoding the Onkyo uses a 2-times interpolating digital filter with independent left- and right-channel A/D converters, for decoding a 4-times interpolating digital filter and independent left- and right-channel DAC's. The digital input and output jacks—by the way and apropos of nothing—offer the choice of either coaxial or optical connection.

Our listening tests also gave complete satisfaction. We recorded pink noise on the cassette and tried to hear differences as we switched back and forth between the generator and the DT-7700's line output (a more critical test in many ways than when the signal is music). No difference was audible between the source and the recording. That is total accuracy, and nobody can ask for more than that. We also compared the dmp and Sheffield Lab demo DAT's with the CD versions of some of the same tracks. Such a comparison is ever so slightly booby-trapped because of (1) possible sampling-frequency conversions from the master to the CD or DAT in some cases but not others and (2) the difficulty of setting equal levels without a prerecorded 0 dB reference standard for DAT. Nevertheless, we managed to adjust the levels accurately enough by ear to yield at least reasonably credible results, to wit: exceedingly small and possibly nonexistent differences. The lack of rigor in this particular test permitted us, however, to indulge in just a bit of subjectivity, so that we ended up with a vague feeling that some of the dmp tracks were marginally better-sounding on DAT than on CD. Well, Tom Jung at dmp records on the Mitsubishi X-80 digital master recorder with

48-kHz sampling, and his DAT's are therefore digital-to-digital duplicates without conversion, whereas his CD's are converted at 44.1 kHz... who knows?

In any event, we think that DAT is the bee's knees and the cat's meow, that the Onkyo Integra DT-7700 is a lovely example of the breed, and that the politicking provincial protectionists who are keeping this important technological development off the market are nothing but picayune pea-brained Luddites who probably beat their wives and change their underwear infrequently. Do we make ourselves clear?

Philips CD880

N.A.P. Consumer Electronics Corp., I-40 & Straw Plains Pike, Knoxville, TN 37914-1810. CD880 compact disc player, \$749.00. Tested sample on loan from manufacturer.

What do you get for \$200 less than the CD960? A somewhat cheapened though commercially more up-to-date player which, in our opinion, is less attractive by a wider margin than \$200. We feel that if you can afford the tourist-class ticket here you can also afford the first-class one.

The CD880 offers the same top-of-the-line Philips digital chip set (see above) as the CD960 and DAC960 flagships, although we are inclined to suspect that the selection process includes some further fine-tuned grading, so that the low-level DAC linearity in this case is third best by a hair, but really just a hair, and possibly not even in all samples. Maximum error is still of the order of 0.5 LSB, and who can object to that? What we like less about the CD880 is the decidedly sluggish disc drawer, for one thing. It opens by means of a button right on the drawer, just like the CD960 but much more slowly; to close it, however, you have to nudge the front—no button available—and hope the drawer responds, an eventuality on which the odds are about fifty-fifty. Somebody's idea of simplified ergonomics, no doubt. The front-panel display and controls are also updated—or shall we say Japanized?—with additional bells and whistles; the trouble is that when you want to punch in 2-1 for track 21 and linger a little bit over the 2, track 2 starts to play automatically. The damn thing takes charge instead of letting the user have the last word; Sony and Denon do these things better. On top of it our CD-1 test disc, which allows perfectly normal track search and skipping on all other players known to us, made the CD880 flash the error sign when certain tracks were punched in, although the same tracks were played normally in a continuous sequence. One other minor annoyance is that the up and down buttons for index are on the remote control unit only. The latter is a new and very nice design, but we like to be able to operate all functions from the front panel if we so desire and resent the assumption that most users just pork out on the couch and never get up again.

In sound quality the CD880 falls very much into the same excellent but not necessarily unexceptionable category as the CD960 and DAC960; more about that below in

our review of the latter. If the CD880 were the only CD player available in the company's Philips-branded line, we would have to recommend it enthusiastically on the basis of its superior chip set and digital performance, if nothing else; as it is, we feel a little blah about it.

Philips CD960

(follow-up)

N.A.P. Consumer Electronics Corp., I-40 & Straw Plains Pike, Knoxville, TN 37914-1810. CD960 compact disc player, \$949.00. Tested sample on loan from manufacturer.

It turned out that the "improved" version we had been promised and had finally received was not a reengineered design but merely a unit double-checked to incorporate the selected chip set discussed above. Not all CD960's did, at least initially—our first one, as it happened, yes; a second one we looked at, no; this latest one, yes; Len Feldman's sample as reviewed in the June 1988 issue of *Audio*, obviously no, judging from his measurements; his sample of the DAC960 reviewed in the same issue, again no. By now we are reasonably certain that things have settled down and nothing but the *primo* chips are used in the three top-of-the-line Philips models.

This time we obtained absolutely symmetrical square waves (without even-order harmonics of course), and the low-level linearity was, if anything, a smidgen better than in our first sample, with a maximum error of less than 0.5 LSB. Very impressive performance, very beautifully built machine, four separate power supplies, outstanding control and display facilities with very good human engineering, still the old-style (CDB650-type) remote control though, and no volume-controlled main output—as if it mattered with a maximum of only 2 volts out. (That CD convention was established, we are absolutely convinced, as affirmative action to assure jobs for preamplifiers even where there is no phono source.)

The sound of the CD960 appears to be identical to that of the topologically extremely similar DAC960; further comments in our review of the latter below.

Philips DAC960

N.A.P. Consumer Electronics Corp., I-40 & Straw Plains Pike, Knoxville, TN 37914-1810. DAC960 D/A converter unit, \$949.00. Tested sample on loan from manufacturer.

This is not a "digital audio preamplifier" package *à la* Denon DAP-5500, as there are no analog inputs, not even for line-level sources. The DAC960 is strictly a digital-to-analog converter of great versatility, designed to be inserted between a digitized signal source (coaxial or optical, CD, DAT or satellite tuner) and an analog input (preamp, power amp or what have you). It uses the same selected and top-graded Philips chip set (TDA1541A-S1 and SAA7220P/B) as the top-of-the-line Philips CD players; we even suspect

that the absolutely best chips may be reserved for this one model because the low-level linearity we measured was close to perfection, with a maximum error of 0.25 LSB in the better channel and only infinitesimally more in the other. All other parameters of digital performance were of the same order of excellence. The unit is probably the most sumptuously built of all the Philipsses, with three separate power supplies incorporating three individual transformers, balanced/fixed/variable outputs, an extra 6 dB of gain available at the volume-controlled output (no preamp needed), beautiful control panel with automatic indication of sampling frequency (48, 44.1 or 32 kHz), and other goodies too numerous to mention. Since all the quality, both digital and analog, is built into this one box, the CD player you plug into it does not have to be particularly sophisticated; a good disc drive, drawer, laser and error-correction chip are the main requirements. Even so, to eliminate any possibility of a compromise, we decided that the CD960 plugged into the optical input of the DAC960 would be our arbitrary reference—the most elaborately engineered hookup available to us—for at least one of our full-fledged double-blind listening comparisons. The variable output option on the DAC960 made it easy to match volume levels accurately.

The CD player we pitted against the "double 960" was the Precision-Audio-modified Sony CDP-910, which had impressed us equally in casual listening. The details of that ABX test are given in our Precision Audio review below; suffice it to state here that there was a minuscule audible difference and that our very hesitant vote at the end was not in favor of the Philips combination. It was strictly a choice between analog output stages, and the high-feedback integrated op amp of Philips, although unquestionably excellent in sound, was judged to lack the special qualities of the other player's custom analog board with discrete components. It was close, though, very close.

Precision Audio D1 Analog

Precision Audio, 223-47 65th Avenue, Bayside, Long Island, NY 11364. D1 Analog section replacement for Magnavox, Philips and Sony CD players, \$450.00. Tested samples (Magnavox CDB472 and Sony CDP-910 mods) on loan from manufacturer.

Precision Audio is a tiny company with an uncompromising attitude toward audio circuit design. David Rich, their R and D man, is a highly articulate young man who teaches electrical engineering to college students, designs VLSI chips (i.e., integrated circuits of great complexity) as his main professional activity and yet believes that integrated op amps should not be used in the audio signal path, least of all in the analog section of a high-quality CD player. The company has published two position papers on this subject, "Application Note #1: Ten Reasons *Not* to Use Integrated Operational Amplifiers in Audio Applications" and "Application Note #2: The Transimpedance Amplifier & Its Use in CD Players," the latter a technical explanation of the circuit concept used in the analog replacement board

under review here. These short but highly informative papers are available directly from Precision Audio.

The D1 Analog board, which must be installed by its makers, incorporates two discrete, class A, low-feedback, high-slew-rate and very fast current-to-voltage amplifiers in the proprietary configuration called transimpedance amplifier, plus all the associated analog circuitry. The DAC of the CD player produces current, not voltage, and this current signal is not smooth and continuous but full of high-frequency glitches at the transition points of the staircase waveform. Converting this input into a line-level voltage output is not at all the same problem as amplifying a small voltage signal with a stage of gain; the solution is of necessity somewhat different, and the transimpedance amplifier appears to be a very good solution.

The D1 modification is compatible only with DAC's having low glitch currents on bit transitions and therefore requiring no sample-and-hold circuit after the current-to-voltage converter stage. Right now, that leaves the Philips TDA1541 pretty much in a class by itself, although others are expected to be forthcoming. We first tested the Magnavox CDB472 (\$229.00 in the stock version) with the D1 board added; this is one of the Philips-based players with the asymmetrical transient clipping problem discussed above, and it also has a linearity error of 1.75 LSB at the lowest level in one channel (only 1 LSB in the other). Even so, we found the sound to be very pleasing on a purely subjective basis without a double-blind listening test; furthermore, the player is quite impressive in mechanical operation and ergonomics for such a cheap machine (not so cheap, of course, once you add the D1). Precision Audio is a little bit down on this model for the reasons mentioned and also because of inadequate power supply regulation, which they try to improve in their mod. Unfortunately, the TDA1541-equipped choices are somewhat limited. Their best shot so far has been the Sony CDP-910 (discontinued but still available here and there in the upper \$300's), which is a marvelous CD player digitally, even though its 1541 has no suffixes of any kind (a selected chip predating the current designations?). We measured mind-blowing low-level linearity in our D1-modified sample, equal to that of the DAC960 or possibly even a hair better—if such a thing is possible. Mechanically, too, and in ease of operation, control facilities, display, etc., the CDP-910 is close to the top, regardless of price. Great value. The bad news: its successor, the CDP-950 (\$450.00) is without the +15-volt supply rail, which was removed—and the whole design watered down—to reduce the manufacturing cost and hold some sort of price in the face of the dollar-yen exchange rate. Precision Audio wants to have nothing to do with this model. The Sony CDP-507ESD (\$600.00), on the other hand, is quite similar to the CDP-910 but uses an 8-times interpolating system which requires time-multiplexing two TDA1541 chips. Since the chip was not designed to operate in this mode, Precision Audio is hesitant to do a D1 mod on the unit. The best immediate solution? The Philips CD960,

most probably, but then we are talking big bucks. Get up-to-date information from the company before you make a move, in case you are interested.

As already summarized above, we were sufficiently impressed by the sound of the Sony CDP-910 with the D1 Analog board to run for our ABX comparator and set up a double-blind listening comparison at matched levels with the Philips CD960 plugged into the optical input of the Philips DAC960 (\$1898.00 the package and until then our more or less arbitrary reference). We must repeat once again that our sporadic ABX tests with just a few highly motivated participants cannot possibly have the statistical authority of a massive test program with dozens of panelists and hundreds of comparison trials. On the other hand, we firmly believe that if one listener in a hundred can *provably* hear a difference, then the difference is real—even if 99 others are unable to hear it. Our conclusion in this case was that the modified Sony is indeed distinguishable in sound from the Philips combination; the difference, however, is very small and not easy to zero in on. One panelist did it with a confidence level of 98.9%, and another was not far behind, but everybody agreed it was a tough one. The main difference, after A and B were identified, was felt to be an “etched” or super defined quality in the sound of the Philips combination as against a slightly softer, spatially more convincing and somehow more musical quality in the Precision Audio mod. It seemed to make sense, as excessive etching is considered one of the possible artifacts of high-feedback integrated op amps. Remember, though—we are nitpicking between two outstanding CD playback systems.

Even so, the Sony CDP-910 with the Precision Audio D1 Analog modification became our new reference.

Yamaha CDX-5000

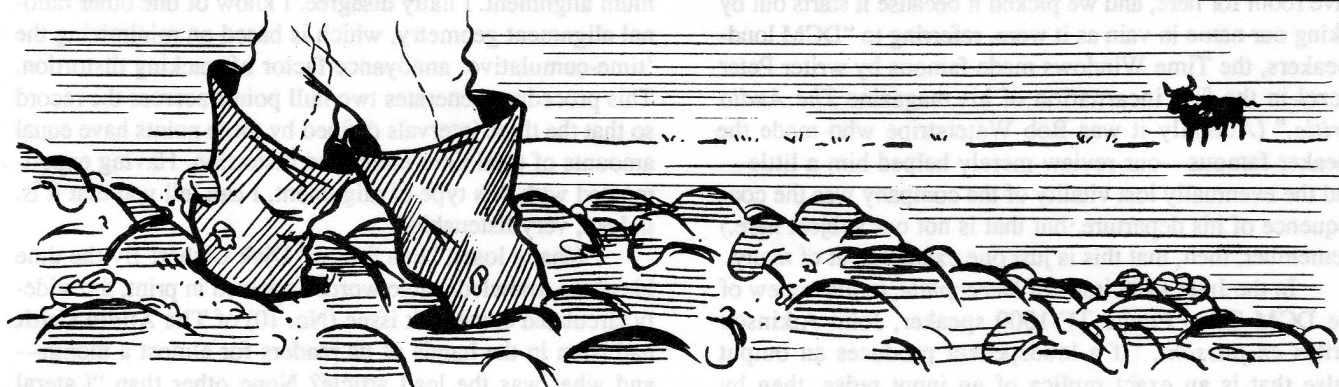
Yamaha Electronics Corporation, U.S.A., 6660 Orangethorpe Avenue, Buena Park, CA 90620. CDX-5000 compact disc player, \$2200.00. Tested sample on loan from owner.

A friend who had paid only \$1000 for a brand-new CDX-5000 brought it to our lab for just a few hours to find out how it performed and why it was being discounted from \$2200. It is certainly a massive, luxurious, beautifully built unit. We measured some seemingly negligible DAC nonlinearities at the middle as well as the lowest levels; it must be noted, however, that an error as small as 0.5 LSB measured at the output of this bit-shifting quasi-floating-point “18-bit” player means a 2 LSB error in the DAC itself because of the 12 dB attenuation resulting from a 2-bit shift in the binary point—and some of the errors were bigger than that.

In a quick ABX test at carefully matched levels (the CDX-5000 has a digital volume control), your Editor was able to distinguish the Yamaha from the Precision-Audio-modified Sony CDP-910 with a confidence level of 92.7%, the owner with only 61.3%. Very inconclusive, but we still prefer the Precision Audio for the reasons stated above. ◊

Hip Boots

Wading through the Mire of Misinformation in the Audio Press



Remember "The Admonitor" from our early days? It focused on technical misstatements and general misrepresentations of the truth in audio manufacturers' advertising. Eventually we discontinued the column because we perceived that the central issue was the credibility of the media, not just the credibility of the pages purchased by advertisers. In this new column, both editorial and advertising pages will come under scrutiny, with emphasis on the exposure of deliberate hype as well as sweet ignorance.

So many years have elapsed since our last column in this vein, and so many printed absurdities have insulted our intelligence and gone unanswered, that we are experiencing a kind of *embarras de richesses* as we look at the choice of subjects for this first go-around, like a hungry man at the *smörgåsbord* trying to decide what to put on his first plate. We might as well observe the accepted tradition and start with something fishy...

Straight Wire

In Issue No. 10 we put in a good word for this wire and cable marketing company because of something intelligent they once said, but now we are sorry. Their currently advertised product (we saw it in *Stereophile*) is the Triaxial Power Cord, headlined as the Power Conductor. It is "the cleanest sounding AC cable," the ad says, priced—we kid you not—at \$149 for the 6-foot length and \$199 for the 10-foot model.

Do you understand? This is a *line cord*, to plug your equipment into the wall, at \$1.66 to \$2.07 per inch! We refuse to dignify the ad by arguing with its pathetic pseudo-technical claims about low Q, RFI, etc. All you need to know is that there are hundreds of yards of wiring in your wall and that the electricity does not know where the wall stops and the line cord begins. If the latter is of large enough gauge to handle the current flowing through it and is adequately insulated, you have a good one. Of course, for all we know, Straight Wire may be willing replace all the wiring in your wall with the Power Conductor, possibly even discounting it to \$1.25 per inch. Or how about putting in the "cleanest sounding" feeder line between your house and the power substation? How about pouring a bottle of Perrier into the river to make it cleaner?

We are aware that just about all marketers of audiophile-oriented wire and cable products, not just Straight Wire, make totally untenable and, indeed, ignorant claims. The Triaxial Power Cord, however, sets a new record in one or the other of two categories: (1) contempt for the mentality of the well-heeled audiophile or (2) totemistic belief in the Cable as the mystical repository of good sound.

John Atkinson in *Stereophile*

The high-end audio journals are probably the main source of folklore passed on from audiophile to audiophile, and right now *Stereophile* has the largest circulation of them all, so that it is capable of derailing more minds with casual misinformation than the rest of us. Hence our present concern.

When Larry Archibald, the automobile repairman and audio entrepreneur who had acquired Gordon Holt's faltering publication (we know the syndrome!) in 1982, decided four years later to import John Atkinson from England to be his editor, it looked to us like a good move. Larry, like Mussolini, had "made the trains run on time," and now he was ready to go quasi-slick with the magazine, under the stewardship of someone who had done it before in the home country of audiophilia. About a year ago *Stereophile* became a monthly, and we must give John Atkinson full credit for the professional discipline it took to make that happen and keep it going. We could use someone like that.

When it comes to science and technology, however, we have a big problem with "JA." He talks too much about technical matters in his articles and editorial comments, even when he is not actually expected to, and he is too often wrong. He interrupts a perfectly straightforward discussion of equipment with a gratuitous, grandstanding technical

aside, clearly intended to remind the reader that he is in scholarly company, and makes a mess of it. We have kept track of quite a number of these bloopers, but one is all we have room for here, and we picked it because it starts out by taking our name in vain as it were, referring to "DCM loudspeakers, the Time Windows made famous by writer Peter Aczel in the first incarnation of his magazine *The Audio Critic*." (Actually it was Bob Waterstripe who made the speaker famous—our review merely helped him a little—and the eventually lost vitality of the company was the consequence of his departure, but that is not our subject here.) Remember, then, that this is just one example out of many.

In the June 1988 issue of *Stereophile*, in his review of the DCM Time Frame TF-1000 speaker, John Atkinson writes *en passant*, "If a loudspeaker produces an output pulse that is an exact replica of an input pulse, then by definition it must have a perfectly flat frequency response. In practice, as to do so would necessitate the speaker being able to reproduce the DC component of the pulse—something that only a fan can do, DC implying a constant-velocity stream of air—some modification of the pulse shape is inevitable, equalizing the areas above and below the time axis." That is the rankest nonsense—quite aside from the terribly constructed second sentence—and indicates a fundamental lack of understanding of waveforms. All that JA would have had to do to test his statement was to plug the output of a square wave generator into the AC (i.e., DC-blocking) input of an oscilloscope. Except at the lowest frequencies, where the phase shift introduced by the blocking capacitor causes some tilt, the waveform is exactly the same as with DC coupling—and most certainly at any frequency ever used for pulse testing a loudspeaker. DC components and blowing fans forsooth! The flat ramp of a square pulse is synthesized by a long series of harmonics at exponentially declining amplitudes—pure AC, John, courtesy of Monsieur Fourier—and a loudspeaker of sufficient bandwidth without amplitude and phase errors could, in theory, reproduce it perfectly. (Look, Ma, no fans.)

All this is pretty elementary stuff and makes us wonder why ex-editor Holt, who appears to know about such things, is not asked to edit the incumbent editor. *Quis custodiet ipsos custodes?* Larry Archibald cannot be expected to catch the technical bloopers, but he ought to be aware by now that audio journalists who are on shaky ground technically are in plentiful domestic supply—he did not have to import one for *that*.

Dick Olsher in *Stereophile*

While we are on the subject of our brethren in Santa Fe, let us kill two birds with one stone: settle a minor grudge and straighten out some major misinformation.

In the January 1988 issue of *Stereophile*, referring to the Bärwald lateral tracking alignment in a tonearm review, Dick Olsher wrote as follows: "A now defunct audio critic and publisher, whose identity I shall not divulge except to say that his initials are PA, fervently promoted this align-

ment. This same fellow went on to claim that correct tonearm geometry was not a matter of opinion, and that for a given record geometry there was only one correct or optimum alignment. I flatly disagree. I know of one other rational alignment geometry, which is based on minimizing the 'time-cumulative' annoyance factor of tracking distortion. This procedure generates two null points across the record so that the three intervals defined by these points have equal amounts of total time-integrated distortion. Having experimented with this type of alignment, I can tell you that it is, indeed, very listenable."

What a loser, "this fellow" Dick Olsher! By the time his oh-so-knowledgeable words appeared in print, the widely circulated comeback issue (No. 10) of *The Audio Critic* had been in the hands of its readers for almost a month—and what was the lead article? None other than "Lateral Tracking Alignment Revisited," explaining in painstaking detail the specifics of the "other" alignment (the one we call Löfgren B), complete with optimization charts, references, and other previously unpublished information. A certain reviewer, whose identity we shall not divulge except to say that his initials are DO, was left with egg on his face.

But wait—that is not the whole story. Whether or not he knows calculus, Dick Olsher obviously has never set eyes on the integral which the Löfgren B approach requires to be minimized by optimizing offset angle and overhang values; his explanation involving three intervals of equal distortion is the most horrendous gobbledygook, unrelated to the actual nature of the alignment. He has got it "bass ackwards"—it happens to be the Bärwald solution in which three maxima are made equal... hell, read our article. The sad part is that we know exactly how much, or rather how little, information DO had on the subject and where he got it before he garbled it. Every bit of it came from a telephone conversation with Sao Win, one of the grand total of four persons who could possibly have told him about Löfgren B (the other three being Græme Dennes, Barney Pisha and your Editor, none of whom did). It was all news to DO, but he quickly decided he could gain some Brownie points among his readers by tossing off such a hip little tidbit and at the same time be one up on good old "defunct" PA. Burn, baby, burn.

Almost sloshing over our hip boots is the much more seriously misinformative loudspeaker cable article by Dick Olsher in the July 1988 issue of *Stereophile*, for which he has already run into a lot of flak, but not the right kind. We have yet to see a subscriber's letter or manufacturer's comment pointing out that he actually wrote two articles in one, the first having absolutely no connection with and no relevance to the second. The first is a rambling hodgepodge of technical vignettes on subjects as loosely related as low-level noise currents, skin effect, thermophonics (!), Fibonacci numbers (!!) and so forth. The intent is to have the reader say to himself, "Hey, this guy knows his stuff!" Then comes the second part, consisting exclusively of self-

indulgent subjective observations and descriptions of quasi-mystical experiences *à la* Enid Lumley—"dark electronic flavoring," disembodied treble, "airy and quick" bass (yes, bass), liquid textures, etc., etc.—without any attempt to establish even the vaguest cause-and-effect link between these sonic impressions and the previously discussed technical parameters, or to normalize the listening comparisons to some sort of initial reference or common denominator (let us not even talk about ABX). Thus the introductory technical palaver was sheer window dressing; it might as well have been published, for whatever it was worth, in another magazine two months earlier or a year later.

Why is it so terrible for the high-end audio community to accept the simple fact that audible differences between loudspeaker cables are amplitude (i.e., equalizer-type) differences of a few tenths of a dB and, on the bass end, Q (i.e., damping) differences? It is so obvious from a simple analysis of the cable as an LCR network between a source impedance and a termination impedance. (See also Issue No. 10, page 22.) We have started to model some of these differences—typical as well as extreme cases—with a neat little piece of software easy enough even for your Editor, namely the MICRO-CAP II Macintosh Professional Circuit Analysis Program by Spectrum Software of Sunnyvale, California. Our plan was to have some of this work published quite casually in this issue (as hinted on the back cover of No. 11), but we have meanwhile become so disgusted by the intellectual unaccountability of various wire/cable marketers and their journalistic sycophants that we want to tighten up the article, add a few more examples to it and make it into a full-fledged tutorial-*cum*-exposé. This is the darkest side of the audio industry today, where the temptation of easy high-ticket sales without any engineering overhead has produced a whole subculture of charlatans, hustlers, parasites and suckers. Where is the FTC? Where is Savonarola?

Harry Pearson in *The Absolute Sound*

"Records are more revealing of the performance of components than are CD's because they contain more information. At this point, I see little to be gained from using CD's as a source, since they are so limited in what they can reveal."

—Harry Pearson (*The Absolute Sound*, Spring 1988)

"A properly dithered 16-bit digital audio storage system with accurate analog-to-digital (A/D) and digital-to-analog (D/A) converters will outperform any analog storage medium in existence...[It] is distortion-free, displays no noise modulation or other digital artifacts, and resolves arbitrarily small signal details well below the least significant bit (LSB) of the number system employed."

—Prof. Stanley P. Lipshitz, Ph.D. (AES, March 1988)

No comment is necessary except to note that we have measured a few playback systems that appear to satisfy the conversion accuracy requirements stated by Dr. Lipshitz, who is possibly the world's top authority on the subject. ◇

Analog Miscellany

(continued from page 12)

KEF, points out that there is quite a bit of intermodulation distortion, with 250 Hz and 2 kHz mixed 1:1, at levels far below the power-handling limits of the speaker. Both of those frequencies are handled by the midrange driver, which is quite clearly overburdened, as we already implied above. The biggest and most information-rich part of the music all has to be funneled through that little flexible polypropylene cone. KEF should have opted either for a more conventional bass system allowing a higher woofer-to-midrange crossover frequency, say 400 Hz, or else for an additional lower-midrange driver to make the Model 107 a 4-way system. The conceptual beauty and lean elegance of the design as it stands may be its hidden weakness, at least in the opinion of one reviewer.

Record & CD Cleaning Machine Nitty Gritty Hybrid

Nitty Gritty Record Care Products, Inc., 4650 Arrow Highway, Unit F4, Montclair, CA 91763. Model Hybrid 2 record and CD cleaning system, in solid oak cabinet, \$599.00. Tested sample on loan from manufacturer.

Keeping phonograph records clean is like brushing teeth, unquestionably necessary but an obsession with some people and merely a routine with others. We have always kept our LP's satisfactorily clean from the first play, with just ordinary care, so that machine cleaning them never made a dramatic difference in listening quality. It is, however, the best way—with really filthy records probably the only way—and Nitty Gritty has been the commonsense industry standard ever since the esoteric Keith Monks machines priced themselves out of the market. V.P.I. is the available alternative; we have no opinion on that subject, having had no experience with the latter.

The Nitty Gritty Hybrid intrigued us because it is the first machine to offer both LP and CD cleaning in a single unit. Now, cleaning a CD is rarely necessary; the disc is easier to handle without soiling than an LP, and the very method of playing it is inherently clean; on the other hand, some bozos still think a CD is rugged enough to be used as an ashtray or as a frisbee, and they clog up the microscopic pits beyond the clairvoyant powers of the Reed-Solomon error-correction code. In such a case a thorough cleaning that avoids circular motion (in the direction of the pits) is indicated, and the Nitty Gritty gadget is just the ticket.

What Nitty Gritty did was to take their trusty .5Fi series design, which is next to the top of the line, and add to it an eccentric capstan adapter to "decircularize" the cleaning motion. You place the CD on the adapter, apply "Pure CD," which is Nitty Gritty's proprietary CD cleaning fluid,

(continued on page 48)

Reference Systems: Some Tentative Recommendations

It would be too soon after our comeback, with not enough tests of current equipment under our belt, to make sweeping judgments here of what is absolutely “the best,” but we do have a few candidates.

When we were younger and still a little brash, more specifically in our Winter/Spring 1979 issue (Vol. 2, No. 1), we wrote that “...only two choices of equipment are of genuine interest to the serious audiophile: (A) the best in sonic performance, regardless of price or other considerations, and (B) something reasonably close to the best, at a much, much lower price—if such a thing exists. Thus, the world’s third-best preamplifier over \$1000, or the fourth-best under \$500, is an absolute bore even if it happens to be a respectable engineering achievement and the designer’s mother is proud of it. The fact is that only Reference A and Reference B, conceptually speaking, are worth considering at any given time in any given component category, unless some very specific reason exists for a substitution.” That was the rationale behind our two different reference systems, which we kept revising and updating; we suspect that some of our more impatient readers were interested in little else when a new issue came out.

Since then the climate of the audio world has changed so greatly that our assertions regarding these matters can no longer be so sweeping. There are at least twice as many different products on the market today, maybe more, the vast majority of which will never be tested by us or any other audio publication. Even the most important and/or most intriguing items constitute a forbiddingly large group for the conscientious equipment tester, whose only consolation is the undeniable convergence toward a single standard of quality in similarly marketed and priced components, so that omissions are of smaller consequence than they used to be. Most significantly, a tremendous change in price structure has taken place, putting certain high-end items (e.g., \$33,333 speaker systems—see below) into the never-lend-it-to-anybody category and making even B-level choices extremely difficult because of the A-ish price tags.

Thus the recommendations below must be taken as expressions of our admiration and considered judgment, rather than as absolute rankings, and certainly not as the conclusions of any kind of comprehensive survey. It is quite possible that substitutions of equal or even higher quality could be found in each category, but that reservation applies to any all-star team.

Reference A

Those who look for The Best no matter how much it costs always run the risk of being talked into something that is best merely by virtue of having the highest price tag. Many ultrahigh-end audio products are poorly, indeed irresponsibly, engineered, not only because the emphasis is on the sizzle, not the steak, on image rather than solid concept and execution, but also because the designer is often an ego-tripping cultist instead of a disciplined technologist. In our admittedly fallible opinion the Reference A components we have selected here, staggeringly expensive as they may be, are essentially honest products designed with performance rather than the maker’s early retirement in mind.

Loudspeaker System

Although we have not tested it in our laboratory, we auditioned the **Martin-Logan “Statement”** (\$33,333.00) at the Betsy Rosenfield Gallery in Chicago in June and have to report that we have never been quite so impressed by a speaker system. We were promised the opportunity to measure it and put it through any test we wish at a nearby location as soon as it is installed there, but they will not ship us the Statement from Kansas City on loan. (Can you blame them?) We are listing it here anyway because we know of no other speaker likely to beat it.

Each side of the stereo system consists of a slightly curved, seamless electrostatic panel 6 feet high and 3 feet wide, similar to the CLS but with about twice the surface area, and a separate 7-foot tower enclosing four very costly 12-inch woofers. An electronic crossover/equalizer comes with the system; crossover frequency is 120 Hz. The sound can best be described as life-size and lifelike—overused words almost automatically discounted by audiophiles as hyperbolic but in this case perfectly fitting. The dynamic capability of the electrostatic transducer is claimed to be 120 dB average SPL at 5 meters at all frequencies, and what we heard seemed to corroborate that specification. It is possible that the huge room in which the Statement was demonstrated contributed significantly to these impressions.

Power Amplifiers

Since we formed our opinion of the Statement speaker system as demonstrated with Krell amplifiers, and since Martin-Logan has worked closely with Krell in developing and testing the speaker, it is reasonable to assume that Krell would be the right—or at least a right—choice here, even though we have not tested any of their power amplifiers so far. What we do know is Dan D'Agostino's uncompromising design philosophy (see Issue No. 10, page 16) and sky-high construction standards—so why not drive the Statement the way Martin-Logan prefers to, especially when price is not an issue?

To drive the electrostatic panels, then, two top-of-the-line **Krell KRS-200** mono power amplifiers (\$16,000.00 the pair) would be the ticket; below 120 Hz, to drive the woofer towers, two of the dirt-cheap but twice as powerful **Krell KMA-400** mono amps (\$11,000.00 the pair) will be just perfect. Balanced operation is standard in both models.

Now, if you think \$27,000 for power amplifiers alone is a little on the crazy side—and the thought has occurred to us, too—we have an alternative for you at less than half that price: four **Boulder 500** stereo amplifiers bridged for mono (\$3295.00 each, \$13,180.00 total). The bridged 500 is the finest power amplifier we have actually tested and lived with; it can swing 70 volts into the load, more than either Krell, although the pure-class-A Krells have the stiffer power supply. A pair of bridged 500's connected in their optional balanced mode is our own reference at this writing; they sound magnificent and are undoubtedly compatible with the Martin-Logan speakers.

Preamplifier

Exactly the same argument applies in this category to the **Krell KRS Balanced** mono preamplifiers (\$10,000.00 the pair) as in the case of the Krell power amps above. They were part of the Krell/Martin-Logan system that sounded so fantastic in Chicago; although we have not tested them, we know that they are designed without the least compromise and superbly constructed—so why break up the set? Again, at less than one third the price, the **Boulder MS** stereo preamp system (\$3144.00) with the balanced output option is our own reference and giving us total satisfaction.

Wires/Cables

The mono amplifiers should be positioned behind the speakers in such a way that each connection to the speaker terminals is only a couple of feet long; this will make the choice of speaker wire completely uncritical as long as it is, say, No. 14 or thicker—notwithstanding tweako howls to the contrary. At line level, the balanced outputs must be connected to the balanced inputs by means of professional XLR-type connectors and matching cable with two conductors plus shield, designed for balanced operation; thank heavens the mystics, pseudoscientists and gougers have not invaded this specific territory yet (we could be behind the times, though), so that the very best you can find should be

quite acceptable in price. We use Canare Cable (courtesy of Boulder), but others should be equally suitable.

Turntable and Tonearm

We have not tested it and are unlikely to do so in the near future, but the **Versa Dynamics 2.0** (\$11,500.00; optional noise shield for the air pump, \$600.00) just has to be the turntable/tonearm of choice here from all we can judge on our own and have heard from others. Apparently a true delight to those who love to fuss a little and listen a lot (to LP's, that is), it looks to us like a real piece of machinery, unlike that snobby French exercise in unearned technol-elitism, the Goldmund Reference (\$27,250.00, *oh là là*). The \$4000 increase in the price of the Versa Dynamics since its debut looks to us a bit arbitrary, however. As our readers know, our own reference is the **Win SEC-10** turntable (\$4000.00) with SDA-10 tonearm (discontinued), and we feel absolutely no need to upgrade it.

Phono Cartridge

Out of the relatively limited number of ultrahigh-end designs known to us, the totally new and different phono transducer we reviewed in the last issue, the **Win FET-10** (\$2250.00, complete with electronics), would be our logical choice here, but we have two reservations about it. One is that some users might consider the hiss level from the fixed outputs of the electronic source module just a little high for an "ultimate" system; the attenuator-controlled variable outputs provide the better signal-to-noise ratio but are unlikely to be plugged into the preamplifier of a system in which all program sources are expected to be more or less matched at line level. (Future production units will not have this minor problem, we are told.) Secondly, regardless of the choice of outputs, the cartridge makes no use of the costliest part of the preamplifier, which is the phono stage. (The modular design of the Boulder MS eliminates this dilemma; you can buy it without the phono module.) To those who must absolutely have the Krell, then, we recommend the **Highphonic MC-D15** (\$1500.00), one of the two finest-sounding moving-coil cartridges in our experience (the other is the discontinued Win Jewell). There is also an **MC-D15 Signature** (1995.00), which we have not heard.

CD Player

Judging from its description, technical specifications and all the right noises its marketers are making, the **Wadia Digital 2000** Decoding Computer (\$6500.00) would be the obvious D/A converter for this system, but we have not tested it yet. As a front end to it—from disc to digital output, with controls—the **Philips CD960** (\$949.00) has all the right stuff, but so do a number of others.

Tuner

We have no opinion at all in this, to us, low-priority category. One of these days... (Hint: freedom from low-level "birdies" is the rarest quality in FM stereo reception.)

Reference B

Ten years ago, when we made our first Reference B recommendation, the idea was to keep the price of the entire system in the middle two thousands. Those days are gone forever; audio component prices have increased tremendously, so that to satisfy our B requirements any system today will have to be almost disturbingly costly, though still far short of the A bracket. Maybe we should start thinking about a Reference C, even if it sounds a little less good...

Loudspeaker System

This is an easy and unequivocal choice. The Carver "Amazing Loudspeaker" (\$1576.00 the pair) is not only the best speaker system known to us in its price range but also a plausible contender against all comers—though not necessarily for all tastes—up to almost the Reference A class. In our opinion, it is true a classic. It must be broken in, however, before you can form any kind of opinion about it, and it is far from efficient. On the other hand, its bass performance is so good that you will not even have to think about a subwoofer.

Power Amplifier

The Carver speaker soaks up lots of watts (without the slightest distress, to be sure), so the problem here is to find something very powerful and accurate at a lower price than those qualities generally cost. The solution could very well be the Carver M-4.0t (\$799.00), but we have not been able to test it yet although it is definitely in production; in fact, our promised review sample is overdue. The reason why we feel we can recommend it, at least tentatively, is that it is Bob Carver's "t-mod" of a pair of his deliberately and parodistically overengineered Silver Seven mono tube amplifiers (\$17,500.00 the pair), which we reviewed very favorably in Issue No. 11. On the basis of previous experiences with the Carver t-mod technique, we can assume with some degree of confidence that the M-4.0t is an exact sonic clone of the Silver Seven. Enough said (except to knee-jerk Carver resisters, of course).

Preamplifier

We have tested such a limited sampling of the current crop in this category that we are in no position to have strong opinions on the subject. The Citation 21 (\$599.00), which we did test, fits in here very nicely, but it would be unfair to other contenders (Adcom, Hafler, PS Audio and

more than a few others) to make that an "official" recommendation. We simply need more time.

Wires/Cables

Much the same comments apply here as in the case of Reference A above. If you put the stereo power amplifier between the speakers (you can watch the level and clipping display that way), only about four feet of speaker wire will be needed to reach the speaker terminals on either side, and therefore ordinary No. 14 wire (No. 12 if you are worried) will do just fine. The line-level connections should be made with premium-quality phono plugs (Tiffany, for example); this is more important than the brand of shielded coaxial cable you use as long as it is not cheap junk (the aforementioned reasonably-priced Canare Cable is very good in this configuration, too).

Turntable and Tonearm

The last time we looked at mainstream (i.e., other than ultrahigh-end) phono components was quite some time ago, so once again we have no definitive recommendations to make. The Systemdek IV (\$850.00 with arm) looks like a good choice to us, based on what we understand about the design and on favorable reports from highly knowledgeable users. We would have to test it, of course, to confirm that impression.

Phono Cartridge

Since the good Japanese MC cartridges have priced themselves out of the Reference B bracket, we would be inclined to opt for the Grado Signature MCZ (\$300.00), a sophisticated magnetic design incorporating all that Joe Grado has learned about phono transducers in the last 30 years, which is considerable. We have never measured it, but we know the Grado scene well enough to recommend it quite confidently.

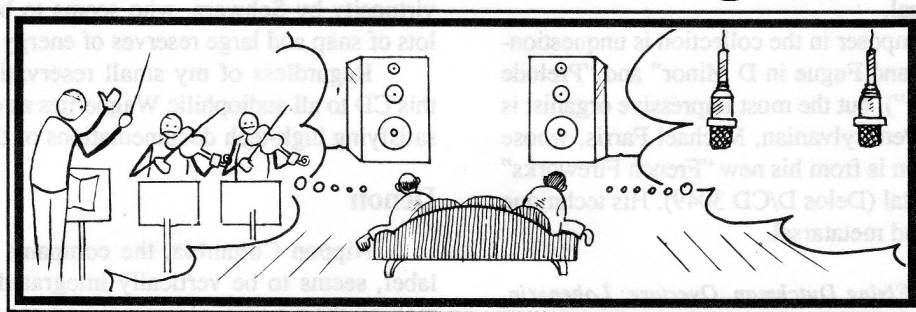
CD Player

The best bet here would be to find a Sony CDP-910 in a factory-sealed carton (discontinued but still available in the upper \$300's if you look for it hard enough) and then have the Precision Audio D1 Analog section replacement (\$450.00) put into it. If you cannot find the CDP-910, ask Precision Audio for their latest recommendation. They know what they are doing.

Tuner

See under Reference A above; the same comments apply here.

Records & Recording



This is one column your Editor would gladly assign to outside reviewers; the problem is that the most perceptive music critics seem to have little patience with the subtle difference between good, better and best in audio quality, whereas connoisseurs of the latter are too often naive on the subject of musical values. Until that dilemma is resolved, our readers are stuck with the obvious compromise at hand.

Good Engineering in the Service of Good Music: Recent CD's from the Record Companies That Know How to Do It

By Peter Aczel
Editor and Publisher

No, I have not forsaken analog LP's altogether. I do confess to a strong leaning toward CD's, however, because of their vastly greater convenience (no small matter!), wider dynamic range, freedom from hiss/clicks/pops, cleaner bass, superior physical stability and durability, and just plain higher fidelity. It would have to be an extraordinary analog LP to get me excited these days. Those who fiercely proclaim the continuing supremacy of analog recording and the phonograph appear to me almost as strange and bewildering today as, say, flat-earth cultists or flagellants. Do these people hear something totally different from what I and thousands of other audio professionals hear? Do they have their nostalgia, their loyalties, their resentments, their peer-group pressures where their ears should be?

I am not talking about specially engineered, 30-inch-per-second, extra-wide-track analog master tape vs. the standard Sony, JVC or Mitsubishi digital master tape. That kind of comparison might still tip the scales in favor of the analog recording, although I doubt it. What I am talking about is the finished, packaged, off-the-shelf consumer product, LP vs. CD. No comparison there.

In the last issue, I focused on Delos International as a prime example of a good-music label with state-of-the-art engineering, viz. the work of John Eargle. In this issue, I am covering a wider sampling of comparably worthy labels

with different repertoires and engineering styles, represented by recent (or at least not too old) releases.

Delos

Alphabetical order rather than favoritism is my reason for leading off with the latest from Delos and John Eargle, in further confirmation of the views expressed in my last column (to which the reader is referred for background information).

"The King of Instruments: a Listener's Guide to the Art and Science of Recording the Organ" (ten selections by J.S. Bach, Buxtehude, Messiaen, etc., from the recent Delos catalog). Delos DiCD 3503 (made in 1988).

For the serious organ-music lover, this is strictly a sampler to facilitate buying decisions. For the audio freak with a when-you've-heard-one-you've-heard-them-all view of Bach fugues, it may well be all the organ music he will ever need for window-rattling demos.

The ten selections are from nine different Delos CD's and represent nine different organs and churches. The sound is awesome, with incredible definition of the sub-bass line, stupendous dynamics and superb rendering of the various reverberant spaces; I am unaware of better organ recordings than these. John Eargle, himself an organist, was

the recording engineer and producer of all but one of the albums represented; his technical/musical program notes are worth reading, as usual.

The greatest composer in the collection is unquestionably Bach ("Toccatina and Fugue in D Minor" and "Prelude and Fugue in D Major"), but the most impressive organist is probably the young Pennsylvanian, Michael Farris, whose Marcel Dupré selection is from his new "French Fireworks" symphonic organ recital (Delos D/CD 3049). His technique is digital all right—and metatarsal.

Richard Wagner: The Flying Dutchman, Overture; Lohengrin, Prelude to Act I and Prelude to Act III; Parsifal, Prelude to Act I, Prelude to Act III, Good Friday Spell. Seattle Symphony Orchestra, Gerard Schwarz, conductor. Delos D/CD 3053 (made in 1988).

The title of this CD is actually "Wagner 2" to distinguish it from the first Delos collection of Wagner excerpts played by the same forces, which was John Eargle's earliest effort in the Delos digital/symphonic series and not quite on the same level of sonic excellence as later productions. This one is. All the spatial, textural and dynamic qualities I enthused about in my last column are here, with the difference that Wagner's sonorities are generally not as phonogenic (CD-genic?) as those of his orchestrational heir, Richard Strauss. As an orchestral demo, I would still pick the Schwarz *Zarathustra*, but *Parsifal* is greater music and its sound is as perfectly captured here as the current state of the art allows.

In performance, the *Parsifal* excerpts, which take up well over half of the CD, are not quite in the same league with those recorded by Toscanini for RCA in 1949 (in somewhat deficient mono)—admittedly a purely personal yardstick of mine and not very contemporary at that. The Old Man made Wagner sound like a composer of Beethoven-sized stature, which he was, not like the father of movie music, which he also was. The tautness and plasticity of line, the unfailing grasp of overall structure, the balance of main themes and inner voices, the dramatic inflection of crucial phrases in Toscanini's Wagner are missing from Schwarz's still quite beautiful but laxer, more episodic, more coloristic performances. A startling difference can be heard in the announcement of the "Faith" motif in the Act I prelude, where the trumpets seem to be blown by synchronous archangels in the NBC Symphony Orchestra, making you sit bolt upright; by comparison ex-trumpeter Schwarz's players sound much too polite in the same passage. A similar contrast is discernible in the rip-roaring Act III prelude from *Lohengrin*, which Schwarz conducts with almost as much panache as Toscanini (in another mono recording for RCA, 1951 and cleaner), except that the Seattle trombones are too round, smooth and recessive—and not because of John Eargle, I think. On the same old LP, Toscanini's Act I prelude from *Lohengrin* is again steadier, more cohesive and more subtly inflected than Schwarz's, not surprisingly since the piece anticipates *Parsifal* in mood, although without the latter's ultimate refinement of the Wagnerian idiom.

The much earlier, Weber-like *Dutchman* overture, on the other hand, is conducted with tremendous flair and great virtuosity by Schwarz, who seems to be at his best when lots of snap and large reserves of energy are called for.

Regardless of my small reservations, I recommend this CD to all audiophilic Wagnerites as one of the very few satisfying high-tech documentations of the Wagner sound.

Denon

Nippon Columbia, the company behind the Denon label, seems to be vertically integrated for digital audio, making their own professional and consumer hardware as well as software. The technological sophistication you would expect as a result is quite evident in the sound of the Denon symphonic and operatic productions, which for some years have been recorded with a very elegant method of microphone deployment. Two closely spaced Brüel & Kjør 4006 omnidirectional condenser units, at a carefully researched optimum location, are the stereo reference pair. For certain pieces of music nothing else is used, the two microphone preamp outputs going directly into the digital tape recorder—total purism—but, as all audio professionals know deep down, that works only sometimes. Usually, to delineate the complexities of a larger work and to define in space a larger body of performers, there is no escape from additional mikes. When these are used, Denon adds exactly as much digital delay to their outputs as will normalize all time/phase relationships to the location of the main stereo pair, making the latter appear to have the magic capability of picking up all the specially miked detail from the ideal "one-point" stereo position. A neat trick, at least in theory.

Gustav Mahler: Symphony No. 8. Frankfurt Radio Symphony Orchestra, Eliahu Inbal, conductor; seven combined choruses and eight soloists. Denon 60CO-1564165 (two CD's, made in 1987).

This is supposed to be the ultimate, state-of-the-art embodiment of the Denon digital-delay microphone technique; apparently they deliberately planned this, the most massive and complex Mahler opus, to be recorded last in the Inbal/Frankfurt series of Mahler symphonies so that the latest updates and highest refinement of the system could be applied to the task. It works—the recording leaves little or nothing to be desired in the way of clarity, detail, dimensionality, dynamic range and just plain clean sound. Quite an achievement, considering that the microphones were registering the acoustic output of some 700 performers, occasionally blasting forth all at once (but still short of the 1029 at the world premiere in 1910). For the first time anywhere in the world, the new Brüel & Kjør 4011 cardioids were used (22 of them!) to supplement the main 4006 omni pair with digitally delayed close-ups, accents and sweetenings. The renovated Alte Oper in Frankfurt seems to have highly suitable acoustics for this kind of structured audio orgy; overall, however, I have no sonic yardstick against which to measure this unique recording. John Eargle's more

pragmatic, less Japanotechnocratic approach at Delos yields perhaps a more vivid orchestral panorama, but that is an apples-and-oranges comparison; Delos never had quite such a big fish to fry—if I may mix my alimentary metaphors.

As for performance, Inbal's Mahler is more of the subtle, nuanced school (e.g., Jascha Horenstein) than of the powerhouse persuasion (e.g., Solti), and I heartily endorse that, especially in what B.H. Haggin once called "the ranting later symphonies," where I tend to get lost among all the climaxes and perorations. (I must confess to a currently unfashionable propensity to skip from the 5th directly to *Das Lied von der Erde* in my chronological Mahler preferences.) Inbal focuses on the thematic felicities, ingeniously original textures and sophisticated tempo changes of the symphonies, letting the ranting come naturally when it comes. That saves me from being bored to death by this monstrous musical exegesis of the unreadable and unstageable parts of Goethe's *Faust*, which of course Mahler worshipped. (Gounod, being French, knew better.) If this were not an audio-oriented journal, I would have reviewed Inbal's beautifully conducted and recorded 5th instead, on Denon 33CO-1088. So it has no B&K 4011's...

Digital Music Products (dmp)

If I had to name a single nonclassical label best suited for audio demonstrations on the basis of its typical releases, it would have to be this one. Tom Jung, the perfectionist founder, guiding light and recording engineer of dmp, leans heavily toward trendy New York studio musicians and new-wave jazzmen in his choice of program material, which he records "live to 2-track" with esoteric microphones (handmade ribbons, special B&K's, etc.) through Cello class-A electronics. The result is the most uncanny clarity and impact I have ever heard in small-ensemble recording. Advanced technology, when combined with total dedication and a truly good ear, leadeth to audio heaven.

Warren Bernhardt: "Hands On." Nine tracks, each featuring Warren Bernhardt, piano, solo or with acoustic/electric instruments. dmp CD-457 (made in 1987).

Warren Bernhardt is an excellent pianist, with a classical technique and a fine ear for jazz. He is the composer of all but one of the selections recorded; his style could be described as restrained, elegant, lyrical, but not without drive. This is contemporary jazz and not really my personal cup of tea, having been raised on a much more low-down, funky, bluesy tradition, but I appreciate the high level of musicianship displayed by Bernhardt and his seven sidemen, and the sound is a whole order of magnitude cleaner, sweeter, more dynamic and simply more accurate than that of ordinarily good jazz CD's. Tom Jung's recording of the two different Steinways used could be the model for classical piano albums at a number of major record companies I could name. Gréat job.

Thom Rotella Band. Fourteen tracks, featuring Thom Rotella on acoustic and electric guitars, with other acoustic/electric instruments. dmp CD-460 (made in 1987).

This contemporary jazz group is into sonorities and textures which are occasionally startling but tend to grow on you. If you want to astonish your friends with the resolving power of your super system, this is a good CD to play for them. All kinds of sudden transients as well as various swishy, tinkly and rattly flourishes, all captured with the utmost precision. Check out "Little Chubby" on track 10, for example, or "Friends" on track 12. The irony is that Thom Rotella and his band used to be 24-track overdub freaks until Tom Jung proved to them that he can achieve a better sound with live to 2-track. Their music is not something that makes me want to trade in my memories of Lester Young blowing in a dingy, smoke-filled Paris cellar (there I go again, apples and oranges, but what oranges!), but it is skillful, sophisticated and highly listenable. Now, if only Tom Jung would start to record with this kind of fidelity some of the fading, grizzled, half-forgotten jazz greats who hang out at places like Fat Tuesday's in New York, before they are gone forever...

Dorian Recordings

Craig Dory, the technical and musical mastermind behind this new classical label, is another purist/perfectionist, almost to the point of obsession. He dislikes just about all off-the-shelf microphones, electronics and digital tape recorders, preferring to work with specially modified, one-of-a-kind equipment, and he is as much against any kind of signal processing as he is in favor of minimal miking. The results are, well, Natural—still the highest word of praise in audio, when you think about it, and in this case with a capital N. The entire Dorian operation is now headquartered in Troy, New York, and its principal recording studio is the Troy Savings Bank Music Hall, one of the acoustically finest concert halls in the world according to many experts (including the late George Szell) but fallen into total disuse until a recent rescue effort. The combination of Craig Dory and the TSBMH shows every promise of producing world-class recordings, especially since his musical standards are also obviously high.

"Christmas in Leipzig." J.S. Bach: Cantata No. 63 (Christen, ätzet diesen Tag in Metall und Marmorsteine!); Cantata No. 65 (Sie werden aus Saba alle kommen); Sanctus, from the Mass in B Minor (BWV 232). The Bach Choir of Bethlehem & Bach Festival Orchestra, Greg Furfeld, conductor; Sylvia McNair, soprano; Janice Taylor, contralto; David Gordon, tenor; Daniel Lichti, bass. Dorian DOR-90113 (made in 1988).

If you like your Bach choral works in the grand German tradition rather than reconstructed, authenticated and antiqued, this will please you. Scholarly modern research has reestablished the probable sound of Bach a quarter of a

millennium ago; what no musicologist can tell us is whether or not a resurrected Johann Sebastian would approve of the late-nineteenth-century sound of the Bethlehem group and maybe wish he had had the same resources. I am totally neutral on the subject; to me the musicality of phrasing and the *beauty* of sound, not its century of origin, are what count, and these performance are highly musical as well as gorgeous-sounding. The soloists are pretty good to very good; the choir and orchestra better than that. (No, there is no harpsichord.) The Cantata No. 63 is actually an early Weimar work but was probably never performed until Bach's first Christmas in Leipzig, followed by the then new No. 65 on Epiphany. Both are among his finest pieces.

The sound of Craig Dory's digital recording is utterly remarkable. This is probably the smoothest, most edgeless, least fatiguing large-ensemble CD I have auditioned so far, and yet the trumpets and strings have excellent bite and presence, the soloists' top notes come through free and easy, and the choir is very palpably "there," properly located in a definable space (not the TSBMH, though). All that compulsive finickiness about equipment has obviously paid off. The only small quibble I have is that the German words of the choir are not always clear, perhaps because of the puristic eschewal of accent microphones. Overall, though, I cannot think of a better antidote to digitophobia than Bach-cum-Dory. Eat your hearts out, analog diehards.

Reference Recordings

This label needs no introduction to music lovers with exacting audio standards; for about twelve years now it has been the source of outstanding material of—you said it—reference quality, mostly analog but more recently digital as well, mostly classical but far from exclusively. J. Tamblyn Henderson, Jr., the company's exceptionally dedicated president/producer, and "Professor" Keith O. Johnson, famed recording engineer and RR's technological conscience, both have fairly obvious TWAD ("tree-worshiping analog druid"—see elsewhere in this issue) tendencies, but it is to their eternal credit that when the time came they faced the facts of life, deployed a KOJ-modified Sony PCM-701ES digital encoder and taped some magnificent digital masters for CD. Tam has repeatedly assured me that the analog LP versions of the same releases, recorded on the Prof's handbuilt "focused-gap" analog tape machine, are even better, but what else would you expect a TWAD to say? I am perfectly happy with his newer CD's, which of course incorporate the same magic Johnson microphone techniques as the LP's.

"Nojima Plays Liszt." Franz Liszt: Mephisto Waltz #1, La campanella, Harmonies du soir, Feux follets, Sonata in B Minor. Minoru Nojima, piano. Reference Recordings RR-25CD (made in 1987).

I am about to go out on a limb here, not because I am brave and idealistic but because I see no possibility of the

limb breaking. Before this century is over—and there are 12 years left—the name of Nojima will be a household word in classical music circles, comparable to those of Schnabel, Rubinstein, Gieseking and Horowitz. Only his apparent lack of publicity hunger could possibly make a liar of me, but he is at least not microphone-shy, as Prof. Johnson's superb recording proves. He is, however, distrustful of commercial sound, hence his choice of Reference Recordings for his first American release—a tremendous coup for RR and great good fortune for all of us who are not of the pianistic underground or inner circle, which knew about him all along. (Remember, this Japanese artist is no youngster; there is no biographical information available, but he could be 38 or 40 or thereabouts.)

The reason for my boundless enthusiasm is that the man's technique is so stupendous, so completely secure, that all of his energies, his entire inner being, can be placed at the service of musical expression—rhythm, tempo, phrasing, dynamics and color—without constraint, and then, to clinch it, he is a musician of aristocratic taste and great sensitivity, one might say a samurai of the piano in his combination of power, truthfulness and simple grace. Most pianists, including some famous ones, are happy if they can get through these diabolically difficult Liszt pieces without sounding awkward or uptight. Nojima makes them sing as if they were by Mozart with just a few extra notes thrown in. Amazing. He impresses me even more than Lazar Berman on two 1976 Columbia/Melodiya LP's in a similar program because his virtuosity is just as great but more controlled and his interpretation more sophisticated. Of course, Liszt is not considered the acid test of interpretive musicianship (although the sonata is a very serious and beautiful work, and this is a spellbinding performance of it), but Nojima is said to be superb in the Schubert posthumous sonatas and also a great Debussy and Ravel specialist. I can hardly wait for his next release—when, oh when, RR?

The recording is outstandingly fine; its basic sound is apparently the result of a pair of Coles figure-eight ribbon microphones in a Blumlein configuration, but there were also some ambience omnis mixed in. The piano, a Hamburg Steinway, is life-sized (at least through my bridged Boulder 500's, each swinging 70 volts into the load), very incisive yet warm in sonority and precisely located in just the right amount of space. Some tracks were recorded with the piano lid propped up all the way, others with the lid removed; I have no clear preferences as the textures of the pieces vary considerably. I still prefer Tom Jung's piano recording technique at dmp by a slight margin—he makes the instrument even more palpable—but the comparison may not be fair when the music differs so greatly. There is, at any rate, somewhat more hiss than I like in the RR digital recording, probably originating from the microphone electronics, and one or two keys sound just a teeny bit out of tune now and then. Even so, I wish all current piano recordings were as dynamic and spacious, as clean-edged yet sweet-sounding as this. A landmark album, without a doubt.

"Vivaldi • Bach." Antonio Vivaldi: *Sinfonia in C (RV 116)*, *Trio Sonata in G Minor, Op. 1, No. 1 (RV 73)*, *Concerto in E-flat (RV 515)*; J.S. Bach: *Prelude in C (WTC Book 1)*, *Trio Sonata in C (BWV 1037)*, *Concerto in D Minor (BWV 1043)*. Helicon Foundation, Albert Fuller, artistic director, harpsichord; Jaap Schröder, violin; Stanley Ritchie, violin; Linda Quan, violin; Nelva TeBrake and Ryan Brown, violins; Judson Griffin, viola; Myron Lutzke, violoncello; Michael Willens, violone. Reference Recordings RR-23CD (made in 1987).

To balance my remarks above about traditional vs. musicological Bach performances, I must come out in favor of the Helicon group's highly authentic, original-instrument performances of the Baroque masters because they are so clean, vigorous, musical and exhilarating. Rhythm and ictus are all-important in the motor-energetic works of Vivaldi and Bach, and these gifted artists know exactly where, when and how much to stress the right note, without sacrificing beauty of tone. They are a delight to listen to; they also prove to me that the Bach concerto for two violins is a very great piece of music (as if I had never suspected it).

The recording is super transparent, with tremendous presence but no edginess; some might say it is flat in acoustic perspective because the back wall is not a mile behind the musicians, but with only eight instruments playing Bach I want to hear the counterpoint, not the floor plan of the hall, so I like them all up front. There is some low-level hall rumble in the silent intervals (traffic noises?), but so what. This one gets played a lot in my sound room.

Sheffield Lab

The granddaddy of audiophile record companies constitutes a special case in the digital era. Originally they fought against the new technology tooth and nail; Doug Sax called it "musically disastrous" and wrote angry letters on the subject to everyone he thought might listen, including me. Later they faced the facts of the marketplace and began to run simultaneous analog and digital tapes at their recording sessions, except that the resulting CD's did not sound nearly as good as the LP's (e.g., Amanda McBroom's *West of Oz*), almost as if to prove to the world how right they had been in the first place. Today they are singing (and taping) another tune. Keith Johnson (yes, Reference Recordings' wizardly Professor) is doing some of their sessions; their latest CD's are excellent; they are even among the very first record companies offering prerecorded DAT samplers. *Tempora mutantur, nos et mutamur in illis.*

"The Moscow Sessions." Works by Barber, Copland, Gershwin, Glazunov, Glinka, Griffes, Ives, Mussorgsky, Piston, Shostakovich

and Tchaikovsky. The Moscow Philharmonic Orchestra, Lawrence Leighton Smith, conductor (in the Russian works), Dmitri Kitayenko, conductor (in the American works). Sheffield Lab CD-25, CD-26 and CD-27 (made in 1987).

The idea apparently came from Kavi Alexander, a somewhat eccentric Indian whom I know quite well, not only as a devotee of my bad jokes but also as a single-minded purist in the recording arts as well as Sao Win's right-hand man at Win Research in California. I have no idea how many avatars the idea went through, but in the end it emerged as a *détente* or *glasnost* gesture: the great Moscow Philharmonic would play American works under its own conductor, Dmitri Kitayenko, and Russian works under Lawrence Smith, regular conductor of the Louisville (Kentucky) Orchestra. Professor Johnson was borrowed from Reference Recordings to bring his microphones, mixing console, etc., and tape it all on both analog and digital recorders, live to 2-track. (Ironically, the Russians have only recently graduated to the glories of multitrack.)

As the "large hall" of the U.S.S.R. State Television and Radio in Moscow is a good one, and Keith Johnson is a master recordist, the sonic results are at least very good and sometimes excellent, but I hear an ever so slight veil over everything compared to Johnson's best domestic work. Is it possible that the digital encoder used here, Sheffield Lab's modified JVC, does something funny that the stateside KOJ-modified Sony does not? I have no idea. The dynamic and spatial qualities of the Moscow recordings, on the other hand, leave very little to be desired; overall they provide highly satisfactory listening.

The performances are all extremely competent; it would be too much to expect Kitayenko's rendition of peculiarly American classics to be highly idiomatic, but they are very meticulously presented, with truly beautiful orchestral playing; Smith, on the other hand, is obviously at ease in most of the Russian chestnuts. One of the latter, the Tchaikovsky 5th Symphony, happens to be close to my heart despite my lifelong overexposure to it, and I just love this recording. Smith plays it absolutely straight—not for him the famous Mengelberg dictum that "in Tchaikovsky, everyting a little *exagéré*"—and yet the Russian musicians respond to him with the kind of affection and bravura they reserve for their own national favorites. The result is truly exciting; the Russian brasses have a more forward, less rounded or golden quality than their Western counterparts, bordering on coarseness, but wonderfully appropriate to this kind of music—a kind of celestial marching-band sound. I revel in it; this is what Tchaikovsky's unabashedly large-scale music is all about. See if you agree with me. ◇

Analog Miscellany

(continued from page 39)

start the motor, and lower the buffing pad glued inside the integral acrylic dust cover onto the pitted side of the CD. It is rather primitive but it works just fine. The CD comes out spanking clean. Of course, you are supposed to remove the strawberry jam or whatever before you put the CD into the machine; the buffing pad is not a garbage disposal unit, which the vacuum cleaner section for records almost is.

The Hybrid 2 is identical to the Model 2.5Fi in its record cleaning aspects, and the job it does is essentially impeccable. The vacuum motor is very powerful and quite quickly removes all traces of the "Pure 2" record cleaning fluid, which one learns after a few tries to inject into the velvet covering of the hemicylindrical cleaning slot in the correct quantity, without spills. The system is somewhat crude, not at all Swiss-watchlike; the sounds it makes are not always reassuring; but it works every time, and that is what a good tool is all about. Unlike the top-of-the-line Mini-Pro model, the .5Fi series cleans one side at a time, which is good enough for us. Do not imagine, however, that clicks and pops are removed along with the grit noises. When you clean a dirty and scratched record with the Nitty Gritty machine, what you get is a beautifully clean and scratched record. (One reason why we are CD enthusiasts.)

Phono Transducer Win FET-10 (follow-up)

Win Research Group, Inc., 7320 Hollister Avenue, Goleta, CA 93117. FET-10 Field-Effect Transducer with Source Module, \$2250.00. Tested sample on loan from manufacturer.

Having tried our very early sample of the FET-10 in a number of systems with different gains and efficiencies, we are now inclined to regard the hiss level from the fixed outputs of the unit to be higher than we would want to live with permanently. We have been assured by Sao Win that the version about to go into production is vastly superior in this respect. We hope so because the fixed outputs are what audiophiles with preamplifiers are going to use, even though the variable output connection without a preamp is the ideal way to deploy the FET-10.

As for Dr. Win's channel separation table in his letter to the Editor (see page 8), we own a perfect copy of the JVC TRS-1007 MK II test record, obtained directly from JVC in 1981, but we have been unable to duplicate with it the high separation figures claimed in the table. Unless and until this discrepancy is resolved—and there could be any number of reasons for it—we must stick with our original comments on the channel separation specs of the FET-10. ♦

Those who are accustomed to judge by feeling do not understand the process of reasoning, because they want to comprehend at a glance and are not used to seeking for first principles. Those, on the other hand, who are accustomed to reason from first principles do not understand matters of feeling at all, because they look for first principles and are unable to comprehend at a glance.

—BLAISE PASCAL (1623–1662)

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One more thing. We don't sell single issues by mail. You'll find those at somewhat higher cost in selected audio stores.

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In the next issue:

There may be only a scattering of equipment reviews (catching up on our backlog of speaker tests and suchlike), plus our regular columns, in order to make room for a special feature of extraordinary interest.

To wit: the full transcript of an uninhibited round-table discussion of audio subjects by the professionals and academics we most respect. Somewhat in the manner of our still talked-about 1979 seminar but with a more practical orientation—what to buy, what to avoid, what to trust, what to disbelieve, coming improvements, and so forth—this skull session is worth fifty reviews.

The promised guest article on mathematically correct speaker placement makes its delayed appearance.
