# AUDIO

THE EQUIPMENT AUTHORITY

NOVEMBER 1993

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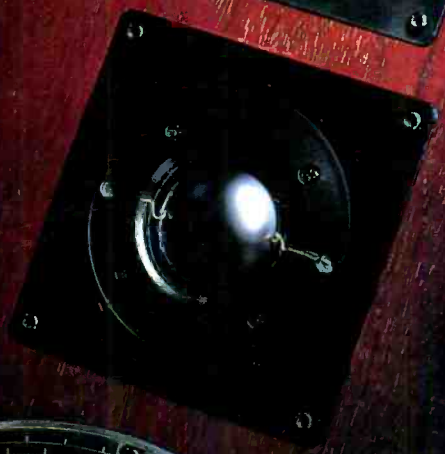

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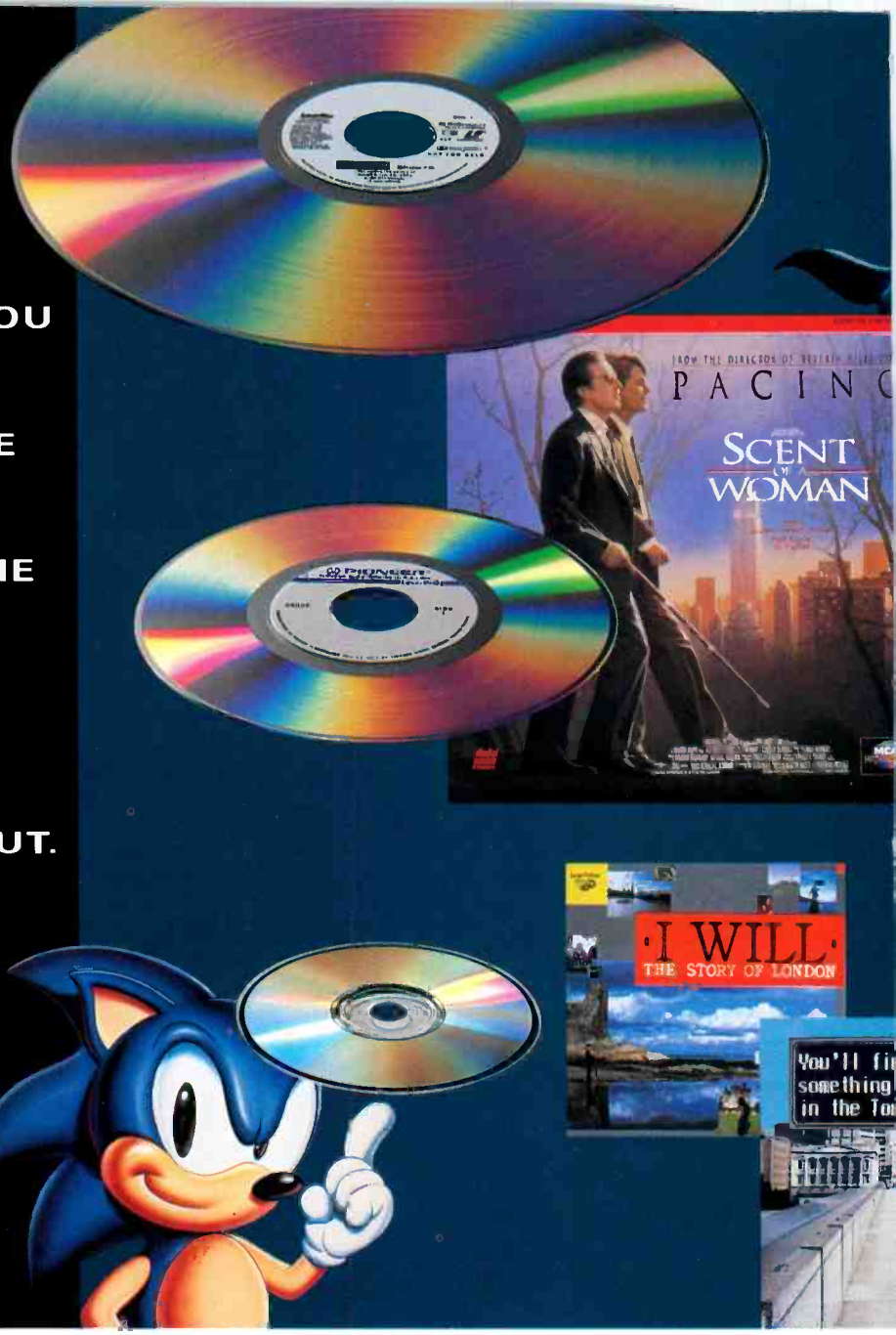


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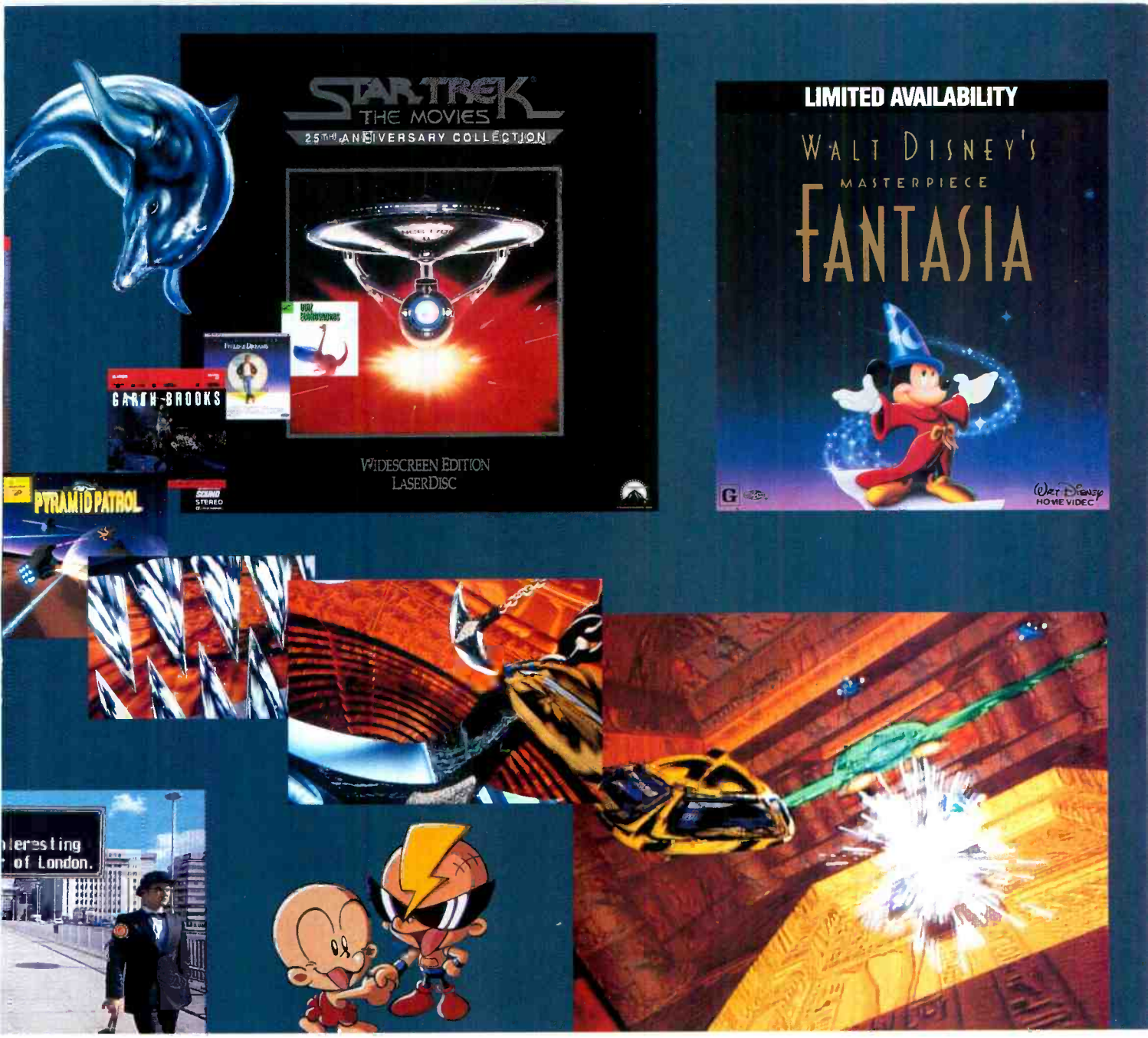


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The Cover Equipment: DGX Audio DDL-1 speaker
The Cover Photographer: Bill Kouirinis Studio

Audio Publishing, Editorial, and Advertising Offices, 1633 Broadway, New York, N.Y. 10019

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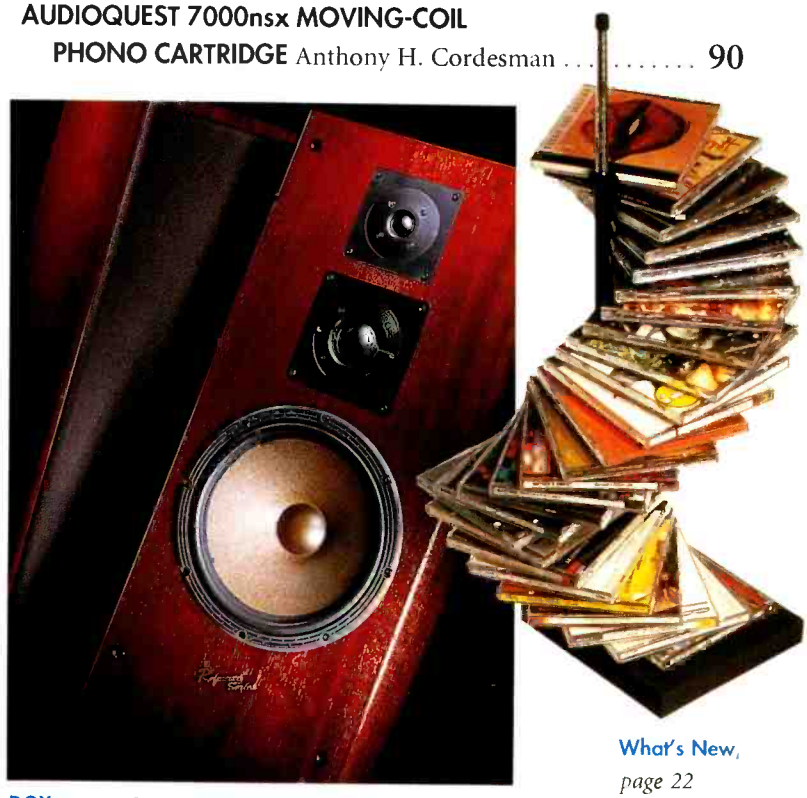

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**Directory of "Equipment Profiles"?**

Dear Editor:

Thank you for a fine publication, which I have read and enjoyed very much for the past 15 years.

Did you ever publish a test report directory, listing equipment reviewed and the issue months and years?

*Michael Mulback*
*Las Vegas, Nev.*

*Editor's Note:* We haven't compiled a list of every report *Audio* has published since its inception (though the idea is a good one, and maybe we'll manage it some day). However, in each December issue, we include an Annual Index that contains a list of every "Equipment Profile" and "Auricle" published that year.—*K.R.*

**No Takers for Audio Ideas?**

Dear Editor:

As a longtime subscriber to *Audio* and purchaser of audio hardware and software, I thank you for all the interesting articles and reviews. In response to one of your "Fast Fore-Word" editorials, asking readers for comments on issues that affect the audio industry, please accept my thoughts on the following item of concern: How do we consumers get the manufacturers to respond to our input on new features for audio equipment?

Recently I mailed a letter to Sony suggesting some new features for CD players. They sent the letter back to me, indicating some legal reason for not accepting it. What does it take to get manufacturers to respond to good ideas? Perhaps a forum via *Audio* may be helpful—or perhaps through organizations such as the Audio Engineering Society or the Electronic Industries Association. I don't believe a single voice is given much attention.

*Richard Preston*
*Northlake, Ill.*

*Editor's Note:* Getting manufacturers to respond to new ideas is difficult. For one thing, they're afraid to look at them: If the ideas submitted by consumers happened to be similar to those a manufacturer was already working on, the company could face a lawsuit once products based on those ideas reached the market. But if the company never looked at those ideas, they're home free. That's the "legal reason." I suspect one could get around this by submitting ideas with a signed cover letter saying that you were doing so with no intention of being paid for them. But I'm not sure even that would get someone to read them.

You could always throw your ideas into the public domain, by publishing them. Then, any manufacturer could use them freely. In my experience, however, published ideas almost never result in products; perhaps companies see no advantage in following up ideas their competitors have equal access to. I know that a few product ideas I have not disclosed to anyone have come to market, but no ideas I've *published* ever have, even though most of them now get into print (writing a column for this magazine has some advantages). But if you still want a forum for your ideas, even after all these caveats, why not try this letters column?—*I.B.*

**Erratum**

In Bascom King's August review of the Parasound HCA-2200$^{II}$ amp, the first two sentences under "Circuit Description" should have read: "Revolutionary is the way I would describe the use of completely quasi-complementary circuitry throughout this design. Just kidding, of course, as John is known for his completely complementary circuits!" Unfortunately, his meaning was changed by an editing error; the amplifier is fully complementary. As the review noted, this is true of all John Curl's designs. Our apologies to Mr. King, Mr. Curl, and Parasound and its dealers and distributors for any misunderstanding that may have arisen.—*E.P.*

AUDIO
THE EQUIPMENT AUTHORITY



AUDIO, November 1993, Volume 77, Number 11. AUDIO (ISSN 0004-752X, Dewey Decimal Number 621.381 or 778.5) is published monthly by Hachette Filipacchi Magazines, Inc., a wholly owned subsidiary of Hachette Filipacchi USA, Inc., at 1633 Broadway, New York, N.Y. 10019. Printed in U.S.A. at Dyersburg, Tenn. Distributed by Warner Publisher Services Inc. Second class postage paid at New York, N.Y. 10019 and additional mailing offices. Subscriptions in the United States, $24.00 for one year, $42.00 for two years, $58.00 for three years; other countries except Canada, add $8.00 per year; in Canada, $32.00 for one year (includes 7% GST; Canadian GST registration number 126018209).

Subscription Service: Postmaster, please send change of address to AUDIO, P.O. Box 52548, Boulder, Colo. 80321-2548. Allow eight weeks for change of address. Include both old and new address and a recent address label. If you have a subscription problem, please write to the above address or call (303) 447-9330. Back Issues: For information, write to P.O. Box 7085, Brick, N.J. 08723.


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# TAPE GUIDE

HERMAN BURSTEIN

### Dolby Tracking on Different Decks

**Q.** *I have just bought a cassette deck with Dolby C NR. My past experience suggests that in a few years it will be cheaper to replace the deck than to have it overhauled. When that time comes, will I have Dolby tracking problems in playing on my future deck the Dolby C cassettes I have recorded on my present deck?*—R. A. Buc, Seattle, Wash.

**A.** If both your present and future decks are properly adjusted on the basis of a Dolby reference tape, there should be no problem.

### Whatever Happened To Automatic Adjustment?

**Q.** *Several years ago a number of very fine cassette decks were available that touted automatic adjustment of bias, equalization, and level at the press of a button. I purchased one of these units, and it seemed at the time to do a fine job of automatic adjustment. It still does today.*

*However, the ads today in* Audio *(and elsewhere) for new decks don't mention this feature. Even the most expensive units seem to provide only manual adjustment, and then only for bias. Is this because the automatic circuits did not provide as accurate adjustment as could be achieved manually, or is it a matter of cost?*—Freeman H. Matthews, Columbus, Ohio

**A.** If you look at the Annual Equipment Directory in the October issue of *Audio*, you will find that a number of cassette decks still provide automatic bias adjustment; I don't know how many of these also automatically adjust equalization and record level. However, it is true that the number of decks with full automatic adjustment has decreased.

Both of the reasons you have given, cost and difficulty of accurate adjustment, account for the less frequent appearance of completely automatic adjustment. This feature entails considerable sophistication of design, with corresponding expense.

Also, by Murphy's Law, automatic adjustment is not unfailingly accurate. I have had a number of letters from readers who complained that automatic adjustment did not work as it was supposed to, either initially or after a while.

In the case of three-head decks—and fastidious audiophiles are apt to have three- rather than two-head decks—manual adjustment is easy and tends to give satisfactory results. Such adjustment ordinarily relates only to bias, in the case of home decks. You can adjust by ear. I do this with my Nakamichi deck, which provides user-variable bias. I record and play interstation FM noise, with Dolby C NR on (theory says Dolby NR should be off; in my case, practice says leave it on). I then adjust bias for the closest correspondence between source noise and taped noise; this is done at a record level of about 20 dB below 0 VU.

Basically the same procedure can be employed with two-head decks except that it is much more laborious. After noise has been recorded, the tape must be rewound and then played. If taped noise is too bright, bias has to be increased; if it's too dull, bias has to be reduced. The tape has to be recorded again, rewound again, and played again, etc., etc.

A number of decks permit you to manually adjust bias by bringing two tones, provided by the deck, to the same level. One tone is relatively low in frequency, such as 400 Hz, and the other is high in frequency, such as 10 kHz.

### Hypersensitive Bias

**Q.** *I use white noise on a test CD to help determine the proper setting for the fine-bias knob of my cassette deck. However, I get different optimum bias settings for two tapes of the same type and brand. Also, I get different settings for sides A and B of the same tape. Further, I get different settings for the same tape and same side when I make the bias adjustment at the beginning and end of the tape. These differences are even more pronounced for metal tape. If I use FM interstation noise to adjust bias, I can't hear the differences as clearly. The bias adjustment is done at –20 dB on the record level meter. Any comments?*—Anthony Hudaverdi, Santa Monica, Cal.

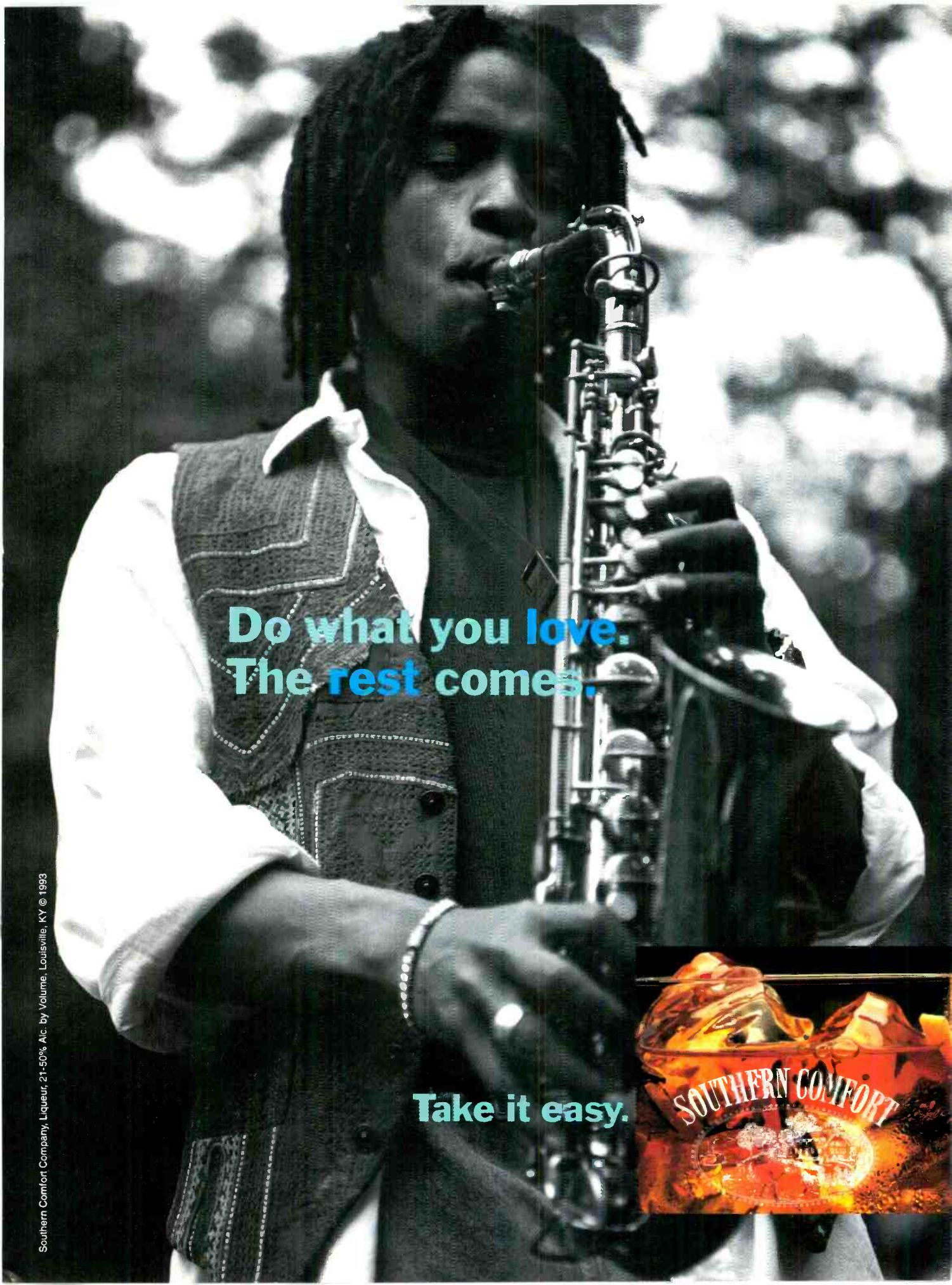
**A.** By using white noise instead of FM interstation noise to adjust bias, you are creating an unduly sensitive and unrealistic test situation. White noise has equal signal amplitude at every frequency. This means that it has more energy in the octave from 1,000 to 2,000 Hz than in the more sparsely populated octave from 100 to 200 Hz; specifically, the power increases 3 dB per octave as frequency rises. On the other hand, FM noise, because of 75-μS playback equalization in the tuner, has drooping response above roughly 2 kHz, so that power per octave tends to stay constant in the high-frequency range. Because most audio program material also has drooping treble response, FM noise makes better surrogate program material for bias adjustments than white noise does.

It would be nice if the "perfect" bias setting did not vary in the manner you have described. However, what ultimately counts is what we hear on program material rather than on test signals. There are many imperfections in audio reproduction, but if they are kept fairly minor the ear tends to gloss over them. Use of white noise to adjust bias requires the tape system to perform to a relatively high degree of accuracy; it exceeds what is needed for auditory satisfaction.

**THERE ARE MANY FLAWS IN AUDIO REPRODUCTION, BUT THE EAR WILL GLOSS OVER THEM IF THEY REMAIN FAIRLY MINOR.**

My answer doesn't exclude the possibility that something might be wrong with

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



your tape deck. Excessive speed variations from beginning to end of a cassette, or from one side to the other, could account for your findings.

In the case of metal tapes, it appears that bias requirements vary more from brand to brand than they do for the other two tape types.

### Erratic Distortion on Old Tapes

**Q.** *I recently played some old open-reel tapes, dating from 1959, that had not been played for several years. At several points I heard severe distortion. The distorted sections are not the loudest portions, which seems to rule out overrecording, and to the best of my recollection the distortion was not there before. I think that I can rule out dirt on the heads, which were still clean after playing. Could the distortion be caused by a loss of lubricant on the tapes? I lubricated the heads after playing one side of the tape and heard no distortion when I played the other. Could some other factor be at work?*

**FRICTION CAUSED BY LOSS OF LUBRICANT IN AN OPEN-REEL TAPE'S MAGNETIC COATING CAN CAUSE DISTORTION.**

*The tape is 1.5-mil acetate, stored on a plastic reel at normal conditions of temperature and humidity, and not subjected to any magnetic fields that I know of. I don't remember if it was played or fast-wound prior to last storage. It was tightly wound on the reel before I recently played it, but the tape pack was not flat.*—Ivan Berger, Technical Editor, *Audio*

**A.** I think you are right in believing that the distortion could have been due to loss of lubricant in the magnetic coating. Sometimes the result is a mechanical vibration called stiction and is apparent as distortion. That is, the tape fails to pass smoothly over the heads and therefore exhibits a series of retardations and accelerations. If the tape was tightly wound and not played for a long time, it might have been stretched in places and acquired a set that prevented it from playing properly. A

# AUDIO CLINIC

JOSEPH GIOVANELLI

### Subwoofer Considerations

**Q.** *My present speakers are flat down to 40 Hz, but I would like to lower the bass response two octaves. Inasmuch as most subwoofers are rated as having frequency responses between 20 and 100 Hz, will adding one to my setup lead to a preponderance of bass in the 40- to 100-Hz region?*

*Granted that most subwoofers have adjustable cutoff frequencies—though I doubt that they would be lower than 40 Hz—how should I go about setting up such a subwoofer to obtain an overall flat response?*—John J. Doman, Scranton, Pa.

**A.** First, we should recognize that much music does not contain frequencies below 40 Hz. This is about the frequency of the lowest note usually playable on a string bass. Therefore, if your present loudspeaker systems are capable of flat response down to 40 Hz, it could well be that you don't need to add a subwoofer. If you desire just a bit more bass, perhaps an equalizer can help because it permits boosting just the very lowest frequencies. The conventional bass tone control tends to boost frequencies that are much higher than the lowest octave we are considering.

Extending your bass two octaves lower than 40 Hz would permit notes to be played down to 10 Hz. This might be fine if you are interested in reproducing organ music and can find recordings that really contain pedal notes down to 16 Hz. Otherwise, I can't see where you would want bass that can reproduce seismic waves.

A subwoofer requires some kind of crossover network to separate the bass from the rest of the spectrum. Even though your loudspeaker system can reproduce frequencies down to 40 Hz, it is probably a good idea to set the crossover point near 80 Hz. Thus, as the satellite speakers roll off, the subwoofers can take over—thereby producing a smooth transition around the crossover point. This avoids the "boominess" that would otherwise be likely in this part of the spectrum.

The greatest degree of flexibility is obtained by using a separate amp to drive the subwoofer. This will permit you to balance the output from the satellite versus the subwoofers so that you can have just the amount of bass you want, avoiding the preponderance of bass that you don't want.

### Here's the Pitch

**Q.** *A friend with so-called "perfect pitch" was listening to my system while I played a phonograph record. He insisted that the music was a little flat in pitch; he seemed familiar with the selection. We then adjusted the turntable speed to his satisfaction.*

*I now have a copy of this recording on CD. To my imperfect ear the analog record sounds a little sharp as compared to the pitch of the CD. All of this is a mental distraction to me, especially when making cassettes. I hate to think I'm making off-pitch copies.*

*It really comes down to knowing whether or not my turntable is running at a true 33⅓ rpm. I can't find a strobe disc to help me check this. How do I solve this?*—James L. Geter, St. Louis, Mo.

**A.** Strobe discs are hard to find, but I've found two sources. Esoteric Sound (4813 Wallbank Ave., Downers Grove, Ill. 60515) sells them for $2.50, shipping included. The GC Electronics 30-230 disc is available from some stores that carry the company's line of parts and accessories. If there's no GC dealer in your area, you can order the disc from Jaytronics (128 North Rockton Ave., Rockford, Ill. 61103) for $9.85, including shipment. And some audiophile LPs, such as M & K direct-cut discs, have strobe bands on their labels.

However, the fact that your turntable's speed can be adjusted makes me wonder if perhaps it doesn't have a built-in strobe disc, either molded into the center section of the rubber mat or visible through an opening on the base, near the edge of the

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platter. If not, your turntable's manufacturer may still have strobe discs available.

Since speed accuracy in CD playback is normally quite high, an easy way to check turntable speed accuracy would be to play CD and LP versions of the same recording, switching back and forth between them while adjusting the turntable's speed so that the pitch of each recording matches. Do this with two or three recordings, just in case the transfer engineers shifted the pitch while making a CD transfer.

You mentioned that your friend with "perfect pitch" made your turntable run a bit faster to sharpen the pitch, and that now your LP sounds sharp compared to the CD version. This suggests to me (assuming the CD mirrors the master tape's pitch accurately) that your turntable's speed is now inaccurate; the speed should be lowered until the CD and LP pitches match. Your friend may have been misled by a performance set at a different pitch than the current standard. Musical standard pitch has changed over the years, and recordings of historical performances are particularly likely to have nonstandard pitch by today's ears.

### The Scraping of CDs

**Q.** *I'm having a strange problem with one of my CD players. When I play my discs, I hear a "scraping" sound from within the player—as though the disc is rubbing on something while spinning. Additionally, it sometimes "skips" during play. After repairs, the skipping problem was better, but it seemed as though the scraping was worse than ever.*

*I examined a disc and found a ring around it that I don't believe was there before I played it in this machine. My other players don't scratch discs or skip, except on discs that have gone through the troublesome machine. Please help me solve this puzzle.*—Michael Sorensen, Pascoag, R.I.

**A.** A couple of ideas come to me. A bearing could be defective or in need of lubrication; this can cause noise as the disc turns. I think it would most likely be the bearing that presses on the upper side of the disc. However, I doubt that this is the cause of the "scraping" that you hear, since you have seen damage to the disc's surface after it has been played on this machine. I suspect that there is a poorly molded plastic part somewhere within the mechanism in which the disc is housed. Unless it is extremely difficult to get to, the defect should not be too hard to locate and to repair.

Measure from the center of the disc to the point where you see the ring. If it's easier, measure from the disc's outer edge to the mark. Of course, your examination of the player will depend on whether the defect is on the upper or lower side of the disc. Let's say that the mark always occurs 1 inch from the center and is on the upper side of the disc. Examine the lid or the upper area of the drawer (or what have you), trying to estimate where the defective part may be, based on your measurement. If you find a small, jagged edge that might be the culprit, shave it down just a bit with a pattern file. It will take very little to smooth off the part.

I'm guessing, of course, but maybe the rotating table on which the disc rests is a bit too low or a bit too high, thereby causing the disc to rub on adjacent surfaces.

The scraping of the disc might be sufficient to disturb the smooth rotation and cause the servo system to lose its "track," leading to skipping. A

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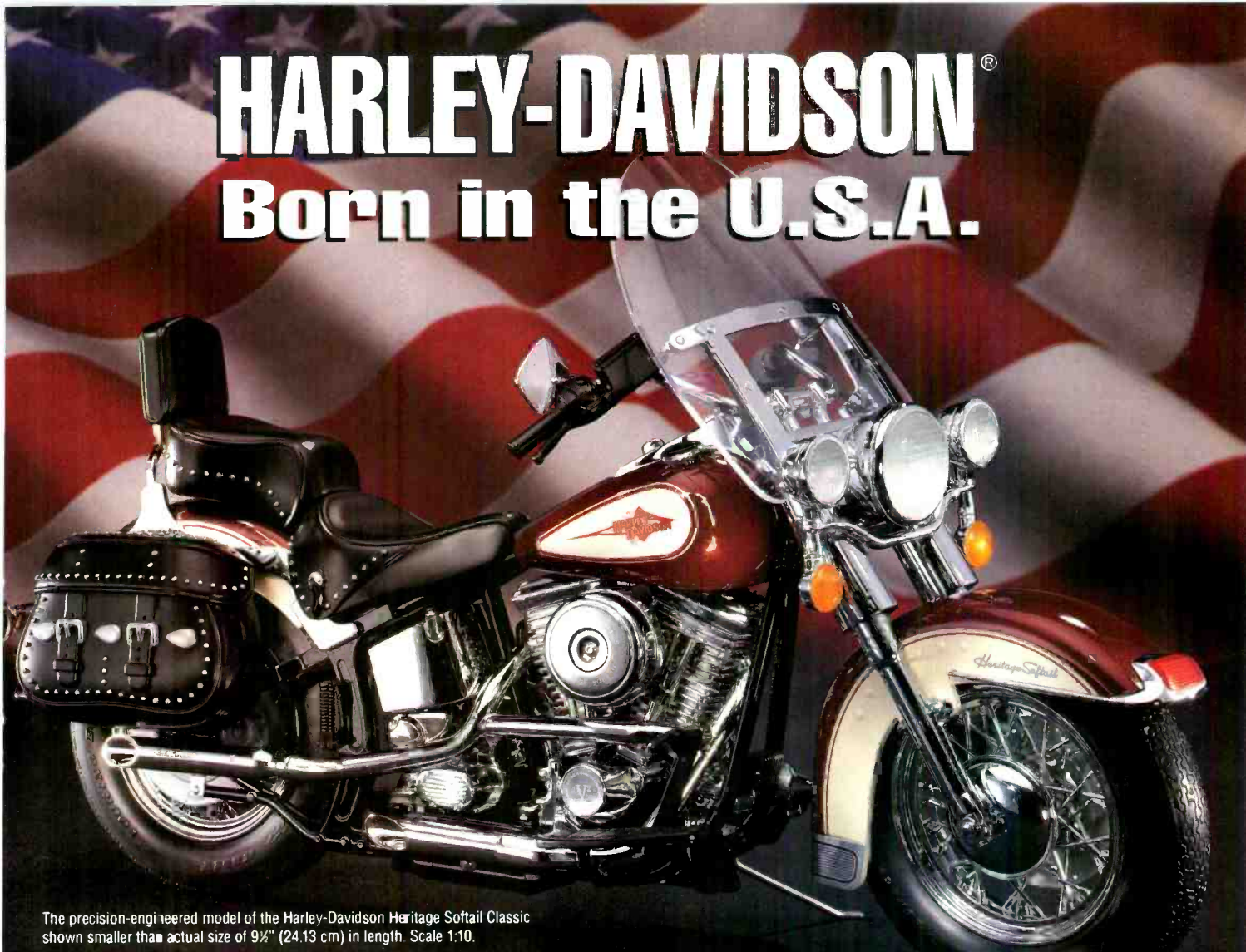

The precision-engineered model of the Harley-Davidson Heritage Softail Classic shown smaller than actual size of 9¼" (24.13 cm) in length. Scale 1:10.

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**The Harley-Davidson Heritage Softail Classic. Exclusively From Franklin Mint Precision Models.®**

EDWARD TATNALL CANBY

# EXPIRATION DATES

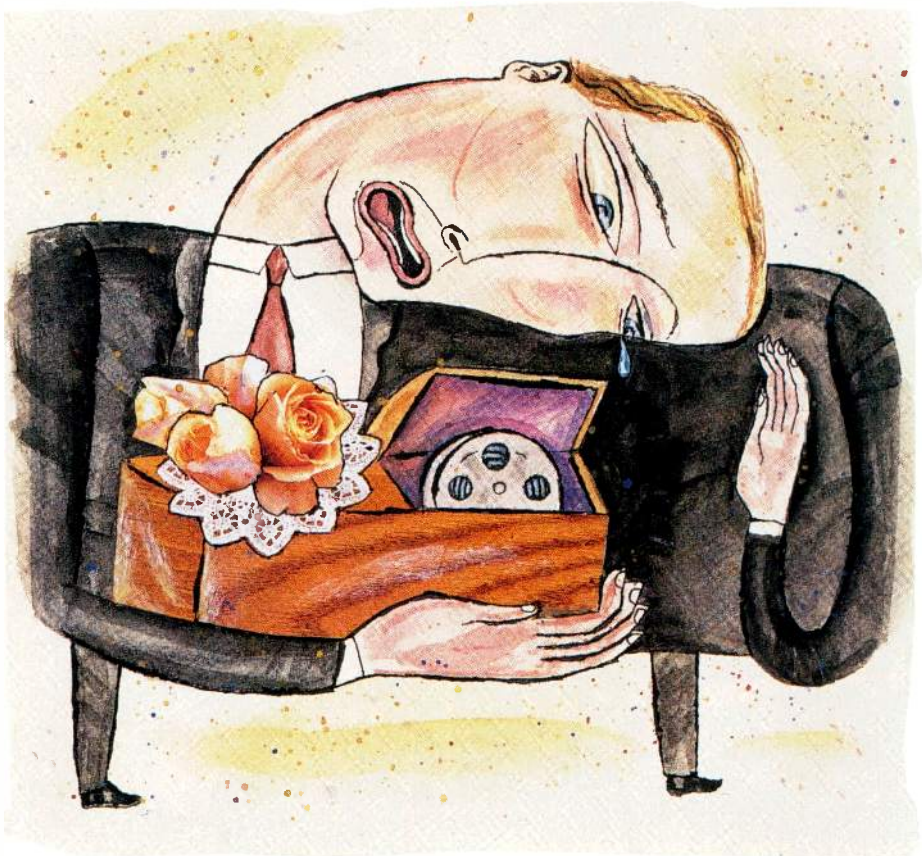

Illustration: Carolyn Fisher

I really do not think that a lifetime of 20 years is very long. I'm not speaking of people. I'm still thinking about our first-of-all audio medium, tape. If I'm right, most professionals, if they give a fleeting thought to preservation, operate in a 20-year mode. That's enough for our present hectic world! Far into the future, after all.

But is it? We are already exploiting quantities of tapes made in the 1960s, already well past that deadline.

To be secure in your audio even after 20 years can be a pain in the neck and a chore. To resurrect the sound on tapes already grown too old is much worse. Forget it! Who needs old tapes? Really old tapes.

It has to be said again. The obvious answer to that question is that our civilization needs these old tapes, and will need them more and more, if it is to last. After thousands of years, we still move on, we live, and we depend on recorded continuity over and beyond that stored in brief human brains.

I figure I myself became archival around age 60. From thence forward one either thinks in terms of preservation or runs one's self into the ground and that is that. Time runneth on for each of us, and for every inch of audio that has ever been recorded. How can we think in 20-year terms? Preposterous!

**IF IT IS TO LAST, OUR CIVILIZATION WILL NEED THESE REALLY OLD TAPES MORE AND MORE.**

These somewhat dismal thoughts follow on my remarks in the April issue, which were more questions than anything else. I received interesting comments on that article from both consumers and audio pros, so plenty of us are indeed wondering what can be done, if anything much. Several writers noted with some pride that *their* tapes were okay after 20 years. (Mine go back 40.) As if that solved civilization's li'l problem with us! One guy, however, signed himself "Frenzied Reader." After reading my column he had perused an article by Wm. J. Staples in *Industrial Photography* (March 1993) entitled, if you will believe me, "Videotape is Dead I Wondered When I'd Finally Say it Don't Take Me Literally, Though, It's Not Dead, It Just Dies." Seems there are video recordings, with audio, that won't play back after *just minutes.* Frenzy indeed.

Dave Bessey of Santa Rosa, Cal. is a computer user with laser printing who has the archive problem very much on his mind—if in the short term—though who knows what he may contribute to Civilization. He won't leave his information unattended for a moment. It might die. It *could* die. "How long can I leave this item untended . . . without 'significant' degradation?" He's not talking 20 years. "There is definitely a problem when storing computer information for even just an hour. Diskettes get dirt on them . . . backup tapes go bad for no apparent reason." Touching faith in the tape medium! And then there are earthquakes. He had just been through one. And I might add, fires, hurricanes, tornadoes, plus of course, nuclear bombs. All in all, things are pretty bad, at least in his view. So what is it that Bessey does? He is quite positive about his practice. He makes three

*Sixth in a series*

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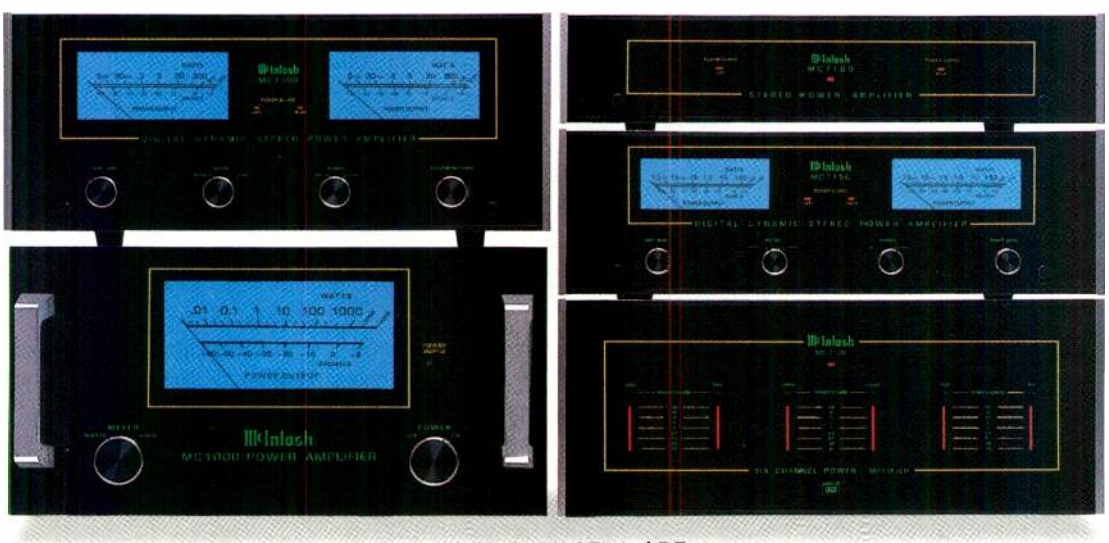

AND THEY STILL ARE.

Some American companies have disappeared. Some have come back. But, the great ones never went away. They kept on building products every bit as good as they used to and they made them better. They improved their products instead of replacing them. They continue to build models whose useful lives are measured in decades, not months.

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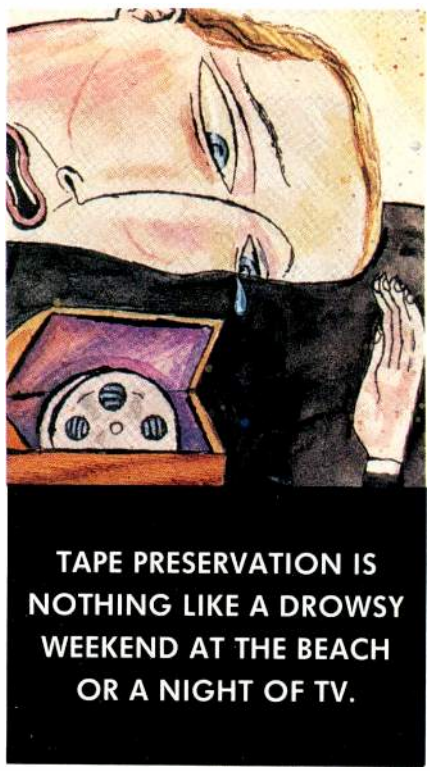
laser printed copies of all the work just done on his computer, *immediately*, before he turns the machine off. Good old paper is still the best, if far from perfect.

The paper moguls, I hear, are in solemn conclave to set up paper standards for use in archival printing. Good, if about three or four thousand years late. On the wall near me as I write are two brochure covers for two different trolley museums, each featuring the very Love of My Life as a child (and still), a beautifully restored curved-roof, 13-bench, open-car series of 1902. I lived for those summer open cars and rode on them too, probably both of these, numbers 838 and 840. The cars still run today, as new. The brochures were around 15 years ago. One of them is on paper so brown, already, that the picture is dulled. The other is white paper, like new. The cars are archival, all those many tons of them, but the paper they are printed on isn't. Again—I have some Kodak color prints from the 1940s, on plastic. Perfectly preserved. But a 1936 Kodachrome color movie is now faded to a single shade of dirty orange. Jump back 175 years: I own a boxful of daguerreotypes, the first photographs, all of family members and friends. The leather-bound frames are a mess, falling apart mostly, but the pictures are virtually perfect.

By far the most useful communication I received on the subject of tape archiving was from an earlier sometime correspondent, Steven Smolian, a thorough audio professional who now is—remarkable!—a specialist in the audio archive business, with his own firm, and a writer on the subject from the most technical point of view as well as the general. I give you his address immediately: Smolian Sound Studios, 26801 Haines Road, Clarksburg Md. 20871. He has an excellent leaflet of information which I am sure he will send to you at a moment's notice: "Audio Preservation Processing of Noncommercial Recordings." This, of course, for those of us who would like expert help in restoring or preserving material that is valuable for us personally—now and hopefully later.

Smolian works too on the professional side, even unto the nth degree. The major part of his communication to me was an enormous article by him from the *ARSC Journal* (Association for Recorded Sound Collections) of February 1989, entirely concerned with the optimum preservation of audio on tape. Not so much in length, some 20 close-packed pages, as in the info. If you want to know just how thorough one must be to do state-of-the-art tape preservation, and what is good and what not good, you will wade through this piece—as I have managed to do twice. Phew! Very discouraging, at least to the likes of myself, who in a thousand years could not accumulate this amount of painstakingly detailed experience and know-how! But at least it is good to know that there are people who have, shall I say, the guts to face the tape problem (and the rest, on into digital) whole, and to summon the patience to do something about it. The ARSC article, to be sure, is some years old. Even so, most of the information will be new to both pro and consumer users of audio tape, those who haven't really given much thought to preservation. Smolian sums up his observations with a list of points to remember—41 of them. I assure you, tape preservation is nothing like a drowsy weekend at the beach or an evening of non-interactive TV.




However, I'll have to add a bit to this intimidating account that will bring us to a positive balance. First, a great deal of what Smolian suggests is the kind of treatment that a common sense technician, amateur or pro, will inevitably find out for himself, simply by trial and observation, not to mention by disaster. In my many years of tape editing I picked up a lot of it, and am pleased to see that I was on the right and proper track. Little matters, not really onerous, like the "tails out" storage of all your reel-to-reel tape—that is, stored in the box as wound at the end of a complete playing. In this way you get a slow, even wind without loose spots or raised ridges of uneven tape height, inevitable when using fast-rewind operations. (Some late recorders have a "library" speed, just for storage, that is faster than play but much slower than rewind.)

Only a bit more of a nuisance is the systematic rewinding of a roll of tape every so often, ending up again with the slow speed. And there is always the problem of splices. (I'm still speaking, of course, of reel-to-reel tape. There is very little you can do to keep your cassettes in working order except, perhaps, a play-through every so often to allow the tape to find its own best relaxation at points where it may be cramped or unevenly wound after sudden stops and starts.)

Many other Smolian suggestions are no more complicated than this, if always time consuming. Each of us will have to derive what seems within our own limited capabilities and do our best to ignore the numerous disturbing factors we would just as soon not know about. The proverbial ostrich technique.

A very positive note to end on. Steven Smolian is now sitting on an awesome committee that is working on assorted archival and testing standards for audio, the better to untangle the present confusion. This is an American National Standards Institute (ANSI) committee, awesome because of its representation in audio, video, film, and music areas. Major outfits such as Ampex, 3M, Daniel Queen Associates, plus Walt Disney Pictures, CBC Engineering in Montreal, BASF from Germany, the Eastman School of Music, and the Library of Congress are all there—two divisions of Ampex, three of BASF. It will take time but this committee should do a lot to bring more knowledge and understanding to the real future of our field—the dim, distant times $20^2$ years from now. And more. A

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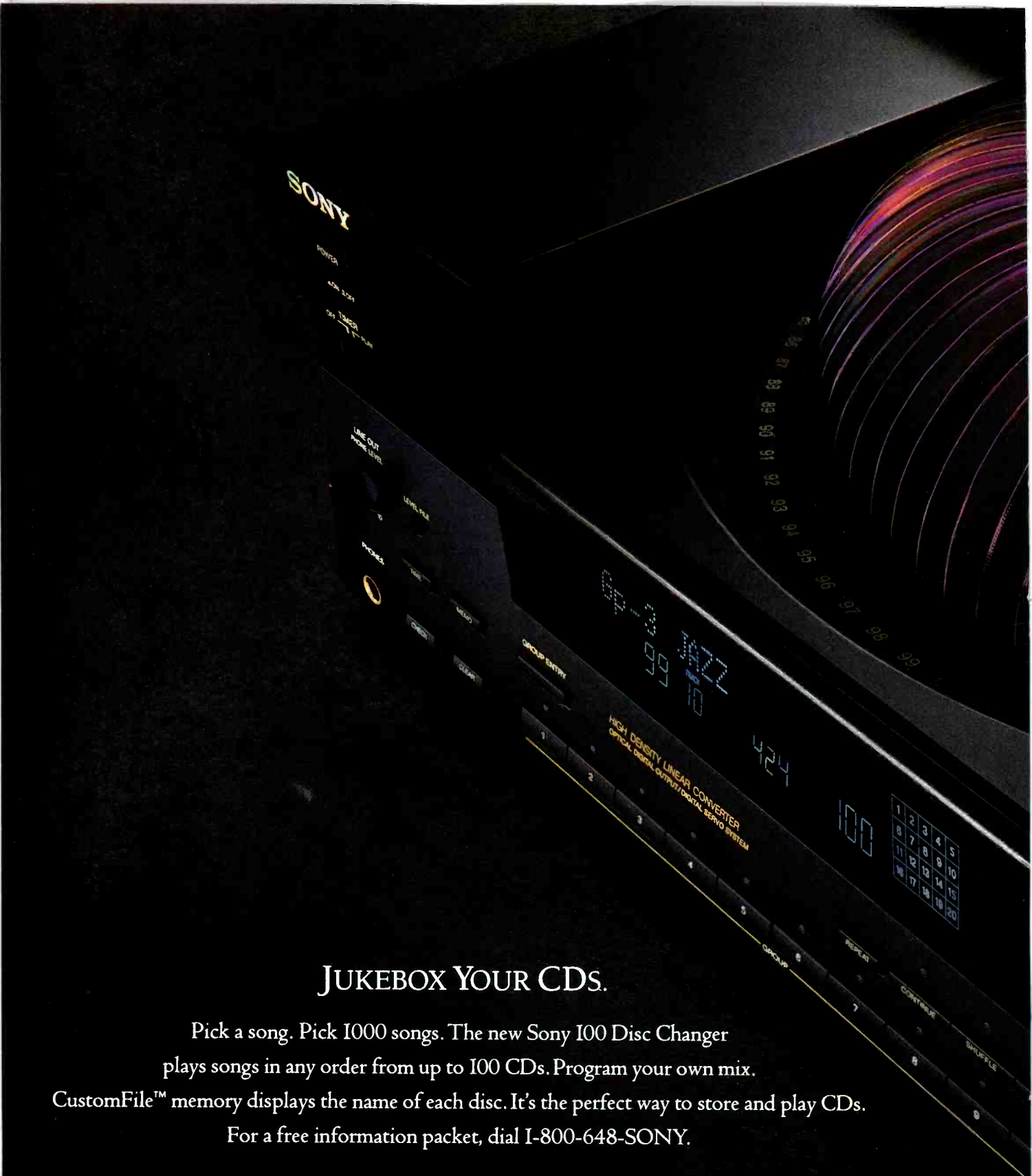


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# WHAT'S NEW

## Quart Indoor/ Outdoor Loudspeakers

A one-piece, injection-molded cabinet and an aluminum-cone woofer with butyl surround help make the Quart 250 weatherproof, but its manufacturer says the woofer's cone construction also optimizes bass. The tweeter is a ½-inch polycarbonate dome. In addition to the color scheme shown (inspired by artist Piet Mondrian), the speaker is available in white or gray. Price: $329 per pair; mounting brackets, $20 per pair.
For literature, circle No. 100

### Fanfare FM Tuner

You couldn't tell by looking that Fanfare's FT-1 is an analog tuner because it has a digital display and lacks a center-of-channel tuning indicator. A microprocessor monitors tuning accuracy and corrects for tuner or station drift. Each of the FT-1's eight presets can be separately programmed with the desired i.f. bandwidth, sensitivity, and mono/stereo settings. Both balanced and unbalanced outputs are standard, and a remote control is included. Price: $1,095.
For literature, circle No. 103

### TDK Recordable MiniDisc

Accommodating the new, longer CDs on the market, TDK's MD-XG recordable MiniDisc offers 74 minutes of recording time and features the same



100% compatibility, high-precision housing, excellent heat and shock resistance, and see-through protective caddy as the original 60-minute version.
Price: $17.49.
For literature, circle No. 101

## AudioControl Car Crossover

This 24-dB/octave crossover from AudioControl includes a phase-adjustment system to ensure that frequency response will be smoothest where the listeners are, despite the speaker-position variations common in cars. Other features of the 24XS include output-level and clipping indicators, and an 18-dB/octave low-cut filter that can be programmed to match the user's subwoofer. For noise rejection, the unit features selectable ground isolation and has balanced (as well as unbalanced) inputs. Specifications include an S/N of 120 dB and 0.005% THD. Price: $179.99.
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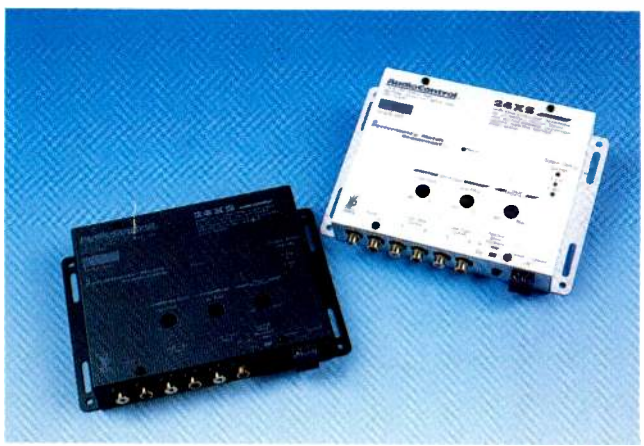
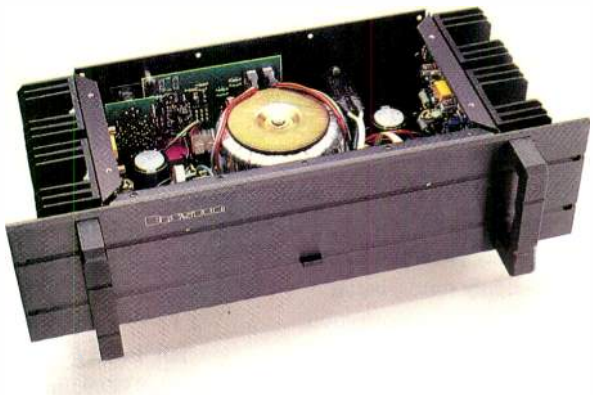


# THE IDEAL AMPLIFIER FOR SUPERIOR SOUND SYSTEMS



**Bryston's**

**3B NRB**

**Amplifier**

Bryston's new 3B NRB amplifier is a companion piece to the 4B NRB and 7B NRB, with a similarly optimized interface between power supply and signal circuitry, and the same ultra-linear amplification as its larger counterparts. Its 120 watts per channel is a popular size for a wide range of music systems requiring the highest quality source of power. The 3B NRB uses Bryston's proprietary Quad-Complementary output section, which improves linearity to a new standard of accuracy, while virtually eliminating aggressive higher harmonic distortion products. From input to output, all the circuitry in the NRB series of amps has been optimized for the most musical amplification possible, with dual power supplies to provide precise and focused imaging. New, three-colour LEDs glow green for power-on, yellow for transient clipping, and red to indicate longer-term overload or any other departure from linearity, including shorted outputs, or strong out-of-band information, like RF or DC. Gold plated RCA and XLR input connectors allow unbalanced or balanced operation at the flick of a rear mounted switch. A ground lift switch separates system ground from audio ground to reduce annoying ground loops and system hum. Finally, switchable monaural operation is available if higher power requirements become necessary. Although the description of circuit innovations can indicate the research and commitment we bring to the design of the finest audio products, only in the listening does the result of that dedication become clear. Bryston's 3B NRB is capable of doing justice to the most refined sound system, with the subtlest details of the musical fabric revealed in their original form. We invite you to experience the musical accuracy, long term reliability and excellent value the Bryston 3B NRB represents.

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# WHAT'S NEW

## Blaupunkt Box-Design Program

A computer-aided design (CAD) program specifically for use in designing car subwoofer boxes, the BlauBox is preloaded


with characteristics of Blaupunkt drivers but can also be used with any driver whose Thiele-Small parameters are known. Designs are based on the trunk space available as well as on acoustical considerations. Once a design is accepted, the program will provide detailed enclosure plans and dimensions, even including cutting angles for wedge-shaped enclosures. Sealed, vented, bandpass, and isobaric designs of various types can be accommodated. The program runs on any PC compatible with a VGA display and DOS 3.1 or better and is compatible with Epson and HP LaserJet printers. Price: $199.95.
For literature, circle No. 105

## Carver/KLW Car Amp


The XA-50 Broadway car power amplifier from Carver/KLW Audio delivers 25 watts per channel into 4 ohms and 120 watts bridged mono into 4 ohms—at less than 0.1% THD + N from 20 Hz to 20 kHz. The display panel monitors power, power-supply status, battery voltage, over-temperature protection, and activation of a thermostatic switch that can control a 12-V remote cooling fan. Price: $329.95 in charcoal, $359.95 in white.
For literature, circle No. 106

## Gaffa CD Holder

The Gaffa Clip-on 35 stores 35 CDs and allows users to store, select, and play discs without removing the case from its holder. Cases can be fanned out, as shown, or stacked. Price: $29.95.
For literature, circle No. 107

## Quad CD Player

The Quad 67 CD player uses low-jitter, one-bit dual D/A converters from Crystal Semiconductor. Analog output passes through a sequence of fifth-order, second-order, and first-order filters before de-emphasis. A remote control is included, and the unit can also share control links with other 60-series Quad components. Price: $1,699.
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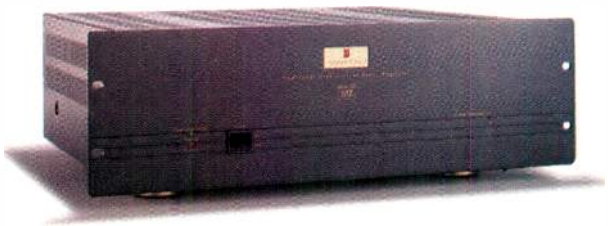

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IVAN BERGER

# DETROIT DOINGS

**Vroom. Vroom. *Vroooom!***

**The Mach 460 sound system.**

Yeah, I know. I should be filling this space with a detailed report on the Mach 460 premium sound system in the new '94 Mustang. But, given the chance to tool around Ford's test track in the new car, months before it hit the dealerships, would you have been able to really concentrate on its stereo system? Just as I thought, and neither could I. So a detailed report will have to await a full weekend at the wheel, a few months down the road.

I can tell you, though, that the Mach 460 sounded good (and noticeably better than the standard Mustang sound system, which was pretty ordinary). It even sounded good when I zipped around the track in a convertible with the top down (how we journalists must suffer!). Whether it can hold its own against the noise of neighboring cars in traffic remains to be seen. However, since Mustangs tend to attract younger buyers than, say, Lincolns, Ford put a lot of emphasis on developing a system that could sound clean while playing loud, so good top-down sound in traffic looks like a possibility.

The main way to make it play loud was to give it power—230 continuous average watts at 2% THD + N. (The Mach 460 name comes from the system's 460-watt peak power, to play off the fame of the fondly remembered Mustang 460 engine.) The system's power is divided among two 85-watt woofer amps and a four-channel amp delivering 15 watts per channel. One woofer amp drives a pair of oval woofers (5½ × 7½ inches) on the lower front of the doors, with the 2½-inch mid/tweeter drivers mounted high up in the doors' triangular "sail" area. The second woofer amp drives the rear woofers, whose size and mounting vary with the body style. In coupes, the same oval woofers are used in back as in front, mounted in a 15.65-liter enclosure in the rear package tray; convertibles use 5¼-inch round woofers in separate 5-liter enclosures mounted in the rear quarter panels. The rear mid/tweeter units are mounted with the woofers in either case, in half-liter enclosures of their own. The crossover point to the woofers is 400 Hz.

The amps have built-in, fixed parametric equalization, with separate curves for the convertible and coupe. Voltage-limiting circuits restrict the woofer amps' output when their distortion reaches 10%, to protect the speakers from over-excursion caused by high volume levels, bass-heavy program material, or a heavy hand on the bass control. That distortion figure wasn't chosen arbitrarily: In tests, Ford found that listeners hearing a signal with 10% distortion felt it was louder than a distortion-free signal at the same level!

The Mustang's dash has two DIN-size slots, the lower of which can hold either a CD player or a MiniDisc player—probably the first MD unit to be available from a car manufacturer. (But then, Ford was quick to adopt both CD and DAT as options, though DAT is no longer available.) The MD player has a larger, brighter display than the Sony MDX-U1 reviewed in our May '93 issue, and has larger, simpler controls because it doesn't incorporate a tuner. The upper DIN slot holds the FM/AM/cassette head unit, similar to the unit we tested in a Lincoln last year (August '92). Step-up features from the Mustang's lower-priced cassette unit include DNR and up-down tuner scanning. A


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JOHN EARGLE

# STREAMLINED SUMMER CES

Mark Levinson displays Grand Master speakers and the Cello Performance Amplifier II set, shown at CES.

Not long after the euphoria of last winter's Consumer Electronics Show it became apparent that the great healing of the economy we hoped was around the corner was not going to happen. What has become obvious since that time is how deep and pervasive the worldwide economic malaise truly is. Last winter's cautious optimism has pretty much vanished, and there is the unsettling thought that the foreseeable future holds little promise of anything significantly better.

Most well-run companies made this observation long ago and have kept themselves streamlined, both in personnel and in product planning and development. Likewise, the buying habits of people in their 20s and 30s have been fundamentally altered during this period. "Consumerism" in its most crass sense is out, and perceived value is in. This may be one reason why neither DCC nor MiniDisc is making much of a dent in the market. (It may also be a reason why used CDs are on the rise.)

**CONSUMERISM IN ITS MOST CRASS SENSE IS OUT, AND PERCEIVED VALUE IS IN.**

The Japanese and Europeans came to this value-orientation position some years ago, when we were heavily into our feature orientation. Now it's our turn.

Attendance at June's CES was noticeably down, and quite a few manufacturers had scaled back their attendance rosters. There were a few no-shows as well. But at the Chicago Hilton, home of the high end, things looked pretty good. Traffic appeared to be brisk, and exhibitors were upbeat about the quality of attendance.

For those videophiles with an unlimited budget, there was the remarkable Cello exhibit. Cello is the creation of Mark Levinson, who made his mark in electronics 20 years ago. A musician and idealist, he has stated his case time and again that the best one can offer will always attract a dedicated clientele, regardless of economic conditions—and pretty much regardless of cost. The Cello Music and Film Systems exhibit played to standing room crowds in the large Erie Room at the Hilton, and I was given a front row seat to see and hear this remarkable collaboration of technology: Cello electronics and loudspeakers, Apogee Electronics digital processing, Ampro video projection, and Faroudja video processing.

The Cello loudspeakers are composed of vertical arrays of cone and dome transducers and, as such, produce wide lateral dispersion with tight vertical control. Cello amplifiers are capable of delivering large amounts of current into the loudspeakers, sufficient to accommodate just about any peak signal demand, and the combination of the Faroudja line doubler and the Ampro video projector produces a picture so real that you completely forget about its humble NTSC origins.

The demo began with music only, convincingly reproduced at realistic levels. Then on to video and finally to HDTV. Not since JBL's Synthesis One (see "Currents," September 1992) have I seen such expertise in audio/video systems engineering.

John Dunlavy, associated for years with Duntech, now heads Dunlavy Audio Labs in Colorado Springs. His new line of loudspeakers is an extension of his "antenna array" approach, in which vertically symmet-

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PRESENTS

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rical transducers are aligned in time so that a listener located at a precise distance and elevation will perceive an ideal re-creation of the loudspeaker's input signal. This is more than a concept; it really works—and you don't have to put your head in a vise to hear it. I had brought along some of my recent recordings and was very impressed with the rock-solid imaging that these new loudspeakers produced. I wish John well in his new venture.

**THE BEST ONE CAN OFFER WILL ALWAYS ATTRACT A DEDICATED CLIENTELE, REGARDLESS OF ECONOMIC CONDITIONS.**

No American company has made a greater mark in audio than Harman International Industries. It is parent to JBL, Infinity, and Harman Kardon, to name only its best known trademarks. They were exhibiting this year in the Wrigley Mansion on Chicago's North Side, and this provided an ideal setting to see and hear their product in actual home environments—complete with a Synthesis Two home theater system in a realistic theater environment that had been set up in the basement game room. Elsewhere in "Harman House" the new JBL SoundEffects video componentry was set up and operating. SoundEffects is a combination of loudspeakers, electronics, and mounting accessories that allows the user to define both music and home theater systems of varying levels of complexity. This provides for orderly growth of a system in logical steps.

Back on the main floor at McCormick Place, Thomson Consumer Electronics, the parent company of the RCA brand, announced that digital video broadcasting via satellite service would begin in the spring of 1994. They stated that Hughes Communications satellite service will bring 150 channels of programming to U.S. and Canadian viewers by way of 18-inch microwave dishes. Programming will include pay-per-view productions, live sports events, and concerts. Digital compression technology developed by Thomson will be used. The basic system will include the antenna, a set-top decoder, and a remote. The retail price is set at about $700. I have no idea how all of this fits into any industry-wide standards activities, but the prospect for this first step is an exciting one.

The Consumer Electronics Group of the EIA had set up a display area at McCormick Place to encourage attendance at the high-end exhibits at the Hilton. While I applaud this, I was surprised at a pamphlet that was being handed out at this exhibit. It was titled "Welcome to Hi-Fi Heaven" and purported to answer your questions about high-end audio. Here are some sample questions, followed by my comments:

*Should I choose CDs or LPs?* While the pamphlet sensibly suggests that you may want to enjoy both, it goes on to say that in some circles records (LPs) are considered the standard in musical reproduction. We are further told that records are a bargain today. I wonder if the writer has checked out the prices of new audiophile LPs from the handful of companies who still make them. Prices are currently about $25 to $30. If you want a good bargain, check out the price of a used CD.

*What is the difference between analog and digital?* Here, we are told that "digital recording represents only slices, or samples, of the music signal—not the complete wave." Has the writer not heard of the sampling theorem?

*Why do recordings sound different?* "... All record companies try to make good recordings. There are several, however, that focus on re-creating the original sound produced by the musicians as accurately as possible. These companies work with a small number of carefully designed and calibrated microphones, and custom-built recorders and electronics. Ask your high-end dealer about LPs and CDs made to sound like 'you are there.' "

What I find disturbing in such comments as these is that the high end is essentially defined as a narrow line or two in what is an inherently wide spectrum of activity and values. In reality, the only thing that appears to be consistent among most high-end manufacturers has nothing to do with performance—it is their approach toward limited distribution. A

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# Slide Tuning A Port Speaker

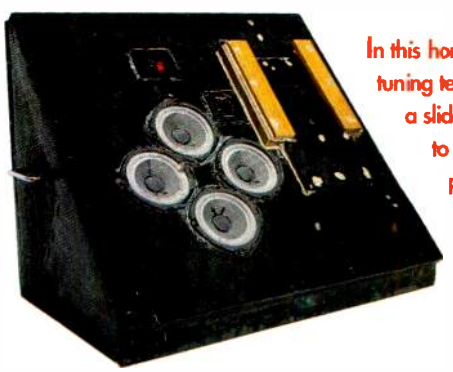
**HAROLD WEINBERG**

Once upon a time, if you wanted a high-fidelity loudspeaker system, you built it yourself, usually relying on one of the better quality commercial speaker driver manufacturers not only for the individual tweeters, squawkers, and woofers, but also for plans for the enclosures.

All that died out with the advent (no pun intended) of the sealed-cabinet, acoustic-suspension loudspeaker system. There remains, however, a hardy breed of do-it-yourselfers, tinkerers, and experimenters who still relish the challenge of making something out of raw lumber and drivers that will make beautiful music. To them, I dedicate this article about a technique for tuning the port in a bass-reflex speaker system for optimum low-frequency response. This technique is definitely low-tech, but I guarantee that it has a high fun quotient.

The idea is to use a sliding wood panel, which is held in place by two wood guides, nailed inside the cabinet and removed after the tuning process has been completed. There may be more scientific ways of tuning a port, but I know of none that is both so very simple for the layman to use and produces better results. All you have to do is move the slider back and forth until the optimum position is found.

The tuning method uses a microphone, fed through a preamp to provide the necessary gain, into the vertical input of an oscilloscope. The use of the 'scope not only enables you to see the amplitude or level, measured by the scale on the scope, but also provides the ability to see the quality of the sine wave produced by the speaker. An audio oscillator feeds the speaker through an appropriate amplifier, while the mike for this use should be a reasonably good unit, providing flat performance down to 20 Hz or so. It should be mounted on a stand so that the distance from the bass port of the speaker to the mike can remain constant. A calibrated measurement microphone would be excellent for this use, but almost any reasonably good mike will do the job.



**In this home-brew tuning technique, a slide is used to optimize port size.**

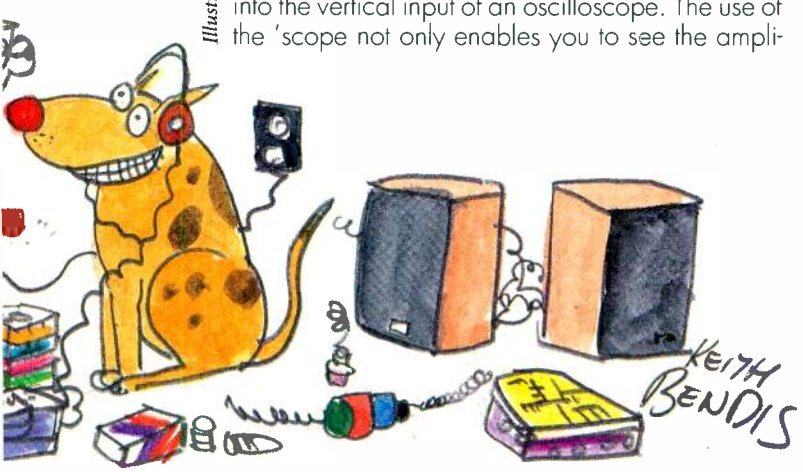
*Photograph: Michael Groen*

I prefer to keep the microphone about 6 inches from the port or speaker in order to minimize the effects of room acoustics. The port is adjusted as the oscillator sweeps slowly over the range from approximately 20 to 150 Hz. You adjust for the least variation in both sine-wave amplitude and symmetry by moving the panel up and down within its guides. What's wanted here is smoothness.

If you don't have access to an audio oscillator, you can tune to the white noise found in between FM stations. It is easier if you use an oscillator, but lacking one, you can get by with white noise from a source such as this.

It takes a little patience, but eventually you'll find the position that gives what you want or—to be more accurate about it—a compromise position that's as close to your ideal as you're likely to get. More importantly, I believe you'll get a strong feeling of satisfaction from tuning your own. A

*Illustration: Keith Bendis*



# THE AUDIO INTERVIEW

*By* SUSAN ELLIOTT

PHOTOGRAPH: DAVE KING

# THOMAS Z. SHEPARD

# MASTER OF THE MUSICAL

Thomas Z. Shepard is arguably the world's most visible producer of Broadway cast recordings. With 11 Grammy awards to his credit, he has presided over the recordings of most of Stephen Sondheim's scores, including *Sweeney Todd* and *Sunday in the Park with George*; the current Gershwin musical *Crazy for You*; *Jelly's Last Jam*; *The Secret Garden*; *Follies in Concert*, and *Ain't Misbehavin*. His classical productions range from *Porgy and Bess*, with the Houston Grand Opera, to sessions with the major orchestras of Chicago, New York, and London.

A graduate of Juilliard prep and Oberlin, Shepard learned his craft primarily at Columbia Masterworks (now Sony Classical), where he started as a trainee and worked his way to the top administrative position. In 1974 he became head of RCA Red Seal (BMG Classics), and from 1986 ran MCA Classics. Currently Shepard is an independent, dividing his time between producing and composing. *S.E.*

Helaine Messer

Shepard, Angela Lansbury, Hal Prince, and Kitty Carlisle Hart at a 1987 dinner of the National Institute for Music Theater.

***Did you go straight to Columbia Records after Oberlin?***

No, first I went to Yale to study composition with Quincy Porter. But Yale was not the ideal place for Broadway writing, which was what interested me the most. So I left after a year and started looking for a job.

***How long did it take to find one?***

About six months. Early in 1960, Columbia Records accepted me into a training program—they were recruiting people with strong musical backgrounds for their A & R staff.

***Just like that? You just walked in off the street?***

Just like that. I went up to Personnel and said, "I can arrange, I can conduct, I can compose and play piano. Can you use me?"

***Sounds like the movies.***

Sure, except they said no, reminding me that they had quite a number of people who could arrange, conduct, compose, and play the piano. But here's where it gets like the movies. As I was half-

Vienna, 1964: Conductor Pierre Dervaux, Shepard, and tenor Richard Tucker recording *A Treasury of French Opera Arias.*

Courtesy of Thomas Z. Shepard

way out the door, a rather attractive woman said, "Young man," and I turned immediately because at that time I was. "We are reactivating a training program for A & R; perhaps you'd be interested." I had no idea what A & R was, but I signed up. They gave me a battery of tests—intelligence, aptitude, personality preference. Apparently I did extremely well. Jumped off the charts in ambition, because I wanted that job. Boy, did I want that job.

***Wasn't Goddard Lieberson president of Columbia Records at the time? [See "The Audio Interview," September 1992.]***

Yes, and the training program was an outgrowth of his belief that you could turn an intelligent musician into an executive, but you couldn't do it the other way around. Goddard himself was an Eastman graduate and a composer; the whole company was run by musicians—Mitch Miller and Percy Faith were vice-presidents; Schuyler Chapin, though not a musician, ran the classical department.

***What sort of "training" did you get?***

First, I was sent off to the plant in Bridgeport, Connecticut for two weeks. It was fascinating. I learned how orders came in, how they were processed, how records were manufactured. The plant had been around since the turn of the century and had been used to press 78s. I've never lost that wonderful smell of vinyl cooking.

Then I was assigned to trail producers Teo Macero in pop and Howard Scott in Masterworks. I spent most of my time with Howard, who had a profound effect on me. The first week I was there he did an album with Luther Henderson as arranger/conductor and Sandra Church, who was playing Gypsy [Rose Lee] at the time. I've adored Luther ever since and work with him every chance I get. [Henderson is the adaptor/composer of *Jelly's Last Jam.*]

## IT'S QUITE IMPORTANT TO ESTABLISH A SPIRIT OF COLLABORATION WITH A SHOW'S CREATORS.

Shepard (far left) assembles participants for the 1964 studio re-creation of *The King and I* (clockwise from left): engineer Fred Plaut, singer Anita Darian, orchestrator Philip J. Lang, singers Barbara Cook and Mary Sue Berry, and conductor Lehman Engel.

Courtesy of Thomas Z. Shepard

They paid me $85 a week, and I worked whenever they wanted me to, which often meant from 6 p.m. to 2 a.m., sitting with an engineer and pointing out where to make the cut. It was a very tight union shop, so I never physically touched anything. Producing was—and still is—a life of talking.

I didn't mind working day and night. I really loved the business, even though at that point I considered it a stepping stone for me as a composer.

***When did you become a full-fledged staff member?***

After about eight months in training, an opening came up in Masterworks for an associate producer. I was 24 at the time.

Very early on, I was producing and planning repertoire for artists like the Budapest Quartet, Richard Tucker, Jennie Tourel, and Alexander Brailowsky. At the same time, I assisted Howard Scott and John McClure on the New York Philharmonic sessions and did a lot of the editing.

***What was your first session as the chief producer?***

An unaccompanied violin album by Joseph Silverstein, who had won the Naumburg Competition that year. [Silverstein went on to become concertmaster of the Boston Symphony and is now the music director of the Utah Symphony.] He played Bartók and Bach. I guess they must have figured, how much can the kid screw up one violin?

***And your first orchestral session? What was that like?***

They threw me in deep water very quickly. It was André Previn's first classical recording—Copland's *The Red Pony* and Britten's Sinfonia da Requiem with the Saint Louis Symphony. He was wonderful to work with. Like Placido Domingo, very decent and collegial. There are certain people who view making records as a team effort and treat you as a major player on that team. It's terrific to work with them.

***Where did you record Previn?***

In some American Legion hall in St. Louis. It was one of those wonderful big rooms that was so acoustically beautiful my inexperience wouldn't show.

***What was your next session?***

A few months later they gave me George Rochberg's Second Symphony with the New York Philharmonic and Werner Torkanowsky.

**With Harold Arlen watching from the background, Shepard (left) is joined by Barbra Streisand and arranger/conductor Peter Matz for the recording of the 1965 album *Harold Sings Arlen (With Friend).***

**Shepard holds score to Jerry Herman's *Dear World* for the 1969 original cast recording; participants include (from right) star Angela Lansbury, production stage manager Jerry Adler, and musical director Donald Pippin.**

Courtesy of Thomas Z. Shepard

***That's a thorny little number.***

Right. Sometimes, if you're young enough you're too stupid to know how high the stakes are. I did my best to learn the piece. I learned much more about score reading at Columbia Records than I ever did in college or graduate school.

There's no doubt that, within the limits of my ability at that time, I did a good job. Of course, I was working with Fred Plaut and Buddy Graham, both engineers who were quite accustomed to the room, which was the Manhattan Center. So even if I had screwed up, they could have bailed me out.

***Were you ever scared?***

No. I'm more scared by sessions today than I was then. There's no reason for it, because sessions used to be much more difficult. You worked in three- or four-track. You had to be very close to a final balance during recording, and sometimes that meant virtually mixing during a session.

Now things are done either straight to two-track, which I don't like to do, or multitrack, which gives you plenty of flexibility to make a truly creative mix. There are so many tools at our disposal today.

***When and where did you first record Leonard Bernstein?***

Around 1963, with the New York Philharmonic. We worked mostly at Manhattan Center and Philharmonic Hall. Thirtieth Street was also in use at the time, but mostly for Broadway show and pop dates. It was really too small for symphony orchestras.

We recorded the Shostakovich Ninth, Prokofiev First, Mahler "Des Knaben Wunderhorn," Verdi Requiem, Haydn's "Creation," Schubert Ninth. . . .

***What was Bernstein like to work with?***

The consummate musician. You knew that in every aspect of music—starting with inspiration and going through structure, harmony, form, counterpoint, keyboard facility, and conducting—Lenny had it all. And he had tremendous energy and enthusiasm. Everything was a cliffhanger: You always felt like you'd be lucky if you finished on time.

***Weren't you Pierre Boulez' first record producer at CBS?***

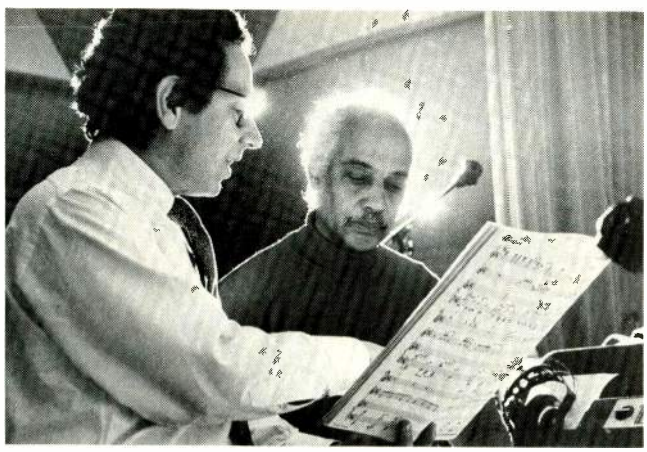
Yes. Boulez was very methodical and meticulous. He balanced and tuned the orchestra so beautifully that his recordings

practically mixed themselves. Some of them are remarkably passionate. *La Valse*, for example, is just incredible.

Lenny was another story. He tolerated more excesses. The orchestra was a lot noisier and not nearly as precise. But of course, he brought a visceral excitement to things that was wonderful.

***So at this point you were primarily involved in classical recordings?***

No, from the beginning I was doing both classical and Broadway, which was also part of the Masterworks division.



With musical director Mercer Ellington during 1981 sessions for *Sophisticated Ladies.*

On hand for the recording of "Suddenly, It's All Tomorrow," the theme song from the 1971 film *Such Good Friends*, are (from right) director Otto Preminger, singer O. C. Smith, lyricist Robert Brittan, and Shepard, who also composed the film score.

***What were your first projects in Broadway?***

Mostly studio re-creations. Masterworks had hired James Fogelsong to be the series producer for re-creations, and he let me do all the editing and mixing, in return for observing him and getting credit as co-producer. This was the early '60s; we were working on *Lady in the Dark*, with Risë Stevens and John Reardon; *The Student Prince*, with Jan Peerce and Roberta Peters; and *Annie Get Your Gun*, with Doris Day and Robert Goulet.

When Jim left, I took over. I did *Oklahoma!*, with John Raitt and Florence Henderson, and *The King and I*, which I just remastered for CD, with Barbara Cook and Theodore Bikel.

Of course, all along I had been attending Goddard's sessions as well, though he didn't know me from a hole in the wall. He did some wonderful re-creations too, like *Pal Joey*, *On Your Toes*, and *Oh, Kay!*

As he became less involved with Broadway shows, I became more involved. Eventually Tom Frost and I ended up as co-directors of Masterworks, and I was still the Broadway producer. I also did film soundtracks and children's records, like *Sesame Street*.

I have always had part of my body in semi-pop recordings and part in classical. I used to think it was a sign of intellectual weakness that I had trouble focusing on any one aspect. But I choose now to consider it a strength. I have a restless nature, and it's better for me not to do the same thing all the time.

***Which is more challenging, producing Broadway or classical recordings?***

The Broadway show is hardest. There's more to do creatively. The symphonic piece is frozen. Whatever it is, it is. The orchestration is fixed, the interpretation is basically fixed. With a show, what goes on stage is fixed, but what goes on record can differ, from the choice and sequence of material to the size and instrumentation of the orchestra, to how the material is delivered.

I think we've seen a tremendous evolution. There was a time when the best popular songs were from Broadway shows by Richard Rodgers, Cole Porter, Frank Loesser, Harold Arlen, Irving Berlin, Jule Styne. When cast albums began to be made on 10-inch 78s by Jack Kapp at Decca Records, cuts were generally around three minutes long so they could fit on a single side of a 78. They were made with the idea that they'd be played on the radio, on the *Hit Parade*.

Then the 10-inch album gave way to the 12-inch—*Kiss Me Kate*, for instance—and the three-minute selection became the five-minute selection. Then came the LP and cassette, which can play 35 minutes or even longer a side. So now you have a 70-minute medium. Meanwhile, the Broadway show started moving away from pop music, to the point where, in the last 20 years or so, the successful shows have managed to prevail without any significant cross-pollination with pop culture. I think Sondheim typifies this, but there are many examples, and a few exceptions—like Andrew Lloyd Webber—to the rule.

Concurrently, there have been major advances in recording techniques, including the ability to play up to about 80 minutes of music without interruption. So the three-to-five minute style of show recording, with that *Hit Parade* mentality, has gradually mutated into a more sophisticated and complex medium, enabling the process of adaption to be more thoughtful.

You know, at one time it was virtually axiomatic that there be no dialog in a cast album. The theory was that repeated hearings of the same spoken lines created boredom and that the songs should stand on their own. But our sensibilities have changed: We don't object to the repetition of dialog, not in this day and age of video and spoken audio cassettes, which we rent

Courtesy of Thomas Z. Shepard

or buy to see and hear our favorite lines spoken over and over.

***So how does all this affect your approach to recording a musical?***

A record is a medium of its own. It's not a souvenir; it's not a newsreel, not a photograph. And I don't believe you should put a Broadway show on record and have it make sense only by already knowing the story or reading the liner notes. So, especially with the CD's capability of 60 or 70 minutes, I think of a cast recording as something with a continuous plot line, not just a collection of songs. I try to figure out what the record needs to make it flow, whether that means using, adding, or rewriting dialog; adding underscoring, or even resequencing material. There's a certain pacing, an energy that gets you from one number to the next so the thing doesn't stop dead emotionally, dramatically.

***For example . . .***

In Steve Sondheim's *Company*, the song "The Little Things You Do Together" is sung as counterpoint to a husband and wife in a karate match. When I recorded it, I thought, why should I record the number without the karate? The whole picture—the plot—is what's important here. So I hired a sound-effects guy to make karate chops and body falls, and had extra lines written into the song so that each character could make it clear when the other was coming at him or her.

I actually conceived of the *Sweeney Todd* recording as a radio show, with bodies that go sliding, and with echo chambers, squeaky doors, factory whistles, and a barber chair that makes funny noises.

*The Secret Garden* is a moving story with a lovely message about the faith kids have and their ability to conquer their own demons. All the characters evolve in that show. By the end of it, everybody is in a different place emotionally than where they began. I thought, how will we tell this story on record? I had a vision, not unlike the *Sweeney* vision, of a radio show. The whole

Courtesy of Thomas Z. Shepard

Conductor Pierre Boulez examines score to Ravel's *La Valse* for the 1974 recording with the New York Philharmonic.

With Danny Kaye in 1970, making the original cast album of Richard Rodgers and Martin Charnin's *Two by Two*.

## AS A RECORD EXEC, I CAN'T STRIP-MINE CULTURE— I HAVE TO GIVE SOMETHING BACK.

Courtesy of Thomas Z. Shepard

Visiting Stephen Sondheim (left) and Shepard at a session for *Merrily We Roll Along* are Garson Kanin and Ruth Gordon.

recording was made to work so that you could just close your eyes and imagine the story.

***How did you accomplish the* Secret Garden *changes?***

I had a tremendous number of meetings with the composer Lucy Simon, scriptwriter Marsha Norman, orchestrator Bill Brohn, and conductor Michael Kosarin. We were all very clear on what we wanted to convey. Marsha had to change some lines to make sense. It was remarkable how much book we were able to get rid of. The final recording has under 20 minutes' worth of dialog. Yet it still tells the story. I added the sound of a train here, a door closing there, some chirps and crickets. . . .

For instance, in the show there's a bird that guides Mary, the little girl, to the key to the garden. The bird is portrayed by a tin whistle. So I put the tin whistle in a booth of its own on a separate track. Then in the mixdown, I "flew" the tin whistle around just as though a bird were flying. When the bird is showing her where the key is, you can feel, especially if you're listening between your speakers, it travelling around. Finally his sound goes off to one side, and then there's the sound of a little piece of metal dropping and Mary asks, "What was that?" Of course, it's the key.

Again, the idea is to be able to close your eyes and visualize the story.

The [stage] show runs two-and-a-half hours. I asked the powers that be at Columbia Records what the maximum time was they allowed for a CD, and they said 77 minutes and 10 seconds. That's exactly how long the album is, and that took some very fancy cutting.

***How about the orchestration?***

Certain changes were made for the recording. Sometimes the vocal line is doubled in the orchestra. If it sounds like a crutch, I prefer to get rid of it. And I generally augment the string section, unless the show works without one. For example, *Jelly's Last Jam* is a Jelly Roll Morton orchestra, and changing that would have been wrong.

***How do the creators feel about making all these changes?***

I always ask them what they think first. It would be arrogant otherwise. It's important to establish a spirit of collaboration with the people who've been with the show since its outset. There I am at 11 o'clock saying, "Hey, I think we should make these changes."

***So how do you define your task as producer of a Broadway cast album?***

Making an intelligible and entertaining self-entity in a medium for which the property is not designed. A show is made to work onstage, so it's my challenge to redefine everything that's strictly visual—every gesture, every piece of choreography, all the wonderful things you see on that stage—and create an aural analogy.

For that reason, it's important for me not to watch the performers in the studio, because they deliver a lot by facial expression and gesture, and it's crucial that that underlying emotion is conveyed aurally.

My job is less to reinvent than it is to translate. To say, here we are in a new medium, what will we do to make it indigenous to this medium? *Jelly's Last Jam*, for instance, had to tell a story; otherwise it might have sounded like an R&B album. It had to be a distillation of the score and script. Fortunately, all the creators agreed. We sat down cutting, pasting, rewriting, to come up with the album to be recorded as opposed to just a simple show album.

*Courtesy of Thomas Z. Shepard*

***It's almost like making a concert version of the show.***

That's why recording *Follies in Concert* was easy—the concert was formatted to become a recording. First we distilled the show, turned it into what it had to be, then we recorded it.

***How do you prepare for recording a show?***

I see it about a half-dozen times, because the clearer I can be in my own mind about what it's going to take to make the show—with its sets, lighting, and costumes—work in a medium for which it wasn't designed, the better.

I'll have a script, and then I somehow manage to find a tape. That's extraordinarily instructive, because right away I can hear what doesn't register: What are those footsteps? What is that pause? Why is somebody suddenly over there instead of there? Why are they screaming when it's a love song? You quickly become aware that what's happening on that stage is not necessarily compatible with a purely aural experience.

***What projects have been the most difficult to record?***

*Porgy and Bess* was hard because it was a three-hour piece that had to be recorded in only three, eight-hour studio sessions. To save time I had everything plotted out in advance. Every singer knew what microphone to walk to for each phrase—I had it written into their scores.

Anything of Sondheim's is difficult because he does not waste a word or a note. Everything is important—there's no padding. And you sure as hell better know why it's there and what you're doing with it.

*Crazy for You* was difficult because one of the show's strongest elements is Susan Stroman's choreography, and I didn't want to lose that on the recording. In fact, the first act finale was probably the hardest thing I've ever done.

***Why?***

Because almost every one of the dance surfaces that is used onstage is on the recording. For instance, Susan has the cast tear down a tin roof, put it on the floor, and dance on it. So we had the tin roof, all kinds of pieces of Masonite and plywood, and God knows what else—anything that people could bang and strum on, just like they do onstage. I knew I was in trouble before I even started, because of the tremendous amount of noise we were in for.

I divided the number ["I Got Rhythm"] into roughly seven sections—solo vocal with orchestra, novelty instruments with orchestra, taps with orchestra, taps with voices, etc. I recorded the orchestra for the whole piece and then edited it to get it in shape to be overdubbed. I then dubbed on top of it each solo voice and then each section that had things like the musical saw, the pots, the pans, the whistles, etc.

***How did you handle the taps?***

One thing I've learned over the years is it's very hard to get precision taps with the whole ensemble dancing. It's also very hard to get a controllable crisp sound, because taps make so much noise—they get into all the orchestra mikes. And conversely the orchestra gets into the dancers' mikes. In this case, I overdubbed them so I wouldn't get unwanted information into unwanted mikes.

There were 21 dancers in "I Got Rhythm." To get unison-sounding taps, Susan designated seven key dancers and, bit by bit, we laid them down over each section. Then we laid them down again and yet again, so that seven came out sounding like 21. That selection, which runs seven-and-a-half minutes, took three days to complete. It was an absolute rat's nest of stuff.

***What are your favorite rooms?***

All of my Columbia original cast albums were done at 30th Street, which was a fine place to work. When I went to RCA in 1974, I started working in Studio A, which at that time wasn't nearly as well known as it's become since. It was a very good room. Remarkable, in fact. The results I got there were certainly comparable to 30th Street.

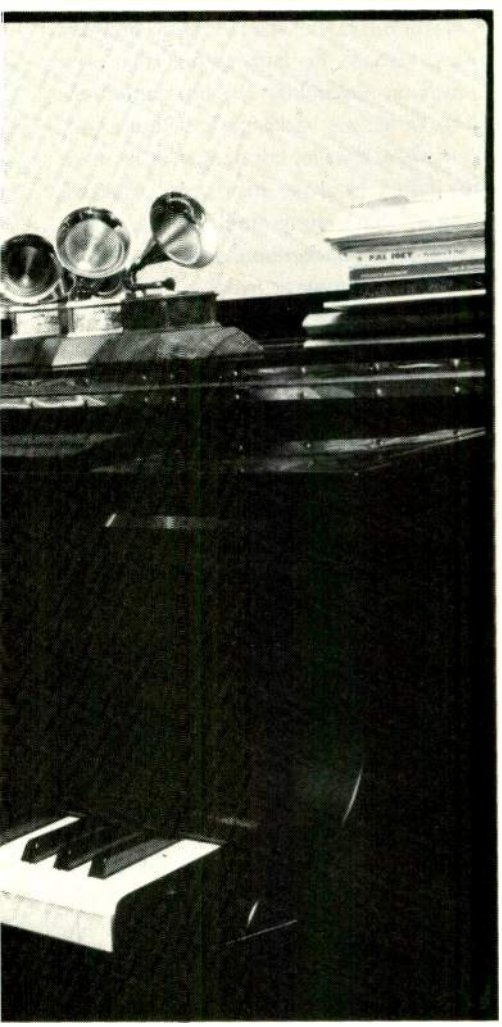
In London, I've worked at Abbey Road; CBS, which is now the Hit Factory; AIR Studios on Oxford Street; Barking; Watford; Walthamstow; CTS.

But part of the craft of producing is learning how best to work in the space you are given. You can't always have the world's most perfect room. I try to understand the characteristics of a room, and if I think it's going to work against me, I tend

Courtesy of Thomas Z. Shepard

**Shepard and soprano Leontyne Price celebrate the release of her 1982 album** *God Bless America.*

## I AM RESPONSIBLE TO MY ART, NOT JUST TO THE BOTTOM LINE OF A COMPANY.



©Elena Seibert

Courtesy of Thomas Z. Shepard

**Overseeing *The Star Wars Trilogy* in 1990 are Shepard, composer/conductor John Williams, and director George Lucas.**

to come in closer on the mikes and get rid of the room as much as I can. The idea is to get as untainted a signal as possible so I can work with it later. Today with Lexicon and other digital reverberation units, we can do so much outside of the studio, in postproduction, that it can be hard to tell whether the ambience on the recording came from the room or was applied later.

***Do you take full advantage of multitrack's potential when you're recording Broadway material?***

Absolutely. There might be a few tracks I don't use. Sometimes I'll use those for room ambience or a quick mix.

***What's the typical track-microphone assignment?***

I'll certainly mike each orchestral section individually, at a minimum. There'll be at least one trumpet mike, one for the trombone, maybe one for a tuba. In 24-track work, each of these will have its own track, though sometimes I'll put three or four woodwind mikes on two tracks. In *Crazy*, I had several trumpet mikes on a single track, which proved very dangerous. We lost one mike, and I didn't notice it until I went to mix. So I had to call the trumpet player back and have him overdub his part.

I like to deploy the high strings and the low brass to the left and the high brass and low strings to the right. Most of the extreme low instruments, like tuba and double bass, I generally put in the middle because I want that center split—I want both speakers putting out that low-energy information.

Percussion I spread as widely as possible. I usually use at least four percussion mikes, sometimes more, and four tracks. A lot of the fun of a recording can be the antiphony of percussion.

***Tell me about working with Sondheim. Is he pretty demanding?***

He's obsessive, though not unreasonably so. When it comes to doing whatever is possible in editing and mixing, he leaves no stone unturned. On *Follies in Concert* there were decisions to be made about how much dialog to keep in, and he often saw things differently than I did. But he was right. He usually is.

***What projects are you most pleased with?***

Certainly *Follies* and *Sunday in the Park*, but I'm fairly pleased with most of my work. Except *42nd Street*—it still sounds like the clatter of hoofbeats on a tin roof.

***How about classical recordings?***

I'm enormously proud of the *Wozzeck* I did with Boulez, as well as his *La Valse* with the Philharmonic and "La Mer" with the BBC. The Brahms German Requiem with James Levine, Kathleen Battle, and Håkan Hagegård is a beautiful recording.

***Would it be correct to call Goddard Lieberson a model?***

He certainly provided an example of how to move among many different worlds of music. He could function equally well with Stravinsky or Jerry Herman. It was that kind of Renaissance spirit that I took as a model. The other thing I learned from Goddard was that, as a responsible record executive, you can't strip-mine your culture. You have to give something back. You're responsible to your art, not just to the bottom line of your company. He was one of a kind. A giant.

***Was he a mentor?***

No. I was influenced by Lieberson, but he never came over and put his arm around my shoulder and said, "Let me teach you what I know, son." Instead it was, "If you want to come to the session, feel free to do so." But I admired the polish, suavity, and urbanity that Lieberson brought to a recording session.

***What exactly did you learn from him?***

Well, for example, not every love song has to have a high note and loud brass at the end—that's great for getting applause in the theater, but it can rob the song of any intimacy on the recording. Also, don't be married to an orchestration if there's something you can do to clarify the dramatic intention. Why double a vocal line if it's only there to give the singer support?

It was generally his point of view that, since you're making something for another medium, you should make it right for that medium. Lieberson's choices would not necessarily be my choices today—maybe at the time they were, because I thought whatever he did was the word of God, so to speak.

Interestingly, he was never very technologically oriented. I remember when we recorded *A Little Night Music*, back at the beginning of the quad age. Buddy Graham and I had set up the whole studio, and Goddard walked in and said, "Oh, my God, what are all these microphones?"

And he paid very little attention to the niceties of postproduction. He turned everything over to Teo Macero, though Teo never got any credit. Goddard was not good about giving people credit.

***Later, when you went over to RCA, you were rivals. Was that awkward?***

Only in the case of the Houston *Porgy and Bess*, because he had wanted that very much for Columbia. The last time I saw him, which was backstage at a Boulez concert, we said hello, but neither of us made the effort to shake hands, for whatever reason. That's always bothered me.

***What sort of background does a Broadway cast album producer need?***

You have to have a feeling for theater, and being a composer helps too. You have to know the limitations and opportunities of the medium. Having vocalists suddenly appear in a different loudspeaker, for instance—if you pan them or have them move when they're not making a sound, you confuse the listener. You have to create reasons to move them or give them dialog or footsteps.

Being a sound buff helps too, since I spend a lot of time on the sound, of course. Is it close, is it far, does it have air around it, is it dry, can you reach out and touch it or is it beyond your reach, is it left, is it right? I could do an entire seminar on the opening 20 minutes of *Porgy and Bess*—what kind of piano we used for Jazzbo Brown, where was it placed, how far back, what was it supposed to convey, how big was the chorus. . . . All these decisions have to be made to envelop, seduce, and inform the critical listener. A

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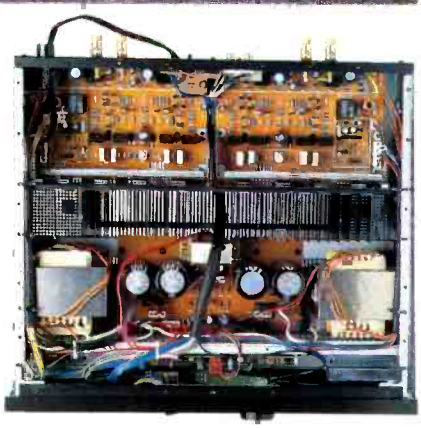
EQUIPMENT **PROFILE**

# DGX AUDIO DDL-1 SPEAKER AND DDA-1 DIGITAL PROCESSING AMP

It would be easy to yawn at yet another nice pair of tower speakers costing about $2,000. *Audio* has reviewed several of these systems in the last two years: PSB's Stratus Gold (November 1991), JBL's L7 (December 1992), Paradigm's Studio Monitor (April 1993), Dahlquist's DQ-30i (June 1993), and so on. But what if the price included a good-quality amp delivering 100 watts per channel—*and* a sophisticated digital time and frequency equalizer? Whoa . . . where's my checkbook?



The DGX Digital Deconvolution Audio System (DDAS) does indeed include all this for only $2,000, with the digital processing and amplifier combined in one component. The system uses patented digital signal-processing (DSP) filter technology, developed by company founder David Chiang, that improves a loudspeaker's performance by flattening its frequency response and simultaneously cleaning up its time and phase behavior. Chiang and partner Gary Brown formed DGX Engineering in 1989 to develop this product and then in 1992 formed an additional company, DGX Audio, to direct-market the newly developed DDAS system.

The DDAS system comes in three parts: Two DDL-1 three-way vented-box (bass-reflex) speaker towers and the DDA-1 100-watt/channel dual-mono power amplifier with DSP filter/equalizer circuitry. In normal operation, you supply your analog or digital inputs to the DDA-1, which in turn is connected to the DDL-1 loudspeakers. With the system thus connected, DGX states that coloration and blurring are virtually eliminated and that the sound is pure and clean.

**THE SYSTEM SOUNDED NEUTRAL AND WELL BALANCED, WITH A WIDE, DETAILED SOUNDSTAGE.**

The DDA-1 DSP amplifier has a black anodized-aluminum front panel, ⅛ inch thick. This amp has both analog and digital (coaxial and optical) inputs and a pair of heavy-duty, gold-plated five-way binding posts for output to the speakers. Front-panel controls include volume, balance, and a three-position input selector. The on/off pushbutton has an indicator that glows red at turn-on and changes to green about 3 S later, when an internal relay connects the amplifier to the speakers with an audible snap. A red digital overflow indicator LED glows when the analog input signal is too strong for the digital section to process. Rear-panel controls include a filter on/off switch and a switch that allows selection of three alternate filter configurations, of which only one was active in my review sample.

The dual-mono power amplifier utilizes two separate power supplies and circuit boards. The left and right channels are mirror images of each other. The power supplies contain a total of 60,000 µF of filter capacitance. No details on the amplifier circuit were provided by the factory.

The DSP filter circuitry, on a single p.c. board mounted just behind the DDA-1's front panel, includes a large application-

## SPECS

System Type: Floor-standing speaker with DSP-based single-box equalizer/amplifier.
Overall Frequency Response: 31 Hz to 20 kHz.

**Loudspeaker**
System Type: Three-way vented box.
Drivers: 12-in. cone woofer, 2-in. soft-dome midrange, and 1-in. soft-dome tweeter.
Sensitivity: 91 dB at 1 meter, 2.83 V rms applied.
Crossover Frequencies: 2.3 and 8.3 kHz.
Impedance: Nominal, 8 ohms; minimum, 6 ohms.
Dimensions: 39½ in. H × 15⅝ in. W × 11 in. D (100.3 cm × 39.6 cm × 27.9 cm).
Weight: 68 lbs. (30.8 kg) each.

**Digital Processing Amplifier**
Rated Power: 100 watts per channel into 8 ohms or 120 watts per channel into 6 ohms.
Damping Factor: 150.
THD: 0.01% at rated power.
Residual Noise: 0.3 mV, measured unweighted.
A/D Converter: Oversampling, delta-sigma type; sampling frequency, 44.1 kHz; dynamic range, 92 dB.
Deconvolution Filter: Type, finite impulse response (FIR); length, 383 taps; multiplier, fixed-point, 16 bits; accumulator, 36 bits; multiply/accumulate time, 54 nS.
D/A Converter: Oversampling, delta-sigma type; sampling frequency, 44.1 or 48 kHz; dynamic range, 95 dB.

Price and Finish: $1,995 per pair, wood-grain vinyl finish, with digital processing amplifier; rosewood veneer finish, $200 additional.
Company Address: 778 Marconi Ave., Ronkonkoma, N.Y. 11779.
For literature, circle No. 90

specific integrated circuit (ASIC) that performs all the filter calculations for both channels. This IC was designed by DGX and made specifically for them by an unnamed manufactuer. The ASIC uses the finite impulse response (FIR) filtering technique and is said to provide more than 18 million multiply and accumulate math operations per second for each channel! It's no easy accomplishment to provide two separate channels of real-time broadband filtering at a sampling rate of 44.1 or 48 kHz!

The FIR filters are 383 taps long and provide a time-domain filter length of 8.68 mS at the 44.1-kHz sampling rate. This length provides magnitude and phase equalization capabilities to equalize the speakers down to about 60 Hz. To provide accurate and detailed equalization down to lower frequencies (or for room equalization) would require a much longer FIR filter than the one in the DDAS system. With the processing time available, the frequency range below 60 Hz can only be shelved up or down by arbitrary amounts.

**THIS IS AN HONEST 8-OHM SPEAKER, WHOSE IMPEDANCE DOES NOT DROP TO HARMFULLY LOW VALUES AT ANY POINT.**

The coefficients of the FIR filter are set to optimally flatten the speakers' frequency response and to compact their time response (and thus eliminate blurring, according to DGX). The coefficient selection technique is described in Chiang's recent patent (No. 5,185,805), titled "Tuned Deconvolution Digital Filter for Elimination of Loudspeaker Output Blurring," issued February 9, 1993. The procedure uses least-squares error minimization, Lagrange's method of multipliers, and other fine-tuning techniques. "In a nutshell," says Chiang, "error minimization is done in the time domain while subject to a set of constraints which guarantee flatness in the frequency domain."

The DDL-1 is a fairly large three-way tower system. The drivers are stacked vertically along the center line of the front panel, and the port is at the rear. The tweeter is mounted above the midrange, and the woofer is about one-third of the way up from the bottom. All drivers are flush-mounted. The 12-inch long-throw woofer has a rigid cone made from polypropylene particles, a rubber surround, and a die-cast frame. The soft-dome midrange and tweeter are cooled with Ferrofluid. The grille, of molded thermoplastic covered with fabric mesh, attaches to the front with four projections that mate with holes in the panel.

The box is quite solid and made from ¾-inch medium-density fiberboard throughout. A separate internal enclosure is provided for the midrange and tweeter drivers. The crossover is mounted behind the woofer on a small (3½ × 4½ inch) p.c. board. Because of the high crossover frequencies (2.3 and 8.3 kHz), the crossover components are quite small compared to other systems'. The drivers are hooked to the crossover with 18-gauge stranded wire, attached to the drivers by clips.

The crossover of the DDL-1 contains 11 components—three resistors, four capacitors, and four inductors. The woofer is rolled off at 12 dB/octave, while the midrange is high-passed at 12 dB/octave and low-passed at 6 dB/octave. The tweeter is high-passed at 12 dB/octave and includes a high-frequency lift network. Metallized polyester and nonpolarized electrolytic capacitors are used. Connections are made to the rear panel through a pair of gold-plated five-way binding posts with standard, ¾-inch spacing. No provisions are made for bi-wiring, and the speaker has no user-adjustable controls.

### Measurements

Figure 1 displays the tenth-octave-smoothed on-axis anechoic frequency response of the DDL-1 speaker, driven with and without the DDA-1 processing amplifier (with its filtering engaged). Ground-plane measurements were used below 1 kHz, and the grille was off for this and all the following measurements.

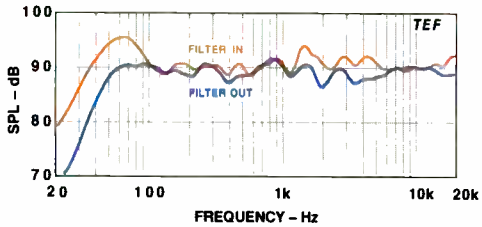



**Fig. 1—Anechoic frequency response.**

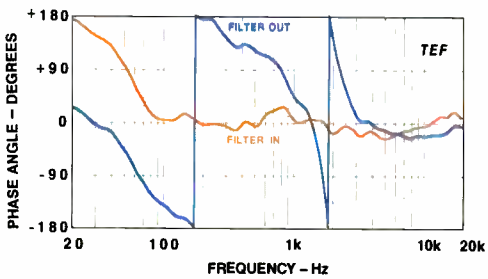



**Fig. 2—Phase response.**

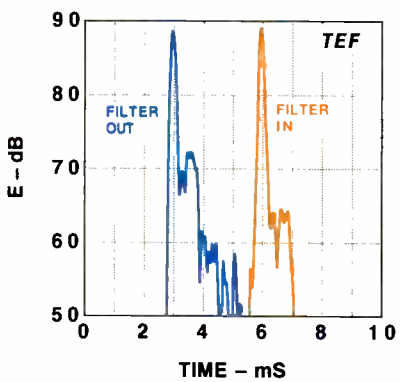



**Fig. 3—Energy/time response of speaker.**

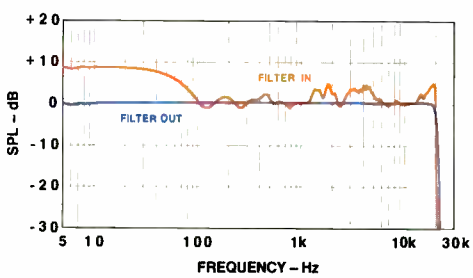



**Fig. 4—Amplifier frequency response, with and without filtration.**

I followed my usual procedures, taking measurements 2 meters away from the tweeter, on the tweeter's axis (which is about 35 to 36 inches high, depending on whether spikes are used), with 5.66 V rms applied, and referenced back to 1 meter.

The manufacturer indicated that the DSP filtering is based on measurements taken at a point 1 meter from the speaker, halfway between the midrange and tweeter, or about 3 inches below the tweeter's axis. I measured the response at a more realistic listening distance of 2 meters and a point only about 2° above the manufacturer's measurement point, obtaining virtually the same results as the manufacturer.

As can be seen, the frequency response of the speaker with filter out and driven by my test amp is quite flat all by itself! It fits a fairly tight, 5-dB window (±2.5 dB) between 46 Hz and 20 kHz. With filtering, the general trend is even flatter; the response has a more extended low end but has peaks at 65 Hz and 1.4 kHz due to overemphasis in the filtering. Excluding these two peaks, the response fits an even tighter window of about 3.4 dB (±1.7 dB referenced to 1 kHz) from 33 Hz to 20 kHz. With filter in, the system's low-frequency, 10-dB-down point is extended from 35 Hz down to 22 Hz. (The frequency response of the amplifier is shown in Fig. 4.)

Comparing the curves in Fig. 1 shows that the filter-in response actually has higher deviations from flat than the filter-out response. Note, however, that the response in the two regions covering 100 Hz to 1.2 kHz and 2 to 16 kHz is definitely flatter with the filter in. The factory-supplied filter-in response curves for the DDAS system were significantly flatter than my measured curves. These differences could be due to differences in test conditions (such as environment, technique, and equipment), to production variations from unit to unit, or both.

The grille of the DDL-1 caused only minimal variations in frequency response (not shown). Maximum deviation occurred in a narrow range from about 3.5 to 4 kHz, where the response was reduced by about 2.5 dB. At higher frequencies, the deviations were only about ±1.5 dB. The right and left speakers matched closely, within ±1 dB, above 200 Hz. Averaged over the range from 250 Hz to 4 kHz, the sensitivity of the speaker (without filter) was 88.9 dB, only 2.1 dB below DGX's 91-dB rating.

The frequency response is not the whole story, however: The phase and time behavior of the response are also important. The on-axis phase response, with and without filtering, is shown in Fig. 2. Unlike my usual "unwrapped" phase graphs, I have chosen to display the curves on a "wrapped" ±180° vertical scale to reveal small phase changes.

An additional item needs to be pointed out. Both curves in Fig. 2 were obtained with the speaker's polarity reversed, by transposing the connections to the speaker. Without this reversal, the filter-in phase curve bobbed around the 180° mark instead of 0°.

Without filtering, the phase curve rotates twice in the negative direction, going through 720° as frequency is increased. The two rotations are clearly indicated by the sudden jumps, or wraps, in phase at 180 Hz and 1.9 kHz. With filtering, however, the phase rotation is completely eliminated, resulting in approximately zero phase angle and linear-phase behavior above 100 Hz.

For signals whose spectra are restricted to this linear-phase region, waveshapes will be roughly preserved. Without the DDA-1 filtering, nonlinear phase rotation will distort the shape of any wave passing through the speaker. The audible effects of such waveshape distortion, if accompanied by a flat frequency response, are quite subtle if the band-to-band differential group delay is less than about 500 µS. Most of the nonlinear phase distortion in the DDL-1 speaker is due to the crossover.

With the filter out, the speaker's group delay (not shown) exhibited lots of variation above 200 Hz, reaching a midrange peak of +1.1 mS at about 1.7 kHz. With

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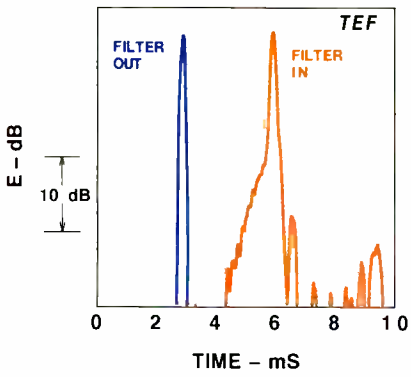



**Fig. 5—Energy/time response of amplifier and filter.**

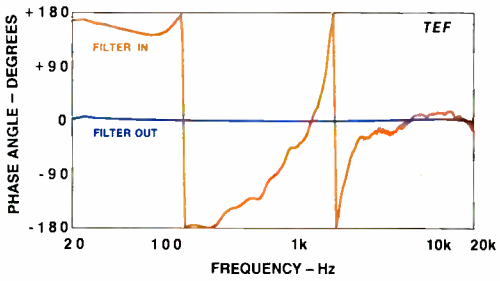



**Fig. 6—Phase response of amplifier and filter.**

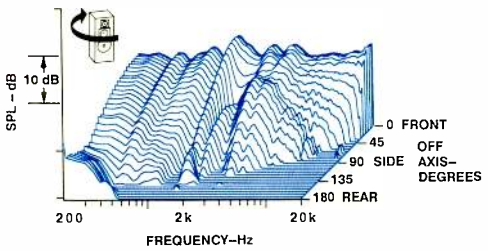



**Fig. 7—Horizontal off-axis frequency response.**

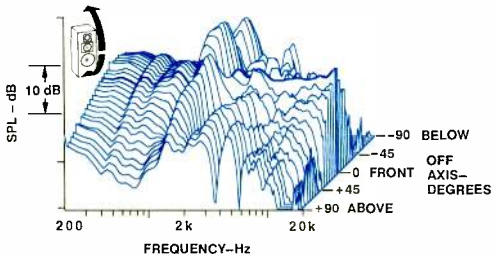



**Fig. 8—Vertical off-axis frequency response.**

filter in, the variation was considerably reduced and stayed within ±100 µS above 700 Hz.

Figure 3 exhibits the speaker's energy/time response, with and without filtering engaged. The test parameters were chosen to accentuate the response from 1 to 10 kHz, which includes both crossover regions. With filter out, the main arrival, at 3 mS, is quite compact but is followed by a secondary peak only 17 dB down and then by many lower level peaks out to about 2.5 mS later. With filtering, the main peak arrives about 3 mS later than the unfiltered main peak (actually, 2.985 mS), due to the inherent processing delay, and is considerably cleaned up. Absent are the many lower-level peaks, and the secondary peak has been reduced in level by about 8 dB, making it more than 25 dB down from the main arrival.

I made only limited tests of the DDA-1 DSP amplifier, using only the analog inputs and outputs. I did not do any digital-related tests, such as checks of A/D and D/A low-level linearity.

The frequency response of the DDA-1 digital processing amplifier is shown in Fig. 4 with the filter in and out, and is plotted over an extended range of 5 Hz to 30 kHz. (The amplifier's phase response is shown in Fig. 6.) As noted earlier, you can easily engage or defeat the filter by using a switch on the rear of the amp. With the filter out, however, the A/D and D/A converters and the DSP circuitry are still in the signal path. In the filter-out condition, the coefficients of the FIR filter in the DSP circuitry have been set to yield a flat response while maintaining the same delay time as when the filter is engaged.

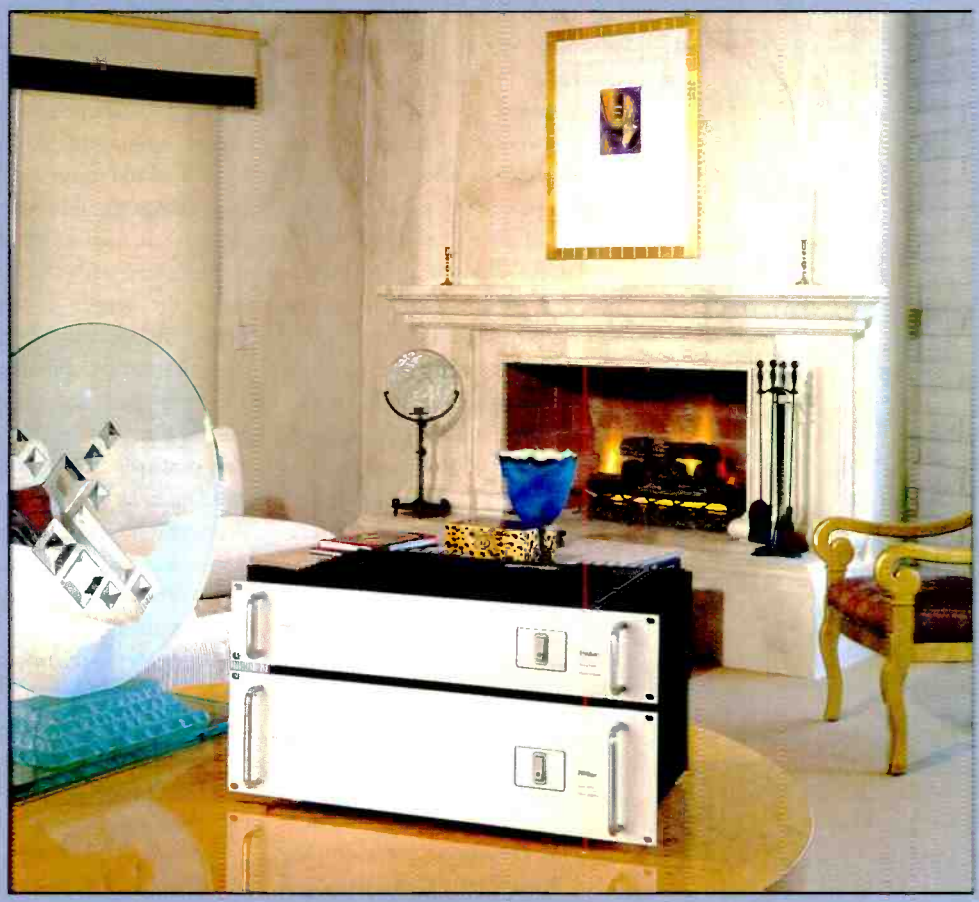
The amp's response was checked by applying a sine-wave signal of 1 V rms at the analog input of the amplifier, adjusting the unit's volume control for unity gain, and then measuring the output voltage with the speaker connected as the load. With filter out, the frequency response is very flat but exhibits a very rapid roll-off above 20 kHz due to the DDA-1's anti-aliasing and anti-imaging filters. With filter engaged, the response correction of the DDAS system is clearly seen. It consists mainly of boosts, with a shelving lift below 100 Hz that reaches 8.5 dB at about 30 Hz, and boosts centered around 1.7, 4, and 20 kHz. Note that at 1 kHz, the response is unity in both positions of the filter switch. With equalization, the roll-off above 20 kHz is even more rapid than without it; in the first 20 dB, it drops extremely rapidly, at about 670 dB/octave!

The amplifier's processing delay was assessed by running an energy/time measurement with the filter in and out (Fig. 5). The test parameters were set to the same values used for Fig. 3. With the filter out, the energy/time response is extremely sharp and well defined, has no later arrivals, and is centered at 2.9847 mS. This curve looks like the curve of a perfect loudspeaker measured at a distance of about 1 meter. The curve taken with the filter has been shifted 3 mS to the right for clarity. It exhibits a gradual increase in level and a sharp peak, followed by several lower level peaks. It is this response that pre-processes (or pre-cancels distortion in) the incoming signal, so that the resultant output from the DDAS system is more like the response of a perfect speaker.

Figure 6 shows the measured phase response of the amplifier with the effects of its inherent processing delay (2.9847 mS) removed. Both filter-in and filter-out curves are shown. With filter out, the phase response is appropriately flat, with a phase angle of zero over the whole audio range. With filter in, the phase curve above 200 Hz is the approximate reciprocal of the speaker's measured phase curve (see filter-out curve in Fig. 2). The phase of the overall equalized response (filter-in curve of Fig. 2), is just the sum of the un-equalized phase curve (filter-out curve of Fig. 2) and the amplifier's phase response (filter-in curve of Fig. 6).

A high-level low-frequency sine-wave sweep revealed only one significant cabinet resonance. This was a front-panel resonance at about 220 Hz. When I first received the system from *Audio*'s New York

# TRANS•NOVA AMPLIFIERS



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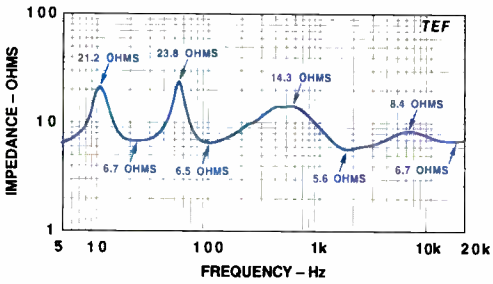


**Fig. 9—Impedance.**

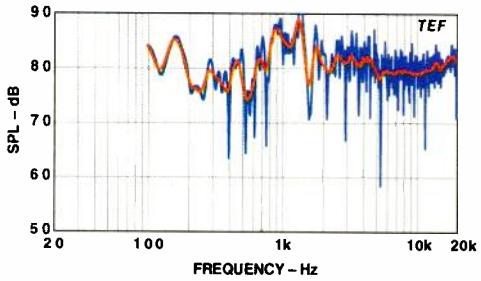


**Fig. 10—Three-meter room response.**

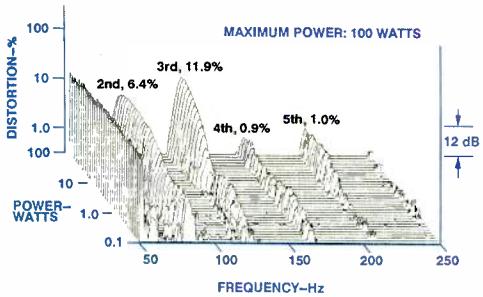


**Fig. 11—Harmonic distortion for $E_1$ (41.2 Hz).**

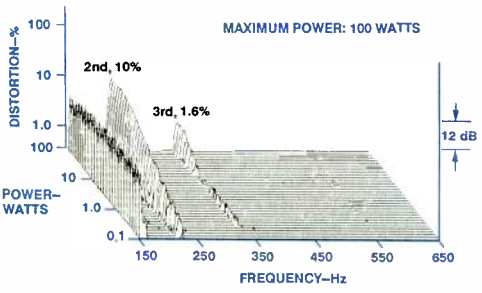


**Fig. 12—Harmonic distortion for $A_2$ (110 Hz).**

offices, both speakers had loose woofer screws that caused a buzz between the woofer frame and the cabinet at this frequency. (It's a good policy to occasionally check your loudspeakers' driver mounting screws for tightness, to prevent extraneous noises.) At other frequencies, the cabinet was quite well behaved.

The woofer's maximum displacement was about 0.55 inch, peak to peak, before distortion became excessive. The woofer exhibited some dynamic offset distortion at levels above 15 V rms. The woofer reached a solid dip in displacement at about 27 Hz, where the loading of the vented box was at its maximum. At this frequency, with an input of 20 V rms, the vent wind noise was quite low. The sound was quite clean and effortless during all the sine-wave tests.

Figure 7 shows the horizontal "3-D" off-axis responses of the DDAS system with the filter in use. The bold curve at the rear of the graph is the on-axis response. The system was measured at 2 meters from the tweeter, with the tweeter the center of rotation. The uniformity of the curves indicate very good horizontal off-axis response and coverage. Note how well the 1.4-kHz peak in the on-axis response is carried over into the off-axis responses. However, the curves obscure a sharp dip at 1.8 kHz in all the off-axis curves beyond 30°. This dip indicates an off-axis interference between the woofer and midrange.

Figure 8 shows the vertical "3-D" off-axis curves of the DDAS system with the filter in. The bold curve in the center of the graph (front to rear) is the on-axis response. The most noticeable feature of the curves is a prominent 1.8-kHz ridge in the off-axis responses, especially for angles below the axis. Note that there is no corresponding peak in the on-axis response at this frequency. This prominent off-axis ridge indicates that there is major lobing in this frequency range.

The existence of the off-axis ridge prompted me to investigate the crossover phase relationships by measuring the on-axis response with the midrange in normal and inverted polarity. For a speaker to have minimum lobing error, the respective drive units should be acoustically in phase with each other throughout the whole crossover region. Minimum lobing for the DDL-1 speaker would mean that a reversed-polarity midrange should cause a deep null in the response at each of the two crossover frequencies (2.3 and 8.3 kHz). This would indicate the proper in-phase condition for the normal polarity condition.

With inverted midrange polarity, the on-axis response exhibited a broad trough, only about 5 to 10 dB deep, between the two crossover frequencies instead of two good nulls at the crossover points. More important, reversing the midrange connections caused a peak in the response at 1.8 kHz! When reversed, the on-axis output between 1.6 and 2.1 kHz was actually higher than with the normal connection, reaching a maximum about 6 dB higher at 1.8 kHz. This indicates that the outputs of the woofer and midrange are significantly out of phase in the 1.8-kHz region with the midrange connected normally.

Between 900 Hz and 1.6 kHz, reversing the midrange had very little effect on the response. (It did have a significant effect on the response at lower frequencies, between 400 and 800 Hz.) This indicates an approximate 90° phase condition in this frequency range. With these values of phase response, major lobing is expected! Unfortunately, lobing and problems in directional response *cannot* be corrected by an in-line equalization device, no matter how sophisticated it is!

The speaker's polar behavior in both planes should have been optimized without regard to on-axis frequency response. The on-axis frequency response could then be nicely corrected with an in-line equalizer. As a side comment, the previously mentioned off-axis nulls in the horizontal response at 1.8 kHz (Fig. 7) are explained by the out-of-phase midrange. Lowering the crossover frequencies might improve the vertical polar response; the crossover frequencies, 2.3 and 8.3 kHz, are the highest

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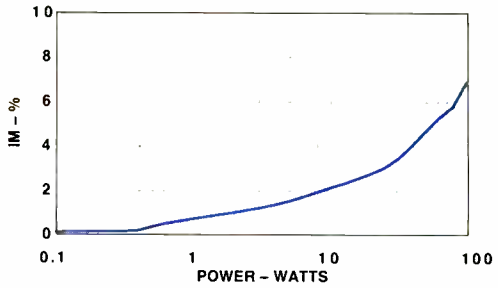



**Fig. 13—IM distortion for 440 Hz ($A_4$) and 41.2 Hz ($E_1$).**

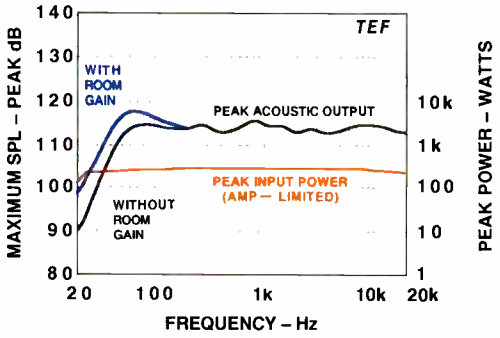



**Fig. 14—Maximum peak input power and sound output.**

of any three-way speaker I have reviewed!

Figure 9 shows the impedance magnitude versus frequency. I have extended the plot down to 5 Hz, instead of cutting it off at the usual 20 Hz, because there is significant activity below 20 Hz. Below 100 Hz, the speaker's impedance exhibits the typical vented-box characteristic, two peaks straddling a dip. The frequency at the bottom of the dip (approximately 25 Hz) coincides with the Helmholtz resonance, where the loading of the vented box is at a maximum. The impedance does not drop to harmfully low values at any point. A rather high minimum impedance of 5.6 ohms occurs at 1.9 kHz, and a maximum of 23.8 ohms occurs at 56 Hz. This is an honest 8-ohm speaker.

Although the curve has a fairly high max./min. variation of about 4.25 to 1 (23.8 divided by 5.6), its relatively high minimum impedance of 5.6 ohms means that the speaker will be fairly insensitive to cable resistance. Cable series resistance should be limited to a maximum of about 85 milliohms to keep cable-drop effects from causing response peaks and dips greater than 0.1 dB. For a typical run of about 10 feet, 16-gauge or heavier low-inductance wire should be used. The complex impedance of the speaker (not shown) was well behaved.

Figure 10 displays the 3-meter room response of the DDAS system with both raw and sixth-octave smoothed data. The speaker was in the righthand stereo position, aimed at the listening position, and the test microphone placed at ear height (36 inches), at the listener's position on the sofa. The system, with its filter engaged, was driven with a swept sine-wave signal of 1 V rms and its volume control was set so that the amplifier would deliver 2.83 V rms (corresponding to 1 watt into the rated 8-ohm load) at 1 kHz. The direct sound and 13 mS of the room's reverberation are included.

Overall, the curve is well behaved but exhibits midrange peaks between 800 Hz and 2 kHz. These peaks coincide with some of the anomalies noted previously in the off-axis curves. No deep dips caused by room effects are apparent in the range from 200 to 600 Hz. Above 2 kHz, the response is quite flat but rises above 10 kHz.

Figures 11 and 12 show the single-frequency harmonic distortion spectra versus power for the musical notes of $E_1$ (41.2 Hz), and $A_2$ (110 Hz). The power levels were computed using the rated impedance of 8 ohms. A maximum power of 100 watts (20 V rms) was set as the upper limit and was supplied by the DDA-1 amplifier. The system sounded quite clean through all the harmonic-distortion tests.

The $E_1$ (41.2-Hz) harmonic data is shown in Fig. 11. Fairly low distortion levels of only 6.4% second harmonic and 11.9% third are reached at full power, with 1% or lower values of higher harmonics.

Figure 12 shows the $A_2$ (110-Hz) harmonic data. The only significant distortion at this frequency consists of 10% second harmonic and only 1.6% third at full power. Higher harmonics were below the measuring floor of my analyzer. The $A_4$ (440-Hz) distortion data (not shown) rose only to 4.6% second harmonic, with negligible higher harmonics.

Figure 13 displays the IM created by tones of 440 Hz ($A_4$) and 41.2 Hz ($E_1$) at equal power. The IM distortion rises only to the relatively low level of 6.8% at full power, despite the fact that the speaker's 12-inch woofer handles both frequencies of the test signal. Because the DDA-1 did not have enough peak power capability to handle the IM test signal at 80 and 100 watts, the two highest power levels of this test, another amplifier was used. (An amplifier of 200 watts average power is required to reproduce the 100-watt summed sine-wave test signal without clipping, due to the signal's high, 6-dB, crest factor.)

Figure 14 displays the short-term peak-power input and output capabilities of the DDL-1, as a function of frequency, measured using a 6.5-cycle third-octave tone burst. The peak input power was calculated by assuming that the measured peak voltage was applied across the rated 8-ohm impedance. The DDA-1 amplifier was used for these tests.

The peak input power is equal to the peak output power of the DDA-1 amplifier with the speaker connected as the load. The DDL-1 speaker essentially handles the full peak power of the DDA-1 amplifier at all frequencies. Only at 20 Hz does the amplifier's peak output roughly match the speaker's input capability. With the speaker as a load, the amplifier's peak output is about ±50 V midband (312 watts, peak), tapering off to about ±43 V (231 watts, peak) at the frequency extremes. Spot checks of input power with a far more powerful amplifier (not shown) revealed that the speaker, at most frequencies, can handle much more peak power than the DDA-1 amplifier can provide!

The peak acoustic output of the system reaches a very usable 113 to 117 dB SPL from 60 Hz to 20 kHz. Because the maximum input power is amplifier-limited, and thus very flat with frequency, the maximum acoustic output essentially follows the axial frequency response of the system, scaled up in level. With a more powerful amplifier, such as the one I normally use

for these tests, the maximum output of the system can easily reach levels 10 dB higher—not that 115 dB SPL is anemic to start with!

With room gain, the system can generate impressive outputs of 110 dB SPL above 35 Hz and 115 dB above 45 Hz. With both speakers playing bass material common to both channels, peak levels above 120 dB SPL should be easily reached.

**Use and Listening Tests**

The amplifier included with the DDAS system complicated matters somewhat in my reviewing. I was evaluating not only a loudspeaker but a processing amplifier as well. I listened to the DDL-1 loudspeakers as stand-alone speakers driven by my electronics and as a system driven by the DDA-1 amplifier.

My review speakers were quite attractive in their supplied rosewood-veneer finish (all six sides of the cabinet!). Their attractiveness is not diminished with the grille off. Excellent workmanship and attention to detail were clearly evident. The bottom of each speaker has four threaded inserts installed to accept supplied screw-in spikes. The DDA-1 DSP amplifier is quite handsome. All controls felt very solid.

The 13-page owner's manual is a small-format (8½ × 5½-inch) piece that devotes only six pages to the actual installation and operating instructions for the system. The rest of the manual consists of an introduction, specifications, and warranty issues. Most of the installation and operating pages are devoted to the electronics of the system and only one short paragraph to the loudspeaker itself. Room placement and orientation is covered by only one sentence in this paragraph: "Place your loudspeakers two to three feet from the wall for best performance." The electronics are covered quite well, however, with a lot of emphasis placed on electrical safety.

I placed the speakers, with their grilles removed, in my usual listening positions and canted them in so that they were aimed toward me. This placed them about 8 feet apart, 10 feet from my sofa, and about 5 feet from the rear wall. In addition to the DGX amplifier/processor, my other listening equipment included the usual Krell preamplifier and power amplifier along with Rotel and Onkyo CD players. Reference speaker systems were B & W 801 Matrix Series 3 units. All cabling was from Straight Wire.

I first listened to the speakers driven by the Krell preamplifier and amp. My first reactions were quite favorable. There was a robust, low-distortion bass, excellent dynamic range, and an overall balance quite similar to that of my reference speakers. When driven by the DGX amplifier with filter on, the overall sound of the speakers was subtly improved in all frequency ranges except in the bass and low bass. In this range, the low end was quite accentuated and a bit overpowering, although quite clean and well controlled. This was in comparison to the bass when the DDL-1 speaker was driven by its own amp with the filter off, or by the Krell amp, or as compared to the B & W speakers driven by the Krell electronics.

**THE DIGITAL FILTER IS DESIGNED TO OPTIMIZE BOTH THE FREQUENCY AND TIME RESPONSE OF THE SPEAKERS.**

The bass overemphasis was well demonstrated on the acoustic bass tracks (particularly 1 and 4) on Rob Wasserman's *Duets* CD (MCA Records MCAD-42131). On other inherently bass-heavy material—such as rock and dance/party music, where bass enhancement actually adds to the presentation—the extra bass fit in quite well because the system could easily and cleanly handle the extra bass power. On the title track of Brooks & Dunn's country Compact Disc, *Hard Working Man* (Arista 07822-18716-2), the DDAS system did particularly well handling the bass line and reproducing very cleanly the remainder of the material, including vocals, at near concert levels.

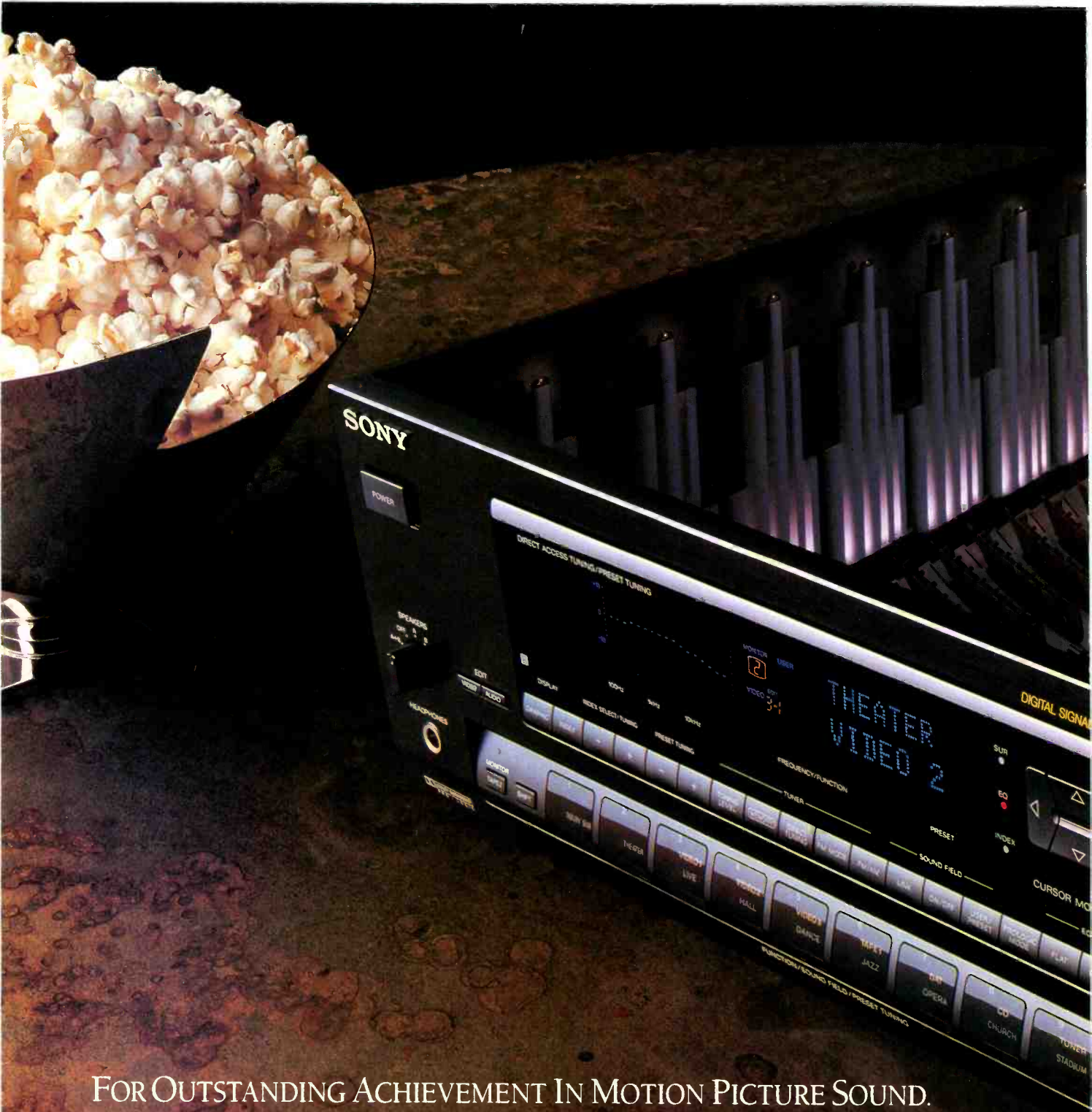
On pipe organ with high-level bass pedals, such as the very demanding *Pictures at an Exhibition* played by Jean Guillou (Dorian DOR-90117), it was possible to turn the system up to the point where the bass sounded mushy, presumably due to the amp running out of gas. Before the mushiness level was reached, however, the system could reach impressive levels of clean bass. With the speakers driven directly by the more powerful Krell amp, even greater clean bass levels could be reached. It would make sense for DGX to supply a line-level analog output on the DDA-1 so that a more powerful external amplifier could be used.

The filter in/out slide switch on the rear of the DDA-1 made comparisons between the two conditions quite easy. However, the change from one condition to the other is not instantaneous. When the switch is changed, the sound shuts off for about 1 S, presumably to allow sufficient time for the new filter coefficients to be loaded into the DSP circuitry.

The effect of the system's DSP filtering was subtle on some program material and more obvious on other material. The presence of any bass material made the filtering obvious. In the absence of bass, the effects of the filter were most easily heard on transient material, such as the synthesized plucked-string sounds on track 14 ("Silicon Valley Breakdown") of *Digital Domain* (Elektra 9 60303-2). When the filter was switched in, the sound change was subtle but perceptibly more distinct and realistic sounding. The filter could also be heard well on more continuous wide-band material such as pink noise, where the effects were slightly emphasized highs, just perceptibly higher volume, and, of course, more low end.

On the stand-up/sit-down test with pink noise, the tonal differences between seated and standing listening positions were major. These tonal changes affected both upper mids *and* highs. The system's sound was most similar to my reference speakers' when I was sitting down on the sofa (or slouched down, placing my ears slightly below their usual level). This placed my ears closest to the design axis. Just raising my head slightly caused discernible changes in both the upper middle and high frequencies. From mid height to fully standing, major changes were evident in both these frequency areas. When I stood, the extreme highs took on a distinct one-note quality. In other speaker systems, where the mid-to-tweeter crossover frequency is lower, changes in vertical coverage are restricted to the upper mids, not the extreme highs.

*Continued on page 88*

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The fact that SOTA Industries, best known for its superb phonograph turntables, now offers a state-of-the-art CD player sends a clear message (at least to me): Even the most dedicated vinyl-record devotees must sooner or later acknowledge that CDs are here to stay.

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The power supply for the analog audio circuits uses a low-noise, multiple-winding toroidal power transformer that provides separate regulated output voltages for each channel. Power-supply components are specially selected and, according to the designers of the Vanguard II, play a major role in the superior dynamic range of the product.

The SOTA Vanguard II CD player includes a full-featured remote control. The player has Favorite Track Selection programming in addition to the usual standard programming options. Other noteworthy features include fixed and variable outputs, optical and coaxial digital outputs, a headphone output, and a full-function status display with adjustable brightness.

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One of the most noteworthy features of this CD player is its separate line *input*. The user can connect an extra source, such as a tuner, to this input, giving the Vanguard II some of the added versatility of a preamplifier. The external input can be selected by means of a front-panel button or with the remote control, and the volume level can be adjusted remotely by using the variable outputs. Another unusual feature is the ability to "name" CDs and tracks with up to 12 alphanumeric characters apiece. These names can be stored in the player's memory so that the next time you play the given CD, the names you've stored (for both the overall CD and the tracks) will be displayed.

### Control Layout

The smooth, silent-running disc drawer is located at the left end of the front panel. The display area at the right end of the panel is surrounded by various push-buttons. The buttons just below the display are for "Standby" (in effect, power on/off), CD or line input selection, "Preset" (for storing such attributes as preferred display brightness, play mode, fade-in/fade-out time, and copy pause time), "FTS" (Favorite Track Selection), and "Edit." Just to the right are the "Previous" and "Next" track-selection buttons. Above them are the main transport-control buttons: "Open," "Play," "Pause," and "Stop."

**THE ONLY SIGNIFICANT NOISE WAS 60-Hz HUM—AND THAT WAS MORE THAN 106 dB DOWN!**

While most of the control functions described are duplicated on the remote, this handheld device is also used to access many of the features described earlier, such as adjusting display brightness, applying titles to CDs and tracks, accessing tracks directly, playing tracks randomly, adjusting volume level, fast searching, selecting all repeat-play modes, scanning of the beginning of each track, calling up the various time displays, reviewing a program, and selecting index points.

The one feature that I think was improperly designed is the index selection feature. Certainly, an expensive CD player such as this one should be able to access index points within a track when such points are incorporated in a given CD. So, I was pleased to find "Next" and "Previous" index buttons on the remote control of the Vanguard II—until I started to use them. Suppose I was playing through the third index point on a given track and I wanted to go to the fourth index point. Normally, I would expect to push the "Next" index button once to get there. Not so! Pushing that button simply brought up "Index 1" on the display, so that I had to press the button three more times to get to the fourth index point. Even worse, suppose I was playing through the "Index 3" section of a given track and I wanted to go back to the "Index 2" point. Instinctively, I would expect to press the "Previous" index button once. Guess what! Doing so brings up "Index 99" on the display! If I had the patience, I would then have to press the "Previous" index button *97 more times* to get to my desired index point! Somebody really goofed here, unless there's simply something wrong with the sample player I tested.

### Measurements

Figure 1 shows the frequency response of the Vanguard II CD player. While a minor amount of filter ripple is evident at the treble end of the sweep, overall response is essentially flat, rising by no more than 0.15 dB at 20 kHz. Output levels were identical for both channels, measuring 2.261 V at maximum recorded level.

Shown in Figure 2 is how harmonic distortion plus noise varies as a function of frequency. At 1 kHz, THD + N is a mere 0.003%, rising to just over 0.01% at 10 kHz. While the reading of 0.003% at 1 kHz is slightly higher than the published specification of 0.002%, bear in mind that this plot takes into account both noise and distortion, whereas the specification published by SOTA is for THD alone.

Figure 3 shows how THD + N for a 1-kHz test signal varies as a function of signal amplitude. Many CD players that I have tested tend to show a marked increase in THD + N as maximum recorded level is approached. This is usually caused by the inability of the analog output stages to handle the larger input signals. Notice that in the Vanguard II CD player, this rise is

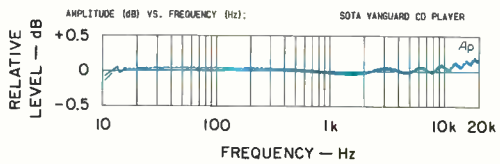


**Fig. 1—Frequency response.**

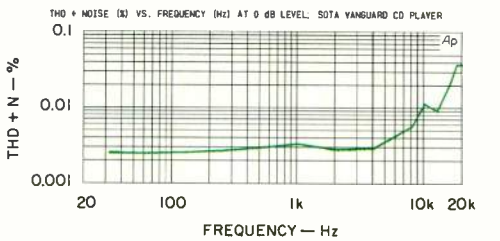


**Fig. 2—THD + N vs. frequency.**

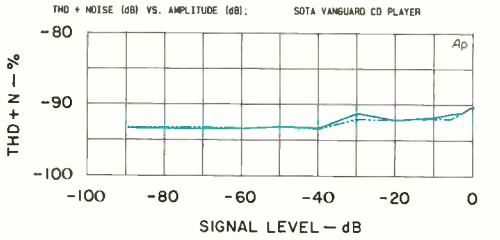


**Fig. 3—THD + N vs. signal amplitude.**

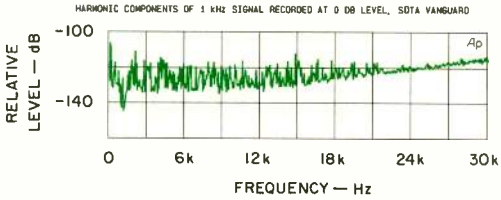


**Fig. 4—Harmonics of 1-kHz signal at 0 dB.**

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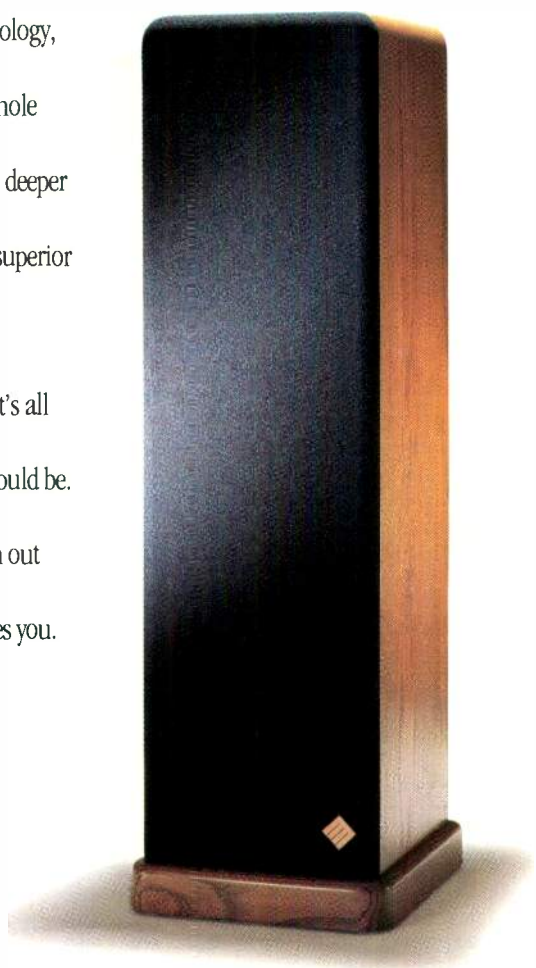

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minimal; THD + N never exceeds –90 dB (referred to maximum recorded level), which corresponds almost exactly to the 0.003% noted earlier in Fig. 2.

Using FFT spectrum analysis, I checked the harmonic content of a 1-kHz, full-amplitude signal in an attempt to separate the actual harmonic distortion from the residual noise (Fig. 4). The only significant harmonic that can be observed is at 2 kHz. It is about 110 dB below maximum recorded reference level, which suggests that the *actual* harmonic distortion for a 1-kHz signal is around 0.0003%—by far the lowest I have ever measured using this FFT technique!

Shown in Figure 5 is how channel separation varies as a function of frequency, over the range from 125 Hz to 16 kHz. At 1 kHz, separation ranges from 112 dB to 114 dB, depending on which channel is measured. Even at 10 kHz, separation is slightly more than 100 dB.

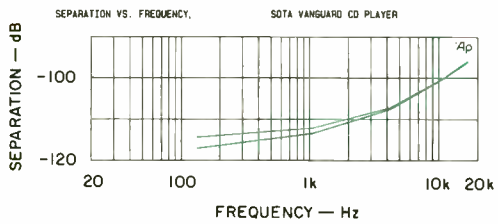


**Fig. 5—Separation vs. frequency, both channels.**

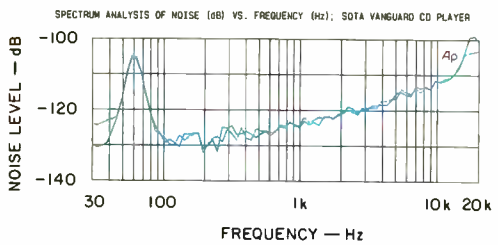


**Fig. 6—Residual noise vs. frequency.**

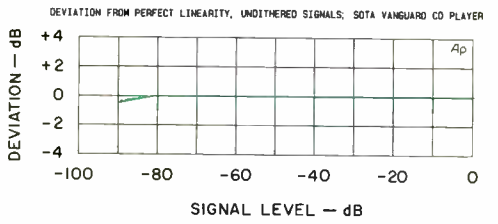


**Fig. 7—Deviation from linearity.**

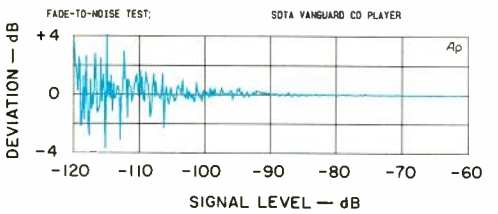


**Fig. 8—Fade-to-noise test.**

The A-weighted signal-to-noise ratio for this CD player measured 104.3 dB for the left channel and 102.3 dB for the right channel. A third-octave spectrum analysis of residual noise content (Fig. 6) shows that the most significant contribution to overall noise is hum at the power-line frequency of 60 Hz. Even this "bump" is more than 106 dB below reference level and is, of course, totally inaudible under any real-world listening conditions.

Deviation from perfect linearity, using undithered signals in the range from 0 dB, (maximum recorded level) to –90 dB, is shown in Fig. 7. Clearly, SOTA's attention to their D/A conversion system (and the use of bitstream technology) has paid off here. Even at –90 dB, deviation from perfect linearity is less than –0.3 dB, about as low as I have ever measured for any CD player.

The fade-to-noise test (Fig. 8) is equally impressive. Notice that even as the signal becomes "buried" in the noise floor, the trace remains centered about the 0-dB point on the vertical axis of the graph. From this test I also calculated that the EIA dynamic range for this player is about 107 dB. Using the EIAJ method for determining the dynamic range, I measured 102.8 dB for the left channel and 103 dB for the right channel—far better than SOTA's conservative claim of only 92 dB.

The last measurement I made involved master clock accuracy, which was within –0.0006% of perfect timing. Impressed with the objective measurements I had obtained, I turned my attention to extensive listening tests. Would the SOTA Vanguard II *sound* as good as it measured on the test bench?

### Use and Listening Tests

The answer was quick in coming. As I played some recently acquired CDs, the descriptive term that came to mind was musicality. A collection from Delos, *Wagner 3* (DE 3120, featuring soprano Alessandra Marc, with Gerard Schwarz conducting the Seattle Symphony), gave me as realistic a soundstage as I have heard with any CD player, accompanied by superb imaging and tonal balance. I find that piano recordings are the most difficult to reproduce realistically, and so I selected a recent Telarc release featuring Mozart Piano Concertos Nos. 20 and 22, with John O'Conor at the Hamburg Steinway piano and Sir Charles Mackerras conducting the Scottish Chamber Orchestra (CD-80308). The second movement of No. 20 displayed none of the strident, grating sound often associated with digitally recorded piano. When I listened to this on an earlier (though not inexpensive) CD player, the difference in sound quality was apparent.

**THE SOTA REPRODUCES NONE OF THE ARTIFACTS THAT HAVE BOTHERED SOME CD LISTENERS.**

To be sure, the SOTA Vanguard II CD player is an expensive component. How much of that extra cost is attributable to low-volume (almost customized) production and how much is attributable to the use of selected, expensive components is hard to say. For the analog audio enthusiast who has, until now, resisted making the transition to CDs, the reasons for the high price of the Vanguard II may not be of paramount importance. The fact that this SOTA product reproduces CD sound with none of the artifacts that have bothered some listeners in the past is really all that matters. *Leonard Feldman*

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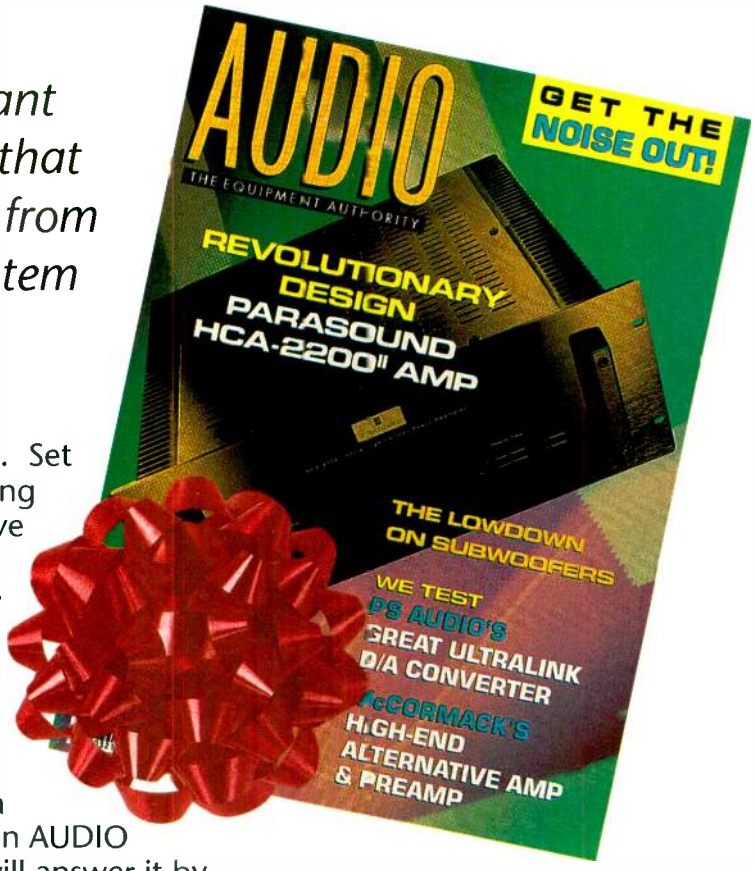


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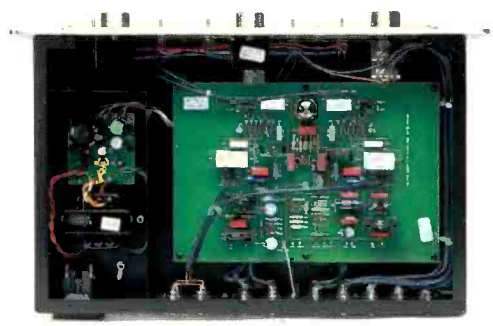
# SONIC FRONTIERS SFL-1 LINE PREAMP AND SFS-40 AMP


The first time I saw a Sonic Frontiers product, about four years ago, I was impressed by the brushed stainless-steel finish of its chassis and the fact that yet another company was starting to make tube amplifiers. Since then, I've watched their product line expand from that first amp to include an absolutely first-rate switched attenuator and other high-quality parts, and a variety of tube amps and preamps. (A forthcoming Sonic Frontiers D/A converter looks really interesting, too.)

The SFS-40 is currently the smallest power amp in their line, and the SFL-1 is their first preamplifier. Starting with the SFL-1 preamp, the front panel is an unusual design that uses a gold-colored trim panel partially covering the stainless steel main panel, which creates a rather striking look. Three rotary knobs handle input selection, balance, and volume control. Below these knobs are toggle switches for "Direct/Normal" input selection, the tape monitor, "Mono/Stereo," and muting. A fifth toggle switch, below and to the right of the volume control, is for power "On/Off." On the rear panel are an IEC a.c. power cord socket and fuseholder and the signal input/output connectors. There is no ground post.

Chassis construction of the SFL-1 is rather simple, consisting of a single bent-up piece of steel that forms bottom, sides, rear, and front subpanel. Another piece of steel is used for the top cover. Internally, the majority of the space is taken up by a thick, double-sided p.c. board for the signal circuitry. About 20% of the internal volume is partitioned off by a steel shield for the power supply. Within it is the power transformer and a small p.c. board for rectifier bridges and filter capacitors. Another p.c. board is mounted to the rear panel to serve as mounting and ground interconnection of the chassis-mounted Tiffany input/output phono jacks. The main signal circuit board is populated with high-



quality parts, including three MIT Multicap film capacitors per channel; other capacitors are by Solen and Wima, and resistors are by Vishay and Holco. Wiring from input/output jacks is with Kimber cable. The selector switch is a high-quality unit by Elma, with gold-plated contacts. Balance and volume controls are laser-trimmed and are made by Alps. All in all, the SFL-1 is a

solidly constructed preamplifier with excellent build quality.

The chassis of the SFS-40, in contrast to the SFL-1, is built of stainless steel and is bent up to form the completed shape. Inside corners are welded, and the outside surfaces are polished and grained. A separate plate of stainless is screwed to the bottom of the chassis. Like the SFL-1, the front of the amplifier has a gold-colored trim panel for visual contrast. A rocker-type power switch is located near the left edge of the front panel. In the middle of the panel is a 100-mA meter for indicating individual output-tube plate currents. A rotary switch for selecting the output tubes to meter is on the top surface of the amplifier, along with individual bias adjustments for each output tube. Two pairs of Edison Price Music Post speaker connectors are on the rear panel of the amp, along with a captive a.c. line cord, a.c. line fuse, and a pair of signal-input RCA jacks. The three transformers (two output, one power) and the output-tube sockets are mounted to the top surface of the unit. Underneath, a thick, double-sided p.c. board serves as mounting for the input-tube sockets and the rest of the components, including the main power-supply filter capacitors. As in the preamplifier, this p.c. board is populated with an abundance of high-quality parts.

## SPECS

**Preamplifier**

**Frequency Response:** 5 Hz to 100 kHz, ±0.5 dB.
**THD + Noise:** 0.01%.
**IM:** 0.01%.
**Gain:** 20 dB.
**Input Impedance:** 40 kilohms; "Direct" inputs, 80 kilohms.
**Channel Separation:** 50 dB.
**Power Requirements:** 10 VA, maximum.
**Dimensions:** 19 in. W × 4½ in. H × 11 in. D (48.3 cm × 11.4 cm × 27.9 cm).
**Weight:** 22 lbs. (10 kg).
**Price:** $1,395.

**Amplifier**

**Power (With 40-mA Bias, One Channel Driven):** 45 watts rms per channel, 20 Hz to 20 kHz; 50 watts rms at 1 kHz.
**Frequency Response:** 5 Hz to 40 kHz, ±0.5 dB; at 1 watt into 8 ohms, 4 Hz to 90 kHz, ±3 dB.
**Input Impedance:** 100 kilohms.
**Input Sensitivity:** 0.8 V rms at 1 kHz for 40 watts out.
**Power Requirements:** 250 VA, maximum.
**Dimensions:** 16 in. W × 7 in. H × 12½ in. D (40.6 cm × 17.8 cm × 31.8 cm).
**Weight:** 36 lbs. (16.5 kg).
**Price:** $1,695; tube cage, $100.

**Company Address:** 760 Pacific Rd., Unit 19, Oakville, Ont., Canada L6L 6M5.
For literature, circle No. 92

### Circuit Description

Four line-level inputs ("CD," "Tuner," "AUX 1," and "AUX 2") pass through the SFL-1 preamp's rotary input selector, tape-monitor switch, and balance control (and branch off to the tape output jacks) to the "Normal" position of the "Direct/Normal" switch. The fifth, "Direct," input goes directly to this switch, bypassing the tape and balance circuitry. The switch's output goes into the volume control, the output of which drives the input of the line-amplifier circuit.

**THE SFL-1'S LINE AMP IS AN INTERESTING CIRCUIT USING A J-FET, A VACUUM TUBE, AND A MOS-FET IN EACH CHANNEL.**

The circuit of the line amplifier is interesting both in its topology and in its use of a J-FET, a vacuum tube, and a MOS-FET in each channel. Signal input is applied through a film coupling capacitor to the gate of a P-channel J-FET connected as a source follower with its drain terminal grounded. The source of this input FET is connected through a small resistor up to the cathode of the triode tube. Plate output of the tube is direct-coupled into the gate of the output N-channel MOS-FET connected as a source follower. A novel negative-feedback loop, which consists of a three-resistor voltage divider, connects the output of the source follower back to the tube's grid. The first tap on the divider is connected to the grid through a high-value resistor and establishes the tube's d.c. grid voltage. The second tap down on the divider is connected to the control grid through a film capacitor and sets the amount of a.c. feedback. Overall d.c. operating point of the output is set by the gate voltage on the input J-FET, which is provided by a voltage divider fed from the operating B-plus supply to the line amp.

Power-supply circuitry for the SFL-1 starts out with three full-wave-rectified, capacitor-input raw supplies fed from three secondary windings on the power transformer. The lowest voltage of these supplies is regulated down from about 12 V to 6.3 V d.c. for the tube heater by a three-terminal regulator. The second of the three unregulated supplies develops about +340 V and is Darlington Zener followed down to a lower voltage and further regulated down to +270 V by an LM317 adjustable three-terminal regulator. The third unregulated supply develops a regulated 15 V, the positive terminal of which is tied through a small resistor to the regulated +270 V. The negative terminal of this third supply is then sitting at +255 V. Further regulation takes place for each signal channel by an interesting scheme: A pair of op-amps is powered by the difference between the 270- and 255-V power-supply rails. A voltage divider between the 270- and 255-V rails sets up a midpoint voltage of 262.5 V that is applied to the positive input of these op-amps. Then, NPN emitter followers, connected at the output of these op-amps, supply the actual current to the line amplifiers. The emitters of the emitter followers are tied back to the negative inputs of the op-amps, thus making the output voltage to the line amps essentially that of the midpoint divider or +262.5 V. Film bypass capacitors are used liberally throughout the power-supply circuitry. Wow! This is regulation taken to a high point! (I wonder what the SFL-1 would sound like with an all-tube, high-voltage regulator instead of all that solid-state regulator stuff that is really in the signal path of the line amplifiers.)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The unregulated +12 V heater supply and an NE555 timer work with the muting relay to provide a turn-on delay. (For manual muting, the front-panel "Mute" switch opens the connection from the timer chip to the relay coil.) Contacts in the muting relay short the signal feed to the main output jacks. The switchover from warm-up to full operation is also shown by a color change in the front-panel pilot indicator, which consists of two LEDs fed by a three-transistor circuit.

**Table I**—Gain and sensitivity, SFL-1 preamp.

| | Gain, dB | | | |
|---|---|---|---|---|
| | LEFT | | RIGHT | |
| | Instr. Load | IHF Load | Instr. Load | IHF Load |
| "Normal" or "Direct" to Main Out | 21.12 | 20.7 | 21.11 | 20.68 |
| "Normal" to Tape Out | 0 | 0 | 0 | 0 |
| | IHF Sensitivity, mV | | | |
| | LEFT | | RIGHT | |
| "Normal" or "Direct" to Main Out | 46.11 | | 46.2 | |
| "Normal" to Tape Out | 500.0 | | 500.0 | |

**Table II**—Output noise of SFL-1 preamplifier for full clockwise and counterclockwise positions of volume control. IHF S/N was 80.0 dB for the left channel and 77.6 dB for the right.

| | Output Noise, μV | | | |
|---|---|---|---|---|
| | LEFT | | RIGHT | |
| Bandwidth | CCW | CW | CCW | CW |
| Wideband | 76.0 | 276.0 | 70.0 | 392.0 |
| 22 Hz to 22 kHz | 34.0 | 152.0 | 38.0 | 214.0 |
| 400 Hz to 22 kHz | 26.9 | 55.0 | 30.0 | 74.0 |
| A-Weighted | 23.0 | 52.5 | 26.5 | 70.0 |

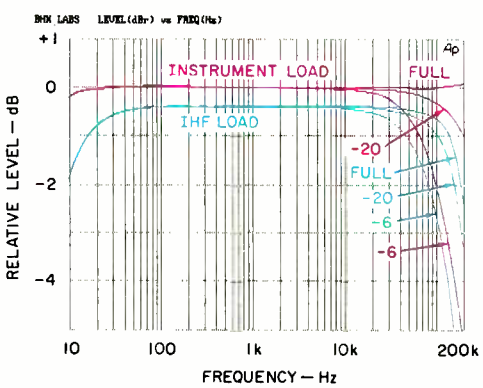


**Fig. 1—Frequency response of SFL-1 preamp vs. volume setting and load.**

Signal circuitry in the SFS-40 amplifier is also a bit out of the ordinary in a number of respects. The front-end of the amplifier is a cascoded differential amplifier using two 6DJ8 tubes. Cathodes of the lower tube pair are tied together, with no feedback resistors, and go to ground through an NPN bipolar-transistor current source. The plates of the lower input-tube pair are direct-coupled to the cathodes of the upper pair through small bias resistors. These plates are also coupled, through high-value resistors, to the grids of the upper tubes, the upper grids being bypassed with film capacitors to ground. The foregoing constitutes a self-biasing arrangement for the upper tubes. More usual is a fixed voltage divider to set the potential at the upper tube grids.

Push-pull outputs of the upper tube plates are capacitor-coupled to the output-tube grids. Another interesting twist is a set of summing resistors from the upper tube plates that feed down to the base of the constant-current transistor that feeds the lower tube cathodes. This is a feedback loop that would tend to remove common-mode signals at the two output plates and stabilize the operating point.

The output stage is pentode-operated with fixed bias, as are a number of new tube power amplifier designs of late. Pentode operation means that the output-tube screen grids are operated from a fixed potential, as opposed to being tied to a tap on the primary winding of the output transformer (as in UltraLinear operation). Usual consequences of the pentode-mode output-stage configuration are higher power output, higher output impedance, higher stage gain, and higher distortion than UltraLinear or triode operation. Cathode current is sampled for the meter circuit via 5.1-ohm resistors from the cathodes to ground. Overall negative feedback is taken from the positive output terminal back to the inverting input of the input differential amplifier. This design doesn't have separate connections brought out for 4-, 8-, and 16-ohm matching as is usual in most tube power amplifiers. Instead, the output transformer secondary can be strapped for 3.5-, 8.0-, or 14.5-ohm impedance matching. The reviewed amp was set up for the 3.5-ohm connection.

The power supply in this amplifier is fairly elaborate, as in the preamplifier. Starting with the simple stuff, a heater winding supplies 6.3 V a.c. to all the tube heaters. The center tap of the winding goes to ground through a 0.1-μF film capacitor. This method of grounding the heater supply lets the heater windings float up toward whatever tube that has the leakiest heater-to-cathode interface.

A main high-voltage winding has a tap for the output-tube bias supply and another set of taps for the main output-tube screen supply. The outside ends of the winding provide the highest voltage for the output-stage plate supply and are full-wave-rectified into two 1,700-μF/300-V electrolytic filter capacitors connected in series for an effective filter capacitance of 850 μF/600 V. Additional film bypass capacitors, of 5.1 μF and 0.1 μF, are connected from the supply rail to ground. This supply, of course, is connected to the center tap of the two output-transformer primary windings. The screen taps of the main high-voltage secondary windings are full-wave-rectified into a 10-μF/450-V capacitor. A series filter resistor and a final 10-μF capacitor feed the filtered voltage to the screen regulator's series pass-transistor collector.

Another regulator circuit, similar to that used in the SFL-1 to supply regulated voltage to the output amplifier signal circuitry, is used here in the amplifier to supply regulated voltage to the front-end/phase-inverter circuit. A voltage divider, from the output of this regulator to ground, supplies a reference voltage to the screen-regulator circuit, which will provide this same voltage (+320 V) at considerable current capacity to the output-stage screen grids.

A third secondary winding on the power transformer is half-wave rectified into appropriate amounts of voltage for an op-amp error amplifier. The aforementioned screen reference voltage of 320 V is applied to the floating "ground point" of the screen regulator op-amp circuitry and, through a

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series resistor and shunt capacitor to ground, to the positive input of the error op-amp. The output of the op-amp goes through an emitter-follower NPN bipolar transistor and into the base of the series pass NPN transistor that supplies the output-tube screens; 100% feedback is taken from the output back to the negative input of the error op-amp.

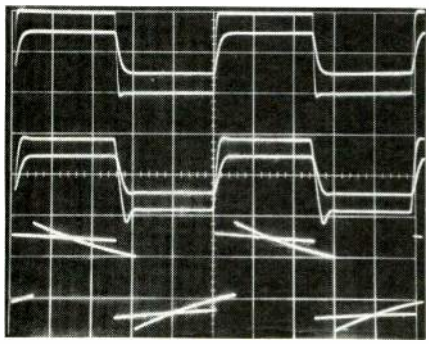

**Fig. 2—Square-wave response of preamp; see text.**

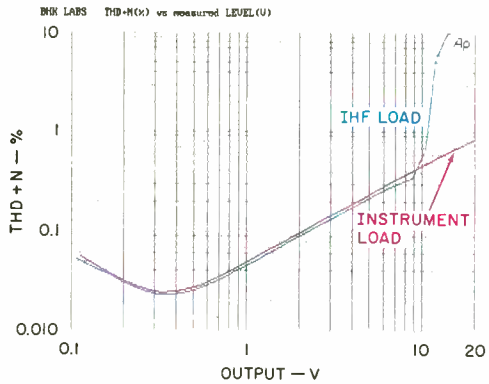


**Fig. 3—THD + N at 1 kHz vs. output level.**

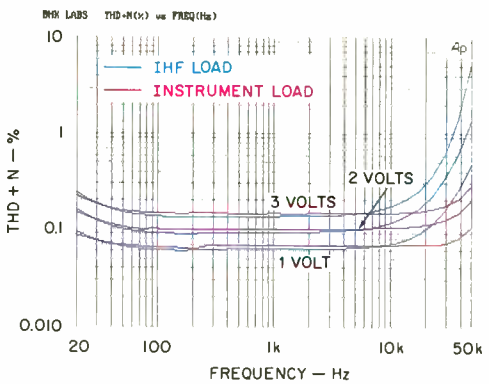


**Fig. 4—THD + N vs. frequency and output level.**

**Measurements**

I must be honest at the outset and report that I had a problem with the SFL-1. I blew the output MOS-FET transistors in both channels by connecting signal inputs to the unit with the volume turned on. Replacement devices got the preamp up and running with no further problems. Sonic Frontiers assured me that they have had very low failure rate in the field with customer units. I therefore chalk this situation up to bad lab practice on my part, although I haven't had this happen with other models.

Looking at measurements for the SFL-1 first, gain and IHF sensitivities are listed in Table I. Gains are the same in both the modes, because there are no series resistors in the signal chain with the "Stereo/Mono" switch in the stereo position and because the balance control is a "silvered" type. This kind of balance control has one-half of the track covered with high-conductivity material and the other half covered with the normal resistive material used for variable-resistance control functions. When one turns the control to the right, for instance, the right-channel wiper travels on the high-conductivity part of the path while the left-channel wiper travels down its regular resistance material; this attenuates the left channel but leaves the right channel with no attenuation through the control at all. Of course, this works similarly when turning the balance control to the left.

Frequency response under a number of conditions is plotted in Fig. 1 for the left channel. Results are shown for volume at full clockwise and at 6-dB attenuation and 20-dB attenuation, for instrument and IHF loads. The curves at the 0-dB level are for the instrument load, and the curves with about 0.4-dB attenuation are for the IHF load. The greatest high-frequency attenuation is for the –6 dB volume-control setting and the least for volume full up; the remaining curves are with the volume at –20 dB. The effect of the size of the output coupling capacitor on the 10-kilohm load is evident in the IHF loading curves as low-frequency roll-off. To put the high-frequency effects in perspective, even in the worst case, 6-dB attenuation, the bandwidth (–3 dB point) is still greater than 100 kHz, and the control will probably be used more in the vicinity of the –20 dB position, with greater high-frequency bandwidth. The right channel's behavior was similar but with a slightly higher bandwidth. Rise- and fall-time, with an instrument load at an output of ±2 V, was about 0.7 μS with the volume control full up. Rise- and fall-time, of course, will be lengthened at the –6 dB position and with IHF loading.

**CAPACITANCE HAS LITTLE EFFECT ON THE SFS-40'S RESPONSE, MAKING IT A GOOD CANDIDATE FOR DRIVING ELECTROSTATICS.**

Figure 2 illustrates the SFL-1's square-wave behavior under various conditions. In the top traces, a 20-kHz frequency is shown for instrument loading with the volume control clockwise (largest signal) and with the volume down 6 dB. The effects of IHF loading are shown in the middle traces for the same volume-control positions as in the top traces. Some slewing is in evidence in the top traces and assuredly in the middle traces. My usual test amplitude for preamps, ±5 V, was a bit much for this circuit; consequently, the 2-V peak level was used. In the bottom trace, the frequency is 20 Hz with instrument and IHF loads. The greater tilt is seen, of course, for the IHF loading.

In attempting to measure distortion and noise in this unit, I encountered a greater than normal intrusion of my computer monitor's horizontal scan frequency into the measurements. It seemed that it was coming in on the inputs, as the interference went away when the volume control was turned down. Later, when measuring noise, I found that even with the unused inputs terminated with 1-kilohm resistors, this noise was still getting in with the volume up. The noise was much less with the "Direct" input; I don't know why.

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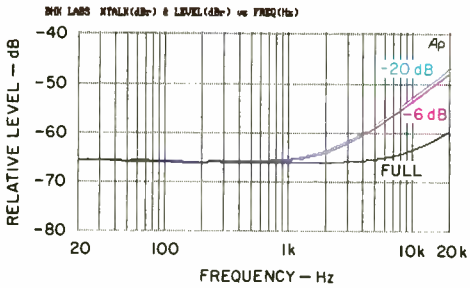


**Fig. 5—Crosstalk vs. volume setting.**

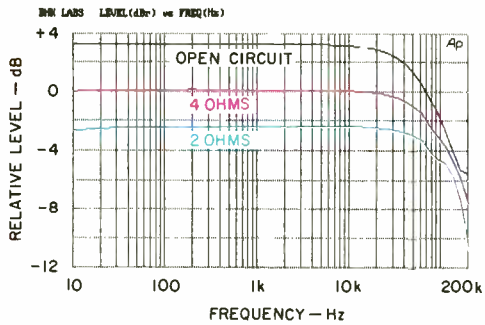


**Fig. 6—Frequency response of SFS-40 amplifier.**

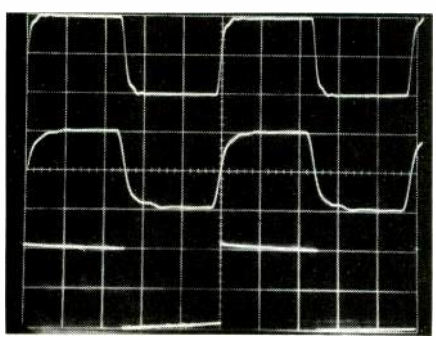

**Fig. 7—Amplifier square-wave response; see text.**

**Table III**—Output noise of SFS-40 amplifier. The A-weighted IHF S/N ratio was 85.0 dB for the left channel and 94.0 dB for the right.

| | Output Noise, μV | |
|---|---|---|
| Bandwidth | LEFT | RIGHT |
| Wideband | 360.0 | 323.0 |
| 22 Hz to 22 kHz | 300.0 | 316.0 |
| 400 Hz to 22 kHz | 150.0 | 53.0 |
| A-Weighted | 140.0 | 50.0 |

Figure 3 shows 1-kHz THD + N versus output voltage with instrument and IHF loading. This data is for the CD input in the "Normal" input group. When going through the "Direct" input, the portion of the curve below about 0.5 V simply is lower because of lower noise. (The data for this and the following preamp curves is shown for the right channel unless otherwise noted, as both channels measured very close to each other in distortion.) Distortion was essentially all second harmonic. This circuit can put out a healthy amount of output into the IHF load; note that the distortion below about 9 V is little different between IHF and instrument loading, a good result.

The THD + N versus frequency and load for output levels of 1, 2, and 3 V are plotted in Fig. 4. With the lower capacitance of the instrument load, which is more or less typical of 1-meter interconnects, the distortion is refreshingly constant across the audio band. With the IHF load's extra 1,000 pF of capacitance, the distortion starts to rise more in the audio band. What is interesting is that the distortion rise with either load, and the slight rise at the low-frequency end, are independent of output level in the range covered.

Noise measurements are listed in Table II for various bandwidths, for a "Normal" input and for the "Direct" input. Table entries are for output noise and are not referred to the input. The aforementioned computer monitor noise interference is part of the measurement amounts (note the lower values for the "Direct" input), and good old internally generated line harmonics (hum!) are also present, as reflected in the difference between the 22- and 400-Hz high-pass filtering.

Interchannel crosstalk was not very good in the low and middle frequencies, and deteriorated further at the high-frequency end of the audio band. Figure 5 shows left-to-right crosstalk with the volume control at maximum, –6 dB, and –20 dB; right-to-left crosstalk was very similar. Volume-control tracking, however, was extremely good, being within 0.5 dB down to –80 dB.

A few remaining comments on the SFL-1: The a.c. line draw was about 200 mA at 120 V, low enough to let you leave the unit on continuously for best sound without worrying about the electric bill. Output resistance, computed from the gain data in Table I, was about 500 ohms.

For the SFS-40 amp, voltage gain and IHF sensitivity (8-ohm loading and input voltage for 1-watt output) were 28.5 dB and 105.8 mV, respectively.

Frequency response at a nominal 2.83-V output for open circuit, 4-ohm, and 2-ohm output loading is shown in Fig. 6. As can be seen, the output changes quite a bit in level with loading; this translates to a low damping factor, as will be seen when that actual measurement is discussed. Bandwidth is quite good for a tube amplifier, 3 dB down

**EVEN THE WORST-CASE FREQUENCY RESPONSE OF THE SFL-1 PREAMP EXTENDS PAST 100 kHz.**

at about 100 kHz. The little aberrations in the response beginning at about 60 kHz occurred in the left channel (shown in the figure) but not in the right. Square-wave response is shown in Fig. 7 for the left channel, which looked a little worse than the right. Frequency for the top and middle traces was 10 kHz; loading was 8-ohm resistive for the top trace and 8 ohms in parallel with 2 μF in the middle trace. Of particular note here is the response shape with the 2-μF loading, which is about as little affected as I have seen in a tube power amplifier. This is a good result and would make this amp a good candidate for driving an electrostatic speaker without any degradation of treble response. Low-frequency tilt in the bottom trace is minimal but noticeable and relates to the good low-frequency response seen in Fig. 6.

Since the amplifier's output-transformer secondary was set for a nominal 3.5-ohm matching, I measured THD + N at 1 kHz as

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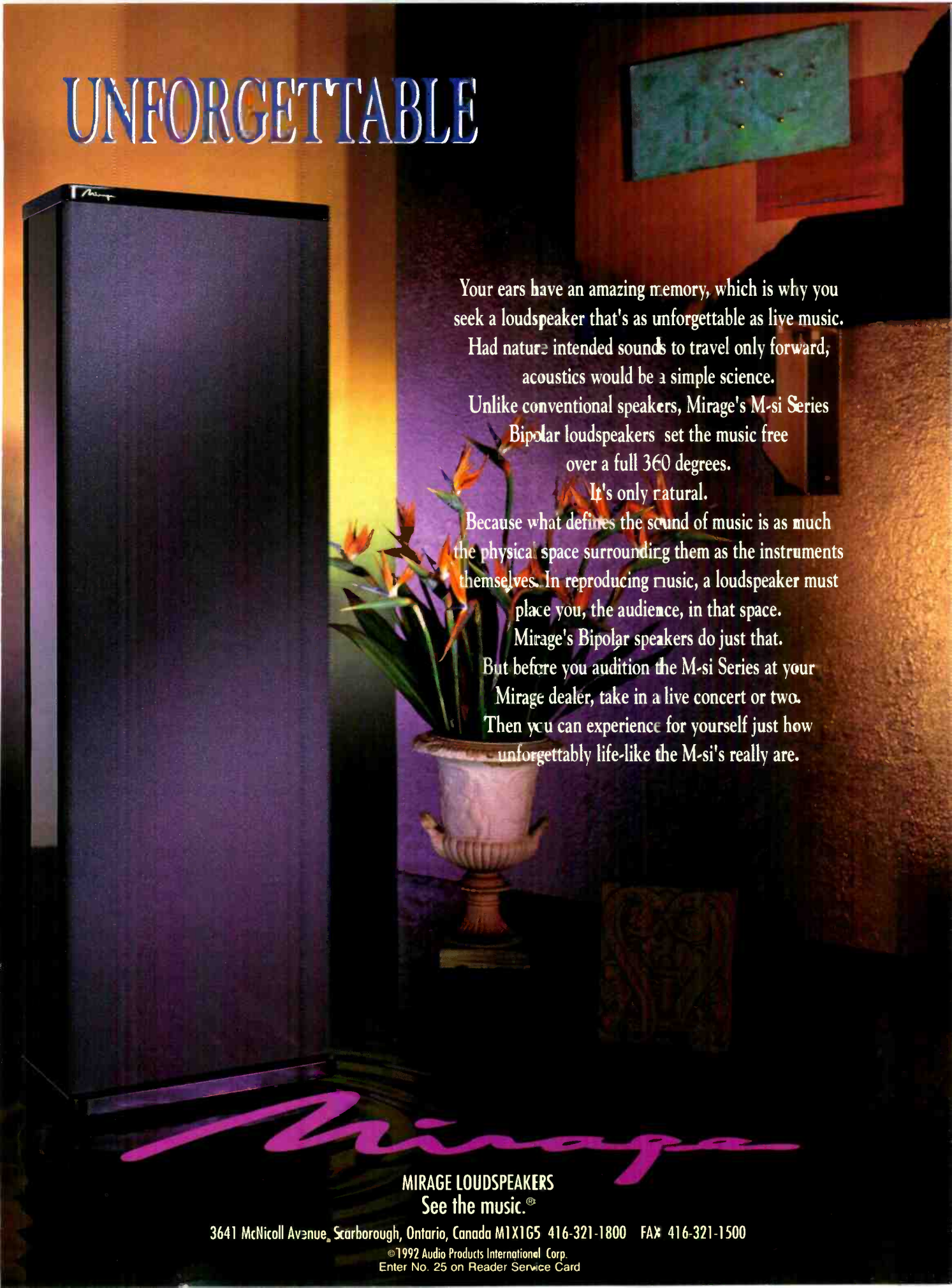

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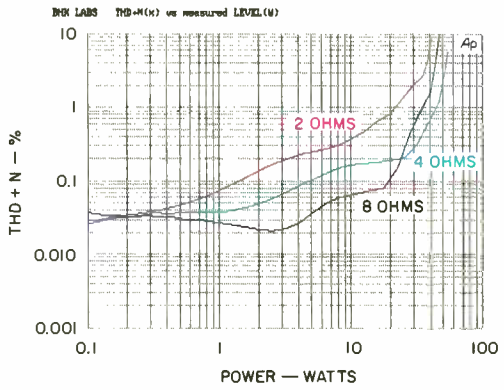


**Fig. 8—THD + N vs. power output.**

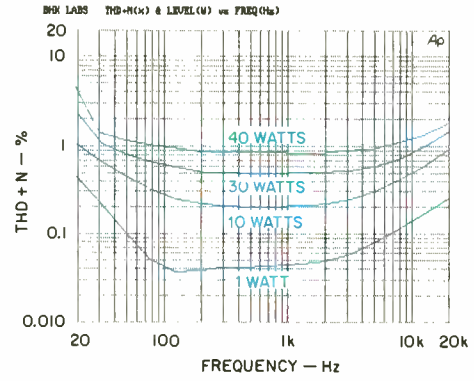


**Fig. 9—THD + N vs. frequency.**

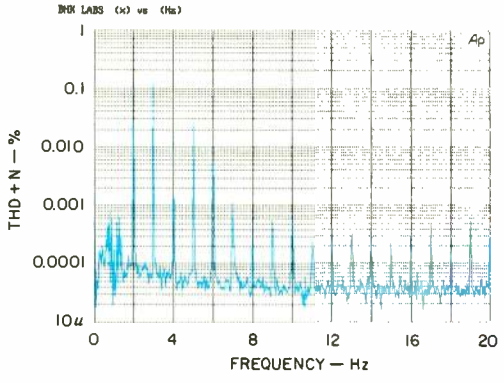


**Fig. 10—Distortion spectrum of 1-kHz signal at 10 watts into 4 ohms.**

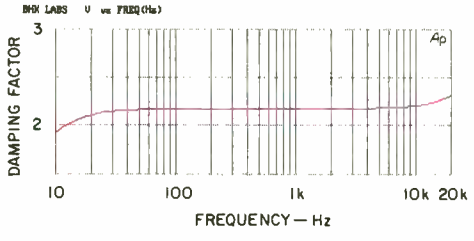


**Fig. 11—Damping factor vs. frequency.**

a function of power output for 8-, 4-, and 2-ohm loads (Fig. 8). As is usual with a tube power amplifier, power delivery falls off on either side of optimal loading, and distortion is higher with lower loads. The SMPTE-IM distortion (not shown) was about four to five times higher than the 4-ohm harmonic distortion levels shown in Fig. 8 over most of the output range.

Total harmonic distortion versus frequency at several power outputs is shown in Fig. 9 for the left channel. Rise in distortion at low frequencies and lower power levels was not as pronounced in the right channel. A spectrum of the harmonic-distortion residue for 10 watts out at 1 kHz is shown in Fig. 10 for the left channel. Principal harmonics are second and third, but a significant amount of fourth, fifth, and sixth are present. A whole string of harmonics above the sixth at a much lower level is also present. Not a simple spectrum, this.

Output noise levels, along with IHF signal-to-noise ratios, are enumerated in Table III. The left channel had more line harmonics than the right, hence the poorer IHF signal-to-noise ratio. It has recently come to my attention that some readers don't understand the true relationship of the IHF S/N ratio to the S/N quoted by many manufacturers. It is simple: The IHF S/N shows the difference, in dB, between the A-weighted noise level and a 1-watt output into 8 ohms. Most manufacturers relate noise to rated power output (usually with no weighting or filtering specified), a difference of some 20 dB for a 100-watt amplifier. (The difference would be greater for amplifier power levels above 100 watts.) Making reference to a fixed power output is more meaningful in noise comparisons.

Interchannel crosstalk in the left-to-right direction was more than 110 dB down from 20 Hz up to about 2.7 kHz, rising at 6 dB per octave to about –93 dB at 20 kHz. Crosstalk in the right-to-left direction was obscured by noise at about –105 dB and rose to about –95 dB at 20 kHz. There is very low crosstalk in this amp.

Damping factor for the right channel is shown in Fig. 11; results for the left channel were substantially identical. As can be seen, the damping factor is rather low. Incidentally, the damping factor is computed relative to 4 ohms, as the single available output-transformer tap had been strapped at the factory for approximately that value.

**OF ALL THE SIMILARLY POWERED TUBE AMPS I'VE REVIEWED RECENTLY, I LIKE THE SFS-40 BEST.**

Dynamic power output, using the IHF tone-burst signal, yielded an output power of 60.5 watts with a 4-ohm load. This translates to a dynamic headroom figure of 1.3 dB. Steady-state power output at the visual onset of clipping was about 50 watts, yielding a clipping headroom of 0.46 dB.

A.c. line current at 40 mA per output tube was 1.6 amperes. I noticed that the amount of indicated plate current on the meter would slowly drift down with time. If current was about 50 mA after a few minutes of operation, the long-term value would be 40 mA.

### Use and Listening Tests

Ancillary front-end equipment used to evaluate the Sonic Frontiers units included an Oracle turntable fitted with a Well Tempered Arm and Spectral Audio MCR-1 Select moving-coil cartridge; Krell MD-10 and Theta Digital Data CD transports feeding Theta DSPro Generation III, Counterpoint DA-10, PS Audio UltraLink, and several experimental D/A converters; a Nakamichi ST-7 tuner and 250 cassette recorder, and a Technics 1500 open-reel recorder. Other preamplifiers used were First Sound's Reference II, a Quicksilver Audio, and a Forssell tube line driver. Power amplifiers used for comparison were a pair of Quicksilver M-135s, a Crown Macro Reference, McIntosh MC1000s, Marantz Model

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9s, and an Arnoux Seven digital switching unit. Speakers used were B & W 801s and Win Research SM-10s.

I hooked up and listened to the SFS-40 first. My thoughts at that time were that it generally sounded pretty good but was just a bit forward and hard. I felt that some more operating time would mellow it out. Accordingly, I lent it out to a friend for a while. My friend reported that the amp was thought to be okay by a number of observers but was nothing special. Getting the amp back and listening again, I felt that it had indeed broken in and that it sounded better overall than in my first listening. One thing that I noticed at this time was that the imaging did not appear to be as far back on the sides as with the Crown Macro Reference. After measuring the units, I again listened to the amplifier and honed in on its sonic character. I felt that it still had a trace of hardness and had some lack of air and resolution. Bass seemed a little weak on some material but more or less normal on other selections. Bass quality and damping seemed good despite the low measured damping factor. At times I was surprised at the potency of some of the bass whacks that came out of the speakers. Also, the amp could play fairly loudly without obvious breakup. Plate currents were going through wild excursions and the woofers were displacing in one direction, a sure sign of clipping, but it didn't really sound very bad. I guess what I am saying is that the amp has reasonably graceful overload characteristics! Of the 35- to 50-watt stereo tube amps that I have recently reviewed, I think I like this one the best overall.

**TOGETHER, THE UNITS SOUNDED MUSICAL, WITH GOOD DIMENSION AND TONAL BALANCE.**

When I tried out the SFL-1 line preamp, I just put it in my system; much to my surprise and amazement, I found certain aspects of the sound to be better than I was used to by using a passive attenuator—namely bass impact and overall definition. This naturally prompted me to try all the preamps I had on hand. After I had listened to the other units listed above, I concluded that the SFL-1 was a little on the additive side of being articulate but had a fairly low amount of irritation and edginess in its sound. All in all, I used the preamp quite a bit and liked its sound and especially enjoyed the feel of the controls.

When I finally paired the units up together, I found the sound to be musical, with good space, dimension, and tonal balance. Again, on some of my favorite material, there was a hint of hardness and of the sound being closed in a bit compared to some of the other equipment I use. A definite plus was the general lack of high-frequency edginess and irritation that I get with so much equipment.

No operational hitches were encountered except the amp's propensity to have the plate current decrease, as mentioned in the "Measurements" section.

In conclusion, I enjoyed my stay with the Sonic Frontiers equipment and would encourage prospective amp and preamp buyers to give these pieces a listen.

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EQUIPMENT PROFILE

# NEUMANN KM 100 MIKE SYSTEM

My last review of a Neumann microphone was in January 1978, covering the Fet-80 group of mikes (KM 83, 84, and 85). The KM 100 series is the range of miniature mikes in the Fet-100 group, which replaces the Fet-80. The Fet-100 technology puts most of the electronics in the capsule—thus, the capsules are "active," compared to the "passive" capsules of the Fet-80 group and most other condenser mikes. The advantage of active capsules is that they can be operated at a distance up to 100 meters from the output stage, by means of a cable adaptor and special, small-diameter cables with Lemo connectors (which are much smaller than XLR plugs). A large number of mounting accessories are available to take advantage of this technology. For instance, you could "fly" the mike capsules over a stage, and they would be very unobtrusive.

A basic KM 100 microphone set—consisting of one capsule, an output stage, windscreen, swivel mount, and wooden case—can be purchased at a bargain price, but equipping it with every possible accessory could add much to the cost. Among these options are an omnidirectional capsule with free-field equalization, a wide-angle, or subcardioid, capsule (a limacon, in mathematical parlance), and a hypercardioid. With comparable capsules, the specifications of the KM 100 are similar to those of the KM 84 but with 8 dB greater dynamic range and a 5-dB increase in maximum SPL.

Neumann recently merged with Sennheiser, after the passing of founder Georg Neumann. As a result, the U.S. distribution has passed from Gotham Audio, which handled Neumann for many years, to the Neumann division of Sennheiser. (Gotham now handles microphones made by Gefell, in former East Germany, the site of the original Neumann factory.)

Neumann microphones have been in the studios of major record labels since the 1950s, starting with the legendary U-47—

**NEUMANN'S LONG LIST OF OPTIONS INCLUDES A MULTIPLICITY OF CAPSULES AND MOUNTS.**

now in great demand for making Compact Discs, as some audio engineers feel that the vacuum tube in that mike reduces sonic harshness in digital recordings. The KM 100 series is solid-state and transformerless, so it will probably handle a wide range of sound levels and frequencies without appreciable distortion. The noise specification is quite low, and very adequate for virtually any on-site recording. The noise is also low enough for satisfactory use in many studios, although a few studios might have acoustic noise levels even lower than the noise of the KM 100 series.

The available accessories form an extremely wide array. Neumann's catalog does show typical ways to assemble these parts for a variety of situations. I was interested in a compact stereo miking setup to go with a Sony portable DAT recorder. I had a stereo mike mount and a folding stand, and I chose a battery power supply from Neumann. I was pleased that Neumann offers a ready-made cable set to go from the 5-pin XLR jack of the power supply to the recorder's stereo mini-phone mike input jack.

The quality of the KM 100 series is very high, and all of the pieces are finely crafted. The hardware that was reviewed included a

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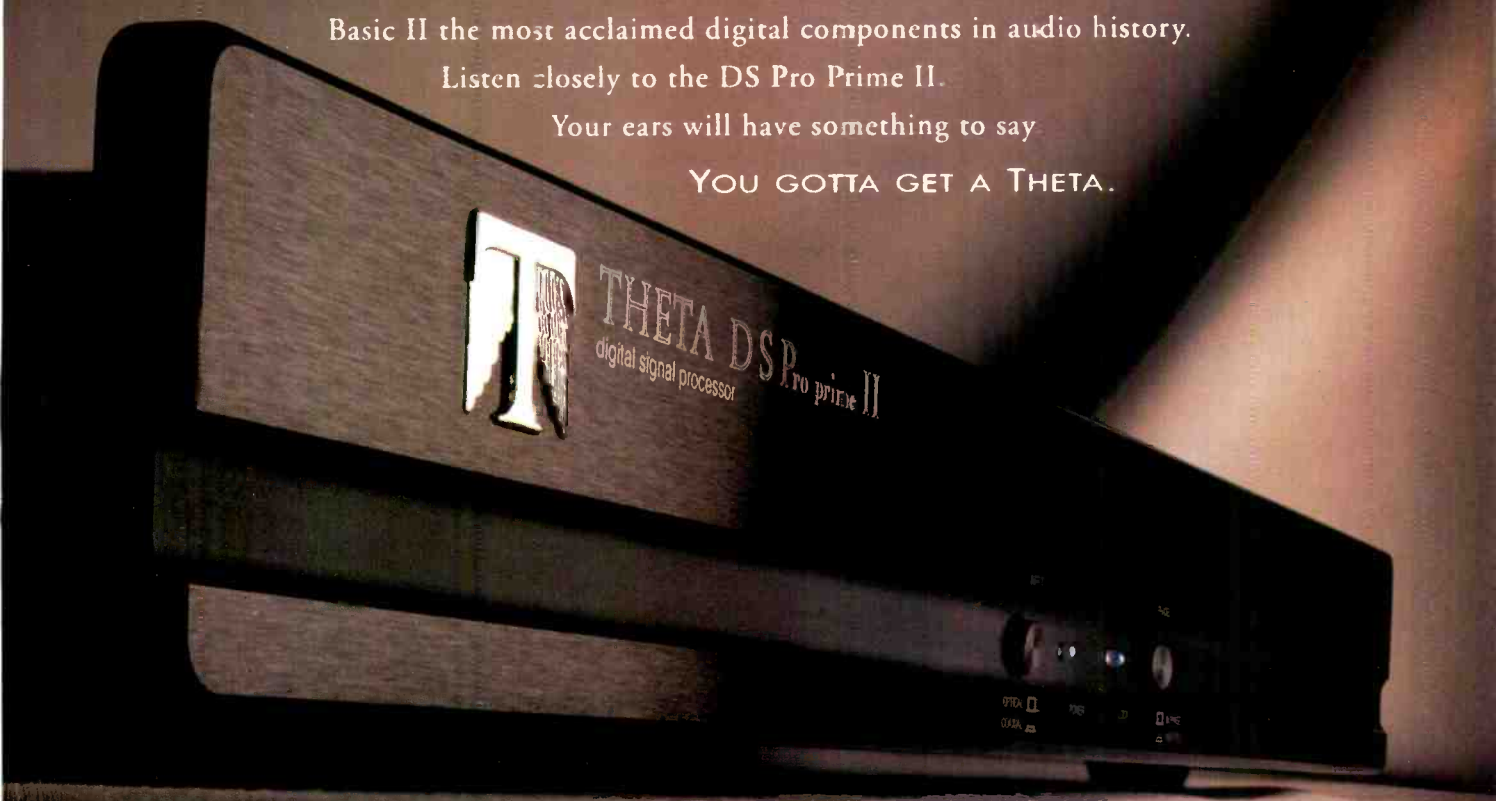


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KM 130 omnidirectional microphone set (with the KM 100 output stage) and four spare capsules—another omni, two cardioids, and one hypercardioid. This means that two omnis and two cardioids were available for stereo recording, and at least one mike set of each of the above directional patterns was available for lab testing. In addition, we received one BS48i-2 battery power unit (two channels, 48 V), as well as three sets of cables for connecting the BS48i-2 to the Sony DAT Walkman and other recorders: A KA 100 cable adaptor, an LC3 locking cable, and an LC2 5-meter extension cable. We were thus able to conduct an acoustic test using the capsule at a distance from the output stage.

### Measurements

The basics of microphone testing that I discussed in the April 1977 and September 1978 issues have not changed. To measure impedance, we apply a constant sinusoidal current of variable frequency and plot a strip chart of the voltage on the mike, which is the analog of its impedance. To measure frequency response, we use a very special precision sound source that has a 2-inch aluminum piston set in a head-size sphere. A swept-frequency tone is applied to the source, and a strip chart is plotted of the microphone's output voltage. Essentially, the output of the test mike is compared to that of a standard condenser mike. We still prefer to use the Western Electric 640-AA as a standard because of its long-term stability. Our sound source is stable too, and the source response curve as measured by the 640-AA has not changed for more than 20 years.

**THE KM 100 SERIES OFFERS EXCELLENT PERFORMANCE AT A REASONABLE PRICE.**

For my first test, I tried powering with the BS48i-2 battery supply, as I intended to use it with the Sony DAT Walkman for concert recording. I discovered that the BS48i-2 gave only 41 V d.c. with two mikes connected, and the audio shorted out with pin 3 of the output cable connector grounded, so pin 2 had to be grounded instead. A test with our EMT-160 Polarity Tester showed that the phase of the outputs was inverted. All of this was no problem in recording, but not desirable for lab testing. Therefore, I used an old standby for lab-test powering: A UTC HA-108X triple-shielded line transformer with unity gain, with a string of five fresh 9-V batteries on its center tap. This gave almost exactly 48 V d.c. with mikes in the KM 100 series. The isolation afforded by a transformer resulted in a floating output circuit with no d.c. present.

Impedance measured 46 ohms at 1 kHz, close to the specified 50 ohms. It rose to 298 ohms at 20 Hz, so the mike should be used as a nominal 200- or 300-ohm unit. This means that the minimum load should be 3 kilohms; otherwise, some bass response will be lost (as would occur if you tried to record 16 Hz from an organ on a DAT). The output of the KM 100 mikes is so high that, if needed, a resistive pad could be used to keep the load high at the expense of output level.

As in 1978, Neumann did not furnish any frequency response curves with the mikes. However, this is still no problem, as the catalog curves include a ±2 dB tolerance envelope with the 0-dB reference at 1 kHz.

Figure 1 shows the 0° and 90° responses of the KM 130's omni capsule. The 0° curve matches the catalog curve within 1 dB, and the measured sensitivity was within 1 dB of its specified value. The second omni capsule matched the first within 0.5 dB in both response and sensitivity. The omni's response above 3 kHz became smoother when I used the cable adaptor and the 5-meter cable to separate it from the output-stage "handle"; wiggles of 0.5 to 1.0 dB were reduced to 0.3 dB. Note that when I mounted the capsule separately I used a tiny microclamp, whereas the complete

## SPECS

**Type:** Condenser; modular system of interchangeable capsules and choice of output stages with and without switchable high-pass filter; directivity and response characteristics selectable through capsule choice.

**Capsules:** Omnidirectional with diffuse-field equalization (included in KM 130 set), cardioid (KM 140), or hypercardioid (KM 150); also available, omni with free-field EQ (KM 131), wide-angle cardioid (KM 143), and cardioid with low-frequency roll-off (KM 145).

**Frequency Range:** 20 Hz to 20 kHz.

**Sensitivity:** Omni, 12 mV/Pa (–38 dBV/Pa); cardioid, 15 mV/Pa (–36 dBV/Pa); hypercardioid, 10 mV/Pa (–40 dBV/Pa).

**Rated Impedance:** 50 ohms.

**Equivalent Noise SPL (A-Weighted, re: 20 μPa):** Omni and cardioid, 16 dB; hypercardioid, 18 dB.

**S/N (A-Weighted, re: 1 Pa at 1 kHz):** Omni and cardioid, 78 dB; hypercardioid, 76 dB.

**Maximum SPL Input for Less than 0.5% THD (re: 20 μPa):** Omni, 140 dB; cardioid, 138 dB; hypercardioid, 142 dB; 10 dB greater with preattenuation.

**Total Dynamic Range:** Omni and hypercardioid, 124 dB; cardioid, 122 dB.

**Power Consumption:** 2 mA for 48-V (±4 V) phantom power, per DIN 45596.

**Dimensions:** 13/16 in. diameter × 3⅝ in. long (21 mm × 92 mm).

**Weight:** 2.8 oz. (80 grams).

**Prices:** Output stage, windscreen, swivel mount, and wooden case are included in any set; with diffuse-field omni or any cardioid capsule, $950; with free-field omni or hypercardioid capsule, $1,125; additional capsules, $695 for diffuse-field omni or any cardioid, $875 for free-field omni or hypercardioid.

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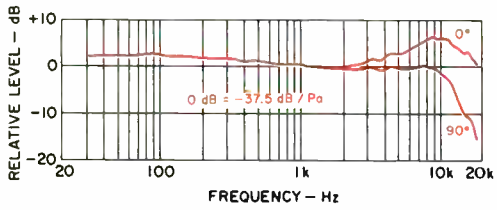


**Fig. 1—Frequency response vs. angle for KM 130 omnidirectional.**

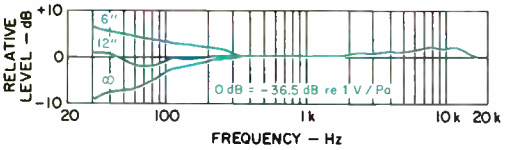


**Fig. 2—On-axis response vs. distance for KM 140 cardioid.**

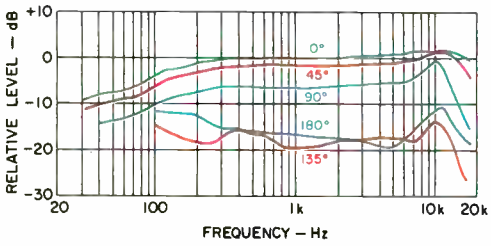


**Fig. 3—Frequency response vs. angle, KM 140 cardioid.**

mike was mounted by a relatively bulky Neumann swivel. There are numerous mounting accessories available for the KM 100 series that will minimize reflections causing wiggles. I found that the windscreen, when used on a capsule plus the output stage, caused a 3-dB roll-off at 15 kHz, so it is best used only to reduce breath blast or "pop" noise on vocals.

The KM 130's capsule is equalized for a diffuse field, meaning that the high-frequency response is flat if the mike is used at a distance from the source in a reflective room. If it is used close-up, high frequencies will be exaggerated.

Figure 2 shows the response of the KM 140's cardioid at various distances. The curve for infinite distance was calculated from the other curves. Our curves match the specified nominal response within 1 dB, if one assumes Neumann used a 1-meter test distance. Our sensitivity value at 1 kHz was about 1.5 dB below spec. All of the small-diameter (12- to 18-mm) cardioids we've reviewed have the bass roll-off seen here. (Note that this is not the model that is said to have bass roll-off; the KM 145 has even less bass.) The directional curves of Fig. 3 show excellent uniformity all over the front hemisphere, up to about 8 kHz, which is about as good as one can do with a mike 18 mm in diameter. The rear hemisphere shows a pleasant surprise: The 135° and 180° curves are both 15 dB below the 0° curve; this is a null, for practical purposes, in our test room.

The axial response of the KM 150's hypercardioid (Fig. 4) is similar to that of the cardioid, including the same bass roll-off. The KM 150 shows more peaking of very high frequencies. This may be desirable in music recording. Our measured response curve on axis is within the ±2 dB limits of the catalog specifications, and the sensitivity at 1 kHz was 0.5 dB greater than specified. Figure 5 shows uniform response to 45° off axis, and a good null, greater than 15 dB down at 135°. The response at 90° was 10 dB down over a wide frequency range. The 180° response, which should be similar to the 90° curve, was close to it over a range of frequencies but was irregular above 8 kHz. This was not a major defect.

I chose the cardioid for the noise test, as it rejects acoustic ambient noise well; this helped me measure the electrical noise of the electronics and capsule. The KM 100 series has very low noise, so the mike had to be put in our sound-attenuating test box and measured at midnight, for lowest ambient noise. The noise levels, in third-octave bands, are shown in Fig. 6, where 0 dB is 20 μPa. The curve is very smooth and has a desirable downslope with increasing frequency. The overall noise level, A-weighted, was 15 dB, just 1 dB lower than the catalog value. I was pleased to see such a low noise level.

The remaining lab tests were for polarity, hum, and overload. Using the EMT-160 Polarity Tester, we found (as previously hinted) that pin 2 had positive phase, which agrees with standards. There was no measurable hum induced by a large transformer into the KM 140. A 'scope test of overload with the omni mike showed no clipping with input levels of up to 136 dB.

### Use and Listening Tests

Prior to any test recordings of concerts, I made some listening tests in the lab. The KM 100 output stage has a better XLR output connector than most quality condenser mikes: It will accommodate several brands of plugs without excessive force, and the rubber ring inside the mike's end prevents rattling of metal plugs such as Switchcraft's. The omni mike sounded natural with speech at about 45° off axis; on axis it was a little bright. It was not very sensitive to wind or pops, and adding the foam screen made it fairly pop-proof. The cardioid was very wind-sensitive, but the screen helped somewhat. Generally, small-diameter cardioids should be used close to the source of sound, although some good recordings may be made at a distance with them. But contrary to this and to the curves of Fig. 2, the KM 140's cardioid sounded boomy at 12 inches and was more natural at arm's length. Again, the on-axis sound

**THE OMNIS HAD CRISP TREBLE AND EXCELLENT BASS, CORRELATING WELL WITH THE LAB MEASUREMENTS.**

was a little bright, whereas the sound at 45° was very natural. At 90°, it sounded a little muffled. It rejected sound very well all over the rear hemisphere. In contrast, the hypercardioid sounded natural at a 6-inch distance and at ±45° off the axis. It had excellent rejection from 90° to 270°, with a little less at 180°. This would indicate a good vocal mike, but it was as wind-sensitive as the cardioid.

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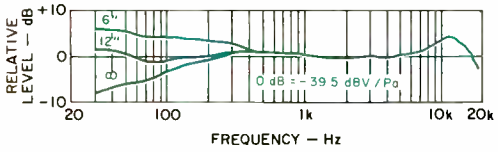


**Fig. 4—On-axis response vs. distance for KM 150 hypercardioid.**

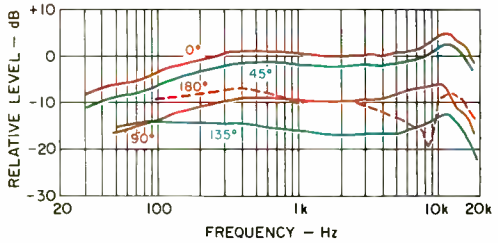


**Fig. 5—Frequency response vs. angle, KM 150 hypercardioid.**

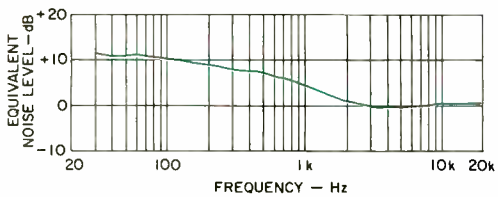


**Fig. 6—Third-octave noise spectrum of KM 140 cardioid.**

The first opportunity to check out the pair of omni mikes, along with the DAT Walkman and power supply, came unexpectedly when folk singer Jim Conley performed at a party in our home. He played in our listening room (which is also our home theater), a space measuring 15 feet wide by 25 feet long. Conley set up in front of the wide movie screen, a rigid drywall structure flanked by Altec 640C loudspeakers. The rear wall of the room is made absorptive by 15 inches of fiberglass; the floor is hard, and the side walls are lined with old radios, which diffuse sound. The mikes were spaced about 7 inches apart, 3 feet in front of the artist and pointed to the ceiling. The resulting tape sounded quite good. Voice and guitar were very natural, and the overall effect was of a live recording in a nightclub; the mikes and their location made the room sound larger than it is. Pickup of audience remarks was quite clear and natural. Stereo imaging was good.

Another recording with the above setup was made of the Mozart Requiem at the First Presbyterian Church of Haddonfield, N.J. by colleague Carlton Read. The church has a square floor plan, with altar, choir, and orchestra in a corner of the square. Acoustics are dry. The recording sounded excellent: The "esses" of the choir were audible without being excessive, while the bass viols and timpani were satisfyingly loud. However, the mikes did not liven up the acoustics enough for this work. Later, when I played the tape on a system with a digital signal processor, the addition of some "church" acoustics helped the sound quite a bit.

The last tryout—with the cardioid mikes in an ORTF (spaced x-y) array pointing at the artists—was made at a concert at my own Haddonfield United Methodist Church, which has a 1,000-seat cruciform sanctuary. Instruments included organ, piano, flute, and tambourine. The mikes were positioned 14 feet high in front of the young people's choir, about 2 feet under the permanently flown AKG C-422 stereo mike (which was set on cardioid pattern), and angled 90° between axes of capsules. A DAT tape was made from each mike. The tape from the Neumanns sounded fairly comparable to the tape from the AKG. With the Neumanns, there was less bass from the organ, but the choir's "esses" were more pleasantly distinct. Also, the stereo perspective was wider and more dramatic. The piano sounded similar on the two tapes, as did the flute. Tambourine was brighter on the Neumann tape.

The listening tests correlated with the lab tests in that the omnis had crisp treble and excellent bass and the cardioids were lacking in bass with distant sound sources. On the whole, the KM 100 series offers excellent performance with reasonable cost, and I would recommend that you try out these microphones. *Jon R. Sank*

**DGX,** *continued from page 57*

The high-frequency sounds of the shaker (or cabaça) that comes in at 1:58 on track 6 of David Chesky's *Club De Sol* (Chesky JD33) sounded quite realistic and detailed when I was sitting down. With my ears in a higher position, the sound was significantly degraded.

On low-frequency third-octave band-limited noise, the DDAS system could keep up with the B & W speakers at the 31-Hz band and above. However, at 31 and 40 Hz, the DDAS system was not quite as clean as the B & W speakers when playing at the same level. At the 20- and 25-Hz bands, a usable amount of fundamental was generated but was accompanied by a noticeable amount of distortion and port wind noise.

On challenging chorus and orchestra material, such as *Mozart: Masses K139 and K257* (Argo 421 365-2), the DDAS system sounded neutral and well balanced, with a wide and detailed soundstage, but only when I was sitting down! On purely orchestral recordings, such as the Handel and Vivaldi compositions on *Highlights on Period Instruments* (Sony Classical SXK 52498), the DDAS system demonstrated excellent accuracy and detail, with a good recovery of recorded ambience.

With a sophisticated DSP-based equalizer included in a system, the designer has the luxury of being able to design a speaker *without* the heavy burden of ensuring that its frequency, phase, and time responses are correct. These characteristics can easily be corrected with the processor. The designer can and *should* place high emphasis on those attributes that can't easily be corrected by equalization—such as distortion, dynamic range, power handling, and directional coverage. I believe that the DDAS system's designers did not take total advantage of the design freedom that an accurate frequency/time equalizer provides.

Overall, the DDAS system exhibited many very positive attributes, including a well-balanced and neutral sound, extended low-distortion bass response, very good dynamics, excellent transient response, and a detailed and accurate soundstage. However, the system's performance does have an overemphasized (but well controlled) low-frequency response and poor vertical coverage. Check it out for yourself!

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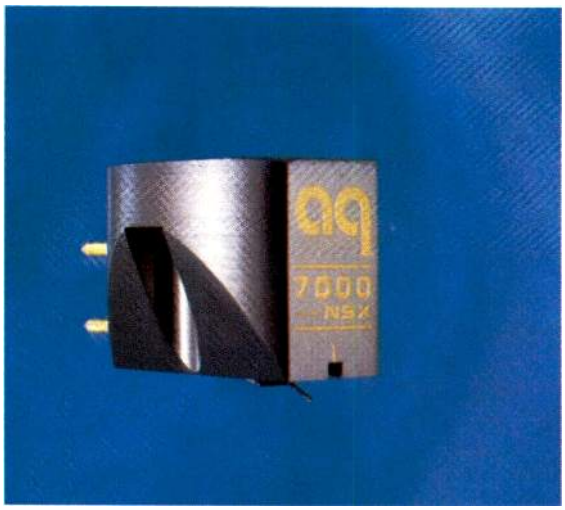
# AUDIOQUEST 7000nsx MOVING-COIL PHONO CARTRIDGE




**The solid boron cantilever is light but sturdy.**

Good as digital has become, there is still much to be said for the joys of analog. High-end cartridges, tonearms, and turntables have improved steadily over the decade since CD first appeared and now offer resolution and detail that rival the very best of digital. It is amazing how good an LP record can sound with a carefully selected turntable, tonearm, and cartridge.

A great cartridge is the key to great analog. An ordinary cartridge can leave records dull, noisy, and musically uninvolving. It is one of the tragedies of audio that a whole generation of audiophiles has grown up knowing analog records only through mediocre cartridges and mediocre players. The result is like seeing a Rembrandt through dirty glass in a dark room.

Some very good cartridges are available at very reasonable prices. The Joseph Grado Signature 8MZII, the Sumiko Blue Point and Blue Point Special, and the Shure V-15 are cases in point. Great cartridges, however, come at a higher price—over $1,000, with some costing well over $3,000.


A cartridge also has to be chosen very carefully, particularly at a time when dealer demonstrations are harder and harder to get. More and more high-end cartridges are fragile. Stylus and cantilever problems have become increasingly common—usually without warranty coverage and involving extremely expensive repairs or cartridge replacement. Many very expensive moving coils have outputs too low to be fully compatible with the gain of the best high-end preamps. This forces the audiophile who buys such a cartridge to accept hiss, hum, and compression of the sound or use a transformer or high-gain pre-preamp that robs the sound of some of its life and detail.

The AudioQuest 7000nsx is a luxury product. It costs $1,595. It already has an excellent reputation for reliability and consistency among the audiophiles I have talked to and offers the sound of a truly great cartridge.

The 7000nsx's coil has a single-layer winding and is made of high-purity solid silver. While experts may debate the importance of given types of wire in interconnects and speaker cables, I know of no cartridge designer who has not found the choice in coil wire to be critical. The cartridge also uses neodymium magnets, a low-resonance sandwich body, and a solid boron cantilever.

This cantilever design is light enough to get the best out of the record, but it is not fragile. My sample has survived several tonearm changes and other exercises in reviewer clumsiness. It is the product of several years of careful evolution and refinement, and other reviewers indicate that its performance is predictable and consistent. While it takes about 20 to 30 hours of breaking in to sound its best, it also sounds good from the start and has provided consistent, superb sound over hundreds of hours of playing. I have yet to hear any cartridge that does an equally realistic job of extracting musically convincing information from the record groove. There are many cartridges that provide unusual amounts of detail or sonic surprises. In virtually every case, however, time shows that they simply have some special or subtle coloration.

The AudioQuest 7000nsx provides exceptional detail, life, and air without altering timbre or natural musical dynamics. In fact, its dynamics are exceptionally lifelike, which is surprisingly rare in expensive, high-end cartridges. Far too many recent high-end designs emphasize information without providing natural musical dynamic con-

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trasts. This kind of sound may be romantic, and offer some of the feeling of sitting in the middle of a large, warm concert hall, but it usually has little to do with what is actually on the record.

Similarly, the 7000nsx provides natural lower-midrange warmth and natural upper-midrange and treble detail and air. Far too many moving-coil cartridges offer either natural timbre and warmth or upper octave detail. I do not find either side of this trade-off pleasant, although I would rather have warmth than the kind of upper-octave detail that dries out the music and often has an audible resonant peak. The 7000nsx is ideal for solo piano, violin, and guitar. Instruments do not change character with frequency and are clearly identifiable by manufacturer and age.

**I BELIEVE THAT THE 7000nsx WILL REMAIN A STATE-OF-THE-ART REFERENCE FOR YEARS.**

The imaging and soundstaging also offer exceptional realism and detail without exaggeration. The imaging is open and natural, with excellent placement in an arc from left to right and with layers of depth. At the same time, there is no artificial exaggeration of depth, width, or left-right separation, and instruments neither wander nor are etched in place.

I am always leery of comparisons between CD and analog record, but one other advantage of the AudioQuest 7000nsx is that it blends very well with the sound of the best digital-to-analog converters. Quite a number of modern cartridges can only be made to sound their best if a system's sound character and speaker placement are matched to the sound of that cartridge. In many cases, this means that such a system is colored in ways that make it unsuitable or less desirable for reproducing CD and digital tapes.

The relative neutrality of the 7000nsx allows you to set up your system to give you the best of both worlds, and I believe this is essential in today's high-end systems. I regard any cartridge that requires tailoring of the rest of a system in ways that color the sound to be a design failure, regardless of how well the system may sound if you only listen to analog records.

I have only two reservations about the 7000nsx. First, its output level is lower than that of some other MC cartridges, though still high enough to be compatible with the MC gain stages of virtually every top preamp. (And I've tested several cartridges with rated outputs that equal or exceed the 7000nsx's 0.3 mV yet deliver significantly less signal to the preamp.)

Second, I would like just a touch more deep bass. The B & W 801 Matrix Series 3 that I now use as one of my reference speakers produces audible bass down to about 18 Hz, so I know that other cartridges can deliver better deep bass from about 70 Hz down. Much depends on the tonearm, though; for example, the 7000nsx sounds relatively flat with an SME Series V or IV arm as compared to my Wheaton Triplanar III.

I should also add a caution that applies to all moving-coil cartridges: No modern, high-end MC cartridge is so robust and tolerant that it can survive careless handling, poor setup, or installation in a mediocre tonearm and turntable. The AudioQuest 7000nsx requires careful setup in terms of tracking (about 1.75 to 1.8 grams), azimuth, and vertical tracking angle. The cartridge body rides low, near the record, and you need to be careful about tonearm height. You have to be reasonably cautious in lowering the arm and cleaning the stylus (always from back to front, never from front to back or side to side).

If the AudioQuest 7000nsx is not perfect, I have yet to hear any cartridge that is as naturally musical and revealing. I believe that the 7000nsx will be a state-of-the-art reference for some years to come. I also believe you will find it to be well worth your while to seek out a dealer who can demonstrate it, if only to learn just how good analog can be.

Most important, it may persuade you that your record collection is still an important part of your musical life. Nothing is more tragic than the audiophile who dumps a good analog collection and shifts into CD simply because he can't take the time to listen to the best of both mediums. Both can be superb, and the high end of audio has never been a sport for the lazy and indifferent! *Anthony H. Cordesman*

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## BACH

## COMPLETE ORGAN WORKS


Illustration: Karen Stolper

**Bach: Complete Organ Works**
*Lionel Rogg, organ*
HARMONIA MUNDI
HMX 290772/83
12 CDs; DDD; 11:18:17

Every now and then a particularly adventurous recording firm, if it has the musical taste to match its venturesomeness, comes forward with one of those rare sets that make the more ardent music lover feel almost like dropping to his knees in thanks. Harmonia Mundi does that with this monumental set, which brings together some of the most magnificent of all music, performed by one of our era's greatest organists, on one of Europe's finest baroque organs.

The remarkably brilliant sound of the splendid organ Johann Andreas Silbermann built in Arlesheim, Switzerland in 1761 (it was renovated from 1959 to 1962) is masterfully recorded and makes this boxed blockbuster set a must for lovers of Bach's organ music. It is also a rare bargain, as a sticker on the wrapping proclaims: "12 CDs for the price of 4"!

During the baroque period, church organs provided the nearest thing to a concert orchestra that most music lovers below the nobility ever managed to hear. As a result, such composers as Frescobaldi, Buxtehude, Bach, and Handel composed some of their greatest music for it. Not only do many major American concert halls not even have an organ, but cinematic and bar-&-grill conditioning has made most American ears react with shock to authentic baroque organ sound, which at first encounter may seem unsettlingly shrill; the Wurlitzer organ from silent-movie days and the electronic Hammond and its successors compare to the baroque organ as a tenor sax does to an oboe. Serious amateurs of baroque music, though, refuse to accept anything else. In this set a feast awaits them.

Don't let Swiss and German stereotypes mislead you. When the music scampers, Lionel Rogg scampers right along with it; in fact, watching his feet in the D Major Fugue, for instance, would prove a serious distraction, for he virtually dances a jig, fully in keeping with this organ's effulgent sound. When rollicking music comes his way, he lets it rollick with joy unconfined. In all music literature, you will find no composition greater than Bach's majestic, overpowering Passacaglia and Fugue, a work both noble and ennobling; Rogg here delivers it in a glowing performance.

All 12 of these discs also contain a high assay of sheer jubilation; no one listening to this radiant music could ever again think of Bach as square or forbidding. If you seek a truly princely gift for that music lover who already has everything, you've found it. *Paul Moor*

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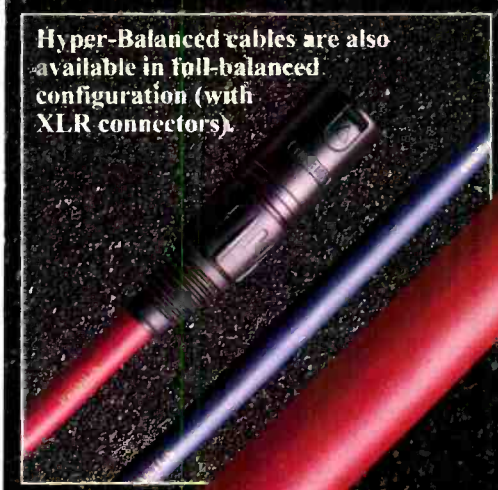
**Hyper-(hi´pər) [[ <Gr *hyper* ]]** *prefix* over, above, beyond, surpassing

**Balance(d) (bal´əns) [[ <LL *bilanx*]]**

1 general harmony between the parts of anything, springing from the observance of just proportion and relationship; esp. in the Arts of Design

2 stability or steadiness due to the equilibrium prevailing between all the forces of any system

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**Richard Strauss: Don Juan; Berlioz: Symphonie Fantastique**

*Royal Philharmonic Orchestra; Rudolf Kempe (Strauss) and Massimo Freccia (Berlioz), conductors*

CHESKY CD88, CD; 64:35

The Cheskys in New York are dedicated to the reconstituting of outstanding tapes from the '60s and such. Here is an interesting one.

As a listener throughout the entire span of the electrical recording age to date, I am more and more astonished at twin aspects of the sound of our art over the years, hand in hand but not related. These two recordings are unmistakably, instantly recognizable as of their time. First, in the musical performance, though one is led by a German conductor, the other an Italian: Spare, often at lightning speed, smooth and, one might say, streamlined, the music is not unattractive but very definitely held in a tight rein. No excess schmaltz, no dwelling over loving details! Businesslike, efficient, gleamingly powerful but cool in the old sense. Not warm. Rudolf Kempe's "Don Juan" whirls through his successive amours and torpors as though he had a plane to catch any moment. Massimo Freccia projects Berlioz's incredibly original and mystical orchestral effects—the horror-movie sounds of his days—with the same spare and precise playing, not really good for the music. Even the guillotine crashes down with scarcely a bump as the head bounces away.

**The recordings here are unmistakably, instantly recognizable as of their time.**

On the audio side, the music is, for this pair of ears, just as instantly identifiable and familiar. The soft, light parts are cool in the new sense, quite deliciously recorded. But whenever the horsepower goes up, there is that distortion. I hesitate to call it distortion, because it worked, but in the end it is that. A roughness, a harshness, which to me is the very sound of electrical recording right through until the digital age. Today it is *gone*! Absolutely. But older engineers well remember the succession of special types of distortion, previously disregarded, which successively occupied audio attention over the years of improvement—intermodulation, phase distortion, and so on. Surprising to find how much of this historical sound still exists as late as the 1960s. It is unmistakable. But it was at the time simply *not heard*. The ear is a wonderfully adaptable organ!

*Edward Tatnall Canby*


**Rachmaninoff: Symphony No. 2; Vocalise**

*Sylvia McNair, soprano; Baltimore Symphony Orchestra, David Zinman*

TELARC CD 80312, CD; DDD; 68:00

Number Two, in the Rachmaninoff symphony series, is surprisingly far back in time. It was begun in 1906, after the composer moved from Russia to Dresden in Germany. Yet the well-known and darkly Romantic Rachmaninoff style, as craggy as the face of the man himself, was already mature and highly developed. At that time, just short of 90 years ago, Richard Strauss was the Great Modernist, with his outlandish Greek-based operas; Schoenberg was still a super-Romantic composer, and Rachmaninoff rated as a darkly Russian conservative. Now, I think, we can hear him as a real innovator, sounding even then as he would in his last big works during World War II. What was once innovative was by 1940, simply, Rachmaninoff, the eternal Romanticist! So does our perception change.

I like this Baltimore performance; it is so very moody, so darkly Slavic, and so unlikely from a city such as Baltimore. Good stuff. The famous Vocalise, for voice without words, was just one of a batch of songs with piano (1912) until somebody realized its catchiness as sheer melody. It makes a good and dreamy ending for this CD.

*Edward Tatnall Canby*


**Shostakovich: Symphony No. 10**

*Atlanta Symphony Orchestra, Yoel Levi*

TELARC CD-80241, CD; DDD; 58:47

A fine Telarc recording and a stunning performance of this rather unfamiliar Shostakovich symphony, generally thought of as his orchestral masterpiece. Telarc seems to be sweeping up our local big-city orchestras one after the other. Let's hope ambition doesn't reach beyond them to the top names, for these "lesser" orchestras reveal some remarkable musical talents. Telarc should hang in and be satisfied with the best.

Number 10 is curiously betwixt and between, well after those enormities and banalities that came out of the stress of World War II and the Germans at the door, but not yet into the dry, pessimistic exercises of the late and dismal-minded Shostakovich, he with the down-turned mouth. The 10th is big but no longer opulent, banal, or—in the Shostakovich context—overly long. The beautifully contrapuntal opening slow movement is a mere half hour. It makes sense, every bit; it has a breadth and an arch and a span that are awesome. The expected and typical explosive scherzo is not anti-German: It is anti-*Stalin*. That, immediately after the dictator's death in 1953, was the potent motivation for the composer, and it accounts for the profundity, no doubt about it.

What distinguishes this extraordinary recording is the projection of all this by an obviously dedicated orchestra, superbly understanding of the musical shape and

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sense as directed by the conductor Yoel Levi. Rarely, very rarely, will you find such musical conductivity among the great orchestras! Nor is there lack of polish—anything but. My congratulations to Atlanta.

*Edward Tatnall Canby*

### David Diamond: Symphony No. 1; Violin Concerto; The Enormous Room

*Ilkka Talvi, violin;*
*Seattle Symphony, Gerard Schwarz*
DELOS DE 3119, CD; DDD; 71:00

David Diamond is, at age 78, the last living member of the "American Symphonist" group (that also included Barber and Copland). His well-crafted and accessible music now makes the *Billboard* classical chart after years of neglect.

This is the third volume in a series. In it Diamond looks back to works from the 1940s that he describes as probably the most modal, melodic, and lyrical that he ever wrote. Later, Diamond adopted a very personal atonal language that avoided doctrinaire serialism.

The First Symphony was written following Diamond's return from studies in Paris with Nadia Boulanger. He worked for the things she emphasized, including "economy, not too much pompousness, good melodies, and contrapuntal know-how."

The Violin Concerto only had a previous single performance, in 1948. A work of high spirits, it is also lyrical, with some syncopated passages. "The Enormous Room" is a free-form fantasia full of striking orchestral sonorities. The Seattle Opera House and John Eargle's engineering combine for a rich and natural soundstage presentation of the orchestra. *John Sunier*

### Bach with Pluck!

*Dusan Bogdanovič, guitar;*
*Elaine Comparone, harpsichord*
ESS.A.Y. CD1023, CD; 72:35

It is the thing today to grace classical records with tricky titles, the better to catch the buying eye. This one merely caused me to stall awhile, until curiosity got the better of me. Bach with guitar? And here are the Six Trio Sonatas for Organ (BWV 525 through 530). Etudes originally composed with three independent melodic lines for two organ keyboards and the pedals and still today a test for any organist's musical coordination. How, then, guitar?

I am glad I broke down and tried this record. It is superb! The playing is delightfully musical; the fast movements are shaped and *phrased* and are as rhythmical as any good dance music. So rare! I had forgotten how good Bach sounds when he is not pounded and banged.

As for the arrangements—for of course they are that even to the transpositions, though they might seem unlikely they are not—Bach himself was an inveterate arranger, transferring music from one medium to another with the utmost ease, even from voices to instruments and vice versa as did most other baroque composers. Always with subtle changes to suit the changed medium. Here, the two upper "voices" are taken by the similar but nicely contrasted guitar and harpsichord (the right hand), the lower voice on the keyboard's lower register (left hand). It works like a charm, and the consummate musicianship of these two and the perfect coordination between them are things to hear. Lighten your life and Bach with a bit of this.

*Edward Tatnall Canby*

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Julian Hirsch-Hirsch Houck Laboratories

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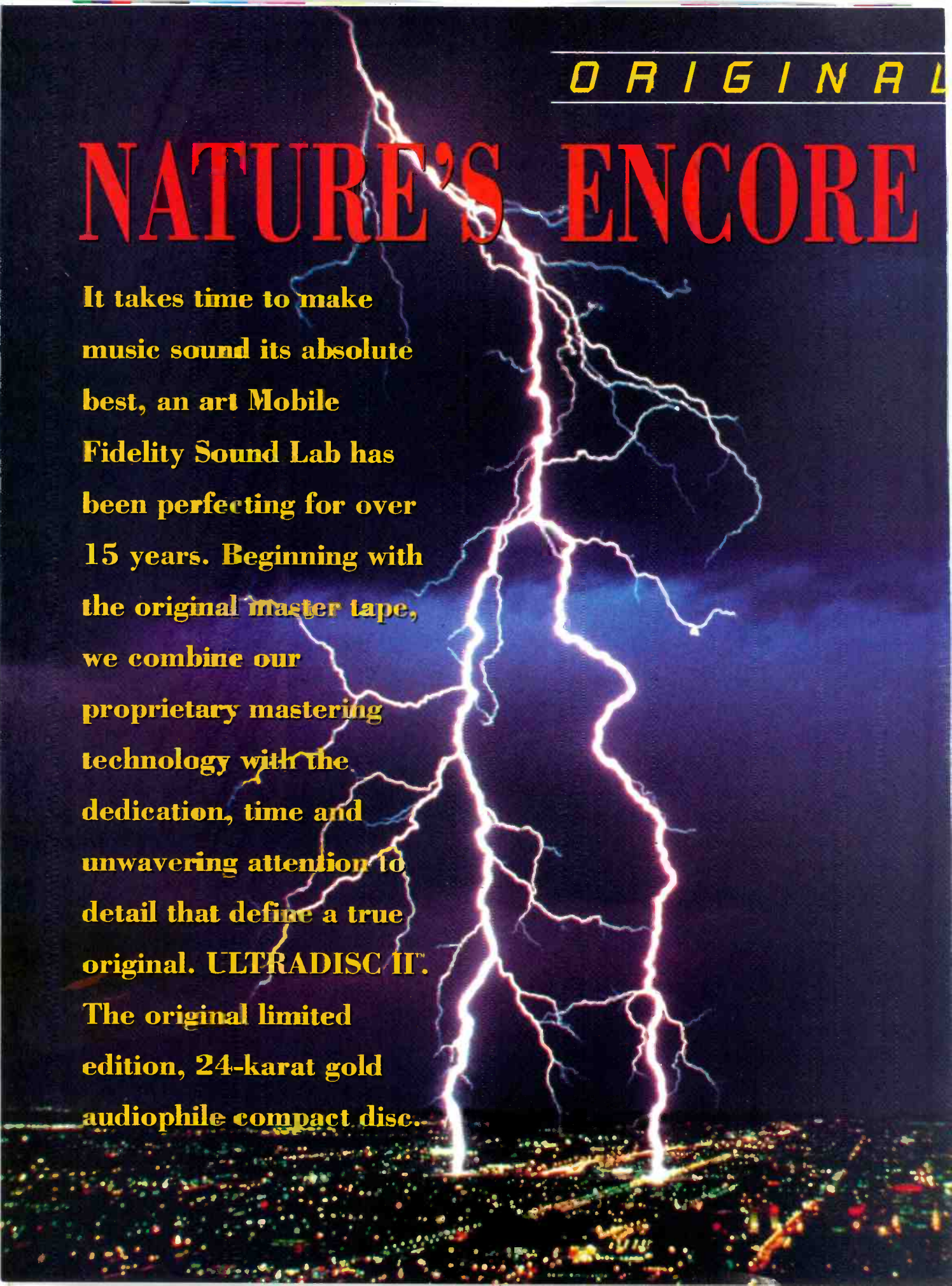
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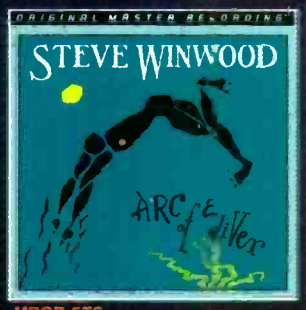


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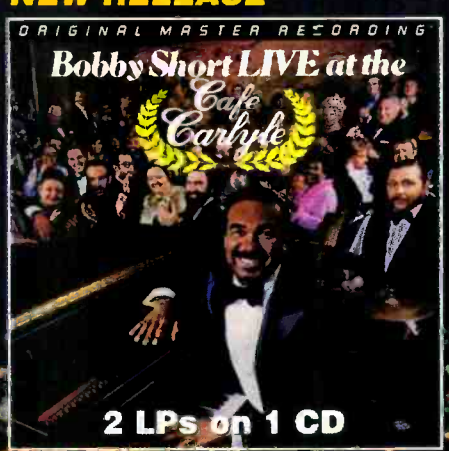


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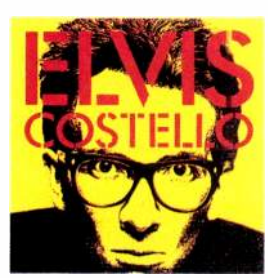
# 2½ YEARS
# ELVIS COSTELLO


**2½ Years**
*Elvis Costello*
RYKODISC RCD 90271-74
Four CDs; 3:38:22
Sound: A+, Presentation: A+

Croon (krōōn) v. 1) To sing or hum softly, murmur. 2) To sing popular songs in a soft, sentimental manner. 3) *Scottish & British regional.* To roar or bellow.

Elvis Costello is a crooner. Always has been. The occasion of Rykodisc's reissue of Costello's first three Columbia LPs—available individually or as part of the *2½ Years* box set—is a perfect time to listen anew to his historic and groundbreaking earliest recordings with the added benefit of hindsight.

From his very first album, 1977's *My Aim Is True*, it is clear that the young Declan MacManus was a dedicated student of the full breadth of pop music before he ever took his stage name. The liner notes he has added to the reissue cite as key early influences Randy Newman, Hoagy Carmichael, Lowell George, John Prine, and The Band. Throughout the album he styles his vocals to emphasize the melody, nowhere more than on the gorgeous ballad "Alison,"




where his breathy, subtle performance reveals true heart and artistry.

At a time when punk rock was breaking loose, it was the anger of Costello's songs that caught people's ears and critics' pens. In retrospect, the most important elements propelling the songs are his stylized singing and his ear for melody and arrangement. Consider that thrilling moment of tension and release near the end of the film noir reggae song "Watching the Detectives," the very first recording with his band The Attractions, where Elvis murmurs "it only took my little finger to blow you away" over near silence before the band storms back in. Or the vocal acrobatics in "Little Triggers" on *This Year's Model*. Or the wonderfully voiced melody of *Armed Forces*' "Accidents Will Happen." Over the course of these first three albums, you can feel Costello's reach and daring and confidence grow track by track as he and his band precociously master an ever-widening array of forms and styles.

Rykodisc and Costello have generously bonus-tracked each original album to include all songs from divergent English and American versions, creating new "universal" editions; also added are relevant B-sides compiled from the *Taking Liberties* collection (which will not be reissued) and surviving demos from the respective periods. Highlights include a demo of "Mystery Dance" with an extra verse (later discarded), demos of "Big Boys" and "Green Shirt" (also with an extra verse), and Costello's charming take on "My Funny Valentine." Also of note are three live takes from a show at Hollywood High featuring a version of "Accidents Will Happen" backed only by grand piano (does a complete tape of this show exist?).

*Illustration: Rick Tulka*

The fourth CD here is a white-hot concert at Toronto's El Mocambo club, originally pressed by CBS Canada as a radio promo item, but one that was widely bootlegged. The sound here is much improved over my treasured boot. Most noteworthy is a version of "Less Than Zero" with totally different lyrics and story line than the original version on *Aim*. Although this CD, unlike the other albums, is not also being reissued separately, there is a way to acquire it without shelling out for the whole box. Consumers who eventually buy the three individual studio CDs have the opportunity to send away for the Mocambo disc for just a nominal shipping and handling fee.

Tremendous care has gone into these reissues, in the tradition of Ryko's Frank Zappa and David Bowie catalog reissues.

**OVER THE COURSE OF THESE DISCS, YOU CAN FEEL COSTELLO'S REACH AND CONFIDENCE GROW TRACK BY TRACK.**

Valued content, again, is a primary concern, resulting in the lavish amount of "extended play" selections (Costello's preferred term for bonus tracks) and Elvis's own liner notes written for the occasion. Sonics are also a concern, especially considering the infamous problems Columbia's Costello catalog CDs have had over the years—and here we have a distinct, palpable improvement. This is most noticeable on *Armed Forces*, where a recently discovered mistake in the equalization of the master tapes—leaving one channel with NAB equalization and the other with CCIR—has been corrected for the first time; thus, Costello's third studio album is only now being heard as intended. And the Mocambo CD has a gloriously furious live ambience.

The rest of the Costello reissues—from *Get Happy!!* to *Blood and Chocolate*—promise to be at least as wonderful as these. Kudos to Rykodisc for fulfilling the vision.

*Michael Tearson*

**Big Red Letter Day**
*Buffalo Tom*
EASTWEST/BEGGARS BANQUET
92292-2


On their last release, *Let Me Come Over*, Buffalo Tom stepped out from behind the feedback, allowing strong melodies to emerge. On *Big Red Letter Day*, the Amherst, Mass. trio continues travelling down that path, with the same pleasing results. Most of the tracks fall into two categories—slower acoustic songs with melancholy lyrics, and deceptively catchy, even anthemic, faster ones with either melancholy or angry lyrics. What makes this a good album—and proof that the band's songwriting is maturing—is the fact that they play and sing with consistent conviction throughout. The better songs begin slowly with sad verses and gentle melodies, only to gain momentum, peaking with passionate choruses and stark epiphanies that transform good songs into haunting music.

*Gerald McCarthy*



**Heidi Berry**
*Heidi Berry*
4AD 9 45301-2

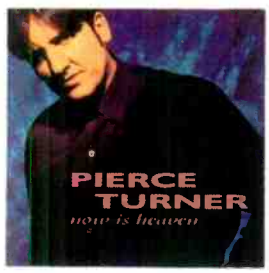
Heidi Berry's enigmatic, sorrowful songs are a cousin to Leonard Cohen's early folkish work. In her singing, she sounds like a warmer, smoother June Tabor. The arrangements, too, are warm and smooth but not at all syrupy. As a whole, this third album feels atmospheric and oddly joyous considering the songs. Standouts are "Mercury," "The Moon and the Sun," and a cover of Anna McGarrigle's "Heart Like a Wheel," an uncommonly apt choice.

*Michael Tearson*


**The Return of The Hellecasters**
*The Hellecasters*
PACIFIC ARTS AUDIO PAAD-5055

Like a nostalgia trip back to 1963 (replete with a convertible and the music cranked up), this is archetypal instrumental rock "played the way they used to" by super-hot guitarists John Jorgenson, Will Ray, and Jerry Donahue, a.k.a. The Hellecasters. Or actually, "played the way they should have," since these fleet-fingered romps through "Peter Gunn," a dizzying

nuclear-powered "Orange Blossom Special," and the haunting, slinky sustain of the Gipsy Kings' "Passion" are really pastiches crafted by precise technique and crystal-clear production you'd never have heard 30 years ago. No matter, this great music captures the essence of the time when pop was still quite a bit hillbilly and thoroughly American. (Pacific Arts Audio, 11858 La Grange Ave., Los Angeles, Cal. 90025.) *Michael Wright*




**Now Is Heaven**
*Pierce Turner*
GREEN LINNET GLCD 3083

A lilting yet rocking album that percolates with Celtic rhythms and sounds. Van Morrison clearly is Pierce Turner's touchstone, and hammering the point home is a celebratory version of "Here Comes the Night," as well as a clutch of Turner's own charming songs. Witty production by John Simon. The stellar cast of players includes Jerry Marotta, Fernando Saunders, Seamus Egan, and Garth Hudson. *Michael Tearson*

## FAST TRACKS

**When I Was a Boy:** *Jane Siberry* (Reprise 9 26824-2). Siberry's latest is as arty as ever and in places as difficult as ever. Brian Eno's production on "Sail Across the Water" is glorious, like the song. This won't be the breakthrough she craves, but the best here is as good as she's ever done. **M.T.**

**Love Under Will:** *Tribe After Tribe* (Megaforce 202-866-915-2). This N.Y.C.-based band's second album of progressive hard/alterna-rock is a melding of textural guitars, smart (mostly) lyrics, big production, and double-drummed rhythmic reminders of their native South Africa. Recommended. **M.W.**

**Sex & Religion:** *Vai* (Relativity 88561-1132-2). Steve Vai and his band explore philosophical paradoxes, aided by the crooning of Devin Townsend and the killer rhythm section of T. M. Stevens and Terry Bozzio. Vai's legendary axe dexterity is kept more within song contexts than expected, though "accessibility" doesn't diminish the soloing or intellect. **M.W.**

**Infamous Angel:** *Iris DeMent* (Warner Bros. 9 45238-2). DeMent is one of the most ingenuous, charming, and original storytelling songwriters in years. Her nasal, heartland voice won't be for everyone, but there's no doubting her sincerity and honesty. John Prine's liner notes reveal him to be a big fan, and that should be a clue. **M.T.**

**Out of Body:** *The Hooters* (MCA MCAD 10753). Their first for MCA is a return to form with catchy, intelligent songs and smart Joe Hardy production. New Hooter Mindy Jostyn's violin is an excellent addition to the arsenal of exotic textures. **M.T.**

**Bus Named Desire:** *Ashley Cleveland* (RCA 66215-2). Ashley and her big, husky, gospel-soaked Southern voice may sometimes remind you of Melissa Etheridge but without all the pathos. A veteran of John Hiatt's band, Ashley is more upbeat in attitude, and *Bus Named Desire* has a smart, gritty feel that gives it resonance. **M.T.**

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| **Pioneer TSA6970** 4-Way 6" x 9" car speakers | NEW |
| **Phase Linear PL2650** 6.5" graphile coxial speakers | $69 |
| **Phase Linear PLS1000** 10" earthshaking subwoofer | LOW |
| **JBL GT102** 10" long throw subwoofers | LOW |
| **JBL GT82** 8" long throw subwoofers | PRICE |
| **JBL GTB12** Full range speaker box w/12" woofers | CALL |
| **Soundstream SS-12** 12" subwoofers for the car | LOW |
| **Brand Name** 5 1/4" 2-way component system | $129 |
| **JVC CSMR626** 6 1/2" marine speakers for boats | $59 |

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| **Advent A1042** 6 1/2" 2-way in-wall speaker | $139 |
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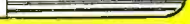

# WAREHOUSE CLEARANCE SALE

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| **Sharp VCH96U** HiFi stereo VCR, 4-hd digital tracking | $359 |
| **Panasonic PV4362** 4-head HiFi stereo VCR | $399 |
| **JVC HRS6800U** S-VHS HiFi VCR with remote control | $599 |
| **JVC HRVP606U** VHS HiFi VCR with jog shuttle & VCR+ | CALL |
| **Hitachi VTF372A** 4-head HiFi VCR with VCR+ | LOW |
| **Hitachi VTF462A** VHS HiFi stereo 5-head flying erase head | PRICE |
| **Mitsubishi HSU55** 4-head, flying erase head HiFi VCR | $429 |

**LASER DISC PLAYERS**

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| **Panasonic LX600** laser disc w/auto reverse & remote | $599 |
| **Panasonic LX900** Laser disc w/jog shuttle, digital FX | CALL |
| **Brand Name** Laser disc player with remote | $399 |
| **Denon LA3100** Laser disc/combi-player jog/shuttle | CALL |
| **Philips CDV400** Multi-laser disc player S-Video out | $429 |
| **Mitsubishi MV6021** Combi-laser disc player | $599 |

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**CAMCORDERS**

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| **Panasonic PV43** 4-hd VHS-C camcorder 20X dig zoom | CALL |
| **Panasonic PVIQ303** VHS-C camcorder 10:1 power zoom | $699 |
| **JVC GRSZ1** S-VHS-C camcorder HiFi stereo digital effects | CALL |
| **JVC GRAX35** VHS-C camcorder 1/3" CCD 10:1 zoom 2 lux | $659 |
| **JVC GRAX55** VHS-C camcorder, synchro edit & light | LOW |
| **Sharp VLE30A** 8mm ViewCam Hi8 w/4" LCD monitor | NEW |
| **Sharp VLHL100U** ViewCam Hi8 w/4" LCD monitor | LOW |
| **Canon UCS3** Hi8 cam flying erase head, 4-hd, 12X zoom | $1299 |

**SWITCHERS & CONTROLLERS**

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| **JVC JXSV55** Audio/video editor editor/mixer w/wipes/fades | $349 |
| **JVC JXS900 Audio/video switcher w/S-video** | CALL |
| **Panasonic WJAVE5** Digital A/V mixer w/special effects | FOR |
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| **Sharp XVH30** LCD projector with remote | PRICE |
| **Panasonic PVM2023** 20" Combination TV/VCR w/remote | $499 |
| **Hitachi 50UX14B** 50" Ultravision projection TV | CALL |
| **Hitachi 20VR** 20" combination TV/VCR (Black or White) | LOW |

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| **Aiwa ADF810** 3-head cassette deck with remote | CALL |
| **Cerwin Vega SW12B** 12" passive subwoofer | $159 |
| **Brand Name DAT** Remote controlled Digital Audio Tape | $469 |
| **Philips CDC935BK** Rated #1 Consumer carousel | CALL |
| **Audio Source VS Two** Center channel w/built-in 30W amp | $99 |
| **JVC TDV661TN** 3-head cassette deck | CALL |
| **Denon DAP 2500** Digital preamp with remote ORIG $1000 | $399 |
| **JBL LX300 • LX500 • L3 • L5 • L7** | CALL |
| **Sherwood RV6010R** Dolby® Pro Logic receiver | $299 |
| **Technics SAGX650 100W x 3 Center/Right/Left** | CALL |
| **NAD 6325** Cassette deck (Factory Reconditioned) | FOR |
| **NAD 2100X** Power amplifier (Factory Reconditioned) | OUR |
| **Advent Legacy III** 2-Way floorstanding Tower speaker | LOW |
| **Advent A1063** Satellite subwoofer system | LOW |
| **Denon DCD3500** Reference CD Player | PRICE |

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| **Ergo 70 Oak** 3-Way bass reflex tower speaker | Orig $1500 | $769 |
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| **Karat 940 Mah** Tuned port 2-way w/6.5" driver | Orig $1800 | $729 |
| **Plus S** 2-Way mini-speaker ORIG $350/pr | | SALE CALL |
| **Plus C** Passive 12" subwoofer ORIG $600/ea | | SALE CALL |
| **Ergo 80** 3-Way bass reflex speakers | | SALE $1199 |
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| **Sony MDRV600** Studio sound stereo headphones | $69 |
| **Beyerdynamics DT511** Open design circumaural phones | CALL |
| **JVC HAW55** High quality cordless headphones | $119 |
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| **RCA WHP101** 3-Way Lightweight cordless RF phones | $139 |
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| **AKG Full Line K260 • K270 • K280 • And More** | CALL |

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**SALE $279**

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|---|---|
| **Aiwa NSX3500** 30W/ch AM/FM/Cass/CD | $459 |
| **Denon D60** CD/Cass/AM/Fm tuner remote mini system | CALL |
| **JVC MXC7** Multi-disc • dual cass AM/FM tuner bi amped | $579 |
| **Panasonic SCCH55** single disc 50W • AM/FM/Cass w/remote | $439 |
| **Technics SCCH555** 3-disc changer 70W mini with remote | CALL |

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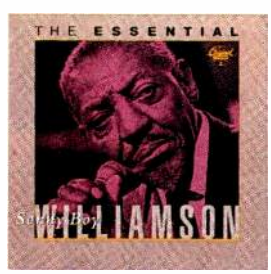
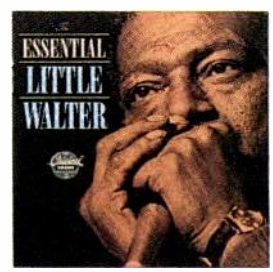
# THE ESSENTIAL SONNY BOY WILLIAMSON

# THE ESSENTIAL LITTLE WALTER

**The Essential**
**Sonny Boy Williamson**
*Sonny Boy Williamson*
CHESS/MCA CHD2-9343
CD; 2:06:18
Sound: B, Presentation: A+




**The Essential Little Walter**
*Little Walter*
CHESS/MCA CHD2-9342
CD; 2:09:31
Sound: B, Presentation: A+

Alex "Rice" Miller's life is a confused jumble of half-truths, but his legacy is clear. As Sonny Boy Williamson, he recorded some of the finest and most influential postwar blues. Already an accomplished musician and recording artist when he signed with Chess in 1955, he distilled his original songs and distinctive style into a string of classics, aided by the cream of Chicago's sidemen: Guitarists Robert Jr. Lockwood, Luther Tucker, and Buddy Guy, pianists Otis Spann and Lafayette Leake, drummer Fred Below, and bassist Willie Dixon.

Sonny Boy's songs grab you with earthy imagery (as in "Born Blind," later covered by The Who on *Tommy* as "Eyesight to the Blind"). Only later do you appreciate his sly wit in "Fattening Frogs for Snakes," his pithy comment about struggling on society's bottom rung. Many of his songs remain blues staples: "Don't Start Me to Talking," "Nine Below Zero," "Down Child," "One Way Out," "Help Me," and a slew of others. At the center of his performances was his harp blowing, among the most expressive in the blues. Every solo is tightly knit into cohesive band performances. Not a note is wasted.

If Williamson represented the height of the amplification of Southern band blues, Little Walter Jacobs was definitely something new under the sun. He intuitively understood (as Jimi Hendrix would years later) that amplifying his instrument didn't merely make it louder; electricity added a new, as-yet-uncharted dimension. Walter redefined the role of the harp in blues bands, and the blues itself was transformed in the process. His successors drew upon not only his songs, solos, and riffs but also his attitude.

Walter was among the first electric bluesmen to seize center stage with aggressive, lengthy solos in a brash "king-of-the-hill" challenge to the world. (Remind anyone of '60s blues rock?) His stripped-down,

*Photographs: Courtesy MCA/Chess files*

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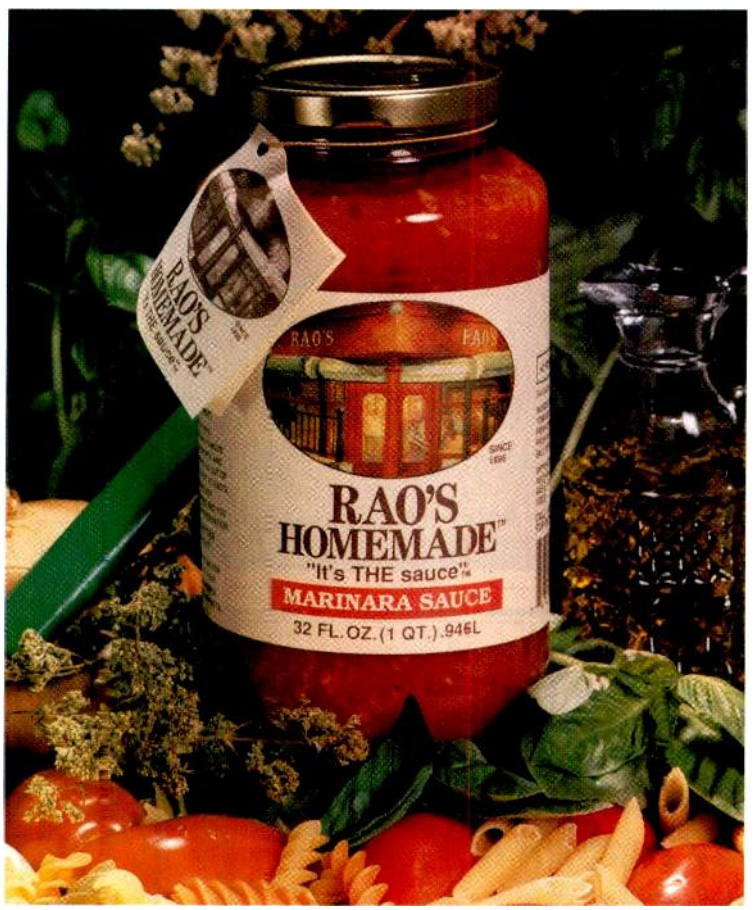


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three-piece back-up unit, driven by the fine, jazz-influenced drumming of Below, was equally adept at propelling him to new heights or getting out of his way when he caught fire.

*The Essential Little Walter* is the holy grail for blues harp players. Walter's strength and fluency on these sides remain astonishing, and one listen to "Boogie" will convert all nonbelievers.

Both sets get the highest recommendation to even marginal fans of electric blues, with one consumer advisory: After you play these CDs, most other harp players will never again sound as good as they did before. *Roy Greenberg*

## FAST TRACKS

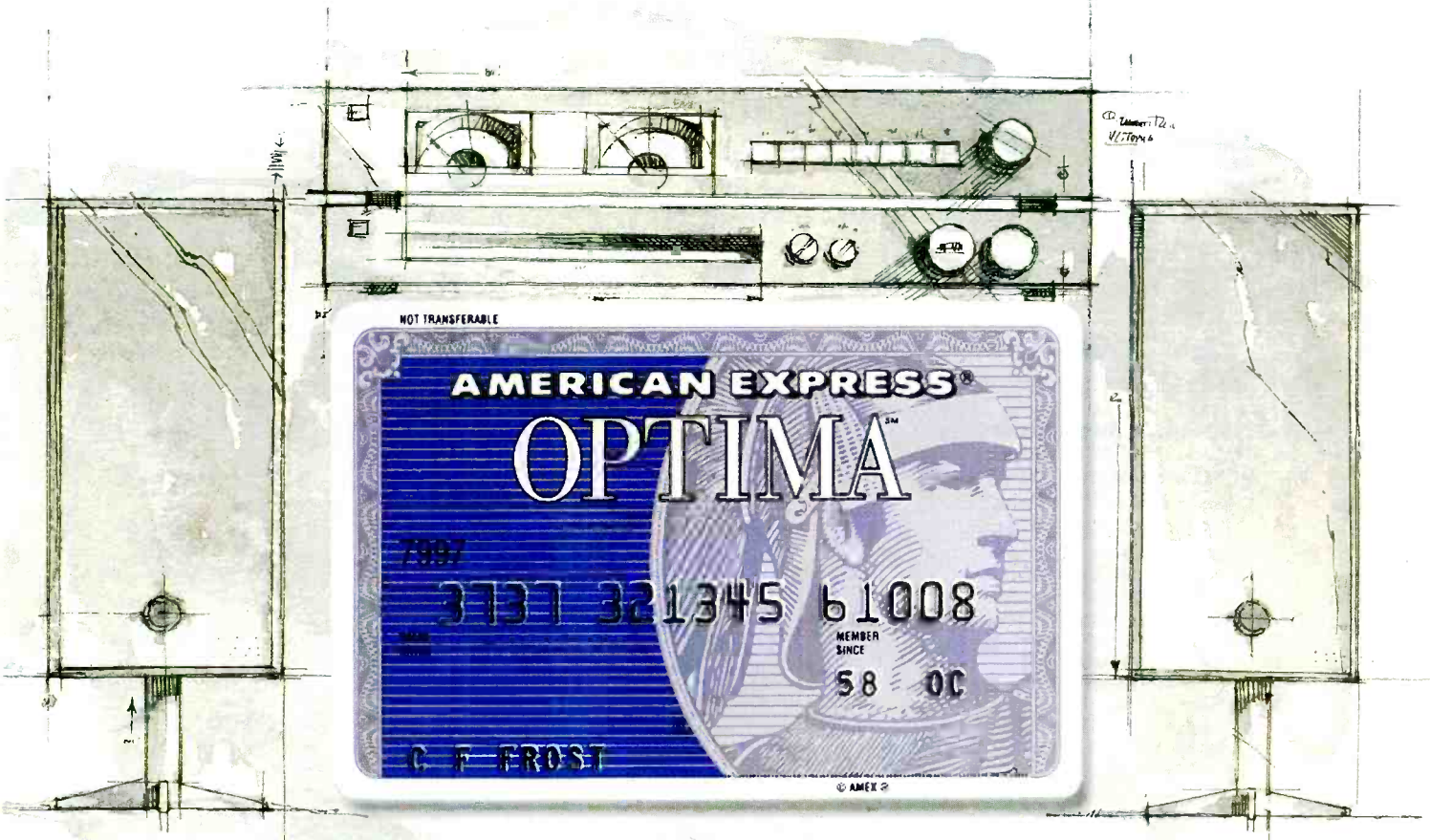
**Blues Summit:** *B.B. King* (MCA MCAD-10710). An instant classic! B.B. duets with Robert Cray, Katie Webster, Buddy Guy, Koko Taylor, Etta James, Lowell Fulson, Albert Collins, Ruth Brown, Irma Thomas, Joe Louis Walker, and perhaps most intriguingly, John Lee Hooker. The sessions must have been a ball. The performances are relaxed but sizzling. **M.T.**

**Excursion:** *Ray Drummond* (Arabesque Recordings AJ0106). For his sixth album, the bassist draws from his two decades worth of compositions. With Joe Lovano in one channel, Craig Handy in the other, and a rhythm section of Danilo Perez and Marvin "Smitty" Smith in both of them, it's a killer session with great execution throughout. **J.W.P.**

**Windows on the World:** *Milton Sealey Trio* (WOW/WTC/North Country Distributors). When he's not working lounges in and around New York, Sealey is a jazz composer with a particularly visceral approach to ballads. This homemade effort—Sealey's third recording—was taped by Rudy Van Gelder and serves as an exquisite showcase for Sealey's talents. Give him your attention; he deserves it. (North Country Distributors, Cadence Building, Redwood, N.Y. 13679.) **M.B.**

**Ease On:** *Jeff Palmer* (AudioQuest AQ-CD 1014). A quirky, bluesy, energetic session that places the organist in charge of guitarist John Abercrombie, altoist Arthur Blythe, and the always on-target drummer Victor Lewis. Guess what? *Ease On* houses some fine moments. (P.O. Box 3060, San Clemente, Cal. 92674.) **J.W.P.**

# SOUND THINKING.

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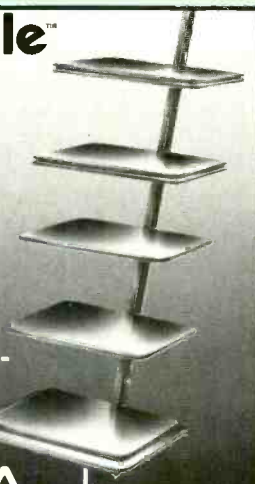

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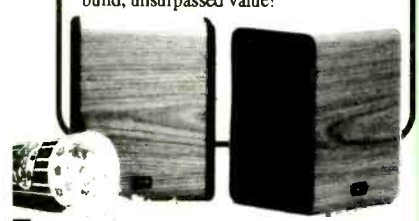

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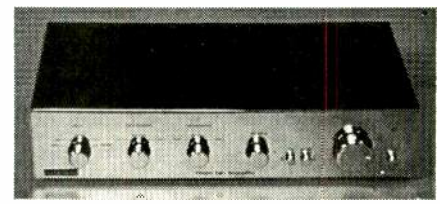

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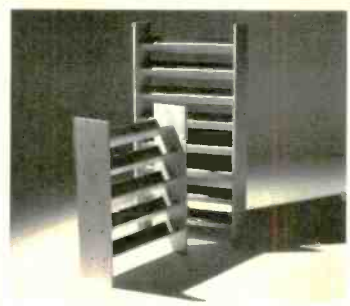

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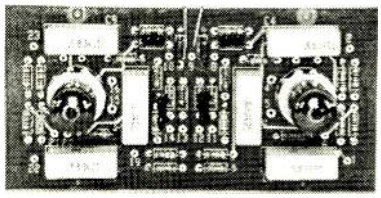

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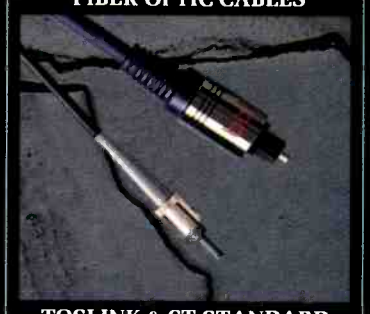

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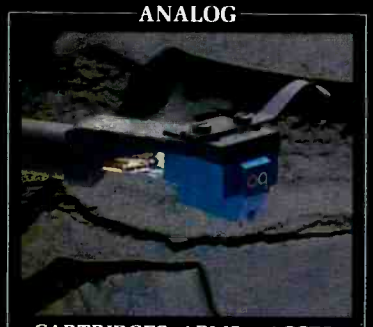

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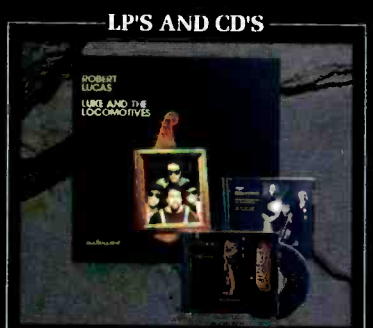


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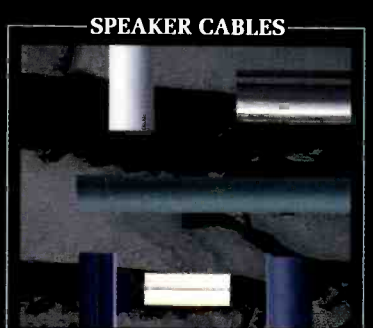

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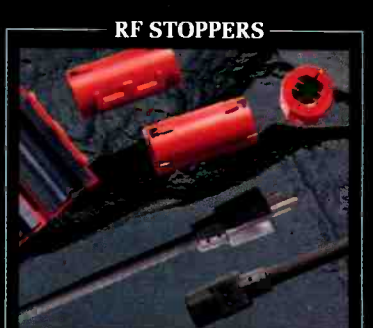

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