THE CARTRIDGE ISSUE

CORDESMAN ON CARTRIDGES
COLLOMS ON R-DAT
HOLT ON COPYCODE
ATKINSON ON LOUDSPEAKERS
OLSHER ON THE OLD QUAD
LIPNICK ON CONCERT HALLS
because people like music
Half Again as Much

We've had our firsts in subjective ("underground") reviewing, but the latest development at Stereophile is earthshaking: starting with the issue you hold in your hands, Stereophile will publish every month—12 times a year!

Call us blabbermouths, or what you will, we just couldn't get it all said in a mere eight issues, so we've decided to add new staff, bite the workaholic bullet, and come out every month. The fact that we're not the first magazine to do this—Time, for instance, went monthly quite some while ago—detracts not a bit from this accomplishment.

You may be imagining that your subscription will run out much sooner now. Well, it just ain't so. First, every current subscription will expire at exactly the same calendar date as if we hadn't changed our schedule. If your old label said you expired with Issue Number 96 (Vol.11 No.2), you still do—except you'll get an extra issue: Vol.10 No.9. If you're set to expire with Issue Number 104 (Vol.12 No.2), you'll get five extra issues: Vol.10 No.9, plus Vol.11 Nos.9-12! All this at no extra cost. Your new expire date appears on the label for this issue, but is shown as Volume and Issue rather than Issue Number.

Second, because you're a loyal and faithful subscriber, you have a chance to renew your subscription at our old rates ($24/year) for up to three years. And that's for 12 issues per year, not just 8. At Stereophile, the good deals never stop.

The bad news: our standard subscription and renewal rates are going up to $35/year. Compared with some others, this is a great deal (and it does save you 8.33 cents per issue over our current rates), but I admit it is more money per year.

So, sit back, relax, read... and look forward to another issue of Stereophile just one month from now.
How can you tell when a politician is lying? His lips move. How can you tell when a recording system is perfect? CBS tries to outlaw it.

That is exactly what was happening in Washington in April though June. The American record industry is so horrified at the prospect of a "perfect" home-recording medium—the new DAT system—that they are doing their best to legislate it out of existence. Or, at least, to de-fang it. Believing their own propaganda about "Perfect Sound Forever," they are afraid the new DAT system which the Japanese are poised to unleash in the US will allow their copyrighted recordings to be illegally duplicated so faithfully as to be indistinguishable from the originals. Their proposed solution? Find a means for copy-protecting their recordings, the way computer software is often protected.

To this end, CBS Labs has devised an ingenious system, involving the use of an IC chip in the recorder which regularly scans the signal: if it senses an anticopy code on the recording, it shuts down the recorder's record function for 30s. The "encoding" consists of a deep, narrow, frequency-response notch centered at 3840Hz, which CBS has assured everyone is "totally inaudible." So enchanted were they with their ingenuity, and so endowed with countless lobbying dollars, that they succeeded in getting two bills before Congress that would mandate the inclusion of the "spoiler" chip in every DAT unit brought into the US, record companies then marking all their CDs by omitting the

1 The software encoding of CBS's aptly-named "spoiler" system consists of a very narrow 20-50dB notch in the audio band centered at 3840 Hz. The copy-protection chip in the recorder measures signal energy in that band and compares it with the energy in the adjacent bands, and if it finds a large difference (indicating the presence of the notch), it shuts down the recorder. The chip has no effect at all on DAT playback, since the detection notch is not in the signal circuit, but merely runs parallel to it to feed the sensing comparator.

The system has been proven to work, but it has also been proven (contrary to CBS's claim) that the encoding has a deleterious effect on the sound, which should come as no surprise to audiophiles (see "Pure Gold" in this issue). It must have also been clear even to the densest of our legislators that DAT was not the only target of Copycode. The notch was at a low enough frequency that the system would just as effectively prevent the recording of such low-fi encoded signal sources as analog LPs, cassettes, and eventually, radio and TV broadcasts. It could have put an end to all home taping of commercial material, leaving nothing to record except thunderstorms and baby's first belch. And if you don't think wiping out a billion-dollar industry would have a disastrous effect on our and the world's economy, think again.
The new PMF5550 500 watt* power amplifier

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The new PMF5550 with its huge power reserve meets the demands of the most sophisticated recordings you have or may encounter, regardless of speaker efficiency. Yet its ability to delineate the most delicate nuances is without peer.

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musical notes around 3840Hz (see "Letters").

As I write this, it looks as if those bills, which would have put an end to most home taping in the US, are dying in Committee—partly, I am told, because even the Committee members could hear the damage done to the sound by the encoding. (For a sample of Stereophile's behind-the-scenes politicking, see my letter at the end of this article.) But you can be confident that our poor, struggling record industry (which racked up bigger profits in '85 and '86 than ever before in the history of the universe) is not about to give up so easily. Because, you see, they are convinced they are losing millions of dollars a year to citizen bootleggers.

The Congressional record for February 5, 1987, in which Sen. Albert Gore and Pete Wilson introduced the "DAT Bill," contained several references to the "perfect copies" of which DAT is supposed to be capable. This, I believe, is irrelevant. Most illegal copying is done to obtain the music; the sound is very much secondary, and the superior sound of DAT is unlikely to have any impact whatsoever on the amount of such copying that is done. There is also a statement therein to the effect that illegal home copying is costing record companies "about one third" of the revenues they are entitled to. I don't know where the authors of the bill ever came up with that figure, but I think they would have a very hard time documenting it.

The vast majority of illegal copying is done by teenagers for their friends, and by record buyers of all ages who want customized cassettes for the car. Most kids, like most adults, would prefer to own a legitimate copy of an album than a dub. Owning is an essential part of the consumer mystique, and owning the music is only half of the motive for buying a record. Owning the record is the other half. (In addition, teens have also found that blank cassettes which cost much less than an LP have a tendency to get eaten by cassette players, so they prefer to have the record as insurance against that eventualty.) Besides, the real thing looks gaudier, sometimes comes with jacket notes for the benefit of those who learned to read, and buyers know it sounds better than a dub would, even if they can't hear the difference. But the average teen, unlike the average record-company executive who is pointing the finger at him, and yelling Thief!, has limited disposable income. He simply cannot afford to buy all the $6.98 records he wants, but he can often cough up $1.98 for a blank cassette. If he can't copy to that from a friend's LP or CD, he will simply do without that music. He won't start collectively feeding millions more dollars into the record manufacturers' swollen coffers, because he can't. The money just isn't there. Our record industry's pot of gold is at the end of a rainbow!

Another very common practice, among both adults and kids, is the copying of one's own CDs or LPs onto cassette for use in the car. Obviously, the record companies would like to see everyone buy a CD for the living room, an LP for the family room, and a cassette for the car, but people don't work that way. Except for those CD fanatics who are replacing their analog discs with CDs as fast as they come out, no one will buy the same recording in two formats. If they cannot copy, they will buy one recording in the format which most meets their needs, and that's all they will buy. The money may be there to buy duplicate copies in more than one format, but it won't be spent that way. It will be spent on a different record.

Perhaps the question here is whether or not buying a recording makes you the owner of that copy of a musical performance or merely a renter. If you own it, you should be entitled to copy it for any personal use, just as you are allowed by law to copy a book you have purchased. If you are merely renting the use of it, you should be required to sign, with the purchase of any record, an unenforceable exclusive-use agreement such as is provided with many computer programs.

This industry paranoia has gone entirely too far, and may already have done irreparable damage to the new DAT format's introduction. The new system's proponents have yielded to pressure from the CD forces, primarily Philips, to the extent of omitting from DAT machines the ability to record at the CD sampling rate of 44.1kHz. The reason

2 The record industry is not unanimous on this matter. According to Billboard of June 6 1987, Nimbus and Harmonia Mundi have no intention of spoiling their recordings with CD's Copycode notch, and I have been told by representatives for Angel and Telarc that they also will refuse to label their CDs with the notch.
...audible results with the finest in connecting components.
Thanks to Nitty Gritty, every music lover can get the best sound from his records (and compact discs, too)

Says James Jarvis of the SENSIBLE SOUND. And Bert Whyte of AUDIO, Tony Cordesman of STEREOPHILE, Julian Hirsch of STEREO REVIEW, Enid Lumley of INTERNATIONAL AUDIO REVIEW, Michel Prin of SON HI FI, Al Fasoldt of FANFARE, and Jack Philpot of AUDIO AMATEUR all agree: there is no other record or compact disc cleaning system that is equal to those made by Nitty Gritty Record Care Products of California.

Why do these independent audio critics feel so strongly? Because cleaning systems made by Nitty Gritty get records and compact discs 100% clean. Free of dust, grease and static electricity. Microscopically clean. Perfectly clean.

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sound, whether or not some people have the acuity to hear it. (Experienced listeners who have heard the encoder in action declare it to be very audible and quite unacceptable.)

Second, the disable/enable chip in DAT recorders will occasionally give false alarms when recording un-encoded material, making the system too unreliable for professional use. This will be bad news for the film industry, which has anticipated R-DAT as the ideal medium for on-location sound recording.

Third, CBS's anti-copy system would be easy to defeat, by a device any smart kid could make on his kitchen table. So even if it didn't degrade the sound, it is not going to be all that effective anyway.

Fourth, the law is wrongheaded from the start. Copyright law is to protect creators and their publishers from unfair competition from those who would copy, mass-produce, and sell their creation. The CBS system will not accomplish this. And the idea that a copyright should be construed as prohibiting private individuals from copying, for their own use, material which they have purchased is absurd. This DAT anti-copy law is no different from one that would outlaw (or prevent) your making a Xerox copy of a magazine article to send to your son!

The record industry would like everyone to buy a CD for their home and a cassette (or DAT tape) for their car, and maybe also an LP for their summer cottage. Consumers will just not do that. If they cannot copy from one format to another, they will simply buy one of them that best suits their needs. Few people will ever buy more than one version of a recording.

If this anti-copy bill becomes law, it will open a can of worms. The precedent will be set for, first, legislating similar anti-copy systems into video and non-digital audio recorders, then for outlawing all consumer tape-recording devices. Next would go Xerox-type copiers, computers with dual disc drives, character readers, and ultimately all devices capable of information duplication. I think you will agree that it is a mistake to support this legislation. Most respectfully yours,

J. Gordon Holt
Santa Fe, NM

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Introducing Vintage, Sansui’s collection of components created for the discriminating listener. The performance story starts inside the AU-X901 integrated amplifier which is designed to bring you sound previously associated only with separates.

Sansui’s exclusive “Alpha” X-Balanced technology works together with balanced inputs to address the problems of today’s noisy RF home environment. It also reduces potentially negative ground influences from both the power supply and the counterelectromotive current from speakers, thereby producing cleaner, purer sound.

With 130 watts per channel, the AU-X901 delivers 390 watts of dynamic power at 4 ohms. Key features include: anti-resonant Excelite PC boards; a massive transformer; a balanced power supply; high-grade capacitors; and discrete componentry.

*130 watts per channel, min. RMS, both channels driven into 8 ohms from 20-20kHz with no more than 0.005% THD.
The Vintage performance story continues on the outside. Sansui’s AU-X901 features a double chassis to reduce resonance and provide heavy shielding, plus a strategically placed fifth foot to further reduce resonance. Coupled with gold-plated terminals and balanced inputs, the result is sound clarity.

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For further information, call or write: Sansui Electronics Corporation, PO Box 624, Lyndhurst, NJ 07071 (201) 460-9710.
A flat response

Editor:
In John Atkinson's report from the London AES Convention in Vol.10 No.4, he reported that CBS's infamous Copycode notch removes the note A-flat from the top of the piano's register. Surely 3840Hz, the center frequency of the proposed notch, lies between B-flat and B?

Bo Fleming
Santa Fe, NM

Mr. Fleming is correct; the CBS device is a B-flat remover. I must have been feeling a little flat from jet-lag when I looked up the note corresponding to the notch frequency. —JA

A sailor's best friend?

Editor:
Congratulations on the best magazine for the audio enthusiast to ever hit the presses. I'm currently serving this great country in the US Navy, and I must say that every time I have to leave my family, Stereophile becomes my best friend. The reviews are always excellent; so good, in fact, that in my mind I can often project myself into the same listening room as AHC or JGH.

A lot of people complain that Stereophile focuses only on the expensive stuff. All I can say is, "can they help it if the best costs more?" To be totally honest, I would buy a component on the basis of one of your reviews alone, I trust your opinion that much.

Unfortunately, Uncle Sam doesn't pay me enough to afford what I would like. But one of these days . . .

Randy Dirilo
USS Independence

Colloms, peanut-butter, & A/B tests

Editor:
Martin Colloms's articles are "peanut-butter sandwiches": they provide nourishment, and can be read next month, next year. They are 50% of the value of your magazine to me.

I can feel the difficulty your reviewers have shifting gears from describing "My favorite fantasy" to "This is where I live" in your review of your reviewers ("A matter of taste," Vol.10 Nos.1, 2 & 3). Thanks to reviewers and editor for the extra hard effort.

A/B testing, etc: My 9-year-old claims he knows his multiplication tables perfectly—except when I ask "What's 9 x 7?" I could be insulted and angry if he launched into a half-hour explanation of "left brain, right brain" just because he didn't know 9 x 7.

I would say, "You're OK, keep trying."

Charles W. Fowlkes
Bozeman, MT

Why bicker with Bob?

Editor:
Why don't you guys quit bickering with Bob Carver and just give him an editor's job? It may work out to both your advantages. But insist on paying him with "rolled pennies via parcel post"!

N. Inal
Balboa, CA

Enough already?

Editor:
Enough already! Bob Carver is simply not worth the kind of effort—or ink—you've devoted to him in the past year. As an almost legendary member of the "I don't care what you say about me as long as you spell my name right" brigade, his interests are being served with every word you write. And the irony is that you have never given this kind of coverage to Bill Johnson, Lew Johnson, Dan D'Agostino, Nelson Pass, or Tim de Paravicini—truly original designers all, whose minor efforts overshadow the best work Bob Carver has done in the best year he ever lived.

Let's look at the facts:
- Carver's company was funded with the proceeds of his sale of Phase Linear to Pio-
neer... a transaction that remains a mystery to this day, based on what Pioneer did with the name and the products after purchase. But the new company allowed him to correct the one egregious error from Phase Linear days: he could now look out his office window and see CARVER write large on the side of the building.

- His work at Phase Linear probably came closest to being serious or original; certainly nothing he has done since could be considered a contribution to the high end, consisting, as it does, of tricks and effects, supported by specmanship that would make the Japanese blush.
- Presently he builds products to a price point. There's nothing wrong with that. Solid reputations have been built in this industry by people who made and marketed very good products to a price point.
  But he's not satisfied with this. He wants the sales figures and profits of a price-point manufacturer and he wants the reputation of the designer giants. He wants to build products that must, by definition, be compromised by price considerations, and he wants these products to be taken as seriously as the products of designers who make no compromises. Like Rodney, he don't get no respect. And he's not happy about it. Rich is nice, but ego gratification is nice, too.
- Now we get his latest approach. Bill Johnson, Lew Johnson, or whoever, designs the "reference amp," builds a monster product, and Carver responds, "I can do that." And not only can he "do that" but he can do it at his price point. Sure, Bob. Pontiac builds decent cars to a price point. But Pontiac does not waste its time trying to convince people that a car built to an $8500 price point will be as good as my $25,000 Porsche 944, specs or no specs. And by the way, meeting a spec for a moment or "sounding the same" for a week or a month does not mean that the Pontiac—or the Carver—is as good as the high-priced spreads. There's more to a Krell or an ARC or a Porsche or any product that aspires to be "The Best" than good short-term performance; things like residual value, long-term performance, pride of ownership. (Check the "Audiomart" pages and see how a Carver product holds its value in the marketplace.)
- And now, deja vu. When you guys find things that keep his amplifier from being the equal of the reference amplifier, Carver says you guys are wrong. And he isn't the only one who thinks so. Who else? Why, The Inner Ear Report (established September 1986), one of the leading voices of that bastion of the high end, Canada. Of course, the review hadn't been printed yet when he quoted it so copiously in his ads, but we all know that that's never stopped Bob Carver. He's one of the few people who ever saw the last issue of The Audio Critic, and he kept quoting the review of his amp that allegedly appeared in that issue—"sounds just like a Mark Levinson and Pete Aczel thinks so, too"—for years in spite of the fact that the ultimate TAC was never distributed to subscribers.

Did Bob blush about being party to a high-end scandal? Certainly not. Business is business. (By the way, Bob, when you see Peter, would you ask him where my $30 refund is?)

So back to my original plea: enough already. I'd rather hear how Bill Johnson designed the SP-11 or the M300, or how Nelson Pass balances handling design projects for a number of client companies while still delivering top-rank designs for his own firm, or what Dan D'Agostino had for breakfast, than read one more word from or about the Whining Engineer. Remember, you could accuse him of murder in big block letters on the cover of your next issue just as long as you got one thing right: that's B-O-B C-A-R-V-E-R.

John C. O'Hara
Oak Brook, IL

Carver & self-parody

Editor:
Your article in Vol.10 No.3 evaluating the Carver M-1.0t amplifier, and Bob Carver's reactions to this evaluation in "Manufacturers' Comments," provided some of the most entertaining reading that I have recently encountered. All parties involved exhibited a devotion to the cause of excellence in sound reproduction, and an intensity in pursuit of this goal, that took them virtually to the limits of self-parody. While I admire the zeal exhibited in the articles, I feel that a more balanced perspective can be presented.

Clearly a difference between the reference amplifier and the Carver M-1.0t amplifier was exhibited. Bob Carver blamed this difference on old tubes, and J. Gordon Holt worried that
The Threshold models S/200, S/300 and S/500 now employ a proprietary optical bias system. The isolation and tracking accuracy of this system allows idling bias at levels significantly greater than so-called "high" bias class AB designs.

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of everything. The conclusion, however, remained clear: Carver lost, and he knows it.

In the course of the review, you hit on the amazing but repeatable phenomenon that amplifier differences seem to shrink to almost irrelevant subtleties if one is put under stress. JA's remark (mentioned in the editorial) on left and right brain functions is very intriguing, but could he please indicate where to find this in the literature? It would be interesting to confront this with the right/left brain differences in musical perception between Europeans and East-Asiatics, on which Jean Hiraga reported in L'Audiophile (#12). You will probably also have experienced that amplifier differences equally shrink in an ABX test when switching forth and back during the music (or when changing plugs quickly), even when this is done in a very relaxed manner, at home and alone.

So what's happening? Are "subjective" reviewers all over the world merely idiots who by some wondrous chance hear the same things in this or that amplifier? Or is our knowledge of how we hear largely insufficient? If so, even Hafler's null test won't help (there is good evidence it doesn't!), because if we don't know how we hear, who are we to say what exactly an amplifier should or should not do? The letters from Babrauskas and Nelson in Vol.10 No.3 put a very clever finger on this weak spot in Hafler's test.

I have read quite a lot on human aural (and visual) perception. Not only is there a poor correlation between "our" technical standards regarding frequency response, distortion, etc., and the way the ear and brain seem to analyze sound; there are also quite a number of contradictions between hypotheses that cover one aspect of aural perception. There isn't such a thing as one integrated theory explaining hearing. Even when taking these contradictions for granted, you don't get very far when trying to understand how we perceive our beloved stereo image. I have the feeling that we know only 25% of what we should know, in order to have a workable idea of what is going on beyond our tympani.

I know from my own experience that it takes time to evaluate an amplifier. It is as if your brain adapts slowly to a certain situation, the growing adaptation enabling greater and greater resolution in hearing. You can even be aware of such an adaptation. Differences in loudspeakers are less subtle and more "natural" than those in amplifiers. If you listen to one pair of speakers, then disconnect them, put them away, install a pair of different speakers and then listen, it's okay. If you use an A/B box, the moment you switch, your first reaction is one of awe, you may even unconsciously move your head backward to protect yourself; after 30 seconds or so you feel yourself adapting to the new sound and can start listening again. Differences between amplifiers are "unnatural" and are more difficult to grasp. Use an A/B switch a couple of times and you're lost.

I think this has to do with the data reduction applied by both our aural and visual systems. This is easier to grasp in visual perception: if you look out of the window, you seem to see everything there is outside. In fact, however, that is not true. In reality you directly see only structures and some details, the rest being "made up" by the brain, using memory, logic, and expectation. Take those double "find-the-eight-differences" cartoons in the newspaper: they look identical, even on second and third inspection. Then, slowly, you become aware of one difference, then a second, etc. Once you know where they are, you can see them all at once and you wonder, "was it that easy?" Then again, these cartoons are easy from a data point of view. Imagine two Rembrandts with eight differences! If you always literally see all the visual information that reaches your eyes, you would have gone instantly crazy the instant you opened your eyes after you were born.

Back to hearing. When you start listening to the sound in a stereo image, you may think you are hearing everything, but in fact you mainly hear what your memory leads you to expect to hear. Then, slowly, helped by the tonal structure of musical instruments (depending on your familiarity with them) and by the structure of the music itself, you gradually become aware of anomalies. This is where the Guilbert letter on "Music and A/B-testing" in the same issue comes in. You simply can't hear everything at once. Otherwise, why would people ever play a recording twice?

I would be thrilled to see people from perceptual sciences and people from the hi-fi scene cooperate on that mysterious sound-
The affordable new hybrid from Audio Research

It's no secret that the Audio Research SP11 hybrid preamplifier has secured its reputation in esoteric music systems around the world. Now, Audio Research introduces some of the SP11's acclaimed hybrid technology in a simpler, less costly format.

The new SP9 hybrid preamplifier combines the essential controls and pure musicality listeners want most, with the robust construction Audio Research is noted for. Using just two 6DJ8 vacuum tubes and proprietary FET-based circuitry, the SP9 provides more than enough gain (66 dB) for popular moderate-to-high output moving coil phono cartridges (loading may be set internally). High-level circuits have been optimized for overload-proof reproduction from compact discs. Two tape inputs/outputs, plus automatic/manual muting, add convenience and protection.

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NOISE:
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DIMENSIONS:
19"W x 5.25"H x 10.25"D.
26 lbs. shipping weight.
object we call a stereo image.

Peter van Willenswaard
Rotterdam, Holland
The difference in how the two sides of the brain handle information was first pointed out to me by the British audio writer Adrian Orlowski, following which I found a complete report in the British magazine New Scientist. Unfortunately, I cannot now find the reference, but a thorough discussion is included in Gary Zukav's classic study of modern physics, The Dancing Wu Li Masters, published in 1979 by William Morrow & Co. Inc., New York. It was also briefly mentioned in the June 13-19 issue of The Economist. —JA

Carver & common sense
Editor:
I feel compelled to throw in my two cents' worth to the Stereophile/Carver M-1.0t controversy in Vol.10 No.3.

Facts:
I have continually upgraded my hi-fi component system for the past 22 years. I act as a consultant to most of my friends about their audio enquiries.

My American Express Platinum Card allows me the flexibility of choice, but not insanity.

I own an M-1.0t, serial number 8.

I don't subscribe to Stereophile but greatly enjoy fiction. (One part fact plus seven parts fantasy equals fiction.)

I trust my ears and common sense to allow me to make sound decisions.

A question: If an average audiophile has an annual income of under $100,000, then where does he get the money to buy $5000 power amplifiers, or find the time to listen for days on end, or get the technical training to become a self-proclaimed expert?

I would personally like to thank Bob Carver for his innovations and down-to-earth approach to high fidelity. DW Tomamichel
Redmond, WA

PS: No, I haven't missed the point. Stereophile is in the entertainment business, and apparently controversy and self-proclaimed opinions are the kind of things on which religions can be founded.

Subject vs object
Editor:
In reviewing (subjectively) the Stereophile-

Carver controversy in Vol.10 No.3, I noted that both sides seemed to consider the performance of the ad hoc-modified prototype only as a standard to be met by regular production models.

But 18 months ago, it was a proxy for the sound of your reference amplifier(s). At that time JGH and LA had arrived, by exhaustive listening, at the perception that their reference amplifier and the hand-tweaked unit sounded identical. By excluding the prototype M-1.0t from the latest listening sessions, you seem to have removed a valid opportunity for judging the effect, if any, of speaker substitution and tube aging, as well as the level of manufacturing ability and quality control at Carver Corporation.

The Spanish philosopher Jose Ortega y Gasset has pointed out how the conception of "subject" entails and must be completed by that of "object," if we are not to go astray in a world of hard realities. The mutual dissatisfaction resulting from your re-challenge would indicate that subjectivity is as much problem as solution. Evidently the design and production of an electronic object by a skilled engineer contains just as many subjective traps as the review of its performance by equally skilled listeners.

But thanks for accepting the original challenge, and for your excellent reportage of its sequel. This is the stuff that makes Stereophile the most adventurous and readable publication in the audio field. H. Kenneth Hayes
River Forest, IL
I appreciate the concern shown by readers who feel that we missed a trick by not reviewing the production M-1.0t amplifier in the context of the performance of the original hand-tweaked prototype. In matter of fact, as pointed out by LA in his response to Bob Carver's "Manufacturer's Comment" in Vol. 10 No.3, although the prototype was in Santa Fe for a short period of time, it was not available either to JGH or myself when we carried out the review, Bob Carver having insisted that it be sent back to Lynnwood. He could have brought it with him when he visited Santa Fe for the listening tests, but he didn't. In addition, we only have Bob's word for it that the prototype was identical to the amplifier auditioned by JGH and LA two years ago. With all best wishes concerning Bob's integrity, that
Enjoy the Music as Well as the Convenience

The SONOGRAPHE SD1 features analogue circuits by conrad-johnson to bring musical accuracy to the compact disc format.

Tony Cordesman, Stereophile Volume 10 Number 1 (January 1987): "...the Sonographe is, to my ears, the best CD player to hit the market."

the conrad-johnson group
2800R Dorr Avenue
Fairfax, Virginia 22031
(703) 698-8581
is hardly something I would like to take on trust.

Frankly, I regard this prototype business as a smokescreen thrown up by Mr. Carver to obscure the fact that two experienced listeners—pace Mr. Tomamicbel—proved to him that they could distinguish a production M-1.0t from the amplifier to which it was widely and loudly proclaimed to be sonically identical. In essence, the Carver Corporation has been claiming publicly that its M-1.0t amplifier effectively offered $5000 worth of sound for $500—if $5000 A = one-off B, and B = $500 C, then A = C—and that was the point examined in the Stereophile review. If we had been unable to distinguish it, we would have said so; indeed, that would have been news! As it was, however, Bob Carver failed; that, no hint of malice, is what we reported.

Something we omitted from the review which, with hindsight, should have been included, was that our observations on the M-1.0t were not only made with the review sample sent to us by Carver. They were also based on auditioning and measuring a representative sample M-1.0t borrowed from a dealer. This latter produced a worse null against the reference amplifier than did the "official" review sample.

As far as Stereophile is concerned, the matter of the Carver Challenge is now closed. Moreover, in response to Carver pressure with respect to the editorial content of Stereophile, we have suspended all business dealings with Carver Corporation, including the acceptance of advertising. —JA

Who stole the bass?

Editor:

In response to AHC's ridiculous comment regarding small monitor speakers in Vol.10 No.3: "virtually all of today's small 'monitor' speakers are reasonably incapable of high-fidelity reproduction, and have no place in a decent audio system," I say that AHC is measurably incapable of listening to and reviewing high-fidelity reproduction and has no place writing for a decent audio magazine. I therefore suggest that Mr. Cordesman stick to reviewing for Audio magazine, where everything is "decent."

Howard Butler
Audio Advisors of NY

Pure subjective garbage

Editor:

I take strong exception to JGH's remarks that he was the first to invent subjective testing. What he meant to say must have been that he was probably the first to publish in a ground magazine using subjective testing to mislead the consumer based on his personal opinions. I am not saying this was intentional, it has just developed that way.

Having had 40 years' experience of hi-fi, both as hobby and as a business, I can confidently say that you, Pearson, and our own Hi-Fi Screws and Rubbish Reviews magazine are continuing to mislead the consumer. Virtually everything Stereophile prints is pure subjective garbage, personal opinion, and has no real substance in scientific principles.

I can see from Sam Tellig's review of the Quad 306 in Vol.10 No.3 that Americans—not all, of course—do not understand what is meant by an amplifier having an output that is a larger facsimile of the input. You prefer bass-heavy amplifiers, and colored ones to boot—the Adcom 545, for example. However, I agree that the Quad 606 drives the "World's Best Loudspeaker for Music Lovers in the Home"—the Quad ESL-63—slightly better than the 306.

I am surprised that JA can test any amplifier with the Celestion SL600s: they are very room-dependent, and although not box-like, are still a poor speaker. The American reviewer who gets it right is Len Feldman of Audio.

I am going to continue to expose you for what you are: a bunch of charlatans, as I say in my ads. The only "High" in high-end audio is the price. Readers, believe absolutely nothing written in any hi-fi magazine—you must listen for yourself.

Gerald Bearman
Mayware Ltd., Edgware, England

A bad experience

Editor:

I have had a bad experience with one of Stereophile's advertisers: Sound Vision by Marc, 265 E. Eau Gallie Causeway, Melbourne, Florida 32937.

I ordered a pair of Quad speakers from this store on March 19, 1987. They were to deliver the speakers freight collect, and charged the price to my MasterCard. I called a week later,
DIVA
The Next Step

Audition this acclaimed loudspeaker at your nearest high end dealer.
and they told me it had been delivered by special carrier. I called them again a week later and got a busy signal five times during different times of the day. I got the same response four days in a row. The telephone company in Florida could not give me the status of their phone. On the sixth day of trying, I got a message from the phone company that the telephone had been discontinued and was not in service.

At the present time I am writing to MasterCard, trying to get credit for the charge Sound Vision by Marc so promptly made.

Please cancel their advertisement in Stereophile; it would be a service to your readers. I believe they also advertise in other magazines such as The Absolute Sound.

Russ C. Tongco
College Station, TX
Sound Vision by Marc has been cancelled by us as an advertiser, though it was for non-payment of advertising invoices—since that happened before we received your letter. There has been no answer at their phone for some time. We regret any inconvenience or loss of money occasioned our readers by response to this ad, and will keep you informed if we are able to get hold of the deadbeat(s) responsible.

—LA

Hafler on the Hafler test

Editor:
Since J. Gordon Holt’s description of the SWDT (straight wire differential test) in Vol.10 No.1, there have been many comments and inquiries directed both to Stereophile and directly to me concerning this test. I will try to answer most of these in this catchall commentary.

The starting point is that it is very difficult to compare amplifier A with amplifier B to make a quality assessment. The conventional A/B test, or any comparison, may indicate that the amplifiers are different, but how can one determine which is “best”? “Best” is a matter of judgment, and even though many golden-eared experts think their ears are infallible, they disagree among themselves as to amplifier quality. What is needed is an accurate reference against which an amplifier can be judged—a reference which does not involve the entire listening chain, from source to loudspeaker, but which is the equivalent of a perfect amplifier. That reference is the straight wire.

If readers recall the Carver “challenge,” they read where Bob Carver put two amplifiers into a bridge configuration and adjusted one to match the other on a differential listening test. In analogous fashion, the SWDT matches an amplifier to a straight wire rather than to another amplifier. This is precisely a comparison of the input of an amplifier with its output. If the input and output are the same, the amplifier is accurate. If they differ, the amplifier is inaccurate. This has nothing to do with the subjective reaction of whether the amplifier has “pleasant” or “natural” sound. It has to do with correct sound.

To carry out the SWDT, the input signal is applied to one terminal of a headphone or monitor loudspeaker; through a variable attenuator, the same signal is fed to the input of the amplifier under test. The output of the test amplifier is connected to the other terminal of the monitor transducer. The normal loudspeaker is also connected to the output so that its load becomes part of the test, but it must be moved to a separate area so that its sound will not interfere with the sound through the monitor transducer. The test signal for this arrangement must come from a low-impedance source: this can most simply be one half of the stereo amplifier. The attenuator is adjusted for minimum sound output in the monitor speaker while the input signal is set to normal listening levels in the load loudspeaker. The input and output conditions are precisely those which prevail in normal listening operation.

When the attenuator is adjusted for minimum sound, the best “null,” the signal in the monitor represents the difference between input and output. If input and output are the same, there is no voltage potential across the monitor, and consequently no sound in the monitor. When the null is inaudible, it means that all of the distortions in the amplifier are inaudible; at that point, there cannot be improvement in the audible performance of the amplifier—until, perhaps, some new program sources come along which will be more difficult to handle.

The logic is irrefutable: if the input and the output of the amplifier are the same, the audible performance of the amplifier cannot be faulted.

Now let’s consider the questions which have been raised about the SWDT.
At last, high-performance audio comes down to earth.

High-performance audio by Rotel has arrived. With remarkable sonic quality you've previously associated only with esoteric equipment selling at other-worldly prices. Now, however, at prices you'll find very down-to-earth.

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This pursuit of affordable sonic perfection may explain why Rotel outsells most other specialty hi-fi brands in Great Britain. And why hard-to-please British audio critics consistently give Rotel components rave reviews.

For reprints of these reviews, and a brochure on our receivers, Compact Disc players, tuners, integrated amplifiers, power amplifiers, preamps, cassette decks and turntables, just send your name and address to Rotel Audio of America Inc., Department ST, P.O. Box 653, Buffalo, NY 14240. Or call us at (416) 297-0599.

Rotel

High performance. Down to earth.
Mr. Babrauskas' convoluted arguments in Vol.10 No.3 against low-source impedance amplifiers take me back some 40 years. He has discovered interface intermodulation distortion at a time when it is no longer of consequence. All present loudspeaker manufacturers use amplifiers which are essentially constant-voltage devices to design and test their loudspeakers, and modern amplifiers are all designed to give uniform voltage output into speaker systems in which the impedance varies with frequency. With properly designed amplifiers with very low impedance output, the back-EMF from the loudspeaker has no detrimental effect and does not affect the SWDT. An accurate amplifier can still achieve a deep "null" despite Mr. Babrauskas' contentions.

Reg Williamson, whose opinions I very much respect, says that what we have done is not new but is the reinvention of the wheel. I agree that differential testing is not new—I used it myself back in the 1960s to test components. However, has anyone else applied the SWDT to amplifier design to make an amplifier which has no audible aberrations? I have not seen any signs of that. I am aware, of course, of the excellent work done by Peter Walker of Quad in testing amplifiers with a differential bridge. Quad's approach was a laboratory approach, not readily applicable by the hi-fi hobbyist. The SWDT can be set up and checked with a minimum of equipment.1 Quad also introduced phase and amplitude compensation in the straight-wire path to improve the null by making the amplifier and the wire more alike. This alteration—"bending," if you will—of the straight wire was done on the assumption that phase and amplitude errors are inaudible. I prefer to make no assumptions as to audibility, thus making the test more stringent.

Mr. Williamson incorrectly faulted our arrangement in claiming that it was not operating under "normal working conditions of source signal and load." If he examines the arrangement carefully, I believe he will see that his conclusion was not correct. He also criticizes our tweaking of the amplifier to make it have a better match with the straight wire. I feel that it is standard good engineering practice to trim an amplifier for minimum distortion under actual working conditions. Matching the straight wire is exactly the same as trimming for minimum distortion.

There were several readers who have questioned the use of a driving amplifier to supply signal for the SWDT. They mistakenly believed that the characteristic of the driving amplifier is to provide a low-impedance signal at a level equal to the level desired in the test amplifier. As long as the drive amplifier supplies a wideband, fast-risetime signal, its own distortion characteristics do not matter. It could be a noise generator or a spark gap, and the SWDT would still be valid. If the drive amplifier has distortion, then the test amplifier is being tested as to its capability to handle a distorted signal without adding further distortion.

Several people misanalyzed the circuit as having positive feedback and assumed that this would affect the results of the SWDT. The connection of the monitor speaker from input to output of the test amplifier superficially appears to be a positive feedback connection. However, if there were positive feedback, it would be reduced to insignificance by the low output impedance of the drive amplifier. Further, with an accurate amplifier, there is little or no current in the monitor speaker; it is, effectively an open circuit, not making a feedback connection.

The question of phase shift and time delay from input to output has been raised by several readers. That difference between input and output will prevent a good "null" and will produce residual sound. Obviously, a constant time delay (uniform across the band) will not produce an adverse audible effect. However, the residual from phase shift might mask other distortion components in the SWDT. I prefer to see, therefore, an amplifier design which is sufficiently broadband to minimize time delay in the audio band. This can be accomplished with some phase compensation.

While many people do not believe that phase shift is audible, there is one place where it definitely has an effect, and that is between the two stereo channels. Unless the two sides track phase precisely, there will be problems of stereo imaging. The most practical way to have the left and right channels track is for each of them to have little or no phase shift.

---

1 The David Hafler Company will supply a schematic and instructions for any reader who sends a stamped, self-addressed envelope with their request to 5910 Crescent Boulevard, Pennsauken, NJ 08109.
With a worldwide reputation for sonic excellence, the new Luxman Receivers also deliver more power than ever before.

For over 60 years, Luxman audio components have been internationally recognized for their superb sonic quality. However, the recent introduction of compact discs with wide dynamics and high-accuracy loudspeakers with low impedance ratings has created a need for receivers with "real" output power.

With the tremendous dynamic power of the new Luxman receivers, our reputation for "Ultimate Fidelity" is likely to change to "Ultimate Power."

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The design efforts which make the Hafler XL-280 amplifier perform well on the SWDT give a side-to-side differential null of about 70dB. This preserves the stereo imaging better than on any other units we have examined.

The question has been raised as to why some subjective reviews have not always been consistent with the rankings of the SWDT. Preferences do not necessarily have to correlate with objective tests. A deep wideband "null" may not be necessary for euphonious sound, but it is sufficient to establish that the amplifier has no audible aberrations. Although there is high correlation between a deep "null" and good (accurate) sound, it is conceivable that there can be a poor "null" with pleasant sound. This can happen if the distortions are of a non-offensive nature, such as a small high-frequency roll-off. It can also come from a listener's inaccurate mental reference standard as to what is accurate sound.

There is a philosophical question here. Should an amplifier be pleasant sounding, or should it be accurate even if accuracy is not as pleasant? The SWDT reveals accuracy or the lack of it. It is the only way to assess accuracy directly and objectively with the amplifier operating under normal signal and load conditions. It does this in real time, with a dynamic signal source. It encompasses all forms of distortion. It requires no special instrumentation or skill. If the residual "null" is inaudible, the conclusion that the amplifier is accurate is unequivocal.

Can anyone suggest a more meaningful or practical test of amplifier accuracy?

David Hafler
The David Hafler Company, Pennsauken, NJ

What it's all about
Editor:
I jotted down a few lines to express an appreciation for my husband's most cherished belongings. I wanted him to know that I did not view the left side of our living room as a messy menace anymore. Would you please print this? It may help some of your reader's partners to surrender and possibly enjoy the losing battle.

"Oh please stop soldering in the living room! I can't stand that smell. We're having company over and I'll scream if you don't hide that stuff along the side of our walls. Yes, that umbilical cord, moose cable, or whatever you call it. Honey, what are those brackets over the dining room table for? The rear channels?! To be honest, that black thing doesn't look beautiful to me, and why must we have speakers long enough to seat five comfortably? If we turn them sideways we'll have an extra couch. Oh, I'm sorry, I didn't mean to hurt your feelings. Your system is perfect now? That's nice. Oh, well, I'd love to listen, just let me put these groceries away. Please don't look at me like that. I'll listen now. What's wrong with where I'm sitting? OK. This really makes a difference, huh? Yes, I'm ready.

"Close my eyes, are you serious? OK, OK. Wow... Oh... It's... It's like I am being held by this glorious music. It's as though I am perceiving this harmony both physically and emotionally. I can feel myself willingly surrendering every imperfect thought, allowing this perfect sound to take its place. It's so warm and soothing. My mind is taking hold of the notes and wrapping my whole body in a melodious blanket. I don't really want to cry but her voice is so beautiful. Something deep inside of me has wakened; I feel as though some insensible feelings are being challenged to surface.

"This is like the best dessert I've ever tasted. It's a kind of food that has not been provided before. I've caught what he has and now I'll want to consume it every day. I love it. Oh God, it seems right to speak to you now. No wonder they play music in church, it can sound so wonderful.

"Thank you for letting me enjoy it, and thank you for making me understand why he is so occupied with this mania. This is like an escape or maybe not so drastic. No, it's more like taking a vacation without actually leaving home. Oh, it's over.

"It sounded pretty good, Dear. Help me with these bags, will ya? As a matter of fact, hearing that made me decide not to pester you so much about the cost and the mess and all. Just one question... How long would it take to put a system together for upstairs? I wouldn't mind if you wanted to hang a pair of minis in the hallway. What about some, uh, bookshelf speakers for the kitchen? Mind if I invite a few more friends over?... wait till Gilbert hears Evita!"

Debbie Romeyn
Novato, CA
As audio and video technologies merge, exciting new possibilities in home entertainment present themselves to the discriminating listener. Turning these possibilities into reality demands more than adding token amplification to a video tuner, or VCR inputs to an audio receiver.

Nikko's creative engineering delivers more. Our AVR-65 is a true audio/video receiver that adds full stereo reception and remote control to any TV or monitor. It incorporates a 139-channel video tuner with built-in MTS/SAP, an AM/FM stereo tuner, plus carefully engineered audio preamp and amplifier circuitry. Our NA-1050 is a comprehensive audio/video control center with extensive mixing and switching functions. And both components exemplify Nikko technology, bringing out the best in audio and video.

NIKKO AUDIO
The power of technology.
A
lways trying to save Stereophile mon-
ey, I flew out of Newark on Conti-
nental—the best Super Saver deal left
to Chicago. I figured, what the heck. I had just
spent ten days flying around the Soviet Union
on Aeroflot. How much worse could Con-
tinental be?
I found out when it came time to fly back.
An Aeroflot flight is almost always—how
shall I say it?—interesting. We were minutes
from landing in Stockholm and stewardesses
were still serving lunch. Some passengers had
30 seconds to eat their meal. Stewardesses
scurried to collect trays, even as the wheels
hit the runway. I have heard Aeroflot horror
stories, journalists stranded in the middle of
Siberia for days at a time, for example, but
Aeroflot did get me where I was going, and
more or less on time. The same cannot be
said of Continental.
Stereophile's Ad Director, Ken Nelson, and
his wife Libby were aboard the same Cheaps-
kate flight to the Windy City. Poor Ken—
Continental lost one of his bags and he had to
go shopping for shirts and underwear.
On landing, I started making for the sub-
way—cheap, fast, no tipping necessary. But
Ken said, "Why not share a cab?" Hard to ex-
plain that I don't like cabs even when some-
one else is paying. I gave in, shared the taxi.
Cheap described our hotel, too. But I had
better luck with the Ascot Motor Hotel than
with Continental. The Ascot is on Michigan at
11th, four blocks south of the Americana
Congress, the site of the show. Convenient
enough. And no serious complaints. At least
none of our staff was burgled, like last year at
the Rodeway. Only trouble was the hot
water—most of the time there wasn't any. But
I like cheap hotels. Sometime I'll tell you
about the Hotel Minsk, in downtown
Moscow.
I settled in early enough on Friday after-
noon, the day before the show, to catch the
Chicago Symphony at Orchestra Hall. The
band, alas, was not at its best. Sir Georg Solti
had injured his knee, bowing out, and a
young conductor, who will remain nameless,
filled in. I don't know what it is with Sir
Georg; he seems always to be injuring his
knee, his elbow, whatever. The surrogate Sir
Georg went through the motions of conduc-
ting, but the band seemed to pay not the
slightest attention.
There's always a problem, covering a show.
You look for exciting things, and quite often
don't find any, at least not right away. I think
that many of the best high-end products sort
of emerge; they don't call immediate atten-
tion to themselves. There were excellent new
products at the show; I just had to look for
them. There were also plenty of mediocre pro-
ducts, most of which I found on the first day.
Discouraged, I looked at my watch that
Saturday afternoon, saw it was almost five
o'clock, and made for Music Hall (Roy Hall).
If my timing was right, he would be just
about to open a bottle of Scotch. Indeed he
was. Roy had just the thing to cheer me up: a
25-year-old Islay malt, a private bottling
available only in the UK to members of the
Scotch Malt Whisky Society—104 proof.
Hoots, mon! This was The Real MacStuff. It
seared my throat, cleaned out my sinuses,
and satisfied my soul. Roy was grinning from
ear to ear.
Things began to improve on the spot. Roy,
for instance, had the DNM (Denis N.
Morecroft) preamp and power amp from
England. The DNM Preamp is perhaps Brit-
tain's most highly regarded preamp—plenty
of theory behind it, which went in one ear
and out the other, what with the Islay malt.
It—the preamp, not the Scotch—will retail
for around $2800. A matching power amp,
rated at 30 "British" watts (Roy's term) per
channel, will retail for $1400. Both are en-
chassised in plastic, DNM not approving of
metal cases. Enid Lumley take note! Nor does
DNM approve of stranded cable. Roy will also
be bringing in DNM's solid-core intercon-
nects and speaker cable, both of which are
cheap and good. I should know. I've been us-
ing the stuff now for about three months, at
For over thirty years Teac has been famous for building precision tape recording equipment. But, we're not willing to rest on our reels. So now Teac offers its most comprehensive line ever. From audio and hi-fi video recording equipment, to compact disc players, to graphic equalizers, speakers, and a complete line of audio and video accessories.

One thing, however, will never change at Teac—our obsession with creating the most advanced, feature-filled, superbly executed audio and video we can make.

Teac

Hi-Fi in the extreme.

TEAC
AG's suggestion.

There was fun to be had at the show — new people to meet, old friends to see. And the Tennessee Sound Labs room to visit. After DO's review of the Symphony Is, I had to hear them for myself. TSL had the Symphony IIIs on demonstration. They were playing an Amanda McBroom record when I breezed in. The sound was, well, unique. Amanda's voice was deeply recessed behind the speakers, overpowered by her instrumental accompaniment.

I sent my roommate, Martin Colloms, over to hear them. The Symphony IIIs reminded him, he said, of his grandfather's gramophone — a windup affair with adjustable doors for varying the sound. No doubt about it — Tennessee Sound Labs gets First Prize for most peculiar sound at the show.

Second Prize? The new Apogee Divas ($7000 a pair). In my opinion — others differed — these full-range ribbons had some peculiarities, being excessively tizzy on top and boomy on the bottom (although the room certainly didn't help; at least one of the "walls" was mere curtain). Tympani, triangles, and snare drums were all overprominent. Imaging was oversized. "I can't believe that vocalist," one listener later said; "her mouth is 10 feet wide."

Incidentally, if you are into Apogees, B&K has a new amp — the Pro 600 — which lists for $1295 and puts out 150 watts into 8 ohms, doubles that into 4, and doubles it again (600 watts) into 2 ohms. It's said (by John Beyer) to drive 1-ohm Scintillas, so if you can't afford a Krell...

Also out with a new amp is PS Audio — the $995 100C, using the same circuitry as the 200C and rated at 100 Wpc. If you go in for a clean, powerful solid-state sound, this could be your amp. What about the Electron Kinetics Eagle IIA, you ask? Well, Eagle has been running ads in the New York Times classifieds lately, offering the amp factory-direct for $895. You can draw your own conclusions as to what this might mean.

I can't pick on Martin-Logan this time, because Gayle Sanders kept his company away from the show entirely. I spoke with him by phone a few days before. "Every time I come to the show," he said, "I have trouble with the room, and my stomach ties in knots." Not to mention after the show, when he reads the Cheapskate's comments.

Actually, as I have made clear, I think the CLs are among the most transparent speakers I have ever heard. I could live with the lack of deep bass, the limited dynamic range and volume levels. It's the over-prominence of the treble and the overall thinness I have problems with. Perhaps they would pair perfectly with my new Jadis JA-30 amps. I hope to obtain a pair in black for review. The light oak should be an export model: California only.

Speaking of the Golden State, California Audio Labs introduced their third CD player, this time all solid-state, the $995 CD-3. Deemed a "moderately priced player," it is said to incorporate circuitry by Mike Moffat. Compared with the Tempest, the soundstage was smaller and dynamics were diminished. Not promising. CAL also had a $995 preamp sans preamp — a line-level switching box with optional gain. No tubes.

QED also had a line-level switching unit, but with no gain stage — their "Compact Disc Passive Preamp," which comes on a blister pack at $125, no money wasted on packaging. It features a single volume control and a switch — preamp or CD. If your CD player has enough gain, you can send its output through the QED volume control directly to your power amp — no going through your preamp's line-level gain stage. An excellent device, but you will be lacking a balance control.

By far the hit of the Americana Congress, however, was not a piece of equipment, but a recording: Fritz Reiner's Chicago performance of Rimsky-Korsakov's Scheherazade, just out on Chesky. It was reproduced from the original three-track master session tape using a tube preamp. The preamp signal was fed directly into the lathe, bypassing the mixing console and all equalizers. If we all run out and buy this disc, Chesky promises to give us more from the RCA catalog. Let's support David and Norman Chesky; they don't have deep pockets. They need profits to pursue their mission.

Rowland Research demonstrated their new Gemini mono amps (100 Wpc, $3900 a pair) driving the Wilson Audio Tiny Tots (WATTs), themselves a mere $4700 a pair in standard...
Because it’s there

SOMETIMES THE ANSWER IS SIMPLE — BUT THE TASK IS DIFFICULT

It’s simple: The Aragon should cost several thousand dollars. If you can appreciate the difficulty of creating a world class amplifier for under one thousand dollars, then you must go see, hear and feel the Aragon. There is a quality retailer near you that will be happy to introduce you to Aragon and explain how the task was accomplished. We are certain you will enjoy the visit.

MONDIAL DESIGNS LIMITED
Two Elm Street, Ardsley, New York 10502 • (914) 693-8008
black. Perhaps the best sound at the show. The WATTS now come with "beards"—drop panels made of the same methacrylate polymer as the speaker cabinets. The beards are said to extend and tighten the bass, and help focus the imaging.

Madrigal demonstrated the Jadis JP-80 preamp, along with the JA-30 amps, driving a pair of Vandersteen 2Cs. (Mark Levinson gear was used to drive the woofers.) Here, too, was some of the best sound of the show. The JP-80 preamp is only $7200. It is my sad duty to tell you that the preamp looks and sounds like it might be worth all that money and more. Jadis equipment is more than music: it is civilization.

Nothing from Quad, except news that ESL-63s now exported to the US are braced so the frame is more rigid. You can probably effect the same improvement in sound—an overall tightening, particularly in the bass—with the excellent Arcici Quad stands.

Cheapskate: "Where's the Quad 406?"

Ross Walker (of Quad): "What's a Quad 406?"

Cheapskate: "A 306 with more balls. Replacement for the 405-2."

Walker: "Stop spreading rumors. The 306 is perfectly adequate for driving the ESL-63s." (Agreed.)

Archibald: "The Cheapskate misses last year's free Quad breakfast on Sunday morning at the Blackstone."

Walker: "Does Quad have a responsibility to buy breakfast for the Cheapskate?"

Archibald: "He thinks you do. He's been taking it very badly."

Of course, I can buy my own breakfast. What I missed was the pleasant social occasion, and the wit and sophistication of Ross Walker's press presentations. I hope Quad will have some product introductions next year.

Spendor, and their importer, RCS Audio International, were absent from the show, save for a tent card atop a loaner pair of SP-1s, making glorious music with ARC equipment in the Harmonia Mundi room. Spendor SP-1s are said to be back-ordered for six months, so I suppose there was no need for them to spend money exhibiting. British Fidelity, also imported by RCS, will be appearing shortly with a new range of products, including a 70W integrated amp to retail for around $500.

It's expensive to exhibit at the show. Figure it costs a small manufacturer or importer about $1500 to rent a room at the Americana-Congress. You can easily triple that, with shipping, travel, accommodation, subsistence, entertainment, and miscellaneous expenses, but for most exhibitors it's money well spent. How else can you get your customers—the dealers—to come to you? It's a lot less expensive than going to them.

Over at McCormick Place, popularly referred to as the "Zoo," mind-boggling sums are spent on displays. For instance, any of the major Japanese companies can count on spending $1,000,000 or so to create a new exhibit—and that's just for designing and construction. Refurbishing an existing exhibit, the usual practice, costs $100,000 to $250,000. Floor space at the McCormick Convention Center? $80,000 to $100,000. Add shipping, meals, etc., and a company can easily spend another $1,000,000.

The main convention floor is truly a zoo. How else to describe the spectacle, what with Sony featuring live circus acts upstairs, and third-rate tape companies in the basement building booth traffic by hiring Penthouse
models to autograph glossy photos of themselves. Sleaze, in other words. Oscar Wilde would have loved the zoo. "Nothing succeeds like excess."

More so than in previous years, I was appalled by the spectacle of the zoo. I now know what it must have been like to live through the decline and fall of the Roman Empire. We export dollars to Japan for gimmicks and gadgets—dollars that might be better spent meeting social needs here at home. Meanwhile, we drown in our own debt to pay for it all—the microwave ovens, cordless telephones, camcorders, the CD-eivers (receiver with built-in CD. . ."from sharp minds come Sharp products").

Too much time spent in Russia? No, I would not wish to be a Sovyetsky Soyuznik, much as I love traveling in the country. The Soviets squander their national wealth, too—on the military and the KGB. I do feel a certain freedom in Russia, though. Freedom from information—no advertising. Nothing much to buy in the stores (Soviet citizens always have more money than they know what to do with). So things like hearing real music and visiting with friends become much more important than they do in the US, or elsewhere in the West. Funny thing about Russians who emigrate, though: some of them become hypermaterialistic, as if to make up for lost time.

The Zoo gets more difficult to cover each year. It's very hard to snoop around and get answers to your questions. The manufacturers are just trying to sell, sell, sell, and pesky reporters from small audio publications, mice under the feet of elephants, merely get in the way. For a lot of manufacturers, including Sony, I get the impression that audio doesn't matter much anymore. (You had to look hard to find any audio at the Sony display.)

But a few of the Japanese companies were taking some serious interest in good sound, perhaps out of desperation as much as anything else. As one manufacturer explained, off the record, the strong yen has made many items unprofitable—price-driven items like your average receiver, cassette deck, budget CD player, etc.—so the impetus is now toward quality items. Volumes may be much lower, but margins are higher. Such a move is actually beneficial to consumers, he explained, because with price-driven items, quality is automatically driven down, too.

Well, maybe. Sansui has introduced a line of upmarket components, centered around integrated amps—the Vintage line. I think they have miscalculated. Separates would sell better—preamps and power amps. Sansui has already given up manufacturing rack systems. Can they regain the quality image they once had?

"What would it take for audiophiles to take our company seriously?" asked one manufacturer's representative.

"Oh," I replied, "come out with a pair of tube monoblocks."

"My development people in Tokyo laugh when I talk about tubes."

This is just the problem—a gap between what American audiophiles want and Japan, Inc. is willing to produce. Case in point: one Japanese company has already introduced a killer amp—big, powerful, imposing. What do Japanese customers do with it? They use it to drive efficient horn-loaded speakers, speakers you could drive with 10 to 15 watts. And they just look at the amp, revere it as if it were some gift from the Buddha. Like I say, a real gap.

One Japanese company which may not have such a problem is Marantz. Marantz USA is now owned by Dynascan, the car stereo people. But in Japan and the rest of the world, Marantz International is a subsidiary of Philips, and thus has close contact with the European market. Over the last half dozen years or so, Marantz has introduced some excellent products, made in Japan but designed to be saleable in Europe. As a result, Marantz is now a major audio brand in countries like the UK and France. Unfortunately, few of these items have made it to the US and the company has an image here on a par with Sansui. Still, there are some who remember the days of Saul Marantz and Sid Smith . . .

Now Marantz will be bringing in most of the items which have been so well received in Europe, including their CD94 CD player, which will retail for $1900. Not excited about a $1900 Marantz CD player? What if I told you it had the Philips 16-bit chip and a build quality and appearance comparable to the new $5000 Accuphase CD player? What if I told you it was finely tweaked, with hand-chosen, premium-quality components? I
Conceived in Europe; built in Japan; the Marantz CD-94

think this player might be a hit. The CD94 can be fed into the matching Marantz CDA outboard D/A converter, which also lists for $1900. Street prices are expected to be somewhat less. By the way, the Marantz factory in Japan makes the Philips CD960, their top-of-the-line player not imported by Magnavox. Really high quality is apparently beyond the ability of the Philips factory in Belgium.

Marantz USA is also bringing in the PM94 integrated amp, which lists for $3000 in gold, $2800 in black. Not cheap. But the appearance and build quality are absolutely first-rate. I auditioned a PM84 integrated a few years ago, which uses the same “Quarter A” circuitry (the amp operates in real class-A up to a respectable level), and I found the sound to be smooth, pure, and musical.... tubelike. True class-A sound, not at all like the various trick, sliding-bias class-As that have come out of Japan in the past. Ken Ishiwata, a knowledgeable Japanese audiophile based in Belgium and product manager for Marantz International, assures me that the sound is considerably upgraded over the PM84 I heard several years back.

Maybe this isn’t the right product for the American market—again, I think separates would stand a much better chance. But it’s encouraging that Marantz USA is bringing it in. It may be just the thing for your non-tweak friends who want audiophile quality sound and first-rate construction, with user-friendly features. If I’ve spent a lot of time dwelling on these Marantz items (and there are more), it’s because I’ve been bugging Marantz USA for over two years to bring this stuff in. Incidentally, I suggested that Marantz consider hiring Sid Smith. The old Marantz USA would have said, “Sid who?” The new Marantz asked if I knew his phone number.

Sony has introduced a new line of 16-bit, 4x oversampling CD players, one of which, the $1000 list CDP-705ES, is rumored to use the Philips TDA 1541 chip. Just what the world wants: a Sony that sounds like a Philips. I could not get anyone from Sony to confirm that the player uses the Philips chip. But I couldn’t get a flat-out denial, either. Obviously, Stereophile’s Manufacturers’ Comment pages are open to someone from Sony, should they care to clarify the situation.

I didn’t see many phono cartridges over at the Zoo, even at Audio Technica. Shure Brothers, too, appear to have lost interest in cartridges, concentrating on the introduction of their latest video surround-sound unit. I’ll pass along another unconfirmed rumor: Shure is said to have laid off or transferred all of its cartridge development people; no plans for a Shure V15 Type VI. The Shure V15 Type V MR and the Ultra 500 are probably the end of the road.

Ortofon, on the other hand, are continuing to develop cartridges and bring them to market—among them the new X5-MC, a 2mV, high-output moving-coil listing at $300. Sound should be similar to the X3-MC, which is one of the best high-output coils I’ve heard. The X5-MC features a line-contact stylus similar to a van den Hul Type 2. It was stylus quality that made the X3-MC sound so much better than the less expensive X1-MC, so I expect great things from this cartridge. Up-market, there’s the new Ortofon MC3000 at $1500 with 0.1mV output, twice the output of the MC2000. It sounded wonderful on demonstration—detailed, dynamic, silky smooth.

Ortofon is discontinuing the VMS series, including the venerable VMS20E (good cartridge, if you see one cheap), and is coming out with a new line of moving-magnets. But the VMS20E is not disappearing: it’s defec-
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ting! No, not quite. But Ortofon has sold the VMS cartridge-production equipment to the Soviets, and VMS20Es are now being produced near Leningrad! No bull, this is true. What's more, Kevin Byrne of Ortofon said he'll try to get the Cheapskate a sample of the Leningradskii Ortofon. Watch this space!

Goldring, of England, introduced a new moving-coil, with van den Hul Type 2 stylus: the Eroica, in a high-output version (2.5mV) and a low (0.25mV). The coil on the low-output version has fewer turns, resulting in lower inductance and tip mass for what Goldring says is a smoother response. The cartridge body is made of Pocan, a glass-filled polyester resin, very rigid and tough. Good thing, too, the way Brits do up their cartridges so tight. I have been especially fond of Goldrings in the past, their moving-magnets having produced a certain sweetness and delicacy in the treble. Looks like I'll have a cartridge article coming up.

Anything else? Lots. Can't cover everything. I have dis to say about DAT: nuttin'! I'm ignoring it. Hope it goes away. CD-V? Well, you can read about that elsewhere. I'll just say that Japan, Inc. and Philips may have made one of the dumbest marketing moves in an industry notorious for inept marketing. The players will accommodate not only 5", but also the 8" and 12" discs, and list for $800 to $900. Yet CD-V is aimed at teenagers, the MTV crowd. Record companies can't wait to support CD-V and recoup the high cost of producing all those music videos. But what teenager is going to be able to spend close to a grand on a machine? The first company that comes out with a cheap player taking only 5" discs will probably walk away with the market, what market there is. I predict not much. I'm reminded of what Ken Kessler said last Winter in Vegas: "There are three infinitely repeatable forms of human pleasure: music, food, and sex." (I don't remember which one KK put first.)

SOTA has a pair of mini-monitors—"true to the psyche, not to the computer"—priced at a mere $850 a pair. Cheapskate territory. "Poor man's WATTS," I exclaimed to Messrs. Becker and Herman. Maybe so. I'll have to get a pair to audition.

An entire range of speakers will be coming from Monitor Audio of England, a company headed by one Mr. Mo(hammed) Iqbal, a fellow driven to provide good clean sound for not a lot of money. Exquisite cabinetry, too. No vinyl—just wood veneers. Mo said samples would be on the way.

Of course, there was more. I just didn't get to it. I was too busy visiting the Art Institute, Kroch and Brentano's bookstore, Rose Records, and helping Roy Hall finish off that Islay malt 

Oh, yes, about the flight back to Newark on Continental. It was Tuesday afternoon, last day of the show. I took the subway/elevated to O'Hare in the midst of a torrential downpour. Well, wouldn't you know—Continental had no plane to fly. Three flights to Newark either cancelled or indefinitely delayed, my flight being one. Other airlines were experiencing disruptions and cancellations, too—but they seemed to handle the chaos better than Continental.

Communication with the passengers was terrible—no news at all for a while. No indication of where the planes were—it seemed the Continental people didn't know. ("Excuse us, ladies and gentlemen. Several of our planes are missing.") Finally, a Continental agent told me that I might be able to fly out later that evening. On the other hand, I might not. It was impossible to get mad at the agent, who was trying his best to cope. I took the subway back into town and flew out the next morning without incident. Since Martin Colloms still had the room at the Ascot, I had a place to stay.

There's such a thing as being too cheap, I decided. Too bad Aeroflot doesn't fly to the Windy City.
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When I decided to write a piece on the subject of concert-hall acoustics, I realized that almost all discussion concerning this topic is based on the viewpoint of the listener in the audience. While this is important (since the primary purpose of any hall is to bring audience and performance together), the criteria that musicians employ in concert-hall evaluation address sonic parameters that are probably not obvious to the casual listener, and may often be at odds with conclusions reached from the other side of the footlights. Some readers might feel that any discussion of concert halls has no place in a publication such as *Stereophile*; they may have a point, especially if their sole aim through audio is to produce sonic spectacle, rather than to recreate an artistic event. I believe, however, that there are some readers who would like to gain some insights into the specific problems and acoustical considerations presented to performing musicians, and possibly come away with some fresh ideas to incorporate in their listening criteria.

1 Lewis Lipnick is Principal Contrabassoonist of the National Symphony Orchestra
Practical Considerations

During my preparation and research for this article, I spoke with dozens of musicians: professional symphony players, chorus members, prominent instrumental and vocal soloists, chamber-music specialists, and conductors. When asked about their priorities concerning concert halls, several initial responses (primarily from jaded orchestra musicians) addressed such mundane subjects as "Are the dressing rooms decent?" or "Is there a good cheap restaurant nearby?" After these issues were put to rest, all participants agreed that probably the most important and significant musical features they look for in concert halls are properties that: 1) allow them successfully to aurally relate to one another on stage, without the distractions of false and irregularly delayed musical information; 2) the ability to hear themselves clearly in proper perspective, thereby enabling them to cohere musically with their surrounding colleagues (especially important in large orchestral and choral ensembles); 3) a sense of consistent resistance and "coupling" with the hall (feedback necessary for the artist to interact harmonically with a set of specific acoustics, and project into the house with a good sound); and 4) resonant (but neutral) tonal characteristics, neither overly bright nor dark, with very quick transient response to all instrumental and vocal attacks at all volume levels.

The first item listed above, the necessity of the performers to relate aurally, is probably the most important. If they cannot comfortably hear one another and maintain precise ensemble and balance, the resulting less-than-adequate performance will render further acoustical discussions superfluous. It is also important that the ratio of direct to reflected sound be very high, because the leading edges of vocal and instrumental attacks cannot be together unless the performers receive the musical information surrounding them in an accurate and consistent time frame, without varying degrees of delay.

The second item, the importance of hearing oneself in proper perspective to the other musicians, is of greatest importance in large ensembles with significant distances separating the performers, such as a full orchestra, band, or chorus. As a professional orchestra musician, buried in the woodwind section, I can attest to the importance of being able to hear myself as well as distant colleagues, so we can play together and keep a "tight"-sounding ensemble. I find that there is nothing more musically defeating than attempting to make music on a stage that provides me with a sense of aural detachment and isolation. This situation is all too prevalent (especially in halls of recent vintage), and can be likened to trying to land an airplane in dense fog without the benefit of instruments or radar. Some readers might think that aural communication between musicians is not so important, since the visual cues from the conductor should be adequate for precise ensemble—in some very poor halls this is the only way—but the vague, irregular, and often confusing signals received from the podium are not always reliable. Further, in an ensemble such as a symphony orchestra, where the surrounding sounds can be louder than one's own instrument (such as the brass section directly behind me), it is important for each musician to hear him or herself, thereby having some control over individual tone production and attack.

The third item mentioned above, the necessity of a sense of resistance and "coupling" with the hall, is more subtle and difficult to explain to the non-musician. Playing in a good, responsive hall is somewhat like driving a great automobile: it tracks every attack and nuance that the musician creates with speed and immediacy. Without some resistance to the attack, however, the performer cannot sense how his sound "loads into the hall acoustic," and therefore will not be able to comfortably "open up and play out into the house." The best concert halls always "talk to me," letting me "lean into them and feel an immediate, active response," while the worst (and there are plenty of those) make me feel like I'm playing outside, and any sound I produce just vaporizes into thin air.

The fourth, and final, requirement is similar to what one should expect of a good full-range loudspeaker. Just as with audio components, concert halls have colorations, resonant frequency suckouts and spikes, and overload points. The ideal hall would have a completely neutral tonal balance, with an even frequency response throughout the complete musical spectrum. Every hall has a
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specific set of tonal characteristics which the performing artist must complement (similar to matching components within any system), and most musicians prefer theatres with colorations that enhance the musical performance in a euphonic sense, to a greater or lesser degree (analogous to the tube vs solid-state debate?). I happen to like halls that have a great deal of life and resonance, with clarity, immediacy, and visceral presence. (So that's why I own Martin-Logan Monoliths!) It always makes me chuckle when I meet those off-the-deep-end audiophiles who use one or two "well-chosen" recordings to tune their systems, and can't quite figure out why the same conglomeration of equipment sounds intolerable on any other program source. They have not yet discovered that the halls in which their reference sources were produced have colorations, and to use the tonal characteristics of one theatre as the absolute (as do some members of the high-fidelity audio press) is not only unrealistic, but foolish.

One of the questions I frequently encounter, especially from people interested in audio, concerns the sonics presented to the musician on stage vs those apparent to the listener in the audience. The immediacy and visceral presence experienced when sitting in the middle of a full symphony orchestra is exciting and impressive, but I don't think it gives a very realistic point of view. (Every audiophile should have the opportunity to experience this first hand...no subwoofer in the world can come close.) As suggested by my previous discussion of desired hall characteristics, musicians have specific requirements that don't necessarily jibe with listeners' priorities. Audiophiles, on the other hand, are often looking for sonic characteristics not necessarily important to performing musicians. Many of these characteristics are not as obvious during live performance in the concert hall (due primarily to the gross sonic exaggerations and manipulations on the part of the recording industry), but are nevertheless important factors that contribute to any concert hall's musical appeal. Keeping this in mind, I would like to examine a few halls (from both sides of the stage) that I feel represent significant positive or negative contributions to the musical world.

Carnegie Hall, New York: Then and Now... I recently returned from a short tour with the National Symphony which included two concerts in the newly renovated Carnegie Hall. Although there will undoubtedly be several editorial comments on the new revisions, this will probably be the first from someone who has actually performed there. As soon as I sat down to warm up before our first acoustical rehearsal, it was difficult for me to believe that this was the same hall that I remembered...not only visually, but sonically. Now that the famous hole in the top of the ceiling over the stage has been covered up—created for the filming of the 1946 movie Carnegie Hall—and all of the curtains and other sound-absorbing materials removed, the previously overly warm, euphonic quality has been replaced by a much more neutral, clear, and dynamic sound. The most significant improvement, however, is in the bass: at first hearing the low frequencies appear to be thinner and leaner, but are actually more natural, with less mid-bass fatness and more top-to-bottom spectral coherency.

Playing on the new stage was, for me, an enlightening and revealing experience. Whereas many of my colleagues did not care for the new acoustical environment, claiming the sound to be too hard and honky, I found it to be extremely honest and revealing. The textural nuances coming from all of the orchestral choirs were more evident than ever before, with a sense of transparency that allowed me to hear every musical line in proper perspective. I felt very comfortable when playing, being able to hear exactly what my instrument produced, and therefore able to color and "bend" my sound to fit each musical phrase. The presence and "ping" on attack in Carnegie is superb, and one is able to sense the resonance projecting into the house, but without any frequency dependency. Furthermore, even in the most aggressive full orchestral passages, the hall never overloaded, giving the performer the feeling of ease and equilibrium.

There is a higher ratio of reflected-to-direct sound in the renovated Carnegie, and this has caused some concern and negative reaction from performers who claim that they cannot hear one another as well as before. While this
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may be true for some, I maintain that the feedback the artist receives from the house is more honest and accurate, and therefore more artistically valid. In my opinion, the new Carnegie is the most neutral-sounding concert hall presently standing.

**Symphony Hall, Boston**

Symphony Hall is, like Carnegie, a neutral transducer, but with more colorations and greater sensitivity to sonic overload. The stage is a bit small for a full symphony orchestra—something made very clear to me when I got jabbed with a trombone slide in my back—but when you have the opportunity to play in a place like this, such problems appear trivial. The sound in Symphony Hall is more immediate to the audience than in Carnegie, and the stage feels "tighter" and less airy in tonal quality to the performer, resulting in an acoustic favoring a lighter style of playing. The spectral balance in the house is tilted slightly upward, so the musician must be careful not to play with too much "zing" and edge to the sound, and the stage resonance is projected into the house with incredible immediacy and presence, without any frequency dependency. There is a higher ratio of direct-to-reflected sound on this stage than at Carnegie, and the performers can hear one another's instrumental attacks more intimately.

**Musikvereinsaal, Vienna**

The Musikvereinsaal is undoubtedly the most colored-sounding hall to be discussed in this article, but the glow of the sound that comes off the stage is alluring and captivating. Although the overall texture is clear and transparent, the excessive warmth gives everything a complimentary quality that musicians just love... even if it isn't accurate.

At first, the uninitiated performer feels somewhat isolated (you can really hear yourself in this place), and usually tends to underplay, in order to "feel" the hall and mesh with the rest of the ensemble. I personally prefer colder, more objective tonal characteristics, but the Musikvereinsaal is probably the best example of an intimate, but completely musically satisfying concert hall.

**Gammage Center for the Performing Arts, Arizona State University, Tempe, Arizona**

Most readers probably haven't heard of this place, but they should have. Completed in 1964, the Gammage Center is the finest contemporary hall in which I have had the opportunity to perform, and may well have the best mix of superb stage acoustics, tonal neutrality, and transient response/instrumental attack of any large hall built in the twentieth century. It was designed by Frank Lloyd Wright, and the consulting acoustician was Dr. Vern Knudsen. Actually, the Gammage Center (which seats 3029) is even better than Carnegie Hall in its ability to support the sound of a full symphony orchestra, and conveys the stage resonance to the audience more successfully than any other hall that I have heard. Unfortunately, there have not been any commercial recordings produced in the Gammage Center; I say "unfortunately" because this would be the perfect venue for recording of works by Mahler and Strauss.

**Philharmonie, West Berlin**

Opened in 1963, the Philharmonie (home to the Berlin Philharmonic) is a successful example of radical contemporary design. In this hall, the sunken stage is surrounded by the audience, which not only gives the sonics an open, airy quality, but allows the listeners to become more intimately involved with the performers.

From the point of view of the musicians, however, this hall offers mixed blessings. The stage is very "spotty," having specific resonant and dull spots, and aural communication among the musicians is dependent on the positions of the individual artists. For example, the strings can clearly hear the winds (assuming the former are not out at the extreme edges of the orchestra), but the winds cannot often hear the strings with the same immediacy and clarity.

Even with these shortcomings, the Philharmonie is (in my opinion) one of the world's finest concert halls. It is neutral-sounding, without any obvious frequency aberrations, and affords every listener a good seat, both sonically and visually. The very wide soundstage projected to the farthest reaches of the
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audience is remarkable, and there is no smearing of tonal colors and instrumental attack. It is unfortunate that most of the commercial recordings produced in the Philharmonic do not do it justice.

Kennedy Center for the Performing Arts Concert Hall, Washington DC

It is embarrassing to admit that the hall in which my orchestra (the National Symphony) is resident is one of the least musically inviting in which I have ever played. The acoustics on the stage are impossible; we cannot hear one another, and if we do, the various reflections are so overwhelming that visual and aural signals have no relationship to one another. The spectral balance is thin, with severe peaks in the upper midrange that cause the hall to "honk" when overloaded (which occurs at much too low a dynamic level). There is no real bass response, and instruments such as contrabass, bass drum, tuba, and contrabassoon sound washed out and dull. Furthermore, the sound on the stage gives the false impression of resonance (there is none), there is no feedback from the house (something like playing outside), and the performers are placed in an artistically hostile environment for making music. As one of my colleagues in the NSO stated, "playing in here has all the warmth and resonance of the city morgue."

Unfortunately, many halls of recent vintage share the cold, harsh, unmusical sonic characteristics of the Kennedy Center. Avery Fisher Hall, alias Philharmonic Hall at the Lincoln Center, New York, for example, has not fared much better (even with all its revisions); I should certainly hope that these are not examples of what we should expect in the future.

I'd like to conclude this article with a quote from a marvelous musician who was once our music director and conductor—Antal Dorati. After completing our first, depressing, rehearsal in the Kennedy Center Concert Hall, Maestro Dorati put down his baton and quietly stated, "Ladies and gentlemen, nothing improves the acoustics of a hall quite like a good performance."

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Two new technologies shared the spotlight at the Summer CES in June: CD-Video and R-DAT.

A CD-Video is, as you might expect, a Compact Disc with video added. The disc looks exactly like a conventional CD, except that the shiny surface is gold rather than silver, so that you can distinguish it from a plain, ordinary, music-only CD—unless you have some Mobile Fidelity Sound Lab Ultradisc CDs, which also are gold. (There’s always gotta be a rebel!) And instead of up to 73 minutes-odd of state-of-the-art stereo music, each CD-Video disc offers a 5-minute MTV-style music video plus 20 minutes of audio alone. The audio is digitally encoded stereo, exactly as on a conventional CD; the video has the potential quality of a conventional laser-optical video (LV) disc.

Beyond that, the distinction between CD-Video and ordinary LaserVision software is blurred, because CD-Video’s promoters are also applying that term to what used to be called LV Singles—8" LVs of pop music videos—and to any 12" LVs with musical material on them, including classical operas, ballets, and symphonic performances.

I refuse to go along with this. As far as I’m concerned, LaserVision is the correct term for any video disc with a 1" center hole, regardless of what is recorded on it, while a CD-Video is a CD with video on it. That makes sense, doesn’t it? Of course it does. The industry’s proposed terminology just invites chaos.

Despite the splashy launch, there seems to be very little material available as yet in CD-Video format. Several hundred jewel boxes with CD-Video titles were on display, but I was told by one exhibitor that the discs in most of those boxes were dummies. And I am not at all certain that CD-Video has much relevance for the high-end audio buff anyway. The format is aimed unabashedly at the lucrative teenage market rather than at the mature audiophile, and record producers have a longstanding tradition of scorning every aspect of the teenage market except its easily accessed shekels. Regardless of CD-Video’s potential, I will be surprised if the sound quality on most of them is anything better than very mediocre. But I can only say I am more than pleased to note—if we may judge by the (dummy?) 12" albums on display—that CD-Video is going to bring us a wealth of what looks like very interesting classical LVs from such music mills as Polygram, A&M, Island, CBS, MCA, Capitol, Chrysalis, and the Warner group. Other listed participants include Disney, MGM/UA, LDC America (Pioneer’s LV division), Warner Bros., Embassy, Paramount and Columbia Pictures. If all this CD-Video hullabaloo accomplishes nothing else, it will at least help to popularize the shamefully neglected LaserVision disc in the US.

DAT, on the other hand, is far more relevant. An R-DAT recorder is essentially a miniaturized
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videocassette machine, which records data on diagonal “stripes” along a ¼-inch-wide cassette tape. Each stripe—1/10 the thickness of a human hair—can store 61 kbits/inch of data, resulting in a mind-boggling storage density of around 1.2 Gigabytes of audio and subcode data on a 120-minute cassette two-thirds the size of a compact audio cassette.

Besides the audio material, there is room for data pertaining to stripe (frame) number, selection number, elapsed time, and tape-to-head synchronism, with room left over for additional special-requirement data such as time codes for motion-picture production. The recorder can thus be programmed on replay in much the same manner as a CD player. The system can produce perfect digital-to-digital copies, and can be used for the kind of pre-programmed fully-automated editing that has hitherto been possible only with professional systems costing around $100,000 or more. In fact, DAT developer Sony has been touting the new system’s professional applications over its consumer use, but the realization of this has fallen somewhat short of the promise, because all current DAT machines have been deliberately rendered incapable of recording at the CD’s 44.1kHz sampling rate. This is ostensibly to prevent D-to-D copying of CDs, but it also means that, for CD mastering, a DAT tape would need to go through a bit converter, which can degrade signal quality almost as much as back-to-back D/A-A/D conversion. DAT appears, therefore, to be neither fish nor fowl. Its recording quality will represent ludicrous overkill for the person who just wants to copy commercial recordings for use in his car, and it is compromised for the professional user who could take full advantage of its fidelity capabilities.

This is the third CES at which working DAT units have been demoed; although the system was introduced in Japan this Spring, its US release date is still—as I write this—four months in the future. Why this uncharacteristic Japanese reluctance to unleash an exciting new technology? Because there has been a lot of industry pressure for DAT’s promoters to hold off. The CD people have been afraid DAT would hinder consumer acceptance of CD by presenting the buyer with an incompatible choice (shades of quadraphonic!) when they wanted him or her to see an inexorable revolution. That concern has now passed. CD’s public acceptance is no longer in question.

Of much greater concern to DAT’s promoters has been the almost-paranoid reaction of the American music and recording industries, which see DAT as the ultimate nemesis of copyright. They don’t want a recording system this good coming into the US, and have been trying their best to legislate it out of existence. To date, they have failed, and time may now have run out for them (see “As We See It” on p.5). R-DAT is ready to go, and there doesn’t appear to be much chance of stopping it now.

At the Chicago CES, working DAT units were being demoed by Casio (no model number, between $1000 and $1300), Harman-Kardon (Citation 26, $1500), Hitachi (DAT-9000, no price), JVC (XD-Z1100, no price), Luxman (KD-117, $1300), Marantz (DT-84, $2000), Mitsubishi (an in-dash auto unit, no model number or price), Onkyo (DT-2000, $1800), Sharp (RX-X100, no price), Sony (DTC-1000es, no price) and Technics (SV-D1000, no price).

All the quoted prices were “tentative,” largely because of the very unstable dollar/yen situation, and of all the DAT exhibitors, only Marantz would commit itself to a US delivery date (October ’87). The others either had no official target date, or cited a vague “next Spring” or some such. Onkyo, however, indicated it would not allow Marantz to have the marketplace all to itself. Denon evinced no interest in DAT, claiming there did not appear to be any consumer demand for it. I felt that was a brilliantly astute observation (but I wondered how much demand there was for CD before it was launched).

Already, industry scuttlebutt has it that the DAT players sound better than CD players. This is interesting, in light of the continued use of CD’s “Perfect Sound Forever” slogan, so I will refer you to Martin Colloms’s report on the Sony DTC-1000es in this issue.

1 The Society of Motion and Television Picture Engineers’ time code allows film or video sound to be keyed to picture frames by minutes, seconds, and frames.

2 Akai announced an R-DAT player some months ago, but the company has since become the first casualty of the Japanese/American trade war. Bravo, Ronnie! Now, if you can just topple some more Japanese giants, we can all go back to good ol’ American apple-pie products with their legendary reliability and cost effectiveness! That’s called a free market, right?
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When I first mentioned that I would be covering the musical aspects of the 1987 Summer CES for Stereophile to a few friends in the high-end audio retail community, they all exhibited basically the same reaction: skepticism. After recovering from the initial shock of my seemingly preposterous statement, each one, to a man, said “what music?” One even suggested that I spend my time at the show searching for the lost chord, possibly finding it buried somewhere inside the bowels of an amplifier chassis.

Having attended several CESs myself, I would agree that the physical situation presented to the exhibitors is certainly not ideal. But some manufacturers do care enough to rise above the masses, make the best of a difficult situation, and actually produce some damned good music. It is true that those picky few who obtain the prime spaces have a definite sonic advantage (something like “he who has the biggest room wins”), therefore precluding the listeners from making any conclusive judgments as to the merits (or lack of same) of displayed products. In spite of this, I was able to successfully uncover enough interesting musical sounds and ideas to satisfy the most ardent skeptic.

Stereophile, August 1987
This is the first time (to my knowledge) that a regularly performing professional musician has filed a report on CES in the high-end audio press. The point of view that I take will undoubtedly be considerably different from anything previously written, hopefully unearthing some heretofore neglected aspects of the show. While Martin Colloms will be discussing technical aspects and trends (being much more qualified in this area than yours truly), I have decided to report on what I heard from a purely musically critical viewpoint; not only from the products themselves, but also from the designers of those products.

Unfortunately, I had only a short two days in which to cover the show, since the aggressive schedule of the National Symphony Orchestra prevented me from staying any longer. (I actually had to take one rehearsal off with personal leave... something that went over with the Symphony Management like a lead balloon.) This severe time limitation prevented me from seeing and hearing some of the products, and speaking with all of the people I would have liked. I tried to visit all active displays twice, in order to assure that my first and second impressions were consistent (it's amazing how time of day and personal disposition can color one's listening acuity). Most of my time was spent with the high-end products and manufacturers in the Americana Congress Hotel, with shorter visits to the Blackstone and McCormick Hotels to see and hear particular products and people.

The high-end audio world is distinguished from the jungle of mid-fi in more ways than the obvious tangible differences. Most of the better equipment generally accepted to be included in the elite group of high-end is manufactured by relatively small enterprises controlled by one or two strong-willed individuals who have invested a great deal of economic and emotional resources in their products. As a musician and performing artist, I can personally relate to the ego and personality extension that many of these manufacturers seem to display through their work. When purchasing a quality piece of equipment, the audiophile is getting much more than just a well-made piece of machinery; he is also buying a piece of sweat and blood from someone who has definite ideas on just how music should be perceived by a listener. While many manufacturers might take issue with this assessment, claiming that their only aim is to reproduce music without any editorial comment, the fact remains that any product designed by one or two people is going to reflect their personal biases. This is by no means a negative situation; it affords the audiophile a much more varied and colorful choice than the bland cardboard so often turned out by the mid-fi market.

With all of the above in mind, I decided to tackle CES from a rather novel point of view: listen to the product first, then discuss musical preferences and design philosophies with the manufacturer, avoiding any unnecessary allusions to the technical aspects of the product. I felt that, if I could successfully gain an insight into a manufacturer's musical goals, the resulting information might help illuminate and explain the sonic trademarks of his products.

The results of my endeavors were quite interesting and, I think, actually revolutionary. Not being an established member of the audio press, I expected a cold shoulder from the "heavies" in the high end. When I introduced myself as a professional symphony musician covering CES for Stereophile from a musician's point of view, almost every manufacturer was visibly intrigued by my novel approach, making some sort of declaration indicating that "it was about time." Some appeared to be caught off guard at first, probably not being used to talking audio to a musician, but after I proved that my mission was only in the interest of musical reproduction, they felt more at ease.

I arrived on the second day of the show (I had a concert in Washington the previous evening), and after dealing somewhat unsuccessfully with O'Hare Airport and a clerk at the hotel who insisted that I did not exist (you've heard of the Incredible Flutist; how about the Invisible Contrabassoonist?), proceeded to the Americana Congress.

My first stop was at the Krell exhibit. As I expected, Dan D'Agostino was using his KRS balanced preamp and reference mono power amps driving Apogee Duetta IIs. I found the sound to be superb, very much like what I heard last summer, but somewhat more recessed and less focused than I recalled. A recording of a small jazz combo was being
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played, and I couldn't quite get comfortable with the performance; it seemed to suffer from an overly commercial, coagulated sound. On my second visit to Krell the next day, the same music was being played, and the same compressed quality of sound was evident (since this was the basic electronics setup that was being used at the Apogee exhibit, I concluded that the program material was undoubtedly a contributing factor). Even with the less-than-perfect program material, the "Krell sound" came through: transparent, liquid, and musically involving (there's no secret that musicians love this equipment... if only vicariously). Dan appeared to be preoccupied, and did not wish to talk about his musical predispositions and design philosophies at the time. Although I felt that the musical ideas from this important manufacturer would be enlightening, I respected his feelings, and departed.

The Apogee exhibit, my next stop, was one of the high points of the show. Jason Bloom was demonstrating his newest baby, the Diva full-range ribbon speakers ($7000/pair). These were being driven by an all-Krell system (KRS-1 balanced preamp and 200W mono Reference amps), and they sounded spectacularly good. As Jason went through his musical selections, I couldn't help but think that this was a musician's stereo system... I could detect almost no system colorations, and the quality of sound changed drastically with the various recordings— not in a negative sense, but in an informative one. I listened to the Divas for about 25 minutes without any fatigue or other unpleasant side effects. After my visit to this suite, I had an enlightening discussion with Leo Spiegel, Apogee's design engineer. Most of the information he supplied me with centered around the technical aspects of the product, and he suggested that I speak with Jason (otherwise occupied at the time), since all tonal qualities attributed to the speakers were directly linked to Jason's personal musical tastes.

When I returned the following day, I heard something that convinced me that these speakers were incredible music transducers. When Jason played the final movement of Rimsky-Korsakov's Scheberazade (without any mention of the performing ensemble), I knew, within about a minute, that the Cleveland Orchestra was performing. The ensemble was not as perfect as one would expect from this orchestra, nor was the intonation up to the usual standard, but the unique tonal characteristics of the first bassoon (George Goslee), first oboe (John Mack), and first trumpet (Bernard Adelstein) came through in a natural and unmistakable way. Although the overall spectral balance of the Divas was on the bright side of neutral, this didn't seem to detract from their totally musical presentation.

When I first sat down to speak with Jason after the demo, the fact that I was able to positively identify the Scheberazade ensemble through his speakers elicited a positive and incredulous reaction. I asked him if, had he to choose only one, he would go for tonal accuracy, soundstage dimensionality, or dynamic impact in loudspeaker design. His answer of tonal accuracy was certainly consistent with what I had heard, and he continued to explain that he did not care for an "overly bright and crisp" tonal balance. He further mentioned that the proper representation of tonal decay, as well as attack, is essential, as is the necessity to capture the particular characteristics of the hall in which the recording was made (which he termed "the flavor of the room"). Although he likes to listen to full symphonic works, he prefers to listen to chamber music at home, because of the difficulty in credibly portraying a full symphony orchestra in the living room. When I suggested that the tonal balance of his speakers approached the sonics of Boston's Symphony Hall (immediate and somewhat bright), he refused to admit that he used that sound as a model, but mentioned that he does often attend concerts there. Interesting...

My next stop was Audio Research, an entirely different perspective. Bill Johnson was utilizing the new infinity IRS Beta speaker system with an SP-11 preamp and M300 amps. I'm not sure whether to blame the electronics or the speakers (although I've heard Audio Research in other situations sound much more neutral), but the sound was much too glassy and bright for my tastes, to the point of distraction. I'm led to believe that the speakers were the cause of the problem, since the tonal balance between source material (vinyl vs. open-reel tape) was prac-
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some other full-range speaker systems at Bill Johnson's exhibit in addition to the IRS Beta.

When I was finally able to corner Johnson (a very busy man), I discovered that his musical goals are consistent with what I have heard through his equipment. His first priority is the correct recreation of dynamic attack and weight, without any strain or constriction, and with tonal accuracy taking second place. He mentioned that he wouldn't mind hearing a Steinway piano sound more like a Yamaha, as long as the dynamic contrasts were accurately reproduced. This is an intriguing point of view, because, as musicians know, accurate tonal reproduction is directly linked to the correct representation of instrumental and vocal weight and attack, along with other things. I personally consider tonal accuracy to be of foremost importance, but would readily admit that many products that get this right sacrifice correct dynamic expansion, thereby not allowing the music to "explode out into space" as it does in the concert hall.
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Synthesis Reference loudspeaker system ($6800). Using their flagship Premier Seven preamp and mono Premier Five amps, the sound through the new reference speaker system was musical and spectrally well balanced, with believable soundstaging and excellent subwoofer integration. The real attraction here, however, was the master tape of Andrew Litton’s latest efforts: a spectacularly good performance of George Gershwin’s *Rhapsody in Blue* (with original jazz band orchestration), and *Song Books*, with the RPO, conducted by Mr. Litton, who also appeared as piano soloist. What made this occasion so special was the fact that this particular commercial recording was funded by Conrad-Johnson, who have, by making this important gesture, put their money where their mouth is (this should be an example for other manufacturers, who pay lip service to their support for the arts and musical commitment).

Although Conrad-Johnson had no artistic input into this project, and are not using it as a vehicle to sell their equipment, I think the Gershwin tape gives a good indication of their musical goals. Unfortunately, Lew and Bill were unavailable for interview during my visits.

Across the hall from C-J, Bob Fulton was showing off his Symphony loudspeakers with some of his own tapes of various instrumental groups. Using a Nakamichi cassette deck, the reproduced fidelity may not have been up to present-day standard, but it was adequate for me to identify Thomas Stacey’s (English hornist in the New York Philharmonic) solo playing. The Symphony speakers reminded me a bit of the old large Bozak systems: musically accurate, but a bit on the honky side. Bob and I discussed the attributes of the minimalist (two) microphone technique he employs, and the generally dismal state of recordings in the commercial world.

At this point, I bit the bullet and made the obligatory pilgrimage to the McCormick Center “zoo.” Carefully navigating across the main floor, I saw a few examples of the new DAT hardware (couldn’t hear anything valid through the general din), but was unable to get a straight answer from any of the exhibitors as to release dates or realistic expectations of prices. Down in the lower level, I found the people at Telarc to be cordial and informative, even though their booth was like the Carnegie Deli at lunchtime. Bill Baxter (Marketing Analyst for Telarc, and bass trombonist of the Akron Symphony) and I had an in-depth conversation concerning the qualitative differences of Telarc’s new recordings utilizing Tony Faulkner’s redone Sony digital tape machine, as well as some of the musical points I discussed in my *Stereophile* article on recording (Vol.10 No.1).

Across the street at McCormick Inn, B&W was introducing some new speakers to launch their own US distribution company. The Concept 90 Matrix Mini two-way and Matrix Mini-Tower three-way systems were being offered as what I perceived to be “domestic alternatives” to larger systems, but without the complete sacrifice of sonic virtues. The real news here, however, was the debut of the redone Matrix 801 Series 2 speaker. Almost every recording session that I have participated in within the past five years has used the 801 speakers as monitors. While I’ve liked their sound (when placed up on stands and driven by adequate solid-state amplification), they always seemed a bit “tubby” in the low end and discontinuous throughout the midrange and highs.
TIE BEDS.

PHILOSOPHY

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From what I heard at two relatively short demonstrations, the new Matrix 801 is a clear shift (for the better) in B\&W's design philosophy, presenting a much more dynamic, clean, and less colored sound than before. The icing on the cake is that the designers have extended the two frequency extremes by a full octave in each direction. Musicians generally like the harmonic accuracy of B\&W speakers (even if some audiophiles find them boring), and I wished I'd had more time to audition the new 801s thoroughly. At the press introduction, John Bowers explained the new computer-aided design that has enabled his company to accurately predict the performance of a drive-unit without actually having to build a prototype. While I generally don't believe that it is possible to build any piece of audio equipment on theoretical design, it seems to have worked magnificently for B\&W.

When I later spoke with Mr. Bowers, he was very careful to point out that he believes an accurate loudspeaker should only reproduce what is put into it, good or bad. He went on to say that the only way to determine if this is really happening is to ask the performers involved in the recording to judge the accuracy of playback through the transducers. He accepts the fact that recordings are definitely not the same as live performances, and that true monitor speakers must remain faithful to the perspective created by the engineer, musically valid or not. We had a marvelous conversation about the professional music world in London (we know several of the same players), and I was left with the impression that the man who shapes the artistic directions of B\&W would rather hear music than an impressive hi-fi.

By the end of the second day, I was ready for a place to relax and listen to music. I found it at the Kinergetics suite. Tony Di Chiro was demonstrating his new 16-bit, oversampling CD player (KCD-30) with his 75 Wpc class-A amp (KBA-75), and a pair of Spica TC-50s, along with a pair of his BSC SW100 subwoofers. Pure musicality is the only way I can adequately describe what I heard: no sensation of electronics or speakers, with believable soundstaging and tonal accuracy. Bernard Haitink's CD of Shostakovich's Symphony 15 had all the weight and depth of the Concertgebouw Orchestra and Hall. When one takes into account that the entire system I was listening to costs less than 5000 bucks retail, I think it would be safe to say that this represented the most "music for dollar" at the show.

As I would have expected, Tony's ideas of correct music reproduction include a natural perspective without any artificially induced clarity in the upper octaves. He also felt that most people listen to classical music at much too high a level for realistic reproduction (one of my pet peeves). Those audio fanatics who want to be bombarded by jet planes, earthquakes, thunderstorms, and even atomic bombs would probably not like the Kinergetics sound, but if they're searching for music, here is an oasis.

In conclusion, I would have to say that I heard more valid musical reproduction at this show than at any previous. I certainly heard my share of downright unmusical sound equipment, and less than adequate recorded musical performance, but on balance, I was not disappointed. There seemed to be less synthesized music (Flim & The BBs?) and more introspective types of program material (Appalachian Spring, Vivaldi Four Seasons, etc.), with what appeared to be a trend toward believable reproduction. There were, of course, those manufacturers who obviously had the need to bombard the listener with outrageously unmusical effects, but they were in the minority. I think that someone should hire the Chicago Symphony to perform a concert for CES, so we might all be able to recalibrate our ears; and if that program source doesn't sound right . . .

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THE ENGINEER AT THE SHOW

Martin Colloms reports from the summer CES

Stereophile commissioned me to assess the CES with an ear and mind fresh from an eight-year absence from the show. With little knowledge of recent shows apart from that gleaned from published reports, I was able to view the presentations as a virtual newcomer to the US scene. New products were of obvious interest, but I did not deliberately seek out hot product news or extract promises from manufacturers for the supply of early review samples. Many of the exhibits familiar to me as promised designs and prototypes from earlier reports were available here and now as finished products ready for demonstration and sale. The status of a demonstration, however, should not rely on a single special product, but on the completeness of a product line. It can take years for such a line to evolve; in many cases, my show judgment and opinion were based on that longer view of development and product innovation.

Thanks to Stereophile's invitation, I had the opportunity to meet many industry figures and exchange views on design and reviewing,
many of these discussions lasting several hours. This helped to provide much of the basis for my present discussion of design trends. I should like to thank the staff of Stereophile, as well as all the following people, noting that this list is not comprehensive or ranked in order of importance: Dan D'Agostino (Krell), Jeff Rowland (Rowland Research), Jim Thiel (Thiel), John Curl (consultant/Lineage), Jim Strickland (Acoustics), Tom Colangelo (Cello), The Audio Cheapskate and Dick Olsher (Stereophile); Richard Fryer (Spectral), Peter Suchy (Clear Audio), AJ van den Hul; Bruce Brisson (MIT), Bill Johnson (Audio Research), Leo Spiegel (Apogee), David Wilson (consultant/Wilson Audio), Michel Reverchon (Goldmund), Doug Sax (Sheffield Lab), and Len Feldman, David Clark, and David Hafler.

I hope that readers and manufacturers alike appreciate the difficulties of achieving and assessing reasonable sound under trying show conditions. Given the American habits of talking through the demonstration, company staff competing with the music in order to carry out discussions with other visitors, and noise from adjacent exhibitors, listening conditions were far from ideal. As the show, like a party, got into its swing, volume levels rose in competition, reaching near-blast levels in acoustic battles fought along some corridors. In only a few cases was I able to achieve a temporary closure of the room doors, aiding signal/noise ratio and improving concentration.

In any given presentation, several factors are at work, not least the quality of the specific item under temporary, lightning analysis. The different room acoustics, the chosen ancillary equipment, the program material, and the skill in system alignment shown by the exhibitor, are all major variables. Given these factors, the following opinions should be considered as indicators of future promise. Given also the small scale of the UK market and the relatively modest presence of US audio in Britain, I saw a number of brands for the first time at the CES; accordingly, I will report on these as if they were also new to the US market.

Amplifiers
The demonstration aspects first: Audio Research Corporation did not impress with their SP-11/M300s combination driving a new Infinity loudspeaker, the IRS Beta. Whether due to room acoustics or system difficulties, the sound lacked coherence. It had good mid-depth but a "bitty" treble. Krell was rather more successful in their own room, using the small Reference power amplifier and balanced KRS preamplifier to drive the latest version of the Duetta (which has improved treble extension compared with the sample I reviewed for Stereophile in Vol.10 No.1). This system provided real musical drama from an Air Tangent parallel-tracking tonearm fitted to a new US turntable, the superbly crafted Debut from Basis. Krell Reference series amplifiers also provided solid support for Apogee's presentation of their new Diva loudspeaker.

Rowland Research also set a high standard with their Coherence One preamplifier and Model 5 stereo power amp, demonstrated via the musically appealing Wilson Watts. Kinergetics amplifiers cannot be neglected, instrumental as they were in an effective company demonstration described later in the CD section. I mention Mirror Image only for the poor impression given. I could not really fault the system—Magneplanar Typani IV, Alpha 2, good turntable—but the sound of the Mirror amps, despite a careful arrangement, was surprisingly spiky and brittle; judgment is reserved. Wingate showed a class-A 100W power amplifier of zero-feedback design and promising build. No attempt was made to disguise the moderately high distortion figures on the specification, a brave commercial statement and one with which most subjective reviewers would agree. Spectral confirmed their substantial reputation via an effective demonstration with the
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Dunitech Sovereign and Wilson Watts. Spectral pre- and power amplifiers, and their prototype CD player, were used. Musical dynamics, focus, and depth were all well in evidence, despite poor room conditions.

On my first visit to B&K, they used Vandersteen 2Cs, producing a fine sound with their modestly priced electronics. The sound was spacious and pleasant, exploiting the loudspeaker’s fine imaging and dimensional properties. Naim Audio showed a well-finished version of their new preamplifier, the NAC 52, a slick production in the NAD 250 case excursion, complete with a motorized, tinted, hinged panel and full remote control via motor-driven potentiometers. The combination of manual and remote control is interesting, as is the use of LED indicators to show control positions even when the transparent cover is hinged shut. The SBL loudspeaker was also on dem using a turner source—unusual at a show, it well demonstrated Naim’s skills at FM design.

While Clear Audio is noted for fine cartridges, they appear in this section by virtue of the availability of production Harmony head amplifiers—a high-tech insert placed in the headshell under a moving-coil cartridge to amplify and equalize at source before losses occur. The final results will depend on the quality of design execution, but the theoretical potential is high: the system includes a straight-line control preamplifier and power source for a substantial $2000 or so. Sharing a demonstration with Souther, the speakers used precluded serious assessment.

After an untimely and fruitless association with Swiss Physics, Goldmund has developed their own range of electronics, the Mimesis line. This comprises a very slim 100Wpc, widebandwidth “Model 3” power amp; in the Model 2, a two-unit design, the phono preamp may be remotely located adjacent to the turntable, or even inside it, if space permits. Some facilities for remote control are provided, with future upgrades to include volume and balance. A simpler version of the Studio turntable was shown and, given Goldmund’s reputation, the new electronics should be interesting, to say the least.

Counterpoint gave a promising account of their unbelievably high-priced SA-11 “line amplifier,” despite cramped demo conditions.

Aragon’s distinctive power amplifiers are joined by a preamp

This thermionic preamplifier uses the older, full-size tubes, and is built to the highest standards, offering infra-red remote control—a surprise from such a company.

Conrad-Johnson demonstrated, with restraint and a certain lack of excitement, their Premier Seven flagship preamplifier. A single case externally, inside it is of double mono build. Full-size Synthesis speakers of comparable price were also on show, with a handsome finish and unusual, well-finished shapes. C-J played a digital master of an RPO Gershwin recording which they had sponsored in the UK. Much activity was in evidence in their Motif and Sonographe lines: a complete system is now available from Sonographe, namely FET-technology pre- and power amplifier, turntable, CD player, and loudspeakers. The Motif power amplifiers are finally available, and promise to make an impression on the solid-state amplifier market.

Superphon has completely revised their Revelation II preamp and upgraded the 220 power amp. No comments on these, as I didn’t think much of the speaker line they co-demonstrated and shared the room with. Lineage appears to be approaching production status; their concept, new to me, is that of a well-equipped line of electronics with a traditional flavor, built to a realistic separates price, yet designed by John Curl to modern sonic standards. Curl feels that the engineering-vs.-value concept represents a major design challenge.

Concerning design trends, the exhibits and the views of their associated designers showed evidence of strong continued progress on the part of the US audio industry. Dan D’Agostino of Krell gave a detailed exposition of his aims, which include top-quality build coupled with high reliability, and the design of products...
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High Fidelity, January 1986, on the ESM-2

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ability... definitely an excellent value."

Stereo Review, February 1986 on the ESM-3

"exceptional overtone balance... imaging was just about the best I've heard... excellent
dynamic range... it sounds great... no real compromises in its design... anyone looking for a
$1,500.00 to $2,000.00 system would be foolish not to carefully audition the Energy ESM-2...
amazing at the price."

Audio Ideas, 1985 edition, on the ESM-2
whose performance sets high standards, but which also maintain those standards over long periods and a wide range of operating conditions: input-output matching, speaker loading, and the like. He expressed some resentment over certain reviews of competing products whose optimistic claims for load tolerance were not properly explored in review. This brought up an area relevant to our discussions, namely the advancement of sound quality via the improvement of the overload performance. Given that amplifiers are subject to clipping in the real world, D'Agostino heavily stressed the importance of good overload behavior, freedom from latch-up and parasitic oscillation, and quick recovery, an aspect now becoming more widely appreciated. Certainly my recent experience of a KMA-100 II convinced me that its exceptional load tolerance and overload behavior undoubtedly improve its performance and review status. With the requirement of increasing dynamic range, partly determined by the quietness of CD background noise, Krell is moving away from fan-cooled designs through the development of higher-efficiency external box-finned heatsinks, and aiming for lower mechanical noise. The first of these new designs is the new KSA-200; fanless versions are expected to appear down the range. Krell does not anticipate a budget amplifier line; instead, existing models will be upgraded on a revolutionary basis, with a general increase in output power and dynamic headroom. In this view the '50 will approach 100W/ch., the KSA-100 200W/ch., and the KMA-100 300W/ch.

In company with many top-line manufacturers, Krell appreciates the need for short, "straight-line" signal paths in both pre- and power amplifier designs, eschewing complexity and technology for their own sakes. Many manufacturers, among them Krell and Rowland, are adopting purely symmetrical arrangements for the two channels in their stereo designs, this practice appearing to reinforce image focus and stage width.

Other developments include a greater awareness of grounding and the interfacing of separate components in an audio chain. With an MC preamplifier highly susceptible to stray ground or chassis circuits due to the microvolt signal levels involved, it seems madness to join a preamp ground to that of a large power amplifier capable of driving 60A peak into a load. Many designers agree that the solution lies in adopting balanced-line working to effectively remove ground-loop problems from the interfaces. Several benefits arise, including a 6dB improvement in signal/noise ratio, the capability for a completely hum-free connection to an MC cartridge, and the ability to drive balanced twisted-pair interconnect cables properly, while the ground-noise immunity
remains the primary factor. Krell Reference Series models are balanced, as are Cello electronics: the Premium Audio Suite, Palette, and Performance power amplifiers. (Meitner adopted a different approach, with 1:1 isolating transformers used to isolate preamp and power-amplifier grounds.) We can expect balanced electronics to assume increasing importance in future, creeping down in price point.

Virtually all amplifiers showed a strong awareness of the importance of the “building bricks” involved in amplifier design, namely the sound quality of the raw parts: resistors, capacitors, cable, etc. When questions re. the sound quality of a printed-circuit track were raised, Jeff Rowland pointed out that in the development of the Coherence One preamplifier, the final level of sound quality could only be achieved by raising the signal lines off-track and hardwiring them with a special grade of discrete cable.

Many of the solid-state designs showed an awareness of tube qualities—good signal handling, high stage gain and high linearity—and embodied these factors in their circuitry via the use of FETs, a practice pioneered in high-end audio some years ago by Nelson Pass in the Threshold FET-One preamp. Class-A stages, often complementary, are seen in the Krell, Rowland, Superphon, ARC, and several other designs, in the case of the ARC combined with a sprinkling of tubes (M300, SP-11, SP-9). Even in these tube-like circuits, the trend is for fully DC-coupled arrangements. DC drifts, often found in fashionable low-feedback arrangements, are nulled via the use of slow integrator op-amp servos. These IC chips should not be confused with the true active components in the signal path. DC servos have been with us for some time now, but are finally assuming increasing importance in high-end designs.

Another clear trend concerns an increasing awareness of the fundamental importance of power supplies. In the case of Rowland’s Coherence One, no less than 16 subregulators are used to feed the various preamp stages. Such practice is also evident in the Cello Audio Suite Premium line.

Passive RIAA equalization continues to be fashionable, while some designers continue to achieve high-class results from full series-feedback equalization; eg, ARC and Conrad-Johnson.

In power amplifiers, the Krell example is widely followed as regards wide bandwidth, high stability margin, class-A or enriched class-AB operation, massively generous power supplies, and an increasing tolerance of adverse speaker loading. In the case of the new Cello Performance amplifier, a classic power-supply technique is used to great advantage: choke input regulation. When consumer electronics went mass market and power-supply electrolytics became cheap, the industry threw out supply chokes as an unnecessary expense. Conventional capacitor-input rectification, however, demands high peak currents throughout the supply, often generating noise and wide-band RF breakthrough. Choke input filtering costs extra but improves the performance of the mains transformer, reduces peak currents, operates the rectifiers more smoothly, greatly improves regulation, and reduces rectifier interference considerably. It is also rumored that choke input rectification is used in the...
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THE RAREST IN THE WORLD

PLATINUM

Gold Aero
new British Fidelity preamplifier, successor to the established MVT. I reckon we will see more of this in future designs, once its benefits—particularly with respect to its ability to filter noise from the mains supply input—are more widely appreciated.

**Compact Disc & Digital Recording**

A valuable discussion with Doug Sax of **Sheffield Lab** revealed our close agreement concerning the relatively poor absolute merit of the majority of commercial digital recorders (see my R-DAT/PCM-1630 review in this issue). Doug was aware that, since even the best CD players are utterly dependent on the quality of their sources, this sets a natural ceiling on their maximum possible attainments. He explained that for his recent CD releases—the Moscow Sessions discussed by JGH in Vol.10 No.3—he used a custom-modified version of his JVC digital pro-recorder, whose encode quality had been considerably enhanced. In theory, if Doug is correct, these new CDs should allow a better view of the relative merits of top players, and indeed show more of the true potential of the best.

I have now been able to try the Sheffield Shostakovich Symphony I on a selection of players, and can confirm that it does, indeed, set a new standard. Space and depth are abundant, while the strings are sweet and the treble unforced, with a marked degree of tonal subtlety. Auditioned on the latest Fall 1987 model of the Cambridge CD1, it is clear enough that PCM recording has considerably advanced. By comparison, almost all previous CDs sound, as Alvin Gold has commented, "like cheap amplifiers."

The implications are vital to the audiophile sector: we can expect further advances in recording to be matched by similar replay development, ultimately resulting in the acceptance of CD into the high end. As Doug Sax has noted, digital is here to stay, whatever our feelings on the matter; let us try to make it work, rather than fight over it.

The smaller specialist companies at CES showed a healthy interest in the improvement of CD, exhibiting a number of modified or upgraded versions of mass-market machines. Philips/Magnavox remains the prime source of base machines, with 4x oversampling still the favorite. Not all designers are convinced by the latest 16-bit electronics; several—Meridian, C-J, Sonographe, Kineraetcs, CAL, Acoustic Research, PS, Carver, and Cambridge Audio—have stuck with the earlier 14-bit system, even though Philips has summarily curtailed production of those chips. As supplies run out, all will have to go to 16-bit in the near future. **Cambridge** showed their lower-priced 16 x 16-bit CD2 model, although production of this prototype is still a few months distant. By 1988, their top model will also have to go 16-bit (it is already; via the use of multiple 14-bit decoders). Although Cambridge had been distributed by Sumiko, it was announced in Chicago that the relationship was to end, leaving the British company with no US distribution.

**Kineraetics** showed their new 16-bit Philips-based player, the KCD-30, and gave a most effective demonstration using a modest $5000 system which included the Spica TC-50 speakers. An airy, delicate treble with good space and ambience was noted here; the '30 would appear to move well ahead of the '20, though as the designer noted, it was one hell of a fight to get it there!

CD-player modifications are also in vogue; even **Audio Magazine** published an article by Wält Jung on CD-player sound quality in their show issue—I thought *Audio's* position was that they all sounded the same!—as well as a description of how to modify Philips/Magnavox players to give better results. **Hi-Fi News & Record Review's** June issue contained plans for a still more ambitious rebuild, involving a three-box configuration, with much useful information in the practical aspects of CD system design. (Though Frank van Alstine was not present at the show, his influence was nonetheless apparent in this area.)

Interestingly, among the better players exhibited there was the **Spectral**—expensive and some time away, but sounding very promising on a short audition.

**Vacuum Tube Logic** was one of the few companies to adopt Philips's most expensive model, the Japanese-made CD-960, which sports a diecast case and a diecast laser transport. Holes are cut in the top cover to allow four tubes to poke through—a rather inelegant combination of thin glass and high-voltage metal that is potentially dangerous.
hope a protective cover will be fitted in production.

**California Audio Labs** showed the latest Tempest tube player in a sonically pleasing arrangement including ARC amplification and the Wilson Watt loudspeakers—probably the best CD demo I heard at CES, despite the unfavorable room. Their simpler 16-bit Aria player was also present, but I didn't hear it; this version is set at just below $1000.

R-DAT was well in evidence at the Zoo, with rather low-key displays from a number of the Japanese majors. Several US audiophile makers were also showing interest in the medium, but with an equal indifference with regard to their sound quality. However, something is being done. Dan D'Agostino expressed a strong interest in a long-term project to build an audiophile R-DAT based on a redesign of the encode and decode stages (shades of Doug Sax here). Keith Johnson, among others, is working on similar lines, with direct implications for the sound of Reference Recordings' CD issues. With such high-end audio involvement and a greater awareness of the recording equipment itself, we can and must make digital work.

Significant CD introductions included the DP-70, a new single-unit **Accuphase** player imported by Madrigal. This physically beautiful design offers a number of important internal design features, plus balanced and unbalanced outputs. Digital outputs include both coax and optical formats, and an infrared remote is featured. Passive deemphasis and a high-performance deglitcher are featured, as well as dual-channel, 16-bit, 4x oversampling and high-performance, discrete multiplying D/A converters. Given the sound quality of the two-box Accuphase model, this one should be worth looking out for. **Melos** showed a tubed player, called the CD-T, based on a Philips chassis featuring a superbly developed suspension for the CD transport. Nicely sprung, it proved to be unperturbed by severe whacks to the case. The circuitry is zero-feedback with passive deemphasis, decoding is 16-bit, 4x OS, and the result is quite modestly priced. The Mod Squad's version of the '650 chassis was on view, together with their revised CD damper—a device aimed at suppressing spurious mechanical vibration in the CD itself. It reduces error rates and improves laser tracking, as well as reducing the workload on the servos and digital circuitry, and ultimately helps definition, particularly in the treble.

Trends evident in the main Japanese contingent included heavier, vibration/resonance-controlled chassis and improved suspensions. Dual D/A conversion, one for each channel, is all the rage, while the race is on to bring 4x oversampling to almost all models in major ranges; many of the new Sonys and Yamahas, for example. In addition, Yamaha and Denon are marketing players said to achieve 18-bit resolution, this achieved by ranging the 16-bit DACs according to the signal level. At low levels, the DAC is switched so that the 16-bit word is still applied to the whole signal; in effect, the signal is being multiplied by four so that it still can be examined by the whole 16 bits, a form of low-level digital compression for decoding, the complementary "expansion" being carried out in the analog domain to give 18-bit dynamic range. Whether the theoretically improved resolution will be compromised by the introduction of switching artefacts remains to be heard.

Analog-to-digital isolation is a strong theme, with optocouplers extensively used in top players—Nakamichi, Denon, Sony etc.—to remove the need for a common ground connection between the two processing parts of the player.

In concert with these developments, additional emphasis is being placed on power supplies, often with complete separation for analog and digital sections. Some Japanese players have a quaint description written on their mains transformers: "Special for Digital," "Special for Audio," or the equivalent.

Discrete component quality is taken seriously, while some manufacturers are moving away from the ubiquitous IC op-amp output filter and buffer stages to discrete amplifiers. The Japanese appear to remain obsessed with technical specifications, apparently hamstrung by the ability of the CD medium to deliver misleadingly good numbers on paper. US designers seem more open-minded, letting their ears take preference over their distortion analyzers. With the imminent emergence of the domestic digital recorder, and the increasing availability of the so-called "digital amplifier" (an integrated amp or preamp with

Stereophile, August 1987
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built-in DACs), many Japanese companies are advancing the concept of a digitally interfaced audio system. At present, digital amplifiers do not look very promising, the digital section apparently something of a compromised afterthought, while the copy-protection flag potentially present on CDs prevents CD-player digital output from being directly recorded by R-DATS, even if the latter could run at 44.1kHz (see JGH's "As We See it" on p.5). We shall have to wait and see how this develops.

Loudspeakers
As promised, there was a wide diversity of loudspeakers to see and hear. Fresh to the scene, I noted a proliferation of relatively modest two-way systems with six or eight woofers, configured as slim, floor-standing columns and priced from $800-1200/pair. Of these, the NYAL NA1 was visually the cleanest-looking, with a promising, well-balanced tonal acoustic presentation. It is clear that strong consumer resistance to loudspeaker stands still prevails in the US, apparently due to a dislike of their appearance as well as their cost. They are beginning to be taken more seriously, however, and hopefully will ultimately be considered a vital part of speaker design, and be supplied as such.

My impression was that US speaker designers have improved their performance considerably over the past few years. A consensus is developing concerning neutral tonal balance, and the wildly bright- or dim-sounding models, previously common, are now few and far between. Designers seem much more aware of drive-unit and enclosure coloration, and great strides have been made in this area, often with the help of imported drivers (Scandinavian models are the most popular, but French and British units are also used).

The beneficial effects of narrow cabinets, vertical in-line driver formations, and low enclosure diffraction are now widely perceived, the results audible in better stereo staging as well as radically improved stereo focus. Irregular shapes also promise lowered coloration due to internal and external asymmetry, with the Wilson Watts and Spica 50 conspicuously successful examples.

The trend to narrow enclosures may also be seen in two recent panel introductions—the Apogee Diva, their thinnest and tallest yet, and the new, large Infinities, whose grilles conceal smooth-contoured baffling, the width of which decreases with increasing frequency. A similar form may also be seen through the foam grille of the Dahlquist DQ20. This is not, however, a new development—KEF, Vandersteen, and B&W have been doing it for years now—and just shows how long it can take for developments to percolate through the industry.

After some initial first-day teething troubles, Apogee's Diva demonstration settled down; I spent an enjoyable 20 minutes or so listening to some of Jason Bloom's own set of classical recordings. Male chorus was most convincing, with excellent separation of individual singers, while the treble was sparkling, airy, and extended well to the audible limit. With a powerful bass end, this flagship is a true three-way with a very wide-band mid-ribbon, a typical impedance of 3 ohms, and a claimed sensitivity improvement (over the Duetta?) of 9dB. Interestingly, acoustic guitar was reproduced with considerable height. A revised Duetta was noted, now enhanced by more high-end extension, and it sounded good in the Krell room.

I found the big Infinity IRS Betas less satisfactory. Again, show conditions could be to blame, but in both their own and the Arc presentations, the bass, although powerful, deep, and linear, did not seem to be fully in step with the mid. The mid sounded a touch
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thickened in the lower register. Mid treble was fine, focus rather better than with previous Infinities, but the high treble seemed wispy, even "tin-foil." Some visiting critics noticed this effect, while others seemed quite unaware of it.

The established Vandersteen 2C was shown with the new strong stands, and gave a fine musical soundstage in several rooms. This is certainly one of the better-balanced US speakers, with its confident presentation of stage size and depth.

Eminent Technology was less successful with their planar speaker dem; showing continuing concern about the room and speaker angling, they produced a rather vague stereo picture when I was there. On hearing the new Acoustat Spectra III speakers for the first time, I found noticeably improved imaging and focus compared with earlier models, and also found that the moving-coil woofers, given dem limitations, offered a nicely subtle enhancement of the low end.

The new Spica floor-standing design, the Angelus, is most unusual: its odd, waisted shape increases in width with height, thus giving a "shoulder" effect reminiscent of the magician's costume in Disney's Fantasia. The sound was good, however.

I experienced two "legends"—one positive, one negative. The good news was the Duntech Sovereign 2001, ably demonstrated by Spectral and providing dynamic authority, extension, and quite decent focus and depth from its massive reinforced frame. The bad news concerned the Polk flagship, the SDA SRS, driven by superb sources including SPI and M300 amplifiers. The stereo was over-wide, with poor central focus. The image was flattened, with little transparency, while dynamics were bland, slow, and softened—rather disappointing, given the heavy media hype.

Another mystifying sound was to be heard in the Tennessee room, from their Symphony 2.1 system. This demonstrated levels of midrange coloration far beyond anything I

Audiofon's Peter McGrath holding his first CD, which sounded excellent on the big Duntechs. CD player and amplification was by Spectral. It didn't sound as good, however, as an analog collection of the recordings Peter has made for Harmonia Mundi USA—played back on Peter's Stellavox
Oracle  Hafler  Vandersteen
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Tandberg Revox  Nitty Gritty
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have heard in the past 15 years—in the negative direction! I may be exaggerating, but what comes to mind is an imaginary, wide-bandwidth version of one of those small acoustic wind-up gramophones—the small box type, on a base with front doors for volume adjustment. The reflective-baffled rear drivers of the Symphony have a similar acoustic path to a non-amplified 78 rpm player.

In the main hall, the Italian firm Charlo showed, under difficult conditions, their high-performance miniature, the Hiper X, built with a thick-panelled, solid-hardwood enclosure and radiused edges. Sounding bright on-axis, inward rotation to 30° produced a pleasing result with exceptional stereo focus.

The tall Princeton PA/10 looked interesting from afar, but on closer aural inspection appeared to suffer from a colored midrange. Their new and costly small system, the PA5, uses a spun-aluminum cone bass-mid (a type also under design in the UK), crossing over at a low frequency to the latest Jordan 2" aluminum mid-treble unit. As demonstrated, it lacked transparency and suffered from some boxy coloration.

Of the "new boys," Amrita showed an astonishingly wide line of speakers with some good build and finish points, including Solen polypropylene crossover capacitors. Their smallest two-way sounded pleasantly balanced on both rock and classical material. New to the States is the Opus Three speaker line, a Swedish company probably better known for its fine recordings. With compatriots Rauna and Avance, they use concrete or similar composite enclosures, but unfortunately at this CES the Opus models sounded rather bright, in the traditional Scandinavian mold.

Thiel's CS3.5, upon first hearing, immediately impressed with its confident approach to good sound. Slightly light, fast, and airy, it showed fine stereo focus and depth, a sense of life and openness, and a well-controlled, extended bandwidth. The care taken over driver-output integration and diffraction control was quite obvious.

Using fairly modest sources, including a Rotel CD player and backed by Meitner electronics, Monitor Audio put together some wide, dynamic stereo, especially via the new R852's particularly clean-sounding metal-dome treble. Metal domes are becoming common in the UK, pioneered in the Celestion SL6 and SL600, and Monitor's own range is now rapidly "going metal."

Such development is apparently slower in the US, and Stereophile's own DO seems to lead here with his latest Dahlia kit, well demonstrated at the CES Americana. In passing, Celestion showed the long-awaited SL700, the aluminum-dome development of the '600, though US price will be rather higher than the '600, which remains in production. (Celestion's new DL Mk.II range—models 4, 6, and 8—all use pure-piston metal domes.)

One of the show's better experiences was the Wilson Watts, equipped with what at first appeared to be quite ordinary drivers—a pulp-cone 6½" SEAS woofer and the inverted 1" Focal tweeter. The cabinet and system design are in fact exceptional, resulting in a costly speaker of acknowledged limited bass extension and some lightness of mid-tonal balance.

However, the proof is in the listening, and here one discovers a sound of exceptional

Transparency and musicality: Celestion's $2200 SL-700

Stereophile, August 1987
In 1972, Magnepan received a patent on a full-range, planar/magnetic type of loudspeaker which became the most successful esoteric speaker in the history of high-end audio. Other companies have introduced speakers with similar drivers (sometimes called "ribbons"), but Magneplanars®, with over 100,000 sold, remains the choice of audiophiles.

Then, in 1982, Magnepan received a patent on a true, line-source ribbon speaker. The combination of these two technologies, as shown above in the Magneplanar MG-IIIa, reconfirms Magnepan's position as innovators of audio products.

Send a postcard to Magnepan for an assortment of reviews.
Roksan's Darius speaker suspends the tweeter on springs.

stereo properties, showing near-superb transparency and depth: a slightly darkened image in a block of tinted glass eight feet wide, six feet high, and about 20 feet deep.

B&W showed an interestingly styled pillar speaker in the Matrix series called the Concept 90. The price looks a little on the high side, however. The speaker’s head is detachable to provide an alternative bookcase miniature. This model, as well as the new 80i and a new mid-priced speaker line comprising models 1600 and 1800, were all equipped with metal-dome tweeters. By all accounts, the revised 80i performed with considerable authority.

Clements did a fine job with their tall, narrow-fronted RT-7—a two-way with an 8" bass and a 7" "planar ribbon" tweeter. Familiar records were played to a decent standard of fidelity via an Audio Research D-115 II, despite the confines of a small room. Keeping good company with Polk, EMC, another manufacturer of the "white coat" variety, featured costly systems and marginal, flat, picture-frame wall-mounted speakers, but these produced very little real music for me.

Awkwardly placed in a separate hotel, Magneplanar demonstrated their new MG 2.5—a weak number for such a strong product! With the benefit of their long ribbon, what was done for the MGIII has now been done for the MGII, which has also been provided with lower coloration and a smoother, more extended bass. It sounded open and lively in their suite at the Palmer House.

Linn, joining the mainstream, showed an improved Sara with a smoother mid and a proper, well-integrated crossover. Their new computer-aided crossover design skills were best illustrated in the production version of the Linn AKTIV Isobarik, with its sophisticated acoustic-target function, linearized,
24dB/octave, Linkwitz, time-compensated chassis. This speaker sounded better than any 'Barik previously heard, with a dynamic and lively clarity throughout the frequency range, untainted by significant excesses and showing promising stereo focus. Including amplifiers, the system price is estimated at £3300 in the UK. It is hard to believe that the 'Barik has been around for nearly 14 years now, but it has been subject to continual development.

One more speaker, the Respons Baby Grand—what a terrible name—proved effective in demonstration at the Americana. This tall, slim, three-way pyramid, solidly constructed and employing dynamic (moving-coil) drivers, gave appropriately fine sound on piano—natural and with good perspectives.

Promising demonstrations were also given by Snell, Merlin, and ARC loudspeakers (not to be confused with the Audio Research Corporation).

In conclusion, while the Show was reported as enjoying lower attendance than in previous years, I found serious interest taken in quality audio separates, and the US manufacturers and distributors put on a creditable performance. US speakers are much improved, and should continue to get better, given the strong commitment shown by the many designers I met.

The amplifier business looks healthy, as top engineers continue to aspire to the state of the art. US amplifiers are particularly impressive. The CD/digital revolution may seem threatening to the industry, but signs are that the challenge is being met; the solution lies in the improvement of digital at both the encode and decode stations.

Many thanks are due to Stereophile for arranging the trip and giving such great support. Thanks also to those exhibitors who gave their time and ideas to help compile this report. For those I have failed to mention, please understand that I could not visit everyone in the three and a half days at the show.
The Energy 22 Pro Monitor has been hailed by critics as one of the major loudspeaker design breakthroughs of the last decade. In fact, the Energy 22 may well rank as a standard against which other speakers should be judged. Audition either the Energy 22 Pro Monitor or the Reference Connoisseur and we think you'll agree that they are not only the most exciting speakers you've ever heard, but "a stunning achievement" indeed!

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Shelly's Stereo, Los Angeles, CA. - Robert Coyle. "The Energy 22 and ESM speaker line offers the consumers styling and value at a price no other speaker line can match. The performance rivals the world's finest speakers."

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I must take issue with AHC and the results he presented in “Who Stole the Bass?” in Stereophile Vol.10 No.3. While accepting that his outright condemnation of small monitors was presented as a minority report and that the article essentially concerned personal taste, it was nevertheless backed up by a technical argument in support of his opinion. Moreover, he misuses anechoic data from my own reviews to aid his presentation.

It is hard to know exactly where to begin, the article being such a complex mix of half-truths and opinions. My understanding of his position *vis-a-vis* the importance of low-frequency extension was that he would prefer a 7-litre Cadillac to a fuel-injected Rabbit: virtues such as precise handling, neutral cornering, grip, and low body roll could all go hang in the quest for low-end torque.

In my opinion AHC is wrong about the importance of the low bass. Midrange is where we live, where we speak, and, as often pointed out in these pages by JGH, if that is wrong, it doesn’t matter if other areas are perfect. Good low bass is a nice bonus if you can get it, but no amount of low-frequency wallop can make up for a flawed midrange. The *raison d’être* for most small, competent monitors is an excellent midrange performance; excellent, that is, in terms of speed, clarity, and focus. In addition, there are ideal places to sit speakers in real rooms, and physically small speakers can take advantage of this in a manner often denied the behemoths.

By taking my measured anechoic -3dB responses for tested miniature loudspeakers but failing to read my accompanying text on the room-integrated curves, or the discussion on room loading and rolloff rate, AHC has misrepresented the data and the resulting opinion.

While it is true that the low-frequency response of rooms is irregular and difficult to define, this is no reason to dismiss the subject and fail to come to terms with room effects. It is a fact that a listening room is not an anechoic chamber—the latter is a place with no reflections, and approximates to free, open space. Given the dimensions of typical rooms, and given a typical box loudspeaker, it is well known that the speaker’s output below 250Hz becomes spherical or omnidirectional, analogous to a naked light bulb. At frequencies below 200Hz, a free-space, stand-mounted loudspeaker radiates sound whose wavelength approaches and exceeds the path lengths from the speaker to the near boundaries. Let us assume a sensible stand and position are designed for the most even distribution of low-frequency output—typically a 0.5m stand height, 1.2m spacing from the side walls, and 0.9m from the rear walls. At frequencies in the 60-80Hz range the floor boundary is coupled, reducing the speaker radiation from 4π (spherical) to 2π (hemispherical), resulting in a 3dB lift. At 45-60Hz, the wavelengths are longer and the rear wall is now coupled, giving a radiation angle of π radians and adding a further 3dB. Ultimately, at still lower frequencies, the side


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wall couples, adding another 3dB (fig.1).

By the time 30Hz is reached, therefore, the mean bass lift in a real room relative to the midband, averaged through the listening space, is no less than 9dB! This is precisely the reason why loudspeakers with flat measured anechoic responses extending to very low frequencies will sound bass-heavy in all but the largest rooms, and why small speakers of slow rolloff rate and reasonable power handling can generate significant bass power. Take the Celestion SL600: JA will testify that at quite decent 95dBA mean sound levels (near to realistic live orchestral volumes), a correctly sited pair of SL600s will deliver competent levels down to 35Hz. I freely admit that an audible 20Hz is out of the question, but could AHC quote a number of recordings where such a bandwidth is essential? The SL600 does not produce earthshattering or nausea-inducing bass, but such overkill is not relevant to the vast majority of records. It can and does produce quite reasonable bass levels at realistic but not extreme sound levels.

A look at the figures is revealing. While the '600 is -3dB at 65Hz, its rate of rolloff is quite slow. Consequently, it is -6dB at 55Hz and -9dB by 40Hz, a rate of rolloff quite similar to the rate of boost provided by the local boundaries. In-room, it can be shown by competent measurement that the SL600 is typically 3dB down at 30Hz, an octave below the limit implied by AHC.

Conversely, another small monitor of higher sensitivity, this time using bass-reflex loading for the woofer, is maximally flat to 70Hz but rolls off at a high 24dB/octave rate at lower frequencies, eg, by 35Hz it is 24dB down. 9dB of room lift at this frequency cannot do much for it as it is still 13dB down, and such a low level of bass will indeed be inaudible.

Measurement of a number of larger US-designed speakers has shown irresponsible degrees of bass lift, even "boom." Just as the Germans appear to like an unnaturally bright balance, so some Americans appear to favor overpowering bass, as if this represents the true measure of the emotional impact of high fidelity.

Don't get me wrong—I can certainly appreciate the merits of a really good, large, high-power, wide-bandwidth speaker system; but there are so few of them. AHC does have a point on costs—small British speakers are expensive in the US. However, I cannot see the realities of intercontinental shipping costs as constituting a prior case for the indictment of the high-quality miniature loudspeaker.

I have the advantage over AHC, having carried out many blind listening tests on a huge variety of speakers,\(^2\) both large and small, ranging from original early IMF transmission lines to miniatures such as the LS3/5a and the SL6/SL600. I agree that bass extension matters, but only when a number of other parameters have first been satisfied: tonal balance, mid-range coloration, treble purity, transparency, transient definition, stereo focus, and depth. Blind listening tests indicate that bass extension seems to rate sixth or seventh on the subjective shopping list. Many, many times, a smaller, cleaner-sounding speaker has been preferred to a larger and more extended design, due to the latter's inferior directivity and focus and higher levels of coloration.

To conclude, the vital measurement for bass response is not the anechoic -3dB point, whatever that is. The correct method is to optimally site the speaker in a well-proportioned room, and take a computed average of 64 or 80 readings over the listening space, height, and lateral spread. Only then will the sound power at low frequencies be properly integrated into the measurement. A measured 25Hz to 5kHz in-room response, \(\pm 2\) dB, is possible with such a method using \(1/2\)-octave analysis, and it can sound that way too!

\(^2\) To date, some 400 models.
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Anthony Cordesman
The pickup cartridge is one of the more critical components in the music reproduction chain, and although the moving-coil cartridge has improved lately, different ones produce different sound characteristics with respect to frequency balance, clarity, and imaging. Unfortunately, none of the usual specifications or measurements completely predict their sound. One thing that MC cartridges almost without exception have in common, however, is that they exhibit an under-damped high-frequency peak in their amplitude response, placed anywhere between 25 and 60kHz, due to the tip mass of the stylus/cantilever/generator reacting against the vinyl compliance.

We have experimented with loading the output of moving-coil cartridges with a shunt LCR network and found that it was possible to improve the sound by modifying the amplitude of the ultrasonic resonance. This improvement resulted in a tonal balance much more like that of a master tape without losing any of the transparency and detail typical of a good MC cartridge.

The importance of the resistive load across the output of cartridges was reported by J. Peter Moncrieff in 1980. He found that a lower shunt (parallel) resistance reduced distortion levels: he postulated that the reduction in distortion was due to electromechanical damping being applied to motion of the stylus assembly (though others were unable to replicate his findings to anything like the same degree). A resistive load, however, cannot be reduced much below the cartridge’s internal impedance without lowering the output voltage to an unacceptable level. Moncrieff also showed that the resistive load did not affect the frequency response or lower the amplitude of the high-frequency resonance peak. This is an important point because it corrected a previously held belief that lower load resistances damped the high-frequency resonant peak.

Most cartridges have a reasonably flat fre-
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Most of our customers are just like Barry, perfectionists to the nth degree. Yet the high praise we receive from each and every one is, to our way of thinking, no cause for celebration. After all, when it comes to something as important as having music in one’s home, who would settle for anything less than the best? Not us. Not Barry. Not the rest of our customers.

So, although we appreciate the recognition, it doesn’t move us all that much. Because to the staff at Sound by Singer, Ltd. being the best is simply business as usual.
frequency response through the audible frequency range to 20kHz, perhaps being 3dB up at 100Hz and 20kHz compared with the typical midband level, yet some sound more bright than such a measured response would indicate. We believe this tonal difference is mainly due to the dynamic behavior on the transients which are an inherent part of music. Fig.1 shows the transient ringing of a moving-coil cartridge tracking the 1kHz squarewave on CBS test record STR112. Note that the initial rise overshoots the squarewave top by about 30% and oscillation continues for most of the half-cycle.3

Electromagnetic damping seemed to offer a way to minimize the amplitude of the peak and the resultant oscillation, so a circuit was devised to provide this damping at the appropriate frequency. A two-element filter, involving a capacitor and inductor in series, placed across the cartridge’s output, gave a clearly evident improvement in sound. The results were optimized by calculation and experimentation. The resonant frequency can be found by counting the number of cycles of oscillation in one half of the 1kHz squarewave and multiplying by 2000. The cartridge in fig.1, for example, resonates at about 38kHz. To reduce the level of this resonant oscillation, a capacitor-inductor (LC) combination is needed that will have minimum reactance at that frequency, given by:

$$F = \frac{1}{2\pi \sqrt{LC}}$$

(where F is the resonant frequency in Hz, L is the inductance in Henries, and C is the capacitance in Farads).

There are, of course, an infinite number of LC combinations that will satisfy the formula: we found it practical to select a given value capacitor, wind a matching coil, and then test the results. In selecting LC combinations, as the value of capacitance is increased and the inductance decreased, the wider is the band of frequencies attenuated. Optimum results are obtained when L and C are selected so that the frequency response in the 15-20kHz region remains flat but the resonant frequency is damped. The optimum values for the cartridge in fig.1 are 0.15uF and 0.117mH. The capacitor is a high-quality polypropylene type, while the inductor was made on a ¾" diameter by 2½" long ferrite core with about 50 close-wound turns of #23 enameled copper wire. The effect of these values in parallel with a 100-ohm resistive load across the cartridge output can be seen in fig.2 (taken from a Gould model 4100 storage oscilloscope). Fig.2A clearly shows some improvement with a 0.15uF capacitor; fig.2B shows the effect of the LCR network.

Fig. 1

Fig. 2A

Fig. 2B

Fig. 3 shows the effect of the LCR network on the cartridge's steady-state sinewave frequency response using the CBS STR120 test record. (The cartridge was mounted in a Sumiko MMT arm on an Oracle table, and its output was recorded on a Urei-HP plotter.) The small wiggles are probably due to the test conditions, since they occur and overlay with

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3 The squarewave ringing universally seen in the output of moving-coil cartridges when using this test record is at least somewhat due to ringing from the record cutter-head as engraved in the grooves of CBS STR112. Electron micrograph examination of the record confirm that the ringing is in the grooves: what cannot be established is the amount of ringing that accurately reproduces the record and the amount contributed by the cartridge. Both the network described by Watkins and Mitchell and the output of a moving-magnet cartridge roll-off ultrasonic frequencies, so the question is still open.

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Stereophile, August 1987 95
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various cartridges. The top curve is with the cartridge resistively loaded with 100 ohms; the resonant peak between 30 to 40kHz can be clearly seen. The second curve is with the 100 ohms now in parallel with 0.15uF; the peak is lower in amplitude. The third curve is with the LCR network; the peak has been eliminated. Note that response remains flat to beyond 20kHz.

![Fig. 3](image)

Squarewaves are all very well, but what was the result using recorded music? We used the Orchestral Bells track on the Shure TTR-101 test record. The top trace in fig.4 is with the 100 ohm resistive load, the bottom trace is with the LCR load. The frequency of the struck bell is about 7kHz—the range where aberrations can cause harsh sound. The top trace shows overshoot and 38kHz ringing that increases the effective amplitude of the 7kHz tone. It is largely eliminated with the LCR circuit, as is shown in the bottom trace. This same effect is visible with the upper notes of a harpsichord.

The most significant audible improvement we found with the LCR circuit concerned tonal purity. The upper midrange and treble were cleaner and more harmonically correct. In addition, imaging was more precise and ambience more accurately reproduced.

This demonstrates why different cartridges with flat response in the audible range may nevertheless sound different in brightness— the higher the amplitude of the high-frequency peak, the brighter the sound. In other words, inaudible ringing above 20kHz appears to effectively increase the amplitude of signals occurring in the audible range, changing the perceived frequency response and leading to harsh or otherwise inaccurate reproduction.

**Editorial Postscript**

The effects described by Bill Watkins and James Mitchell are undoubtedly real, but I doubt very much that they are due to increased electromagnetic damping of the generator assembly. A moving-coil cartridge is not very efficient at turning the mechanical energy imparted by the groove being dragged past it into electrical energy. If it was, say, 5% efficient, then even 100% electrical damping, from loading the cartridge output with a short circuit, would only influence its mechanical motion at resonance by 5%. Rather, I suspect that the very low impedance of the network at its own resonant frequency acts in conjunction with the cartridge source-impedance as a simple resistive divider to give an appropriately positioned notch filter, as is actually shown in fig.3.

I am also not sure that the explanation put forward as to why the presence of an ultrasonic resonance should result in a brighter sound is correct. In a linear system, it should have no effect. Perhaps the amplitude of the resonant vibrations is driving the cartridge into a nonlinear region of its behavior, resulting in the dumping of intermodulation products into the audio band, particularly if the preamplifier also has problems handling high-amplitude, high-frequency signals. In this case, however, filtering the ultrasonics would not change the cartridge's basically nonlinear behavior.

One thing is certain, however: the Watkins/Mitchell network does lower the amplitude of the HF resonance of their cartridge. I would like to hear from readers who have had similar experiences with LCR networks loading the outputs of their MC cartridges.

—JA

*Stereophile,* August 1987
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The art of coping with long plane journeys is to sit back with a pair of head-phones and luxuriate in the certain knowledge that this is the one time you can listen without being disturbed by the phone. In my case, it's one of the few times I can listen without having to write about what I've just heard.

My recent journey to Japan worked pretty well this way. In this instance, Andre Previn had been co-opted to introduce a program of classical potboilers in his characteristically soothing fashion on the British Airways house PA. One of the items he introduced was one I was only familiar with in its original version for piano, even though my record collection actually includes the piece in both piano and orchestral incarnations.

Ravel's *Le Tombeau de Couperin* genuinely took my breath away, both as pure music and as a masterful demonstration of state-of-the-art orchestration. I've been unable to avoid playing it at least once a day since, and recommend it highly as a test piece; it features subtlety in every known form, and is extremely difficult to pull off on record.

All this brings to mind another work from a quite different composer which I also use fairly extensively as a test piece. The composer is one PDQ Bach, "the least favored son" of the great Bach dynasty. The piece? The *Echo Sonata for Two Unfriendly Groups of Instruments*. The work, just a few minutes long, consists of a gloriously scored musical conversation between a delicate group of woodwind and a jugful of coarse brass. The conversation consists of a playful theme passed between the two groups, but the flavor of the conversation is barbed, the brass section laying traps and generally goading and brow-beating the woodwind section until the latter retaliates in a fit of pique; at one point, the playing is accented with the sound of tiny feet stamping the floor.

The recording, credited to the New York Pick-Up Ensemble (sic), appears as part of an album called *Portrait of PDQ Bach* on the Vanguard label (VSD 79399). What is so glorious about the recording is that it has obviously been done on the cheap. The playing is actually rather good, but the acoustics sound untreated and the sound is rough and ready — and more tangibly live and convincing than almost anything I can think of.

But I didn't mean to embark on my list of favorite records. The point I was gradually working my way toward when I so rudely interrupted myself was the answer to a question I put to my Japanese hosts toward the end of a particularly impressive traditional meal: What status does traditional Japanese music have with the Japanese themselves? In all the several days I had been in the country, I had heard barely a note of Japanese music, whether on radio, television, or even back at the works when we were having hi-fi gear demonstrated.

The answer was monosyllabic and instantaneous: "None." OK, there's probably a tinge of Oriental inscrutability about this answer, but it really does seem that Western (read European/American) music has just about taken over completely. This situation holds for the background relax-and-spend music they play in shopping precincts as much as to the stuff they pay to hear in their concert halls — and everything in between as well. Even Japanese musicians seem to express themselves largely through Western styles of music.

Anyone who knows anything about Japanese culture will probably be able to make some sense of this phenomenon, which to my Western sensibilities seems quite inexplicable. Could it be that this apparent disenchantment with their indigenous musical culture lies at the root of the row that has blown up over Digital Audio Tape? Westerners have complained for years that the Japanese treat recorded music as fair game for home copying; and their industry is, after all, hardware- rather than software- oriented. Maybe they just don't understand the role of music in the West, where the market is very much driven by the recorded-music side of the industry.

Record companies have a perfect right to get angry at the wholesale and continued
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piracy of their product, and I think most people are sympathetic to this. But there appears to be a great deal of resistance to the ineptness and arrogance they display in the process, and there is disagreement about the scale of the problem, and its cure.

There's the language, for one thing. The industry talks rather pompously of intellectual copyright. Phrases like this stick in my gullet, given the increasingly formula-ridden and wholly synthetic-sounding product that clutters 90 to 95% of the charts.

But this is nit-picking. What really upset me most was the first press demonstration given in the UK—indeed outside the US—of Copycode, the savior of the record industry in its epic battle against unscrupulous copyright pirates. That, at least, was the unspoken agenda of the press conference, held under the aegis of the IFPI—the International Federation of Phonogram and Videogram Producers (no, I'm not sure how they get the IFPI acronym either).

The demonstration was held just weeks after the US senate subcommittee dealing with the DAT issue had its first Copycode demonstration, which by now you'll have heard all about from other sources. I thought at first we were to be treated to another such futile exercise, using another Barbra Streisand track or something equally compressed and manufactured-sounding, where almost nothing that could be done to the music would have made any difference. But no; they used some solo piano and a Beethoven symphony recording whose genius I couldn't begin to guess at. It's what they did with the music that was interesting.

The way I heard it, the demonstration was rigged, but in subtle ways and perhaps not deliberately. They used a reproduction system based on some fairly disgusting, though outwardly respectable, PA equipment (no names, no pack drill) in a cinema-like setting. I had secured myself a seat near the front and on the line dividing the widely spaced loudspeakers. I was too close to notice what Barry Fox noted from near the back—that the house PA system had been left switched on—by accident I accept—but I obviously wasn't close enough to get any stereo soundstage. What rolled out of those speakers had an anodyne character and the consistency of treacle, and for all intents and purposes the soundstage was homogeneous—like very wide mono.

Even so, the controlled A/B tests showed that the Copycode processing was audible. What could not be determined was which—of the Copycoded and non-Copycoded fragments—was which. I couldn't, anyway. The sound was wretched both ways and the differences did not seem entirely consistent or musically worthwhile. We were asked to say which was which, and, not surprisingly, no one was willing to commit themselves. Not, I fancy, because differences were inaudible, but because no one could ascribe a value judgment to what they heard. Yet the chair couldn't resist drawing attention later in the same conference session to the fact that "no one could tell the difference" in defense of their proposition that Copycode was "inaudible."

There's one more thing I forgot to tell you about this meeting, which was attended by something like 250-300 press people from all over Europe. I met only one other member of the specialist hi-fi press (Barry Fox apart), an acquaintance from Denmark. Maybe he had received his invitation from another non-hi-fi invitee, as in my case. I can only suppose the hi-fi press was deliberately excluded in favor of the comparatively tame music press. And when I say tame, I mean it. This was the only press conference I have ever attended where the chair was repeatedly and enthusiastically cheered when it made its more strident points—more like a revivalist meeting than one attended by what should have been a skeptical, critical press. At times I felt I was an unwillingly member of a lynching party. That worried me as much as what the IFPI proposed to do to recorded music.

Make no mistake about what they want—and demand. Despite protestations to the contrary, they desire nothing less than the complete capitulation of the DAT makers. What they want is what they know they can't have with any other form of software, or any other method of recording audio. The argument they made at the press conference was that recording in the digital domain from CD to DAT is different in kind from any other recording activity, such as making DAT copies of records, or cassettes of CDs. Why? Because such recordings sound perfect. As producer George Martin put it: "The awesome thing
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about digital taping is that it isn’t just taping, it’s cloning. However many copies you make, the product is just as good as you get in a studio. Home taping will become a nightmare for producers because it will put us out of work. Not just people like me, but all the young and enterprising people trying to make a go of it in the business. They will be stymied by DAT unless there’s a control on it.”

Someone asked why Copycode wouldn’t be extended to other forms of software. After all, there aren’t even any DAT recorders out there yet, but there are trillions of cassette recorders and billions of discs and whatnots to copy. But no, DAT is to be treated quite differently from other sources. Could this have anything to do with the fact that CD is the only source guaranteed to run at an accurate enough speed to keep the Copycode notch where the recognition circuitry expects to find it?

Of course it could, and this points to a possible way around Copycode—altering the pitch of the signal by the necessary 5% (or greater) amount, which in principle could be done with digital electronics without altering the tempo. Such circuits are already available as effects units, and could be coupled with a reconversion on playback if required. Copycode’s backers are trying to get EEC and US law to prohibit circuitry designed to circumvent Copycode. However, such a (hypothetical) circuit could be promoted as a pitch-change module, for example to bring recordings back to concert pitch, or to allow users to play along with their pianos. At the very least, this would help show the absurdity of enforcing such a law.

CBS will make Copycode encoders available to other record companies at manufacturing cost, and will allow free access to the technology to anyone who wants to build proprietary Copycode-style circuitry, as long as it remains compatible. It’s also production-ready, or so we were told. Yet in response to questioning, it turned out that the Copycode circuitry we listened to at the demonstration had “some” phase-correction circuitry, and this was not how the system would be marketed.

It was the answer to another question that revealed just how unready the supposedly market-ready Copycode really is. Was CBS using Copycode to protect its current catalog against the day when suitably equipped DAT recorders will be made available? “No” came the reply. Why not, if it can’t be heard, and if it is ready as you claim? “We will not use Copycode until there is an international agreement on its use.” No amount of pressure changed the answer. I have to confess this made no sense to me at the time; it wasn’t until after leaving the meeting that I twigged the obvious: CBS must be afraid of adverse public reaction to Copycoded recordings. Even, we must assume, to unannounced Copycoded recordings.

In my humble opinion, CBS should put up or shut up. If digital-domain piracy is truly in a different league to analog piracy, why not leave it to the DAT recorders themselves which won’t even record at 44.1kHz (the two I’ve just been using certainly won’t—of which more anon?). Perhaps the IFPI can press for sampling-rate converters to be made illegal. All this will mean that only analog copies can be made, even if the signal is stored in digital form at each end of the process. At least then digital-domain copying would be stopped, and the inevitable decline in the sound quality of compact discs would be arrested. There are limited enough quality margins there to begin with, God knows.

Philips has even proposed a more sophisticated version of the CD subcode system, which would allow users to make a single digital copy from CD, but which won’t allow daisy-chaining of recorders. Otherwise we are going to be left in the absurd position where we can make recordings, even digital ones, from records and tapes—with official sanction gained through having paid a levy on our blank tapes. At the same time we will be prohibited from making a simple DAT cassette copy of our own CDs to play in the car. The law would be an ass, would be seen to be an ass, and would surely fall into disrepute as a direct result.

With Copycode in existence, I must assume no one will have the chutzpah to press for a tape levy on DAT cassettes, so copying onto that format would be levy-free. Imagine the fuss if someone tried to put a special compensatory levy on blank DAT cassettes which can only be used on Copycoded recorders anyway! Or maybe the music industry really would like to have its cake and eat it.
Thank you Los Angeles. We are honored that you appreciated our efforts to give you accurate audio at the recent hi-fi show in Santa Monica. A surprising number (over four to one) preferred our sound to that of the next best local dealer. Our exhibit room was fairly congested, but I believe that we managed to give you a pretty good demonstration of the quality of music that our audio systems produce.

Any craftsman is only as good as his tools, so I also want to thank the manufacturers that support Optimal Enchantment with the highest quality audio equipment: Audio Research, Adcom, Alphason, Audible Illusions, Audioquest, Carnegie, Eminent Technology, Koetsu, Martin-Logan, Meitner, Nitty Gritty, Oracle, PSE, Revox, Rotel, SME, Sonographe, SOTA, Spica, Superphon, and Vandersteen. Without these companies, audio would still be in the dark ages.

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I hope that you'll have an opportunity to visit us soon.

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SOTA SAPPHIRE & STAR SAPPHIRE SERIES III TURNTABLES

J. Gordon Holt

SOTA Star Sapphire with Reflex Clamp

Belt-drive, two-speed, suspended subchassis turntable. Dimensions: 20.25" W by 7.5" H by 16.25" D (3" extra depth required when lid open). Price: basic Sapphire turntable with Supermat $1075, Star Vacuum Upgrade $695; Star Sapphire $1600 (oak), $1750 (African Rosewood), $2000 (black lacquer); The Electronic Flywheel $300; Reflex Clamp $95; spare aluminum armboards cut for SME V, The Arm, FT3, MMT, Linn, $90; blank armboards (flat or "stepped"), $75. Approximate number of dealers: 125. Manufacturer: SOTA Industries, PO Box 7075, Berkeley, CA 94707. Tel: (415) 527-1649.

Over these many years of audio testing, I have come to recognize in myself a strong conservative streak. One less-than-admirable manifestation of this is that, when I find a product I really like, I tend to resist thinking about the possibility that another might be better.

A reason for this, I suspect, is that if I cannot actually hear anything the matter with the product, I do not wish to learn that my idea of absolute perfection is flawed. Sure, it's easy enough to say "Go to a concert and compare what you hear there with what you hear at home," but while that may be a great idea in theory, it cannot be of much practical value as long as there continues to be such an appalling disparity between real, live orchestral sound and reproduced orchestral sound. We are, thus, still stuck with the same problem that faced audiophiles 25 years ago: we cannot know what "better" is until we hear it. Sometimes, I think I would rather not know. After all, I keep telling myself, there's got to be an end to this improvement business some time, hasn't there? Things can't keep getting better forever, can they? Well, can they?

At least I'm enough aware of this personal quirk that, although I will not go so far as to try and obtain samples of a new super-cable just because I have heard it may be a hair better than the absolutely perfect ones I now use, I welcome any proffered upgrades to components I currently use. It was different, however, with my SOTA Sapphire.

Having used and loved this turntable for
more than two years, I faced Rod Herman's impending Santa Fe visit with mixed feelings. Would the latest SOTA Sapphire that he was bringing really be better than my present, familiar, reliable one? Would I have to spend a month listening to it before I could pin down its characteristics well enough to be able to judge other components without its prejudicing those judgments? Well . . .

Visibly, the latest-model Sapphire—the III—is indistinguishable from the original version. It doesn't even have Series III written on it anywhere. With the exception of the Supermat (which I had tried but couldn't use because the clamp wouldn't grip the short spindle of my early 'table), all the "improvements" are internal, consisting of an aluminum armboard, a hard-mounted motor assembly with a new pulley, a new platter-bearing block, and a ribbed platter with "constrained-mode" damping. (I can foresee lots of fun and games when Series I owners wishing to trade up to the new version start offering the old one for sale as the new one. Who would know?) And would it make any difference anyway? How much better is the new one?)

Frankly, fitted with a WTA/Ortofon MC2000 combination, there was very little difference. Yes, the Series III Sapphire gave a wider, deeper, and more stable soundstage, better inner detailing, tighter and better-controlled bass, and a generally smoother, more relaxed quality overall. That sounds like a vast improvement, but the fact is that the extent of the improvement in each area was very small. Some of it was due to the Supermat, which, in conjunction with its special clamp, constitutes the only record stabilizer I've seen that will actually make concave-dish records lie flat. But I doubt that I would have detected the differences at all had I not lived with the original Sapphire for a long time and then auditioned the new one with familiar records. The original SOTA Sapphire set a new standard for turntable performance which had not, to my knowledge, been surpassed at under $5000 until the Series III came along, but I do not feel the difference between them to be great enough to warrant upgrading a Series I to the newest version. Not, at least, unless you feel positively compulsive about owning the very best and the very latest: the platter and motor upgrades cost $200 each; the constrained damping (done by the factory) costs $150.

But the latest Sapphire 'table wasn't all that Rod brought with him. One other item was something SOTA provocatively calls the Electronic Flywheel. This is a medium-sized Black Box, which connects between the 'table's outrigger DC supply and the 'table itself. What does it do? It filters everything but DC from the external DC power-supply source, regulates the output voltage, and doubles the available current. Okay, so we can all see what the filtering and regulation will do: they'll keep potential sources of speed fluctuation away from the drive motor. But what could twice the available current possibly buy you? I still don't have a satisfactory answer to that, because I am not sure I subscribe to the idea that varying amounts of load on the 'table, due to drag from loudly modulated passages, could vary the platter speed enough to be perceptible at any level of consciousness. On the other hand, I am not prepared to dismiss that possibility out of hand.

Particularly after having listened to what the Flywheel does.

The Electronic Flywheel isn't cheap. It sells for a respectable $300, which means it had better do some pretty impressive things to the sound. I really did not believe it could. After all, the table normally gets fed only DC, presumably with a fair amount of filtering, and I have never been able to detect any evidence whatsoever of irregular platter speed. I was fully prepared to hear no difference. But I did.

All the things I mentioned in connection with the Series III Sapphire were improved again, but by a greater amount. No way would I be prepared to say the improvements were "dramatic," but they were unmistakable. A bypass switch on the Flywheel made it easy to conduct comparisons, and to confirm that, yes, those differences were unquestionably quite audible. I have to admit that the Electronic Flywheel is worth the asking price.

SOTA admits that, under some conditions, the Flywheel won't make any difference. As

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1 By getting its serial number and telephoning SOTA to ask.
2 Yes.
3 Enough.
long as your AC supply is clean—free from spikes, glitches, RF, and voltage fluctuations—the Flywheel should accomplish nothing. If such clean-line conditions are the norm in your household, the Electronic Flywheel could be a very expensive door stop. But even though I have never had reason to believe my AC supply was contaminated, the Flywheel effected a significant improvement in sound. Perhaps it makes sense to think of it as being like a lightning arrester: it may not be needed most of the time, but when it is you'll be glad you have it.

The other upgrade that Rod had brought was one he requested I defer listening to until I had become thoroughly familiar with the sound of the new 'table with its Black Box. This was the so-called Star vacuum upgrade, which replaces the entire platter, spindle, and bearing assembly with SOTA's vacuum hold-down system, bringing the basic Sapphire up to full Star specification.

Now this I fully expected to bring about an appreciable improvement, particularly at the low end, because I had used Audio Technica's vacuum stabilizer for a while some years ago and had observed a tremendous improvement in all things LF. (Unfortunately, the A-T's high vacuum pressure seemed to provoke conical fracturing of the grooves in playback; it damaged a number of my discs.)

Installing the Star upgrade looks like a major operation but isn't. First, if your tonearm uses viscous damping, remove the arm and set it aside where it won't get knocked over. Then stand the whole 'table up on its motor side and remove, in this order, the platter transit screws (they have nuts on them), the large center bolt, and the three Allen-head screws around the perimeter of the bottom metal disc. The only things that require care are making sure the whole player doesn't fall over while you're unscrewing, and holding the platter in place when you remove the last Allen screw so it doesn't come out until you pull it out.

The special vacuum platter is fastened to a wooden platform in its shipping container. To unpack it, turn the container upside down (platter down), preferably on top of a sofa cushion to catch it when it comes loose, and remove all the visible screws on its bottom plate—the large center bolt last. You'll see a ¼"-thick metal disc under the platter with a T-shaped pattern of small holes in it. Line these up with the matching holes on the bottom plate of the 'table base and, being careful not to rotate the platter, insert it into the base. (This takes a slow, careful action so as not to knock the base over. An assistant holding it would be valuable insurance.) Use a large nail through the base bottom to line up the holes, align the thin metal bottom disc over them, and replace the three Allen-head bolts. In place of the original large central bolt, you must now attach the vacuum fitting provided with the upgrade kit, using a wrench to draw it firmly, but not too tightly, up against the bottom disc. Finally, replace the transit screws, drive them in until they come to a stop, then back each one out ¼" and tighten its nut against the bottom disc. Attach the free end of the vacuum tube to the nipple on its fitting, lay the 'table flat, and you're ready to connect the power-supply cables.

First, you discard the Sapphire's old DC supply and, if you already own the Flywheel, discard also the adaptor previously used to connect them together. The short cable with the multi-pin plug goes from the Flywheel to the pump, the long one (from the vacuum controller supplied) goes to the Flywheel, and the 'table's power-supply cable goes into the vacuum controller. That's all there is to it.

Well, not quite all there is to it. Because the vacuum platter is higher than the standard one—why, Rod?—you will need to readjust the height of your tonearm to preserve proper VTA. And that may pose a small problem. Because the Sapphire's tonearm board was already about 1¼" below the top of its platter, my Well-Tempered Arm was close to the limit of its height adjustment before I installed the vacuum platter. The Star platter added an additional ¼" of height, and I had to slide the arm to the very top of its track to get it close to the proper VTA for my Ortofon MC-2000 cartridge; I still could not quite reach the optimal point. The solution with this particular arm was a simple one, because it has a single-hole mount: I just added a thick metal washer between the arm's pillar and its mounting board. Other arms may not be nearly so easy to shim up, and for these SOTA offers a special stepped aluminum arm board.

I fired all this up with some misgivings, as
I have used vacuum devices which required a motor-driven pump in the past and, their merits notwithstanding, found I could just not tolerate the pump noise. (My listening environment is extremely quiet.) When I turned on the SOTA Sapphire system, there was not a trace of pump noise. Absolutely none. Not even with my ear pressed against the pump case! There was also no vacuum.

Some creative diddling revealed that the vacuum controller adjustment apparently had a "dead spot" at each extreme of its rotation. All the way CC, and the pump would just run out of sauce. Advance the control, and the pump could be heard speeding up until, in the fully CW position, it would cut out again. Not a serious problem, but one I told myself I would have to bear in mind in future. (And one that SOTA's instructions should address.)

I mentioned pump noise. Yes, there is some. But it was barely audible from two feet away in my quiet room, and was not audible at all from distances of more than about four feet. In short, this is the first motorized vacuum-operated audiophile device that doesn't come with a noise price attached. SOTA really did a job on this design!

But how did it sound? Well... it sounded fabulous. Every aspect of the sound was at least noticeably improved, by a margin that was rather significantly greater than the improvement effected by the Flywheel. Except at the low end. There the improvement with some discs almost defied belief! With others it was only very impressive, depending on their shape before the vacuum grabbed hold of them. The greatest improvement, predictably, was with discs that had bad coolie-hat dishing, when they were flipped concave-side up. These are usually real troublemakers, whose completely undamped surfaces ring like the proverbial bell, and which defy the efforts of even the most effective clamp-type stabilizers to get them to lie down and behave. (Only the Supermat will help these, and not even it can cope with the worst of them.) A few such discs, particularly badly deformed, needed to be gently pressed down with the fingers around the perimeter in order for the vacuum to grab hold, but once clamped, they stayed clamped.

From all discs, the immediate impression was of greatly improved solidity across the board. Stereo images were more tightly bunched and stable, the soundstage boundaries became more definite, and inner details I had thought were superbly reproduced before became better focused and more sharply delineated. But most dramatic was the amount of tightness, control, and extension added to the low end. Even the WTA's slight but persistent tendency toward midbass boominess at high listening levels was diminished, if not all that much. I was impressed!

Incidentally, the vacuum pressure (de-pressure?) is quite low, even at the highest setting of the controller. It is widely theorized that excessive vacuum was the reason A-T's vacuum stabilizer damaged discs. Because there was no way it could be evacuated while playing a disc, the space between the disc and the platter had to be evacuated before each play. And because there was always a certain amount of leakage during play, the initial vacuum had to be quite high so there would still be some left at the end of the side. That, apparently, was its fatal flaw.

The physical properties of vinyl relate to the presence in it of what is called a plasticizer—a volatile liquid which gives the material its flexibility. Over time, this plasticizer tends to migrate into the air, at a rate which is inversely dependent on the pressure of that air. A drastic reduction in air pressure will cause a rapid loss of plasticizer from the vinyl molecules at the disc surface, creating a brittle "skin" which will remain that way until more of the plasticizer from deeper within the vinyl migrates to the topmost layer. This may take several days, and if the depleted side is played before the plasticizer has been restored, the "skin" will be less able to dissipate surface-friction heat, and conical fracturing will be exacerbated.  

4 The late Dr. Edward Catelano, founder of LAST, was first to document (with electron microscope photographs) and explain conical fracturing: Sylus/groove friction due to the very high contact pressure (several tons per square inch) causes an instantaneous drastic increase in temperature at the contact surface. As long as the vinyl is completely homogeneous, the heat is absorbed harmlessly by the underlying vinyl. Any discontinuity in the structure of the vinyl, however, will inhibit this absorption, causing the contact point to overheat and to expand to the point where it can no longer fit the space it previously occupied. As a result, a tiny conical bit of material is expelled from the groove wall, leaving a hole that forever after will produce a surface-noise click.
Rod Herman claims the maximum vacuum obtainable from his system is well below the danger point, but nonetheless urges using the least vacuum you can get away with. I think he is being overly conservative. Several times, I tried playing the reverse side of non-LASTed discs immediately after playing side one with the vacuum up full, and got no more surface-noise increases than is normal: an addition of about one tick per five minutes. The amount of vacuum you use does affect the sound slightly, but it is my feeling that, regardless of what sounds best to you, anything less than maximum stabilization can only increase the amount of ringing from the disc, and that the most is the best in terms of accuracy.

Even at the maximum vacuum level, there is never the slightest perceptible resistance to the removal of a disc from the platter (partly because finger pressure at the edge of the disc breaks the seal immediately), and this may give the impression that the system isn't working. There's an easy way to check for a good seal, though: with a fingernail, gently tap the rim of the disc, diagonally from the cartridge, while playing the lead-in grooves. A dull "thud" is a sign that everything is battened down; a "pock" means it isn't, and you should check to find out why.

Incidentally, the Star system also comes with a soft rubber spindle cap, which prevents air leakage from through the center hole. I did not find this to be necessary with most discs, which is a good thing because the cap is difficult to remove, clinging so tenaciously to the disc label that it makes a little POP when it finally lets go.

All of these mods, then, are very worthwhile additions to the standard SOTA Sapphire. If you are now using a Sapphire I or II at the head of a system having high enough resolution for you to hear differences between good interconnects, all three of these upgrades (the third being the Series III mod) are well worth their not-insubstantial cost in terms of improved sound quality. The fully loaded SOTA Star Sapphire is well worth the asking price.

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IN SEARCH OF A REFERENCE CARTRIDGE

Anthony H. Cordesman carries out a post-CD survey

It is a relief to get back to cartridges. For all the improvements in CD players, I still listen to hear how free they are from musical faults. When I listen to analog phono components, I do so to hear how enjoyable they make the music. No-one can honestly deny that CD players are getting better, but I find that CD's outstanding technical specifications are still not accompanied by a matching enjoyability and musical believability.

The evidence is fairly easy to summarize. With the right combination of cartridge, tone-arm, and turntable, the analog record still provides a consistently more realistic soundstage, particularly in terms of depth. Musical instruments are sweeter, and have more musical detail. Musical dynamics are more natural and exciting, and bass has more natural definition and impact.

Put more simply, if I had to choose between investing in the best CD player and the best analog phono front end, I'd invest in the analog option every time. Furthermore, one of the things I learned as a result of this cartridge survey is that cartridges are improving faster than CD players. The latest generation of CD players have fewer faults, but they still lack musical excitement. The latest generation of cartridges are much more believable and exciting than their predecessors, even though several older cartridge designs still consistently outperform the newest CD players.

The search for a reference cartridge is, therefore, as important as ever, ranking in social meaning with the search for an honest TV evangelist, and the best cola. Given the quality of the candidates to date, I can even guarantee that your choice of cartridge will do more to improve your life than your vote for the next President. In fact, if you are a keen
student of British philosophers, you may even agree that a good reference cartridge offers more than sex. To paraphrase Lord Chesterfield, the pleasure is less fleeting, the position less ridiculous, and the expense slightly less damnable.

More seriously, if you do find the right reference cartridge—one that "locks in" to the rest of your system and matches your electronics and speaker—it tends to make all of the music you listen to come alive (something no serious high-end reviewer I know of has yet said about a CD player). I will immediatelyced the point that some of the resulting musical life and believability in an analog phono front end may reflect some degree of euphonic coloration. So what? Pleasure is the name of the game, in my opinion, and coloration is better than irritation.

I should note, however, that the search for a reference cartridge is different from a survey of recent products. It is a search for a cartridge that makes you want to listen to music. A reference cartridge has to be more than simply good value for money, exotic, technically "interesting," or capable of providing new musical "insights." It must succeed in making your system and your music come alive over a prolonged period. I have closets filled with technically interesting cartridges that revealed sounds on my records that I never heard before and have never wanted to hear again.

**Technical Criteria**

At the same time, a reference cartridge has to measure reasonably well in terms of frequency response, separation, and tracking. There is still a great deal we don't know about the subjective meaning of cartridge measurements, but a true reference cartridge has to be able to track the record, and must perform well in technical as well as in listening tests.

These technical performance characteristics are reflected in the frequency graphs that accompany most of the cartridges discussed in this article, and in the data in the table, which show tracking performance, balance, and output. These data are provided for most of the cartridges I felt deserved true reference ranking, although in some cases I could only keep a cartridge long enough for listening tests, or the measurements were not reliable or consistent enough to merit inclusion.

The frequency-response curves shown, made with the JVC TRS-1007 Mk.II test record, are more honest than those that come from manufacturers simply because the sweep rate is much slower. If the plotter is set to race through the printout, the needle tends to produce a straight line in the upper octaves regardless of the actual response. As a rough rule of thumb, however, one must be very careful about the meaning of measured frequency response below 150Hz or above 5kHz. The apparent bass energy in a cartridge bears no clear correlation to its performance on a test record. Most moving-coils show a rise in frequency response above 5kHz, but only some exhibit this rise sonically!

Having a smooth, balanced separation curve for both channels is more important than having high separation per se, in my opinion. I could not hear any clear correlation between measured separation and the sonic quality of the soundstage, but I often heard problems when a set of response curves showed irregularities in the crosstalk signals.

As for cartridge output, the very best cartridges have evolved to the point where it is clear they do not need an external life-support system. Any output above 0.3mV/cm/s is adequate for any good preamplifier with a moving-coil gain stage, and any output above 1.2mV/cm/s is adequate for good moving-magnet stages. Outputs below 0.3mV tend to lead to problems, even with the better transistor preamps: such cartridges having, in my experience, a thinned-out sound, diminished bass, and compressed dynamics. This is true even when the preamp has ample gain and signal/noise ratio. This is one reason I have not included Audionote models or the Ortofon MC-2000; their output is so low that their sonic performance virtually does not matter.

There is no equally good preamp or step-up device to use with them, and the improvement

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1 AHC does not present the whole story here, as measured low- and high-frequency response generally does correlate quantitatively with perceived tonal balance. In other words, the common mid-to-low-bass rise featured by the Koetsus, for example, is reflected in the amount of bass energy heard. What is not indicated is the quality of those low frequencies, whether they are transparent or not, well-defined or boomy, etc. Regarding high frequencies, you will always hear the tonal result of a tilted-up response, but whether you will perceive the cartridge as "bright" and be bothered by the excess of HF energy, or just regard the sound quality as having a "light" balance, depends on many other factors: distortion, phase response, the Q of the tip-mass resonance, the depth of the ubiquitous midrange depression, etc.

—JA

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in the sound of other cartridges has reduced them to exercises in engineering sadism. Channel balance is worth watching. Differences of 1dB or more are common, and this is enough to mean careful balancing of the system every time you play a record. Slight differences in output balance manifest themselves as a tilt in the soundstage to the right or left, and unless you make active use of the preamp's balance control, you'll never be fully satisfied with an unbalanced cartridge.

Tracking ability capable of coping with 80 microns (um) recorded amplitude within the rated tracking force for a given stylus type seems to be perfectly adequate. The improvement from 70 to 80um is apparent on most demanding passages, but the improvement from 80 to 90um is rarely audible.

**System interface and synergy**

You should be aware of the fact that cartridge reviews are a bit more difficult and uncertain than most subjective reviews. Cartridge sound characteristics are not easy to describe reliably because they cannot be divorced from the associated equipment and set-up. While the basic sound character of a given cartridge is rarely tonearm-, turntable-, or set-up-dependent (apart from the very low bass, where the tuning of the LF resonance due to the cartridge compliance and the arm's effective mass\(^1\) will have a significant effect), the nuances of its performance are. This makes it easy to over-review cartridges, and to start comparing sound characteristics which are dependent on the associated tonearm and turntable.

Soundstage details and imaging are especially system- and set-up-sensitive. The finer details of both timbre and soundstage vary according to tonearm and turntable, and any review that gets into exhaustive detail in this area is simply a fantasy: unless you have the same system as the reviewer, you will hear something different.

Turntable and tonearm also powerfully affect other aspects of cartridge performance, particularly bass. The Goldmunds, SOTAs, and VPI, for example, produce more deep bass

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\(^1\) There are valid rules for matching cartridge compliance and tonearm effective mass, but sample-to-sample variation in cartridge compliance is so great that the nomographs involved have little real-world value, in my opinion. Others differ.
than the Linns and Oracles. Most of the cheaper high-quality turntables—the ARs and Duals—are light in the deep bass. The only affordable turntable with deep bass is the Sonographe, and then only when used with a medium-weight clamp.

The sound of many musical details varies according to system. The upper midrange is particularly tonearm-sensitive. For example, the character of sibilants in female voice or the bowing sound of the violin will change when a cartridge is mounted in a different tonearm. The same is true of low-level passages and harmonics, treble detail, and overall dynamics, although dynamics seem to be more turntable-sensitive.

Turntables which combine a plastic platter surface with a good clamping system tend to produce more controlled dynamics but more overall sound energy than 'tables with a felt, plastic, or other mat. The latter produce selective increases in dynamics in some parts of the frequency range which can be exciting or euphonic, but which generally get a bit wearing—particularly with really well-recorded classical music.

This means the search for a reference cartridge is never simply a search for a cartridge. It is an exercise in synergism, where the ultimate goal is a front-end "system" in which the cartridge, tonearm, and turntable really match. The following reviews attempt to get around this by using a range of equipment. They are based upon using the cartridges in the following turntable/arm combinations: SOTA Star Sapphire II with the SME V tonearm; the VPI HW-1911 with the Dynavector 507A and the Eminent Technology II tonearms; and the AR turntable and arm. A range of different electronics, cables, and speakers was also used. The reported results emerged consistently over a wide range of equipment and music.

**Cartridge Set-Up.**

Set-up is supremely important. Poor alignment can produce much the same degree of degradation as using a poor turntable or tonearm. The cartridges included in this review were set up with a Dennesen protractor, and confirmed with a two-point protractor or the Eminent Technology protractor. The azimuth was confirmed with a mirror, and the top candidates were checked for equal crosstalk in both channels to get a precise measure of azimuth adjustment. VTA was checked by ear, although there is a far better correlation between having the cartridge body parallel to the record than in the past. Sidethrust, still a major problem, was also adjusted by ear. The tracking downforces on the SME and Dynavector arms were set with half the force coming from the counterbalance and half from the spring.

It became very clear during this process that a painstaking set-up is even more important than it used to be: virtually any minor tweak has at least a minor impact on the sound. Only major set-up error really matters, however, and there are no agreed rules as to some aspects of final adjustment. I would agree that the obsessive audiophile, in search of pure technical accuracy or ultimate resolution, can only go mad in an effort to resolve all the uncertainties inherent in trying to choose between one adjustment of any given tweak or another.

Nevertheless, even the rare audiophile who loves music above such madness still needs to be sure his or her reference cartridge is set up according to the following rules:

- A medium-mass tonearm should be used in which there is no tendency to move to the right or left when the tonearm is neutrally balanced, the bias compensation set at zero, and when a low breath will move the tonearm easily to either side.

A reviewer can have great fun at shows by grabbing the tonearm tube, appearing to yank as hard as possible, and yelling "loose bearings!" It is almost as much fun as breaking the knobs off prototypes. There is no way that an amateur can really appraise bearing quality, however, and about the only thing you can really test for is imbalance or friction. These, however, are well worth testing for: far too many high-priced arms still have lousy quality control. Further, test the cartridge and tonearm mounting screws to make sure they are really tight. I have seen more tight (or drugged) dealers than tight cartridge and tonearm installations.

- Overhang should be checked with a two-point protractor. While the one-point system is roughly equivalent, it depends a bit too much on either a locatable tonearm pivot point or the cartridge geometry matching the parameters set by the tonearm designer. Any good audiophile dealer can help you perform
this alignment, and a reputable dealer will show you that the cartridge has been properly aligned if he installs it. You should be warned that far too many dealers rush this aspect of set-up or do not know how to do it. A dealer who cannot or will not perform this service or demonstrate its accuracy as part of a sale is neither competent or reputable. Never trust any dealer to do it without a demonstration!

- The front of the cartridge body should move across the record so that the bottom of a rectangular cartridge body is parallel to the record, or an imaginary vertical line through the cartridge is at a 90° angle to the record. Ideally, the "motor" of the cartridge should be at the precise angle that produces equal crosstalk in each channel, but this requires a test record and a cartridge-alignment aid like the Shure or Signet. If you find that equalizing crosstalk in both channels requires an excessive tilt of the cartridge body, return it to the dealer—the generator and stylus axes are too different for both optimal tracking/tracking and crosstalk.\(^3\)

Tonearms that are otherwise superb—the Alphason, Linn Itok, and SME V, for example—do not permit adjustment in this area. There is a rationale for this. Many tonearm designers argue that variable azimuth can only be provided at the cost of compromising rigidity, thus introducing resonant problems. This is undoubtedly true, but in my opinion, precise azimuth alignment is necessary to get the best imaging and soundstage performance from an expensive cartridge. If this is important to you, you should investigate arms like the Air Tangent, Eminent Technology, Goldmund, Grado, Souther, Syrinx, and the Triplanar. Further, Sumiko sells an excellent standard headshell that can be used with any arm with a standard socket. In fact, I will go so far as to say that any arm lacking azimuth adjustment has a critical design defect.\(^4\) If I were in charge of compiling Stereophile's Recommended Components list, I would relegate even the SME V to no better than Class B.\(^5\)

- Tracking weight should be set toward the top of the manufacturer's recommended range. Ideally, I would also check with a test record. This, however, is easier said than done and requires an experienced technician or enough listening experience to know what you are hearing. Be aware that low tracking forces are the fast track to distortion and permanent record damage, and that setting down-force for maximum tracking capability will dull the highs and dynamics, as well as producing some groove damage. Either obtain a stylus tracking-force gauge or insist that the dealer demonstrate the setting. Far too many dealers rush out set-ups with the wrong tracking force.

- Bias should be set for the recommended tracking force. If you can't hear it, the visual testings of overhang are too uncertain to worry about. If you have really good eyesight and a blank record, however, the needle should hit the record at a 90° angle without a sudden tilt to either side.\(^6\)

- Allow for break-in. The suspension of a cartridge consists of a piano wire and a rubber "doughnut," and it can take about 12 hours

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3 A skilled technician can perform a measured azimuth adjustment in about 15 minutes using a test record and a dual-trace scope. This requires a cartridge analyzer or black box for best results. The Shure cartridge-alignment system is no longer sold, but is still used by some dealers. The Signet system is only available at Signet dealers. It is well worth hiring an audio technician to use such devices; adjustment by eye is simply not accurate, nor is stylus alignment relative to the cartridge body. Differences of 5-10dB are common in such set-ups, and they are reflected in every aspect of soundstage performance. Also be advised that most high-end dealers haven't the faintest idea of how to conduct such adjustments. Unless you see them made in front of you, you can virtually count on the fact that they aren't being made and that claims to the contrary are false. Any dealer selling cartridges for several hundred dollars or more should, however, be able to make such adjustments. The technology involved is now about a quarter of a century old.

4 Strong talk perhaps, but I issue an open challenge to John Atkinson, J. Gordon Holt, Harry Pearson, and Peter Moncrieff to listen to the differences between their favorite cartridge with a precisely adjusted azimuth, and the same cartridge with the azimuth error common in unadjustable tonearms. The difference may have been acceptable in the past, but today's cartridges reveal it all too clearly.

5 In my opinion, this is too extreme a view. To place sound-stage symmetry above all else when choosing a tonearm fails to take sufficient note of such factors as the presence or absence of resonant colorations and the ability of the tonearm to provide a stable mechanical "ground" against which the motions of the cartridge "motor" can be referenced. I would agree that precise azimuth adjustment optimizes the soundstage balance. In my experience, however, arms providing such adjustment suffer in other areas: upper-bass clarity, low-bass extension, and midrange transparency, in particular. Readers must decide for themselves the own order of priorities when choosing a tonearm, and not be unduly influenced into an unbalanced buying decision. Regarding AHCh's challenge in the footnote above, I can't see how this comparison can be carried out without the result being confused by the introduction of another variable: a different tonearm, for example, or rigidity being compromised by the use of shims. —JA

6 Good luck. This is a real pain with most cartridges, and I have watched several "experts" discover that their adjustments seemed wrong when they attempted to confirm them.

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of playing music for this suspension to settle in. Don’t set VTA or decide on cartridge performance before this point.
• Set the tonearm height so the flat plane of the lower surface of headshell or cartridge-mounting surface in the tonearm is exactly parallel to the record when seen from the side. If you can easily adjust VTA on your arm, or have experience enough to handle both the mechanics and the listening required to make your own adjustments, do so. You should find that there is a point where the upper midrange and the imaging “lock in” and provide the most musically natural combination of detail and sweetness. If you’re not confident in performing this adjustment by ear, do it by eye.

The results of the search
Enough of the philosophy and deep ultimate truths—let’s get to the products. I have tried to include all the cartridges I still feel to be candidates and to include as many new ones as possible. Where I felt that a cartridge merited historical comment but not full testing, I have included a mini-update.

I also have only attempted to report on sonic characteristics that consistently emerged when I shifted from component to component and from system to system. My goal is to give you enough data to form your own short list, or to tell you when a classic appears to be outdated.

Adcom SXC/van den Hul: $450
Adcom XC/Microridge II: $325

The Adcom cartridges have always been sleepers. The top-of-the-line versions measure well, having flat, extended frequency responses without any rise in the upper octaves, very good soundstaging, and good dynamics. They also do an excellent job of mirror-imaging the sound from a record so that it will match the timbre and dynamics of naturally recorded open-reel tapes and CDs.

If you are looking for a cartridge without coloration, with ample output for any tube preamp, and which blends in smoothly with the timbre and balance of a good CD or tape player, the Adcom XC and SXC are still very good buys. At the same time, they do not have the detail and resolution of the state-of-the-art cartridges, seeming just a bit veiled and almost too neutral. They lack the extra note of excitement that catches the ear or makes music come fully alive. The Adcoms are like a good third dub of a master tape—the sound is still excellent, but something is just slightly missing.

This is less true, however, of the cheaper Adcom XC, the Microridge stylus producing a sweeter and more realistic set of highs and up-
per midrange. At the price, the Adcom SXC is almost ideal for the tube or transistor preamp owner without a moving-coil step-up device and without large amounts of surplus cash. If it does not have the musical excitement and credibility of its higher priced competition, it is also easier to match to most systems.

**Argent Diamond: $1200**
The Argent Diamond is now a relatively old design, but is still a very good cartridge in some ways. The highs from about 2kHz up are very good, although the latest top-ranking cartridges now provide more detail and air in a more musically convincing manner. The Argent’s overall sound is well balanced and musically convincing. It offers a great deal of speed and life, and can still produce considerable musical excitement.

Time, however, has passed this cartridge by in several important aspects. The Argent’s deep bass was never really state of the art, and most of today’s reference cartridges do much better in terms of detail, dynamics, and control. The lower midrange is still acceptable, but lacks the detail and richness available in the competition; the slight lack of warmth and power is more apparent. The soundstage is only good, the competition providing significantly more depth, detail, air, and left-to-right information. The top-ranked cartridges in this survey do all the Argent Diamond does in a considerably more musically convincing and exciting form.

**Clear Audio Veritas: $800**
The Clear Audio Veritas is still a very competitive model. It has good overall frequency response, good dynamics, a good midrange, and, at low frequencies, air and detail. The soundstage is sensitive to loading, but is always very wide and open. There is good depth, and—if you pay careful attention to getting the impedance loading and cables just right for your set-up—good imaging.
The Clear Audio Veritas does, however, have a problem which disqualifies it as a top finalist in this survey: There is something vaguely disturbing about the way in which it integrates information. The imaging is not quite as believable as its top rivals, nor the detail as convincing. This cartridge does not do anything wrong or anything less than well, but a prolonged comparative listening period made me conscious that the Clear Audio interferes with the clarity of the music.

**Decca Garrott**

At its best, the Decca cartridge can still be very good. It is still very live and very dynamic, and initially seems very quick. It still has exceptionally high output, and can make a tube preamp come alive. It has excellent tracking performance in a medium-mass arm, and my sample of the Garrott has held up beautifully over time. Its apparent frequency balance also provides a lot of bass power, slam, and a warm overall sound—provided that it is loaded by around 10k-20k ohms.

Unfortunately, it became increasingly clear during this survey that other cartridges can provide much more musical detail and more realistic dynamics. Exciting as the Decca is, it
simply does not let enough of the music through, and produces some complex colorations in the midrange and upper midrange. You can't go back to even the best of the Deccas once you have heard the Monster Alpha Genesis or Talisman Virtuoso DTi. Anyone want to buy a used Garrott Decca?

**Decca Super Gold: $499**

If the Garrott Decca shows its age, the Decca Super Gold shows its lack of quality control. From the midrange up, it is more colored by obvious frequency irregularities than the Garrott, and the imaging is a bit muddled. Depth is poor, and the initial illusion of speed gives way to the feeling that something is ringing; the more powerful notes don't stop quickly enough to let the detail through.

**Dynavector DV-17DMR: $480**

**Dynavector DV-23SMR: $350**

Like the Argent Diamond, the Dynavectors once set a standard in terms of upper-octave speed and detail. Again like the Argent, however, they have been clearly outpaced in terms of natural detail and speed by newer competitors, such as the Monster Cable Alpha Genesis 1000 and Talisman Virtuoso DTi. The bass and lower midrange of both lack the apparent energy level to match the upper octaves. They are now the kind of cartridge your mother would say is cute.

**Grado Signature 8 MX: $200**

Most seasoned audiophiles (more than three years into the high-end disease) will be familiar with the Grado Signature series. The latest Grado Signature 8 MX does, however, feature a number of design improvements. The generator mass has been reduced by 75%, and the stylus has more resolving power. The magnet and wire used in the cartridge have been upgraded, and the electrical system has a smoother impedance.
Like all of the previous Grado Signatures, the chief merit of the 8 MX is its natural lower and middle midrange. Only the Koetsus and a few other much-higher-priced moving-coil cartridges do better in reproducing a musically convincing sound in this area. This is particularly striking when you have just returned from a live performance and suddenly realize the importance of this part of the musical spectrum.

Grado Signature 8 MX cartridge

At the same time, the Signature 8 MX has smooth and extended highs, and good overall musical life and energy. While the measured frequency response shows a significant rise in the highs, the apparent treble balance is mid-hall, and there is clearly some loss of fine detail, life, and air compared with the best moving-coils—particularly with strings and brass. The upper octaves, however, have the balance of transient dynamics and overall balance of energy detail you would expect to hear if you sat in rows M to R during a live concert-hall performance.

The bass combines power and extension into the deep bass with good control and good, to very good, definition. While the best moving-coils have more detail, particularly in resolving organ and string tones, many of the better moving-coils lack the Signature 8's impact and musically natural power.

Dynamics are also good to very good. The performance is certainly outstanding at the price, but if you compare the Signature 8 MX with the best moving-coils in the $600+ bracket, the overall dynamics and the contrast between very low- and very high-level passages are adequate, rather than exciting and musically involving.

The soundstage is very good. The width and height are excellent, without being exaggerated or leaving a hole in the middle. Imaging is excellent and very natural for the overall balance of timbre and dynamics. Voice and solo instruments are particularly good, having "air" while preserving the stability and natural focus. Depth is good. Again, enough new moving-coils exist to show that significant improvements continue to be made in this area, although they cost much more.

Grado Signature MCX: $300

The Signature MCX is Grado's attempt to provide a fixed-coil cartridge with the advantages of both moving-coil and moving-magnet designs. It raises the cartridge's torsional resonance, and uses a very low-mass generator system. It also has a low impedance and inductance. This gives the MCX some of the superior
electrical characteristics of a moving-coil, although it still delivers a relatively high output of 1.5mV.

The bass of the MCX is directly comparable with that of the Signature 8 MX. The Grado Signature MCX, however, has a slightly better lower and middle midrange. You do not hear dramatic differences between it and the Signature 8 MX, but the MCX has more resolution and gives the entire midrange more transparency and air. The MCX also does a very good job with strings and choral music—something most cartridges with this frequency or spectral balance have trouble with. Only the better moving-coils are its equal in the lower and middle midrange, and only the Koetsu Signature Red and van den Hul MC One clearly outperform the MCX in this region.

The Signature MCX's treble measures flatter than that of the 8 MX, but sounds stronger. The Grado is still soft in overall sound character, air, low-level detail, and upper-octave dynamics compared to most moving-coils, but there is an improvement in the upper four octaves that makes the MCX sound more dynamic and "live" than the Signature 8 MX.

The Signature MCX is also a bit more "forward" sounding in hall position, although the moving-coil fan will still miss the detail and "excitement" of the better moving-coils. The MCX also is a bit too sweet, although slightly less so than the Signature 8 MX. Brass loses some of its natural aggressiveness.

The Signature MCX's overall soundstage is similar to that of the Signature 8 MX, with a bit more depth and detail. Imaging and placement of voice and instruments is better than that of the Signature 8 MX, particularly in fairly complex music or complex percussion passages. The improvement in depth and soundstage detail is particularly important in increasing the overall realism of the sound. The Grado is very good in this respect for a high output cartridge of any kind, although the Talisman Virtuoso DTI high-output moving-coil is clearly better—albeit at a modest $900 increase in price.

Kiseki Blue Silverspot: $600

Each year I listen to some sort of Kiseki as a religious penance. The cartridge is always good in many ways, but its sonic virtues are always offset by something just audible enough to be vaguely troublesome. The music from a Kiseki is never quite as credible as that from the best competition in its price range. The Kiseki Blue Silverspot is a good case in point. It is hard to match to many arms because of its mix of mass and compliance: it needs an exceptionally rigid, medium-mass arm. Even then, it is a bit bright and lean, and the soundstage is a bit less stable and well-defined than its best rivals in this price bracket. The upper midrange and treble aren't hard, but they lack the inner detail and resolution of a Monster Alpha Genesis.

Things improve after run-in, and you may like the bass, which has a slight rise while retaining considerable control. Nevertheless, the Silverspot is not my cup of green (or blue) tea.

**Kiseki Purpleheart Sapphire:** $900

The Kiseki Purpleheart Sapphire is superior in many ways to the Kiseki Blue Silverspot, but I would not really want it as a personal reference cartridge. There seems to be a rise in the presence region that I find musically irritating but that—I suppose—others must love.

![Kiseki Purpleheart Sapphire cartridge](image)

While I could not borrow this cartridge long enough to perform a frequency sweep, I did have trouble with the highs. The main musical content was smooth, but something was going on at the extreme limits of my upper-frequency hearing that I could have done without. This was odd because the Purpleheart is a rather sweet cartridge in the upper midrange and lower highs; this part of the frequency range seems musically natural if you are willing to sacrifice the detail and air now available from the competition.
The bass and soundstage were good to very good, but I found them hard to relate to emotionally. The bass had more power than information and control, and the soundstage did not lock in with the same stability featured by the best cartridges in this survey.

**Koetsu Black Goldline: $750**

I have generally been able to contain my enthusiasm for the Koetsus with more ease than many of my fellow reviewers. I can't deny the joys that the Koetsu midrange provides, but most of the models I have reviewed have tended to be indifferent trackers, with upper octaves that were just a bit too dull to be convincing.

The Koetsu line is also one in which I have seldom heard any clear correlation between cost and performance. Some of the most expensive versions have been little more than status symbols for the lunatic fringe who worry about how much their system costs but don't know enough to hear whether they've gotten what they've paid for.

That said, the current Koetsu Black is a very good cartridge in many respects. The midrange is warmer and more powerful than that of most moving-coil cartridges, without losing detail or being too warm. This is one of the most sensitive areas in making music enjoyable and convincing, and the Koetsu Black outperforms most of its competition in this area.

The bass is good, particularly in the mid- and upper bass, its considerable power retaining a good mix of transient performance and control. There does seem to be a slight rolloff, however, from the lower mid-bass down, and other cartridges do notably better in the deep bass.

The highs are considerably better than those of many earlier Koetsus, including some with stratospheric prices. They are hardly the state of the art, however; the Koetsu Black sounds just a bit lean, without the life and air available in many similarly priced competitors. The overall soundstage is quite good, but a bit veiled and lacking in information. The Koetsu Black is polite when it should be exciting, and dull when other cartridges reveal a lot of inner detail and added information. A very good cartridge in most ways, it can no longer be considered of reference quality.

**Koetsu Rosewood Signature: $1695**

The Koetsu Rosewood Signature is a different story. Later production samples of this cartridge sound even more superb than the early production; they measure superbly as well. The Rosewood represents the state of the art in the lower and middle midrange, making recorded music fully believable. This does come at the cost of some detail when compared with competitors like the Talisman Virtuoso DTi and Monster Alpha Genesis, but detail isn't everything. Nothing else I have heard is quite as real in this area.

The bass is deeper and more dynamic than the Koetsu Black Goldline, without any exaggeration or artificial rise. The upper octaves also seem much smoother and full, and are much more musically natural. However, they fall notably short of the best competition in transparency and resolution. As a result, the
apparent timbre and imaging of virtually every record is moved farther away from the listener. This does make most recorded music seem more natural and believable, however. Live music isn't heard four feet away from the instrument.

The soundstage is tight and very well defined. Width freaks won't love this cartridge, but concertgoers will—there is a very natural overall balance of information. Oddly enough, however, this cartridge proved uniquely sensitive to azimuth adjustment. With what seemed to be good visual alignment, there was a hole in the middle. With correct measured alignment, the soundstage locked in tight, perfectly integrated with the overall timbre and dynamics.

In short, this was one of the four best cartridges in this survey and one of the four best cartridges I've ever heard. It is a cartridge for music lovers rather than detail freaks, but then I've never known a detail freak you could trust with national secrets, church funds, or small boys.

**Linn Karma: $995**

I should carefully qualify my remarks about the Linn Karma with the fact that I heard this cartridge only on a Linn set-up owned by a Scots-Sicilian friend of mine. He brought it over, set it up, and removed it with the agreement I would not touch or tweak his handiwork. One doesn't argue with this kind of ethnic mix.

Even so, it was clear that the Karma is one hell of a step up from the Asak, a very good cartridge in its day. Its deep extended bass compensates for the Linn turntable's slight loss of power in this area, and the control is, at the least, very good—something I do not always find in moving-coils with a slight rise in the deep bass. It is a very open and dynamic cartridge. If it did not rival the Monster Alpha Genesis or Talisman DTi, it came close to the van den Hul MC One.

There seems to be a slight rise in the upper midrange. The effect is not hardness, but a slight loss of air and harmonic sweetness. The soundstage was good, although slightly wider than deep, and a bit forward-sounding: this is a row C-F cartridge. Imaging was good, although not quite up to the top cartridges in this survey which provide a more convincing overall mix of detail and integration.

**Linn Karma cartridge**

In broader terms, the overall sound was better than some of the above comments may indicate. Every cartridge has some sonic problems, and the question is often how well they
balance each other out. The Linn Karma is a bit like the Koetsu Signature in that the end result is consistently more musical than an analysis of its parts might indicate, and much more musical than most of the competition. This is also a cartridge whose merits show up better on some kinds of music than others. While perfectly acceptable with classical music, the Karma comes into its own on jazz with a strong bass section and well-recorded rock.

**Monster Alpha 1: $325**

The Monster Alpha 1 can't really sound that old! In all seriousness, the Monster Alpha 1 now sounds like an antique. Where it once rivaled the state of the art, it now sounds veiled and hard, and there is a distinct upper-octave rise. Bass lacks detail, the midrange is slightly congested, and soundstage and imaging are mediocre by today's standards. It is hard to think this was once a real contender.

**Monster Alpha 2: $650**

The Monster Alpha 2, by contrast, is still quite a nice cartridge. The bass is solid, although not quick or detailed. The lower midrange is good, although lacking in the detail and natural dynamics of its better rivals. The middle of the midrange is good. Even though it measures as having more high end than the Alpha 1, the Alpha 2 also has less hardness and etching in the highs. The Alpha 2 does have a slight rise in the upper octaves, but its main problem in this area is that it fails to retrieve the musical detail that its better rivals provide.

The Alpha 2's overall ability to resolve harmonic detail and handle transients and musical dynamics now only ranks as good to very good. As with some other cartridges, the state of the art in these critical areas has moved on, leaving the Alpha 2 behind.

The soundstage is still good to very good, but the better competition offers considerably more realistic depth and better placement of instruments in every dimension, without the artificial enhancement or etching of the Alpha 2. The coherence between channels is also not convincing. This is disguised a bit with high-impedance loading, which seems to expand the soundstage at the cost of overall control of instrumental and vocal placement, and control of musical dynamics.

**Monster Alpha High Output: $650**

I don't know why I put this in a survey of reference cartridges—perhaps because I wanted to compare the whole Munster family. I heard the Alpha High Output as a prototype, during its early production, and in what I sincerely hope will be its farewell concert. The upper five octaves are too hard, grainy, and emphasized. I don't care what this is called, it is a high-output version of the Alpha 1, not the Alpha 2. A Grado Signature 8, one of the lower-priced Adcoms, and the Shure V-15 V are all more musically natural. Ah well, even the best families have their remittance persons!

**Monster Alpha Genesis 1000: $800**

If I seem somewhat down on the older members of the Monster cartridge family, it is be-
cause the Monster Alpha Genesis is so much better than any of its predecessors. It is a clear sign that the state of the art in cartridges is still advancing at a rapid rate. It is also a leading reason why I have down-rated the Alpha 2 and many other former contenders in the reference cartridge sweepstakes.

**Monster Alpha Genesis 1000 cartridge**

The Monster Alpha Genesis is a superb cartridge in virtually every respect, an equal rival of the Koetsu Signature Red, Talisman DTi, and van den Hul MC One for the title of Best Reference Cartridge I've Ever Heard. In fact, it is difficult to put this cartridge in perspective because it does everything so well. The most I can do is to compare it with the other top three cartridges in this survey:

- Only the Talisman Virtuoso DTi equals it in the ability to recover musically natural detail with all the dynamic realism and reproduction of low-level harmonics and information on the record. Both cartridges reveal this detail with different nuances, and create a different soundstage with any given record, but both clearly stand out in terms of their ability to reproduce believable musical detail. The Alpha Genesis 1000 has slightly more output than the Virtuoso DTi in the bass and lower midrange, but the difference is not one that would lead me to pick one over the other. Both have excellent dynamics, a credible, slightly forward timbre and apparent hall position, and both will make your system and records come alive.

- The contest between the Monster Alpha Genesis and the Koetsu Signature Red is also very close, although they sound far more different. There is a clear tradeoff between different sets of benefits. The Koetsu is still unrivaled in the lower midrange, but the Alpha Genesis has more natural detail from the upper midrange up. If the Koetsu is sometimes a bit sweet and forgiving in the upper five octaves, the Alpha Genesis is equally sweet without losing any detail. The Alpha Genesis has more detail in the bass, but a little less force in the deep bass. In many ways, the issue is one of whether you like to sit forward and become directly involved in a performance, or slightly back in the hall, listening to a mix of direct and reflected sound. Both are musically valid approaches.

- The Monster Alpha Genesis is slightly quicker and more detailed than the van den Hul MC One, but the van den Hul has deeper and more dynamic bass, and a little more force in the lower midrange. A pure detail freak will go with the Alpha Genesis, but a timbre and pitch freak will probably try to match the choice to his or her system's overall balance.

More broadly, the Alpha Genesis 1000 has a very natural apparent soundstage for most home listening, particularly with popular music, chamber and small orchestral music, voice, and small- to medium-sized jazz groups. You not only get width, but instruments and voices seem naturally placed in an arc from left to right and front to back. If you've thought you heard good imaging with the Alpha 2—and think my comments on the Alpha 2 too harsh—listen to the Alpha Genesis 1000.

The Alpha Genesis is also significantly cheaper than the other three rivals for my choice of top reference cartridge. It may not suit your particular system or taste, but I have heard $3500 cartridges that don't really come close. No cartridge I have heard at any price is convincingly better in terms of overall performance.

**Ortofon MC-20 Super: $300**

The Ortofon MC-20 is considerably better than its predecessors, and is quite good for a $300 cartridge. It is a bit lean, however, and overall frequency balance is tilted so that the highs are emphasized at the expense of the bass. This is perfectly tolerable if your system does not have any upper-midrange hardness and your speakers tend to roll off a bit or seem a bit slow in the highs.

The dynamics are good, but the bass is a bit slow and overcontrolled, the lower midrange just a bit dull. As is the case with many cartridges, it gives the impression of a very wide but slightly shallow soundstage. Instruments have air and good placement, but the quicker and subtler details of its higher-priced rivals
are missing. A good cartridge with many of the sound characteristics of a good CD player, but not the state of the art. Output is a bit too low to avoid slight noise problems, or a slight compression and loss of upper-octave response with many preamps.

**Ortofon MC-30 Super: $450**
The MC-30 Super, supposed to be derivative of the MC-2000, is a better cartridge than the MC-20. The main difference is a significant improvement in the resolution of the upper midrange and treble. Otherwise, the MC-20's basic sound character is mirrored in the MC-30. The frequency balance tips upward, there is less depth in the overall soundstage and imaging, and the resolution does not equal that of the Monster Alpha Genesis, Talisman Virtuoso DTi, or van den Hul MC One. It is much better and smoother than its predecessors, however, and much more of a music-lover's cartridge.

**Shinon Red Boron: $659**
The Shinon Red Boron holds up very well, although it has been around longer than many of the cartridges in this survey. It is still a very neutral cartridge, with good overall frequency response, speed, detail, and soundstage performance. Its upper-octave response is slightly elevated, but not aggressively so, and there is no artificial spotlighting or "etching" of the highs and imaging. Like the van den Hul MC-10, however, it is outpaced in terms of speed and detail by the Monster Alpha Genesis.

**Shure V-15 V MR: $220**
**Shure Ultra 500: $400**
Shure doesn't always have an easy time of it from high-end reviewers, and I suppose they won't get the best of times from me. I included the Shure V-15 V MR in this survey because so many of the reference cartridges I've discussed are expensive—often more expensive than most audiophiles can afford. The Shure V-15 V MR commonly discounts at mail-order houses for $125-$140. Most of the other cartridges discussed here do not discount heavily, if at all.

What you get for your $125-$140 is a relatively colorless cartridge that works well in medium-quality and even mediocre arms. "Colorless" is, in this case, a blessing. I've heard many reviewers praise other cheap or moderately priced magnetics, but when I tried
them, I found that they accentuate some performance characteristics that a particular reviewer may like, but which comes at the cost of overall balance.

The Shure V-15 V MR does a good job of letting all the music through. It has flat, extended frequency response, good detail, good dynamics, and a stable and realistic soundstage. It does slightly veil virtually every aspect of performance, but does less damage in the process, without calling attention to itself. If you want a budget "reference" cartridge, I believe that the Shure V-15 V MR is it.

That said, I can no longer get excited about the Ultra series—and I have contained my joy from the start. The top-of-the-line Shure Ultra 500 is better than the V-15 V MR, but not more than $20 or $30 worth in terms of percentage of total cost for percentage of improvement in detail, life, and air. I'd much rather have an Adcom or Grado at $200-$325 than a $400 Ultra 500.

**Talisman Alchemist IIIIS: $450**

This cartridge shows its age more than most. The brightness most reviewers detected when this cartridge first came out now seems almost unique when compared with more recent state-of-the-art cartridges. You can get a great deal more detail with far more sweetness and less listening fatigue. This product is now of interest only if you want to show just how much progress the Talisman Virtuoso DTi has made over the Alchemist . . .

**Talisman Virtuoso DTi: $1200**

. . . and the Talisman Virtuoso DTi represents one hell of a lot of progress. It is a superb cartridge, offering extraordinarily lifelike detail and natural musical sound. It is also a high-output cartridge, which makes it the reference cartridge of choice for anyone with a well-loved tube or transistor preamp without a high-gain phono stage.

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**Talisman Virtuoso DTi cartridge**

The Talisman's great strength lies in its superb reproduction of the upper five octaves. It competes with the Monster Cable Alpha Genesis and the van den Hul MC One in providing the most consistently believable and musical detail in these octaves, with no trace of hardness or grain.

Timbre, soundstage, and dynamics are a bit forward, but only a bit—say Row E. Instruments have superb placement, and more air and depth in the upper octaves than any CD listener may believe possible. The practical problem for a review is that this is also true of the Alpha Genesis and van den Hul MC-10, but...
I would defy anyone to precisely define the differences—you have to hear them to decide. The most I can say is that the Talisman DTi tends to have the widest soundstage and most open sound, although this is as much a curse as a blessing. I can't help wondering if it—like the Alpha Genesis and van den Hul—isn't revealing detail that the producer may sometimes have preferred to be left hidden. Certainly, it is merciless in revealing badly placed microphones and poor mixes. Fortunately, these errors aren't all that common unless you listen to records made by little-known firms like Cost Before Sound, Deutchesgrungaphon, and R "C-minus" A.

The lower midrange and bass are very good, but not quite up to the standard of the upper octaves of the Koetsu. The timbre and dynamics are just a bit recessed in the lower midrange and the bass. While the Talisman DTi lacks the artificial warmth of many moving-coil cartridges in the bass, and has excellent resolution of bass detail, it also lacks just a bit of the force that comes through on the Alpha Genesis and van den Hul MC-One.

The Talisman DTi is, however, an ideal cartridge for anyone trying to find out just how much detail his or her records contain. It is superbly and believably transparent, and definitely ranks as one of the four best cartridges tested in this survey.

van den Hul MC-10: $695

If it were not for the Monster Alpha Genesis 1000, I would still rank the van den Hul MC-10 as a competitive reference cartridge. The problem is that while the van den Hul MC-10 still does everything well, it does not do anything quite as well as the Monster Alpha Genesis. Also, its general sound character and advantages are too similar to the Genesis to allow it to stand out against such competition.

The Monster Alpha Genesis provides a level of detail of insight into the music that the vdB MC-10 lacks. It does not remove 100 more veils, but it does let fall one or two. As any good stripper knows, it is the last veils that count. A shift from the Monster Alpha Genesis results in a loss of dynamics, less ability to handle the top of the upper midrange and treble, and less overall coherence and focus.

van den Hul MC-One: $795

By contrast, the van den Hul MC-One is a much better cartridge than the MC-10. While sometimes described as a hand-selected MC-10—and looking somewhat similar, except for the color of its body—my sample of the MC-One sounded much better than the MC-10, and measured better as well. The highs were flatter, and the MC-One had truly excellent separation and interchannel balance.

Whatever the reason, the MC-One has substantially better upper-octave performance, consequently producing significantly more musically natural detail without exaggerating any aspect of musical performance. "Neutral" is an overworked term, but the MC-One has a balanced and uncolored sound that makes it one of the best cartridges I have ever heard.

The MC-One's soundstage is open without being exaggerated. On good records, there is a wide dispersal of instruments and voice in musically natural positions without a loss of
depth etching the imaging unnaturally. The apparent seating position tends to be Row F to Row H, rather than the slightly forward sound of the MC-10, and there is good resolution of hall sounds and low-level detail. Strings, brass, upper woodwinds, and voice are very smooth. There is bite in the upper midrange when this is natural, without any exaggeration or artificial detail.

There are, however, several areas where some slight improvement could be made. The bass has unusual power and will suit many systems, but lacks the definition and controlled power of the best competition. While the van den Hul MC-One’s resolution of dynamics and detail were very good, the Monster Alpha Genesis 1000 and the Talisman Virtuoso DTi did better, with slightly more natural life and air. The Koetsu Signature Red is superior from the upper bass to the midrange. The van den Hul MC-One is clearly a top contender, but its top rivals are equally well worth auditioning.

Some Parthian Shots
This survey is obviously more introductory than comprehensive. Believe it or not, the 1986 Audio Annual Equipment Directory lists 151 cartridges in the $200 or more bracket, and 20 which approach or exceed $1000. While many of these products may never win nominations as the reference cartridge, there obviously are more candidates to hear. Leading omissions include the Carnegie, Cello, and the Linn Troika, but there are many more.

I look forward to hearing as many as possible. I have had a great deal more fun with this survey than most comparative reviews, and I hope that my praise for some of the latest designs will at least tempt you back into reexamining how good the latest cartridges can be. Admittedly, the convenience of CD is terribly tempting. Without adjusting, worrying about dealer set-up and matching components, you can still get very good sound. As I said at the beginning of this survey, however, the tradeoff between the best CD player and the best analog phono front end still favors analog phono. A great CD player is one that does negligible damage to recorded music. A great analog front end is one that makes music come alive.

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Martin Colloms examines the performance of Sony's DTC-1000ES R-DAT recorder in the context of the professional recording standard, Sony's PCM-1630 U-matic recorder.

Specifications (Sony DTC-1000ES R-DAT): two-channel, rotary-head, self-contained digital tape recorder (does not require a separate tape transport). Sampling frequency: 48kHz (will also record/replay at 32kHz and replay at 44.1kHz). Quantization: 16-bit linear. Data transmission rate: 2.46Mbits/s. Subcode capacity: 273.1 kbits/s. Modulation system: 8-10 conversion. Error correction: Dual Reed-Solomon. Frequency range: 2Hz-22kHz. Dynamic range: greater than 96dB. THD at 0dB: 0.005%. Wow and flutter: ±0.01% (weighted peak). Tape speed: 8.15mm/s. Writing speed: 3.13m/s. Head-drum diameter: 30mm. Head-drum rotation speed: 2000rpm. Tape head-drum wrap: 90 degrees. Head azimuth angle: ±20 degrees. Recording time: 2 hours. Tape type: metal powder. Tape thickness: 13um. Tape width: 3.81mm. Cassette size: 73mm W by 54mm D by 10.5mm H. Price: to be announced. Manufacturer: Sony Consumer Products, Sony Drive, Park Ridge, NJ 07656. Tel: (201) 930-1000. Product not yet released in the USA; review sample bought in Tokyo.
With the present furor over the launch of DAT (digital audio tape), it is worth remembering that commercial digital recorders have been with us for some time now: it is now nearly a decade since studio PCM converters were first successfully used for audio recording in conjunction with a VCR (which uses a helical spiral recording via a spinning drum to achieve the high writing speed). Such systems evolved into such relatively popular units as the Sony PCM-Fi, used with the matching SL-2000 VCR for many amateur and professional recordings, and Technics even introduced a PCM console recorder with a built-in VHS transport. Nowadays, however, with professional multi-track digital recorders becoming commonplace, the VCR method has been largely superseded by linear tape recording. Multitrack digital recorders, however, are very expensive, and considerable scope remains for the PCM “adaptor” type of recorder, which exploits the high information-storage density of established inexpensive video recording systems.

When a true domestic DAT system was proposed, two systems emerged. One was based on the use of a stationary multi-track head for which thin-film technology was proposed, 20 or so parallel digital tracks being required for the data and error-protection data for a stereo audio channel. For commercial reasons, the Japanese industry wanted to get DAT onto the domestic market and apparently could not wait for the thin-film technology to mature. Rotary-head designs could deliver the required information-storage performance, but conventional VCR mechanisms were thought to be too big and noisy for serious use in a domestic audio recorder. The development of the compact 8mm video medium provided the potential for very small cassettes and tape widths. From this it was but a short step to define a unique miniature “video” type cassette, specify the complementary rotary-scan video-type recording method, and dedicate it to consumer audio recording, resulting in the R-DAT format. The design includes a synchronizing timecode to allow quite rapid access to any part of the tape and the modest head-wrap angle of 90° allows for the use of easy-loading mechanisms, as well as very fast wind speeds, at present 200 times the play speed.

The commercial result is a range of first-generation domestic machines, looking not unlike large CD players, with a similar drawer-load tray and a very similar control keyboard and numeric display. Automatic track programming is a standard feature of the R-DAT designs: once a tape has been recorded, play modes and track selection operate just like a CD player. Compared with an older PCM/VCR system, or even the professional PCM-1630/U-matic combination, the R-DAT recorder is a joy to use, with fast-access quick rewind of 2.4s/minute (50s for a two-hour tape), and the mechanism is also reasonably quick by domestic CD standards.

Potentially, R-DAT provides the consumer with a digital recorder of near-professional quality, allowing, in theory at least, very high-quality recordings—better than large open-reel sound but with cassette convenience.

For comparison, Sony’s two-track professional machine is the PCM-1630, a unit in the $23,000 class when bought with a matching U-matic recorder. The 1630 is well established in the industry and is specified by Polygram for CD mastering. As its lab performance will show, it is something of a reference machine. I was fortunate enough to have access to a 1630 for extensive lab testing, and the results give some idea of the advances which have been made with regard to PCM recording technology. Against this background, it was instructive to subject the budget domestic equivalent, in the form of Sony’s DTC-1000ES R-DAT recorder, to virtually the same battery of tests. How would the domestic equivalent compare with the professional model at over 10 times the cost?

Sony PCM-1630

Taking the 1630 first, a look at the manual gives some insight into its internal organization. As with many professional units, the design is founded on a large, rack-mount enclosure incorporating an internal backplane (an array of vertical multiway sockets). The electronics are carried on a number of circuit-board assemblies which slide into the enclosure from the front and plug into the backplane sockets. The enclosure constitutes the mainframe, and the backplane wiring, often quite complex, routes signals and power supplies from board to board.
The two balanced input signals enter the 1630's back via XLR sockets and semi-preset level controls, and are routed to the A/D board via 20k ohm series resistors; the first stage is a low-noise 5532 op-amp (a dual 5534) with differential input clamp diodes. Up to 10V RMS may be applied to this input as it is followed by a subsidiary level control, with maximum attenuation limited to 36dB. Another op-amp follows, whose frequency response is determined by an FET-switched capacitor, this the recording pre-emphasis option. Two more biFET op-amps drive the thick-film, brickwall, anti-alias filter, which chops frequencies above 21kHz; more op-amps add feedback/phase correction to the filter. The filter stage for each channel is buffered by yet another 5534 op-amp, followed by the 16-bit linear A/D convertor, a Sony CX-20018, driven by three peripheral IC op-amps; in this case, 356s. The digital data for both channels are then conditioned and processed on the modulator board to constitute an NTSC standard video signal ready for recording.

The 16-bit linear DAC board is stereo, and has a considerable amount of circuitry, with Sony CX 20152 chips used for D/A conversion. Industry-standard IC regulators—7815 and 7915 types rather than the lower-impedance 317/337 types—supply the ±15V op-amp rails, one set per channel. Many small L/C filters are present throughout the power supplies and lines in order to filter and isolate stages from each other, suppressing the digital pulses and their harmonics.

The interesting part of the 1630, as compared with earlier professional PCM machines, is the D/A section, which employs 2x oversampling with digital filtering. It appears to owe much to the design technology of Sony's DAS-702es domestic CD decoder (see Stereophile Vol.9 No.8 for the '702 and Vol.10 No.4 for the similar '703 decoder). Quite a lot happens to the two stereo channels after the oversampling/digital filtering and D/A conversion. The output passes through LF356 op-amps, via the logic switch deglitcher, to a "2525" IC filter stage, using inductor and feedback capacitor methods. This buffer drives the main, thick-film technology, AF LI/201, low-pass filter, this labeled identically to the record input filter. Four more ICs are present, mainly 5534s, for additional filtering, phase compensation, and de-emphasis. The final op-amp drives two class-A/B discrete output stages per channel, one for the "hot" and one for the "cold" halves of the balanced differential output.

I have included this circuit description because I feel that it might give some insight into the sound quality of this processor. It should be noted that both the record and the replay level chains are essentially DC-coupled throughout, so questions of coupling capacitor quality do not arise. However, given that every active stage plays a part in the sound-quality chain, it is worrying to find 13 of them in the record/replay path, excluding the A/D and D/A converters. It is known that, under critical domestic listening conditions, we can hear the loss imposed by a single 5534 op-amp in a preamp line stage. Considering the recording chain as a whole, if the audio has passed through a mixer console it may at best have encountered another dozen or so 5532/4 stages, or, even worse, through stages with less well-considered ICs, as well as through a number of coupling transformers. It strikes me that a lot needs to be done to improve the design practice of recording systems.

Sony DTC-1000ES

I was not able to perform an accurate head count on this R-DAT machine but from a quick look at the boards, I would estimate the number of active stages to be one third that of the 1630, while the physical signal-path length is probably a quarter, and without the need for a backplane or balanced input/outputs. Assuming a similar digital-section performance, one might expect the DTC-1000 to sound more transparent purely as a consequence of its relative simplicity.

As befits its "ES" suffix, the DTC is carefully designed in the Sony Esprit tradition. The chassis is copper-plated to combat induced currents circulating in the metalwork, and the case, like that of the PCM-F1, is damped to reduce acoustic vibration. The analog and digital power supplies are separated—a clear change from the first-generation Sony CD players—and it is clear that some considerable care has been taken over the choice of components: ELNA Cerafine capacitors,
for example, are used in both reservoir and decoupling applications. As with the 1630, the record section is dual-channel, using two of the same Sony CX-20018 ADC chips, non-oversampled. There is one input op-amp leading to the good-quality Soshin anti-alias filter, a thick-film encapsulated model. Two further op-amp stages lead to the A/D. Once in digital form, the coded audio is multiplexed and routed to the main digital processor, the two R-DAT chips, CXD-1008Q and CXD-1009Q. These, in conjunction with two blocks of 64k memory, handle the error-protected transfer of data to the rotary-head recorder section and back.

Once the digital data is recovered off-tape, deprocessing can begin. For replay, decoding is 4x oversampled, ultra-flat passband, high-order digitally filtered and D/A converted, using Philips's dual-channel 16-bit TDA-1541 chip at present. The final output filter is a simple three-pole Bessel type, and the replay chain is linear phase. (The record section is not linear phase owing to the uncompensated input brickwall filter.) Relatively few op-amp chips are used in the filter-output section.

One small difference concerns sampling rate. The 1630 is set to CD standard 44.1kHz (or 44.056kHz). The R-DAT normally works at 48kHz, but it can decode at 44.1kHz, and will also decode and recode DBS (Direct Broadcast by Satellite) digital inputs at 32kHz. Current DAT recorders have a copy-inhibit system which prevents them recording in digital mode from the digital output of a CD player if the appropriate flag is set in the CD's PQ subcode.

Sony PCM-1630 Test Results
Sony specifies a tolerance of +0.5, -1dB for the PCM-1630's overall record/play frequency response; when measured with emphasis off, the result was a fine +0.2, -0.9dB from 10Hz to 20kHz (fig.1 shows the infrasonic response from 0.125Hz to 50Hz, fig.2 shows the response from 1kHz to 26kHz). The anti-alias filter came into effect above 20kHz; at 22kHz, for example, the output was already 50dB down. Considering the minor nature of the variations in frequency response, there is unlikely to be an audible effect.

The two channels agreed closely on the measured parameters, and the unweighted signal/noise ratio was fine at 96dB with preemphasis, 90dB without. Using the CCIR ARM (1kHz) weighting, the benefit of preemphasis is shown more clearly with more

![Fig. 1](image1)

![Fig. 2](image2)
representative record/play noise ratios of -5dB without preemphasis, 90dB with.

Full level—0dB—on the excellent level meters, indicated virtually full modulation; unlike VU-meter systems, however, there was no additional margin.

The record/replay linearity was checked using a precision spectrum analyzer over the full available dynamic range: the surprisingly good results are given in Table 1, which shows that a decent amount of dither has been incorporated to effectively linearize the low-level performance. For comparison, most CD players generate considerable linearity errors by -90dB modulation, typically 3-5dB, while errors of 10dB are not uncommon. The 1630 was 1dB accurate over the record/replay cycle at -90dB and continued to store and recover analyzed sinewaves placed well into the broadband noise floor, eg, down to -120dB. Fig.3, a ±50Hz zoomed analysis, actually shows that a 1kHz signal can be recovered at -118.04dB, over 20dB below the cutoff point of an undithered 16-bit system! Returning to more realistic signal levels, fig.4 shows the harmonic spectrum, or should I say the lack of it, for a sinewave recorded at -90dB. Fig.5 shows the corresponding waveshape, a substantially pure one, masked by the presence of some random-looking noise.

This good distortion picture was little changed when the unit was driven to full level (fig.6, 1kHz signal at 0dB). Third harmonic at -82.5dB (better than 0.01%), for example, was the only significant product. Note the absence of digital spuriae. Reducing the level to -10dB resulted in little change, apart from the second harmonic now being higher.

**TABLE 1**

<table>
<thead>
<tr>
<th>Input Level</th>
<th>Replay Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>-120</td>
<td>-120</td>
</tr>
<tr>
<td>-110</td>
<td>-108.1</td>
</tr>
<tr>
<td>-100</td>
<td>-98.4</td>
</tr>
<tr>
<td>-90</td>
<td>-89.0</td>
</tr>
<tr>
<td>-80</td>
<td>-79.8</td>
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<td>-60</td>
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<td>-9.95</td>
</tr>
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</tr>
<tr>
<td>80</td>
<td>-90.00</td>
</tr>
<tr>
<td>90</td>
<td>-100.00</td>
</tr>
</tbody>
</table>

**Fig. 3**

**Fig. 4**

**Fig. 5**

**Fig. 6**

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in level (-82.7dB) than the third. Fig. 7 shows the distortion spectrum and resulting alias products for a full-level 20kHz tone. This is a demanding test, but the result was really good, with the only significant inband spurious tone placed at 4kHz (44kHz-2x20kHz) at a harmless -75.19dB. Good suppression was also seen for the 44kHz sampling frequency, with an absence of higher-frequency products. The alias products decrease rapidly both with frequency and record level.

Fig. 7 shows distortion for a mid-level signal, 1kHz at -40dB, the spectrogram extending to 100kHz. The 22kHz spurious product was -95dB relative to full level, while the 1kHz distortion was around 0.07% and close to the noise floor. Other spuriae were well suppressed.

Another cruel test concerned both full-

![Fig. 7](image)

Fig. 7

level and -10dB level intermodulation, the test signal consisting of a 1:1 mixture of 19 and 20kHz. At 0dB (fig. 9), the main product was 1kHz at -71dB, a good result for a recording system, while reducing the drive level to -10dB resulted in the 1kHz product vanishing into the noise floor at -85dB.

Channel separation is important in the context of a professional system, and here the 1630 confirmed its competence, exceeding 100dB from 20Hz to 20kHz: typical measurements were 20Hz, 117dB; 1kHz, 119dB; 20kHz, 103dB.

A fine performance was seen in the replay of a 400Hz squarewave with a sensible risetime (fig. 10). The flat tops confirm the extended low-frequency bandwidth, with quite moderate ringing. When the input was driven with a fast-risetime (10us) impulse, the input alias filter rang quite hard, and the output was not linear phase (fig. 11). However, it was non-inverting.

These results show the PCM-1630 to be a well-developed design, with no obvious technical flaws and a wide linear dynamic range. How about its domestic equivalent?

**Sony DTC-1000ES Test Results**

To measure the record/replay frequency

![Fig. 8](image)

Fig. 8

![Fig. 9](image)

Fig. 9

![Fig. 10](image)

Fig. 10

![Fig. 11](image)

Fig. 11

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response, the machine was run at the standard 48kHz sampling rate without preemphasis. It held to a +0.1, -0.35dB tolerance from 20Hz to 20kHz (fig.12), while the -0.5dB points were wide at 2Hz and 22kHz. In record "monitor" mode, the response was a little tighter at ±0.15dB. The brickwall filter point occurred at 24kHz. Channel matching was excellent, typically within 0.1dB, while channel separation exceeded 95dB over the audible range.

The full-level midband harmonic distortion was considered excellent at -90dB, 0.003%. With the input level turned down to -60dB (fig.13), the analyzed distortion spectrum showed no visible harmonics. The computed reading was -47.62dB, but this was merely noise.

Given a theoretical 96dB dynamic range for a 16-bit system such as this one, the measured distortion for a tone at -60dB should be -36dB, yet nothing can be seen (fig.13) at -50dB, below the measurement noise floor. This is reminiscent of the PCM 1630's use of linearizing dither. Checking the DTC-1000 for record/replay transfer linearity, we got the results in Table 2. Again, as with the 1630, if a 16-bit system "stops" at -96dB, how come these machines can encode and decode accurately at -110dB? Certainly a straightforward 16-bit linear system could not do this, but neither the 1630 nor the 1000 are such systems. With dithered encode, the effective linearity is improved by the order of 3 bits, or 18dB, while both machines offer better than 16-bit replay via oversampling, 2x for the 1630, 4x for the DTC. Even so, this still does not fully account for the excellence of the low-level resolution featured by these machines. I cannot see now how objections to the low-level linearity and resolution of digital can be sustained, at least regarding machines such as these, since it is so clearly superior in this respect when compared with other media.

To confirm the R-DAT's resolution, a sinewave was recorded at -90dB. Fig.14 shows that on replay, a real sinewave, albeit noisy, is returned. Few CD players can match this performance.
To check the high-frequency performance, the recorder was driven to 0dB at 20kHz, with a fine result (fig.15). The main modulation product at 8kHz (48kHz-2x20kHz) was well suppressed at -77dB, and decreased very rapidly with decreasing input frequency. However, the ultrasonic (inaudible) product at 28kHz (48-20) was at a higher level of -53dB. Complementary measurements for two-tone high-frequency intermodulation gave equally fine results: -74dB for full level and -82dB at a -10dB test level. Using a -60dB 1kHz “signature,” the spurious upper-range signals were assessed up to 100kHz. 48kHz was the sole component of significance, set at a fine -100dB, relative to full modulation.

The machine delivered an unweighted record/replay S/N ratio of 91dB; this was 93dB with CCIR ARM (1kHz) weighting, which compares favorably with the professional machine. Moreover, the overall linearity and resolution figures were also comparable, with full-scale resolution approaching 15.5-bit, and an effective low-level linearity of near 17-bit.

Absolute-phase correct, the DTC-1000 also showed negligible phase shift between channels, with a maximum of 1° noted at 20kHz. The 400Hz squarewave response (fig.16) revealed a most tidy result, non-linear phase, but with quite moderate ringing and overshoot (18%). An extended low-frequency response with low associated group delay was indicated by the waveform “squareness.”

Digital recording systems have been criticized in the past for poor clipping performance. The DTC1000 was driven into clip with a 1kHz signal: fig.17 shows the replay result. As can be seen, there are no missing codes, no sharp transients or spurious effects—just clean, vice-free, “analog style” clipping. On music it sounded much as it looks here, with a surprisingly mild audible impairment for moderate (up to 6dB) overloads.

Considering that R-DAT has various technical complications such as servo azimuth and the usual clock/timing reinsertion, it was decided to put the Sony claim for wow and flutter to test: namely ±0.01% weighted peak. With the IEC 62 DIN peak weighting, the record/replay value was established at ±0.005% (±0.002). Given that analog tape systems produce relatively high levels of flutter sidebands as well as modulation noise, and remembering that, potentially, R-DAT represents the domestic cassette standard of the future, a narrow-band spectrum analysis was made of the 3.150Hz replayed tone to assess its pitch stability and noise-modulation performance (fig.18). With a total span of 25Hz and an analyzer resolution of just 0.238Hz, the first modulation shoulder was

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as close as 1Hz from the fundamental at a superb 78dB down. The spectral analysis was pure, and no wow components were evident. Compare this with the equivalent result for a good cassette deck (fig.19: note that the span is now ±200Hz, a factor which is kind to the analog machine). Here one might be forgiven for wondering whether compact cassette is capable of holding true pitch at all! I believe that these differences are audible, aurally telling over several minutes of well-tuned piano rather than on a short A/B basis.

Absolute speed was held at 0.01%, and the record/replay tape encoding and error correction was such that one was largely unaware of whether the signals were off-tape or monitored. (The "monitor" line passes through most of the processor circuitry.)

Like CD, the 0dB output level was 2 volts, sourced from a low 364 ohms. A 300mV input will drive the DTc-1000 to full modulation via an unbalanced 50k ohm input (there are no microphone inputs). With a fast-wind time of 27 seconds for an hour of tape, access to individual time-coded tracks was comparatively rapid—one of the fastest tape-handling systems I have used.

Sound Quality
Any representation of the sound quality of a recording system is more complicated than might at first appear. Out in the real world, with live music, the sound quality available as a direct feed from a good microphone transcends that generally replicated and available to the consumer. So good is this quality that, even with the losses imposed by relatively primitive recorders, much still remains. Arguably, the recording technique and the performance itself are far more important than the recorder used for capture and storage.

In this context, it must be said that well-designed digital recorders can do a very competent job. Fine results have been obtained and can be demonstrated from many decks, including Sony's PCM-F1, PCM-701es, DTC-1000es, and PCM-1630. In fact, there is little to choose between them on replay merit. All were free from spurious noise, wow, and flutter; none suffer from high-frequency compression, or irregularities of frequency response or channel balance. Still more important to the operator, no specific tape selection or alignment is necessary, as the replay quality is essentially tape-independent.

In objective terms, the overall sound quality of one of these digital PCM units exceeded that of the channels of a typical modern multi-track mixer; most studio engineers regard digital recording as virtually perfect for this reason. It is worth noting that the $2000 domestic PCM unit essentially equals the sonic performance of a professional machine costing in the region of $23,000; in this respect, competent digital audio is a great leveler. One might then question the sound quality of a studio multi-track console.

However, we can also adopt an alternative standpoint, and place the so-called "perfect" or "nearly perfect" digital recorder in a high-quality audio chain. It can then be regarded as performing as a unity-gain amplifier with programmable time delay! What does it then sound like in a top-class domestic system? Well, if viewed as a preamp line stage and interposed between one’s existing preamp or a good CD player, then the inevitable loss in quality may be put in understandable terms. To define the context, assume that, for the present, I scale subjective audio quality for electronics in the range 0-15, with the top score as present state of the art, "0" a large table radio, and "3" a good budget rack.
system. Competent-sounding audio lies in the 7-11 range.

Top CD sound scores 12.5 at present; against this score, the PCM machines’ record/replay cycle achieved ratings between 6.5 and 7.3 when inserted into the reference system, a surprisingly small spread.

Given this modest rating, the sonic differences between PCMs were not particularly significant, the main differences concerning an easier, sweeter sound, with an improvement in stereo perspectives noted with the R-DAT and PCM-1630 when compared with the earlier non-oversampled PCM-701es. Overall, there was a consistent loss in dynamics and drama, a softening of bass definition, and a reduction in transparency, stereo depth, and treble detail. These effects, however, were not identifiable “digital” in nature: if anything, they related to the usual losses encountered with some of the more complex electronics of the “high-tech” preamplifiers from major Japanese companies.

A grade “10” CD player, recorded and replayed through any of the PCM units, ends up at grade 6.5 to 7—clearly, no audiophile will record CD via the analog domain on to R-DAT except for background-music purposes. In theory, direct digital recording is possible, since the R-DAT will operate at a 44.1kHz (CD format) sampling rate, as well as 48 and 32kHz; given a good, CD-quality equivalent replay section in the recorder, it would be able to record and replay with fidelity equal to CD. This, however, has been blocked by the “copy prohibit” instruction encoded on CD and obeyed by domestic R-DAT recorders.

The additional proposal pioneered by CBS, concerning a spoiler code to be imposed on all records, consists of an intermittent 300Hz-wide notch, 60dB or deeper, at 3840Hz (see JGH’s discussion elsewhere in this issue). CBS claims this to be inaudible, but many industry experts judge it to introduce a degradation in fidelity. Future R-DAT recorders may be forced by law to incorporate circuitry to recognize the presence of this notch and refuse to record. Consumers would thus be prevented from exploiting the true potential of a domestic digital recorder as a rightful component in a digitally based audio system. At the very best, the CBS Copycode proposal must be carefully assessed. If it is recognized, as I think it should be, as a threat to fidelity, it should be stopped.

Comment

The domestic R-DAT format is a successful piece of design and engineering: as typified by this Sony machine, it works very well, with no identifiable code errors, low mechanical noise, convenient tape/time access, and—in context—good fidelity. The lab performance was most impressive, and closely approached the professional equivalent. The latter, Sony’s PCM-1630, shows just how far commercial digital recording technology has come in terms of dynamic range, low-level linearity, and general accuracy. For semiprofessional recording, however, an R-DAT machine would do nearly as well, matching the performance of the full-sized system for simpler productions. If switched to 44.1kHz (some internal modifications are needed, modifications that would be subject to a $50,000 fine under the bill currently before Congress), it could be used for the first stage of CD mastering.

Considered as a hi-fi component, Sony’s DTC-1000es R-DAT works admirably. Nevertheless, two major questions arise. First, why doesn’t the recorder at least match the perceived quality of a good CD player? There is an interesting idea of precedence and logic here. Second, if the copyright constraints prevent effective domestic use of an R-DAT machine except for occasional live recording, thus restricting replay to as-yet-poorly planned prerecorded tapes, what could the machine be used for?

Taking the first point, we have to remember that assessing the sound of a PCM as a complete line stage is illogical, since normally (hopefully!) we would encode once and the replay/decode would be via a CD player with a digital input (the handbook for the 1000 illustrates use with Sony’s DAS-703es). Thus this test is unrealistically arduous. Nevertheless, some of the shortfall, in my view, is not the fault of the digital part of the process but is tied up with the rather lengthy cascades of audio chips used between the input and the outputs of a PCM system. Certainly the simpler consumer models—the PCM-701es, DTC-1000es, sounded “sharper” and more dynamic than the more complex
1630. Improvement in this area is a function of good audio systems engineering, and I suspect that there is considerable scope here.

As regards the second question, I believe that R-DAT is a clever design lacking in mass-market consumer relevance, and is emasculated in terms of its digital interfacing. Perhaps the Japanese Electronics establishment believed that anything with "Digital Audio" on it would sell. At present, R-DAT decks are big and expensive, while tape prices are higher than those of compact cassette. (3M has announced that its 120-minute tape will cost $12.) Pre-recorded material hardly exists, and in any case is only compatible with itself! DAT certainly has a future, but at present it must be considered a long-term one, with possibly five years before worthwhile sales, and 10 before dominance of the quality cassette market. As for CD sales, I think that they will be largely unaffected. Surely R-DAT represents the recipe for minimal sales of a new technology.

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**DBX 700 DIGITAL PROCESSOR**

Bill Sommerwerck

![DBX 700 PCM processor](image)

Rack-mount digital audio processor using predictive delta modulation with compansion (CPDM). Output: conventional TV signal (North American standards) which can be recorded on any high-quality VCR. Power consumption: 60W. Dynamic range: 110dB (maximum 1kHz signal to A-weighted noise 20Hz-20kHz), 105dB (unweighted). Frequency response (sinewave 100mV input): 20Hz-20kHz ±0.5dB. THD (1V input, 1kHz): less than 0.05%. Wow & flutter: less than 0.01% (unweighted), less than 0.006% (weighted RMS). Anti-aliasing filtration: -3dB at 37kHz. Sampling/bit rate: 644kHz. Maximum input/output levels: 24dBm. Mike preamp (optional): adds less than 1dB of noise for mikes between 100 and 1k impedance. Inputs: line 5k, differential; edit audio 20k, differential; mike 100k, 6.8k if phantom-powered (48V); video & sync 75 ohms. Outputs: line 47 ohms, single-ended, drives 600 ohms, switchable to balanced; edit audio 100 ohms, single-ended; headphones 150 ohms. Dimensions: 19” W by 3” H by 11.5” D. Source: long-term manufacturer’s loan. Price: $4600 plus $375 for mike preamplifiers. Manufacturer: dbx Inc., 71 Chapel St., Newton, MA 02195. Tel: (617) 964-3210.

As ALF would say, "There's more than one way to cook a cat." We've been so overwhelmed with linear pulse-code modulation (PCM) recording, we forget there are other ways to pass from the analog domain to the digital.

One of these is delta modulation. The Greek delta (which in its upper-case, block-letter form, looks like an equilateral triangle) is the mathematical symbol for the difference between two quantities; accordingly, in delta modulation, we record not the absolute value...
of a signal sample, but the difference between successive samples.

Delta modulation isn't new. It's been used for years as a simple way to reduce the necessary bandwidth required to transmit TV signals. Poke your nose up against the CRT, and you'll see that one horizontal line is very much like the preceding or succeeding line. The lines' content doesn't change rapidly, so we don't need much information to describe the difference between one line and the next. If we transmit just the difference information, there's a big reduction in the required bandwidth. (Major changes, which require a lot of transmitted information, are uncommon and don't significantly drive up the bandwidth requirements.)

The same principle can be applied to ordinary PCM. The difference between two samples can never be as large as the absolute maximum level of the program material—sounds do not jump 96dB in 1/50,000th of a second!—so our 16 bits, which would normally cover the full dynamic range of the signal, can be applied to the much narrower range of sample differences. If we designed a system on the assumption that the difference between one sample and the next was never more than 1% of peak signal level (a conservative estimate), we'd gain a 100-fold improvement in resolution! (Not bad.) Or, we could use fewer bits, for resolution comparable to that from conventional PCM. An additional advantage, besides the gain in resolution (or a reduction in bandwidth), is that we no longer have to worry about the signal's absolute level. When we "run out of numbers" in conventional PCM, the signal is clipped to produce a nasty-sounding error. But with a delta-modulation PCM system, the analogous situation produces slew-rate limiting—the recorded difference between samples is not as great as the actual difference—a less offensive distortion.

The problem with such a system, though, is that it requires some pretty hairy hardware. Not only do we have to sample the signal as accurately as in regular PCM, but we have to compute a very accurate difference between successive samples. PCM hardware is complex enough as it is. Why should we have to go to all this trouble for a slight improvement?

There's a way out of this dilemma. Suppose we could make a systematic guess as to what the next sample value would be. By systematic, I mean that the guess is not random. It follows a strict set of rules, so the same set of initial conditions always results in the same guess. Both the encoder and decoder would obey these rules. Therefore, we would only need to transmit the difference between the predicted value of the signal and its actual value. The decoder can figure out the predicted value on its own, then apply the difference signal for correction.

Such a system is called (surprise!) delta modulation. PDM creates an estimated model of the signal in much the same way a painter does a quick sketch on the canvas before he fills in the details, then transmits a code that describes whether the estimate is larger or smaller than the actual value of the next sample. If the sampling is fast enough (greater than about 500kHz), there usually won't be too big a difference between one sample and the next. The difference between the sample and the estimate will then be so small that we can accurately describe it with a code of just one bit!

The basic PDM circuit (from the dbx manual) is shown in fig.1. It looks complicated, but it's really very simple. There are three sections which I'll explain one at a time.

Let's start by saying "Hello!" to our old friend, the capacitor. We can charge a capacitor by applying a voltage to it. The capacitor's charge (in coulombs!) is found by multiplying the applied voltage (in volts) by the capacitance (in farads). Or:

\[ Q = CV \]

(I know you've seen that before!)

It works just as well the other way 'round. If we stuff Q amount of charge onto a capacitor, the capacitor's voltage will increase by

\[ V = Q/C \]

Note that the change in voltage is determined only by the capacitance and the change in charge. A given amount of charge added (or

\[ 1 \text{ coulomb is an Avogadro's number's worth of electrons, about 6E23. It's named after Melvin Coulomb, the French music-hall comic who discovered how easy it was to build up an enormous static charge by shuffling across the carpet. Mel died tragically, the victim of a jealous husband whose wife's derriere he (Mel) had zapped once too often. In accordance with French legal precedent, the husband was acquitted.} \]
They're room, those charge, Simple, course, put withdrawals. 

140 by same we For capacitor, The integrator, charge magic to schematic. 

This configuration is called an integrator, because it adds up (integrates) the charge pumped into (or pulled out of) its input.

The exact way the integrator performs its magic is too complicated to go into. (I'd need to explain operational amplifier circuits, an article in itself.) But here's the important part. The injected charge is transferred to the capacitor, and the amplifier's output is the same as the capacitor voltage (given by Q/C).

For example, if the capacitor were 2uF, and we pumped in 0.5uC, the output voltage would rise by 0.5/2.0, or 0.25 volts. Likewise, if we pulled out 0.1uC, the voltage would fall by 0.1/2, or 0.05 volts. The integrator is, of course, adding up all these little deposits and withdrawals. Therefore, the instantaneous output of the integrator is simply the running, net charge, divided by the value of the capacitor.

Simple, n'est ce pas?

Where does the charge come from? From those two little circles marked Ipos and Ineg. They're charge pumps. One pushes charge, the other pulls. Like the two sides of Alice's mushroom, one makes the total capacitor charge grow larger, the other makes it grow smaller. When either is activated, it inserts (or removes) a precisely defined quantity of charge.

As you should have figured out by now, it's the integrator voltage that models the input signal. By pumping in or pulling out charge, the encoder tries to make the integrator voltage match the input. If the integrator voltage is less than the input, charge is pumped in. If the integrator voltage is greater than the input, charge is removed. But how does the encoder know whether to add or subtract charge?

Easy. It uses a comparator. (That's the triangle on the left.) A comparator is simply a high-gain differential amplifier. That is, it subtracts one input from the other, and amplifies the difference.

Assume the differential amp has a gain of 1 sagan (one billion times). If the difference between its two inputs is 1 billionth of a volt, the output will be 1 volt. Of course, a billionth of a volt is awfully small. (The circuit's random noise is much larger!) 10 microvolts is a more likely difference.10uV times 1 sagan is 10,000 volts. How do we get 10,000 volts out of an amp that runs on an 18 volt power supply?

We don't. An amplifier's output is limited to the power supply voltage. The amp simply tries its darndest to meet the 10,000V requirement. The result in engineering jargon is that

2 We assume there's no output transformer to step it up.
the amp "slams up against the rails." That is, the output jumps up to the power-supply voltage (or down to ground), because that's the highest (lowest) it can go. Which way it jumps depends on the polarity of the difference between the inputs. If it's positive, the amplifier moves to the positive rail, and vice-versa. It's highly unlikely that the integrator's output will ever be close enough to the input to produce a bounded output (ie, one that sits stably between the rails). Therefore, the comparator will constantly jump back and forth, high and low, depending on the relative polarity of the signal input and the comparator output.

Of course, we still haven't explained just how this twitching voltage selects Ipos or Ineg. That's done by the little thingy in the middle. It's called a flip-flop. As you might guess from the name, it's a circuit whose output can take one of two states—high or low. High and low can be any two voltages we like; the important thing is that the flip-flop's output must be one of these two voltages.

There are several types of flip-flops. The one shown here is a D-type ("D" stands for "data"). The flip-flop has a special data input: when the flip-flop is triggered, its output jumps to the same logic level (high or low) as the data input. The trigger signal is simply a steady frequency (in the model 700, it's 644kHz). Each time the trigger goes positive (once per cycle), our D flip-flop is triggered, and the data at the input is transferred to the output. The data, in this case, is the comparator output. Therefore, every time the flip-flop is triggered, its output switches to match the current output state of the comparator.

The little dotted line in the schematic is supposed to suggest that this logic level selects between Ipos and Ineg. Indeed, that's just what happens. The comparator "decides" whether the integrator's output is higher or lower than the signal input. The flip-flop is set to this logic state, which in turn determines whether we will inject or remove charge. And so on, as long as there's an input. (By the way, it's this train of logic highs and lows that constitutes our digitization of the input.) That's it! See how simple it is?

I can already hear objections from The Peanut Gallery. "If all you ever transmit is the difference between the actual and estimated signal values, how can you ever reach the absolute level of the signal? Isn't that what you want to recover?"

Good question. Yes, it's the absolute value we want. Imagine this not-unlikely situation. There's no input. Then—suddenly!—a really big sinewave drops by. The comparator notices that there's like, wow, a really gross difference between the integrator and input voltages. So it does out one of its little dribs of charge, and 1/644,000th of a second later, compares again. Whoops! It's still behind, so it dumps in some more charge, and so on. Will it ever catch up?

Technically, no. What happens is that the input signal falls behind. The sinewave eventually reaches its peak level, then falls. At some point on its decline, the input voltage drops below the integrator output. At this point, the integrator voltage and the input aren't too different. Everything settles down, with the estimated value close to the absolute value.

The decoding process is identical to the coding. We simply use the logic highs and lows to switch the Ipos/Ineg charge pumps. The integrator output is then a kind of zigzag approximation of the original input. Of course, the zigs and zags are at 644kHz, so it's easy to filter them out. We're then left with (we hope!) the original waveform. Of course, the actual circuit is rather more complex. A different type of integrator, which produces less quantization noise, is used. The noise level still isn't low enough for critical use, so compression (similar to the system used in MTS) is placed ahead of the encoder. There is even digital compression; if the encoder produces more than nine "highs" in a row, the compressor is told to squash the signal even further. Of course, all the compression is undone in playback.

But the nicest feature of a compounded delta modulation system is its noncritical level setting. The encoder has to be severely overdriven before it goes into slew-rate limiting, and be badly under-driven before noise becomes objectionable. You don't know what a relief it is not to have to worry about clipping the encoder when recording a live performance. (I did it a few times with the Nakamichi DMP-100, but the clipping was so brief as not to be readily audible.)

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Of course, every advantage has its tradeoff. The nature of delta modulation imposes a limit on the maximum slew rate that can be handled. For a given signal amplitude, doubling the frequency doubles the slew rate. So although delta modulation can accommodate very high frequencies, the maximum input level varies inversely with the frequency. dbx gets around this problem by weighting the record-level display correspondingly, to prevent over-recording.

Physical features

The 700 is a professional product. Though light enough to take into the field, it's intended to sit in an equipment rack; its basic configuration, therefore, is a unity-gain, line-in/line-out device. All input and output sockets are XLRs. As shipped, the line outputs are unbalanced. They can be converted quickly to balanced operation with a pair of (supplied) resistors.

The front panel is imposing at first, but the layout is completely logical: each function has its own module, and they proceed from left to right, in input-to-output order. A few minutes' perusal of the instruction book will make you an expert.

Mike preamps are an option, and plug into the first slot on the left. Once installed, a toggle switch selects between line and mike. (There is no mike/line mixing.) A second switch selects 48V phantom microphone powering. A stepped rotary control sets mike gain from 20 to 60dB, in 10dB steps.

The record input module is next. A switch at the bottom chooses record and playback—unlike the Sony PCM units, the 700 cannot simultaneously encode and decode. The 700 has a pair of conventional analog outputs that can feed the video recorder's audio tracks (either linear or Hi-Fi). In playback, these supply quick, easy cueing, since there's no need to wait for the decoder to lock in. A second switch determines whether these analog outputs will be straight or compressed. (Oddly, this compression is not dbx, and there is no playback expansion.)

The record inputs are unity gain. However, there are two options. You can move a toggle switch to ADJ, and turn a knob to vary the gain over a +10 to -60dB range. If only a small change is needed, you switch to TRIM, and use a screwdriver to turn a trimpot. Its range is ±10dB.

The input module has CLIP lights preceding and following the gain stage. dbx claims that a single cycle at 10kHz is enough to light them, if the level is too high. Keep an eye peeled, and lower the gain (at the appropriate point) if either comes on.

The next module, naturally, is for playback. It, too, is unity-gain, and it has the same ADJ and TRIM options as the recording module. There is, however, only one CLIP light, at the input. At the bottom of the module is a headphone jack (with gain control) that's live during both record and playback. A toggle switch selects DIGITAL or EDIT, which switches the headphones from the decoder output to the analog cue tracks during playback.

The last "module" is actually a cover plate for several cards underneath. All the audio and video displays are here. The audio-level display is an LED bargraph with three modes, chosen by a toggle switch. The mode is indicated by red, yellow, and green LEDs.

RECORD LEVEL (weighted) is just that. The scale is from +20 to -40dB; 0dB does not correspond to unity gain. The weighting takes into account both the pre-emphasis of the compander and the limitations of the delta-modulation encoder.

CALIBRATION has a 15dB range (from +5 to -15dB), unweighted, in 0.5dB steps. 0dB is line level. This mode is for setting levels and balances.

SIGNAL LEVEL runs from +20 to -100dB, in 4dB steps, unweighted. It's used during playback to examine the dynamic range of the music or the noise floor of the equipment feeding the 700.

On the other side of this panel are the three LEDs that comprise the video display. The red VIDEO UNLOCK indicates that there is no video input, the yellow STANDBY shows that there is a video signal but the decoder hasn't yet locked in, and the green VIDEO LOCK comes on when the delta demodulator is fully functioning.

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3 Simple math. Doubling the frequency doubles the number of waveform transitions in a given time. To make twice as many transitions, we have to move (slew) twice as fast. Right?
Below these three lights is a red ERROR CORRECT LED. Unlike the PCM-F1, the 700 has the common decency to let you know when it's fixing things. And, unlike PCM units, there is no interpolation. Either the bad bit is properly corrected, or it's missed altogether. As explained, an occasional uncorrected error wrecks no havoc.

This light is a great way to check for tape dropouts. (With Sony ES-HG, there's an error correction about every two seconds; with Maxell HGX, they occur about every 30 seconds!) In any case, the circuitry reconstructs the signal and feeds it to an error-corrected output on the back panel, for dubs.

Fortunately, the 700 doesn't look like a Christmas tree. Only three lights are normally on: power, display mode, and either the record light or one of the playback status lights. Any other light indicates an exceptional condition—48V powering, nonstandard gain, error correction, or clipping. A nearsighted person can stand 20 feet away and still know just what the 700's doing.

My first 700 was DOA; it recorded, but emitted only a low buzz during playback. dbx said it was a show unit that hadn't been checked, and replaced it. The second unit (reviewed here) recorded and played properly, but had a flaw in the display circuits. The left display showed a continuous "ghost" signal. Since 80% of everything I've reviewed in the last six months was defective, broke down, had some design flaw, or featured a combination of these problems, I wasn't fazed by this. I did, however, have a minor problem with the input sockets (both mike and line). My XLR plugs had to be pushed in very hard before they would lock in place, and the left-channel plugs wouldn't lock at all. (There was no problem with the outputs.) This appears to be due to some subtle (!?) incompatibility between XLR brands. I wedged the plugs, then dressed the cables so they wouldn't be knocked loose. I had no problems after that.

The instruction book was up to dbx's usual superb quality: friendly and informal without silliness; clear and simple without inaccuracies. It was a pleasure to read, something I can't say about most manuals. The ability to write literate manuals is common among New England hi-fi companies. It's hardly surprising, considering the area's literary tradition.

### Sound quality

The sound quality was checked in the best possible way—by using the 700 to make live recordings. On one outing, I brought another VCR and the Nakamichi DMP-100 (see Sony PCM-F1) for comparison. I made up a cable so the mikes could feed both digital processors simultaneously. (I didn't use an external mike preamp. I wanted to see how each processor sounded with its own preamp, since this worst-case situation is the way most of our readers would use these products.)

Before going any further, I want to dissociate myself from the opinions about the PCM-F1 and DMP-100 expressed in Stereophile's "Recommended Components" listing in Vol.10 No.3. Although I switched from analog recording to the DMP-100 because of its superior sound quality, I've never claimed, publicly or privately, that it was "99.7% perfect." It ain't. Comparing tapes of the same performance, it was immediately obvious that the Nakamichi DMP-100 and the dbx 700 did not sound alike. The most striking difference was in instrumental timbre. On the DMP-100, almost everything was lighter and brighter in texture, even bass percussion instruments! This was especially noticeable on violin, which sounded as if it were all strings and no wood. Nor did the 700 fully capture the "body" sound of the violin, but it came a lot closer. There was a more solid sense of the fundamental, and less exaggeration of the overtones.

Another difference showed up on brass. The DMP-100 was noticeably grundgy. The 700 had a deliciously smooth brass tone that in no way lacked "flatulent flatness" or attack.

Of course, "different" is not "better." Was the DMP-100 adding something, or the 700 taking something away? I checked this by comparing the direct output of the 700 with the same signal sent through the DMP-100. (The latter has simultaneous encode/decode.) The DMP-100 made the 700 recording sound like the DMP-100 recording, lightening and brightening the instrumental texture. The proper conclusion, then, is that the dbx 700 is the more accurate of the two processors.

The obvious question arises: are these sonic differences due to fundamental differences between PCM and PDM? Unfortu-

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nately, there's no way to tell. They could just as well arise from differences in the analog circuits that surround the digital processors. The only way to know for sure would be to swap the analog sections, an impractical task.

**To sum up . . .**

To say that I am delighted with the dbx 700 is an understatement. It's more accurate than the DMP-100 (and, by implication, the PCM-F1). Although bulkier, it's not especially heavy, and the power supply is built-in. (The DMP-100/PCM-F1 needs an outboard unit.) Best of all, I don't have to chew my nails worrying whether or not I'm going to clip the processor during loud passages. On sound quality alone, it goes right into Class A, with the Nakamichi and Sony dropping into Class B. I also like the 700's open architecture. In principle, any module can be modified or upgraded, something not really practical with other digital processors. (If you've dismantled a PCM-F1, you've seen its tightly wadded inards.) Think you can design a better-sounding line module? Go to it! Further, since delta modulation uses off-the-shelf components, the 700 will probably be repairable well into the next century.4

Of course, $4975 is a bit pricey for a digital processor, even for our well-heeled readers. (Price is not a consideration for entry into Class A.) Still, it's a fine-sounding unit, and any serious amateur or professional recordist should give it a careful listen. Highly recommended.

4 As I write this, dbx tells me that they are selling the 700 "out of stock." They will make at least one more production run of the 700, but I would suggest that if you want a 700, now is the time to buy.

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**BEARD P-35 STEREO POWER AMPLIFIER**

Dick Olsher

Beard P35 power amplifier


Those of you who skim through every fresh issue of Stereophile in search of DO's contributions should be well aware by now of my passion for vacuum-tube technology. These glowing "anachronistic" space heaters unlock for me a magical aural window to the land of make believe, and help make a believer out of me. I suppose this track record
has made it quite easy for JA to finger me for all of these little tube-amp reviews. I don't really mind, John. Thanks!

Beard is a British tube-amp manufacturer that has been in existence for several years now. They had just signed an agreement in 1986 for their amplifiers to be distributed in the USA by Wharfedale America when the latter company folded; distribution is now by a new South Carolina company. The P-35 was introduced in early 1986 and is a chunky little amp, well-built and nicely finished. Good quality parts are much in evidence within the chrome-plated chassis. Although the P-35 is ostensibly a stereo model, with a single mains transformer supplying both channels, there are traces of dual-mono construction, with each channel possessing independent rectification and reservoir caps. In addition, each output tube is individually regulated. Peering through the tube cage, one gets the distinct impression that there is a lot of glass.

Indeed, there are a total of 14 tubes under the metal cage, which serves to camouflage the simplicity of the circuit topology.

The driver stage consists of a single ECC81 dual-triode per channel, with one half handling the voltage amplifier chore and the other acting as a phase splitter. The output stage consists of three pairs of EL84s (high-gain pentodes) per side, operated in parallel. The EL84's plate-power dissipation capability is pretty low, therefore a bunch of them are needed to achieve decent output power. However, one of their virtues is low cost, and because of the automatic biasing feature of the circuit, tube matching is unnecessary, all of which compensates for ultimately having to replace so many of them. The driver-stage ECC81s were stamped as "made in China," which surprised me. I'm not sure which China is at work here, but since the inscription is in red, I assume that the mainland Chinese are responsible. Maybe Bill Beard can enlighten us as to the substance of this Chinese connection.

The front panel is outfitted with two switches, one of which is labeled "Full Power," the other "Half Power." Which of these do you suppose is the on/off switch? If you guessed "Half Power," your logic is similar to mine—but we'd both be wrong. The "Half Power" feature, though, is useful at low-listening levels and allows for reduced tube wear.

The following sonic assessments of the Beard are based on two rather extensive listening sessions. In the first, I used purely digital source material: master tapes and the inevitable CDs played through the Sony PCM-F1 and the Moffat Deluxe CD player, respectively. The Moffat tubed line-stage preamp was used in both cases. The second session was all analog. The front end was as usual: the Sao Win 'table and MC cartridge, the Well-Tempered Arm, the Nestorovic MC Network, and the Moffat Theta Deluxe preamp. The speakers for both sessions were original Quad ESLs with the John Koval modification (see elsewhere in this issue for details). To give you a flavor of how the review progressed, I'd like to describe my impressions in chronological order.

The First Session

It was quickly obvious that the midrange was the P-35's real glory. The mids were very transparent and possessed excellent spatial focus, almost rivaling, in fact, the Jadis JA-30 in this respect. Resolution of low-level detail and spatial information was also very, very good in the range from about 200Hz to 2kHz. Within this range, the Beard was nothing short of wonderful, with very natural reproduction of vocals and musical textures that were liquid, smooth, edgeless, and relaxed in a manner reminiscent of the classic Marantz 8B. After a warm-up period of about an hour, the mids even turned a shade seductive and sweet, but without the thick syrupy textures that afflicted many of the tube designs of yore. All of this was accomplished with an airy quality and a nice sense of dynamic ebb and flow. The music swelled and bloomed from soft to loud in a manner befitting a much more powerful amp. The Beard was wonderful on either solo or massed voices—I could listen to choral music all day (if I wanted to). The P-35 also very capably reproduces soundstage dimensions and does a nice job of unfolding the depth perspective. Topnotch performance indeed.

1 The Chinese, as opposed to the Taiwanese, recently bought tube manufacturing equipment from the British M-O Valve Company, who were responsible for the KT-series beam tetrode tubes.
Yet, as did Luke Skywalker, the Beard had to struggle to avoid the dark side of the "Force." The flip side of being overly liquid and smooth is to acquire a boring politeness that robs the music of incisiveness and excitement. This impression started in the mids and was helped along by relaxed upper mids, a presence region without much bite, and sluggish treble transients. There wasn't enough snap and crunch: it was like biting into an apple or a hard piece of toast and getting a mouthful of Jello. However, I should hasten to add that the Beard P-35's somewhat "toothless" presentation was not without charm, and should mate very well with an analytical, transistorish sort of front end.

More serious were problems at the frequency extremes. The treble did not have the focus, sweetness, or transparency of the mids, being slightly rough, grainy, and opaque. I did not measure the Beard, but this certainly sounds characteristic of an excess of high-frequency, nonlinear distortion products. Neither was the bass very inspired. I found it difficult to discern bass detail, and the overall bass quality was underdamped, lacking sufficient tightness. For example, double-bass notes were loose and ill-defined.

The overall presentation was of neutral perspective—neither recessed nor forward. The perceived tonal balance was also quite neutral, with no trace either of brightness or of excessive lower-mid warmth. My final impressions at the end of this first session were bittersweet. Think of saccharine: the sweet liquidity and transparency of the mids was somewhat tempered by the bitter after-taste of the upper octaves.

**Session Two**

Starting with [Landare! (Proprius 7800), the Beard again evidenced nice resolution of individual voices in the chorus and realistically portrayed hall reverb information. Image size within the soundstage, however, was a little broader (less focused) than with the Jadis monoblocks. The highs were a little grainy and not as transparent as the mids. Bass lines were not particularly well defined. The guttural flavor of Pedro Aledo's voice (Pierre Verany 12793: *Cantos Antiguos y Cantos Nuevos*) was captured just about to perfection, but the guitar sound missed some brilliance on top. The "Tres Hermanicas" cut came to life with convincing depth and startling transparency. The deep bass was not sufficiently detailed.

Cleo Laine's deep-hued vocal colors (Live at Carnegie Hall, RCA LPL-5015) came through with excellent clarity. In general, spatial resolution and resolution of low-level detail were very good. The picture on the album cover shows Cleo clutching what looks like a Beyer dynamic vocal mic, which I assume she used during the performance. These mics have a rising treble response typical of vocal mics. With solid-state amps or even the Jadis JA-30s, this treble emphasis is quite audible—not so through the Beard. That clean midrange window was very much in evidence on Amanda McBroom's West of Oz (Sheffield Lab 15). But again it was hard to resolve bass lines.

Brass, including Harry James's trumpet (Sheffield Lab 3: The King James Version), sounded lackluster, overly liquid, and without sufficient penetrating bite. It was readily apparent at this stage of the listening that the Beard's treble was not in the class of the mids. Itzhak Perlman's violin timbre (EMI ASD 2926: Bruch's Violin Concerto I) was generally very well reproduced—except for a reduction of purity in the high notes. A similar finding was made with the Wilson Audio recording of the Beethoven Sonata for piano and violin (David Abel, violinist), where the violin tone was missing some sweetness in the upper registers.

**Comparison with the Michaelson & Austin TVA-10**

The TVA-10, being a favorite both of JA and myself, seemed a likely candidate for comparison. And I was curious to see how it would fare against its much more expensive British cousin. The TVA-10 originally cost me $400 on the used market, but I've pumped in probably $100 worth of new caps—including power supply reservoir caps. I quickly established to my own satisfaction that the TVA-10's treble and upper mids were better, being quicker and more transparent than those of the Beard. The mids of the TVA-10, however, were not as transparent, there being a little more veiling of musical textures. Resolution of low-level detail was also not as
good, the TVA-10's presentation being broad-brush rather than analytical in nature. Even though it is not as revealing through the mids, I found the sound of the TVA-10 better integrated top-to-bottom and ultimately more satisfying. One of the clinchers for me was the violin tone on the Dave Wilson recording of the Beethoven Sonata. The sweetness of the Guarnerius really came through on the TVA-10, and you could recognize that, indeed, it was a Guarnerius, something that was not obvious with the Beard.

The Final Judgment
I like the Beard P-35 and can recommend it in the context of Class C of Stereophile's "Recommended Components"—but with the caveat that it be carefully auditioned in the prospective purchaser's own system. The character of the upper octaves is such that the Beard will not readily lock into a particular system, preferring, for example, an analytical front end to compensate for its treble softness. I think that the Beard will compete very well, for example, with the Quicksilver monoblocks. True, its treble is not as good, but through the mids it is a couple of notches higher in quality. The Beard's midrange window is quite remarkable for its purity and resolution capabilities, and should appeal strongly to midrange aficionados.

As with any small tube amp, the speaker load must be carefully selected. The Beard should do very well with voltage-limited electrostats. However, an 8-ohm nominal impedance, reasonably sensitive, dynamic loudspeaker will also do well. Do not expect the Beard to be able to go much above loud in a large room with a typical load, but it is very dynamic-sounding in the range from soft to loud. If you're in the market for a small tube amp, be sure to audition the Beard. In the area of midrange reproduction it has few peers at the asking price.

ACOUSTAT SPECTRA 3 LOUDSPEAKER

J. Gordon Holt

Founded in the mid-1970s, Acoustat was the first manufacturer of full-range electrostatics literally forced to address what had long been a major weakness of such speakers: high-voltage breakdown, or "arching." The original design was built and used in JP (Jeep) Harned's home, where the living-room French windows opened out onto a stream in the back yard. That, plus Florida's legendary humidity, conspired to produce summer days when moisture would trickle down every vertical surface in the house, including the speaker elements. With 8000 volts or so running around in the speakers, and the close element/grid spacing necessary for adequate efficiency, heroic measures were needed to produce a system that would operate on its home ground at all without going up in a spectacular display of pyrotechnics. The result was the basic design of what subsequently became the first full-range electrostatic ever sold with a lifetime warranty: the conductive wire stators are sheathed in insulating plastic.

It was that reliability, as well as the consistently high quality of Acoustat's speakers, which caused such consternation in the high-end fraternity when the company went bankrupt two years ago, and such relief when it was rescued from oblivion by David Hafler, who purchased Acoustat as an independent subsidiary of the Hafler Company.

The theoretical advantages of a crossover-less loudspeaker using an extremely large, lightweight diaphragm driven uniformly over its entire surface have been obvious from the start, but so, unfortunately, have the practical disadvantages. Some of the latter, such as dielectric breakdown (which resulted in holes punched in the diaphragm, each one of which then became a constant breakdown point), had to wait for improvements in materials technology before they could be solved. Others, such as the need for a matching transformer with the formidable impedance ratio of 40,000:1 — ie, a voltage step-up ratio of 200:1 — required rethinking and refining old design concepts.

One such refinement was the inspired idea of using not one but two step-up transformers to feed the same set of radiator strips. Each transformer could then be optimized for a specific part of the audio range; while it did necessitate using a simple high-pass crossover network (for the smaller high-frequency step-up), a complementary recombining network could be used to cancel out the phase anomalies which normally result when a crossover is fed directly to individual driver units.

Then there was the treble-beaming problem.

Because of the lateral displacement in space, signals radiated from the sides of a flat panel are in-phase with those coming from the center of the diaphragm only along the axis of the panel. To either side of that axis, interference causes signal cancellation or reinforcement, depending on the angle from the central axis. The effect worsens with increasing frequency, with the result that all flat-panel radiators tend to produce an on-axis "hot spot" — a beam that becomes progressively narrower with increasing frequency. And the wider the panel, the lower into the audio range the beaming occurs.

The method employed by Acoustat for its first model was to construct the electrostatic speaker from several tall, narrow vertical strips arranged as segments of a shallow arc. But this merely exchanges one severe wide-range hot spot for several less severe ones setting in at a higher frequency, and tends to produce severe vertical-venetian-blind effects. Later Acoustats were tall and thin, to maximize lateral dispersion, in order to restrict interference effects to the high treble.

The latest Acoustat speaker, the Spectra 3, uses a different, better, approach. Each unit consists of three identical, tall, relatively narrow electrostatic strips, each of which is split into two electrical sectors. There is no crossover as such, but one sector is operated full-range, the two next to it are rolled off above 1.7kHz, and the final three operate in the lower few hundred Hertz. Doesn't this low-pass filtering cause phase shift and, as a consequence, interference? Of course, but now these side-effects can be used to the system's advantage.

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1 The English Quad ESL-63 uses another approach. The diaphragm is electrically divided into seven (I think) concentric rings, with the outer ones fed through delay lines of increasing length. This causes a signal to be radiated first from the diaphragm's center, then by each adjacent ring in succession, simulating the temporal ideal of a point source situated several feet behind the diaphragm, thus minimizing off-axis interference.
Through careful balancing of strip widths and rolloff frequencies, the Spectra 3’s phase “anomalies” are used to shape its polar pattern into a single, broad lobe aimed at an off-axis angle of about 20°. Each speaker unit is a mirror image of the other, and when oriented with their widest-range strip toward the inside, the result is two broad energy lobes intersecting at a point in front of and midway between the speakers. Does that sound familiar? (If not, read the reviews of the dbx Soundfield 1-A and Ohm 5 loudspeaker in Vol.10 No.4.)

Essentially, what this radiation offset does is compensate for the timing and amplitude changes which occur when one moves out of the “sweet spot” on the center line of the speakers: it prevents the lateral image shift and collapse of the stereo stage which would otherwise occur. In other words, this is the first full-range electrostatic which should allow the listener to hear a stable stereo image right across the listening area!

The specs at the head of this review mention an “optional” subwoofer. It isn’t exactly optional: it comes with the speaker whether you opt for it or not. (It adds no more than “a few dollars” to the cost, according to Acoustat.) The woofer is optional only in the sense that you don’t need to use it if you don’t choose to. It operates below 100Hz, and is mounted, face-down, at the bottom of the speaker’s base unit (which strikes me as being one of the least attractive-looking pieces of audio furniture I have seen in years). The bottom panel of the base is slanted upward toward the rear, so that the speaker operates into a loading arrangement which combines elements of the classic slot load and a linear-flare horn.

The module containing the electrostatic power supply, audio step-up transformers, and woofer crossover fits into an opening in the bottom panel next to the woofer. On it are two sets of 5-way binding posts (with standard ¼” spacing for dual banana plugs) and three bat-handle switches. One switch selects between direct (full-range) connection of the electrostatic panels, or connection through the woofer crossover network. The second switches the woofer from direct-in to the internal crossover, while the third turns the woofer on or off. (In its Off position, the woofer is connected to its own pair of binding posts, for blamping or biwired operation.)

The Spectra 3 system is shipped from the factory in four pieces—two bases and two panels—which require assembly prior to use. Although this is simple and straightforward enough, it is nonetheless a royal pain in the butt, because attaching each panel requires applying appreciable force between it and the base, to compress some air-seal gaskets, before attaching the assembly screws. It was a chore for two of us working together; it would be almost impossible for one person to accomplish alone. And once assembled, the speakers were quite awkward to move, again requiring two persons (or one plus a hand cart). I strongly recommend that you have your dealer do the assembly, in your home if possible. If not possible, you may then have to hire a van to get the things home, and will need at least one other person to help you get the speakers from the van into your listening room. Once set up, it is easy enough to move them a couple of inches at a time to tweak their placement.

It is necessary to remember that the panels are mirror images of each other. The bases are identical, however, and the only way the L and R panels can be distinguished is by a tiny hole drilled in the metal strip that tops off each panel, at a distance of 7” from the edge of the panel. Viewed from the front (the side with the Spectra 3 logo on it), the right-side panel has its hole at the right, while the left one has it at the left. Once the speaker is assembled, you have to be a lot taller than my 5-6 to see the hole (although you can feel it with a fingertip), and that, plus the awkwardness of moving the assembled speaker, make it advisable to identify and install the right-side panel on the rightmost base to begin with.

The panels are hinged, allowing them to be tilted forward or back to accommodate any likely listening height, as well as unlikely ones like LA standing up. (Yogis please note: the forward tilt range is not great enough to allow listening from the lotus position, unless you are able to levitate.) Two screws on each base can then be tightened to lock the panel in position. This tiltability is a dandy feature, and one I wish had been available on other large electrostats I have tested in recent years. It must also be said that it is almost a
liability on the Spectras, because they have such broad vertical dispersion that the tilt feature will rarely be needed, and the adjustability makes it possible to end up with different tilt angles. Both panels must be at exactly the same angle; if they aren't, the panel top/bottom timing differences between the two speakers will cause phase interference, resulting in an apparent channel imbalance.2

Acoustar recommends that the speakers be toed in, with the axes of their innermost panel strip intersecting at or just in front of the center listening seat. The distance from the rear wall will depend on whether or not the woofer is used. If it is, the speakers can be anywhere beyond two feet from the rear wall; if not, they should be at least four feet from the wall.

Initial listening was done with the woofers off and the panels running full-range. Equipment used was the Ortofon MC-2000 cartridge with its own step-up transformer, SOTA Star turntable, Sony '650/'703 CD combo, with Audio Research SP-11 preamp and Threshold SA-1 power amps.

Four things struck me immediately about the Spectra 3s' sound. First, their extreme high end is exquisite: velvety smooth, open, and detailed, without a trace of sizzle or tizziness. Second, their low end is fuller and more extended than I have ever heard from any full-range electrostatic. Third, they have superb lower-midrange, which gives cellos and large brasses marvelous weight and authority. And fourth, their sound is a little brash, almost but not quite to the point of being sizzly. Massed violins were not exactly steely, but they were imbued with a slight edginess. I suspected a mild peak in the 6-9kHz region, but could not measure any such. In fact, the measured high-end response was extraordinarily smooth, except for a mild discontinuity around 5kHz, where a 2dB dip was followed by a 2dB hump. I doubt if that would account for the hardness, but it could.

Imaging from the center listening seat was excellent—stable and specific. And it stayed centered from any listening seat along the entire length of my seven-foot sofa! But while off-center listening preserved the stereo stage in good balance, it shot down the imaging specificity, producing broad, vague center images several times wider than they should have been. So, while we now have, for the first time, an electrostatic speaker which allows off-center listeners to hear a balanced stereo stage, we still haven't eliminated the center "sweet spot." But it's a step forward, nonetheless.

Soundstaging was good, but not very. The Spectras had a tendency to compress width, putting extreme-left and -right images at the inside edges of the panels rather than behind the middle of the panels. With those rare recordings which (because of phasing anomalies) sometimes image beyond the speaker positions, those images never went beyond the outer edges of the Spectras. The obvious solution here—moving the speakers farther apart—didn't work, because the center imaging from the center seat fell apart, becoming vague and unstable. Clearly, what is happening here is that the ear is latching on to the full-range panel as the primary source of directional information from each speaker, but why the problem is not soluble by wider spacing is something I cannot explain. The Ohm 5s, which also crossfire their middle and upper ranges, produced definite, stable images from way out beyond their physical locations with those same recordings.

Bass output from the Spectra 3 was way out of balance with the rest of the spectrum, and no amount of messing with room placements helped. (The output at 40Hz measured 6dB above that in the midrange! Output at 32Hz was only 4dB below that at 40.) The low-end rise made the sound tremendously impressive but, probably for the same reason, LF definition was rather mediocre. Pitch delineation was only fair, there was no count-the-cycles throb from bowed basses, and bass drum was soggy.

On many recordings—some Telarc in particular—at average listening levels of only around 85dB, sudden LF onslaughs (as

2 The easiest way to make sure two panel speakers have the same tilt angle is to use a plumb line from the top of the panel to its bottom edge. (An effective substitute for the real thing can be made by tying one end of some sewing thread—still attached to its bobbin—to a small hex nut. With the bobbin on end on top of the panel, you can rotate it until the nut is at the right height above the floor.) Drape the plumb line over the top of the panel, on the side toward which the panel is leaning, and adjust until the plumb weight (or the nut) is level with the bottom edge of the panel. When the measured distance between the thread at the top of the nut and the surface of both panels is the same, their tilt angles will be the same.
from bass drum) caused the entire sound to choke down for a moment as though the step-up transformer was saturating. At one point during the Sheffield Shostakovichitch 1, three rapid bass drum strikes took the output level down by increments of about 2dB each, reaching about -6dB before the drum let up and the signal output could recover. Acoustar’s chief engineer, Jim Strickland, told me this had nothing to do with the step-up transformer, but was due to momentary loss of the high-voltage charge when the diaphragm comes very close to the stator wires. (As if it matters what is causing it!) He also pointed out that that is the main reason for including the dynamicwoofer with the system.

Worse, though, was the fact that at and above moderately high (90dB) midrange volumes, the diaphragms frequently bottomed out on strong bass signals, causing irksome clicking noises. Now, 90dB is probably loud enough for many listeners, but it is not going to satisfy audiophiles who like to shake the floor during fortissimos. Neither does it approach the live peak spls reached by instruments like the bass drum. (English audiophiles recognize a phenomenon called scale distortion, which results when a recording is played at a higher volume than that at which it would be heard live from its apparent distance. With most minimally miked symphonic recordings, proper scale is obtained at average levels around 90dB. With most small-group pop and jazz recordings, levels around 100dB or more are called for. The Spectra 3s cannot handle the latter, full-range.)

Next, I tried the Spectras with their woofers and internal crossovers switched in. This (of course) had no effect on their upper ranges, but it did ameliorate the LF problems immensely. I was now able to run the system at midrange peak levels of around 100dB before encountering any problems with LF stress. Unfortunately, there was also some loss of output below 50Hz which, since the 50Hz region was less affected, tended to remove some of the underpinnings of the sound. LF quality, however, improved with the cone woofers working—something that rarely happens with electrostatics. Usually, cone woofers tend to impair bass detail, but in this particular case the bass from the full-range panels was so ill-defined that the cones could only help matters.

I am aware—perhaps more so than many reviewers—of how much a loudspeaker’s sound is influenced by the power amplifier used to drive it. How, then, can I can so confidently attribute the problems I heard from the Spectra to the speaker itself? Because I have found the Threshold SA-1s to be almost right down the statistical middle when it comes to bass balance and control and to neutrality of midrange. Just a shade less forward through the midrange than the least-forward tube amps, they have the midbass quality of the tightest-sounding tube amps, and a deep-bass performance completely in keeping with their midbass quality—much stronger and better controlled than any tube amp. I will not claim for a moment that they are perfect, any more than I would do so for any other audio product, but their sound is representative of all the other power amps that have garnered enthusiastic reviews.

At the time of testing the Spectra 3s, I also happened to have in-house a model 1.1S power amplifier from a new company called Mirror Image. As I had been impressed with what I heard from that amp during a brief pre-listen—review next month—I tried it with the Spectras.

Reverting to full-range operation of the electrostatic panels again, I repeated the same tests with the Mirror Image amp as I had used with the Threshold. Every aspect of the sound was improved! Highs were, if anything, even more sumptuously sweet and delicate, and bass was tighter, more detailed, and much better balanced with the upper range. The upper-midrange glare was substantially diminished, too, although it was still there to a moderate degree. In addition, bass/treble balance was markedly improved: the system now had what I felt to be fairly natural balance, with only a hint of heaviness, and it was now possible to run the midrange signal levels up to about 96dB before diaphragm bottoming from strong LF material occurred. (Measured LF output, relative to the upper ranges, was exactly as it had been with the Thresholds, but it did not sound remotely the same. So much for objective testing!)

Although the bass quality was much improved with the Mirror Image amp, it still wasn’t great. The low end still lacked punch
and impact, and while pitch delineation was now at least what I would call good, it was still not great. Now, this is not to say, necessarily, that the Spectra’s low end is a lost cause. Large-panel speakers are notoriously unpredictable when it comes to bass performance in a given room, and it is certain that there are lots of rooms out there in audioland wherein these speakers would probably yield well-balanced, controlled bass performance. But better-balanced LF output will not change the fact that the electrostatic panels of the Spectrum 3s are definitely limited in their ability to handle high levels of heavy bass.

I can see why it was necessary to include the “optional” woofer. Without it, the Spectra 3 hardly qualifies as an audiophile loudspeaker. With the woofer, however, and the Mirror Image amplifier (or any other possessing a similarly lean low end), these speakers do a very respectable job at midrange levels well up toward 103dB, which is quite enough for most classical listeners but still shy of what a hard-rock nut is going to demand. (The saving grace here is that many rock recordings don’t have a damned thing below 60Hz. Unfortunately, a few do. Sheffield’s Track Record, for example, was bottoming out the cone woofer at LF levels of 105dB, when the measured average SPL was only around 97dB.)

In conclusion, I must qualify the foregoing by saying that I have an unusually large listening room (24 by 19 by 9 feet), and tend to listen at higher levels than many people—particularly those with neighbors nearby. The Spectra 3’s output-level capabilities may well suffice for many listeners, who can then appreciate the system’s incredible transparency, speed, delicacy, and midrange naturalness. But unless used with a very polite-sounding amplifier, the Spectra 3’s hardness is going to be difficult for any critical listener to tolerate. It’s not that there’s a lot of it; it’s just that I do not expect to find any hardness in a system at this price level.

To sum up, the Spectra 3 is a very good loudspeaker; it falls short in some areas of performance, but in my opinion, this does not detract from its overall appeal.

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**THE PERFECT BOX SPEAKER?**

John Atkinson reviews seven loudspeakers costing less than $1000/pair


Introduction

"Allegretto!" said JGH. "Why don't you start your review with a word like allegretto?" Well, stranger things have eased a writer out of a block, and that seems to have been as good a way as any. Let me tell you how I spent the month of May: I had been musing about a comment made by JGH following the 1986 SCES that it seemed that the loudspeaker high end was populated exclusively by planar models: Apogees, Acoustats, Martin-Logans, Magneplanars of various kinds, the Quad ESL-63, and an assorted Infinity or two. The problem is, however, that folks as a rule buy speakers made from boxes; boxes priced a little lower than the esoteric beasts so beloved of reviewers. "OK," said LA, "as your block has been removed, how about reviewing some moving-coil loudspeakers? Tell you what. Let's make it interesting; make them box loudspeakers costing under $1000. It'll give you a feel for the kind of affordable speaker that sells in quantity." Little could I protest that two of my favorite speakers—the Celestion SL600 and KEF RI07—are conventional; at $1600 and $4750 respectively, however, they hardly qualify as "affordable."

Thus it was that my house filled up with seven assorted pairs of loudspeakers: two English, five American; two sealed-box, five reflex; six stand-mounted, one floor-standing; six two-way, one three-way; four with metal-dome, three with conventional, soft-dome tweeters. The test procedure was as follows: each pair of speakers was substituted for the SL600s in my usual system of Krell KSA-50 power amplifier, Audio Research SP-10 II preamp, CAL Tempest II and Meridian MCD Pro CD players, and Koetsu Red/SME V/Linn Sondek LP player mounted on a Torlyte stand. (At the end of the listening period, I substituted a 1987 Linn/Itoh combination fitted with the new composite armboard and the new Linn Troika cartridge—review next month—the whole sitting on a Sound Organization table.) Interconnect was Monster Interlink Reference A, and Monster M1 speaker cable was used for all speakers. Each pair of loudspeakers was carefully positioned for optimum performance, and either Heybrook metal-frame or
Celestion/Foundation pillar stands were used to raise the speakers to the appropriate heights. (Exceptions were the Monitor Audios, which were used with their own matching wooden stands, and the floor-standing Thiels, which rested on TipToes.) All the stands were spiked to couple vibrations to the tile-on-concrete floor beneath the rug.

Each pair of speakers was used over an extended period of time for all my recreational listening; once I had become happy that I was getting the best sound, I measured the frequency response of each speaker in the listening window—spatially averaged to minimize room standing-wave problems—using third-octave pink noise, and measured the near-field low-frequency response with a sinewave sweep to get an idea of the true bass extension. In addition, a more critical series of listening tests was performed using an identical selection of music to get an idea of the comparative strengths and weaknesses of each design. The tracks used were as follows: Chopin Waltz in C-sharp minor, HFN/RR test CD¹ (my own recording, made with the Calrec Soundfield mike in crossed figure-eight mode); the drum-kit recording on the HFN/RR test CD (again recorded with the Soundfield mike); Beethoven “Pathetique” sonata, Performance Recordings PR-S² (recorded with crossed figure-eight ribbon mikes); Stan Rogers’ Northwest Passage (Fogarty’s Cove Music FCM-004,³ a naturally recorded collection of Nova Scotian-style songs sung by a baritone, recommended to me by Mission’s Armi Leonetti); Ray Noble’s “The very thought of you” (Ken Kessler’s favorite test track, the incomparable Ella Fitzgerald backed by a naturally miked big band, recorded in 1962 when engineers didn’t know enough to spoil the music); and Stravinsky’s Firebird suite, on Sheffield Lab CD-24 (pure Blumlein-miked orchestra, using Coles ribbon mikes). Particularly useful for judging accuracy of timbre on voice was the Freehold, New Jersey, recording of “Papa-oom-mow-mow” (Rhino RNLP 70827).

The two things these recordings have in common, apart from the fact that I know them all intimately, is that they all were recorded in such a way as to produce a tightly defined, tonally neutral soundstage, and that none have been “doctored.” As I have pointed out before, how on Earth can a reviewer make valid value judgments if he doesn’t know what to expect from the recordings he uses to make those judgments? Somehow he or she has to break the circle of not knowing what a recording sounds like apart from judging it using loudspeakers, the properties of which he or she doesn’t know apart from judging them using the unknown recording.

A comment on the nature of my subjective assessments will be in order. There is no doubt that both readers and manufacturers prefer bold, definitive statements of opinion, all black and white with nothing in between. With speakers in this price range, however, we are dealing very much with assessing the quality and quantity of different shades of gray. My subjective comments will therefore tend to concentrate on departures from neutrality and ideal behavior, but this doesn’t mean that the models reviewed were bad; rather, the compromises inherent at this price level will be more obviously audible than with speakers costing, say, $2000 per pair. Nevertheless, in the right system and room, at least half of these speakers will shine, musically.

A note to those who condemn tweakery out of hand: At the start of the auditioning of the first model, I had all the other loudspeakers in a pile in the corner of my listening room, some 10 feet from the left-hand speaker. Sitting listening to my chosen test tracks, I starting noting down adverse comments regarding stereo imaging: unstable center imaging, different image width at different frequencies, etc. The penny dropped; I removed all the other speakers from the room; now, the imaging was actually very good. So I advise you to insist upon auditioning loudspeakers one pair at a time before making a final purchase decision. Dealers won’t like you, but only then will you get a true idea of the soundstage capability of a pair of speakers. Reviewers also hate auditioning loudspeakers one pair at a time, particularly if the speakers are heavy, but I can assure you that that will be Stereophile’s policy.

Now, on to the reviews:

¹ Available from the HFN/RR Accessories Club, PO Box 200, Bedford MK40 1YH, England. Tel: 011 44 234 741152.
² Distributed in the US by Harmonia Mundi, USA, 3364 South Robertson Boulevard, Los Angeles, CA 90034.
³ Distributed in the US by Silo/Alcazar Ltd., Box 429, Waterbury, VT 06706.
Celestion SL6S: $900

Successor to 1982's very musical SL6, which pioneered the resurgence of interest in metal-dome tweeters, the SL6S replaces that system's copper-dome unit with a more sensitive aluminum-dome driver. Whereas the copper-dome had a first-breakup mode fairly low in frequency, the lighter dome doesn't go off until above 23.5kHz, doing away with the need for an individually tuned notch filter. Although the cabinet dimensions are approximately the same as its predecessor, the '6S is a complete redesign: the MDF-walled cabinet has a horizontal figure-eight brace and an inset rear panel to increase rigidity. Though the bass driver, designed with the help of Celestion's laser interferometry techniques, looks the same, it too is different, having reduced voice-coil inductance and a two-piece surround. The inner part of the surround is of PVC, to correctly terminate midrange traveling waves in the cone, while the outer half is of soft rubber, to give a freer action at lower frequencies; this results, hopefully, in better articulation. Both drivers are manufactured by Celestion.

The high-quality crossover features a 12dB/octave low-pass slope for the woofer, but an 18dB/octave high-pass function for the tweeter drive, with the nominal crossover frequency being 2.8kHz. Electrical connection is via Michell gold-plated binding posts, which have a knurled screw rather than one which can be fully tightened with a nut-driver. The speakers were auditioned on the matching, single-pillar Foundation stands. I should point out that Stereophile contributor Martin Colloms acted a consultant to Celestion on the design of the SL6S: this in no way affects anything I have to say about the loudspeaker; indeed, upon reflection, it may be that I will be a little too critical.

The sound: I am no stranger to the basic sonic character of Celestion's small-speaker range, having owned a pair of the original SL6s, lived with SL600s for five years, and used a pair of SL6S speakers for two months before moving to Stereophile from HFJ/RR. The original SL6 design was noteworthy for its musical qualities, though it suffered from a lack of lower-midrange transparency and a depressed HF response, and was perhaps too insensitive for use with low-priced amplifiers.

The former defect was cured in the SL600 by the use of a ridiculously expensive Aerolam cabinet; the SL6S represents an attempt to increase sensitivity a little, and to deliver a more neutral HF balance, at a lower price-point than the SL600, or the even more expensive SL700 launched at Chicago in June.

First impressions were of a lightweight balance, with a very neutral midrange. Piano timbre was quite naturally reproduced, with no undue emphasis of any notes through the tricky upper midrange. Voice was also neutral, apart from a little chestiness on baritone when compared with the SL600. Bass was well-controlled, if lacking a little weight; low-frequency instruments were superbly articulate, however, if not quite up to the standard set by the '600, and there was not quite as much mid-bass "thunder." There was a slightly hard coloration in the low treble which gave overall reproduction a slightly cold quality, something which bothered JGH more than it did me.
Where the SL6S excelled, however, was in its imaging and presentation of soundstage. The piano images on the naturally miked Boyk and Stanczyk recording were superbly delineated, with no spatial blurring, and the imaging was consistent with frequency. Some dislike this holographic presentation, feeling that it too ruthlessly reveals the lack of true soundstaging on multimiked classical recordings, but I want to hear truth, not some collage of recorded inadequacies fuddled-over by loudspeaker problems (even if that collage does then correspond to what the listener might expect to hear sitting in Row Z in the concert hall). The drum-kit image, too, was natural, and the dynamics came over very well. In fact, I would say that the SL6S suffers less from compressive effects at reasonably high levels (up to 100dB) than any other small speaker I have auditioned. It is a small speaker, however, and it proved possible to bang the woofer against its end-stops with the very high-level bass drum notes in the Sheffield Firebird, the excellent dynamics giving no warning of incipient overload. (With other small speakers, you become aware that the woofer is working very hard well before it runs out of mechanical headroom.) There should be no problems with amplifiers of up to 100W power, however.

Measurement: The in-room response showed a smooth characteristic with a slightly falling trend above 80Hz, broken only by a slight excess of energy in the 3-10kHz region. The nearfield -6dB point lay at 55Hz, but, as indicated by Martin Colloms in his article elsewhere in this issue, an optimally damped small sealed-box design can still have useful in-room bass extension, and this was true for the SL6S, the response extending to 40Hz or so. It rolled off gently below that frequency, without the sudden nosedive typical of vented designs. The impedance curve indicated the box resonance to be at 63Hz, and the lowest point reached was 6 ohms, suggesting that the SL6S will be relatively easy to drive.

Conclusion: Though the SL6S lacks the LF extension of, say, the Thiel CSI, it has sufficient authority and lower-midrange transparency to make reproduction of bass instruments believable. Though it is neutral through the midrange, the slightly cold balance may not suit all tastes. Nevertheless, regarding overall performance, though it doesn't communicate the music as effectively as the almost-twice-as-expensive SL600, the SL6S is an excellent speaker by any standard.

The point has been raised by AHC, among others, that small British loudspeakers represent poor value for money, their price having to reflect the costs of transatlantic shipping and the increased overhead of running an extra distribution company. With a model like the SL6S, however, no excuse need be made.

**JBL 18Ti: $590**

Introduced two years ago as the smallest model in JBL's 'Ti' range, the 18Ti shares with its larger siblings a high-tech tweeter that uses a one-piece ribbed titanium-foil dome/surround just 25um thick. This is both rigid and of very low mass, pushing its first-breakup mode up to the region of 30kHz. The tweeter is mounted above the polypropylene-cone woofer, offset a little to one side to make room for the 45mm diameter port (though the speakers are not supplied as a handed pair). The 10-liter internal volume box is well-constructed from 20mm chipboard, covered in real-wood veneer. The second-order crossover uses good-quality components, the speaker is internally wired with Monster Cable, and electrical connection is via gold-plated 5-way binding posts on the cabinet rear. The grille is smaller than the baffle size, and "floats" on its stud supports; as the baffle is veneered, I used the 18TIs sans grilles.

The sound: I started out using the 18TIs mounted in free space on 16" stands, but quickly became aware that there was a suckout in the upper midrange, the sound being wiry and lacking body on violin. Changing to 23" stands filled in this depression, resulting in a tonal balance that was quite natural overall. The main failings were still a slightly wiry emphasis in the high treble which exaggerated the splash of cymbals, and a lack of definition in the upper bass which lent a wooliness to bass guitar. Low bass was absent, bass guitar and double-bass sounding a little small as a result, but the power of recorded drums came over very well. Timbre on both male and female voice was very good, though with a slight "eee" coloration, the former acquiring a slightly
phlegmy edge and the latter a little too much throat tone. Recorded piano was evenly reproduced, with a clean HF, but perhaps a slightly too lively upper midrange.

The 18Ti didn't have quite the same clarity of soundstaging featured by the Celestion SL6S, the central imaging being a little more diffuse and there being less depth than I expect. Instruments with generous amounts of treble energy — hi-hat cymbal, for example — were projected forward a little, and my Chopin piano recording was unrealistically shallow. All in all, however, this is very good performance at the price, and, true to the JBL tradition, these speakers will play loud, despite their relatively low sensitivity.

**Measurement:** The low-frequency -6dB point, measured nearfield, was 42Hz, but there was a little too much upper-bass energy in the room between 63Hz and 200Hz, suggesting that the woofer could do with a little more damping. Given that this lift will artificially extend the bass extension, the true cutoff point would probably be around 50Hz; this was confirmed by the in-room measurement, which showed the response to be falling rapidly below this frequency. The in-room response, very flat from 200Hz to 3kHz, met excellent ±1dB limits apart from a slight prominence just above 1kHz (which may correspond to the slight “eee” coloration noted). Above-axis, a slight notch developed in the crossover region, showing that JBL's engineers have optimized the vertical dispersion for the speaker's use on reasonably high stands. There was perhaps a little too much treble energy in the final octave. The measured impedance fell to around 6 ohms in the lower midrange, but the load will present no problems to amplifiers.

**Conclusion:** The 18Ti is tonally the most neutral JBL I have heard, and offers a reasonable compromise between the need to play loud and to squeeze as much sensitivity and low-frequency extension as possible from such a small box. Personally, I would have liked a less generous, better-defined upper bass, perhaps from a closed-box alignment, but the 18Ti's balance was undoubtedly chosen to give the illusion of “good” bass to non-audiophile customers. An overall performance not up to the standards set by the better, more expensive speakers in this group, but excellent value at the price.

**Kevek ES-6: $495**

Reference Monitor International handled the British Rogers line when the LS3/5A was the reviewers' darling baby box. When Rogers
transferred their distribution elsewhere, however, RMI's John Bradford decided to go into the speaker business on his own account. The Kevek range is the result, and the two-way ES-6, styled superficially to resemble a baby Dahlquist DQ-20, is the first model in the line. The black-painted, fairly shallow, MDF carcass has an elaborate grille frame attached to its front, with curved wooden endcheeks holding the grille cloth away from the baffle in a vertical arc. (These endcheeks are quite deep in the center, and I must admit that I worried about their effect on high-frequency dispersion.)

Both drive-units, the ¾" soft-dome tweeter and shallow, straight-flare, 6.5" woofer, are sourced from the Danish Vifa company, and fed via a simple six-element crossover. The woofer is reflex-loaded via a 2" port on the front baffle. Electrical connection is via 5-way binding posts on the cabinet rear.

The sound: The manufacturer recommends an open-space placement for the ES-6, but I then found the upper bass—there is no low bass—to be somewhat anemic. Positioning the speakers two feet from the rear wall brought up the upper-bass level to a sufficiently high level that the "slam" in such outrageous mixes as the live Talking Heads "Psycho-Killer" became suitably impressive. The balance was still light, however. On the tweeter axis, there appeared to be a slight suckout in the upper midrange. This filled in above-axis, so ES-6 owners should take care not to use stands that are too high; 16"-18" would be best, and although the design may suggest shelf-mounting to be a possibility, the shelves would have to be quite low.

Vocal sound was open, but a little uneven through the midrange; some notes becoming a little over-prominent. In addition, there was a slight cupped-hands coloration noticeable, adding a slight "aw" sound to woodwind, and a "cack" to snare-drum sound. The extreme HF was a little hard, exaggerating sibilance and CD brightness.

At highish levels, the sound hardened somewhat; this speaker lacks dynamic range when compared with, say, the JBL 18TI. Center imaging was vague, though there was a reasonable rendition of depth. Overall, however, this is not a bad performance for the price.

Kevek ES6 loudspeaker

Measurement: Nearfield, the low-frequency response was as expected from a small box like this, at -6dB, 54Hz. In-room, however, there was usable output to 48Hz or so, and the upper-bass tuning was just about ideal, with no upper-bass boom. The averaged in-room response from 100Hz to 5kHz was surprisingly flat for a speaker in this price category, holding to ±1.6dB limits. (This would suggest that the midrange coloration noted above could have been due to cabinet resonance problems.) Within those limits, however, there was a slight rising trend, which would contribute to the impression of a light balance. The impedance measurement confirmed the 8-ohm rating.

Conclusion: Offering an acceptable performance for an average price, the Kevek ES-6 is quite good value for money. It may not excel anywhere, but neither does it do anything particularly wrong. I do feel, however, that its imaging performance has been traded off against the aesthetically pleasing and unusual visual design, and I would like to see John Bradford tackle a more conventional design in the $900 price region.
Monitor Audio R652MD: $859

Though new to North America, the British company Monitor Audio has been in existence for 15 years, and was originally formed by Mo Iqbal and Martin Colloms to manufacture loudspeakers designed by Martin. Martin parted company with Mo in the mid '70s to take up full-time reviewing, and Monitor Audio speakers have been designed in recent years by the well-respected ex-BBC engineer Robin Marshall, also responsible for the excellent metal-dome tweeter Epos design. Unique for a UK loudspeaker company, Monitor Audio owns its own cabinet facility, and supplies custom cabinets to many well-known companies. It is not surprising, then, that Monitor Audio loudspeakers are renowned for the excellent finish and construction of their boxes.

The R652 MD was the top-of-the-line model until the launch of the R852 and R952 models at Chicago. The attractively proportioned box is only just wide enough for the polypropylene-cone woofer, mounted symmetrically below the aluminum-dome tweeter, developed by SEAS for Monitor Audio. The woofer is reflex-loaded by a 60mm diameter port on the rear panel, and the speaker is intended for use reasonably near a rear wall. The R652s were auditioned two feet from the rear wall and six feet from the sidewalls. The review samples were beautifully finished in light-oak veneer—walnut, black, rosewood, yew, pine, mahogany, and teak are the other finishes available—and were supplied with matching dedicated stands, made from veneered MDF, which bolt into the loudspeaker's base.

The sound: The upper midrange and low treble were impressively uncolored, spoiled only by a slight HF emphasis noticeable on vocal sibilants and a slight "aw" coloration, this very mild in degree. The treble was not hard, however, and this SEAS tweeter is obviously a good performer. The picture was less good at low frequencies, the mid bass sounding somewhat detached from the lower midrange, with a lack of upper-bass power. There was also too much mid-bass, which, coupled with the apparently weak upper bass, gave low-frequency instruments a rather loose character, with insufficient definition. The exact degree of the mid-bass excess was extremely room-dependent, but it couldn't be removed altogether, even after considerable experimentation. The loose quality was less noticeable on classical music—rock music gives the listener four opportunities every bar to become aware of any bass shortfall—and low-frequency extension seemed good.

Stereo imaging was excellent, being laterally precise with good reproduction of recorded ambience, though I got the impression that the precision was less good in the lower midrange and below.

Measurement: No nearfield bass response was taken, as the port being on the cabinet rear makes this measurement somewhat arbitrary.
The spatially averaged response in-room was both smooth and flat from 125Hz to 10kHz, above which there was a slight HF emphasis. In the bass, however, there was an excess of energy in the octave from 63Hz to 125Hz, more sharply delineated than the Siefert Magnum III, for example, with a sharp “knee” and a steep roll-off below that range. Undoubtedly this accounts for the peculiar subjective nature of the low frequencies. The impedance measurement revealed the twin LF peaks typical of a vented design, and the R652 should be very easy to drive, the impedance only occasionally falling below 8 ohms.

**Conclusion:** Offering an excellent performance from the lower midrange upward, the Monitor Audio R652MD is compromised, in my opinion, by the somewhat one-note character of its low frequencies. The degree of this will be room-dependent, however, and the R652MD should be considered by someone who wants a visually unobtrusive, beautifully finished, and relatively neutral loudspeaker for mainly classical reproduction.

**Pres Classic II: $849**

Pres, a small company based in Massachusetts, has an appealing motto: their loudspeakers are said to be "completely touched by human hands." The two-way Classic II is the second most expensive model in their range, and features one of the most solidly constructed cabinets I have seen. The 1" particle-board sealed cabinet is extensively braced, with liberal use of reinforcing panels, and is finished in oak veneer, the whole beautifully finished to a furniture standard. Mounted symmetrical on the wide ply baffle, which is finished in the same veneer as the carcass, are the two drive-units, an 8" doped paper-cone woofer from Scanspeak in Denmark, said to feature a patented magnet assembly designed to minimize distortion, and a 3/4" ferrofluid-cooled, soft-dome tweeter. The latter is surrounded by an anti-diffraction ring of 1"-thick Pyrell foam.

The simple crossover consists of three resistors, two inductors, and two capacitors, and the internal wiring looks like Esoteric Audio cable. Electrical connection is via two custom, gold-plated terminals on the cabinet rear, again by Esoteric. Stands around 20" in

**Pres Classic II loudspeaker**

height are recommended, which is how I auditioned the Classic IIs, effectively sitting on the tweeter axis.

**The sound:** Well, to cut a long story short, I was disappointed with the sound of the Classic IIs. The bass was light, the lower midrange lacked weight, and the upper midrange/lower treble was very forward in balance, with a hollow, nasal coloration. Piano sound was warm, with undue emphasis on several notes from middle C upward, and baritone voice took on a hard edge. In fact, on pink noise several resonant peaks could be heard; these were of almost high enough Q to be heard as musical notes. The cabinet walls themselves seemed quite inert, apart from the top, which was a little lively, and I suspect that the midrange colorations are due to internal box resonances: the coincidence of the width and depth dimension seems to be an unfortunate design decision, resulting in mutual reinforcement of internal resonant modes. The paper-cone woofer will act virtually as an open window to such resonances.

High frequencies seemed suppressed, although this was probably a function of the forward mids. Stereo imaging was poor, even with the grilles removed, and the soundstage was both shallow and ill-defined.

**Measurement:** The nearfield -6dB point lay at quite a high 48Hz—the impedance meas-
urement revealing the cabinet resonance to lie at 64Hz—and the lack of extension was exaggerated in-room by a steadily rising measured response through the midrange, the 1kHz level being around 4.5dB higher than that at 100Hz. This would explain both the lack of lower-midrange weight and the way the soundstage was projected forward, resulting in a very close sound on piano, for example. Although Pres recommends use of the Classic IIs in free space, this response suggests use close to a rear wall, which would usefully bring up the upper bass/lower midrange a little. The resonant problems would remain, however, and probably correlate with the measured uneven, bumpy roll-off above 1250Hz.

**Conclusion:** The Classic II may be beautifully constructed, but its sound is tonally unbalanced and marred by resonant colorations. In my opinion, a complete redesign is called for.

**Siefert Magnum III: $799**

An imposing, well-finished, three-way design, the Siefert Magnum III is the latest model from the company that made their name with the two-way Maxim III, the latest version of which was favorably reviewed by TJN in Vol.10 No.4. Much is made in Siefert's literature of the wide range covered by the 4", polypropylene-cone, midrange driver: the three and a half octaves from 250Hz to 3kHz, covering the fundamental range of both the human voice and of all but bass instruments, with performance said to be well-behaved for another octave of either side of its passband. In theory, this should result in a seamless midrange performance, bolstered by a bass unit crossed over to below the region of critical musical importance, and highlighted by a tweeter crossed over above the region where the human ear is most sensitive.

The drive-units themselves are from Norway: the tweeter is particularly interesting as it appears virtually identical to the aluminum-dome, polyamide-surround, SEAS unit used by Monitor Audio in the R652 reviewed above. Both tweeter and midrange unit are housed one above the other in a small sub-enclosure behind the wide MDF baffle; placement is asymmetrical, and the speakers are therefore supplied as a handed pair. The bass unit is reflex-loaded, the alignment being the once-popular B4 (fourth-order Butterworth), whereby flat LF extension is maximized at the expense of a higher Q than is fashionable these days. The port is in the form of a 3"-high slot running the full width of the heavily braced cabinet, and is not covered by the snap-on grille. The latter didn't appear to show any signs of being profiled so as to avoid diffraction problems; accordingly, I auditioned the Magnums au naturel.

The 21-element crossover uses third-order slopes, achieved with polypropylene-dielectric capacitors. Clip-on rather than soldered connections are used to connect the drive-units to the crossover, and electrical connection is via recessed, angled binding posts on the cabinet rear. Though these take both banana plugs and spade lugs, I found them to be a little awkward with bare-wire connections, there being very little space for fingers.

**The sound:** Siefert recommends that the Magnums be placed 3-4 feet from sidewalls and at least two from the rear, on 11" stands; accordingly, this was how they were auditioned. The tonal balance was warm, with heavy upper bass, and an impressive low-bass extension. Bass instruments reproduced with true power, but male voice took on a chesty boom, and ultimately the bass quality was felt to be a little oppressive and slow. Not a loudspeaker, then, to be recommended with tradi-

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tional-sounding tube amplifiers.

The treble was very clean, apart from a slight sizzle around 8kHz, similar in character to the Monitor Audio speaker, which accentuated breath noise on flute. The top two octaves were a little recessed, microphone noise on the Boyk recording becoming a little "pinker" than usual.

The cabinet was a little livelier than I would want, with a resonance around the E above C1; but string tone was natural. The dark character of the midrange, however, meant that less detail was apparent, clarity being only fair. Dynamics, too, were a little restricted, both by the slow bass and by the indistinct midrange. The fast octave-C quavers at the end of the first movement of the Boyk "Pathetique" were somewhat blurred, for example. Overall, the Magnum's tonality may not be that neutral, but it is inoffensive; the speaker loses out, though, when it comes to midrange clarity and dynamics.

Imaging and soundstaging were only fair, lateral precision being a little blurred compared with the better speakers in this group. Though there appeared to be a reasonable amount of depth apparent, you couldn't "hear the walls" on my Chopin piano recording to anything like the same degree as with SL600s or Thiel CSIs. Similarly, though you could hear the birds twittering at the end of the HFN/RR drum recording, they were not precisely localized at the end of the hall roof, as can be heard with SL600s, Quads, etc. There also seemed to be some disparity between the HF and midrange imaging, the depth being somehow dependent on frequency, something that was noticeable on the Boyk piano recording. At the Magnum III's price, however, this is not a serious criticism.

**Measurement:** The nearfield -6dB point was an astonishingly low 27Hz ref. the level at 100Hz, but the implied LF extension is exaggerated by a measured in-room boost between 5dB and 7dB in the mid- to upper-bass region (40-125Hz) when compared with the midband. Siefert's own anechoic measurements reveal a 2dB hump in the response around 70Hz; one would expect this to translate inroom to an upper-bass-heavy sound. Apart from that, the in-room response was reasonably smooth, though it lacked energy in the upper midrange, and rolled off a little prematurely in the high treble. Siefert claims that their crossover network is conjugate-load compensated; certainly the impedance varied only slightly with frequency, and the Magnum will not present amplifiers with any drive problems, despite its 4-ohm specification.

**Conclusion:** The Magnum III purchaser gets a lot of loudspeaker for his or her money, with a bass response effectively extending an octave lower than with most of the other speakers reviewed here. In my opinion, however, this extension has been obtained at the expense of bass quality, there being both too much midbass and a lack of low-frequency transparency and speed. I would have liked an LF alignment with a lower Q, something that the designer could have got away with in a box this large without sacrificing too much measured extension. I was prepared to be unimpressed by this loudspeaker, with its unwieldy proportions, lively cabinet, and wide baffle, but was pleasantly surprised. It isn't perfect, being more colored through the midrange than either the Celestion, Thiel, or Monitor Audio designs, but it may work well in carefully chosen systems in larger rooms, where the exaggeration of the bass will be less pronounced.

**Thiel CS1: $950**

Kentucky manufacturer Thiel has acquired a reputation for the coherence of sound presented by its range of distinctive, sloping-baffle, floor-standing loudspeakers. Designer Jim Thiel gives a high priority to linearity of phase response; as a result, he chooses to use phase-linear, first-order crossovers in his designs, the target response being the combination of electrical and mechanical filtering. As the out-of-band rejection is then only 6dB/octave, it places demands on his chosen drive-units to be well-behaved, not only in their passbands, but also outside of them. In effect, the loudspeaker has to be designed as a whole system, the interaction between the drive-units and crossover being considerable.

The CS1 is the least expensive in the Thiel range, combining a Norwegian plastic-cone, diecast magnesium-chassis woofer with a 1" soft-dome tweeter in a well-built, heavily braced cabinet, finished in real-wood veneer. The woofer is reflex-loaded with a 2.5"-dia-
The sound: With the CSIs placed well away from room boundaries, there was an immediate impression of a light, airy tonal balance, coupled with excellent low-frequency definition. The woofer alignment seemed to be well-nigh perfect, with very good bass transparency. This speaker should work well with classic tube amplifiers. Midrange timbres were excellent, though strings were a little thin-sounding, and bass guitar was somewhat reticent. High frequencies were a little excessive in level, with surface noise and recorded tape hiss “whitening” a little. Breath and key noise on woodwind instruments was slightly accentuated, and snare drum acquired a few more snare wires than usual.

Imaging was very precise, laterally as good as the Celestion SL6S, but there was slightly less depth apparent than with the British loudspeaker. That tilted-up HF response projected vocal sibilants forward a little, and treble depth was shallower than midrange. Instrumental delineation was excellent, however, and the CSIs were never less than musical.

Measurement: The nearfield -6dB point was a respectable 37.5Hz, which agreed closely with the measured amount of low bass in the room. This response showed only mild exaggeration in the upper bass, and the response was pretty flat through the midrange, ±2dB limits holding up to 3.15kHz. Above that frequency, however, there was a little too much energy—1.2dB or so—in the last two octaves, which correlates with the perceived treble sound balance.

Conclusion: The CSI is truly an affordable high-end loudspeaker, offering a well-balanced performance with no significantly weak areas, and losing out to the more expensive competition in terms of midrange/treble transparency, low-frequency extension, and ultimate loudness.

The slightly tilted-up HF balance seems to be an inherent feature of a Jim Thiel design; while not unmusical in itself, it does make demands on the rest of the system that there be no treble nasties. If you use a Quad 34 preamplifier, then I would recommend applying a little down tilt; otherwise, it's very easy to knock up a little passive network to fit be-

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between pre- and power amplifier or in the preamplifier's tape loop (see diagram). As shown, this gives a response hinging down above 2kHz to level out as a -3dB shelf above 8kHz: increasing the value of the 6k8 resistor (use metal-film types) reduces the depth of the shelf; increasing the size of the capacitor (use a polystyrene or propylene dielectric) lowers the hinge frequency.

**Overall Conclusion**

Two loudspeakers stood head and shoulders above the rest: the Celestion SL6S and Thiel CS1. Almost the opposite in tonal character—the British speaker a little subdued, the American having almost too much HF verve—both featured a lack of uncolored coloration, created solid soundstages with very well-defined width and depth, and revealed enough of the dynamic shadings of the music to produce an enjoyable sound.

Below that level of attainment, the Sievert Magnum III, Monitor Audio R652, and JBL 18Ti all offered what was basically a well-balanced mix of virtues, compromised by one or two areas where performance was less good than I would expect at the price. Nevertheless, in the right rooms, with carefully chosen ancillaries, any of these three could work well. In particular, the little JBLs offer exceptional value for money, and can be heartily recommended at the price.

The Kevez, too, offers good sound at the price, though not to the level reached by the speakers above. It suffers serious competition, however, from the similarly priced Spica TC50.

The Pres Classic II, though having the potential for good sound—a well-made cabinet, promising drive-units, good appearance—appears overpriced for the sound quality offered, and cannot be recommended.

On a more general note, three loudspeakers not reviewed should nevertheless be considered by someone thinking of spending up to $1000 on loudspeakers: the Magneplanar SMGa at $535/pair, the Spendor SPI at $950/pair, and the Vandersteen 2C at $1150/pair. The Spendor offers similarly accurate stereo imaging and midrange neutrality to the SL6S, but with better low-frequency extension, higher power handling and maximum spls, these at the expense of a slightly less smooth treble. It is very competitively priced in the US, but may be hard to find. The Vandersteens, reviewed in Vol.9 No.6 by AHC, are better overall than any of the under-$1000 speakers reviewed here, and it would be worth considering whether your budget will stretch another $200 or so. The small Magneplanars are less neutral than either the Spendor or Vandersteen designs, having a warm balance with rolled-off highs and a less-than-well-defined upper bass, but are inherently musical. If you don't need razor-sharp analysis of soundstage or recorded detail, the SMGas offer a lot of music at an affordable price.

One thing I think should be stressed: you shouldn't think of spending $1000 on a pair of loudspeakers unless you have a good front end and a reasonable amplifier. To purchase a pair of Thiel CS1s, for example, and to use them with a Japanese direct-drive turntable fitted with a MM cartridge and an inexpensive receiver, would be to throw away most of the extra performance you've paid for compared with, say, a pair of $300 speakers. More on this topic when I review the next batch of relatively inexpensive loudspeakers—I can see LA approaching with another pile of cardboard cartons in tow.

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**THE ORIGINAL QUAD ESL**

Dick Olsher takes a retrospective look and listen

High fidelity took a giant step forward in 1956 with Peter Walker's introduction of the Quad ESL. Walker's research efforts had been motivated by his firm belief in the superiority of the electrostatic dipole over the box loudspeaker, but actually to take the economic plunge and market such a speaker was surely an act of bravery. After all, those were the pre-tereo, pre-audiophile days of the mid '50s, and the public's tastes and expectations were relatively unsophisticated. The average front end was abominable by today's standards, so that
making definitive assessments of loudspeaker quality was a difficult task at best. At the time, the "hornless" direct-radiator loudspeaker reigned supreme. Rice and Kellogg's moving-coil loudspeaker, which had displaced the competition during the radio boom days of the '30s — primarily because of its ruggedness and low cost — had had 25 years to be perfected. A credulous public was besieged by a variety of loudspeakers whose usual claim to fame was some sort of "innovative" cabinet design housing one or more paper cones. There were infinite baffles, misguided baffles, and a bounty of booming phase-inversion (bass-reflex) enclosures. And Edgar Villchur's air-suspension principle, in the shape of the AR1, was about to revolutionize the mass market.

Against this background, what chance for survival did this exotic new kid on the block have? It would seem that the forces of history were stacked against the newborn Quad, which appeared to be destined to play out its life cycle as a "small voice in the wilderness."

With hindsight, however, it now appears obvious that the Quad ESLs were at the right place at the right time. The age of stereo and the resultant audio boom were just around the corner; indeed, during the '60s, the reputation of the Quads grew exponentially. Early audiophiles quickly became aware that the conventional box loudspeaker was a very weak link in the sound reproduction chain, and many of them discovered to their amazement the clean, transient-quick, transparent, and focused sound of the Quads.

The rest is history. For over a generation, the Quads were proclaimed a reference standard, being used by countless reviewers, as well as a multitude of audiophiles. Around 60,000 of the original Quads were produced, and most of them are still in active use. In 1984 production of the ESL was finally wound up in order that the company could concentrate their resources on the Quad ESL-63s, introduced in 1981. However, as Fred Yando at Quad America tells me that there are enough spare parts on hand to safely see Quad owners through to the 21st century, it seemed appropriate to assess the Quad classic's sonic worth in a modern setting. Is it still a viable speaker or simply an anachronistic relic? Do you have to be over 50 to enjoy them? Do mods improve the sound? These are some of the questions I will attempt to answer.

**Prologue**

It is commonly assumed that the electrostatic speaker is a fairly recent high-tech innovation. Nothing could be further from the truth. Its roots are firmly planted in 19th-century scientific invention. For example, in
1881 Professor Amos Dolbear of Tufts University patented a condenser-type telephone receiver and transmitter. I quote from Professor Dolbear's US patent (No. 240,578): "My receiver is based upon the discovery that one terminal of an open circuit will attract and be attracted by a neighboring body when the terminal is charged." The commercial success of radio during the 1920s generated much interest in the electrostatic speaker, although it seems that only two commercial ESLs were produced in any numbers: a German design, and the US Kyle condenser speaker which was incorporated into the Peerless radio of around 1930. ESL designs in those days were handicapped by the lack of suitable materials. Light plastic films and mylar were not available, and inventors such as Colin Kyle had to resort to india-rubber diaphragms, aluminum foils, and mosquito netting for insulation. Needless to say, there were reliability problems, and these early ESLs were quickly driven off the market by the advent of the rugged and more efficient dynamic loudspeaker.

The original Quad is a full-range electrostatic loudspeaker which uses the well-known push-pull grid geometry, but with an important new wrinkle: constant-Q or constant-charge operation. This means that a constant charge is maintained on the diaphragm, usually by using a high-resistivity coating. If this condition is not maintained, it can be shown that the electrostatic forces acting on the diaphragm will be nonlinear, i.e., dependent on the location of the diaphragm between the grids. Constant-charge operation leads to effectively linear drive conditions.

A Quad ESL is made up of two bass panels and three centrally located "strips." The two outside or midrange strips operate in parallel and roll off above 2-3kHz, while the middle or treble strip reproduces all the frequencies above 600Hz. At serial number 16800, additional high-pass filtering, in the form of an RC network, was added to protect the treble unit from damage due to low-frequency signals. The bass units are biased at 6kV, and the strips at 1.5kV nominal. Plastic dust covers are used to isolate the grids from dust accumulation and to preserve the life of the high-resistivity diaphragm coating. Expanded-metal grilles are used front and rear to protect the dust covers and drive-units and to prevent curious hands and fingers from getting zapped. Thick felt damping is provided behind the central treble unit, while "burlap" damping material is glued to the inside of the rear grille to control bass panel resonances.

The ESL Sound
It is difficult to conceal one's respect and admiration for the midrange quality of these "antiques" in stock condition. In a cognitive sense, you can readily dissect the Quad's sonic attributes: excellent resolution of low-level detail, transient quickness, and cohesive harmonic textures. But the instant emotional impression is one of naturalness. They don't scream, shout or wave their hands at you with a phony sonic signature. Instead, you're confronted with a clean and harmonically convincing sonic window that captures the heart of the musical experience. The perspective, however, is quite distant, even on closely miked recordings: you're invariably transported to the back of the hall. This is readily explainable on the basis of the Quad's frequency response, which features a broad valley from about 2.5 to 8kHz, or from the upper mids through the lower treble. Another side effect of this response anomaly is an occasional slight honky quality to female voice, no doubt caused by a slight suppression of the upper speech formants.

In matters of dynamic contrasts, say from very soft to loud, the Quads are outstanding. True, they are limited in ultimate SPL to about 95dB at a realistic listening position, but within this range they are capable of excellent dynamic bloom. The Quads are startling performers indeed, and the "startle index" is quite high through the middle octaves—I'd say about 8 on a scale of 10. What is the "startle index," you ask? Well, it's my slightly tongue-in-cheek attempt to quantify the physical sensation of involuntary bodily movement associated with a sudden SPL change. (The startle index should not be confused with the wet-spot, or ring-around-the-

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1 I've always been amazed at the facility MC shows (at least in his writings for Hi-Fi News & Record Review in the UK) in nailing down sonic quality to a single percentage point (e.g., 83% sonic score for a component under review). I can't do that. It is extremely difficult to quantify personal sensations, and is very likely to be of limited usefulness to someone else, considering the variability in individual response to physical stimuli.

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sofa, syndrome, which is a measure of a speaker's ability to scare you.) No, you don't have to listen to the Quads in diapers. There are no chest-crushing crescendos. There is no bass punch. There isn't even any deep bass, though with the right amplifier and the modifications described later, the midbass is tight and very well delineated. They're not monster speakers. King Kong is not likely to own a pair, though Godzilla might. After all, he appears to have audiophile instincts. Why else would he periodically destroy the city of Tokyo, if not to vent his frustration with the Japanese audio mass market?

The Quads possess a definite sweet spot, which is to say that the upper octaves are rather beamy—sort of like the way a flashlight concentrates light in the forward direction. The spatial extension of this sweet spot is defined primarily by the dispersion in the vertical plane, which is a mere $15^\circ$ in the treble. Beamy treble is not a problem unique to the Quads, or to electrostatics in general, but is common to all speakers where the active dimensions of the treble driver are on the order of the radiated wavelengths or larger. For example, the length of the tweeter strips is around $24^\circ$, which corresponds to the wavelength at 550Hz. At frequencies above 550Hz, therefore, the Quads become increasingly directional in the vertical plane. It becomes necessary then to contain the listening seat to the area of the sweet spot.

The speakers must first be toed in toward the listener and the height of the listening seat adjusted so that the ears are no higher than the top of the panels. The sweet spot is then defined (according to DO, at least!) by an area centered on a line bisecting the speakers, six to eight feet from the plane of the panels and one foot wide on either side of the centerline. The optimum distance from the speakers is somewhat room-dependent and should be selected on the basis of active experimentation in your room. Within the sweet spot, the sound of the Quads is quite cohesive and capable of excellent imaging. Outside of the sweet spot, their imaging ability and tonal balance deteriorate. The Quads are therefore a one-person speaker. That's fine with me; I prefer to do my private listening solo and reserve mingling with the crowds to live performances.

As you can see, I prefer to listen to the Quads rather close-up—almost using them as headphones—but a caveat is in order here: at distances less than about six feet, the speakers don't quite gel, so ultra-nearfield listening is to be avoided. The idea of listening in the nearfield, however, is to maximize the ratio of direct sound to room reverberation, and thereby reduce the sonic signature of the room. Intense, early room reflections are the most significant offenders, capable of defocusing the soundstage and, even more importantly, of modifying instrumental timbres.

It is well known that the direction of a broad-band sources is largely determined by interaural cues associated with the earlier-arriving direct sound to the neglect of later-arriving reflections. This is precisely the precedence effect. (Note that the precedence effect does not preclude the perception of two separate but simultaneous auditory events from a pair of loudspeakers if the spectral content of the left and right signals is greatly different.) Experimental evidence supports the notion that the time course of the precedence effect spans two "windows." Following the abrupt onset of a sound, the sensitivity of the ear/brain system to interaural intensity and time differences is greatly degraded over the following 0.5 to 10ms. This means that during this time, the listener cannot distinguish even intense early reflections from the direct sound. Early reflections arriving in this 10ms window fuse with the direct sound and the sum is spectrally dissected by the ear/brain in order to form an impression of timbre or tonal color.

Sizeable reflections arriving during the second window, from about 10 to 50ms, are largely recognized as such by the ear/brain and do not figure prominently in timbre perception. However, because they are still below the threshold where they are recognized as discrete echoes, these later reflections are not perceived as separate auditory events; instead, they are localized with the direct sound and used in determining the size or diffuseness of the spatial impression. After about 50ms, the spatial persistence of the auditory system fades and the cycle repeats itself.

With this introduction out of the way, it should be easy to understand the sonic degradation introduced by nearby room sur-

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faces during playback. For example, strong lateral room reflections will fuse with the direct sound and cause the perceived image to shift toward the source of the reflection. This may result in the extension of the soundstage width well beyond the edge of the speakers, but the rub is that the subsequent size of the instruments will appear broader or more diffuse. Timbre accuracy suffers when the room generates early reflections (delayed less than 10ms) from walls, floor, ceiling, or even a coffee table in front of the listening seat.

To prove to yourself that the ear/brain actually works this way, you might want to try this rather interesting and elegant experiment. Record a short passage of a familiar solo instrument on a two-track open-reel tape deck. Then play the passage forward and in reverse and compare timbres. Even though on a gross time scale of several seconds the spectral content of the passage in reverse is identical to that in the forward direction, the reverse presentation sounds strange and unrecognizable! That's because during the "reverse" playback, the ear's 10ms window integrates primarily over the decay part of the musical information. One can conclude from this that correct arrival times for the various frequency components are crucial for the interpretation of timbre, and that extraneous room reflections can influence timbre perception.

Positioning the Quads in the listening room should follow the rules of thumb applicable to any dipole radiator, and they should be positioned several feet away from the back wall and side walls. In addition to acoustical treatment of the back wall, the side walls should be treated—at least when the Quads are fairly close to them. Generally, you wouldn't think that a figure-eight radiator is likely to create much in the way of lateral wall reflections, but because of the toeing-in requirements, the back-wave can interact strongly with the side walls.

Choice of amplifiers is also important. The Quads work extremely well with the old Quad II tube amps, simply because these amps were designed around the speakers. Any candidate amp must meet strict stability requirements into a significantly reactive load (30-15 ohms in the range 40Hz to 8kHz, falling above 8kHz) and possess a voltage-limited output of no greater than 33 volts (peak), this limit representing the threshold of physical pain for the Quads. More than 33 volts and you will punch holes in the diaphragm. The Radford STA-25, Marantz 8B and, of course, the Jadis JA-30, are all good choices. The nature of the load tends to favor tubed amps, but small class-A solid-state designs like the Krell KSA-50 should also mate well with the Quads.

Quad Mods: from the Simple to the Sublime
As with any other piece of classic gear, the Quads have not escaped audiophile intervention in an effort to improve an already good product to further sonic heights. And considering the amount of time the product has been around, I believe that everything possible has been tried.

The simplest possible mods consist of discarding the cosmetic accoutrements—namely, the back and front grilles. Removing the rear grille, together with the burlap padding, trades off bass control against enhanced midrange transparency. (Although with the Koval mod described later, bass control is not a problem and the reduced veiling and midrange congestion are worthwhile benefits.) Removing just the burlap padding and retaining the grille does not work as well. The gain in midrange transparency is not as great, and a standing-wave resonance develops in the response at about 4kHz, where the wavelength corresponds to the spacing between the back grille and the treble panels. Do not remove the thick felt padding behind the central treble unit, as it provides needed acoustic damping and controls what would otherwise be serious ringing in the mids. Removing the front grille provides an even more dramatic gain in transparency and focus, which must be heard to be believed. It appears that the front grille acts as a diffraction grating or diffuser for the sound, veiling musical textures and reducing clarity. Without the front grille, clarity top-to-bottom is now competitive with any modern design—the Martin-Logan CLS, for example. There are practical problems, however, inherent in removing the grilles—the least of which is the resultant ugly cosmetics. The dust covers are now exposed and vulnerable to rupture. High-voltage terminals are accessible to prying hands and curious pets. If there
are small children or pets around your listening room, I'd think twice about these modifications. In my case, the Quads in my new listening room are quite isolated from such intruders, except from an occasional visit by one of JGH's cats.

The next modification is a lot trickier to implement. It is not one that I've personally tried, but I have it on good authority that it is sonically worthwhile. It involves replacing the dust covers with thinner mylar sheets. Such plastic sheets are readily available at hardware stores, and are commonly sold as paint drop-cloth. The reported improvement is in the same direction as that afforded by the removal of the grilles. Of course, no dust covers are better than even thin ones, so you may be tempted to dispense with them entirely. Don't! You will drastically shorten the life of the diaphragm by doing so.

Finally, the Koval mod. Amazingly, this mod was first advertised for public sale around 1979, and is still available from John Koval. You'll need a pair of his mysterious-look modules (one per channel), for which he asks a modest $160/pair, post paid, and there is a money-back guarantee in case you're not satisfied. The modules are completely potted-in, with only five wires and six connecting pins protruding from the body. They are to be installed in the bottom of the audio transformers. The installation is not overly complex, but is time-consuming (figure on a few hours), and requires care and a lot of soldering. Electrically, the mod involves, among other things, allowing the two midrange strips to run fullrange, rather than rolling off above 2-3kHz. The woofer panels are also rebalanced to complement the new and much simpler radiation scheme, which eliminates the overlap and interference between the mid and treble strips. Another benefit is the elimination of capacitors from the signal path — no caps are better than good caps.

As you can see, the Koval mod borders on a redesign of the stock unit. Is all of this effort justified? The answer is a resounding yes! Sonically, the most significant improvement is in the area of tonal balance. The Koval mod eliminates the speaker's broad midrange recession. My measurements show the modified Quads to possess flat response on-axis (within 2dB) from 700Hz clear out to 17kHz. Below 700Hz, the room response is excellent but a bit more jittery (4dB glitches) down to about 55Hz. The change in balance is quite obvious and results in a more lively and spacious character through the mids and treble. It takes some getting used to, especially if you've tailored the rest of your system around the tonal balance of the original Quads. Initially you might think the sound a bit bright or the treble a bit tipped up, but in the final analysis, the Koval mod advances the Quads much closer to reference caliber. The focus of instruments within the soundstage is also tighter, improving imaging specificity. The bass (with both grilles removed), too, is better defined, with now what strikes me as an almost ideal Q. It is now much easier to follow bass lines and to identify various bass registers.²

Of course, the Koval mod is not an overall panacea. The dynamic range and deep-bass limitations of the original Quads are still apparent. But the improvements are so significant that I think the Koval mod may be the best-kept secret in audio. It represents great value for money, and, together with the other modifications outlined above, pumps new life into the original Quads.

I have been using my modified Quads for quite a while now, not only as a reference tool, but simply for the sheer enjoyment of it all. It will be a cold day in hell before I retire these babies!

Addresses

Quad of America
142120 Sullyfield Circle
Chantilly
VA 22021
Tel: (800) 824-7855.

The Koval Mod
Linear Acoustic Labs
11521 Cielo Place
Santa Ana
CA 92705
Tel: (714) 838-6555 or (714)730-9011 to leave a message.

² Bass transparency also improves if the Quads are used on rigid 15-inch stands, as recommended by CB in Vol.10 No.1. —JA
Reference cartridges don't really require a great deal of care and feeding, provided they are properly housed to start with. Proper set-up is essential, but the rest is fairly easy, being largely a matter of cleanliness and a little technical attention. If you follow these rules, you will enjoy a long and happy relationship with your cartridge:

• High-quality cartridges require clean records; a good record-cleaning machine, like the VPI or Nitty Gritty, is essential to getting them to sing their best. You will never hear what a top cartridge can do if you stick with a manual cleaner, and new records often come with as much factory-applied grunge as old ones can hold. If you pay hundreds of dollars for a cartridge, along with thousands for a turntable and LP collection, it simply doesn't make sense not to have a record cleaner.

• It essential to clean the stylus regularly with Stylast, using a brush with stiff, short bristles. Always brush gently from the back forward. Do not scrub! If you can't find Stylast, the Audio Technica/Signet fluid or pure ethyl alcohol will do nearly as well. However, Stylast is consistently better at removing the baked-on black coating from the stylus. Be sure to use a brush stiff enough to remove both residue and cleaning fluid. A stylus still wet with cleaning fluid is a dust magnet.

• Having spent some years shifting between pro and con, I recommend that you resist gilding the lily by using any other form of stylus or record treatment, even Last. Whatever Last's theoretical merits, I have not found a way of evenly applying a thin enough coat to benefit from them. Either passages are missed, or the coating is too thick and ends up on the stylus.

If you use an expensive MC cartridge, however, there is still one aspect of its care and feeding requiring attention. The magnetically permeable components of an MC cartridge can become magnetized, and this is especially true of the coil former or armature. When this occurs, the magnetic circuit is modified, leading to a reduction in apparent dynamics, worsened imaging capabilities, and diminished soundstage size; even the tracking becomes less secure. The same things happen with MM (fixed-coil) cartridges when the pole pieces become magnetized.1

The Sumiko FB-1 "Fluxbuster" is intended to solve this problem, and it works very well. Bill Sommerwerck sang its praises in Stereophile Vol.9 No.4, Barney Pisha did likewise in the April 1987 issue of Audio, and I can testify that I found the Fluxbuster to be extremely useful when I was carrying out my survey of reference cartridges, published elsewhere in this issue.

The Fluxbuster is remarkably easy to operate. If you use an arm with a standard headshell, just plug the headshell into a socket on the top of the Fluxbuster, flip one switch twice and you are done. If you use an arm with a fixed headshell, plug the tonearm lead into the Fluxbuster's two RCA sockets; again, you are done.2

I have found that some MCs need fairly regular Fluxbuster treatment: the Monsters and Koetsus, for example. Others, like the Argent, didn't benefit even after two years' use. By and large, however, all MC cartridges should probably be demagnetized on a preventative basis. When I delved into my collection of historical cartridges, I found that about one in two benefited quite audibly. A brand-new Koetsu Signature Red showed a clear improvement in imaging.

Aside from these few minor guidelines, you should find a reference cartridge easy to live with. Just treat it like any other pet rock that happens to be a diamond!  

1 Do not use a conventional tape-head demagnetizer with a cartridge. You will almost certainly ruin it!

2 Do not use the Fluxbuster on anything other than an MC cartridge without consulting Sumiko or the cartridge's manufacturer. With an MM cartridge, you must remove the stylus/magnet assembly, if possible, or you will partially demagnetize the tiny moving magnet, resulting in reduced output voltage and probably altering the performance permanently.
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*Alvin Gold, Stereophile (Vol. 10, No. 4)*

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*Hi Fi News (June 1987)*

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Christopher Breunig offers a miscellany of recent issues and happenings

I was tempted to call this month's fragmented column "Bagatelles" but, mindful of the classic description of Beethoven's pieces—"shavings from the master's work bench"—thought that presumptuous. It has been a significant quarter for Beethoven collectors: Arrau has at last rerecorded the Diabelli Variations, and his fourth recording of the G major Concerto—Davis conducting the Dresden Staatskapelle—appeared, coupled with the 32 Variations W60.80 (Philips 416 295-2 and 416 144-2). More exciting, if only because it was so unexpected, RCA has put the 1949 Toscanini/NBC "Eroica" on CD, adding the performance of the First Symphony which Stravinsky so disparaged (In Conversation with Robert Craft, 1958) (RD 87197).

It is quite true that Toscanini's introduction to the first movement of the C major is Andante rather than Adagio molto, and in his 1936 recording with the BBC SO the tempo is slower, the phrasing much more ardent. I say...
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"is," not "was," as you can now hear a newly refurbished set of Symphonies 1, 4, and 6, together with a previously unpublished live Symphony 7 (and a first release of a 1939 Prometeus Overture), all with the BBC Orchestra (EMI IC-6156 29 09309: 3 LPs). I rather upset transfer engineer Keith Hardwick when I described his work here as less good than that of AC Griffiths, who remastered these recordings in 1970 for World Records UK; this time, more of the crackle has been suppressed, and EMI's dmm pressings give the sound not only a glassy smoothness, but transients that peak uncomfortably. Upper-frequency curtailment is fairly drastic, and the finale of 7 is cut abruptly at its conclusion.

If you don't know these recordings, acquire them—not least for the glorious account of the first Leonore overture. Toscanini's 1935 concert performance predates by a few months his classic NYPSO Symphony 7 without, in my view, equaling it, except perhaps in the cumulative effect of the slow introduction to the work, where he combines unusual flexibility with terse accenting in taut balance. (And yes, I do know Spike Hughes's chapter on the NY LP transfer change, in his Dover softback!)

Engineers have never ceased trying to modify the sound of Toscanini's Studio 8H and Carnegie Hall recordings; I suppose CD represents a last effort—though the original quality has rarely proved as dreadful as writers have suggested. For the younger collector, Toscanini's "Eroica" has meant the 1953 live recording first released by RCA Italy in 1960. Wonderful though that achievement was, Toscanini's tempo for (i) tends to sweep along the subsidiary parts which make the movement so imposing a structure: the opposite approach from Klemperer's. But in the 1949 version more weight was given to the two opening chords, and in general throughout—this not just a question of sonics. Not all critics would agree, but the extra spaciousness helps the music to breathe, and this reading seems to have more freshness and meaning.

It is good to see someone at RCA not acting merely on the principle of "latest equals best" in reviewing their past catalog for CD rerelease. For example, of the two stereo recordings Rubinstein made of Brahms's B-flat Concerto, they have picked the one with Krips conducting, not the later, poorer Ormandy alternative.

More EMI treasures disappear from the catalog in acceptable analog form, to reappear in the travesty of digital dress. The fine Beecham Scheherazade, produced by Olof and Collingwood, though sonically faded, was held in high UK audiophile regard for its simple yet tangibly present soundstage characteristics. In May I scoured London for a replacement pressing (I think I found the two remaining SXLP30253's!), having heard the unlistenable ADRM replacement. You still catch all the incidentals—the fluffed solo violin note near the beginning of (ii), the Kingsway subway rumbles—but the only redeeming feature of the new disc is its Bakst artwork. Still available is a 1960 analog Philharmonia/Kletzki Scheherazade, which has fewer sonic virtues and lacks the Beecham magic. The vintage Reiner/Chicago recording, much loved by TAS, has now also been digitized.2

Similarly, the 1967 Barbirolli/Scotto Madama Butterfly has been withdrawn in favor of a 2-LP remastering: all the vibrancy of the production, its spaciousness and dynamics, have been lost; the big climaxes are soured.

Mention "LP" to any record company executive now, and you might as well be talking quadraphonics.

Eyebrows were raised when, in 1981, Karajan's BPO set of the six "Paris" symphonies was endorsed by no less a Haydn authority than HC Robbins Landon. After all, his previous Haydn recordings (the earlier Creation apart) were pretty smooth and uneventful. This digital cycle, 82-87, is now on 3CDs: DG 419 741-2. A rehearsal reminds me that this is one of Karajan's most vital, committed, and engaging projects of the last decade.

Compared with the LPs, the CDs show a slight edge or coarsening of the sound, but not to a distracting degree. There is an enormous feeling of power in the allegros—in slow introductions too—and Karajan always has you thinking about the music itself,
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Stereophile, Vol. 9 No. 7, October 1986

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Stereophile, August 1987
though the execution is technically superb. Haydn's music is inventive to the point of eccentricity in the *Vivace of La Reine*, where the strutting figures over *legato* string lines give way to two contrasting vigorous ideas in the exposition.

Why does 1986 Moscow Competition winner Barry Douglas's first solo recording—Liszt, and *Pictures at an Exhibition* (RCA RD 85931)—sound so good? Engineer Tony Faulkner tells me it is because the equipment he used was partly tubed. Dynamic range is wide; there's a nice sense of presence and an appreciable halo of ambience to the instrument, but *fortissimo* attack never hardens. This is not a completely electrifying recital, but it is imaginative, especially good in the quiet passages, and with strong atmosphere in Liszt's transcription of Wagner's *Tristan* "Liebestod."

Watching Eliahu Inbal with his Frankfurt Radio SO recently, I realized that of all the conductors committed to the Mahler Symphonies, he most closely resembles the composer in action, as shown in contemporary silhouettes.

Symphony 5 stands at the pinnacle, so far, of Inbal's Denon CD-only cycle, of which we have had the first seven works in number order. Available on just one 72-minute disc (33CO-1088), this sets out the score with a kind of dispassionate, even cold-sounding logic, strangely at odds with Inbal's obvious personal involvement with, and belief in, the music. If the *finale* doesn't quite sweep through to the coda as overwhelmingly as this orchestra now does it in concert (the recording was made in January '86), that is partly because Mahler's expectations were superhuman. The Frankfurt strings don't have the sweetness of the Philadelphians' in the Levine/RCA Fifth, which is finnicky in the *Adagietto*, and although the *finale* is only 2½ longer than on Denon, seems an easier option on the music. Not a wholehearted Tennstedt admirer, I nevertheless find, in my comparisons, his LPO *finale* the most satisfying of the lot.

The Denon sound is extraordinarily transparent, so clean that it is practically the only CD I own for which I'd want to put the volume up to roof-raising levels.

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Stereophile, August 1987 177
We asked visitors to the Stereophile show in March what they thought was the room with the best sound—the results were published in Vol.10 No.4, p.4. The voting form also contained a number of questions about visitors' systems, recorded-music buying habits, and taste in hi-fi magazines, and we thought you would be interested in what was revealed.

Regarding reading habits, it appeared most visitors read about four magazines regularly: the low readership for Digital Audio is interesting, as is the high readership of UK magazines. Those motivated to fill in the form must undoubtedly have been the hard-core

<table>
<thead>
<tr>
<th>Magazine</th>
<th>Percentage of visitors who regularly read it</th>
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<tbody>
<tr>
<td>Stereophile</td>
<td>88%</td>
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<tr>
<td>Audio</td>
<td>67.5%</td>
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<tr>
<td>The Absolute Sound</td>
<td>53%</td>
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<tr>
<td>Stereo Review</td>
<td>36.5%</td>
</tr>
<tr>
<td>Hi-Fi News &amp; Record Review (UK)</td>
<td>25%</td>
</tr>
<tr>
<td>High Fidelity</td>
<td>20.5%</td>
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<tr>
<td>High Performance Review</td>
<td>11.5%</td>
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<tr>
<td>The Audio Amateur</td>
<td>10%</td>
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<tr>
<td>The Sensible Sound</td>
<td>9%</td>
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<tr>
<td>Hi-Fi Answers (UK)</td>
<td>6.5%</td>
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<tr>
<td>Fanfare</td>
<td>5%</td>
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<tr>
<td>Hi-Fi Choice (UK)</td>
<td>4.5%</td>
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<tr>
<td>International Audio Review</td>
<td>3.5%</td>
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<tr>
<td>Hi-Fi Heretic</td>
<td>2.5%</td>
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<tr>
<td>Digital Audio</td>
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</tbody>
</table>
audiophiles; how, otherwise, could the top rating for *Stereophile* be explained? Thanks for your support, guys.

When it came to age, the breakdown was as expected, with "baby-boomers" predominating:

The value of people's systems came as a surprise, in that so many had ventured into the real high end:

<table>
<thead>
<tr>
<th>Value of system</th>
<th>Percentage</th>
<th>Percentage Over</th>
<th>Percentage under</th>
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</thead>
<tbody>
<tr>
<td>Under $1000</td>
<td>3.1%</td>
<td>96.9%</td>
<td>3.1%</td>
</tr>
<tr>
<td>$1001-$2000</td>
<td>11.5%</td>
<td>85.4%</td>
<td>4.6%</td>
</tr>
<tr>
<td>$2001-$3000</td>
<td>12.7%</td>
<td>72.7%</td>
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<td>$3001-$4000</td>
<td>13.9%</td>
<td>58.8%</td>
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<td>$4001-$5000</td>
<td>12.1%</td>
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<td>37.6%</td>
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<tr>
<td>$6001-$7000</td>
<td>6.7%</td>
<td>30.9%</td>
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<td>4.8%</td>
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A good rule of thumb to judge whether a person is more interested in music than the sound it makes is to look at his or her record collection. Accordingly, we asked visitors about the size of their collections, both of LPs and of CDs:

<table>
<thead>
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<tr>
<td>1-50</td>
<td>4.7%</td>
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<tr>
<td>51-100</td>
<td>10.5%</td>
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<tr>
<td>101-250</td>
<td>19.2%</td>
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<tr>
<td>251-500</td>
<td>28.7%</td>
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<tr>
<td>501-1000</td>
<td>17.0%</td>
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<tr>
<td>1001-2000</td>
<td>10.5%</td>
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<tr>
<td>Over 2000</td>
<td>5.9%</td>
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</table>

<table>
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<tr>
<th>No. of CDs</th>
<th>Percentage</th>
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<td>1-10</td>
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<td>101-250</td>
<td>6.9%</td>
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<td>251-500</td>
<td>2.9%</td>
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<tr>
<td>501-1000</td>
<td>1.2%</td>
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</table>

Don't forget: *Stereophile*’s New York Hi-Fi Show will take place at Manhattan’s Omni Park Central Hotel, 7th Avenue and 56th Street, from October 16th to 18th. See the ad in this issue for details.
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Stereophile, August 1987
Solid-core cable

Editor:
The concepts put forth by Alvin Gold on solid-core cable in Vol.10 No.4 are so far removed from the years of research and testing we've performed, it's difficult to comment on them.

Our position sharply disagrees with Alvin's. We've found that solid-core cables do not and cannot match the performance of a properly designed, multi-stranded cable.

True, solid-core cables are simple, inexpensive to construct, and even pleasant to listen to, but they cannot compensate for the frequency and time domain problems that occur in audio cables. The control of these parameters is what gives us the sense of spaciousness, ambience, depth, and frequency balance that we have come to expect from a properly designed, multi-stranded cable. Other parameters such as transient response, intertransient noise, and the extension of frequency response, while not an inherent characteristic of multi-stranded cables, cannot be improved without them.

A qualification is in order here. It is entirely possible to degrade the sound by the improper construction of multi-stranded cables, much more so than with a single solid strand (there isn't much you can do with one strand). The design problems are more complex and the solutions require knowledge and experience, just as it is easier to design a good single-driver speaker than a good three-way system. (Not that it can't be done, it's just more difficult.) The smearing and edginess that Alvin is experiencing is due to the improper cable design rather than the concept of multi-stranding itself. Surely Alvin can understand that a poorly executed design does not disqualify the underlying design concepts.

Lest you think that we oppose this design concept because it is not represented in the Monster Cable line, permit me to relate a story of the development of our low-priced "budget" interconnect cable, the Interlink 300.

Our initial design goal was to use the solid-core concept. After all, it was inexpensive to make, easy to solder, and sounded "OK," according to our UK friends. We purchased every type of solid-core cable we could find: large conductors, small conductors, high-purity copper, linear-crystal copper, oxygen-free copper, long-crystal copper (with exotic fabrication techniques from Japan and Europe); we even tried silver. While some sounded better than others, all exhibited a collapse in depth and dimension, and lacked frequency extension when compared with even our lowest-cost, time-compensated design, the Interlink 400. We ended up using a special construction of ultra-thin ribbon wound around a modified flux-tube design which helped to regain what we lost using just a straight solid core. Anyone who doubts this result can easily duplicate the same listening test by purchasing 2mm-diameter copper from any electronic supply store and trying it.

Finally I feel that Alvin's article lacks credibility. The technical descriptions of why solid-core works have no scientific basis, and neither do his analogies of multiple microphone setups and signals being "squashed out of existence." The idea of constraining the current field is equally ludicrous, since you are not constraining the current field, but instead letting it do its job of altering the audio signal by making no attempt to control it.

And finally, the constant plugging of DNM throughout the article with constant references to their unsubstantiated design theories, and publishing the fact that they are looking for US distribution, reads like a commercial. It has no place in an article discussing design theories.

In conclusion, while it is entirely possible to construct a decent-sounding solid-core cable, it has been our experience that the use of solid core itself cannot approach the state-of-the-art sound we can obtain from a properly designed cable using multi-strands.

Noel Lee
Monster Cable Products Inc.

SOTA Star Sapphire turntable

Editor:
I should like to thank Stereophile for covering the entire family of SOTA turntables: this is the first review to do this.
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As with all visits to reviewers, I faced my impending Santa Fe visit with mixed feelings. Would Gordon be able to hear all the improvements in our "new, improved" SOTA Sapphire? Would the latest be so much better than his familiar and reliable reference? Would we be able to stand the wait? We knew what we had achieved; we just hoped it would be obvious to the dean of reviewers!

Well, we are indeed well rewarded. Not only does JGH recognize the differences, he is able to understand and elucidate the nature of our improvements, leaving us with little to add other than "Well done."

For the record (no pun intended), all existing SOTA turntables (Sapphires and Stars) may be fully upgraded. To transform a Series I Sapphire to Series III Sapphire (with Supermat) costs $550. To transform a Series I Sapphire to a vacuum Series III Sapphire, the cost is $850. To transform a Series I Star to Series III, the cost is $550. Reflex Clamps and aluminum arm boards are not included, nor are they with newer turntables; both are options. Please consult your dealer.

Anybody wishing to verify the currency of a SOTA may do so by either calling the factory (415-632-0394) or inspecting the table: Series III platters have distinguishing round pressure plates on the underside of the subchassis (surrounding the transit screws), and Series III motors have a silver pulley and a slit in the top plate adjacent to the pulley.

I am mystified by the reported differences in height of the two platters, since the only difference is that one has a vacuum seal and the other doesn't. As they say in LA, Gordon, we need to dialogue on that one! Also, the vacuum controller should not switch the vacuum off at its extreme position.

Despite the quality of this review, we are happy to announce that there are no price increases expected! Except for the Black-lacquer Star, whose price was raised in April to $2000, SOTA prices have been constant for some time. In May, we began production of exotic wood finishes for Stars: Cherry, Walnut, Maple cost $1750; Ebony, Brazilian Rosewood, Padua, Cocobola Rosewood, and Koa cost $1900. They are among the most beautiful turntables we have ever seen.

Finally, a little Tweek will lubricate the inside of the rubber Spindle cap to make it more flexible to use. Frankly, though, most Stars come with the Reflex Clamp since virtually all of our dealers find considerable improvement even to the vacuum hold-down (you don't use the rubber washers needed for the Sapphire). Because of the Reflex Clamp's unique hard-clamping action, it functions as an energy terminator for the platter bearing, giving greater clarity, better bottom-end reach and fullness, and extended top-end reproduction. We urge Gordon to give it a try!

Rodney A. Herman
SOTA

Siefert Magnum III
Editor:
Although Mr. Atkinson's report seems to have been carefully carried out, we were disappointed to learn that he had chosen to audition the Magnum IIIIs on 11" stands, whereas the Owner's Manual provided clearly states optimum height to be 12" to 18". This higher elevation, centered at 15", locates the tweeter/ midrange juncture at ear level for a seated listener, and provides optimum imaging, better tonal balance, and minimizes the low-end emphasis encountered. We believe that some experimentation with height, such as was done with the JBL 18Ti, would have quickly revealed the necessary upward adjustment.

Regarding the binding-post accessibility, these have been changed on the Maxim III series to larger, gold-plated types, which not only will accommodate #10 wire, but are now mounted within a large 2" x 2¼" recess, which provides easy access. This same terminal arrangement was scheduled to be incorporated on the Magnum III during July 1987.

Ed Miller
Siefert Research

Unfortunately, a copy of the Owner's Manual was not packed with the review samples. Now that we have received one, it is a model of clearly presented and helpful information. However, regarding recommended stand heights, it mentions two optimum ranges: 10"-20" on p. 1 (two mentions) and 12"-18" on p. 3, and this is undoubtedly where the confusion over recommended stand height arose. Although not mentioned in the review, I did
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It should come as no surprise that these two thoroughbreds work so well together. When we saw SME's remarkable achievement of rigidity, non-resonance and neutrality, we set about creating a phono cartridge designed to the same parameters. Separately, each is recognized as the state-of-the-art in its genre. And, of course, the SME V will bring out the best in whichever phono cartridge you decide to use, just as the Virtuoso will perform superbly in other tonearms.

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audition the Magnum IIIs on 16" stands, but found neither the bass excess nor the imaging to be significantly affected. —JA

Pres Classic II loudspeaker

Editor:

After 14 years of producing fun-loving, bass-reflex, multi-driver array loudspeakers (say that fast 10 times), we decided in late 1985 to add two acoustic-suspension “monitor” loudspeakers, the Classic I and smaller Classic II, to our line. Although, up to that point, “neutrality” was hardly a word that could be applied to Pres Speakers, we thought that the concept had merit for those who mainly listened to classical music.

Well, our first working model was the example sent to Stereophile for review in the summer of 1986. Out they went to our regular customers, and back they came, with a distillation of the comments going like: “What have you done to Pres Speakers?!!?!?” Back to the drawing board we went, and came back with the same basic speaker, but with a slightly higher Q, new baffle treatment, different internal wiring, adjusted crossover equalization, and a notch filter. This takes us up to about January 1987. This version was better received, but the hoped-for enthusiasm was not there. I decided to give it another try.

The Pres Dual and Mini “S” had been entertaining people (and selling quite nicely) for 10 years in basically the same evolving form. These are tuned bass-reflex loudspeakers, and are obviously what we know and build best. In a business where small changes make big differences, you shouldn't let the acorn fall too far from the tree. Accordingly, we changed the Classic series significantly, the Classic II being enlarged and changed to a bass-reflex configuration. The baffle was tilted, to time-align the drivers, and a “Scott-felt” baffle treatment was used, though the crossover network was essentially unchanged from the second version. Most importantly, our old customers now felt good about it. It will no doubt change some in the future, but in an evolutionary way. Even my mood is better now.

I suppose you will say, “Now you tell us!” But honest, guys, after almost a year and several “next issue” promises that went by the boards, I honestly didn't think you were going to publish the review.

Mark A. Pieraccini
Pres Speakers

Acoustat Spectra III

Editor:

We are grateful to J. Gordon Holt for taking the time to review our Spectra 3 loudspeakers. He obviously liked the smoothness, transparency and low distortion of our push-pull electrostatic design. Gordon's criticisms of the Spectra concentrated on its limitations in power handling and sound-pressure level, particularly when the dynamic woofer is not used.

(Gordon correctly found that much higher low-frequency levels could be handled with the dynamic woofer switched on.)

Acoustat's position has been that really high SPLs at low frequencies require use of the woofer, which is why it is built in. On the other hand, perhaps 99% of all music will not overstress the electrostatic elements. Most listeners will be able to audition the Spectra 3s as fullrange electrostatics (without the woofer) at normal levels in normal-sized rooms. However, there are sound levels, such as the famous cannon in the Telarc 1812 Overture, which cannot be handled without the dynamic woofer.

What Gordon did not allow for in his review was the high altitude of Santa Fe (7000 feet), which imposes a significant limitation on the power-handling capability of all ESLs (some cannot be used at all at this altitude). The rarefied atmosphere breaks down with high-voltage potentials across it, which can result in small, audible discharge noises, and, in extreme cases, momentary reduction of the constant-charge level on the diaphragms, neither of which have ever damaged an Acoustat electrostatic element.

Even at his high elevation, in Gordon's large listening room, he obtained appreciable sound levels. Closer to sea level, where most people live, I believe he would have found fully adequate sound levels to be produced by the Spectra 3, even at bass frequencies.

Gordon observed that our variable-area concept, as used in the Spectra, eliminates the beaming and vertical-venetian-blind effects inherent in large planar speakers. The imaging and dispersion characteristics of the

Stereophile, August 1987  185
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MAXIM III—J. GORDON HOLT STEREOPHILE—JULY, 1985 VOL. 8, NO. 3

Mr. Holt elaborates: "Of all the speakers in this price class that I have heard, I would say that Siefert's Maxim is probably the most successful design of all... The system is beautifully balanced and almost perfectly neutral... the low end from these is just amazing!... gives a solidity and foundation one does not expect to hear... They have the most accurate middle range I have heard from any speaker... it has one of the best extreme-top ranges I have heard from a dynamic system... the imaging and soundstage presentation from these are excellent... They do not sound small... Recommended."

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MAXIM IIID—TOM NORTON STEREOPHILE—JUNE, 1987 VOL. 10, NO. 4

Mr. Norton reports: "...I was not at all surprised to find that the small Maxim IIID produced an excellent soundstage... The bass of the IIID was surprising for a small loudspeaker. My rather rudimentary measurements indicated that the latest IIID has a very smooth frequency response... The IIID is an excellent speaker for its size and price; it is a very good one by any measure."

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Allen Edelstein
Stereophile, vol. 9, no. 2

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Earl C. Hudson
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Spectras are those of a line-source; the power handling at low frequencies, however, utilizes the entire panel array. This combination of smoothness and good dispersion, along with increased power handling over previous designs, is the salient feature of the Spectras.

We are sorry that Gordon does not approve of the appearance of the bases of the speakers. Most people have commented favorably on the appearance, particularly as they contemplate the difficulty of integrating a woofier enclosure of generous volume with an electrostatic array of only a little over 2" thick. Each of us is entitled to his own preferences. Whether it concerns appearance or sound quality, no-one should blindly substitute another person's opinion for his own; rather, he should look, listen, and judge for himself.

Jim Strickland
Acoustat

Sony DTC-1000ES R-DAT

Editor:
I would like to comment on Martin Colloms's typically thorough examination of the Sony DTC-1000ES DAT recorder. While technically beyond reproach, Martin maintains in his closing comments that the R-DAT format is "a clever design lacking in mass-market consumer relevance...representing the recipe for minimal sales of a new replay technology."

In my opinion, nothing could be further from the truth.

From its original conception, the rotary-head digital audio tape system was designed for a number of applications. In the consumer marketplace, not just component models but automotive and even portable R-DAT players were envisioned. In fact, a number of companies—including Sony, Kenwood, Technics, Clarion, and Mitsubishi—have made their intentions clear in that they regard DAT as having an important future role in the car stereo aftermarket.

In addition, the professional tape-duplication industry, as well as a surprisingly large group of music labels, have already expressed strong interest in the anticipated market for this new medium. None of these business concerns would have invested both time and capital toward this project if it truly lacked "consumer relevance."

Perhaps the real question here is not one of consumer relevance, but consumer preference. I, too, share with Martin the belief that, even with the availability of a non-Copycoded DAT format—if we're lucky—the potential for it to negatively impact CD sales is quite small. However, the issue here is not the R-DAT tape's attractiveness, but rather the different sort of appeal that an optical medium like CD generates, particularly in the areas of archival and interactive use (though questions still remain regarding just how many consumers are interested in CD's optical technology specifically for those reasons).

For the rest of us, the R-DAT system represents, at the very least, a viable digital alternative: a highly miniaturized, remarkably stable, recordable audio format. As for its "future": like all "futures," this one will need some time before the outcome is decided. And the time that R-DAT needs is what we like to call "quality time."

Not just on the editorial pages... . . .

...but in the real world of the marketplace.

Mark Finer
Communication Research Inc.

Beard P-35 amplifier

Editor:
Thank you for the time and effort Dick Olsher took to review the Beard P-35. Although accurate under the circumstances, I'm sorry to say that it's irrelevant.

When I spoke with DO in March I learned that he was reviewing exclusively with the Koval-modded Quads and informed him that the sample he had, a redirected unit from a Wharfedale shipment (vintage Spring '86), would almost certainly misbehave into them. I also informed him that there had been some small adjustments to the product and asked that he delay his review until he had either received a sample representative of what Beard America is shipping or found another, more conventional load on which to test his sample.

DO describes quite accurately the sound of a P-35 exhibiting parasitic oscillation when delivering high-frequency or transient signals into a particularly reactive load. There are a few loudspeakers available which will cause early P-35s to do this. All units shipped by Beard America have had this characteristic corrected by a change in Zobel network.
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values and by a change in driver valves (from Chinese-sourced ECC81s to UK-sourced 5182s). In addition, all units I’ve gotten my hands on have been retrofitted.

DO was shipped a replacement amplifier in late June; I hope he finds the time to test it as thoroughly as he did the initial sample.

Mark Siebert
Beard America

Discrete Technology

Editor:
Stereophile was kind enough to review three different products in three successive issues, beginning with Vol.10 No.1, and we would like to express our thanks and present some comments regarding the reviews.

AHC reviewed our LSI Mk.II CD player in Vol.10 No.1. While the Mk.II enjoyed a great deal of popularity during its product life, we have, during the time the product was submitted for review and the time of eventual publication, introduced the LSI Mk.III, which supersedes the original model. It incorporates some design improvements which result in improved clarity, focus, and depth. (Upgrades of the Mk.II to the Mk.III can be performed upon request. Price quotations for this service will be provided upon receipt of inquiry.)

While the improvements fall within the range of subjective performance evaluation, we have found that compact disc provides a remarkable reservoir of superlative program material capable of exhibiting performance potentials which are revealed by the improved performance levels of the Mk.III. Needless to say, there are some CDs that will simply not be helped and cannot be helped.

AHC also reviewed our LSII power amplifier in Vol.10 No.2. We are particularly pleased that he recognized the program-friendly nature of this amplifier. Our experience has shown us that almost 95% of the available program source material which has aesthetic value, either due to definitive performance or historically important performance, was sorely lacking in the audio quality which would provide the maximum enjoyment.

The ability to draw out of the original program sources, depth, quality, and nuances that were not easily discernible, place this amplifier in a unique category and one which can be used and enjoyed by virtually every user.

We appreciate The Audio Cheapskate’s review of our Power Bridge Cable in Vol.10 No.3. We would like to enlighten consumers as to how this cable functions. Gauge size, in this case, is not the critical element. The gauge size will only dictate the amount of current a cable will safely handle. The cable was designed as an elaborate filter network which does not limit current capacity, as do most of the power-line conditioners on the market. The construction details of this product include Teflon-dielectric, oxygen-free copper wire, pure silver plating, and multiple gauge conductors, all selected to create many exotic filter networks. This, most assuredly, cannot be assembled for $12.

When ST refers to “more power, more dynamics and better bass,” it is the result of this cable filtering out high-frequency hash which would normally be channeled through the power supply and in turn into the speakers, causing a substantial diversion of power and limiting the available power for clean signal. For example, two identical low-frequency drivers are driven with identical signals from identical amplifiers. Speaker A is fed through a crossover network with a wide-band low end, from 30Hz to 500Hz, and Speaker B is fed through a narrow-band crossover from 25Hz to 50Hz. If both speakers were fed with a 30Hz signal, the B speaker would produce a greater SPL at 30Hz.1 What ST heard, obviously, by saying that his cheap-skate homemade cable was more “laid-back and had a smoother midrange,” leads us to believe that there was an absence of high-frequency detail and dynamics and low-frequency detail and dynamics that would obviously be the result of RF on the line getting through.

Handel Ellis, Sal Demicco
Discrete Technology

Meitner MTR-100

Editor:
I wish to express my dismay at Stereophile’s paraphrase of AHC’s review of the Meitner MTR-100s in “Recommended Components,”

1 I find it hard to see how this can be true. If the signal contained wide-band noise, then the noise level through Speaker A would be higher, but this is not what Mr. Ellis and Mr. Demicco are saying.

—JA

Stereophile, August 1987 189
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Stereophile, August 1987
Vol.10 No.3. In your brief summarization you describe the MTR-100s as "lacking soundstage depth." Where, pray tell, does this remark appear in the original review?

Specifically, Mr. Cordesman's remarks pertaining to this area were as follows:

"Soundstage: The Meitner MTR-100 produces a wide and open soundstage, but still with good control and centerfill. It gives a very good illusion of depth, but not to the extent provided by the best tube amplifiers. The overall feeling is one of solidity, and of listening from 40-60% of the way down the hall from the stage.

"This happens to be the kind of soundstage I like, simply because I don't want either a wider soundstage than existed in the original recording, or depth I don't hear when I listen to live music . . ."

I interpret AHC's remarks as follows: The MTR-100s are inherently natural with respect to his perception of live music, providing the listener with a reasonable representation of what is on the source. If the sense of absolute depth is different (for better or worse) as compared with a select number of the finest tube amplifiers, this is not an area where the MTR-100s are lacking relative to our solid-state competitors. I would also call your attention to one of AHC's summary remarks: "It should also satisfy the audiophile searching for the performance usually missing either from tube amplifiers or from solid-state designs."

My point is this: Mr. Cordesman took the time to evaluate the MTR-100s in depth and made comments which were balanced and fair. Knowing that the paraphrase is done by the editorial staff in New Mexico, I take exception to the comment about depth in its present incomplete, and therefore misleading, form. My respectful request is that the statement be amended by AHC to reflect his original intent.  

Brian Gammon  
Museatex Audio Inc.

Having reread the review thoroughly, I am happy that the paraphrase reflects the fact of AHC's auditioning: that the MTR-100s reproduce less stage depth than the finest tube competition. Whether this is less or more accurate is a matter of opinion, and there is not the space to discuss the matter in the brief space allowed for a "Recommended Com-

ponents" entry. If this is felt unfair, as strongly advised in the section's introduction, "We recommend that any product's entire review be read before purchase is seriously contemplated; many salient characteristics, peculiarities, and caveats appear in reviews but not here."

—JA

**RATA Linn mods**

**Editor:**

It was interesting to read Christopher Breunig's comments about the RATA Linn modification in Vol.10 No.3.

Linn has informed us that they investigated "Torlyte" as a possible material for armboard and subchassis construction several years ago, but found it to have no merit for use in the LP12 turntable. They have listened to the RATA modification and have found it to be inferior to a standard LP12.

While Linn's comments seem to disagree with the opinions reached by your reviewer, I should point out that other writers have given the RATA modification rather mixed reviews, one UK publication observing that at times the RATA "would appear critically lacking in resolution and bite." They also found some musical selections "curiously and tellingly compressed by the RATA design." Thus, I would strongly suggest that any reader considering the modification listen to a RATA-modified LP12 for himself before making such a drastic (and expensive) move.

Your readers should also weigh in the cost of voiding the warranty on the product and the long-term effect of making his turntable incompatible with any future update kits that Linn might introduce. (Apparently the main bearing housing must be drilled out when the kit is fitted, so reversing the modification would be a very expensive proposition.)

Those of your readers who are interested in making an improvement to their LP12 should visit their local Linn dealer and investigate the new armboard recently introduced by Linn. In contrast to the Torlyte used by RATA, the Linn board is a sandwich of Formica and MDF (medium-density fiberboard). In addition to appearance and durability advantages, this new board does provide a substantial improvement in performance (all for only $36).

**Gary Warzin**  
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